STAFF REPORT

Report To: Board of Supervisors **Meeting Date:** December 6, 2018

Staff Contact: Darren Schulz, Public Works Director

Agenda Title: For Possible Action: To adopt Resolution No. ____, a resolution adopting the Carson River Watershed Regional Floodplain Management Plan 2018, (Ed James and Debbie Neddenriep, Carson Water Subconservancy District, edjames@cwsd.org).

Staff Summary: The Carson River Watershed Regional Floodplain Management Plan 2018 is a complete revision to the previously adopted 2008 plan and the 2013 supplemental update. The goal of the 2018 plan is to provide information and suggested actions to reduce flood risks throughout the watershed.

Agenda Action: Resolution **Time Requested:** 15 minutes

Proposed Motion

I move to approve Resolution No. _____, a resolution adopting the Carson River Watershed Regional Floodplain Management Plan 2018.

Board's Strategic Goal

Safety

Previous Action

The 2008 Plan and 2013 Supplemental Update were formally adopted by the City and all 4 counties along the Carson River Watershed.

Background/Issues & Analysis

The Carson Water Subconservancy District completed the Carson River Watershed Regional Floodplain Management Plan 2018. The first Regional Floodplain Management Plan for the Carson River Watershed was created in 2008. The document is intended to be a tool to help counties in their planning process. A supplemental update was completed in 2013.

The 2018 Plan is a complete revision of the 2008 plan which incorporates the 2013 Supplemental Update. It was revised through the Carson River Coalition stakeholder process which allowed county staff members to work with CWSD to guide the document's creation. This 2-year process gathered suggestions, information, and input through several Floodplain Management Working group meetings; jurisdiction interviews and follow-up to those interviews was conducted; and several workshops were held. The goal of the 2018 Plan is to provide information and suggested actions to reduce flood risks throughout the watershed.

The purpose of this Regional Floodplain Management Plan (RFMP) is to create a long-term vision and develop strategies which utilize a Living River Approach for meeting floodplain management objectives to reduce flood damage impacts in the Carson River Watershed. The RFMP revision process reviews regional flood risks and suggests watershed-wide strategies and actions to mitigate and reduce these hazards and risks while

maintaining objectives. The plan includes action items that promote floodplain and flood hazard outreach and education.

Attachments:
1. Resolution.
2. Carson River Watershed Regional Floodplain Management Plan 2018.
3. Carson River Watershed Regional Floodplain Management Plan 2018 Appendices.

Applicable Statute, Code, Policy, Rule or Regulation

Benefits the City through the Federal Community Rating System program under the National Flood Insurance Program

Financial Information

Is there a fiscal impact? ☐ Yes ☒ No

If yes, account name/number:

Is it currently budgeted? ☐ Yes ☐ No

Explanation of Fiscal Impact: N/A

Alternatives

Do not take action at this time

Board Action Taken:

Motion: _____ 1) _____ Aye/Nay

2) _____ _____

_____

_____

_____

_____

_____

(Vote Recorded By)

RESOLUTION NO._____

RESOLUTION OF THE CARSON CITY BOARD OF SUPERVISORS ADOPTING THE CARSON RIVER WATERSHED REGIONAL FLOODPLAIN MANAGEMENT PLAN 2018

WHEREAS, the Carson River flows through Carson City and is a valuable natural resource; and

WHEREAS, Carson City recognizes that flooding has and will continue to cause economic losses and threat to human life and health throughout the entire Carson River Watershed; and

WHEREAS, allowing the Carson River to access its floodplain provides public safety, slows flood waters, reduces peak flows, provides recharge to groundwater basins, and protects wildlife habitat; and

WHEREAS, a regional approach to floodplain management benefits Carson City and all other communities in the Carson River Watershed; and

WHEREAS, the Carson River Watershed Regional Floodplain Management Plan 2018 provides a variety of strategies for floodplain management and protection of floodplain function.

NOW, THEREFORE, be it hereby resolved by the Carson City Board of Supervisors to adopt the Carson River Watershed Regional Floodplain Management Plan 2018, and will strive to work cooperatively with the Carson Water Subconservancy District and other organizations and communities to continue to implement the suggested actions presented in the Plan.

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ADOPTED this _____ day of _____, 2018.

AYES: Supervisors _____

_____

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_____

NAYS: Supervisors _____

_____

ABSENT: Supervisors _____

_____
Robert Crowell, Mayor

ATTEST:

_____
SUSAN MERRIWETHER, Clerk/Recorder

CARSON RIVER WATERSHED FLOODPLAIN MANAGEMENT PLAN 2018

Prepared by:

Michael Baker INTERNATIONAL

Prepared for:

Carson Water Subconservancy District, Alpine County (California), Carson City, Churchill County, Douglas County, Lyon County, Storey County (Nevada).

TABLE OF CONTENTS

List of Figures

List of Figures

APPENDICES

ABBREVIATIONS

ASFPM	Association of State Floodplain Managers
BFE	Base Flood Elevation
cfs	cubic feet per second
CLOMR	Conditional Letter of Map Revision
CRC	Carson River Coalition
CRS	Community Rating System
CWSD	Carson Water Subconservancy District
dFIRM	Digitized Flood Insurance Rate Map
ERM	Elevation Reference Mark
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FMA	Flood Mitigation Assistance
LOMR	Letter of Map Revision
msl	mean sea level
NBMG	Nevada Bureau of Mines and Geology
NDEP	Nevada Division of Environmental Protection
NDWR	Nevada Division of Water Resources
NFIP	National Flood Insurance Program
NGO	Non-Government Organization
NPS	Non-point Source Pollution
NAVD	North American Vertical Datum
SFHA	Special Flood Hazard Area
RFMP	Regional Floodplain Management Plan
UNCE	University of Nevada Cooperative Extension
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey

PREFACE

The purpose of this Regional Floodplain Management Plan (RFMP) is to create a long-term vision and develop strategies which utilize a Living River Approach for meeting floodplain management objectives to reduce flood damage impacts in the Carson River Watershed. The RFMP revision process reviews regional flood risks and suggests watershed-wide strategies and actions to mitigate and reduce these hazards and risks while maintaining objectives. It also documents regional and local progress on meeting plan objectives.

The RFMP is a living document to guide implementation of suggested actions (Table 11) for regional floodplain management planning which is compatible with each community's planning activity documents and is meant to serve as a quick reference for each identified floodplain management strategy.

The five county boards that reside on the Carson River within the watershed have all adopted the 2008 Plan and the 2013 Update in support of this regional floodplain management approach and have agreed to work together to implement these suggested actions. These suggested actions continue to be supported by local, state, and federal agencies, non-government bodies, and residents, and this revised RFMP will again be presented to each of the counties in the Carson River Watershed for formal adoption (Appendix G).

Bafford Lane Bridge, Fallon, Nevada

Acknowledgement:

Thank you to CWSD's board and staff and all the members of the Carson River Coalition Floodplain and River Management Working Group. Your support has been critical. We also want to specifically thank NDEP's Water Quality Planning Division, Lahontan Regional Water Quality Control Board staff and county staff members. The data and input you provided to draft this document are key ingredients to successful regional floodplain management. This RFMP revision was funded through FEMA's Cooperating Technical Partner program.

EXECUTIVE SUMMARY

Flooding is a regular occurrence in the Carson River Watershed. It is also one of the costliest natural disasters our communities face. Ongoing floodplain management can reduce future flooding by planning for new development, population growth, and mitigating flood hazards. This revised RFMP recognizes the importance of balancing the river's natural floodplain form and function with various land uses to reduce flood damage impacts in the Carson River Watershed.

A primary focus of this Carson River Watershed RFMP is promoting floodplain management and restoration activities which allow the river to access its natural floodplain. This RFMP revision reviews regional flood risks and suggests watershed-wide strategies and actions to reduce and mitigate these hazards and risks while maintaining plan objectives.

This RFMP addresses the Federal Emergency Management Agency (FEMA) requirements for floodplain management planning and delineates potential credit for the National Flood Insurance Program (NFIP) Community Rating System (CRS). The RFMP is a supplemental document to the Carson River Watershed Adaptive Stewardship Plan (2007/2017) and updates the Floodplain Conservation Category, one of seven integrated watershed management categories outlined in that document. The RFMP's strategies for flood mitigation are consistent with the State of Nevada's and each participating county's Multi-Hazard Mitigation Plan (Section 5).

This revision is a collaborative effort guided by Carson Water Subconservancy District (CWSD) and the Carson River Coalition's (CRC) Floodplain and River Management Working Group. The Carson River Coalition is a long-standing group of interested stakeholders made up of local, state, and federal agencies, local non-profits, landowners, and residents. CRC members support addressing the impacts of flooding with a regional approach which considers the health and safety of residents, the river, and the watershed. CRC members developed the long-term vision, *the Living River Approach,* which recognizes the

STRATEGIES TO MITIGATE FLOOD HAZARDS:

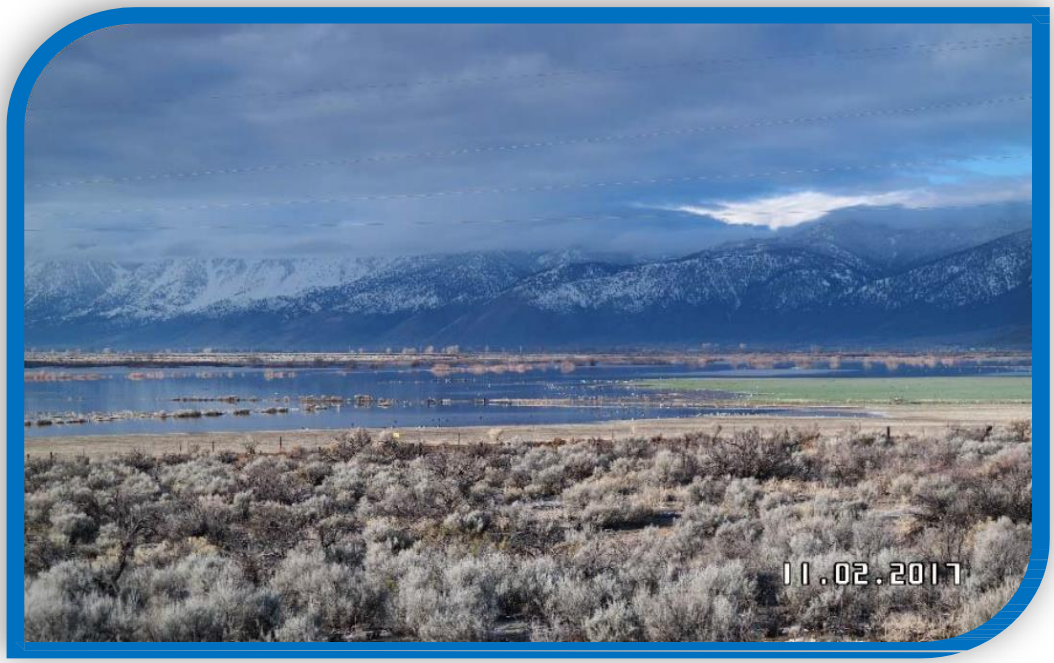
1. Protect Natural Floodplain Function and Values
2. Set Higher Regulatory Standards
3. Collect Flood Data Information and Maintenance
4. Balance Channel Migration and Bank Erosion Monitoring
5. Increase Floodplain and Flood Hazard Outreach and Education
6. Reduce Infrastructure Impact
7. Map/Study Alluvial Fans
8. Minimize Stormwater Impacts

ACHIEVE STRATEGIES WHILE MAINTAINING OBJECTIVES:

- Manage economic development without sacrificing floodplain and river form and function.
- Ensure public safety upstream and downstream.
- Protect property rights while conserving natural resources.
- Provide river continuity and connectivity - connection of river to its floodplain.
- Protect and improve water quality and wildlife habitat.
- Promote conservation of lands within the river corridor.

importance of balancing the river's natural floodplain form and function with various land uses to reduce flood damage impacts in the Carson River Watershed. This RFMP also recognizes that flooding is a watershed-wide challenge and the actions of one community affect surrounding communities. The 48 suggested actions (see Table 11) are outcomes of CRC collaboration, FEMA requirements, and the application of long-term regional floodplain management principles (see Watershed Guiding Principles and/or Carson River Main Message publication).[1, 2]

Carson Valley agricultural lands inundated during 2017 flooding



[1] http://www.cwsd.org/carson-river-coalition/

[2] http://www.unce.unr.edu/publications/files/nr/2004/fs0471.pdf

1.0 INTRODUCTION AND BACKGROUND

STRATEGIES TO MITIGATE FLOOD HAZARDS:

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The first humans likely entered the Carson River Watershed around 12,000 years ago. Known as the Martis people, they built pit houses along the edges of valleys close to springs and smaller streams. During this period the valley bottoms of the Carson Watershed were seasonally inundated, and wetlands were more abundant. The western pioneers didn't arrive *en masse* until the 1840's looking for opportunities to search for gold through placer mining. The larger incorporated settlements we know today (Genoa, Dayton) began to establish during the 1850's in response to the initial mining boom of the Comstock Era from 1860 to 1920. Agricultural operations grew in response to the new demand for food supplies and other goods desired in the rapidly expanding mining communities. Requiring access to water to support crops and animals, farms and ranches occupied the lands adjacent to the Carson River. Agriculture claimed these tracts and inadvertently preserved the undeveloped floodplains we enjoy today along the Carson River.

This agrarian land use has provided for unique opportunities. Most often communities develop directly adjacent to rivers and encroach upon floodplains. As a result, businesses and residences within the floodplain suffer severe economic loss during flood events. In contrast, floodplain development is minimal in Carson River Watershed communities, and today the open floodplain land along the river offers the best forms of natural flood protection.

This document demonstrates how floodplains provide for public safety during flooding events by storing and slowing down floodwaters. They also enhance our communities and help preserve our natural resources by recharging groundwater, protecting water quality, and providing wildlife habitat.

The Carson River Watershed, like most Eastern Sierra basins, experiences different types of flooding depending on the season and nature of the storm. The most damaging type of flood is a rain-on-snow event.

These storms tend to be infrequent but are large-scale and can cause tremendous damage. The second type of flooding is an extended high-water flow event, often associated with an atmospheric river or the succession of multiple storms. These extended events of tremendous hydraulic pressure lead to bank failure and even the collapse of structures like bridges and roads. Finally, the Carson River Watershed experiences a combination of alluvial fan flooding, flash flooding, and debris flows. These tend to be localized and small-scale but can be very damaging to public infrastructure and the affected property owners. These different types of floods create distinct types of hazards and damages. Proper planning and implementation of floodplain management strategies is essential to build resilient communities prepared for all types of flood scenarios.

According to FEMA statistics, floods cause a greater loss of life and property and devastate more families and communities across the United States than all other natural hazards combined. Floods still occur, and losses rise despite attempts to control damage with costly flood control infrastructure (e.g., levees and dams). Across the United States people and communities are recognizing how protecting the natural resources and functions of floodplains can effectively reduce flood losses. Therefore, FEMA encourages communities to adopt and implement programs which preserve floodplain resources and functions through funding and incentives to reduce flood hazards and risk. FEMA recognizes floodplain management plans that provide a written description of the flood risks and actions a community will take to address how to mitigate those flood hazards. The National Institute of Building Sciences recently reported "mitigation funding can save the nation $6 in future disaster costs, for every $1 spent on hazard mitigation (Natural Hazard Mitigation Saves: 2017 interim Report). [3]

A floodplain management plan assists communities in building resiliency and reducing flood risk. Flood hazards in the Carson River Watershed are primarily due to allowing residences and other structures to be built within the floodplain, river corridor, or on alluvial fans. By placing family residences and businesses in flood prone areas, the potential for considerable damage or loss of life increases.

Since there is little storage to provide flood control in the Carson River's upper watershed, large events can lead to unattenuated downstream flooding. During a major flood event, both Carson Valley and Dayton Valley are typically inundated. Over-bank flows often reach depths of multiple feet. Continued development on open floodplain lands and river and alluvial fan corridors will intensify future flooding events causing inundation in areas that have not previously flooded. Initially elevating building pads, foundations and first floors above the 100-year flood level (base flood elevation) may appear to protect the inhabitants. However, this extra fill reduces a floodplain's natural storage capacity, while increasing flow velocity and can divert flows into new locations.

Regional flooding has been exacerbated in the last decade by highly variable weather conditions. The watershed is subject to extreme drought, forest fires, excessive rain, with minimal snowfall one year and record-breaking amounts of snow the next. In addition to variable weather, there is a significant elevation gradient between the high Sierra and the Carson Sink.

[3] https://www.nibs.org/news/381874/National-Institute-of-Building-Sciences-Issues-New-Report-on-the-Value-of-Mitigation.htm

In the past five years, variable weather has created many diverse types of flood hazards that often catch our communities surprised and unprepared. In 2017, riverine floods caused extensive damage watershed- wide. In 2014, 2015, and 2017, localized alluvial fan floods inundated neighborhoods, clogged drainage infrastructure, and covered roads with sediment and debris. In 2016 and 2017, post-fire flooding caused mudslides and debris flows in multiple locations in the upper watershed.

Presently most of Carson Watershed communities are acutely aware of riverine floods; however as our climate and weather patterns become more variable other types of flooding (alluvial fan/flash flooding, post-fire flooding, and extended high riverine flows) are becoming more frequent. We need to increase awareness to these other flood risks and emphasize the necessity of preparation and mitigation. All of these factors warrant this holistic floodplain management approach to identify and mitigate flood hazards throughout the Watershed.

1.1 STRATEGIES

The purpose of this RFMP revision is to continue support of the adopted *Living River Approach* in river and floodplain management and to reduce flood damage impacts in the Carson River Watershed. The *Living River Approach* recognizes the importance of balancing the river's natural floodplain form and function (fluvial geomorphology) with various land uses. Therefore, the objectives and strategies of this RFMP include:

- Connect floodplain to its riverine channels;
- Provide seasonal continuity of riverine flows;
- Improve water quality;
- Recharge the water supply;
- Mitigate flood hazards;
- Keep structures out of unstable, unsafe areas near river channels;
- Minimize modification of riverine channel and riparian habitat;
- Balance sediment input with sediment transport;
- Convey variable flows which preserve and restore habitat in the floodplain;
- Sustain fish, birds, and other wildlife;
- Enhance aesthetic and recreational qualities which enrich the human environment;
- Minimize Stormwater impacts through various best management practices; and
- Implement Post Disaster mitigation measures.

Minimizing stormwater impacts using methods such as green infrastructure/Low Impact Development and Post-Disaster Mitigation are additional strategies identified to mitigate flood hazards. As effects of actions are felt watershed-wide, communities are key to ensure the long-term objectives are maintained as these strategies are implemented.

1.2 REGIONAL APPROACH AND PLAN ADOPTION

Communities benefit from a regional approach through consistency in planning efforts, programs and projects. Carson Water Subconservancy District (CWSD) coordinates cooperative action between counties and other stakeholders to address river and floodplain and river management so hazards within the region are recognized, prioritized, and addressed. This approach provides a big picture view that helps communities understand the benefit of conserving floodplain lands both within and outside their respective jurisdictions to protect community members from flooding hazards. CWSD coordinates messaging with federal, state and local partners so flood outreach and education to residents, policy makers, and elected officials is consistent. A regional approach reduces duplication of efforts, amplifies messaging and supports community efforts.

Regional floodplain management benefits:

- Enhance public safety by reducing flooding risk to all communities;
- Reduce flood damage costs to all communities;
- Enhance awareness of flood danger and risk throughout watershed;
- Provide messaging consistency with resources for local floodplain programs;
- Deliver collaborative support to local floodplain administrators;
- Maximize Community Rating System credit;
- Lower community flood insurance rates; and
- Increase funding leverage and opportunities.

1.3 WATERSHED CHARACTERISTICS

The Carson River Watershed (Watershed) is the land in Nevada and California that captures, stores, and releases rain and snowmelt to the Carson River (Figure 1). It is located east of the Sierra Nevada range and is characterized by partly filled alluvial valleys ranging in elevation from 3,000 to 6,000 feet above mean sea level (msl), surrounded by mountains ranging in elevation from 6,000 to 11,000 feet msl. The area is seismically active with a complex series of faults spanning a large area of Western Nevada. The Genoa Fault Zone is one of the most active faults in the region (Ramelli, et al., 1999).

The watershed consists of 3,966 square miles, with 606 square miles located in California. The Carson River flows approximately 184 miles from its headwaters in Alpine County, California, to the terminus at the Carson Sink in Churchill County, Nevada. The upper watershed in the Sierra Nevada experiences long, very cold winters and short, moderate to warm summers. The upper elevations receive more than 40 inches of precipitation per year, usually as snowfall, decreasing to about four to eight inches in the arid to semi-arid valley floors. Habitats within the watershed range from dry, salt desert scrublands, and sagebrush steppes to lush mountain meadows, forest, and aspen groves. Watershed characteristics and history are comprehensively detailed in Section 3 of the Carson River Watershed Adaptive Stewardship Plan (CWSD 2017).[4]

[4] http://www.cwsd.org/carson-river-watershed-adaptive-stewardship-plan/

Population centers in the watershed include the Minden/Gardnerville area in Douglas County, Carson City, Dayton and Silver Springs in Lyon County, and Fallon in Churchill County. The physical setting of the watershed has somewhat influenced the occurrence and size of population centers. Localized urban and residential areas (often located along or near the river) are separated by larger areas of ranchlands, farmlands, or sagebrush. A significant increase has been seen in population over the last few decades (Table 1), with Lyon and Douglas Counties experiencing the greatest population growth (166% and 74%, respectively). These areas provide the greatest opportunities for continued floodplain protection.

Table 1. Population growth from 1990 to 2015

	1990	2000	2015
Alpine County	1,113	1,113	1,071
Douglas County	27,637	41,259	48,020
Carson City	40,443	52,457	54,742
Lyon County	20,001	34,501	53,179
Storey County	2,526	3,399	4,051
Churchill County	17,938	23,982	24,198

Source: US Census Data (www.data.gov)

Figure 1. Carson River Watershed

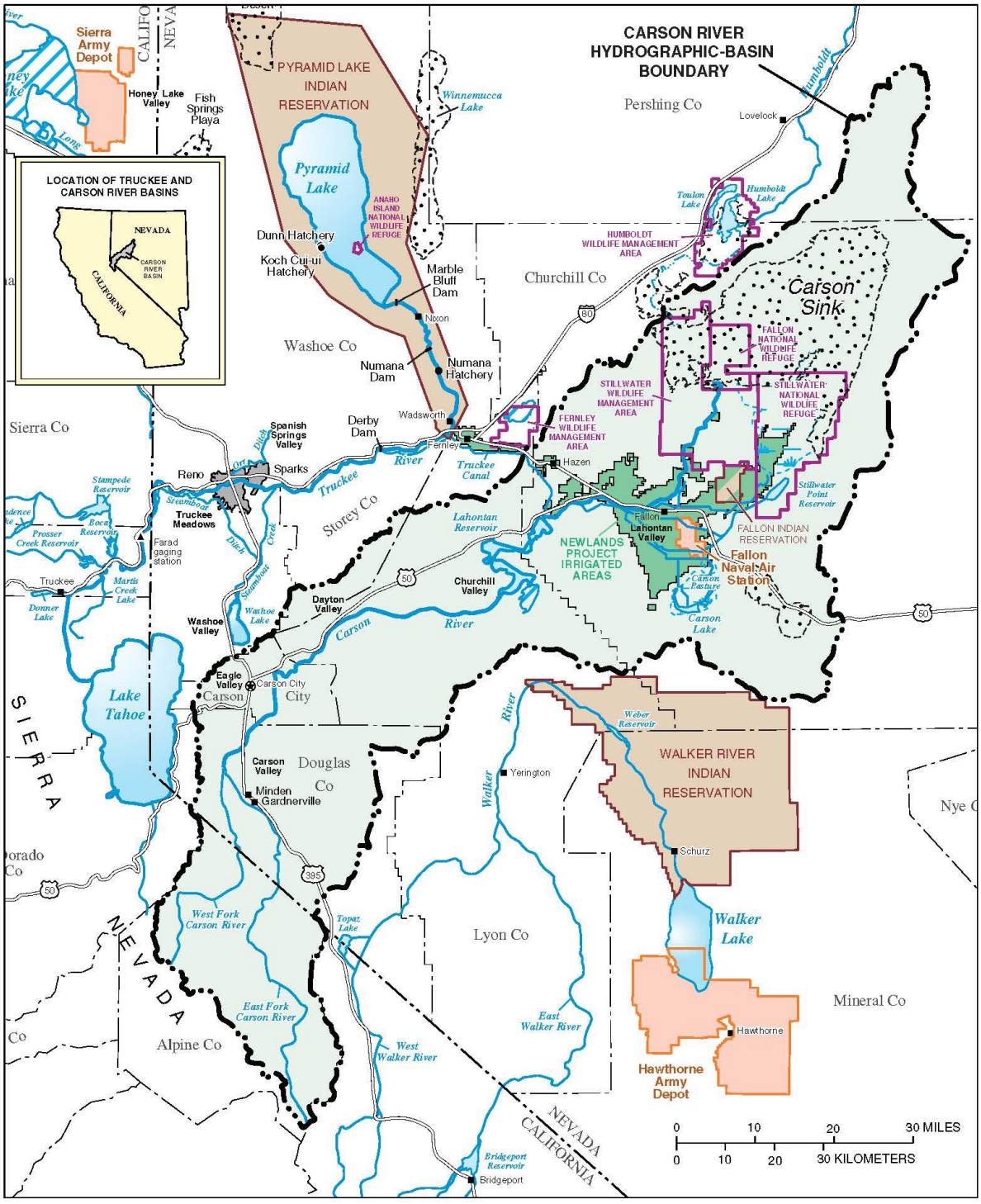


Figure1. USGS hydrologic features map of the Carson River watershed and surroundings.

1.4 ECONOMIC IMPACTS

During the 1997 flood event, economic damages to the communities adjacent to the Carson River were orders of magnitude less than those of adjacent watersheds such as the Truckee River Watershed (Table 2). This difference can largely be attributed to the extent of development on floodplain lands adjacent to the Truckee River in Washoe County, as opposed to the extent of floodplain protection on lands adjacent to the Carson River. The Carson River is surrounded by many areas that have remained agricultural or otherwise undeveloped, thereby retaining floodplain function, and lessening the economic impact when large-scale flooding events occur.

Carson Valley, 1997 Flood

Table 2. 1997 New Year's flood damage estimates and 2017 damage estimates, Carson and Truckee Rivers*

	1997 FLOOD DAMAGE	2017 FLOOD DAMAGE
Alpine County[1]	$331,372	$1,250,003
Douglas County[2]	$13,100,000	$475,000
Carson City[2]	$5,300,000	$1,700,000
Lyon County[2]	$10,000,000	$100,000
Churchill County[2]	$345,000	$5,800,000
Storey County[4]		$288,623
Total Carson River	$29,076,372	$9,613,626
Total Washoe County Only	$686,000,000	

Source: 1) Alpine County Auditor's Office; 2) NBMG 1998; 3) FEMA (https://www.fema.gov/media-library-data/1511811936286-6a8ffe2fd0ff2e7a675025c95704eb79/11-27-2017_Daily_Public_Assistance_Grant_Awards.xlsx)4) Storey County Planner's Office *Cost estimates include entire counties not just the Carson River Watershed and do not represent the actual paid out costs associated with the 1997 flood event.

Many residents have regularly dealt with flooding along the Carson River as the 1997 and 2005 flood events directly affected the floodplain. More recently, summertime cloudburst events on hillslopes or alluvial fans beyond the river corridor have resulted in flash flooding. These flood events have left residents wary and communities in need of money to pay for the cleanup of roads and infrastructure. Record breaking winter snowfall in 2017 led to melt conditions causing high flows and flooding that lingered for months (Table 3). This resulted in saturation of lands and structures adjacent to the river, causing hazardous conditions and continuously eroding the banks and channels. Local ranchers experienced loss of productive lands as portions washed away along the river corridor due to this flooding. Agricultural fields were saturated for months but provided area for the high flows to spread out across the natural floodplain.

With no upstream storage, record snowfall in 2017 also led to record runoff volumes in the Carson River and downstream into Lahontan Reservoir. Lahontan Reservoir was designed to store approximately 300,000 acre-feet of water. However, in 2017, the inflow was three-times this amount. The Carson River alone had its largest cumulative flow volume on record at 920,000 acre-feet (the average is 269,000 acre-feet). Construction of emergency structural improvements to convey the water away from populated areas was accomplished in only a few weeks, as there was significant threat of imminent, widespread, potentially damaging flooding to the communities of Fallon and Churchill County. The actions to release and convey the water from Lahontan Reservoir was at a cost of almost $5.8 million; costs for the Nevada Department of Transportation (NDOT) were approximately $1.5 million for the culverts under Highway 50/95. Monthly average river flow data from 1940 through 2016 (USGS Carson River Gage near Carson City, 10311000) was compared to the monthly flows during 2017, emphasizing the difference between the two periods of record (Table 3, Figure 2). The relentless storms and resultant floods in the first few months of 2017 yielded two Presidential Disaster Declarations in Northern Nevada[5] as summarized in Table 4. While the series of alluvial fan or flash flood events in 2014 and 2015 resulted in damage to residents in some communities, the costs of cleanup did not reach the required minimum to receive a disaster declaration. A lesson learned during those events, however, was that an accumulation of costs by multiple jurisdictions affected could have brought a declaration, potentially allowing for federal funds to help pay for the cleanup and damages.

These data highlight that the communities must maintain an awareness of the different type of flood events and continue to implement management strategies to address these hazards.

[5] DR-4303: PDAs; (Douglas, Lyon, Storey, and Washoe; the independent city of Carson City; and the Pyramid Lake Paiute Tribe, the Reno-Sparks Indian Colony, and the Washoe Tribe of Nevada and California). A total of (Total Public Assistance Grants (PA)), $3,678,371.81 (Emergency Work (Categories A-B)), and $3,936,634.38 (Permanent Work (Categories C-G)).
DR-4307. PDAs: A total of $13,135,370 assessed (Washoe, Storey, Douglas, Carson City, Churchill, Humboldt, Elko); PA grants $8,459,421.78 spent on Emergency Work (Categories A-B)), and $4,990,193.52 (Permanent Work (Categories C-G)).

Table 3. Comparison of average monthly flows (cfs) at Carson River near Carson City

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
1940 – 2016	348	363	409	580	1,153	921	252	53	42	95
2017	1,397	2,302	1,404	1,910	3,162	3,050	1,114	235	215	236

Figure 2. Graph of monthly average flow conditions for 2017 compared to period of record

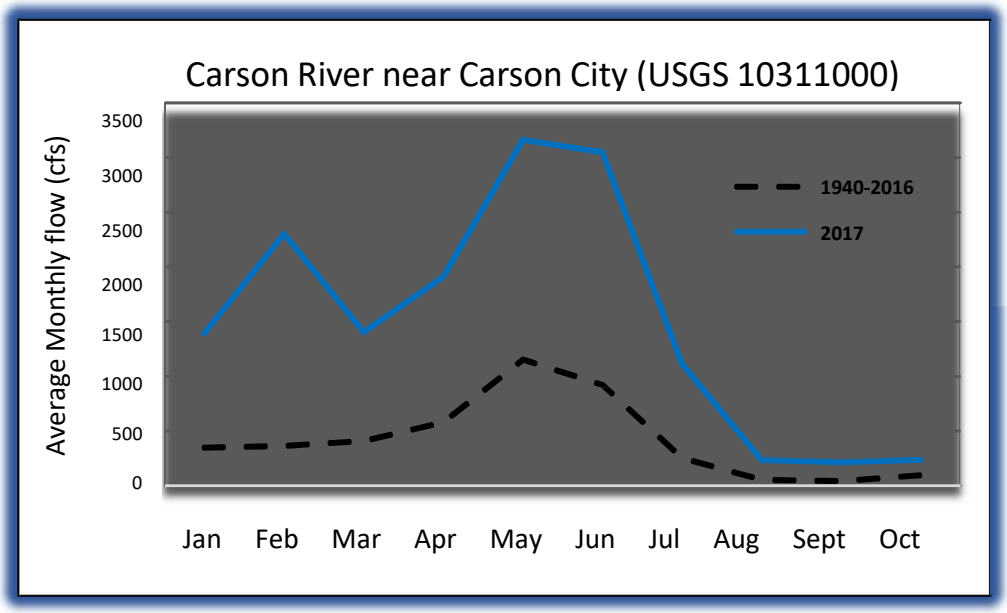


Table 4. Preliminary damage assessment (PDA) in 2017 for northern Nevada counties for which a Presidential disaster was declared

	DAMAGE ASSESSMENT	COUNTIES AFFECTED
January 5-14, 2017 DR-4303	$14,988,043	Washoe, Storey, Lyon, Douglas, Carson City,
Feb. 27-Mar. 3, 2017 DR-4307	$13,135,370	Washoe, Storey, Douglas, Carson City, Churchill, Humboldt, Elko

2.0 FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA)

The Federal Emergency Management Agency (FEMA) coordinates the federal government's response to all domestic disasters, whether natural or man-made. FEMA's suite of disaster actions includes disaster preparation, loss prevention, hazard mitigation, and response and recovery when catastrophes strike. The National Flood Insurance Program (NFIP) was created in 1968 to provide flood insurance to homeowners. The NFIP encourages communities to enact and enforce minimum federal floodplain regulations so residents qualify for flood insurance. Communities that adopt regulations that exceed the NFIP's minimum standards earn premium discounts for residents who purchase flood insurance. This premium discount program is described in depth in section 2.2.

2.1 COOPERATING TECHNICAL PARTNER PROGRAM (CTP)

FEMA carries out some of its flood hazard mitigation activities through the Cooperating Technical Partner (CTP) program. This program provides funding to local communities for actions such as flood hazard map revisions, flood hazard mitigation planning, and outreach and education. Created in 1999 to help FEMA stretch limited mapping dollars and increase local involvement in the creation of floodplain mapping projects, the CTP Program creates partnerships between FEMA and participating NFIP communities, regional agencies, state agencies, tribes, and universities that are interested and capable of being active participants in the FEMA flood hazard mapping program. Each fiscal year, FEMA issues a Notice of Funding Opportunity (NOFO) document to announce the availability of the CTP cooperative agreement funding opportunity. The NOFO describes the available funding, priorities, requirements and process for eligible applicants to request funding for program activities. CWSD has been a CTP since 2005, and through its activities it acquires, administers, and distributes FEMA project funding and oversees all funded projects. Each funding round includes a Mapping Activity Statement (MAS) which identifies the various flood studies and activities that will be accomplished. From 2010 to 2018, CWSD has received approximately $2,800,000 from FEMA, and has provided over $500,000 as in-kind and cash match. Projects resulting from CWSD CTP funding are detailed in Table 5. Listed MAS project funding includes LiDAR or surveying. The CTP agreement is included as Appendix F and the links to CTP projects CWSD has completed is in Appendix D.

Parks and Open Space are good uses in a floodplain. Morgan Mill River Access, Carson City, 2017

Table 5. Mapping activity statement projects completed

MAS	YEAR	CTP PARTNERSHIP PROJECT
1	2012	Physical Map Revision (PMR) of the portions of the Carson River through Lyon County.
2	2014	PMR of the portions of the Carson River from Lyon County to Carson City
3	2015	Hydraulic modeling of the Carson River in the Carson Valley
4	2016	Hydraulic modeling of the Carson River in the Carson Valley; Mitigation Plan and Draft Ordinance created
5	2016	Map alluvial fan watersheds in Douglas County and the Eagle Valley Golf Courses A&B Drainages in Carson City; support Northern Nevada Flood Awareness Campaign.
6	2017	Identification and mitigation projects in Douglas County; support Northern Nevada Flood Awareness Campaign; and creation of Carson City Inundation maps
7	2018	Update the Saliman/Voltaire alluvial fan drainages in Carson City; create a Johnson Lane Area Drainage Master Plan in Douglas County; and update the 2012 Discovery Report and 2013 Regional Watershed Floodplain Management Plan; and funded public outreach and education
8	2018	Creation of a Dayton Valley Area Drainage Master Plan in portions of Lyon and Storey Counties; update floodplain ordinances in Alpine County, California, and Douglas, Carson City, and Lyon Counties in Nevada; and work with state and federal partners to continue flood outreach and education.

2.2 COMMUNITY RATING SYSTEM (CRS)

The Community Rating System (CRS)[6] supports the NFIP by providing a premium discount to policyholders if their communities participate in the program. The CRS program design encourages communities to implement floodplain management programs that go above and beyond the minimum NFIP requirements. Community activities are scored by Public Information Activities; Mapping and Regulatory Activities; Flood Damage Reduction Activities; and Flood Preparedness Activities. These 19 activities are shown in Table 6 and are utilized in formulas that measure the extent a community meets the goals of the CRS program to:

1. Reduce and avoid flood damage to insurable property;
2. Strengthen and support the insurance aspects of the NFIP; and
3. Foster comprehensive floodplain management.

Flood insurance premium discount rates are calculated by a community's CRS classification, which is tabulated as the sum of CRS activity points. There are 10 classes (1 through 10), with a Class 1 Community receiving the greatest flood insurance premium reduction. Table 7 provides a breakdown of the CRS credit points, classification and premium reductions, as well as the status of CRS classification for the counties within the Carson River Watershed.

[6] https://www.fema.gov/media-library-data/1493905477815-d794671adeed5beab6a6304d8ba0b207/633300_2017_CRS_Coordinators_Manual_508.pdf

Table 6. CRS activities outlined in CRS Coordinator's Manual (2017)

	ACTIVITY	MAXIMUM CRS POINTS
300 Public Information Activities	310 Elevation Certificates	116
	320 Map Information	90
	330 Outreach Projects	350
	340 Hazard Disclosure	80
	350 Flood Protection Information	125
	360 Flood Protection Assistance	110
	370 Flood Insurance Promotion	110
400 Mapping and Regulatory Activities	410 Additional Flood Data	802
	420 Open Space Preservation	2,020
	430 Higher Regulatory Standards	2,042
	440 Flood Data Maintenance	222
	450 Stormwater Management	755
500 Flood Damage Reduction Activities	510 Floodplain Management Planning	622
	520 Acquisition and Relocation	2,250
	530 Flood Protection	1,600
	540 Drainage System Maintenance	570
600 Flood Preparedness Activities	610 Flood Warning Program	395
	620 Levee Safety	235
	630 Dam Safety	160

This regional floodplain management plan addresses activities eligible for CRS credit and provides a significant amount of points for participating communities in the Carson River Watershed (Figure 3). CWSD's integrated watershed management process includes many CRS activities which incorporate:

- Public information activities of Section 300 such as public outreach and flood protection information;
- Mapping and regulations activities in Section 400 such as flood hazard mapping and higher regulatory standards; and
- Flood damage reduction activities of Section 500 through its floodplain management planning, floodplain acquisition, and flood protection.

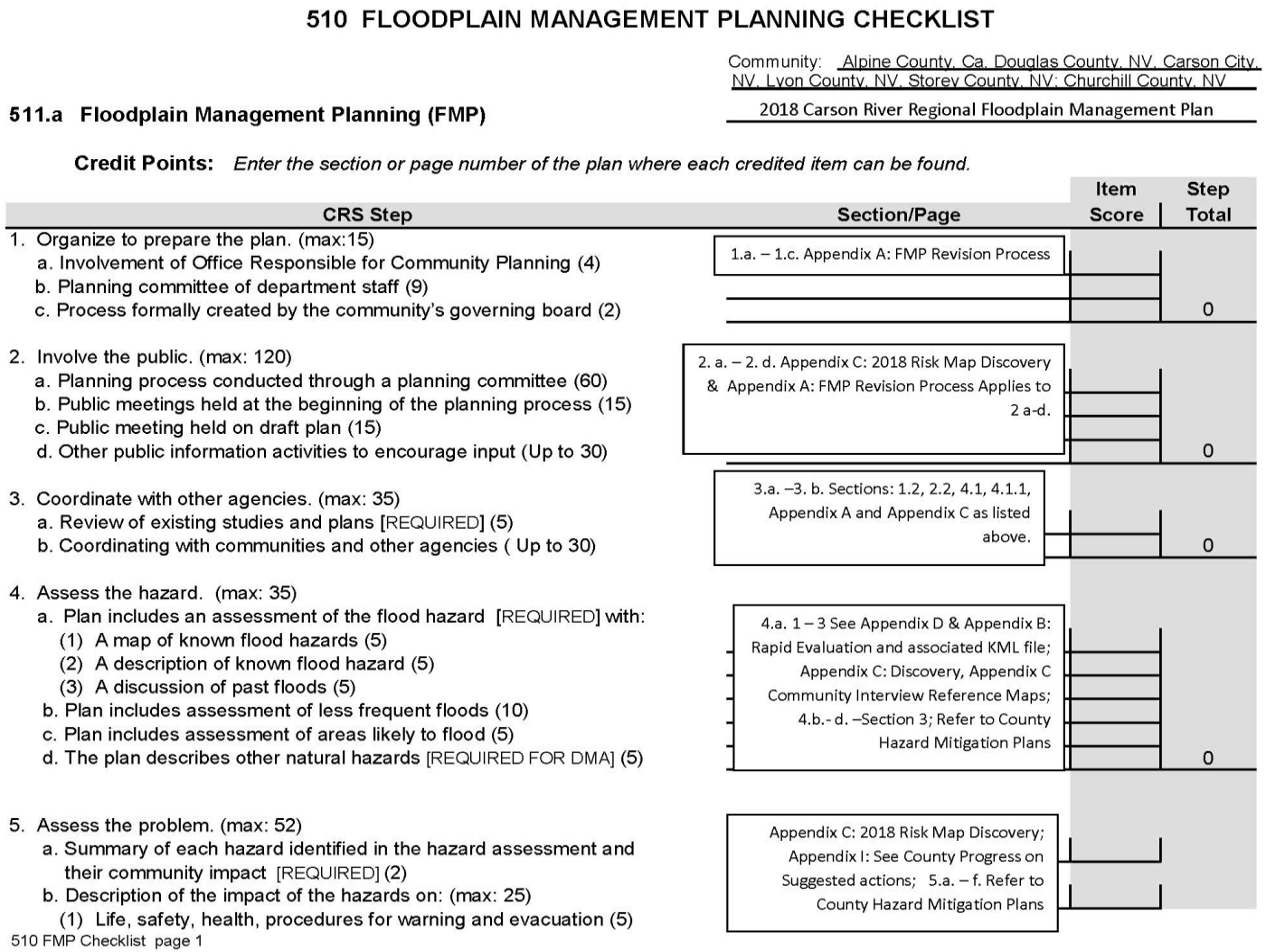
CWSD provides an annual CRS report summarizing these activities to watershed communities who participate in the CRS program. Watershed communities already conduct many of these activities during their regular maintenance and operations; therefore, obtaining the discount is often a matter of documenting those actions. ***A Class 1 community can reduce flood insurance rates for homeowners in special flood hazard areas (SFHA) by 45%.*** Currently, CRS communities in the watershed provide a 10% - 20% flood insurance rate reduction for homeowners in SFHAs as noted in Table 7.

Table 7. Community Rating System classification and flood insurance premium reductions

CREDIT POINTS	CLASS	SFHA	NON-SFHA	JURISDICTION
4,500 and above	1	45%	10%	
4,000 – 4,999	2	40%	10%	
3,500 – 3,999	3	35%	10%	
3,000 – 3,499	4	30%	10%	
2,500 – 2,999	5	25%	10%	
2,000 – 2,499	6	20%	10%	Douglas County, Carson City
1,500 – 1,999	7	15%	5%	
1,000 – 1,499	8	10%	5%	Storey County
500 - 999	9	5%	5%	
0 - 499	10	0	0	Lyon*, Churchill* Alpine County*

Notes: SFHA – special flood hazard area. *Participates in the NFIP but does not currently participate in the CRS program.

Figure 3. CRS 510 Floodplain Management Planning Checklist



510 FLOODPLAIN MANAGEMENT PLANNING CHECKLIST

Community: Alpine County, Ca, Douglas County, NV, Carson City, NV, Lyon County, NV, Storey County, NV; Churchill County, NV

511.a Floodplain Management Planning (FMP)

2018 Carson River Regional Floodplain Management Plan

Credit Points: *Enter the section or page number of the plan where each credited item can be found.*

CRS Step	Section/Page	Item Score	Step Total
1. Organize to prepare the plan. (max:15)			
a. Involvement of Office Responsible for Community Planning (4)	1.a. – 1.c. Appendix A: FMP Revision Process		
b. Planning committee of department staff (9)			
c. Process formally created by the community's governing board (2)			0
2. Involve the public. (max: 120)			
a. Planning process conducted through a planning committee (60)	2. a. – 2. d. Appendix C: 2018 Risk Map Discovery & Appendix A: FMP Revision Process Applies to 2 a-d.		
b. Public meetings held at the beginning of the planning process (15)			
c. Public meeting held on draft plan (15)			
d. Other public information activities to encourage input (Up to 30)			0
3. Coordinate with other agencies. (max: 35)			
a. Review of existing studies and plans [REQUIRED] (5)	3.a. –3. b. Sections: 1.2, 2.2, 4.1, 4.1.1, Appendix A and Appendix C as listed above.		
b. Coordinating with communities and other agencies (Up to 30)			0
4. Assess the hazard. (max: 35)			
a. Plan includes an assessment of the flood hazard [REQUIRED] with:	4.a. 1 – 3 See Appendix D & Appendix B: Rapid Evaluation and associated KML file; Appendix C: Discovery, Appendix C Community Interview Reference Maps; 4.b.- d. –Section 3; Refer to County Hazard Mitigation Plans		
(1) A map of known flood hazards (5)			
(2) A description of known flood hazard (5)			
(3) A discussion of past floods (5)			
b. Plan includes assessment of less frequent floods (10)			
c. Plan includes assessment of areas likely to flood (5)			
d. The plan describes other natural hazards [REQUIRED FOR DMA] (5)			0
5. Assess the problem. (max: 52)			
a. Summary of each hazard identified in the hazard assessment and their community impact [REQUIRED] (2)	Appendix C: 2018 Risk Map Discovery; Appendix I: See County Progress on Suggested actions; 5.a. – f. Refer to County Hazard Mitigation Plans		
b. Description of the impact of the hazards on: (max: 25)			
(1) Life, safety, health, procedures for warning and evacuation (5)			

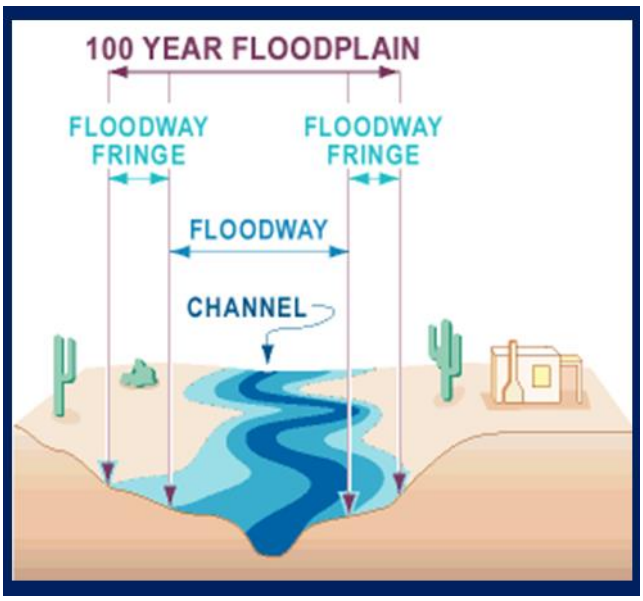
510 FMP Checklist page 1

(2) Public health inlcuding health hazards to floodwaters/mold (5) (3) Critical facilities and infrastructure (5) (4) The community's economy and tax base (5) (5) Number and type of affected buildings (5) c. Review of all damaged buildings/flood insurance claims (5) d. Areas the provide natural floodplain functions (5) e. Development/redevelopment/Population Trends (7) f. Impact of future flooding conditions outline in Step 4, item c (5)	Appendix C: 2018 Risk Map Discovery; Appendix E: See County Progress on Suggested actions; 5.a. – f. Refer to County Hazard Mitigation Plans	0
6. Set goals. [REQUIRED] (2)	Section 1 and Section 4, Table 11; Appendix C: 2018 Risk Map Discovery;	0
7. Review possible activities. (max: 35) a. Preventive activities (5) b. Floodplain Management Regulatory/current & future conditions (5) c. Property protection activities (5) d. Natural resource protection activities (5) e. Emergency services activities (5) f. Structural projects (5) g. Public information activities (5)	Section 4 applies to all sections; specifics called out for each: 7.a. Section 1 & Section 4.3,4.5,4.6, 4.8 & Table 11; 7.b. Section 4.2; 7. c. Sections 4.1, 4.3; 7.d. Section 4.1; 7.e. Section 7; 7.f. Section 4.3 Appendix I; 7.g. Section 4.5	0
8. Draft an action plan. (max: 60) a. Actions must be prioritized [REQUIRED] (1) Recommendations for activities from two of the six categories (10) (2) Recommendations for activities from three of the six categories (20) (3) Recommendations for activities from four of the six categories (30) (4) Recommendations for activities from five of the six categories (45) b. Post-disaster mitigation policies and procedures (10) c. Action items for mitigation of other hazards (5)	8.a. – 8. c. Conducted by each County Section 4 Suggested Actions is the Action Plan. See Also County Hazard Mitigation Plans	0
9. Adopt the plan. (2)	9. See Appendix G for County Adoption Dates	0
10. Implement, evaluate and revise. (max: 26) a. Procedures to monitor and recommend revisions [REQUIRED] (2) b. Same planning committee or successor committee that qualifies under Section 511.a.2 (a) does the evaluation (24)	10.a. – b. Carson River Coalition Floodplain & River Mgt working groups meets regularly to assess and recommend revisions. Regional FMP is updated every 5 years. Refer to Appendix A	0
Maximum Credit for 510 FMP = 382	**Plan Total:**	**0**

510 FMP Checklist page 2

2.3 FLOODPLAIN 101

Figure 4. Floodplain Components



This section provides a brief overview of floodplains, how they function, and describes how FEMA regulates floodplains through the National Flood Insurance Program (NFIP).

The level area bordering a river channel is known as the floodplain; the area that is naturally subject to flooding (Figure 4). The river channel meanders through the landscape and over time shapes the surface geology of the landscape and deposits sand, silt, and other material. These deposits are referred to as alluvium.

The floodway is a critical component of the floodplain relative to maintaining the flood carrying capacity of the river. For regulatory purposes, the floodplain is divided into the floodway and the floodway fringe. A "Regulatory Floodway" means the channel of a river or other watercourse and the adjacent land areas that must be reserved to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. Communities must regulate development in these floodways to ensure that there are no increases (also known as zero rise) in flood elevations. Within the floodway fringe, there must be no more than a 1' rise in flood elevations above base flood elevations.

Floodplains perform natural and beneficial functions. FEMA describes three types of "natural and beneficial functions" that warrant protecting floodplains in their natural state (FEMA 2002).

FEMA encourages state, local, and private programs that preserve or restore the natural state of floodplains.

1. **Floodplains** in their natural state have an important positive impact on flooding. Flood waters can spread over a large area in floodplains that have not been encroached upon. This **reduces flood velocities** and provides flood storage to **reduce peak flows downstream**. Vegetation on the floodplain surface stabilizes soils during flooding. Protected floodplains reduce flood energy and, therefore, reduce damage to adjacent properties and areas downstream.
2. **Floodplains** in their natural state provide "ancillary beneficial functions" beyond flood reduction. **Water quality is improved** in areas where natural vegetative cover acts as a filter for runoff and overbank flows. Natural floodplains moderate water temperature, reducing the possibility of damaging impacts to plants and animals.
3. **Floodplains** can act as **recharge** areas for **groundwater**, reduce the frequency of low flow events, and increase minimum flow rates of riverine systems.
4. **Floodplains provide habitat** for diverse species of flora and fauna, some of which can live nowhere else. They are particularly important as breeding and feeding areas for birds and other wildlife.

Floodplain Economic Value is often not considered. Services provided by undeveloped floodplain lands include flood protection, a public safety benefit, improved water quality, flood water retention, and wildlife habitat. These are economic goods even if they are not explicitly bought and sold like other commodities (Lichtenberg 1994). Floodplain managers recognize the costs to landowners of open floodplain lands who provide the benefits of these natural goods and services. Often referred to as **ecosystem services**, it is critical to acknowledge and support landowners who provide these benefits by preserving undeveloped or agricultural floodplain lands.

Development within floodplains often occurs without consideration of the effects on floodplain function. Development increases impermeable surfaces, such as buildings and pavement, as it replaces vegetative cover. Rather than being infiltrated into the ground, water runs off these hard surfaces. Replacing naturally functioning floodplains with impermeable surfaces significantly impacts water quality. This runoff becomes a vector for diffuse "nonpoint sources" (NPS) of pollution, such as lawn fertilizers, leached materials from waste disposal, sediment from excessive erosion, and chemicals from automobiles, to name a few. As NPS pollution accumulates in runoff, it threatens water quality. Natural floodplains and vegetated buffers along waterways can help significantly to mitigate this NPS pollution, also known as polluted runoff.

Land use that allows and encourages native vegetation to flourish is highly suitable for floodplains. Well-placed parks, trails, or other recreational areas that include native vegetation are ideal for flood storage capacity. They support the floodplain's natural and beneficial functions that protect water quality and sustain wildlife habitat. In the Carson River Watershed, agricultural lands provide a sizable portion of open lands that maintain flood storage capacity. These compatible land use choices are critical to naturally reduce flood hazard risks associated with a more developed floodplain.

A 100-year flood does not only occur once every hundred years; it can occur anytime since there's a 1% chance it could occur in any given year.

Floods are frequently defined in probability terms of occurring in a given year. Floods are classified according to their frequency and depth. For instance, there are 10-year, 25-year, 50-year, 100-year, and 500-year floods. A 100-year flood is less frequent than a 10-year flood but is deeper and far more destructive. The 100-year flood is commonly referred to as the "base flood." However, floodplain managers are moving away from calling it a 100-year flood since many people underestimate their risk. Instead, they are referring to the base flood as a flood which has a 1% chance of occurring in any given year. The 1% annual chance (or 100-year) floodplain and the floodway makes up the Special Flood Hazard Area (SFHA). Buildings located within the SFHA are required to have flood insurance as a condition of receiving a federally-backed mortgage loan or a home equity loan. Given that most mortgages have a 30- year repayment period, there is a 26% chance that the building located within a higher risk flood area will experience flooding during the life of the loan (Table 8). The occurrence of a flood does not affect the probability of a flood to occur again in the same or next year. Flood frequency values adjust either up or down as more data is collected and the flood frequency is recalculated. Bank full discharge is predicted to occur for most alluvial streams, like the Carson River, once every 1.5 years on average (Leopold 1994). Out-of-bank flooding occurs once every 2.3 years on average, with a 40% chance of occurring in a given year. Inappropriate development on vulnerable floodplain lands can cause an increase in the risk and frequency of flood-related damages to property and infrastructure. It is important to encourage

homeowners in areas adjacent to or in potentially susceptible areas to purchase flood insurance. As many residents learned during the 2014-2015 alluvial fan/flash flood events, residents everywhere must be aware of potential flood risks and hazards and be prepared accordingly.

Table 8. Statistical chances of being flooded during a 30-year mortgage.
Percentages represent the probability of the flood occurring in any given year.

PERIOD OF TIME	10-YR FLOOD	25-YEAR FLOOD	50-YEAR FLOOD	100-YEAR FLOOD
1 year*	10%	4%	2%	1%
10 years	65%	34%	18%	10%
20 years	88%	56%	33%	18%
30 years	96%	71%	45%	26%
50 years	99%	87%	64%	39%

Source: Morgan, 2003

Floodways and flood zones are denoted on a FEMA flood insurance rate map (FIRM). FIRM maps delineate the flood hazard areas and divide the mapped areas into zones according to flood hazard factors. They are prepared for insurance rating, land use regulations, and for lenders in determining areas where flood insurance must be purchased. These are the maps that local governments typically use for determining locations of SFHAs. SFHAs have a high risk of flooding and are delineated by FEMA as flood Zones A and V (V refers to coastal flooding). Appendix C: 2018 Risk MAP Discovery Report shows the FEMA flood zones and links to FEMA DFIRMS provided in Appendix D. Because of activities coordinated by CWSD (see Table 5), FIRMs for many jurisdictions in the watershed have been and continue to be updated (Douglas, Carson, Lyon). In the remaining jurisdictions where FIRMs are outdated, the current watershed conditions may not be correctly represented; however, those jurisdictions are considering updating their county's FIRMS.

3.0 FLOOD HISTORY AND RISK ASSESSMENT

Repeated incidents of flooding in the Carson River Watershed are detailed on the U.S. Geological Survey (USGS) website, "Flood Chronology of the Carson River Basin." While rain-on-snow, high-intensity and short-duration flood events continue to occur, other flood events have raised awareness to the distinct types of flood hazards. These events include alluvial fan flooding; post-fire debris floods; extended periods of high river flows; and consistent rain which overwhelm stormwater systems. Incidents of these types of floods are described in detail in section 3.1.

The National Oceanographic and Atmospheric Administration (NOAA) National Weather Service (NWS) website[7]provides information on flood levels and associated potential flood impacts. Table 9 provides risk assessment information from NWS for the Carson River near Carson City. As evidenced in the table, 9,800 cfs begins to cause significant impacts to communities from flooding. If future conditions result in more frequent and more intense flooding events, ***a flood greater than the 22,000 cfs event experienced in 1997, is not unrealistic***. For reference, in 2017, peak flow reached 10,500 cfs during the February runoff period. Sustained flows of 1,500 to over 3,000 cfs continued from March through October.

USGS Flood Chronology of the Carson River Basin available online at: https://nevada.usgs.gov/crfld/Carson/floodevents.htm

Flooding in Dayton Valley area 2017 (Courtesy NWS)

[7] https://water.weather.gov/ahps2/hydrograph.php?wfo=rev&gage=stwn2

Table 9. Potential flood impacts related to flood stage for Carson River near Carson City (USGS)
(Source: NOAA National Weather Service, Advanced Hydrologic Prediction Service: Reno: Carson River near Carson City)

LEVEL (FT)	FLOW (CFS)	POTENTIAL FLOOD IMPACTS
19.0	38,000	Incredible flood with damage previously unknown from Carson Valley to Fort Churchill including Empire and Dayton areas. USGS estimated 100 yr. flood.
17.0	29,600	Record flooding. All towns cut off…bridges and roads destroyed.
16.0	25,800	Near record flooding with massive destruction throughout reach. Most towns isolated with transportation nearly impossible.
15.0	22,200	Major flood disaster with widespread destruction throughout reach from Genoa to Weeks. Transportation extremely difficult.
13.5	17,400	Flood disaster throughout reach. Transportation very difficult. Large number of structures affected and infrastructure damage (roads, bridges, power, water).
12.0	13,300	Extensive flooding with major damage. Most roads in valley areas flooded making transportation difficult. Massive erosion with large agricultural losses and cattle drownings.
11.0	10,900	Major flooding. Many roads and highways flooded. Transportation becoming difficult…US Hwy 395 closes. Massive bank erosion with the ability to wash away buildings…cars…roads. River channel begins to move around laterally.
10.5	9,800	Moderate flooding through reach. Damage to roads, bridges, crops, irrigation systems, and buildings in lower areas. Transportation begins to be affected.
10.0	8,800	Flood stage. Minor to moderate lowland flooding with several homes having flood problems in Genoa, Carson Valley, Stewart, and Dayton. Minor to moderate damage to agriculture.
9.5	7,800	Minor flood impacts in lower portions of reach.
9.0	6,900	Minor lowland flooding through reach in lower flood prone areas.
8.5	6,000	Minimal lowland flooding through reach.
8.0	5,200	Monitoring stage. Flood threat and localized overbank flows begin in lowest areas.

3.1 TYPES OF FLOOD HAZARDS

Flooding, whether localized or basin-wide, is a common occurrence in the watershed. The three main types of flooding that occur are described by USGS (2006) as the following:

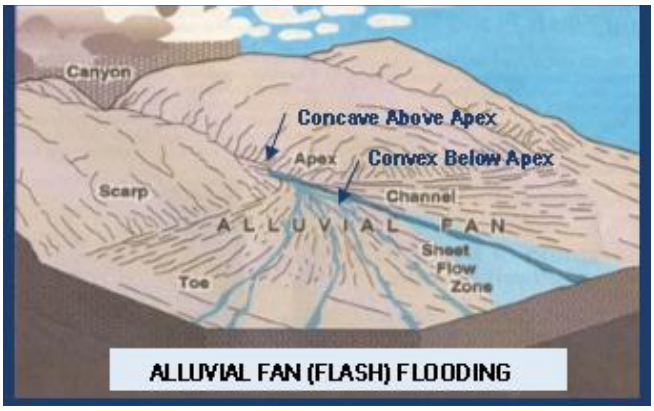
Main Channel (Riverine Flooding): Main-channel floods result from rain on the mountain snowpack which contributes to rapid snowmelt. As flows in the Carson River increase due to the rapid snowmelt, the channel overflows and floods adjacent areas or floodplains. More recently, these types of floods have occurred due to unusually long runoff events due to heavy winter precipitation. Such floods emphasize the importance of maintaining the floodplain in a condition where it can take on the

Lloyd's Bridge in Carson City; maximum depth measurements and known flow rates should be coordinated at such locations

additional flow without harm to life or property. Documented footage of the 1997 flood is available and useful for public outreach and education.[8]

The most significant recorded flooding event in the watershed occurred on New Year's 1997, when flows of up to 22,800 cfs ravaged Carson, Eagle, and Dayton Valleys. A decade later, on New Year's 2006, another flood (~12,000 cfs) reminded our communities that flooding regularly occurs on the Carson River. Some residents and natural resource managers reported flooding in areas during this relatively small event which had not previously flooded. Several potential causes of increased river flooding in areas previously considered safe during moderate to moderately high-volume water flows have been hypothesized as follows; however, more study is needed to verify why lower river flows are causing more damage:

Figure 5. Alluvial fan graphic from Nevada Floods Brochure FS 14-12 created by UNR Cooperative Extension



- Increase of floodplain development may be changing the flood routes and increasing velocities;
- Increased debris and sediment in the river are displacing water, bridges plugged with debris and sediment are causing water to back up.

Alluvial Fan Flooding: Also known as flash flooding, alluvial fan flooding results from intense rainfall during summer thunderstorms on alluvial fan surfaces (gently sloping, fan-shaped landforms common just below mountain canyons – Figure 5). Flash flooding is characterized by high-velocity flows, sediment and bedload transport, erosion and deposition, and unpredictable flow paths. The risks from this type of flooding increase if development occurs on alluvial fans.

In the summer of 2014, the Johnson Lane area of Douglas County was damaged from three intense flash flood events (July 20, July 30 and August 6). The Nevada Division of Emergency Management (NDEM) conducted a damage assessment and estimated that 101 properties were damaged with a total cost to private homeowners of $1.5 million. Damage to public infrastructure was estimated at $927,205. In the summer of 2015, the Johnson Lane area of Douglas County was inundated from flash floods on July 8 and 9. A damage assessment conducted by NDEM estimated that 162 properties were damaged, and $2.2 million was required to restore damaged public infrastructure.

In Lyon County and Storey County, the residential and commercial areas of Dayton Valley experienced several alluvial fan floods during the summers of 2014, 2015, and 2016. In 2017, alluvial fans in these counties received considerable damage from severe winter flooding. Damage to public infrastructures in the Carson River Watershed portions of Lyon County and Storey County has been estimated to be over $5 million.

[8] https://carsonvalleytimes.wordpress.com/2017/01/02/video-footage-from-the-new-years-flood-of-1997-20-years-ago/

Debris Flows: Debris flows are the result of water from intense rainfall or rapid snowmelt mixing with sediment and bedload to become a slurry like wet concrete. In steep canyon (for example, the east slope of the Carson Range), debris flows can reach high velocities, transport large boulders, and cause catastrophic damage from impact or burial. Debris flows usually originate in post-fire burn areas. Alpine County experienced debris flows in January and February 2017 after the Washington Fire. The East Fork of the Carson River next to Wolf Creek Road was filled with debris and there were many landslides on Highway 89 adjacent to the East Fork of the Carson River.

Debris Flow in Alpine County, 2017

Extended Periods of High Flows: In years when there is an uncharacteristically high snow pack, the duration of spring runoff is prolonged. These conditions can cause flooding below Lahontan Reservoir when the reservoir is near or at its storage capacity, creating a unique set of challenges. For instance, in 2017, record snowfall and subsequent snowmelt runoff led to the threat of flooding along the Carson River into the City of Fallon.

CWSD, in partnership with the River Corridor and Floodplain Management Working Group, conducted a Carson River Regional Flood Management Workshop on March 8, 2017, to discuss best options for mitigating flood risk from the high runoff expected. Stakeholders, including the U.S. Bureau of Reclamation (USBR), Truckee Carson Irrigation District (TCID), Churchill County and City of Fallon agricultural producers, and residents, discussed ideas on how to control the forecasted runoff volume, with ideas such as inter-basin transfer, groundwater injection, and revisiting former dam sites. However, to solve the immediate hazard within the timeframe required, downstream structural solutions were sought. An emergency task force convened including the TCID, Churchill County, USBR, and the Nevada Department of Transportation. The task force worked together to gather funding, approve designs, and install emergency weirs and ditches that released flows from Lahontan Reservoir and its irrigation ditches into the desert and onto Bravo 16, a Navy training range, and then east under new culverts placed on both U.S. Hwy. 95 and U.S. Hwy. 50. The water filled Carson Lake (generally a dry playa) and the construction of the "Big Dig" (a deep, wide channel) then carried the water under U.S. Hwy. 50 north of Grimes Point toward the Stillwater National Refuge and Carson Sink.

This creative solution averted severe damages to Churchill County and City of Fallon residential and commercial properties developed within the historic floodplain. These communities and local entities continue to work together to determine if this is the best permanent solution and consider any maintenance or follow-up mitigation measures to alleviate unforeseen impacts from the construction (e.g., dust, water quality, and invasive species).

3.2 FEMA REPETITIVE LOSS AREAS

According to FEMA, a Repetitive Loss (RL) property is any insurable building for which two or more claims of more than $1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978.

The history of the loss includes all flood claims paid on the property, regardless of any change(s) in ownership since the building's construction, or back to 1978. It is important to know about such areas as they affect the credits awarded under the CRS. The repetitive loss properties recorded by the CRS communities In the Carson River Watershed are listed in Table 10. Lyon County and Storey County do not participate in the CRS program.

Table 10. Repetitive loss areas within CRS communities in Carson River Watershed (2018)

JURISDICTION	REPETITIVE LOSS PROPERTIES:
Alpine County	The only repetitive loss property is in Bear Valley, which is not in the Carson River Watershed.
Carson City	3 repetitive loss properties
Churchill County	1 repetitive loss property
Lyon County	0 repetitive loss properties
Douglas County	Within Douglas County, there are 2 repetitive loss properties in Genoa, 2 repetitive loss properties in Gardnerville, and 5 repetitive loss properties in Minden.
Storey County	0 repetitive loss properties

3.3 RISK ASSESSMENT (HAZUS)

HAZUS is a nationally applicable standardized methodology that contains models for estimating potential economic losses from disasters such as floods, earthquakes, and hurricanes. HAZUS uses Geographic Information Systems (GIS) technology to estimate physical, economic, and social impacts of disasters. It graphically illustrates the limits of identified high-risk locations, and users can then visualize the spatial relationships between populations and other more permanently fixed geographic assets or resources for the specific hazard being modeled, a crucial function in the pre-disaster planning process.

At the current time, there is one HAZUS analysis done along the Carson River in Carson Valley, but it will be superseded when the Physical Map Revision currently under FEMA review becomes effective. This tool can provide valuable economic loss data to help guide floodplain management decision making, gauge the effects of future changes, and provide input into a community's capital improvement projects on a much broader basis. HAZUS data can be used in conjunction with the two-dimensional hydraulic modeling to generate baseline economic loss data. With much of the watershed studied using 2D modeling, communities should take advantage of these existing data sets and HAZUS to fully understand the potential impacts of future flood events. An analysis of potential economic losses from multiple return interval flood events could be either a FEMA or community funded effort. It could provide local agencies with an understanding of the cost versus benefit of capital improvements and the overall cost of flooding. New data and statistics would improve analysis focused on urban areas rather than that provided in past analysis (impacts on wilderness).

3.4 PUBLIC AND PRIVATE INFRASTRUCTURE

The Carson River Watershed is typical of many irrigated watersheds in the western United States. The watershed is a large land mass traversed by the river, providing a water supply from which the local economy is largely based, and where agricultural needs are primarily served through a series of irrigation canals. Over the years many of the developed areas discharge their stormwater into irrigation canals. This results in an array of infrastructure owned by public and private entities. Local entities periodically conduct routine maintenance to ensure conveyance capacities. Jurisdictions generally have a stormwater inventory, inspection, and maintenance of such facilities which is included in their CRS (540) responsibilities. While public infrastructure may have some funding associated with maintenance costs, private irrigation infrastructure may not. However, it is equally important to maintain the private infrastructure, as it is usually the secondary receiver of the floodwaters. If not functioning or clogged, flood flows may back up onto adjoining properties or infrastructure, leading to risk or potential harm.

Future updates to this plan may start to inventory, categorize, and house public and private drainage and flood control infrastructure in the Carson River Watershed. An inventory of these facilities can provide stakeholders and end users a database of conveyance features to begin prioritizing maintenance and improvements and identify deficiencies in the system.

3.5 FUTURE CONDITION CONSIDERATION AND IMPACTS TO FLOODPLAIN

There is ongoing discussion at working group and technical advisory group meetings about the importance of outreach and education to residents outside of the federally regulated SFHAs within the 100-year floodplain SFHA. There is concern that critical infrastructure (hospitals, schools, fire stations) should be designed to be protected from the 500-year event. This should be concurrent with relating flood risk to residents to ensure they understand flood hazards exist beyond the 100-year floodplain. Flood insurance in the 500-year floodplain is prudent and is much less expensive than the 100-year floodplain. In addition, climate change impacts may result in changing storm patterns, rainfall amounts, and snow levels, adding uncertainty to future conditions. Sound floodplain management in the Carson River Watershed should include a margin of error in all decisions that accounts for this uncertainty.

Photograph of construction during the 2017 "Big Dig" in Churchill County

4.0 FLOOD RISK REDUCTION AND FLOODPLAIN STRATEGIES

As stated in Section 1, the long-term vision and strategies for regional floodplain management are categorized as follows:

1. Protect Natural Floodplain Function and Values
2. Set Higher Regulatory Standards
3. Collect Flood Data Information and Maintenance
4. Balance Channel Migration and Bank Erosion Monitoring
5. Increase Floodplain and Flood Hazard Outreach and Education
6. Reduce Infrastructure Impact
7. Map/Study Alluvial Fans
8. Minimize Stormwater Mitigation

Table 11 provides a summary of the suggested actions for each strategy presented in this section. Since this floodplain management plan and its suggested actions are elements of the Carson River Watershed Stewardship Plan, the correlation between the two documents is indicated. The table also includes suggested responsible parties and potential sources of funding for specific actions and correlates suggested actions to FEMA Community Rating System (CRS). Refer to Table 6 for a description of each CRS activity, defined objective, and listed activity elements.

Suggested actions are desirable actions to be completed within staffing and budgetary limitations to further local jurisdiction and Carson River Watershed Regional Floodplain Management Plan goals. The suggested actions updated from the 2008 RFMP are included in Table 11. As part of this update each jurisdiction reviewed the suggested actions to assess progress made, prioritize, and identify any new hazards or strategies for which additional suggested actions should be implemented. During the RFMP update process, and in conjunction with other watershed plans (Stewardship Plan, Table 8.8), additional strategies and suggested actions were recommended. These include recognition of alluvial fans and associated hazards, stormwater, and Low-Impact Development considerations.

Table 11. Summary of strategies and suggested actions (SA) for watershed flood risk reduction

	SA #	CRS	SUGGESTED ACTION	Responsible Party	Existing or Potential Funding Partner
PROTECT FLOODPLAIN NATURAL FUNCTION AND VALUE (1-8)	1	320 420 510	Maintain 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
	2	350 410	Develop, support and implement a good neighbor floodplain management policy that recognizes cumulative impacts and actions by one property owner can impact upstream, adjacent and downstream property owners.	All entities	N/A
	3	420	Investigate, identify, and implement areas where stream zone buffers would provide multi-objective benefits for river system and downstream communities. (Previously SA # 4)	Local and tribal governments	NDWR Clearing and Snagging Fund; FEMA; State Lands; NDEP
	4	310 410 530	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. (Previously SA # 6)	Local and tribal governments; CWSD	Local Governments
	5	320 450	Promote and utilize best management practices as a means of protecting riparian habitat. (Previously SA #10)	All entities	NDEP, FEMA, USBR, Local Governments
	ECOSYSTEM SERVICES IMPORTANT to MAINTAINING LIVING RIVER APPROACH				
	6	350 420	Consider Floodplain and flood hazards ecosystem service objectives which preserve open floodplain lands when selecting acquisition targets and establishing management strategies for open spaces. (Previously SA #3)	Local and tribal governments, NGOs, CWSD	FEMA, Local Governments, NDEP
	7	520	Identify and promote options for landowner incentive programs, such as floodplain leasing program and conservation easements that provide compensation to landowners providing ecosystem services and seek funding mechanisms. (Previously SA# 9)	Local & tribal governments, NGOs, CWSD, CRC, landowners	Federal, State and local sources, , Question 1, SNPLMA
	8	420 520	Retain lands that preserve floodplain storage which maintain and/or restore connection of river with floodplain through land acquisition, conservation easements, local open space programs, TDR and PDR Programs, and other protection methods. Pursue protection of additional acreage in flood prone areas (See UNCE 2015, Floodplain Protection Inventory for the Carson River). (Previously SA #7)	Local and tribal governments, NGOs, landowners	Question 1; SNPLMA; NGOs; local governments

SA #		CRS	SUGGESTED ACTION	Responsible Party	Existing or Potential Funding Partner
			HIGHER REGULATORY STANDARDS (9-11)		
HIGHER REGULATORY STANDARDS (9-11)	9	430	Periodically review county ordinances that include floodplain protection as a purpose, account for the loss of floodplain storage volume, and mitigate losses through a variety of methods. (Previously SA # 11)	Local governments	FEMA, Local Governments
	10	430	Investigate, promote, and implement of additional flood protection measures that go beyond minimum FEMA requirements, such as improving community rating system. (Previously SA # 12)	Local governments	Local Governments
	11	430	Development and adoption of consistent floodplain management ordinance language and consistent use of hydraulic model of Carson River system. (Previously SA # 13)	CWSD, CRC, local governments	FEMA, CWSD, Local Governments
			FLOOD DATA INFORMATION AND MAINTENANCE (12-21)		
FLOOD DATA INFORMATION AND MAINTENANCE (12-21)	12	410 440	Establish and adopt funding source, and protocol / procedures to consistently update watershed-wide unsteady state modeling to identify flood water storage requirements and to look at the cumulative effects of watershed development. (Previously SA #14)	Local & state governments, CWSD	FEMA, CWSD, NDEP, other local & state entities
	13	440	Support FEMA's Map Modernization Program and encourage FEMA to update FIRMs with current and future conditions. Significant verification of topography and other variables should be conducted prior to release of draft FIRMs. (Previously # SA 15)	Local governments, FEMA, CWSD	FEMA, CWSD, Local Governments
	14		Participate in FEMA's Cooperating Technical Partner Program. (Previously SA#16)	CWSD, FEMA	CWSD
	15	410 440	Collect and Maintain up-to-date and consistent data collection which includes updating flood studies as needed and conducting new studies for significant water courses and alluvial fan areas. This data should be used to update FEMA maps and/or fill local data gaps. Complete delineation of the floodway throughout river system and incorporate into FIRMs. (Previously SA #17)	Local governments, CWSD, FEMA	All Federal, state and local funding sources
	16	410 440	Update flood studies and maps after significant flooding events. (Previously SA #18)	Local governments	FEMA, CWSD, Local Governments
	17	410 440	Update and Maintain Elevation Reference Marks (ERM) as- permanent monuments using NAVD88 Datum which matches base flood elevations on FEMA FIRMs. (Previously SA #19& 20)	Local governments	All Federal, state and local funding sources
	18	410 440	Develop and maintain master list of ERMs provide-to interested parties. (Previously SA #21)	Local governments, CWSD	All Federal, state and local funding sources

SA #		CRS	SUGGESTED ACTION	Responsible Party	Existing or Potential Funding Partner
FLOOD DATA INFORMATION AND MAINTENANCE (12-21)					
FLOOD DATA INFORMATION AND MAINTENANCE (19-21)	19	350 410 440	Develop and coordinate photo-monitoring program (on-the-ground and aerial) on a watershed level to consistently document flooding and flood hazards. (Previously SA #22)	CWSD	All Federal, state and local funding sources
	20	350 410 440	Establish and maintain rain gage data network in each local jurisdiction.	Federal, State and Local governments, CWSD	All Federal, state and local funding sources
	21		Evaluate potential impacts due to climate variability which could include changing storm patterns, rainfall amounts, and snow levels, adding uncertainty to future conditions.	Federal, State and Local governments, CWSD	All Federal, state and local funding sources
CHANNEL MIGRATION AND BANK EROSION MONITORING (22-29)					
CHANNEL MIGRATION AND BANK EROSION MONITORING (22-29)	22	410	Document/map and update known and projected hazard areas including channel migration hazards and incorporated into planning processes. (Previously SA #23)	Conservation Districts, CWSD, NDEP, FEMA, local & tribal governments	FEMA, CWSD, NDEP, NDWR, BIA, Conservation Districts, local & tribal governments
	23	440	Conduct LiDAR and/or aerial photography (on a watershed level) on a 5-year basis, or as needed, to provide updated information on channel movement and floodplain condition. (Previously SA #24)	CWSD, NDEP, CVCD, DVCD, NGOs, BOR, local governments	All Federal, state and local funding sources
	24	430	Conduct research and establish appropriate building set-backs in flood hazard areas to reduce severe hazards from channel migration. (Previously SA #25)	Local and state entities, CWSD	All Federal, state and local funding sources
	25	410 440	Conduct and document channel cross-sectional surveys to track long term changes in river channel. (Previously SA #26)	CWSD, conservation districts	All Federal, state and local funding sources
	26	410 440	Identify unstable stream banks and areas with high potential for erosion. (Previously SA #27)	Conservation districts, NDEP, CWSD	All Federal, state and local funding sources
	27	510	Promote the use of non-structural, bio-engineering (soft-engineering utilizing natural materials) techniques in river restoration projects in combination with other proven methods. (Previously SA #28)	All entities	FEMA, NDEP, CWSD
	28	440 510	Update the 1996 Fluvial Geomorphic Assessment and create a sediment transport model of the Carson River. (Previously SA #29)	CWSD, NDEP, conservation districts	FEMA Pre-Disaster Mitigation grants; USACE: UNR Graduate Grants; DRI; NSF
	29	440 510	Create a baseline study that informs management and project decisions regarding flood risks, damages, and ecosystem impacts.	CWSD, NDEP, conservation districts	FEMA Pre-Disaster Mitigation grants; USACE: UNR Graduate Grants; DRI; NSF

SA #		CRS	SUGGESTED ACTION	Responsible Party	Existing or Potential Funding Partner
FLOODPLAIN AND FLOOD HAZARD OUTREACH AND EDUCATION (30-34)					
FLOODPLAIN AND FLOOD HAZARD OUTREACH AND EDUCATION (30-34)	30	330	Continued implementation of watershed-wide outreach and education program about floodplain importance and flooding hazards.	FAW Working group which includes CWSD, Federal, State and Local Jurisdictions	FEMA; NDWR, and Federal, state and local partners
	31	330	Promote and participate in Annual Flood Awareness Week (FAW) and events throughout the year with the objective of providing information about protection of floodplains, flooding and flood hazards to the general public.	FAW Working group which includes CWSD, Federal, State and Local Jurisdictions	All Federal, state and local funding sources
	32	330	Develop and update media in conjunction with FAW working group (social media, videos, brochures, web content, press releases etc.) for distribution throughout watershed with consistent messages and information for the general public.	FAW Working group which includes CWSD, Federal, State and Local Jurisdictions	CWSD, NDWR, USACE
	33	330	Promote FAW partner websites (e.g., NevadaFloods.org, National Weather Service, CWSD, and county websites) which provide information on the Regional Floodplain Management Plan, floodplain protection, flood risk, emergency preparedness, and emergency contact information. Link to one another's websites and social media sites to amplify message.	In conjunction with Flood Awareness Campaign led by NDWR, CWSD, NOAA -NWS Reno specifically address flood risk and local jurisdictions have websites as well which also link to these websites.	CWSD, NDWR, NOAA -NWS Reno
	34	330	Utilize special Events, River Work Days, and other outreach opportunities in conjunction with FAW working group to raise awareness of flooding hazards and importance of floodplains.	FAW Working group which includes CWSD, Federal, State and Local Jurisdictions	All Federal, state and local funding sources
REDUCE INFRASTRUCTURE IMPACTS (35-39)					
REDUCE INFRASTRUCTURE IMPACTS (35-39)	35	510 540	Investigate opportunities and implement actions when feasible to remove existing restrictions, such as berms or uncertified levees, to allow flood waters to access floodplain.	Local & tribal government organizations, landowners	All Federal, state and local funding sources
	36	510	Limit the use of future management measures such as dams, levees, and floodwalls.	Local & tribal government organizations, landowners	All Federal, state and local funding sources
	37	540	Design future bridges and roads to protect floodplain and accommodate rather than restrict river course changes, and minimize back up of flood water.	NDOT, local governments	All Federal, state and local funding sources
	38		Investigate opportunities to enhance grade control structures.	Local governments, CWSD	FEMA, NDEP, CWSD, and local governments
	39		Inventory, categorize, and house data regarding public and private drainage and flood control infrastructure in the Carson River Watershed.	Local governments, CWSD	FEMA, NDEP, CWSD, and local governments

SA #		CRS	SUGGESTED ACTION	Responsible Party	Existing or Potential Funding Partner
ALLUVIAL FAN HAZARD REDUCTION (40-43)					
ALLUVIAL FAN HAZARD REDUCTION (40-43)	40	440	Investigate extent of potential alluvial fan flood damage and include on maps.	Local governments, CWSD	FEMA, USACE, CWSD, and all other Federal, state, and local funding sources
	41	440	Conduct Area Drainage Master Plans for alluvial fans which examines infrastructure, land use, sediment transport & identify alternative to mitigate and/or reduce risk.	Local governments, CWSD	FEMA, CWSD, and all other Federal, state, and local funding sources
	42	440 530	Implement studies to inform and motivate land use planning & development which protects high risk areas, and/or allows flood waters and debris flows to safely move through fan flood zones;	CWSD, Local governments	FEMA, CWSD, and all other Federal, state, and local funding sources
	43		Define and implement means to protect existing open alluvial fans, implement recommendations associated with SA#'s 38-40 to limit further development and/or alleviate hazards in high risk areas.	CWSD, Local governments	FEMA, CWSD, and all other Federal, state, and local funding sources
MINIMIZE STORMWATER IMPACTS (44-48)					
MINIMIZE STORMWATER IMPACTS (44-48)	44	450	Promote stormwater infiltration rather than direct outflow to urban infrastructure, ditches, creeks, rivers to capture groundwater, improve water quality, and reduce flood risk.	State, CWSD, Local Governments	FEMA, CWSD, and all other Federal, state, and local funding sources
	45	450	Plan for and mitigate cumulative effects of watershed urbanization, including stormwater runoff, to reduce flood hazards. (Previously SA #5)	All entities	FEMA, Local Governments, NDEP
	46	450	Encourage and incorporate low impact development (LIDs) principles into all development proposals to decrease stormwater run-off, improve water quality, and promote groundwater recharge. (Edited from Former SA #8)	Local governments	Incentives to Development (fee waivers, credits?;
	47	450	Encourage adoption of model LID ordinances created for Watershed.	CWSD/Local governments	Local Governments/CWSD
	48	320 450	Promote and utilize best management practices to reduce urban runoff (Refer to SA #5)	All entities	NDEP, FEMA, USBR, Local Governments

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4.1 PROTECT FLOODPLAIN NATURAL FUNCTIONS AND VALUES

The Carson River system is fortunate in that there are still large areas of undeveloped floodplain that that provide ecosystem services to our communities. Agricultural land and areas of open space adjacent to the river allow flood waters to spread out, slow down, and sink in; flood velocities are reduced; emergency managers are given more time to respond; and cumulative impacts of flooding in the river system and adjacent communities are lowered. By allowing the river to access its floodplain, adjacent communities upstream and downstream reap these benefits. This approach acknowledges the open floodplain itself is the best floodplain protection. The following sections summarize the watershed-wide progress accomplished through protecting natural floodplain function and values.

The CRC Guiding Principles (2000) and the original 2008 Carson River Regional Floodplain Management Plan, each adopted by the five counties that the river runs through, promote the protection of natural open floodplain and land uses that are compatible with floodplain form and function. FEMA and the Association of State Floodplain Managers (ASFPM) are now recommending the protection of the natural functions and values of a floodplain as a priority in floodplain management. The CRS has increased the amount of credit that is available for communities implementing these types of strategies. As stated in Natural Hazard Mitigation Saves: 2017 interim Report, "mitigation funding can save the nation $6 in future disaster costs, for every $1 spent on hazard mitigation."[9]

4.1.1 Living River Approach

This approach of keeping land adjacent to a river system in a natural state is often referred to as a "***Living River" approach***. For 20 years, the CRC and watershed stakeholders have promoted and actively implemented this approach.

SUGGESTED ACTIONS 1-8:

1. Maintain 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.
2. Develop, support and implement a good neighbor floodplain management policy that recognizes that actions by one property owner can impact adjacent and downstream property owners.
3. Investigate, identify, and implement areas where stream zone buffers would provide multi-objective benefits for river system and downstream communities.
4. 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.
5. Promote and utilize best management practices as a means of protecting riparian habitat.
6. Consider floodplain and flood hazards ecosystem service objectives when selecting acquisition targets and establishing management strategies for open spaces.
7. Identify and promote options for landowner incentive programs, such as floodplain leasing program and conservation easements that provide compensation to landowners providing ecosystem services and seek funding mechanisms.
8. 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.

[9] https://www.nibs.org/news/381874/National-Institute-of-Building-Sciences-Issues-New-Report-on-the-Value-of-Mitigation.htm

The “living river” approach is an effort to achieve a more natural riverine state, an equilibrium between an undisturbed, protected channel and a channelized river in a concrete ditch.

There is an understanding that development will occur, but with a focus on maintaining a river that functions as naturally as possible given the existing constraints. This approach provides numerous benefits including:

- Continuity (un-impeded flow conditions)
- Connectivity (connection of the river to its floodplain)
- Minimizes disruption and alteration of the river and riparian habitat
- Conveys variable flows
- Preserves and restores habitat in the floodplain
- Balances sediment input with sediment transport
- Provides fish and wildlife habitat
- Enhances water quality and supply
- Maintains aesthetic and recreational qualities
- Enhances the human environment

Allowing development to occur in natural areas increases flooding and the potential for detrimental impacts, which increases public expenditures to manage and repair flood damage. No other water quality improvement practice can equal the benefits of retaining undisturbed natural areas adjacent to waterways. Communities that adopt policies that retain the open floodplain and support the living river concept save money in the long term by protecting the lives and property of their residents. The policies include limiting growth in the floodplain and/or clustering growth outside the floodplain, implementing low impact development (LID) practices, incentivizing conservation easements or floodplain leasing, and adopting a Good Neighbor Policy.

"Building on the floodplain is like setting up your tent on a freeway when no cars are coming."

Dr. Vicki Martin, University of Montana

Morgan Mill Park, Carson City, 2017

4.1.2 Good Neighbor Policy

A "Good Neighbor Policy" for floodplain management recognizes that actions by one property owner can impact adjacent and downstream property owners and communities. Adoption of this RFMP includes a good neighbor floodplain management policy as one of its main goals. Efforts to accomplish mitigation of cumulative effects of watershed urbanization include the development and participation in the watershed model and ordinance, which demonstrates that actions in one section of the floodplain or watershed have consequences in others, sometimes adverse. Negative impacts can be measured by an increase in flood stage, flood velocity, peak flows, the potential for erosion and sedimentation, degradation of water quality, and/or increased cost of public services. Through FEMA CTP funding, an unsteady-state HEC-RAS hydraulic model has been developed that can be used to assess impacts of potential watershed urbanization, track the hydraulic and hydrologic impacts of land use changes, and evaluate civil drainage projects and development throughout the entire Carson River Corridor.

Ordinance language is being updated to support a physical map revision and accompanying hydraulic model of the Carson River upstream of Lahontan Reservoir to Alpine County and will be presented to county boards for adoption in early 2019. This ordinance revision will require the use of this model to incorporate changes and assess hydraulic impact for all areas within the newly established SFHAs. Using the model to assess the timing, volume, and peak flow impacts of proposed projects ensures the evaluation and possible mitigation of flood hazards to downstream communities, loss of riparian habitat and floodplain function, and degradation of water quality. The watershed model also enables management of development in Special Flood Hazard Areas and other flood hazard areas (those known flood hazard areas that are not represented on current FIRMs) to provide public safety, protect the natural functions and benefits of floodplain lands, and minimize the loss of floodplain storage capacity. This model, in coordination with updated floodplain ordinances, will enable jurisdictions to make informed decisions as to the extent of development that should be allowed without adverse impacts to adjacent and downstream properties and communities.

4.1.3 Floodplain Function and Flood Hazards

As described throughout this document, there are ways that the floodplain can be used to protect residents and structures from flood hazards. Agricultural production is the primary use of much of the floodplains. These fields act as natural flood storage, serving to distribute and slow the flow across the floodplain. Natural floodplain function also enhances groundwater recharge and water quality. Open space program objectives are integral to this strategy. Efforts must continue to retain the lands that provide floodplain storage and maintain or restore connection of the river with the floodplain through land acquisition, conservation easements, local open-space programs, and transfer of development rights (TDR). Jurisdictional implementation of these activities has been ongoing, as seen in the Rapid Assessment of the River System (Appendix B) and summarized herein.

Agricultural and ranch lands are consistent with the living river approach and are appropriate for critical floodplain lands. Providing ways to protect and sustain these lands remains a top priority.

Jurisdictions actively promote floodplain protection mechanisms including conservation easements, transfer of development rights (TDR) programs, and local and federal land protection initiatives including land purchases, as follows:

Conservation Easements

"Conservation easements are legal agreements between property owners and another entity, usually a land trust or a government body. The easement restricts land uses to allow for protection of an array of conservation values. The land remains in the property owner's possession and they can continue to use it, sell it, or pass it onto their family/heirs. Flexible in nature, conservation easements can be negotiated to limit development on all or a portion of the property. They do not necessarily provide for public access and often prefer the continuation of the existing land use, such as farming or other open space uses. The holder of the easement is responsible for ensuring the terms of the agreement are followed." (Land Trust Alliance website 2013)

Transfer of Development Rights (TDR) Programs

According to the Center for Land Use Education, "the Transfer of Development Rights (TDR) is a voluntary, incentive-based program that allows landowners to sell development rights from their land to a developer or other interested party who then can use these rights to increase the density of development at another designated location." (Miskowiak and Stoll 2006) The landowner who sold the development right maintains ownership of the property and generally a conservation easement or other restrictive covenant is placed on the property to limit or prevent development. TDR programs are useful to protect land uses and land areas such as farmlands, open spaces, floodplains, habitat areas and/or places of historical significance. The program is an equitable market-based program that protects natural/historical values while providing incentives to both the seller and the buyer.

State Question No. 1

Monies have been awarded to fund projects in the communities to help mitigate flood risks. These included plans to preserve acreage adjacent to the Martin Slough in Douglas County through purchase of private lands, construction of a trench, and creation of a floodway. These activities have been ongoing since the early 2000's.

Carson City Question 18 Quality of Life Initiative

In 1996, Carson City voters approved the Quality of Life Initiative that provided a ¼ cent sales tax increase to acquire and maintain open space (40%), develop community park facilities and trails (40%), and maintain and operate the park facilities developed through Quality of Life Initiative (Q18) (20%). (CCPRMP 2006)

Carson City Open Space Plan

The Open Space Plan, which is an element of the Carson City Master Plan, identifies resident surveys reflecting the number one priority as preserving open space in the river corridor and the importance of open space to public health and safety (e.g., watersheds, drainage ways, flooding). Since its inception, Carson City's Open Space program has significantly contributed to the protection of lands in the Carson River Corridor. Along the Carson River corridor through Carson City, there are only about three acres of lands that have been identified for potential purchase that has yet to be acquired.

The Douglas County Economic Development and Conservation Act of 2018

This Bill has been introduced to Congress but has yet to be enacted. It will allow for (1) the disposal of certain excess and difficult to manage federal lands, ensuring that the sales proceeds are used to acquire conservation easements in the floodplain from willing landowners in Douglas County; (2) transfer of federally-owned flood control management areas and important water resource infrastructure parcels to Douglas County; (3) transfer of

important federally-owned cultural sites to the Washoe Tribe; (4) dedication of the Burbank Canyons Wilderness Area while maintaining vehicular use of historic and existing roads; and (5) improved management of certain federally-owned public recreation parcels. (Etchegoyhen 2013).

Based on the UNCE's **Floodplain Protection Inventory for the Carson River** published in 2015 (UNCE 2015) which only looked at Douglas and Lyon Counties, and Carson City, we have protected 31% or 12,315 acres. With continued partner collaboration to implement this plan and suggested actions, protected floodplain acreage should increase over the next 10 years.

January 2006 Flood, Dayton, Nevada

4.2 HIGHER REGULATORY STANDARDS

FEMA has established minimum regulatory standards for communities that participate in the NFIP, including the adoption of a floodplain ordinance that meets minimum federal requirements. While this provides the community an adequate level of protection, damage can still occur. One of the best tools to provide increased public safety is to enhance and/or implement regulatory standards that go beyond the FEMA minimum standards. A higher standard would include the adoption of an ordinance that is more specific to the actual flooding hazards of the community and include good neighbor language that protects adjacent and downstream properties.

SUGGESTED ACTIONS 9-11:

9. **Periodically review county ordinances that include floodplain protection as a purpose, account for the loss of floodplain storage volume, and mitigate losses through a variety of methods.**
10. **Investigate feasibility and implementation of additional measures that go beyond minimum FEMA requirements.**
11. **Develop model watershed floodplain management ordinance language that can be adopted by counties to provide watershed-wide consistency.**

Aftermath of debris flow in Douglas County

4.2.1 Revised Ordinances

As long as development is allowed to occur within the identified SFHAs, construction of buildings must be regulated to provide for increased flood protection. Local jurisdictions support actions that go beyond the minimum requirements and provide additional protection to residents and to the natural resources. In support of this, FEMA CTP funding has been acquired for the development of a "model" floodplain ordinance that includes Alpine County, California and Carson City, Douglas, Lyon and Churchill counties in Nevada. Storey County is also conducting a comprehensive floodplain ordinance update which is consistent and in concert with CWSD's regional effort. This model ordinance language can be adopted by counties to provide watershed-wide consistency yet is customized to enhance each jurisdiction's existing ordinances. In the Carson River Watershed, it is recommended that county ordinances should be implemented or enhanced to:

- Include protection of floodplain function as a purpose of the ordinance;
- Be based on a good neighbor policy;
- Require mitigation for the loss of floodplain storage capacity; and
- Account for the cumulative impacts associated with floodplain development.

To develop and implement the model ordinance, CWSD is working collaboratively with county planners and floodplain managers to update local flood regulations. The first phase was a Floodplain Ordinance Review and Improvement Project (2016), which consisted of a multi-jurisdictional effort led by the CWSD to prepare for the adoption of new Flood Insurance Rate Maps (FIRMs), considered implementation of the Carson River Hydraulic Model and improvement of floodplain management programs and regulations. Floodplain ordinances were preliminarily drafted which align with the needs and opportunities identified within each jurisdiction. The model ordinance project assisted each jurisdiction in the review and future amendment of their floodplain ordinances. The model ordinance will incorporate the Carson River Hydraulic Model and the Model Management, Distribution, and Update Guide to accommodate the new regional floodplain mapping and Flood Insurance Rate Maps (FIRMs). These comprehensive ordinances would provide consistency across the jurisdictions for building and construction standards and must include enforcement by a regulatory agency such as each community's building or zoning department. This model ordinance updates will need to be incorporated/adopted by each community. Ordinance implementation is expected in 2019. To support implementation of the model ordinance, local government staff will be trained to implement the hydraulic model and its update protocols. They will also be provided tips to assist residents in understanding the impacts of the new FIRMs and how the development community will apply the Carson River Hydraulic Model. The 2016 Floodplain Ordinance Draft Report and Mitigation Plan Table can be accessed in Appendix D in the CWSD projects table, MAS 4 section.

4.3 FLOOD DATA INFORMATION AND MAINTENANCE

Technical information that can be used for flood risk analyses and risk reduction is critical data for local jurisdiction planning and management. This information includes hydrologic and hydraulic studies, floodplain and channel migration zone maps, LiDAR surveys, geologic studies, geographic information system (GIS) land use data, habitat studies, risk assessments, flood hazard management maps, and FIRMs. To the extent possible, flood data and other related information should be updated and managed in a manner that provides the most current information to all users in a timely and useful manner. CWSD continues to coordinate with FEMA and all watershed jurisdictions to identify, prioritize, and mitigate flood risk reduction projects. This partnership motivates strong inter-jurisdictional partnerships and leverages and maximizes federal, state, and local funding opportunities to complete new or revised FEMA FIRMs and other priority projects. A major accomplishment was the development of one Carson River Hydraulic Model through four watershed counties upstream of Lahontan Reservoir.

The following programs are encouraged by FEMA to ensure consistent maintenance of data and are incorporated into CWSD's everyday implementation activities for the Mapping Activity Statements (MAS).

4.3.1 Up-to-Date and Consistent Data Collection

It is essential to maintain current data and information to properly manage our floodplains and any development that may occur. A lack of reliable data upon which to base and defend decisions can be a significant deficiency. For example, the location of the river and floodplain initially delineated over 30 years ago may not be representative of today's conditions. Unreliable data can leave local governments in the position of having to use inaccurate maps for planning purposes and may leave potential hazard areas unidentified. Over the last decade, CWSD, through CTP funding, has conducted numerous technical data updates useful for flood studies and FIRMs. Additional studies are planned, such as customizable Area Drainage Master Plans (ADMPs). These plans address relatively small areas that have experienced flooding, such as summertime cloudburst flash floods or alluvial fan floods, and can be used throughout the watershed.

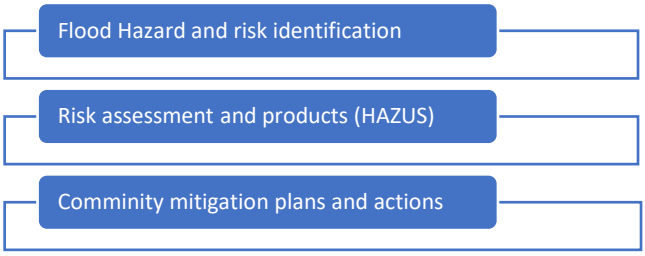
SUGGESTED ACTIONS 12-20:

12. Establish and adopt funding source, and protocol / procedures to consistently update watershed-wide unsteady state modeling to identify flood water storage requirements and to look at the cumulative effects of watershed development.
13. Support FEMA's Map Modernization Program and encourage FEMA to update FIRMs with current and future conditions. Significant verification of topography and other variables should be conducted prior to release of draft FIRMs.
14. Participate in FEMA's Cooperating Technical Partner Program.
15. Collect and Maintain up-to-date and consistent data collection which includes updating flood studies as needed and conducting new studies for significant water courses and alluvial fan areas. This data should be used to update FEMA maps and/or fill local data gaps. Complete delineation of the floodway throughout river system and incorporate into FIRMs.
16. Update flood studies and maps after significant flooding events.
17. Update and Maintain Elevation Reference Marks (ERM) as permanent monuments using NAVD88 Datum which matches base flood elevations on FEMA FIRMs.
18. Develop and maintain master list of ERMs and provide to interested parties.
19. Develop and coordinate photo-Monitoring program (on-the-ground and aerial) on a watershed level to consistently document flooding and flood hazards.
20. Establish and maintain a rain gage data network in each local jurisdiction.
21. Evaluate potential impacts due to climate variability which could include changing storm patterns, rainfall amounts, and snow levels, adding uncertainty to future conditions.

ADMPs can be used as tools to help identify priority areas for data collection or improvements. CWSD plans to continue to work with communities to find solutions and to identify data gaps, maintain and collect up-to-date data, and seek funding to help reduce flood risk and community hazards.

4.3.2 Risk Mapping Assessment and Planning (Risk MAP)

The FEMA Risk MAP (Risk MAP) Program provides communities with flood information and tools they can use to enhance their mitigation plans and act to better protect their citizens. Through Risk MAP, FEMA is engaging communities to accurately map, communicate, and mitigate flood risk. The Risk MAP program focuses on providing flood prone communities across the nation with tools and data that can be used to mitigate the risk and impact from flooding and communicate with residents and businesses about that risk.[10] Those tools include flood hazard mapping studies and risk identification products and risk assessment tools (e.g., HAZUS – a FEMA GIS tool to estimate economic losses) so communities can make informed decisions about reducing flood risk.



This program assists communities in hazard mitigation planning, education, and outreach about flood risk, flood insurance, and flood hazards. The flood risk information can be used to enhance hazard mitigation plans, make informed decisions to improve resiliency after flooding, protect the beneficial functions of floodplains, and raise awareness about local flood risks. This program encourages a watershed-wide approach as a strategy.

FEMA's Risk MAP Charter (Appendix F) with CWSD in 2011/2012 was the first to be signed in FEMA Region IX. The agreement formalized the collaborative flood management efforts between CWSD; Alpine County in California; Douglas, Carson City, Lyon, and Churchill Counties in Nevada; FEMA Region IX (FEMA); U.S. Army Corps of Engineers (USACE); U.S. Geological Survey (USGS); U.S. Department of the Interior Bureau of Reclamation (USBR); National Flood Insurance Program (NFIP) Coordinator; State Hazard Mitigation Office; and other partners. Storey County joined the Charter in 2016. The Charter outlines the process to identify, assess, communicate, and plan for flood risk within the Carson River Watershed. All Counties are members of this Risk MAP Charter. CWSD actively pursues CTP projects and programs that are consistent with and meet the suggested actions under the collection and maintenance of flood data information category.

4.3.3 Updating and Maintaining DFIRM

In order to fully utilize FEMA programs, a process was developed to provide procedures for coordinating with FEMA on how county GIS, planning and engineering departments, and floodplain administrators can best utilize and update DFIRMs. A common challenge faced by the counties is that base maps change much faster than the FEMA process. A consistent watershed-wide process is beneficial and allows for easier data sharing and up-to-date map maintenance.

4.3.4 Elevation Reference Mark Maintenance

Elevation reference marks (ERMs) provide a baseline for ground elevation reference. This is important for surveyors when determining specific site information such as building elevations, cross sections, or topography, and

[10] https://www.fema.gov/risk-map-program-information-community-officials

is critical to determine lowest floor elevations in flood-prone areas. ERM datum should be collected in NAVD88 format, so it is consistent with FIRMs. Some counties (e.g., Carson City) have ERMs publicly available, while others have yet to complete this suggested action.

4.3.5 Floodway Delineation

The floodway is the area with the greatest danger during flood events. A floodway is determined with a computer program that "squeezes" the floodplain toward the channel and causes the flood level to rise. At the point where the water level is a maximum of one foot above the base flood elevation the floodway boundaries are drawn. Some states and communities use a more restrictive standard for delineating floodways. Some require less than one-foot rise (e.g., 0.5'); this results in a wider floodway and less area in the flood fringe. This approach provides the community with a higher level of protection during flood events. FEMA suggests that development not be allowed in delineated floodways due to their hazardous nature. However, development in floodways may be permitted if it can be demonstrated that no rise in base flood elevation will occur.

As part of the FEMA Risk MAP Program, floodway delineations were successfully incorporated in 2016 on the Carson River for portions of Douglas County, Carson City, Lyon County, and on a number of tributaries to the Carson River (Clear Creek, Goni Canyon Creek, Kings Canyon Creek). Floodway delineation continues to be a priority in the remaining sections and should incorporate appropriate data verification and address any inconsistencies.

4.3.6 Unsteady-state model for the Carson River

The development of an unsteady-state hydraulic model for the Carson River under FEMA MAS 1-4 was a major accomplishment in attempts to identify flood water storage requirements, and to look at cumulative effects of watershed development to the floodplain corridor. One of the main modeling objectives was to track the hydraulic and hydrologic impacts of land use changes, civil drainage projects, and development throughout the entire Carson River Corridor. Floodplain ordinance revisions are underway and will require the use of this model to incorporate changes and assess hydraulic impact for all areas within the newly established Special Flood Hazard Areas. Ordinance revisions are anticipated to be completed in 2019 and will include all Zones A, AE, AH, AO, and Floodways. Using the model to assess the timing, volume, and peak flow impacts of proposed projects ensures the evaluation and possible mitigation of flood hazards to downstream communities, loss of riparian habitat and floodplain function, and degradation of water quality. This model will represent a single tool to help water resource practitioners in the public and private sectors comply with NFIP guidelines and regulations, as well as meet local floodplain management objectives for the multiple communities that are impacted by flooding events on the Carson River. The following documents have been prepared to supplement the use of this model and are linked Appendix D, CWSD project report table, MAS 4 section.

- Hydraulic Modeling and Floodplain Mapping Guidelines (2011): These guidelines provide criteria, standards, and modeling guidance for future hydrologic analysis, hydraulic modeling, and flood hazard mapping studies on the Carson River within Lyon, Carson City, Douglas, and Alpine Counties. It provides technical information specifically tailored to the unique hydrologic and hydraulic characteristics of the Carson River Watershed. Practitioners' use of this consistent set of criteria will result in uniform modeling practices throughout the watershed, across jurisdictional boundaries, and potentially reduce conflict between regulatory agencies and the land development community. The Guidelines only apply to the floodplains and floodways associated with the East Fork, West Fork, and mainstem of the Carson River. It is not intended to provide modeling direction for tributaries or alluvial fans associated with the Carson River.

- ❖ Model Update Protocols: The Model Management, Distribution, and Update Guide (2017) has been prepared to set up standard protocols for updating the model as new development occurs in the floodplain.

4.3.7 Photo Monitoring

Photographs of flooding are an invaluable tool for monitoring the impacts of flooding events, as well as verification of model predictions. The development of a photo-monitoring program with individuals and/or organizations assigned as photo-monitors during events would provide historical documentation and data for tracking flooding trends. The need for consistent photo-monitoring continues to be discussed, including a systematic plan to track flood events at specific sites.

4.3.8 Rain Gage Network

In 2018, the CRC Floodplain and River Management Working Group identified the need for rain gage data. All of the counties need to know precipitation levels which could cause flooding in localized areas of the river or above/within alluvial fans. Rain gage data can be used to predict flooding, inform response, and help communities mitigate hazards for watershed residents.

Lloyd's Bridge in Carson City. Maximum depth measurements and known flow rates should be coordinated at such locations.

4.4 CHANNEL MIGRATION AND BANK EROSION MONITORING

The Carson River tends to change course or move laterally in places during flood events due to the wide, flat, almost unrestricted floodplain. Areas with high potential for channel migration (movement) are extremely hazardous areas for development. Long-term monitoring of the river system can help to identify areas with high potential for excessive erosion and migration. In some areas building set-backs or buffer zones may be appropriate in order to provide public safety in these hazardous areas.

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. Channel movement that has occurred in Carson Valley from 1907 to 2003 is shown in Figure 6. It is important to continue to consider this potential for channel migration when allowing for development to occur. While a flood may not have affected an area 10 or even 50 years ago, changes in the river course, as well as upstream development or impacts, can have an impact downstream. Carson River gages are monitored by the USGS and data is available on their website (West Fork Carson River near Woodfords, East Fork Carson River below Markleeville Creek near Markleeville, Carson River near Carson City).

Flooding at Minor Ranch, 2017, showing extent of bank erosion

SUGGESTED ACTIONS 22-29:

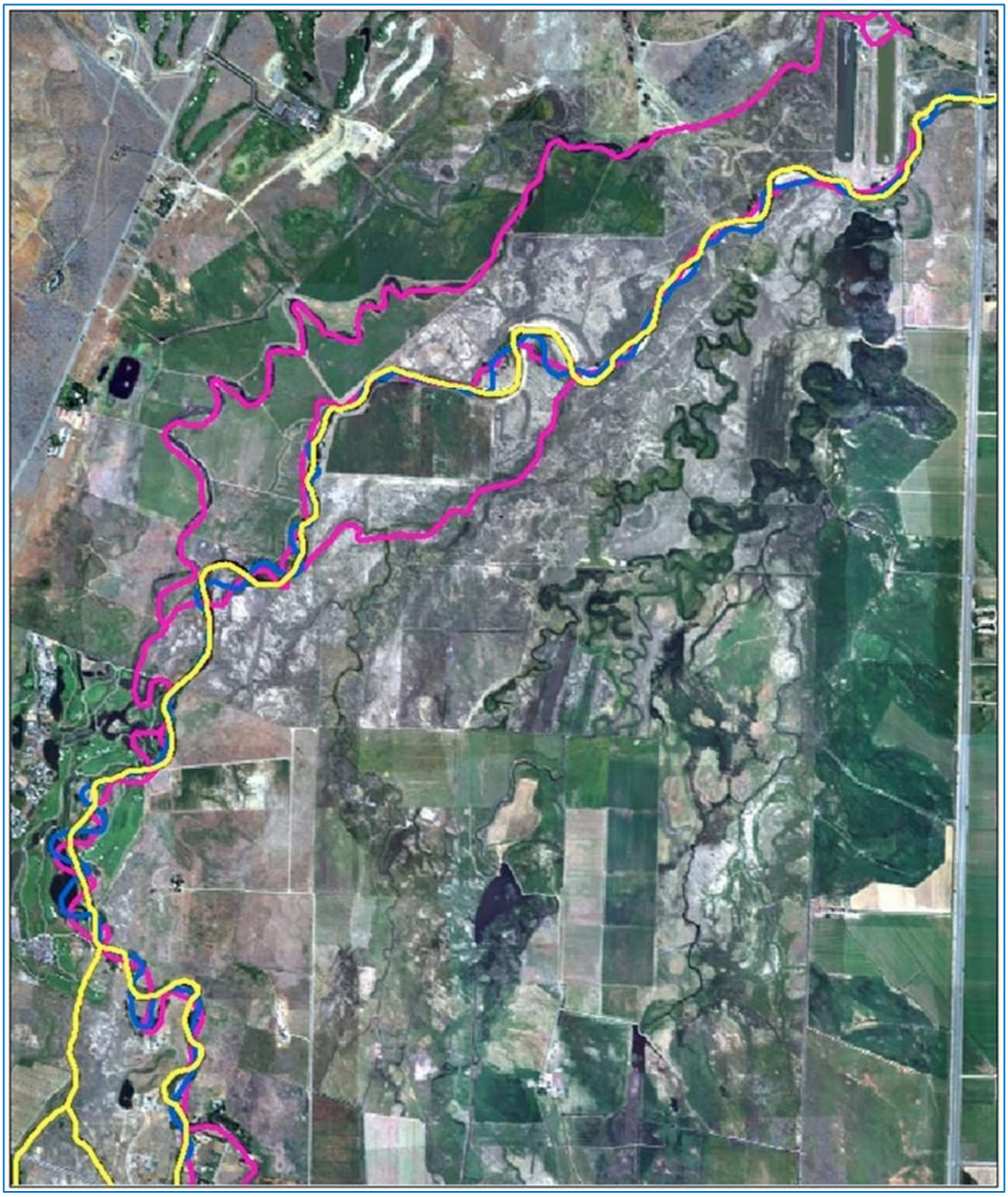
22. Document and update known and projected hazard areas including channel migration hazards and incorporated into planning processes.
23. Conduct LiDAR and/or aerial photography (on a watershed level) on a 5-year basis, or as needed, to provide updated information on channel movement and floodplain condition.
24. Establish building set-backs in flood hazard areas, where appropriate, to reduce severe hazards from channel migration.
25. Conduct and document channel cross-sectional surveys to track long term changes in river channel.
26. Identify unstable stream banks and areas with high potential for erosion.
27. Promote the use of non-structural, bio- engineering (soft-engineering utilizing natural materials) techniques in river restoration projects in combination with other proven methods.
28. Update the 1996 Fluvial Geomorphic Assessment and create a sediment transport model of the Carson River.
29. Create a baseline study that informs management and project decisions regarding flood risks, damages, and ecosystem impacts.

Channel migration risks are at least twofold in the Carson River valleys. Incised rivers are known to widen their gullies, and valley bottom rivers tend to meander. During floods the river will erode the outer banks of bends, and these bends will also migrate downstream. While this happens especially during extreme flood events, it can also happen during long-term (months-long) high flow events, where the banks are saturated and weakened over time, and collapse or erosion occurs. This unexpected erosion and channel migration further validate the need to keep the floodplain free from development.

Figure 6. Channel movement from 1906 to 2003 {Courtesy of Randy Pahl and Jean Stone, NDEP)

Genoa Lane to Cradlebaugh Bridge,
Carson River, Carson Valley, NV
1:24,000 scale

2003 Carson River
1938 Carson River
1900 Carson River



Floodplain managers throughout the nation are urging jurisdictions to consider the risks of allowing urban and residential development near meandering channels. Keeping such areas in agricultural or other open space uses is ideal in terms of avoiding economic losses for property owners and the community as a whole. Carson City has purchased almost all of the riverine floodplain lands in Carson City, allowing for the land to retain its floodplain storage capacity and reducing potential risk to life and property. The photo of Ambrose Natural Area (below) shows an example of the open space purchased by Carson City where floodwaters are allowed to overflow the banks without causing harm to residents.

Ongoing progress in the watershed includes continued funding by CWSD to the local conservation districts (Carson Valley Conservation District, Dayton Valley Conservation District, Lahontan and Stillwater Conservation Districts) to conduct bank stabilization projects that reduce erosion and reduce impacts to water quality and habitat values. These stabilization efforts may also limit loss of agricultural lands adjacent to the river. $250,000 from the State Clearing and Snagging Fund is available for the conservation districts to undertake clearing and snagging projects throughout the watershed to assist hazard removal. Additional funds to the conservation districts are used to promote the use of bioengineering and non-structural solutions for river restoration and rehabilitation; Friends of Hope Valley and the Alpine Watershed Group actively work to restore and rehabilitate river function in Alpine County. All of these actions are important in maintaining the waterway in a condition to ensure unimpeded flows during high events.

Carson City lands purchased for use as open space; Ambrose Natural Area serves as flood storage areas during the flood

4.5 FLOODPLAIN AND FLOOD HAZARD OUTREACH AND EDUCATION

Outreach and education are critical and low-cost tools that can be used to increase public safety, reduce flood risks, and raise awareness of the importance of functioning floodplains. CWSD and its partnering agencies and jurisdictions continue to conduct watershed-wide outreach programs to assist local programs and reinforce the flood hazard message in a consistent format. These activities are numerous, continuous, ongoing, and dynamic. A flagship event is the annual Flood Awareness Week, an outreach and education event held since 2014 across northern Nevada. Additional actions include development of watershed-based outreach and educational maps and brochures[11] including the University of Nevada Cooperative Extension (UNCE) brochure *The Importance of Floodplains in Our Communities and Floodplain Protection* for use throughout the watershed.[12] CWSD also debuted its "Floodplains as a Community Asset" video series. There are four videos prepared in this series listed below (website addresses and links are provided as footnotes). The videos support CWSD's overarching objective of informing watershed residents, policy makers, and developers on the importance of conserving the Carson River Floodplain and will be utilized in flood awareness outreach and education efforts throughout the watershed.

1. Public Service Announcement (PSA) – Conserving the Carson River Floodplain as a Community Asset[13]
2. Agriculture's a Good Fit in the Floodplain[14]
3. A Case for Developers to Conserve the Carson River Floodplain as a Community Asset[15]
4. Our Officials' Role in Conserving the Carson River Floodplain as a Community Asset[16]

Information about the floodplain and flood hazard outreach and education is posted on CWSD and Nevada Floods Websites[17],

SUGGESTED ACTIONS 30-34:

30. Continued implementation of watershed- wide outreach and education program about floodplain importance and flooding hazards.
31. Promote and participate in Annual Flood Awareness Week (FAW) and events throughout the year with the objective of providing information about flooding and flood hazards to the general public.
32. Develop and update media in conjunction with FAW working group (social media, videos, brochures, web content, press releases, etc.) for distribution throughout watershed with consistent messages and information for the general public.
33. Promote FAW partner websites (e.g., NevadaFloods.org, National Weather Service, CWSD, and county websites) which provide information on the Regional Floodplain Management Plan, flood risk, emergency preparedness, and emergency contact information. Link to one another's websites and social media sites to amplify message.
34. Utilize special events, River Work Days, and other outreach opportunities in conjunction with FAW working group to raise awareness of flooding hazards and importance of floodplains.

[11] Carson River Watershed Map: http://www.cwsd.org/wp-content/uploads/2014/07/USGS-Watershed-Map- 836x1024.jpg
[12] University of Nevada Cooperative Extension Floodplain Protection Inventory: https://www.unce.unr.edu/publications/files/nr/2015/sp1505.pdf; The Importance of Floodplain Lands to our Communities: https://www.unce.unr.edu/publications/files/nr/2012/fs1206.pdf
[13] https://www.youtube.com/watch?v=OzkvVBD43is&feature=youtu.be
[14] https://www.youtube.com/watch?v=2TTYIS3oxC0&feature=youtu.be
[15] https://www.youtube.com/watch?v=aR9aaecjmbA&feature=youtu.be
[16] https://www.youtube.com/watch?v=ZGco3s6K_AY

[17] www.nevadafloods.org; www.cwsd.org

as well as local jurisdiction websites. Continuing education and outreach are vital to keep residents and communities aware of the flood hazards faced in the community, how to prevent or reduce damage, and what to do in case of such an emergency. CWSD provides annual reports to the jurisdictions that participate in the CRS program outlining outreach and education efforts. These include detailed descriptions of the activities conducted each year in satisfaction of CRS crediting requirements (Section 3.5 of the annual report). It is important for each jurisdiction to have a watershed-wide message regardless of differing flooding hazards. "Turn around, don't drown" and the Flood Awareness Week are campaigns that improve awareness for the public everywhere. Individual communities may also require additional or specific outreach and education. Activities include monitoring of river channels and restoration projects, river clean-ups, and elementary school curriculum. It is important to maintain the frequency of these events to keep flood awareness on residents' minds. Other non-profit groups, such as River Wranglers, Sierra Nevada Journeys, and The Nature Conservancy, provide invaluable education and community outreach that assists in maintaining river function and while reducing flood risk.

Flood Awareness Week activities include using the flood model to promote awareness of changes to the floodplain due to upstream changes.

4.6 REDUCTION OF INFRASTRUCTURE IMPACTS

Restrictions to the movement of flood waters due to existing infrastructure include:

- Raised roadways and driveways that do not have appropriate drainage to pass flood waters. This can result in a back-up of floodwaters affecting not only the landowner but adjacent properties.
- Work conducted in the 1960's by various governmental organizations resulted in berms along portions of the Carson River that restrict access of the river to its floodplain. This results in faster, more erosive flows impacting downstream communities.
- Many of the bridges crossing the Carson River have low capacity during flood events and act as constrictions to the passage of flood flows. This can result in increased flood damages and excess streambank erosion.
- Grade control structures in the river are frequently damaged during flood events. Repairs to the structures after flooding events has historically returned them to the same pre-flood condition per FEMA requirements. This can result in similar damages to the structures in future flooding events, thereby requiring the same types of repairs. Seeking opportunities to upgrade/redesign these structures to not only meet the needs of the water right user but be beneficial to other integrated watershed management objectives is important.

SUGGESTED ACTIONS 35-39:

35. Investigate opportunities and implement actions when feasible to remove existing restrictions, such as berms, to allow flood waters to access floodplain.
36. Limit the use of future management measures such as dams, levees, and floodwalls.
37. Design future bridges and roads to protect floodplain, accommodate and not restrict changing river course, and minimize back up of flood water.
38. Investigate opportunities to enhance grade control structures.
39. Inventory, categorize, and house data regarding public and private drainage and flood control infrastructure in the Carson River Watershed.

Culverts and other drainage infrastructure often fill with sediments and debris after flow events, thereby restricting the amount of flood waters that can flow through them and in many cases backing up flow. Often, lack of county resources limits ongoing maintenance which keep these structures operating as constructed. There are opportunities throughout the watershed for the enhancement and/or design of roads, culverts, grade controls, and bridges to accommodate floodwaters better, protect floodplains, and decrease bank erosion. New opportunities are evident after each large flood event, and such opportunities were identified during the "Rapid Evaluation of the River System" described previously. Such identification will lead to funding opportunities to address the known impacts. Rebuilding damaged infrastructure so that it will be more resilient to flooding is a good investment and is promoted by FEMA.

Funding has been secured for minor stormwater conveyance and culvert upsizing for specific locations that were identified after flood events. Current and planned area drainage master plans, such as the Johnson Lane Area Drainage Master Plan in Douglas County, will likely serve to identify locations in need of such improvements. While these studies are generally in upland areas that are tributary to the Carson River, some improvements have been identified along the Carson River itself. The Martin Slough irrigation ditch has been expanded and the Cottonwood Slough ditch will be completed in 2019, both to prevent water from backing up upstream into communities and causing flooding and closing major highway routes.

4.7 MAP/STUDY ALLUVIAL FAN FLOOD HAZARDS

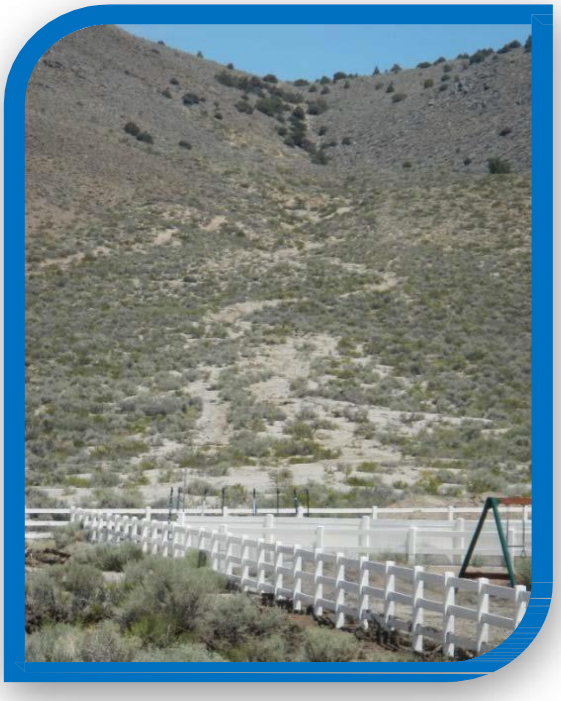
Recently, flood damage has resulted from alluvial fan flooding throughout the watershed. Such flooding presents unique problems to federal and state planners in terms of quantifying flood hazards, predicting the magnitude at which those hazards can be expected at a particular location, and devising reliable mitigation strategies. Existing and future development on alluvial fans and other areas subject to flash floods or debris flows is of great concern.

In an effort to identify risk of alluvial fan flooding, the USACE (December 2017) prepared an initial alluvial fan classification in the watershed. Alluvial fans were delineated based on aerial imagery, soil, and geological maps, then ranked by relative risk using specified criteria. These criteria can be altered to assess more specific local or regional risk based on each alluvial fan. The mapping results provided by USACE are not intended to be used for community or planning purposes or for informing emergency response decisions.

SUGGESTED ACTIONS 40-43:

40. Investigate extent of potential alluvial fan flood damage and include on maps.
41. Conduct Area Drainage Master Plans for alluvial fans which examine infrastructure, land use, sediment transport, and identify alternative to mitigate and/or reduce risk.
42. Implement studies to inform and motivate land use planning and development which protects high risk areas and/or allows flood waters and debris flows to safely move through fan flood zones.
43. Define and implement means to protect existing open alluvial fans from development and where development exists, implement recommendations associated with SA #'s 40-42 to limit further development and/or alleviate hazards in high risk areas.

Douglas County alluvial fan



Future work to improve the accuracy of this study could include field verification of alluvial fan extents, inclusion of a future development risk factor, weighting risk factors based on the intended application, inclusion of LiDAR data, replacing visual estimations from maps with geo-processes for some risk factors, and adding risk factors such as mining impacts, grazing, slope, and precipitation where applicable. Jurisdictions are encouraged to use the accompanying pilot project maps to identify alluvial fans as flood hazards, develop mitigation strategies, and recommend further studies be conducted to more accurately assess fan hazards based on areal and geographic factors specific to the Carson River Watershed.[18]

[18] The mapping results provided by USACE are not intended to be used for community or planning purposes, or for informing emergency response decisions.

As part of the planning process, several of the counties are developing area drainage master plans to identify the flood hazards and which proposed methods are most effective to alleviate these hazards and reduce risk. These methods include maintaining open channels, locating detention basin sites, and improving infrastructure.

The 2017 USACE Alluvial Fan Mapping Methodology can be found online at: http://www.cwsd.org/wp-content/uploads/2018/08/Methology-for-Carson-River-Alluvial-Fan-Study-Final.pdf [18]

Culvert in Douglas County was upgraded to convey higher flow events

4.8 STORMWATER MITIGATION

Low impact development (LID) practices are beneficial because they can decrease the amount of pollutants and volume of water delivered directly to waterways by infiltrating the water on site. Incorporation of LID principles into development plans to decrease generation of runoff are encouraged by CWSD, FEMA and the EPA. LID practices reduce development and redevelopment stormwater control costs, improve water quality, enhance neighborhood beauty, reduce the severity of costly flooding events, and improve groundwater recharge.

Through funding provided by the Nevada Division of Environmental Protection's (NDEP) Clean Water Act Sec. 208 planning funds, CWSD partnered with Resource Concepts Inc. (RCI, CWSD 2015) to research, document, and enhance LID implementation in the various counties. The document was aimed at county officials and staff with the goal of eliminating existing road blocks to LID implementation by providing clear

SUGGESTED ACTIONS 44-48:

44. Promote stormwater infiltration rather than direct outflow to urban infrastructure, ditches, creeks, rivers to capture groundwater, improve water quality, and reduce flood risk.
45. Plan for and mitigate cumulative effects of watershed urbanization, including stormwater runoff, to reduce flood hazards.
46. Encourage and incorporate low impact development (LIDs) principles into all development proposals to decrease stormwater run-off, improve water quality, and promote groundwater recharge.
47. Encourage adoption of model LID ordinances created for Watershed.
48. Promote and utilize best management practices to reduce urban runoff.

practices and steps to implement LID practices in the Carson River Watershed.[19]

The document recommended training workshops in partnership with local and state authorities, as well as local builders, developers, and landscapers to promote the benefits of LID and how to implement the practices. Currently, funding is available to complete LID ordinances, and to conduct a review and audit of existing ordinances to ensure there is no inconsistencies that limit LID use in existing code. LID practices are often straightforward and should be incorporated into the fabric of the planning process to ensure effective implementation and long-term maintenance. Community outreach and involvement is an important aspect for LID implementation. Every community has different types of impacts, water quality or flooding issues, MS4 system requirements, and existing regulations, so working together to incorporate LID ordinances and practices into local jurisdictions repertoire is important.

[19] http://www.cwsd.org/wp-content/uploads/2015/07/2015-04-07-LID-Carson-Watershed.pdf

5.0 IMPLEMENTATION

As evidenced herein, significant progress has been made watershed-wide to identify existing and new flood risks and implement various types of actions to prevent or mitigate flood hazards. This variety of strategies will require continued progress involving coordination of the stakeholders and, as always, is dependent upon available funding and staffing resources.

5.1 STEPS FOR PLAN IMPLEMENTATION

Regional Floodplain Management Plan implementation has been successful to date through the activities of CWSD, the CRC and the Floodplain and River Working Group, local jurisdictions, and the continued actions and support of technical advisory groups. All these partners have worked to proactively direct research, funding, and improvements in the watershed. Success is evident within every jurisdiction. There are many new areas of protected floodplain (See UNCE 2015), and floodway and floodplain maps have been revised and/or created identifying new flood hazards. All the jurisdictions update their hazard mitigation plans when required to ensure they are not only in step with FEMA and State requirements, but meet the needs of their respective communities. Seeking alternative funding sources is ongoing to support community efforts to address local challenges as FEMA contends with catastrophic national disasters such as hurricanes, floods, fires, and earthquakes.

5.1.1 Summary of Suggested Actions

While suggested actions discussed in this section broadly apply to all jurisdictions and are intended to detail the extent of management actions that have taken place in the watershed, each jurisdiction has accomplished different actions based on their specific needs. Table 11 includes the progress and continued suggested actions to address flood hazard and mitigation within each jurisdiction. The activities of CWSD as a FEMA CTP to be able to continuously secure and prioritize funding and projects is of great benefit to the stakeholders. Appendix E includes county progress toward implementing suggested actions.

Other Implementation Measures:

Establish coordination procedures for county floodplain administrators and the CWSD to ensure regional coordination as well as local. CWSD has developed a comparison of this plan with the Community Rating System and works with the counties to submit proper documentation to allow the counties to receive credit for this regional plan and associated activities. This credit is important to potentially lowering flood insurance rates for community members and to document cooperative activities.

CWSD will continue to meet with the CRC, the Floodplain and River Management Working Group, floodplain administrators, and other stakeholders to coordinate implementation of the suggested actions and implementation of this plan at the local level. CWSD is dedicated to planning, coordinating, and seeking funds to increase awareness relating to this plan. It also focuses on strengthening and expanding the on-the-ground implementation efforts of our local jurisdiction partners to fulfill the floodplain management goals and suggested actions stated in this plan.

5.2 MONITORING AND REVISION

As described previously, an annual CRS report evaluating progress towards implementing the suggested actions is coordinated and prepared by CWSD and provided to the county floodplain administrators and other interested parties. Annual reports for the jurisdictions are included in Appendix D, Project Documents section.

The floodplain management plan and suggested actions will continue to be reviewed and updated on an as-needed basis, not to exceed a five-year time frame. CWSD will work with stakeholders, including the working group and local floodplain administrators, to complete any revisions and updates. All change will be digitally distributed and presentations to stakeholder boards or staff can be requested at any time.

Success and improvements in the effectiveness of the completed suggested actions and the regional approach to floodplain management can be measured by factors such as: reduction in flood damage, enhancement of sediment transport capabilities, protection of additional floodplain acreage, enhancement of water quality, and general awareness of flooding issues by the public.

5.3 LINKING REGIONAL FLOODPLAIN MANAGEMENT WITH OTHER PLANS

This Plan is consistent with the following documents and demonstrates how they link to this plan and complement each entity's floodplain management and hazard mitigation efforts.

5.3.1 Hazard Mitigation Plans

A FEMA-approved hazard mitigation plan is a condition for receiving certain types of non-emergency disaster assistance, including funding for mitigation projects. Ultimately, hazard mitigation planning enables actions to reduce loss of life and property, lessening the impact of disasters. It is most effective when implemented under a comprehensive, long-term mitigation plan. State, tribal, and local governments engage in hazard mitigation planning to identify risks and vulnerabilities associated with natural disasters. The plans outline long-term strategies for protecting people and property from future hazard events and are key to breaking the cycle of disaster damage, reconstruction, and repeat damage.

Developing hazard mitigation plans enables state, tribal, and local governments to:

- Increase education and awareness around threats, hazards, and vulnerabilities;
- Build partnerships for risk reduction involving government, organizations, businesses, and the public;
- Identify long-term, broadly-supported strategies for risk reduction;
- Align risk reduction with other state, tribal, or community objectives;
- Identify implementation methods that focus resources on the greatest risks and vulnerabilities; and
- Communicate priorities to potential sources of funding.

Local jurisdictions have received FEMA funding to update their hazard mitigation plans. Each plan has a section with a goal to reduce the possibility of damage and losses due to flooding. Alpine County has additional language on landslides and severe weather; both of which are related to flooding.

5.3.2 Carson River Watershed Adaptive Stewardship Plan

CWSD's Board adopted the original Carson River Watershed Adaptive Stewardship Plan (Plan) in 2007, and an update was adopted in 2017. The main purposes of the Plan are to:

A. provide an overview of the watershed and its challenges;
B. identify potential sources of nonpoint source pollution;
C. discuss short and long-term strategies and actions to address these potential sources;
D. provide a tracking mechanism for projects and programs;
E. identify future project and program opportunities; and,
F. address the nine criteria elements of the Clean Water Act (CWA) Section 319 Program. These criteria elements are provided on page II, Section 1.1 of the 2007 plan.

Many organizations throughout the Carson River Watershed rely upon CWA 319 funding for projects and programs. It is the desire of the Environmental Protection Agency (EPA) and the Nevada Division of Environmental Protection (NDEP) that all watershed-based plans meet the EPA's nine criteria elements. EPA and NDEP determined that both the 2007 Plan and 2017 Plan update meet the EPA criteria to be considered a watershed-based plan in the Nevada portion of the watershed. All projects and programs implemented within the watershed utilizing NDEP/EPA CWA 319 funds are expected to be consistent with this plan.

For organizational purposes, the Plan focuses on seven project categories. One of the goals of the Plan is to present a comprehensive list of projects that fall within these categories to illustrate how the projects and programs are moving in a purposeful and solution-based direction. The seven major project categories as listed in the 2007 Plan are:

1. Floodplain Management
2. Water Quality
3. Regional Water Supply
4. River Rehabilitation/Stabilization/Habitat Enhancement
5. Invasive Species
6. Outreach and Education
7. Recreation Use and Management

The Plan lists multiple projects under each project category. Projects associated with Floodplain Management and River Rehabilitation/Stabilization have close links to implementation of the goals and suggested actions in the Regional Floodplain Management Plan. Links with other project categories may be less obvious such as water quality, invasive species, and outreach and education. However, stormwater and LID/Green infrastructure projects reduce flooding while improving water quality. Flooding impacts river rehabilitation and bank stabilization processes and becomes a potent vector of invasive species. Flood awareness activities are critical component of CWSD's multi-objective outreach and education efforts.

5.3.3 Carson River Flood Mitigation Plan

As new Flood Insurance Rate Maps (FIRMs) are being generated for the Carson River Watershed, they will establish Special Flood Hazard Areas along the entire Carson River. This Flood Mitigation Plan is a multi- jurisdictional

effort led by the Carson Water Subconservancy District to prioritize mitigation measures implemented by each jurisdiction in conjunction with the new FIRMs. Affected jurisdictions include Alpine County, Carson City, Douglas County, and Lyon County. New FIRMs benefit the Carson River area by identifying flood hazards so that the community can better improve public safety and property protection during future flood events.

New flood maps also bring flood insurance requirements and limitations on uses of property. This plan recommends mitigation measures from a variety of flood management activities listed in existing hazard mitigation plans, comprehensive plans, and floodplain management plans from local communities within the Carson River watershed. These mitigation measures are prioritized according to the effectiveness of each activity based on the individual needs of each jurisdiction.

This plan recommends the most cost-effective and beneficial activities to be implemented as mitigation measures by each jurisdiction in three implementation phases. Mitigation measures are separated into three categories: ordinances, programs, and projects. Ordinances are regulations to be adopted by each jurisdiction, mostly related to development and land use. Programs are community-led endeavors to improve each jurisdiction's floodplain management program through targeted use of finances and staff resources. Projects are construction-based solutions that are recommended to mitigate flood hazards. This plan provides a convenient action plan that each jurisdiction can use to implement mitigation measures to improve public awareness, enhance public safety, and prevent loss of life and property.

5.4 ADDITIONAL REGULATORY AND PERMITTING AGENCY COORDINATION

Local jurisdictions often have their own Floodplain Ordinances. Updated model ordinances are in the process of being developed specifically for the Carson River Watershed entities that have updated FIRMS and are using the new hydraulic model (See Section 4.2.1 Revised Ordinances). In addition to these local ordinances, the following Federal, State, and local permitting requirements are associated with floodplain management and need to be considered when implementing suggested actions (Table 12):

Table 12. Additional regulatory and permitting agency coordination

ORDER/ACT	PERMITTING REQUIREMENTS
Clean Water Act of 1972	Section 303: Authorizes States and Tribal governments to establish water quality standards for navigable waterways to protect and enhance water quality. Section 311: Addresses pollution from oil and hazardous substances. Section 401: Provides that no Federal permit or license is issued for activities that might result in a discharge to navigable waters unless a 401 certification is issued. Section 402: The National Pollutant Discharge Elimination System (NPDES) is a permitting system established to regulate point source discharges of pollutants and is under the purview of the U.S. EPA. Section 404: Establishes permitting systems to regulate the placement of dredged or fill materials into waters (including wetlands) under the U.S. Army Corp of Engineers' purview.
U.S. Fish and Wildlife Service Endangered Species Act of 1973	Consultations are required under Sections 7 and 10 of this Act if development is proposed in an endangered/protected species habitat.
U.S. Coast Guard	Project may require a permit if the proposed development includes a bridge or causeway that may affect navigation.
U.S. Army Corps of Engineers	All projects within a navigable waterway require permits.
State Permits	• Construction in floodways or other designated areas • Stream crossings or projects that affect navigable rivers • Installation of septic systems • Subdivision standards of subdivision plat or lot filling requirements • Manufactured housing (mobile home) park or tie down requirements • Public health facilities, such as hospitals and nursing homes • Operating a landfill or hazardous materials storage facility
Executive Order 11988 was rescinded by the Trump administration in 2017. However, it is recommended for community implementation by the Association of State Floodplain Managers and Floodplain Management Association as a best management practice for floodplain management.	• Requires Federal agencies to first assess whether a property will be located within the SFHA or 500-year floodplain, and, if so, to follow an eight-step process to assure all alternatives and guidelines are met before proceeding with the project. • Enacted to "Avoid to the extent possible the long- and short-term adverse impacts associated with occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative."

5.5 POTENTIAL FUNDING SOURCES

There are many sources of available funding, as detailed in Table 13. Federal and other funding often requires cash and/or in-kind match. Eligibility for funding sometimes requires being named/listed in state or regional plans.

Table 13. Federal, state and local funding sources

ENTITY	SOURCE
FEDERAL	U.S. Environmental Protection Agency
	Federal Emergency Management Agency (FEMA)
	Natural Resources Conservation Service
	Farm Service Agency
	U.S. Bureau of Reclamation
	U.S. Army Corps of Engineers
	U.S. Bureau of Land Management
	U.S. Fish and Wildlife Service
	U.S. Forest Service
STATE	California State Water Resources Control Board Lahontan Region
	Nevada Division of State Lands - Question One Funds
	Nevada Division of Environmental Protection
	Nevada Division of Water Resources
	Nevada Division of Forestry
	Nevada Division of Conservation Districts
LOCAL	Carson-Truckee Conservancy District
	Carson Water Subconservancy District
	Carson City Question 18 Funds
	Private and Non-Profit Organizations

6.0 PLANNING PROCESS

Oversight and administration of this Regional Floodplain Management Plan Revision was provided by CWSD and the CRC Floodplain and River Management Working Group. Information to help update this plan was obtained from September 2017 through June 2018 in working group meetings and through jurisdiction interviews. Appendix A describes this process in detail. Further guidance was provided by the CWSD Board of Directors and Floodplain Administrators from all six counties along the Carson River and within alluvial fan areas.

The CWSD Board of Directors (Board) provided feedback and input throughout the plan development process. This step was critical as the Board is comprised of elected officials from most six counties along the Carson River Watershed. At each step of development, the Board was provided presentations and discussion opportunities about the Plan. This Board will also approve for the Final Plan to be presented to County Boards of Supervisors or Commissioners for their possible adoption.

7.0 EMERGENCY RESPONSE AND FLOOD WARNING

Each county has an emergency response plan on file, but according to the Nevada Attorney General's ruling which cites NRS 239c, these plans are no longer deemed public documents due to homeland security concerns. First responders in appropriate agencies will receive a copy of a given county's or city's emergency response plan.

The following individuals are responsible for emergency response in the event of a flood. Information is also available on the CWSD website at www.cwsd.org and at www.floodsmart.gov.

Table 14. Emergency response contact information as of 9/2018

JURISDICTION	CONTACT	INFORMATION
Alpine County, California	Emergency Response Officer: Spencer Case	(530) 694-2231
	Sandbag Materials Location	Woodfords Fire Station
		50 Diamond Valley Road Markleeville, California
		(530) 694-2922
		Markleeville Fire Station #92
		860 Hot Springs Road Markleeville, California
		(530) 694-2223
Carson City, Nevada	Emergency Manager: Sean Slamon	(775) 283-7722
	Sandbag Materials Location	City Corporate Yard
		3303 Butti Way Carson City, NV 89701
		(775) 887-2355
Churchill County, Nevada	Emergency Manager: Mike Heidemann	1175 Wood Dr. Fallon, NV 89406 (775) 423-4188
	Floodplain Manager: Michael Johnson (Planning Director)	155 N. Taylor Fallon, NV 89406 (775) 423-7627
	Cliff Van Woert (Building Official)	(775) 428-0264
	Sandbag Materials Location	County Road Department Yard
		330 N. Broadway Fallon, NV
		(775) 423-4133
Douglas County, Nevada	Emergency Communications Manager: Todd Carlini, East Fork Fire Chief	1694 County Road, Minden, NV 89423.
		(775) 782-9040
	Floodplain Manager: Mimi Moss	(775) 782-6201
	Sandbag Materials Locations	All Fire Departments in County

JURISDICTION	CONTACT	INFORMATION
Lyon County, Nevada	Emergency Manager: Jeffrey Page	27 S. Main Street Yerington, NV 89447
		(775) 463-6531
		24-Hour Dispatch: (775) 463-6620
	Floodplain Manager: Chuck Reno	(775) 463-6535
	Sandbag Materials Locations	Dayton Utilities Yard,
		34 Lakes Road Dayton NV 89403 (775) 246-6220
		18 Highway 95A Yerington NV 89447
		(775) 463-6551
Storey County, Nevada	Emergency Management: Joe Curtis (Director) OR Cherie Nevin (Deputy Director)	P.O. Box 7 Virginia City, NV 89440
		(775) 847-0454
	Floodplain Manager: Kathy Canfield	P.O. Box 176 Virginia City, NV 89440
		(775) 847-1144
	Sandbag Materials Locations	Virginia City Public Works
		110 Toll Road Virginia City, NV 89440
		Mark Twain Community Center
		500 Sam Clemens Avenue Dayton, NV 89403
Washoe Tribe of Nevada and California	Emergency Management Coordinator	(775) 265-8695
	William Bergquist	

7.1 FLOOD FORECAST AND WARNING SYSTEMS

According to the National Weather Service (NWS) there are three official river forecast points in the Carson River Watershed. There are five locations which NWS also monitors and will issue warnings for these locations if needed, but there are no official forecasts. Locations for all systems and stations are shown in Table 15.

Table 15. NWS Flood forecast and warning systems and weather stations in the Carson River Watershed

JURISDICTION		
National Weather Service River Forecast Points	1	West Fork Carson River at Woodfords, California
	2	East Fork Carson River near Gardnerville, Nevada
	3	Carson River near Carson City, Nevada
NWS Monitoring Station	1	East Fork Carson River below Markleeville Creek near Markleeville, California
	2	Carson River at Dayton, Nevada
	3	Carson River at Fort Churchill, Nevada
	4	Carson River below Lahontan Dam near Fallon
	5	Carson River at Tarzyn Road near Fallon (Bafford Lane area)
Flood Warning Systems	1	Minden – East Fork Carson River
	2	Genoa Canyon – two miles west of Genoa
	3	Lebo Springs – 12 miles northeast of Minden in Buckeye Creek drainage directly east of Johnson Lane/Buckbrush Wash drainage
	4	Pine Nut Creek – 10 miles east southeast of Gardnerville
	5	Fish Springs – 5 miles from Gardnerville
	6	Gardnerville
	7	Spooner Summit
Weather Stations	1	Upper Clear Creek
	2	Carson City Airport
	3	Upper Ash Canyon
	4	Carson City Fire Station #3
	5	Vicee Canyon
	6	Snow Valley Peak
	7	Lower Ash Canyon
	8	Lower Kings Canyon
	9	North Upper Kings Canyon

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APPENDICES

Appendix A Floodplain Management Plan Update / Revision Process

2018 Regional Floodplain Management Plan (RFMP) Update/Revision Process

Section 5.2 Monitoring and Revision calls for an update of the RFMP to be completed on an as needed basis, not to exceed five years. CWSD worked with stakeholders, including the Floodplain and River Management (Formerly the River Corridor) Working Group and local floodplain administrators to complete this revision. The process outline is as follows:

A. Work with stakeholders to determine the update format and what revisions/updates are required in the plan.
B. Interview jurisdictions regarding floodplain management plan and conduct a rapid evaluation of each county.
C. Complete draft revisions on plan and send out for comment by stakeholders.
D. Finalize draft revised plan based on input from stakeholders.
E. Provide final draft revised plan for comments to stakeholders.
F. Incorporate stakeholder comments and present final draft revisions to CWSD Board, September 19, 2018 for adoption by CWSD.
G. Present CWSD adopted final revised plan to Counties and other stakeholders for adoption.
H. Complete Revision Process Appendix L post adoption by CWSD and stakeholders for final.

A. CWSD staff worked with the CRC Floodplain and River Management Working Group on the revision. The group decided the 2018 Revision would be a re-write of the plan:
   a. Complete reorganization of format, content, and appendices;
   b. Content of plan significantly changed;
   c. Incorporate the 2013 updates into document and appendices;
   d. Suggested Actions Table is reorganized and reordered. These new sections were added:
      i. Alluvial Fan Flood Hazards (Suggested Actions 40 – 43; they are all new, see below); &
      ii. Minimize Stormwater Impacts (Suggested Actions 44 - 48; #44 & #48 are new, while #45 & # 46 were moved from other sections, see below)

   New suggested actions were added:
      i. SA #20: Establish and maintain rain gage data network in each local jurisdiction.
      ii. SA #21: Evaluate potential impacts due to climate variability which could include changing storm patterns, rainfall amounts, and snow levels, adding uncertainty to future conditions.
      iii. SA #29: Create a baseline study that informs management and project decisions regarding flood risks, damages, and ecosystem impacts.
      iv. SA #39: Inventory, categorize, and house data regarding public and private drainage and flood control infrastructure in the Carson River Watershed.
      v. SA #40: Investigate extent of potential alluvial fan flood damage and include on maps.
      vi. SA #41: Conduct Area Drainage Master Plans for alluvial fans which examines infrastructure, land use, sediment transport to identify & identify alternative to mitigate and/or reduce risk.
      vii. SA #42: Implement studies to inform and motivate land use planning & development which protects high risk areas, and/or allows flood waters and debris flows to safely move through fan flood zones.

viii. SA #43: Define and implement means to protect existing open alluvial fans, implement recommendations associated with SA#'s 38-40 to limit further development and/or alleviate hazards in high risk areas.
ix. SA #44: Promote stormwater infiltration rather than direct outflow to urban infrastructure, ditches, creeks, rivers to capture groundwater, improve water quality, and reduce flood risk.
x. SA #48: Promote and utilize best management practices to reduce urban runoff (Refer to SA #5)

This revision reflects the detailed Physical Map Revision of the Carson River and other studies and projects since the 2008 Floodplain Management Plan and 2013 supplemental update.
Appendix A, B and C were updated. Appendix D includes list of past projects with links to associated reports. There are also links to the FEMA County FIRMS since the Discovery Report already has maps contained therein. In Section 2.2, Community Rating System, FEMA's 510 Floodplain Management Plan Checklist describes how this Plan meets FEMA requirement for Floodplain Management Planning.

Appendices were reordered:

Appendix A	Floodplain Management Plan Update / Revision Process
Appendix B	Rapid Evaluation of the Carson River
Appendix C	2018 Risk MAP Discovery
Appendix D	CWSD Project Report Links & FEMA County Flood Insurance Rate Maps (FIRMs) Links
Appendix E	County Progress Reports
Appendix F	Risk MAP Charter & FEMA CTP Agreement
Appendix G	Adoption of RFMP

The draft revised plan revised and updates the original table of contents. Draft revisions were sent out to the CRC Floodplain and River Management Working Group in June 2018. Comments and updates were incorporated into a second draft and sent to stakeholders in early August 2018. The *Carson River Watershed Regional Floodplain Management Plan 2018 Revision* will be presented for adoption to CWSD's Board of Directors. Once adopted by CWSD, it will be presented to each County for adoption. Each County's formal actions or resolutions adopting the 2018 Revision will be added to Appendix G's historic adoption documents.

In addition, notes of CRC FRM working group and CRC forum program. The forum attendees indicates ~ 77 people attended. Table J1 lists meetings throughout the revision process.

Table J1. Meeting Dates, Meeting Type and Participants.

Meeting Date	Meeting/ Action Type	Participants
8/15/2018	Carson River Coalition Floodplain and River Management (CRC-FRM) Working Group	see notes in Floodplain Management Plan Appendix H, Discovery Report, Appendix D, Discovery Meetings
10/24/2018	CRC - FRM	see notes in Floodplain Management Plan Appendix H, Discovery Report, Appendix D, Discovery Meetings
1/23/2018	CRC - FRM	See Attached Meeting Notes
2/8/2018	Carson City Interview - conducted table top exercise to update Appendix C Rapid Evaluation and Reviewed Mitigation Plan to discuss changes to ordinances.	Robb Fellows, Carson City Public Works; Lyndsay Boyer, Carson City Open Space; Rob Holley, Dayton Valley Conservation District ; Nicole Goehring, Nevada Division of Water Resource ; Jean Stone, Nevada Division of Environmental Protection; Deborah Neddenriep, Carson Water Subconservancy District, Karin Peternel, Michael Baker
2/12/2018	Douglas County Interview - conducted table top exercise to update Appendix C Rapid Evaluation and Reviewed Mitigation Plan to discuss changes to ordinances.	Erik Nilssen, Douglas County Engineering; Courtney Walker, Douglas County Engineering; Craig Burnside, Carson Valley Conservation District ; Nicole Goehring, Nevada Division of Water Resource ; Jean Stone, Nevada Division of Environmental Protection; Deborah Neddenriep, Carson Water Subconservancy District, Karin Peternel, Michael Baker

Meeting Date	Meeting/ Action Type	Participants
2/13/2018	Alpine County Interview - conducted table top exercise to update Appendix C Rapid Evaluation and Reviewed Mitigation Plan to discuss changes to ordinances.	Zach Wood, Alpine County Community Development; Gavin Feiger, Alpine Watershed Group; Scott Ferguson, California Water Quality Control Board, Lahontan District; Deborah Neddenriep, Carson Water Subconservancy District, Karin Peternel, Michael Baker
3/7/2018	Lyon County Interview - conducted table top exercise to update Appendix C Rapid Evaluation and Reviewed Mitigation Plan to discuss changes to ordinances.	Tammy Kinsley, Lyon County Planning; Rob Holley, Dayton Valley Conservation District ; Nicole Goehring, Nevada Division of Water Resource ; Jean Stone, Nevada Division of Environmental Protection; Deborah Neddenriep, Carson Water Subconservancy District;, Karin Peternel, Michael Baker
4/11/2018	Carson River Coalition Floodplain Management Forum	Attendees of CRC Forum -See Attached Program and Sign-In Sheet

Floodplain and River Management Working Group Notes

Tuesday, January 23, 2018
1:30 PM – 4:30 PM

Location: **Ponderosa Room at Carson City Community Center (SE Corner of Community Center Gym)William Street, Carson City, NV 89703**

Nicole Goehring, NDWR
Lyndsey Boyer, CC Open Space
Mary Crawley, NDSL
Ann Bollinger, CC Open Space
Bunny Bishop, NDWR
Rob Pyzel, Lyon County
Rob Loveberg, Consultant
Steve Lewis, UNCE
Christy Sullivan, LCD
Erik Nilssen, Douglas County
Andrea Moe, NDA
Courtney Walker, Douglas County
Keith Weaver, HDR Engineering
Louise Thompson, CWSD
Brian Peters, Alpine County
Ed James, CWSD
Jean Stone, NDEP
Robb Fellows, CCPW
John Coborn, UNCE
Shyla Lemons, CCPW
Kayla Meyer, NDWR
Darwin Holyan, Washoe Tribe
Debbie Neddenriep, CWSD
Brenda Hunt, CWSD
Karin Peternel, MBI
Geoff Brownell, MBI

1. Welcome

2. 1:30 – 3:30 pm **Agenda FEMA Discovery and Regional Floodplain Management Plan(RFMP) Update Meeting #**

   Meeting Goals:

   - ❖ Finalize Discovery Plan- There was a call for amendments to be sent to Brenda by 1/31/2018.
   - ❖ Gather feedback on needed revisions to format and content of existing RFMP to improve the document, and
   - ❖ Determine how to best collect additional data, mainly in regard to updating the rapid evaluation in current RFMP.

   A. Quick Project Overview of Discovery and Floodplain Management Plan Updates

   B. Review Final Draft Discovery Report before meeting – Follow link: https://eftp.mbakerintl.com/link/Sfz2VZxtATgBcZ2dkrMfBk -

   ACTION: Provide comments back by end of January!

C. Carson River Watershed Regional Floodplain Management Plan (RFMP) Improvements Brainstorm (open discussion)

Please Review the 2008 RFPMP and the 2013 Supplemental Update in preparation of this discussion. Please come prepared to:

1. Share opinions about:
    a. Information gaps- it would be good to include how the FMP relates to other documents: Stewardship Plan, Flood Hazard Mitigation, etc.
    b. Format improvement – The executive summary will be reduced and will improve readability by removing redundant information and creating consistent terms.
        - Page numbers in the appendices
        - Matrix of CRS credits
        - Shorter executive summary
    c. Document usability -Add a description plan's purpose, why is it useful to County and how to use it.
        - Include a specific status update of previously listed actions (perhaps in a matrix form.
        - Categories of actions – in one table and also categorized per county- so each jurisdiction can pull out when needed.
        - Need to update river conditions and what changes have occurred on the river since the original report was published (See Rapid Evaluation 2007 FMP. Brenda described potential FEMA PDM funding for an updated geomorphology/sediment transport report to be done on the River. Various sections of the river have had data collected, such as the Navy imagery collected last year, but that data needs to be compiled and gaps filled to know where changes are substantial and any new hazards which may have developed.
        - Refer to revised (2015) Riparian Proper Function handbook which includes discussion about altered floodplain and the potential for improved riparian function.
        - Develop prioritization criteria and map to identify areas that are of most concern for safety, river rehabilitation, areas of severe erosion and sediment transport with plant growth in river bend; also need to identify high quality habitat such as existing cottonwood galleries and areas where the river effectively accesses the floodplain to preserve. (geomorphology study referenced).
        - Need sediment transport study
        - Two UNCE brochures were identified that could be updated and perhaps included in an appendix were: Floodplain Protection Inventory for the Carson River and River Corridor Protection: Carson River Coalition's Main Message.

- Brenda suggested to incorporate the floodplain inventory into the document and periodically update it as counties acquire land for protection. This is can be one measure of our success.

- Open space designations
- Outline living river concept in detail, what it means, how to apply in planning.
- Identify potential funding sources for planning and implementation

d. What would make it more useful to you?

- It was noted current FEMA funding is helping counties update floodplain ordinances to consider new FIRM maps and language about process to update to the Hydraulic Model.

- Identify Additional Sections:
    i. See Sherm Swanson's publication: RIPARIAN AREA MANAGEMENT: Proper Functioning Condition Assessment for Lotic Areas (https://www.blm.gov/documents/national-office/blm-library/technical-reference/blm-technical-reference-1737-15) that relate to sections of the plan- capability vs. potential 'altered potential'- no longer worth assessment (which riparian functions need to exist for proper ecosystem function).
    ii. Alluvial Fans
    iii. Stormwater/Low Impact Development
    iv. CRS who's in/ who's not/ benefits& liabilities of each
    v. Others?

2. Clarify Data - Needed beyond Discovery Report
   See Item D below.

D. Data Requests from Communities- In person data collection suggested.
    - Focus meetings for Rapid Evaluations per county welcomed

1. Economic Impact Data
2. Emergency Response and Flood Warning including Emergency contacts
3. Plan for Implementation of Flood Risk Projects
    - Will projects promote or reduce flooding?
4. Funding Opportunities
5. Incorporate Each Jurisdiction's Hazard Mitigation Plan
6. Rapid Evaluation of River Systems
    a. Provide Last Rapid Evaluation: If available, as the existing evaluations only cover portions of the watershed. **Action: Brenda to send out**.
    b. Review before Interviews **Action: Each County review past Rapid Evaluation for content for riverine reaches. See below.**

i. Regarding Rapid Evaluation- The meeting attendees clarified these are qualitative, river-focused desktop reviews. Projects to be prioritized by county vs. watershed wide.
ii. Suggest Rapid Evaluations for Carson City, Lyon County, and Churchill staff members, conservation district, NDEP rep, CWSD staff
iii. Alluvial Fans will need to go through same process. **Action: Each County should review USACE Alluvial Fan Report. Additional request for information will be forthcoming from CWSD and Michael Baker.**

7. Suggested Actions
    a. Review Current List to determine current, obsolete, or needs updating
        - Add suggested actions not already on list. Delete actions completed but capture what has been completed in another form. **Action: Counties to review suggested actions and 2013 Appendix in advance of interview.**

    b. Please identify constraints to achieving current suggested actions (funding, political will, etc.) (See Stillwater Report as well).
    c. Will also want to ask if each SA is low, medium, or high priority from county perspective. **Action: Counties to evaluate based on previously provided information.**

E. Next Floodplain Management Plan Revision/Update Meeting Date
1. Schedule Jurisdiction Interviews with Brenda Hunt and Karin Peternel between 1/29 - 2/16/2018; hoping to schedule 2 jurisdictions on the same day.
    a. Alpine County and Douglas County
    b. Carson City and Storey County
    c. Lyon County and Churchill County
2. Next FRMP Revision Meeting TBD- doodle poll

3. 3:30-4:30 pm **CRC Floodplain & River Management Working Group - Regular Meeting:**

A. Presentation on results of USACE Alluvial Fan Mapping Project (Bridget Floyd, USACE)- (see attached presentation). The report and associated data can be obtained from CWSD. Contact Brenda@cwsd.org or Debbie@cwsd.org. Ms. Floyd stressed this report is for informational purposes and is an initial study/screening tool. She reiterated this is not a planning level document as it has not been ground-truthed and boundaries are not exact. Ms. Hunt asked Ms. Floyd to send potential project recommendations via email (next steps to make information applicable and useful). Ms. Bishop, state floodplain manager, noted to staff future project proposals would need to be applied through Silver Jackets committee. Mr. Floyd noted Margaret Engessar is the person to speak with about the Corps internal funding availability. After Bridget's presentation Geoff Brownell commented on the USACE's basic definition of active and inactive fan refers to the active geologic process. This definition is different from FEMA's definition from a flooding / risk perspective. He suggested mapping the alluvial fans using a more thorough process such as hydraulic analysis to assess flood risk. He also mentioned the importance

of each alluvial fan being unique, making a mass-classification process difficult in terms of accuracy.

B. 3-minute Member Round Robin updates

- Carson City noted new mapping for Goni Canyon was close to being finalized and that Eagle Valley golf course A and B are finalized.
- State lands and Churchill County are working aims to secure longer term permits for year-round clearing of the river and are working together to develop a protocol for doing so. This is a work in progress and may be a template for future permitting of clearing and snagging.
- CWSD mentioned USBR application is proposed from CWSD to develop a drought contingency plan to develop a matrix of ranked storage sites in the watershed. (Note: this application has been put on hold).
- Alpine Watershed Group mentioned March 10th volunteer water monitoring opportunity. Contact Gavin Feiger for more information.
- Rob Loveberg mentioned he is working on reviewing and writing update floodplain language for county codes and standards for CWSD.
- The Nevada Department of Agriculture's Weed Free Forage and Gravel program was defined and promoted by Andrea Moe
- The Dayton Area Drainage Master Plan project is underway.
- State Floodplain Manager's office will be offering classes in April. Ms. Bishop introduced Nicole Goehring, who is now in charge of state floodplain mapping. Ms. Goehring recently completed her master's degree in Geology at UNR.
- Carson River Coalition annual forum is scheduled for April 11 & 12. The plan is to use a portion of the first day to include another workshop on the Regional Floodplain Management Plan draft.

C. Grants Update

1. NDEP 319 Grants:
   a. Stewardship Plan Update 2017 – Brenda explained that the CWSD Board adopted the Watershed Plan in Jan 2018; however, the doc was certified by NDEP that it met the nine elements to be considered an EPA Watershed based plan in Nevada. That means the plan can be used to obtain 319 funding in NV. There is more work to do with Lahontan and the CA EPA rep to obtain certification on the CA side. CWSD will continue to work with those entities, including Alpine Watershed Group, to work toward certification so it can eventually be used to obtain 319 funding in CA.
   b. Watershed-Literacy Grants –An update was provided on specific tasks. CWSD is working diligently to complete Phases II & III tasks.

2. 208 Planning – Contract documentation is being reviewed between NDEP/CWSD and our subcontractor, Rob Loveberg to review county ordinances and create ordinance templates in relation to LID implementation throughout the watershed.

3.FEMA Projects Updates
   a. Finalizing:

i. Carson City Eagle Valley Maps Published; Alpine Estates; and Goni – Under FEMA review

b. Remapping:
   i. Voltaire Mapping put on hold
c. Area Drainage Master Plans:
   i. Johnson Lane ADMP finding will be presented April 10, 2018, 5-10pm (more details at meeting) (Erik/Courtney); Propose to have Mike Kellogg, JE Fuller repeat presentation at Carson River Coalition on April 11, 2018.
   ii. Dayton Valley ADMP moving forward with JE Fuller
d. Flood Awareness Outreach
   i. Kayla provided a brief summary of the Flood Awareness Week successes. Funding is in place for FAW for next year.

4.Funding Opportunities:

a. CWSD – Ed stated CWSD funding is available. Applications were sent out earlier and are due Feb. 1, 2018.
b. USBR WaterSmart Funding Opportunity in March – CWSD is planning to apply for a Watershed Planning Phase 2 grant.
c. Question 1 funding still has $3.4 million designated for Carson River project. Could also be used as for federal projects. CWSD will continue to discuss with NV State Lands, including whether bonds will begin to be sold, and may be reaching out to Counties once a path forward is determined.
d. A short announcement for the $50,000 NDEP Recycling program grant was recently sent out on CWSD email.

5.Weed Grants Update

a. Nevada Dept. of Agriculture grant – new grant providing ~$28,000 for yellow starthistle management
b. BLM – Continue to move forward with BLM and partners to treat weeds that are on BLM lands or adjacent.
c. NFWF – Working on completed needed NEPA document with USFWS assistance. Once NEPA complete, weed treatments can resume.

D. Develop and Schedule Rotating Floodplain and River Management Working Group meetings (Spring-Fall only? Or year round?) – Bring ideas, desires and dates to host your field trip

- **Moved this item to the next agenda, please continue to think of ideas for meeting venues and field trips!**

E. Upcoming Meetings:

1. 1/30/2018 Water Summit
2. 2/5/2018 Risk Map Charter Meeting
3. 4/11-12/2018 CRC Forum
4. 4/ 29 – 5/2 River Rally – Squaw Valley
5. Either 6/8 or 6/15 CRC 20th Anniversary Celebration

F. Schedule Next Meeting – CRC forum April 11-12, 2018

Actions:

1. **Will send out doodle poll for jurisdiction interviews to collect data requested and conduct initial Rapid Evaluations for riverine and alluvial fan areas.**
2. **Contractor will take this compile information and create rough draft FMP to review and discuss at April workshop.**

The Carson River Coalition would like to thank you for attending the Forum! We hope that this event inspires you to get involved in making our watershed a healthy place to live, work and play!

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Thank you to all our speakers, table partners, and all who helped make this event successful.

Special thanks to Carson City for providing the venue!

Display Table Partners:

CA Lahontan Regional Water Quality Control Board
Carson Water Subconservancy District
K.A. Smith Consulting
NV Department of Environmental Protection
Sierra Nevada Journeys
University of Nevada Cooperative Extension
US Geological Survey

Sign up for our newsletter on the landing page at www.cwsd.org

Carson River Coalition Watershed Management Forum Supported by:

Funding for the Roundtable provided by CWA 319 (h) grant from NDEP and CWSD.

2018 Carson River Watershed Forum

April 11 & 12, 2018

Carson City Community Center Auditorium

851 E. William St., Carson City, NV
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2018 Carson River Watershed Forum

Time	Wed, April 11	Speakers
9:00 am 9:15 am	Welcome & Overview of Events	CWSD Edwin James—Brenda Hunt
9:15 am 10:15 am	Floodplain Management Draft Doc. Update	Michael Baker International Geoff Brownell—Karin Peternel
10:15—10:30	15-minute break	
10:30 am 11:30 am	Panel Discussion The Living River Concept 10 Years Later	CWSD, UNCE, LLW, CVCD, DC Ed James, John Cobourn, Jacques Etchegoyhen, JB Lekumberry, Craig Burnside, Courtney Walker
11:30 am 12:00 am	Alluvial Fan Mapping Project	U.S. Army Corps of Engineers Bridget Floyd
12:00 am 1:00 pm	Break for lunch - Lady Tamales & Socializing & Visit Tabling Partners	
1:00 pm 1:30 pm	River Forecast Seasonal Outlook	National Weather Service Tim Bardsley
1:30 pm 2:00 pm	Floodplain Ordinances	Planning Consulting Services Rob Loveberg
2:00 pm 2:30 pm	Johnson Lane Area Drainage Master Plan	J. E. Fuller Mike Kellogg
2:30 pm 2:50 pm	20-minute break to visit Tabling Partners	
2:50 pm 3:20 pm	Western Pond Turtle in Nevada's Carson River	Nevada Department of Wildlife Mark Enders
3:20 pm 3:50 pm	Carson River Mercury Site Update	U.S. EPA—NDEP Andrew Bain—Dave Friedman
3:50 pm 4:00 pm	CWSD Wrap Up	

Floodplain Management Focus Sessions

Time	Thurs, April 12	Speakers
9:00 am 9:15 am	Welcome & Water Lit. History	CWSD Brenda Hunt—Shane Fryer
9:15 am 9:45 am	Carson River Watershed Campaign Concepts	Neon Agency Randy Pease
9:45 am 10:30 am	Interactive Social Media Workshop	UNCE Lindsay Chichester
10:30-10:45	15-minute break	
10:45—11:00	River Wranglers	Darcy Phillips—Linda Conlin
11:00—11:15	Sierra Nevada Journeys	Sean Hill
11:15—11:30	One Carson River	Alyse Weyman—Robert Schilling
11:30 am 12:00 pm	Alpine Watershed Group	Gavin Feiger
12:00 pm 1:00 pm	Break for lunch - Lady Tamales & Socializing & Visit Tabling Partners	
1:00 pm 1:30 pm	West Fork Vision Project	Lahontan Water Quality Board Cindy Wise—Carly Nilson
1:30 pm 2:00 pm	Impacts of Reduced Snowpack in the Carson Valley Watershed	US Geological Survey Wesley Kitlasten
2:00 pm 2:30 pm	Climate Change and the Washoe Tribe	Washoe Tribe of NV and CA Norman Harry
2:30 pm 2:50 pm	20-minute break to visit Tabling Partners	
2:50 pm 3:20 pm	Pollinators Along the Carson River	Nevada Bugs and Butterflies Kevin Burls
3:20 pm 3:50 pm	Star Thistle Eradication	DVCD—Rob Holley CC Open Space—Lyndsey Boyer
3:50 pm 4:00 pm	CWSD Wrap Up	

Environmental Education Round Table

Resource Focus Sessions

Carson River Coalition Forum — Day 1

114 individuals — Attendees

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Appendix B Rapid Evaluation of the Carson River

Rapid Evaluation of Carson River System

To assess where the critical floodplain and flood hazard areas are within the basin that are not necessarily shown on FEMA flood insurance maps a rapid evaluation of the river system using photographs, maps, and on-the-ground knowledge was conducted with representatives from each county in the watershed. The evaluation was conducted with the primary focus on known flood hazard areas and critical floodplain areas and did not necessarily consider the political or landowner factors.

For the purposes of this document the following definitions apply:

Critical Floodplain (CF) areas: Lands adjacent to the river that allow the river to access the floodplain, store floodwaters, dissipate flood velocities, and provide critical habitat for wildlife. These lands are highly valued for the public safety and natural resource protection services that they provide.

Flood Hazard (FH) areas: Lands adjacent to the river that are at high risk for hazards associated with channel migration due to factors such as excessive bank erosion.

The following subsections are the result of this evaluation. Each area is labeled by County, Number, Critical Floodplain or Flood Hazard with a brief description (e.g., AC1-CF would indicate Alpine County #1, Critical Floodplain). Click link: Rapid Evaluation of Carson River System to access google map with points. A shape file can be provided upon request.

East and West Fork Drainages in Alpine County (AC), California

Much of the Carson River Watershed in Alpine County is rural with populated areas centered around Markleeville and Woodfords. Over 95% of the land in Alpine County is publicly owned. The floodplain is very narrow throughout the upper river system with canyon walls and wilderness area preventing development in many areas. Flood zones in this area are undetermined by FEMA.

General Recommendations

- Maintain river system to allow floodwaters to access floodplains in valley and meadow areas.
- Support Markleeville Guard Station Restoration Project.
- Investigate restoration activities in Upper Hope Valley and Hot Springs Creek to enhance floodplain accessibility and potential, plus reduce erosion.
- Investigate opportunities for road, culvert, and bridge enhancement to accommodate floodwaters better and decrease erosion.

East Fork Carson River Drainages in Alpine County, California

Wolf Creek Landslide Area 2007

AC01-FH: Flood Hazard Area - Wolf Creek Landslide: The landslide is located downstream of the Wolf Creek meadow area on land managed by the USFS. The landslide causes damage to the road that accesses the meadow and the campground when active. This road is the only access to Wolf Creek meadow and the campground area. Documented landslides have occurred since the 1960's with the most recent during the 1997 flood event. Along Wolf Creek Road, debris from landslides has come across the East Fork Carson River's channel during flood events and caused channel blockage and loaded the river with excessive sediment. The most recent landslide occurred in March 2017 and is still active.

AC02-CF: Critical Floodplain Area – Wolf Creek Meadow: This meadow is wide and long and provides for good storage of floodwaters. Currently there are 4 homes located in the meadow. Allowing the meadow to act as a sponge for floodwaters would decrease the amount of flood water that enters the East Fork.

AC03-FH: Flood Hazard Area - Upper East Fork: Highways 4 and 89 closely follow the East Fork Carson River from the confluence of Silver Creek to Hangman's **Bridge**. There is a high potential for damage to the road during flooding events.

AC04–FH: Flood Hazard Area – Washington Fire Burn Scar: The burn area of the Washington Fire affects East Fork Carson River drainages along Highway 89 and Highway 4, and Wolf Creek Road. The steep terrain of this area already lends itself to debris flows, so record snow pack and extended high flows and precipitation in the burn scar area all contributed to multiple landslides in 2017. Large sections of Highway 89 and Highway 4 were closed until late summer 2017. Wolf Creek Road was blocked with debris flows for many months in 2017 and did not open to public traffic until 2018. Loope Canyon Road, North of Highway 89, is still closed.

Washington Fire Burn Scar 2015 (Photo: Debbie Neddenriep)

AC05–FH: Flood Hazard Area - Silver Hill Mine Road: This dirt road off Highway 4 was closed until spring 2018 after the Washington Fire due to hazards from burned trees, erosion, flooding, and potential debris flows.

C06–FH: Flood Hazard Area - Mountaineer Creek: Mountaineer Creek is also on steep terrain and is subject to cause debris flows.

AC07–FH: Flood Hazard Area – Monitor Creek: Monitor Creek is heavily laden with tailings from historic mining activities. During flood events these tailings could be washed into the East Fork increasing sedimentation and contamination of the river. The USFS completed a project that is reducing the amount of acid mine drainage entering the stream system.

Markleeville Guard Station

AC08–FH: Flood Hazard Area - Markleeville Guard Station Restoration Site: This site, formerly the USFS Guard Station located in the heart of Markleeville, experienced flooding on a regular basis. The guard station was removed in 2012 and designs to return the floodplain to a natural state were created. The flood walls and a bridge at this location constrain high flows and increase flood velocities. Millberry Creek, a tributary of Markleeville Creek, has blown out the road to the pump station and wastewater ponds at its confluence with Markleeville Creek several times. In addition, manhole drains on the guard station property are not sealed and can take on water during floods. When inundated, the wastewater storage could potentially fail and spill which would create both flood and environmental hazards. FEMA funded a gabion repair project in 2004-2005 at this site and the repair of the pump station in 2017. Alpine County continues to seek funding to restore this site and mitigate flood and environmental hazards. FEMA also funded an upgrade of the creek crossing on the Markleeville Public Utility District (MPUD) access road by installing a box culvert and "hardening" the crossing. This project was completed in early 2018

AC09–FH: Flood Hazard Area – Markleeville Airport: Post–fire flooding has blocked airport access when flood waters flow across road.

AC10–FH: Flood Hazard Area - Spratt Creek: The surface water is collected in a gallery, conveyed to pipe, then goes across private lands and ends up at Hot Springs Road. During high flows turbidity levels are too high for treatment, so this source is lost. Spratt Creek has the potential to blow out road and flood private land adjacent to it.

AC11–FH: Flood Hazard Area - Hot Springs Road Bridge: Hot Springs Road Bridge may not have enough capacity to convey high flows. It may plug or overtop during large floods. The bridge is being planned for replacement starting in 2020 or 2021.

Hot Springs Creek

AC12–FH: Flood Hazard Area – Hot Springs Creek: The portion of Hot Springs Creek between Markleeville and Grover Hot Springs has high potential for channel migration and excessive erosion. There have been debris flow problems along the road at the location of the retaining wall.

AC13–FH: Flood Hazard Area - Old Ditch System: This Ditch west of Markleeville from Pleasant Valley Road to Laramie Street in Markleeville, may flood houses and the fire station. It collects all surface runoff and fails regularly. It requires regular maintenance to prevent failure.

AC14–FH: Flood Hazard Area - Unnamed Tributaries of Shay Creek: Culverts need to be upsized to prevent flooding.

AC15–FH: Flood Hazard Area – Burnside Lake: The Burnside Lake area is subject to potential post-fire flooding and debris flows which would impact Burnside Lake Road.

AC16–FH: Flood Hazard Area - Scossa Cow Camp: On Highway 4 near Scossa Cow Camp undersized culverts adjacent to Silver Creek were plugged. As a result, water was diverted and drainages alongside the road in these areas became small creeks (approximately 4-feet wide) before eventually flowing over Highway 4 to Silver Creek. Significant portions of the Highway were eroded.

East Fork Carson River Hot Springs

AC17–FH: Flood Hazard Area – Dixon Mine Road: The bridge capacity has been exceeded and needs to be replaced to pass higher flows, but it will require mitigation associated with wetlands in the construction area. The bridge is slated for replacement in 2019.

AC18–CF: Critical Floodplain Area – East Fork Carson River Hot Springs Pools: In 2017, stakeholders gathered to survey this area to discuss challenges of this popular site. There are many recreational issues at the site, including unregulated boat camps, off road travel, private access, river crossing, road maintenance, and erosion.

AC19–FH: Flood Hazard Area – Leviathan Mine Superfund Site: The holding ponds at this Superfund site effectively contained record snow and precipitation in 2017. A misconception about the site's condition underscored that communication between stakeholders is critical during floods and fires.

AC20-CF: Heenan Lake: Critical Fishery for Lahontan Cutthroat Trout

AC21-CF: Critical Floodplain Area:- Restoration of head cuts, along with removal of dewatering-trails and barriers in Grover Meadow.

West Fork Carson River Drainages in Alpine County, California

AC22–CF: Critical Floodplain Area – Hope Valley: The meadow provides for storage of floodwaters. The area is used for recreation primarily, and there is little or no development upstream.

Hope Valley visit during Get on the Bus Tour 2015 (Photo: Judy Wickwire)

AC23–FH: Flood Hazard Area – Pickett's Junction: This junction of Highway 88 and Highway 89 has closed in the past during major floods because water flows over them. Highway 88 is a trans-Sierra highway and serves as an important corridor within California, and Highway 89 is a key connection between Alpine County and South Lake Tahoe.

AC24–FH: Flood Hazard Area – Indian Creek Bridge at Diamond Valley Road: During high water events clogging occurs at the box culvert on Diamond Valley Road and floods tribal property.

AC25-FH: Flood Hazard Area – Woodfords Bridge at Highway 89 / Highway 88: The bridge may need to be resized to handle larger flow events such as the 1997 flood.

AC26-FH: Flood Hazard Area - Irrigation infrastructure: The irrigation infrastructure affects the roadway, and this problem is exacerbated in high water. However, there are not tail water problems because it goes back into creek.

AC27-FH: Flood Hazard Area: Ditch from Spratt Creek: Spratt Creek supplies water for treatment of Alpine Village and Markleeville Water.

AC28-CF: Critical Floodplain Area - Stream bank stabilization on West Fork of the Carson: There is an undersized highway bridge leading to increased erosion on down stream banks.

AC29-CF: Critical Floodplain Area - Prevent meander bend cut off on West Fork of Carson River: The riverbank needs to be maintained until stabilized.

West Fork River Restoration Project in Hope Valley
(Courtesy of Shane Fryer)

AC30-CF: Critical Floodplain Area - Restoration of Charity Valley Creek and Meadow

AC31-CF: Critical Floodplain Area: Erosion caused by off road travel on abandoned road segments contribute to siltation along river.

East Fork & West Fork Carson River: Stateline to Carson River Confluence, Douglas County (DC), Nevada

From the Nevada/California state line the river travels through a canyon until it reaches the Carson Valley. Carson Valley is situated between the eastern face of the Sierra Nevada and the Pine Nut Mountains. The wide valley floor is the floodplain for both the East and West Forks of the Carson River and is a natural floodwater storage area. Old river channels, also called sloughs, interlace the valley's floor between the East and West Forks and the Brockliss Slough (which carries the West Fork's water). There is very limited water storage available in the upper watershed, and the drainages are composed of highly erosive materials. During flood events, sedimentation and debris deposition often result in rapid channel obstruction and channel migration.

General Recommendations for this reach:

1. Retain agricultural lands west of Highway 395 as floodplain and floodwater storage areas where possible but still provide infrastructure protection where necessary.
2. Investigate opportunities for using existing infrastructure to move floodwater.
3. Utilize the irrigation ditches for stormwater retention not for river release during flooding events.
4. Investigate opportunities to remove portions of berms to allow floodwaters to access floodplain.
5. Support conservation easement to protect critical floodplain areas.
6. Properly manage and control future development in flood hazard and critical floodplain areas.
7. Update floodplain ordinances to new Flood Insurance Rate Maps and to incorporate use of the Hydraulic Model.
8. Design future bridges and roads to protect the floodplain, accommodate and not restrict the changing course of the river, and not create additional levees.
9. Address inadequate FEMA flood zone designations and inconsistent floodway delineation.
10. Evaluate existing bridges more thoroughly for safety and flow constraint concerns.

East Fork Carson River California/Nevada Stateline to the Old Power Dam, Douglas County, Nevada

From the Nevada/California line to the site of the Old Power Dam, also known as the Broken Dam, the river is largely confined through a canyon consisting of a relatively steep, bedrock, boulder and cobble bed stream. The Old Power Dam was removed after the 1997 flood event. Longtime residents attribute the increase of sediment loading to the river to the removal of the dam.

East Fork Carson River Float 2017 (Photo: Shane Fryer)

DC01-CF: Critical Floodplain Area - Bryant Creek: Bryant Creek discharges into the East Fork Carson River at this site. Legacy mining previously contaminated Bryant Creek from Leviathan Mine discharge. EPA, California, and the mine owner constantly monitor discharge and have worked to mitigate contamination; their work is ongoing.

DC02-CF: Critical Floodplain Area - Noxious weeds along the East Fork Carson River from Bryant Creek to Ruhenstroth Dam.

DC03-CF: Flood Hazard - Ruhenstroth Dam: Ruhenstroth Dam was damaged during the 1997 flood. Later the dam was blown up. Remnants of the dam may still be hazardous. As of 2018, the dam is being evaluated by the new owner to possibly rebuild it.

Old Power Dam to Riverview Drive, Douglas County, Nevada

Throughout much of this section, spoils from a 1965 project were turned into berms or unintended levees when the tops of the spoils were compacted. The effort was intended to create capacity, not to protect homes and other infrastructure. Since the creation of the berms the area has had to be defended from high water. In 1997, over 300 homes got wet and many of the homes have been raised using funding from FEMA. Removing portions of the berm may allow floodwaters to access the floodplain.

DC04-FH: Flood Hazard - Tribal RV and Campground Area: The Tribe would like to re-establish the campground, but the site is prone to flooding.

DC05-CF: Critical Floodplain Area: Douglas County purchased a parcel for future park/open space with Nevada State Question 1 funds.

DC06-FH: Flood Hazard - Allerman Diversion and Canal: In the past this canal has taken floodwater and floodwater has been diverted onto the adjacent agricultural lands during flood events.

Downstream Allerman Canal, 2011

DC07-FH: Flood Hazard Area: Tribal property in this area typically floods when Indian Creek overflows its banks. Culvert clogs also lead to further flooding.

DC08-FH: Flood Hazard - Berm Removal: Investigate opportunities to remove portions of the berm near Brunell ponds to allow floodwaters to access floodplain and help divert floodwaters away from development.

DC09-FH: Critical Flood Area: Undeveloped land east of the river could provide storage during flood events.

DC10-FH: Flood hazard area: During the 1997 flood event the river went out of bank by the Dresslerville Community levee and returned to the river further downstream.

DC11-FH: Flood Hazard Area: Berm placed on Tribal property in 2016 using fill has the potential to displace water.

DC12-CF: Critical floodplain Area: Berm prevents the river from accessing its floodplain and provides a false sense of security to residents. Berm breached in 1997; in 2005/2006 water backed up onto Tribal land.

DC13-FH: Flood Hazard: High flows have eroded property away. There was restoration project on Tribal property upstream of Virginia/Rocky Diversion to alter river to the west side during high flows.

DC14–FH: Flood Hazard Area – Riverview Bridge: The river overflowed banks below Riverview Bridge during the 1997 flood event to the east towards Highway 395. There is a large culvert that runs under the highway by the medical center which needs to be protected and could possibly be used to help route floodwaters.

DC15-CF: Critical floodplain area - Tribal Headquarters Ranch: The berm through this reach is preventing the river from accessing its floodplain and provides a false sense of security to residents. Water breached the berm in 1997. During the 2005/06 event the berm backed water up onto Tribal land. The berm on this property may need to be investigated further to see if there is a potential to remove portions to allow floodwaters to access the floodplain, while still protecting the Tribal headquarters infrastructure.

Riverview Drive to Centerville Lane

The river is incised up to 15 feet on both sides from the Riverview Drive Bridge to the Cottonwood Diversion, significantly limiting the river's ability to meander. From the Cottonwood Diversion to the Lutheran Bridge the river can meander. The Emergency Manager created a County Emergency Access Plan for this reach of the river to identify property which would be inaccessible during a flood.

DC16-FH: Flood Hazard - Gravel bars: The gravel bars with willow growth in this section may have a significant influence on river behavior. Clearing and snagging funds may be able to be used to remove the vegetation from the stream bottom and allow the sediment load to continue downstream.

Hussman Ranch Bank Erosion after 2017 floods

DC17A and DC17B–CF: Critical Floodplain Area: This ranch property should be protected to conserve the floodplain and its benefits. It is in an area that historically floods. The buildings on the ranch were constructed after the 1997 flood, so it is unknown what the extent of the inundation would be during a large flood event (100 year). The buildings did not flood during the 2005/06 event. This property is a good candidate for a conservation easement.

DC18-CF: Critical Floodplain Area – Hussman Ranch: The ranch has been in the Hussman family since the 1800's and the family's management approach to the river is "hands off." They report that channel migration occurs on the regular basis throughout this area. There is the potential to utilize the property for storage of floodwaters. This property is under a conservation easement.

DC19 & DC20-CF: Critical Floodplain Area – Hussman Ranch: This ranch, which has a large portion on the east side of the river (#19) and a smaller portion on the west side (#20), is now under a conservation easement. There is a cottonwood gallery adjacent to the river and the Hussman's have seen the river migrate all throughout this area. Some of the area appears to serve as a sediment sink.

DC21-FH: Lutheran Bridge: The river is dramatically incised at this location and may be causing a backwater effect. It is owned by NDOT and needs to be evaluated (if it hasn't been done recently) to pass a 100-yr. flow. Find out the status of NDOT and/or county priority list or Douglas County Transportation Master Plan.

Centerville Lane (Lutheran Bridge) to Highway 88

This entire reach of the East Fork is prone to flooding and is an aggrading reach. Aggrading reaches are typically unstable and tend to shift their course frequently because significant deposits of sediment in the channel divert the flow, leading to bank erosion and lateral shifting of the channel. There are berms on both sides of the river except by the ranch on the south side of the river between Hwy 88 and Waterloo Lane, where the berm is less apparent. Head cuts have resulted in 20–25 feet of incised banks from the Cottonwood Diversion up to the mining site (#25). Conservation easements and other protection methods should be supported and encouraged. This area is critical for the storage of floodwaters.

DC22–FH: Flood Hazard Area: The river changed its path during the 1997 flood event and headed to the west.

DC23–FH: Flood Hazard Area: This area is the continuation of the changed river path area identified at DC22.

DC24–CF: Critical Floodplain Area: Douglas County purchased the parcel for future park/open space with Nevada State Question 1 funds.

DC25–CF: Critical Floodplain Area - Potential area for berm removal. Investigate opportunities to remove portions of the berm through this area to allow floodwaters to access floodplain. This could relieve pressure and divert waters away from residential development.

DC26–FH: Flood Hazard Area – Aspen Mobile Home Park: The park had to be evacuated in January and February of 2017. Water flooded crawl spaces but did not flood any homes. Emergency vehicles were unable to access the mobile home park during the flood. Removal of portions of berm upstream of the area may help protect homes by allowing floodwaters to access floodplain on opposite side of river. Douglas County placed barriers in this location in 2017 and they are still in place.

Highway 88 Bridge over East Fork Carson River, 2005

DC27–CF & FH: Critical floodplain area and flood hazard area: This property is regularly inundated during flooding events. There is a berm on the left side of the river but not on the right so considerable sediment deposition occurs here. Landowner may be interested in a conservation easement or other protective measures.

DC28-FH: Flood Hazard Area: Home is built close to the river channel and there are infrastructure protection issues associated with this property. Access road was flooded in 2017 and emergency crew access was blocked when the house caught fire.

DC29–CF: Critical floodplain area: Landowner may be interested in conservation measures that improve river bank stability.

DC30-FH: Flood Hazard Area - Alluvial Gravel Mining Site: This area was mined in the 1970's. There was a cement plant where the High School is today, and they used material from this area. The sand bars through this area keep changing and the landowner believes that the reach functioned better when the material from this area was mined.

DC31–CF: Critical floodplain area: This ranch has one-acre zoning. This property has been nominated for a conservation easement and would provide excellent storage for floodwaters.

DC32–CF: Critical floodplain area: This ranch has one-acre zoning. This property has been nominated for a conservation easement and would provide excellent storage for floodwaters.

DC33–FH: Flood Hazard Highway 88 Bridge over East Fork Carson River: The bridge is heavily scoured underneath. This bridge tends to act as an obstruction during high water events because it wasn't designed to accommodate the flood flows - both width and height may be insufficient. The next large flood event could result in significant damage to this bridge. Upstream of the bridge the river is not as incised as it is at the Lutheran Bridge.

Highway 88 to Muller Lane, Douglas County, Nevada

There are old levees along the river on the right side from projects implemented in the 1960's. This reach has been the site of numerous conservation projects including river workdays, grazing management, fencing, and a $1 million restoration project. The river tends to move to the west in this area during high water events. Douglas County is currently conducting a culvert expansion project under this bridge.

DC34–FH: Flood Hazard Area - New Housing Development: This property was targeted for 32 townhomes, but the permit expired and the there is no longer a proposed development at this site. The rancher that historically owned this property deeded it to the County because it flooded so frequently. Later the County brought in 4 feet of fill to build the high school. Development of the area has continued since. Wetlands are located on the east and west sides of Highway 88 near this area.

DC35–FH: Flood Hazard Area - Westwood Subdivision: Residents are very interested in protecting structures through this reach. When the river breaches its bank, it tends to move left towards the Cottonwood and Home Sloughs. Historic maps show that the East Fork used to flow through this area. Some homes are very close to the river and have flooded during recent events.

DC36A & DC36B–CF: Critical floodplain area and flood hazard area: The property on the west side of river frequently floods and provides an excellent area for storage of floodwaters. Currently the area is not designated by FEMA as an "A" (100-year) floodplain but should be. The current management approach by Park Cattle is to let the area flood. A conservation easement or other floodplain protection measure would be highly desirable for this area.

DC37-FH: Flood Hazard Area - Muller Lane Bridge: This Bridge has the smallest capacity of any of the East Fork bridges, acts as a dam during high flows, and tends to capture considerable sediment. There are effluent and power lines running under it that could be damaged during a flood event. The 1996 Interfluve Assessment suggests that the river is unpredictable in this area, possibly resulting in further pier and abutment scour and threats to the overall stability of the bridge. The west side of this area is a good storage area for floodwaters

despite the poor conveyance capacity of the bridge. In 2018, NDOT replaced the bridge over the East Fork of the Brockliss Slough and did extensive work on Muller Lane to address access and flood hazards.

Muller Lane to Genoa Lane, Douglas County, Nevada

This entire area is prone to flooding and should be considered a critical floodplain area.

DC38–FH: Flood Hazard Area - Effluent Storage Basins: Two storage basins are near the river. The basins will require protection and/or best management practices to prevent the treated effluent from contaminating the river during a flood event.

DC39–CF: Critical Floodplain Areas: Below the Muller Lane Bridge, floodwaters tend to flow east and west onto adjacent fields. Park Cattle is the landowner and is interested in allowing the fields to flood. However, effluent is used for irrigation and some infrastructure defense may be necessary to maintain permits.

Area where the river blew the bank out during 2005/06 flood event

DC40-CF: Critical Floodplain Area: There was originally planned a large-scale restoration project from the Muller Lane Bridge to the Genoa Lane Bridge to address multiple issues including floodplain protection. However, this Question 1 project was not implemented because it was deemed infeasible. This large-scale restoration project from the Muller Lane Bridge to the Genoa Lane Bridge would have addressed multiple issues including floodplain protection. Proposed restoration approaches included installation of stream deflectors, instream weirs, and low-flow channel meanders. These open lands adjacent to the river in this reach provide extensive flood storage but are still subject to development.

DC41–CF: Critical Floodplain Area - River Fork Ranch: This area is where the East and West Forks of the Carson River merge to form the mainstem Carson River. It is a critical area for floodplain and wetlands management. The Nature Conservancy has removed the berm on the ranch that was at the confluence of the West and East Forks. This may be a good area for floodwater storage even during modest events. This area is under fee title with floodplain protection as one of the main goals.

DC42-CF: Critical Floodplain Area – Wetlands: This area is part of the River Fork Ranch. It is the desire of The Nature Conservancy to increase the capacity of the wetland area. This creates a good opportunity for storage of floodwaters.

Looking upstream from Muller Lane Bridge during 2005 spring run-off

DC43A & DC43 –FH: Floodplain Hazard Area: Genoa Lane Bridges, owned by NDOT, cross the mainstem Carson River just after the confluence of the East and West Forks, and the Brockliss Slough (upper and lower). According to the Interfluve report (1996), the bridges are undersized and, given the large in-channel sediment supply from

upstream, there could be problems with local aggradation and abutment scour during large flood events. All the Genoa Lane bridges are at risk in the event of significant channel shifts above the bridge locations.

West Fork Carson River and the Brockliss Slough, Douglas County, Nevada

In addition to areas covered in the previous section, the following observations were noted.

General Recommendations:

- Maintain critical floodplain areas for storage of floodwaters.
- Investigate opportunities to enhance road and bridge construction to allow for flooding and protection of floodplain areas.
- Investigate the use of the West Fork as a flood storage channel.
- Investigate opportunity to utilize existing infrastructure to move floodwaters.

West Fork "ditch" at Highway 88 looking upstream

DC50–CF: Critical Floodplain Area - all areas north of Mottsville Lane: This area is critical for flood water attenuation and storage. Development in these areas may significantly alter downstream flow patterns. Property previously unaffected may be flooded if urbanization increases in the floodplain.

DC51–FH: Flood Hazard Area - Big Ditch: The ditch runs through the Mottsville Development. It has no defined source and is a collection of tail waters including waters from the Carson Range. It flows into the Brockliss Slough.

DC52–FH: Flood Hazard Area – Mottsville Development: The development is in the floodplain of the West Fork and Brockliss Slough. The homes are elevated and are on septic systems engineered above ground. The cumulative impacts from this development during a flood event will need to be watched. Homes that may not have flooded previously may now have increased risk due to the changes in the floodplain in this area.

DC53–CF and FH: Critical Floodplain and Flood Hazard Area - Centerville to Mottsville: The water table rises significantly in this area during high water events. Mottsville Road acts as a dam, even though it is at ground level, and can cause flooding even when the buildings in the area have been elevated. This flooding along Mottsville Lane blocks emergency access.

DC54–CF: Critical Floodplain Area – Wally's Hot Springs: The area around Wally's Hot Springs has wetlands and is critical for floodwater retention and storage.

Main Stem Carson River from Confluence to Deer Run Bridge, Douglas County to Carson City (CC), Nevada

Carson River at Genoa Lane to Cradlebaugh Bridge, Douglas County, Nevada

DC44–FH: Flood Hazard Area – Willowbend Subdivision: This area is a FEMA repetitive loss area, as several homes are built close to the river in floodplain and are very prone to flooding. The potential for channel shifts and backwater problems may also affect this area. One repetitive loss property was acquired in this subdivision. CVCD helped a landowner implement a 150-foot bank stabilization project in front of their property. The house is located approximately 75 feet from the top of the riverbank.

DC45–FH: Flood Hazard Area - Genoa Golf Course: The golf course was built to allow for flooding and does not have houses adjacent to the river, but some homes flooded in 1997. The Interfluve report states banks were already incised up to 12 feet from Genoa to Cradlebaugh. The river further incised dramatically through this reach during the 1997 Flood resulting in vertical banks of approximately 20 feet. There are three bridges through the golf course and a golf path along the riverbanks, so there is a need to protect infrastructure.

DC46–CF: Critical Floodplain Area: All of the areas east of the river to Highway 395 should be considered critical floodplain and flood storage areas. It is obvious from the aerial photos that the river has shifted course through this area on numerous occasions. One large home was constructed in 2007 on the east side of the river across from the downstream end of the Genoa Lakes Golf Course. As of 2018, a second property owner has graded property right next to the river downstream of Willow Bend. The property owner has dumped concrete and other debris along the river bank, which may be a potential violation of Section 404 of the Clean Water Act. Conservation easements and other methods of protection should be encouraged and implemented. Western Pond Turtles have been identified in this reach of the river.

DC47–CF: Critical Floodplain Area: There is a proposal for a conservation easement on this ranch property just downstream of Genoa Lakes Golf Course on the north side of the river. The owner wants to work the ranch and has given no indication that they will sell or subdivide.

DC48–CF: Critical Floodplain Area - Old River Channel: The old channel has willow growth and water. The channel could support wildlife and serve as a flood channel.

DC49–CF: Critical Floodplain Area - Stewart Ranch: The Washoe Tribe of Nevada and California owns this property. The Tribe has constructed fencing 100-300 feet from the river on 2.5 miles each side of river. The purpose of the fencing is to reduce grazing pressure and protect the floodplain.

Carson River from Cradlebaugh Bridge to Deer Run Bridge, Douglas County to Carson City (CC), Nevada

This section of the river system is in very good shape with regards to flooding and floodplain management. The Nature Conservancy successfully worked with the landowner to secure a large area of the floodplain with a conservation easement (Kirman Field). The Carson City Open Space Program has been very active in acquiring lands along the river corridor and securing conservation easements. The Silver Saddle Ranch (BLM) and the Ambrose Natural Area (Carson City) also provide floodplain protection. Extensive damage in Carson City has been caused by alluvial fan flooding.

Upstream Cradlebaugh
2200 cfs at CC gage

General Recommendations for Carson City – Main Carson River

- Support Carson City's Open Space Program and other organizations, with their ongoing acquisition and protection of critical floodplain lands along the river corridor.
- Stay abreast of issues with the State Land prison property.
- Investigate opportunity to enhance grade control structures, including Mexican dam. The Anderson diversion was removed in 2016.
- Consider bridge designs that do not create a barrier in the floodplain or obstruct flood flows in the river channel.

DC55–FH: Flood Hazard Area - Cradlebaugh Bridge: According to Interfluve (1996) the base level is lowering and pier footings are exposed. NDOT completed work to stabilize and reduce scour around the bridge in 2016. The project involved the placement of riprap around Cradlebaugh Bridge to protect the structure from scour and erosion during high flows. The riprap extended along the river banks approximately 15 feet up and downstream from the bridge. Existing sediment and debris were removed from underneath the structure prior to installation of rock. However, in early 2017, Highway 395 was closed during the January and February floods because the fields around the bridge were underwater and the culverts were clogged north of the bridge.

DC56–CF: Critical Floodplain Area - Kirman Field Conservation Easement: The Nature Conservancy and landowner were successful in protecting this critical floodplain area.

DC57–CF: Critical Floodplain Area - Historic Railroad Bridge: This is a potential site for a right of way bridge crossing from Carson City to Douglas County to accommodate the revived V&T Railroad. Investigate the opportunity to design and construct bridges that do not obstruct the floodplain and allow greater flow capacity.

CC01–CF: Critical Floodplain Area – Prison Farms: This property is owned by the State of Nevada for providing a State prison and associated prison farms. The area provides for good storage of flood waters and should remain in open space. A fluvial geomorphic assessment may need to be conducted at the bend of the river at the north end of the prison property. Snyder Road has over washed previously. The area has the potential for a bank stabilization project.

CC02-CF: Critical Floodplain - Carson River Canyon: This area has many steep banks between the Prison Farm and Lyon County line which erode and add sediment to the river.

CC03–CF: Critical Floodplain Area – McTarnahan Bridge to Mexican Gage: This area provides excellent storage of floodwaters.

CC04–FH: Flood Hazard Area - Golden Eagle Lane: There are several homes very close to the river and in the immediate floodplain in this area. This is the only road to about seven houses, and if the road washes out, access to these homes is cut off. Above the road is high potential for erosion with very steep topography and gullies coming off Prison Hill. A potential project to terrace the bank, and slope to take shear stress off bank. One of the homes in this area is on the FEMA Repetitive Loss List and base elevation for one of the homes is above the garage door.

CC05–FH: Flood Hazard Area – Mexican Gage to Lloyd's Bridge: There are areas that are highly erosive as evidenced by gully washers and sediment deposits.

CC06–CF: Critical Floodplain Area: There is one parcel for sale and the CC Open Space Program is investigating acquiring the property. As of 2018, this Golden Eagle property has been acquired by Carson City as open space.

CC07–FH: Flood Hazard - Mexican Dam: The dam is very old and in disrepair. It should be investigated for repair or possible replacement. There are 10-12 owners in the ditch company. Carson City is working with Lumos to identify a boating portage solution.

2017 Alluvial Fan which drains to Golden Eagle Lane (*Photo: Brenda Hunt)*

CC08–FH: Anderson Diversion Structure: The structure was removed.

CC09–CF: Critical Floodplain Area - Silver Saddle Ranch and Prison Hill recreation area: This property has been acquired by Carson City's Open Space Program from the Bureau of Reclamation. This is a critical area for flood water attenuation. Reuse water will be used for irrigation which may represent additional challenges.

CC10–CF: Critical Floodplain Area - formerly Buzzy's Ranch: This property has been acquired by Carson City's Open Space Program. This is a critical area for flood water attenuation. Reuse water will be used for irrigation which may represent additional challenges.

CC11-CF: Critical Floodplain - Riverview Park: The park is now accessible from Morgan Mill Road, 5th Street, and Carson River Road via a multi-use path through this open space area.

CC12–CF: Critical Floodplain Area – Ambrose Natural Area: This area has been provided protection through the Carson City Open Space Program and is managed to accommodate flood flows.

CC13–CF: Critical Floodplain Area - Empire Golf Course: The golf course is managed to allow for flooding and is crucial for storage and attenuation of floodwaters in the area. According to the effective flood map, in this reach of the river the majority of the golf course is in the floodway with a smaller portion in the floodplain.

CC14-CF: Critical Floodplain Area - Potential land purchase: One land-locked parcel is for sale and the Carson City Open Space Program is looking to acquire the property.

CC15–CF: Critical Floodplain Area – Morgan Mill and Morgan Mill Trailhead: Carson City has developed this area which includes an aquatic trail ramp, picnic tables, restroom, and access to the hiking/biking trail just west of the parking lot. This area was closed January and February 2017 because of extensive flooding.

Carson River: Deer Run Road, Carson City, Nevada to Lahontan Reservoir, Lyon County (LC), Nevada

Portions of this reach have been under tremendous development pressure for the last decade, and this pressure is expected to continue. The prospect of future floods and associated impacts are of concern to landowners and natural resource managers. Controlling noxious weeds, such as perennial pepperweed (tall white top), has also become a huge issue on floodplain lands from the Carson River Park Subdivision downstream to the reservoir.

This reach has high potential for channel migration and excess sediment deposition. During the 1997 event floodwaters spread from ¼ to ½-mile wide and between 2 and 4-feet deep in places through this reach. Extensive volumes of sand deposited on many fields and ranch lands were attributed to channel migration and bank erosion.

Recommendations for Deer Run Road to Lahontan Reservoir

- Manage development in special flood hazard areas and other flood hazard areas (those known hazard areas that are not documented on FEMA flood maps) to provide public safety and protect the natural functions and benefits of floodplain lands.
- Incorporate principles of low impact development in subdivision designs to limit impervious surface and retain stormwater runoff onsite.
- Support conservation easements and other methods for protecting critical floodplain lands and channel migration hazard areas that consider long-term management of the lands.
- Monitor and treat for noxious weeds.
- Support river restoration projects that incorporate principles of bio-engineering and utilize non-structural designs to the extent possible with hard points where necessary,
- Provide public education regarding the importance of riparian vegetation, floodplain protection, and noxious weeds, such as tall white top.
- Design future bridges and roads to protect floodplain, accommodate and not restrict the changing course of the river, and not create additional levees.
- Address inadequate FEMA flood zone designations and inconsistent floodway delineation.

Carson River Through Carson Canyon from Deer Run Road to Santa Maria Ranch

Carson River through Carson Canyon

CC16 to LC01–CF: Critical Floodplain Area - Deer Run Road to Santa Maria Ranch: The river travels from Deer Run Road through the Carson Canyon for about five air miles until it reaches the Santa Maria Ranch area upstream of Dayton. The canyon is a deep, narrow, twisting canyon with steep and rugged terrain. There is no development in the canyon; however, there is an aggregate mine at the site of the historic bridge. Carson City has acquired this property and installed a gate, and its park ranger patrols this area daily. This reach is part of the Carson River Aquatic Trail and of the revitalization project for the Truckee-Virginia Railway.

CC17–FH: Flood Hazard - Brunswick Dam outlet: Carson City is permitted to release water into the Carson River. Significant damage to infrastructure in 2017.

CC18–CF: Critical Floodplain: Carson City looking to purchase this 106-acre parcel from Erickson.

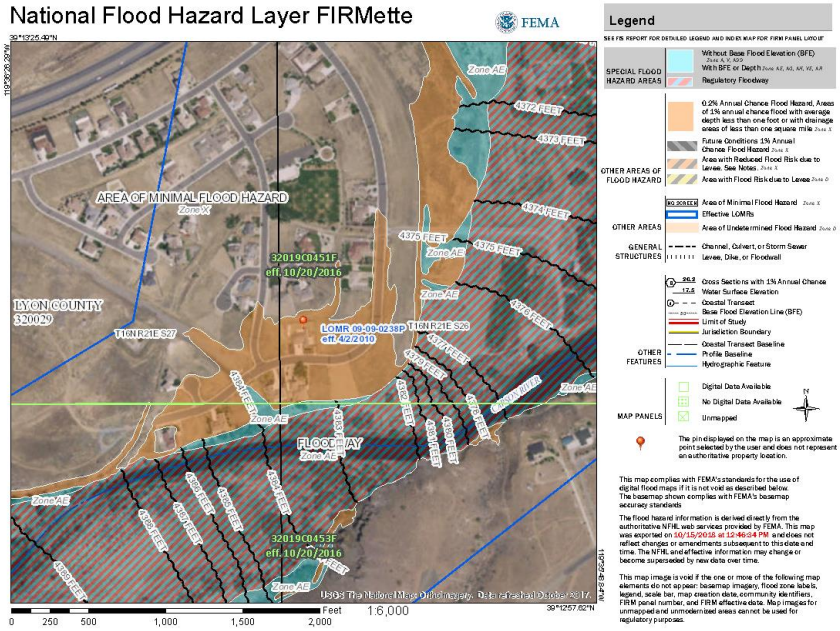
Santa Maria Ranch to Dayton Bridge, Lyon County, Nevada

There has been numerous bank stabilization, restoration and flood repair projects constructed on this reach of the Carson River. These projects are well documented in the Stewardship Plan. The lands along this segment of the river flood on a regular basis. There is a fair amount of unknown risk and uncertainty associated with some of the development that has occurred along the river channel in recent years.

Historic Santa Maria Ranch

LC02–FH: Flood Hazard Area – Santa Maria Ranch Subdivision: Upon emerging from the Carson Canyon, the Carson River used to be able to access its floodplain and spread the floodwaters out over a ¼ to ½-mile wide alluvial fan area. This area has been developed in recent years. The Santa Maria Ranch subdivision was developed on the old Winters Ranch that flooded on a regular basis. Portions of the land where the subdivision is located were underwater during the 1997 flood. The mobile home park, neighborhoods, and agricultural lands downstream of the Santa Maria Ranch flooded in 1997, including about 30 homes and the Dayton State Park. This subdivision is also within the Carson River Mercury Superfund site. A tremendous amount of fill was brought in for the development; however, flood velocities downstream have increased, and downstream properties have experienced flooding in varying degrees since its construction (most notably in 2006 and 2017). The National Flood Hazard Layer Firmette below indicates how water is now diverted around the Santa Maria Subdivision.

LC03–CF: Critical Floodplain -Santa Maria Park: This area provides an aquatic trail ramp, parking, restrooms, and a picnic area. It is closed during floods to attenuate flood waters.



LC04–CF: Critical Floodplain and Flood Hazard Area:
These fields flood on a regular basis and provide critical storage of floodwaters during flooding events. Damage to downstream properties may increase significantly without the storage volume that these fields provide. Lands across the river from the fields have been developed and did flood during the 1997 event. Over 150 feet of bank was lost from this area due to channel migration and erosive action.

There have also been numerous bank stabilization, restoration, and flood repair projects constructed on this reach of the Carson River and, as with the previous reach, these lands along this segment of the river flood on a regular basis. There is a fair amount of unknown risk and uncertainty associated with some of the development that has occurred along the river channel in recent years. The Firmette below includes River Park Subdivision just north of the Dayton Bridge.

LC05–FH: Flood Hazard Area – Dayton Bridge: Encroachment on both sides of the river by trees and sediment increases the potential flood risk.

LC06-CF: Critical Floodplain Area: The ranch lands and open space along this reach of the river are ideal for allowing the river to access its floodplain, storage of flood waters, dissipation of flood velocities, and critical habitat for wildlife. The river has changed its course numerous times in this area as evidenced by the old river channels and oxbows.

LC07-CF & FH: Critical Floodplain and Flood Hazard Area Rolling A Ranch: Lyon County was successful in acquiring the Rolling A Ranch. Portions of this ranch were sold and developed into the River Park Subdivision. Approximately 276 acres of the property adjacent to the river was retained and is part of a large Question 1-funded project that involves river restoration, developing a trail system, floodplain protection, weed abatement, and public education opportunities. Lyon County and the Dayton Valley Conservation District are working together, along with other stakeholders, to implement this project.

An extensive infestation of Perennial Pepperweed (also known as tall white top) is found in this reach. Of the 276 acres of floodplain land mentioned above, 50-75% of the lands are infested with Perennial Pepperweed. Lyon County and the DVCD are actively pursuing treatment options.

The lands adjacent to the river are considered critical flood storage areas and serve as a buffer to the adjacent development. However, it is uncertain how safe the subdivision and associated infrastructure will be during a 100-year event like the 1997 flood when river flows exceed 20,000 cfs. In addition, the raised subdivision may act as a levee and push floodwaters to other properties that previously were not prone to flooding.

Rolling A Ranch Open Space to Lahontan Reservoir

The river leaves the Dayton area and flows northeastward across the broad alluvial valley of the Carson Plains. During the 1997 event this area was inundated with 2 to 4 feet of water and approximately ½-mile wide. Extensive blankets of sand were deposited on many of the fields and ranch in the area.

From the Carson Plains the river flows through a relatively confined bedrock channel through the northern Pine Nut Mountains for about 12 air miles before reaching the area by Fort Churchill Historic State Park. There is little to no development within this reach and it is filled with majestic cottonwood tree galleries. During the 1997 flood event the automobile test track property was totally inundated. Portions of Fort Churchill Road (unpaved) and part of the old Carson River Route of the California Emigrant Trail were washed away and flooded in many places.

By Fort Churchill there is an approximately 25' vertical bank that is approximately 1,100' long that is within 20 feet of the Buckland Ditch and within 35 yards of the Fort Churchill Road. A flood event could easily erode this bank to the point that it impacts the ditch and road. Nevada State Parks, Dayton Valley Conservation District (DVCD), and others are currently investigating options for addressing this issue. DVCD received funding to implement the Buckland/Ft. Churchill bank stabilization project and are expected to start project late summer/ early fall 2018.

A considerable amount of sediment was deposited throughout this area during the 1997 and 2005/06 flood events. Tall white top is a huge problem within the floodplain next to the Buckland Station off U.S. 95 Alternate. Flood waters can easily carry seed to downstream properties. The river flows from the Week's Bridge area into the Lahontan Reservoir system.

Cottonwood Gallery in Carson City, 2003 (Courtesy of Randy Pahl)

LC08–CF: Critical Floodplain Areas – Rolling A Ranch to Weeks Bridge: These lands provide areas for the river to access its floodplain and provide habitat for wildlife. This area includes Fort Churchill State Park and follows historic Fort Churchill Road along the river. There is very little development in this area and a physical map revision which maps floodplain and floodways in this reach became effective in 2016.

LC09-CF__: Critical Floodplain Area: These lands between Rolling A Ranch in Dayton to Weeks Bridge allow the river to access its floodplain and provides wildlife habitat. It is along a designated Important Bird Area for its value to migratory birds.

LC10–CF: Critical Floodplain Areas – Fort Churchill: Fort Churchill is the start of the State Park Recreation Area which includes this historic fort, Buckland Station, and Lahontan Reservoir.

LC11–FH: Flood Hazard Area – Week's Bridge: This bridge crosses the Carson River at U.S. 95 Alternate and was fully surrounded by the flood waters in 1997. Flood debris was trapped by the bridge foundation; therefore, a debris removal device was installed to divert debris to the side of bridge pilings.

Lahontan Reservoir to Carson Sink

Lahontan Reservoir was not built as a flood control facility; it was designed as part of the USBR Newlands Project as an irrigation system. I t can provide some storage of floodwaters if there is storage capacity available in the reservoir. The river system below Lahontan Dam is very different than the reaches above Lahontan Reservoir due to the Newlands Irrigation Project and associated irrigation canals. During the 1997 flood the area did not experience flooding of homes or other structures but did have bank erosion problems. Much of the flooding problems in this area are the result of alluvial fan flooding and storm water drainage issues.

Bafford Bridge has been identified by Churchill County as a flood hazard due to low capacity and sediment clogging. In 2017, Churchill County and TCID received permission to clear and snag much of the Carson River below diversion dam and beyond Bafford Bridge. This increased the river's capacity and reduced flooding concerns.

The river corridor is highly urbanized. Approximately 50% of the property along the river have homes near the channel. The Frey and Bell Ranch conservation easements are great examples of river corridor protection.

Recommendations for Lahontan Reservoir to Carson Sink

- Support conservation easements and other methods of protecting river corridor lands.
- Investigate opportunities to utilize existing infrastructure for moving flood waters.
- Continued public outreach about flooding hazards and river corridor protection.
- Investigate ways to minimize the flood hazard impacts of excess sediment and vegetation.

CH01–FH: Flood Hazard Area – Lahontan Reservoir Dam: In 2017, a record year of precipitation (approximately 912,000 acre-feet of water) had to be moved from Lahontan Reservoir to the Carson Sink. The reservoir's capacity is approximately 300,000 acre-feet.

CH02–FH: Flood Hazard Area: Potential sloughing and cutting of banks can lead to excess sediment in the river. This area has the potential for bank stabilization projects. Something to investigate.

CH03-FH: Flood Hazard Area: The Truckee Canal brings water to Lahontan Reservoir from the Truckee River. In 2008, there was a canal breach in Fernley.

CH04–FH : Flood Hazard Area – V-line Ditch: The V-line ditch extends to the south, carrying approximately 2,000 cfs. In 2017, a weir was built off this ditch to accommodate approximately 900 to 1,200 cfs of water which had to be moved from Lahontan Reservoir to the Carson Sink.

CH05–FH: Flood Hazard Area - T-line Ditch: The T-line is diverted to the north, carrying approximately 150 cfs.

2017 Aerial View of Weir flooding off V-Line Canal *(Photo courtesy of Ernie Schank, taken by Pete Olson)*

CH06–CF: Critical Floodplain Area: The river itself continues between these diversions. Immediately downstream from the diversions is a road crossing of the river (Pioneer Way) that has a severely undersized culvert. The river flows over the road frequently, preventing primary access by some residents. There is a secondary way to get to these properties.

CH07–FH: Flood Hazard Area: Bridge over V-line downstream from diversion.

CH08–FH: Flood Hazard Area - 26-foot drop: This is the original drain to Sheckler Reservoir.

CH09–FH: Flood Hazard Area - Casey Road: This is the road that follows the ditch from the Sheckler drain all the way to Walmart. This area needs consideration by the County for a potential study to evaluate the different potential flood flows (e.g., 3,000 cfs, 5,000 cfs) and needs for mitigation or emergency management operations in the event of overtopping flows, as the canal is not part of the River and therefore not in the FEMA floodplain.

CH10–FH: Flood Hazard Area - Lewis Breach: This was the location of a breach (2008-2010) but is also a way to get water out of the canal and collect it downstream later.

CH11–FH: Flood Hazard Area: Potential flooding from both the river and V-Line ditch to the trailer park and Walmart (mapped in the AE zone).

CH12–FH: Flood Hazard Area – Highway 50 Carson River Bridge: This bridge spans the Carson River at Highway 50 and can cause flooding upstream due to backflow behind the bridge.

CH13-FH: Flood Hazard Area – Bridge US 95: In 2017, NDOT installed four box culverts to move water from the Sheckler Reservoir area to Carson Lake.

CH14–FH: Flood Hazard Area: The County owns most of the open space and the golf course in this area. Consider keeping open for floodplain access to waters. The Omni-Verde subdivision north of Coleman Road is in
the floodplain and several lots are in the mapped floodway. It is also bounded by the V-Line Canal to the South.

CH15–FH: Flood Hazard Area – Old River Channel: The old river channel flows through this area, as shown in floodplain maps with AE zones.

CH16–FH: Flood Hazard Area - Milk Plant: While the floodplain boundary stops at the original City of Fallon line (a jurisdictional boundary since 1977, not a river boundary itself), the river continues and if modeled, this area may result in being assessed as a floodplain area.

CH17–FH: Flood Hazard Area - Bafford Lane Bridge: The Bafford Lane Bridge may need to be rebuilt.

CH18–FH: Sagouspe Dam. Does not have the capacity to flood downstream properties

CH19 FH: Flood Hazard Area – Bridge at Highway 50 East: In 2017, NDOT installed four box culverts to move water from Carson Lake toward Stillwater National Wildlife Refuge.

Homes along the Carson River in Fallon

CH20–FH: Flood Hazard Area - Big Dig Ditch: This is a 17-mile ditch, there are currently no funds or plans to maintain the ditch; however, it is available in the event there are future high flows such as those seen in 2017.

CH21–CF: Critical Floodplain – Stillwater National Wildlife Refuge: This is the end of the line for all ditches and drainage on the Carson River. It did not experience flooding, as the water was 'managed' by the USFWS by controlling flows as they entered the property and huge flows were already reduced by the time they crossed the desert.

Appendix C 2018 Risk MAP Discovery

Discovery Report

FEMA Region IX

Carson River Watershed, HUC 16050201, 16050202, 16050203

Alpine County, California
Douglas County, Churchill County,
Lyon County, Carson City,
and Storey County, Nevada

DRAFT FINAL January 2018

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 EXECUTIVE SUMMARY

The Federal Emergency Management Agency (FEMA) Risk Mapping, Assessment, and Planning (Risk MAP) projects begin with Discovery. This Discovery Report discusses risk for the Carson River Watershed in Alpine County, California, and Carson City, Douglas County, Churchill County, Lyon County, and Storey County, Nevada. A Discovery Report has two goals: to inform communities of their risks related to natural hazards, and to enable communities to take actions to reduce their risk. The data provided here assists communities become more resilient by updating a variety of local plans, communicating risk, informing the modification of development standards, identifying mitigation projects, and ultimately taking action to reduce risk.

The Discovery process for the Carson River Watershed contacted community stakeholders and collected data. The data collected were reviewed, and discussions were held about recent flood events, areas of new growth, floodplain mapping needs, and desired mitigation projects. The Discovery process is the first of many collaborative steps toward implementation of actions that lead to reduction of risk to life and property.

2 GENERAL INFORMATION

The Carson River watershed is comprised of approximately 3,965 square miles and includes portions of six counties and two states in east-central California and west-central Nevada, extending for a distance of about 184 miles (Figure 1). The geographic units of the Carson River watershed are:

- Alpine County, California
- Carson City, Nevada
- Churchill County, Nevada
- Douglas County, Nevada
- Lyon County, Nevada
- Storey County, Nevada

The headwaters of the Carson River lie at altitudes of 10,000 to 11,000 feet in the Sierra Nevada Mountain Range (Alpine County). The East and West Forks of the river join to form the main stem of the Carson River in Carson Valley (Douglas County). The river then flows through the Carson River Basin until its terminus at the Carson Sink (3,970 ft) (Churchill County). The Carson River Watershed has become increasingly urbanized, with an increase in both alluvial fan and riverine flooding events over the past few decades. Many communities and flooding sources in the Carson River Watershed have been prioritized in the past for detailed flood studies, and much progress has occurred to identify and mitigate flood hazards. This report is intended to summarize the information gathered as part of the updated Discovery process for the Carson River Watershed.

The U.S. Geological Survey (USGS) defines the Carson River as three separate hydrologic unit codes (HUC) as follows:

16050201 Upper Carson
16050202 Middle Carson
16050203 Lower Carson

Annual streamflow of the Carson River is extremely variable, ranging from a low of about 26,000 acre-ft in 1977 to slightly more than 926,000 acre-ft in water year 2017 near Fort Churchill. Flooding occurs often in the Carson River Basin. Floods in the basin are categorized as main channel flooding, localized (flash) flooding, or debris flows. The majority of main channel flooding is caused by rain-on-snow events in the higher elevations. Rapid snow melt causes the river channel to fill quickly and overflow its banks. Localized flooding, on the other hand, generally occurs in alluvial fans during the summer months, and is caused by intense rainfall during thunderstorms. Debris flows occur when water from rapid snowmelt or intense rainfall mixes with sediment. Flooding in 2017 was a result of repeated large precipitation events followed by nearly continual runoff events.

Approximately 606 square miles of the watershed are located in Alpine County, California, while the remaining 3,359 square miles of the watershed are located in Nevada.

The five hydrographic areas in the Nevada portion of the watershed are:

1. Carson Valley (Minden, Gardnerville, Genoa – Douglas County)
2. Eagle Valley (Carson City)
3. Dayton Valley (Dayton, Virginia City – Lyon County)
4. Churchill Valley (Fallon – Churchill County)
5. Carson Desert (Fallon, Stillwater – Churchill County)

The Clear Creek sub-watershed in Douglas County/Carson City, Nevada is within the geographic boundaries of the Carson River Watershed.

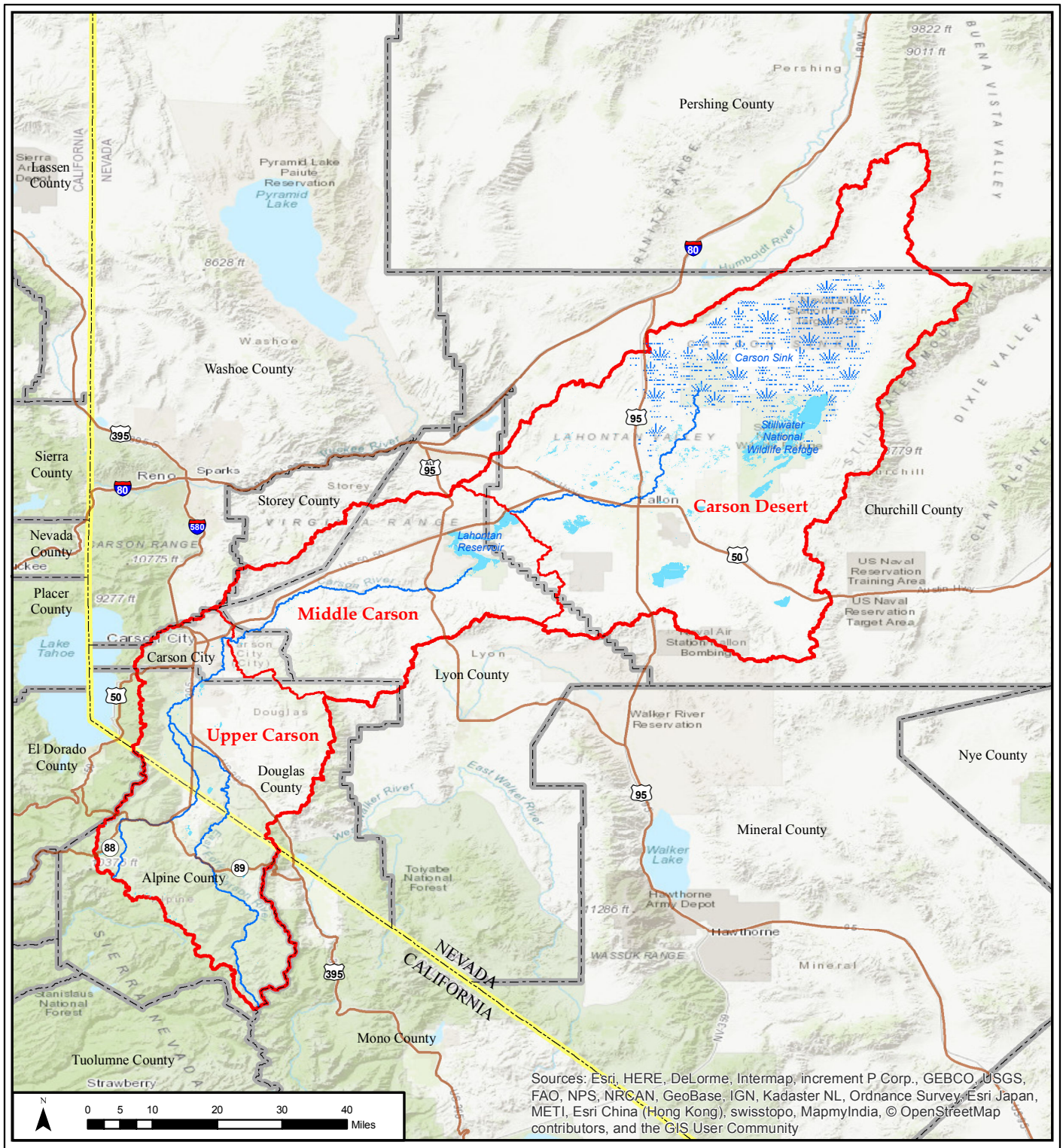
The sub-watersheds in Alpine County, California are designated as follows:

A. Wolf Creek
B. East Fork Carson River
C. Markleeville Creek
D. West Fork Carson River

Segments of the river have been remapped over the past several years using detailed mapping procedures which updated their previous Zone A (BFE Unknown) designation. over the past several years. These projects were identified in the previous Discovery Report (2012) and Regional Floodplain Management Plan (2008, 2013).

The flood mapping as part of FEMA Mapping Activity Statement (MAS) #1 and #2 with the Carson Water Subconservancy District was were completed in December 2012 (MAS #1) and 2014 (MAS #2), and included the portions of the Carson River through Lyon County and Carson City. MAS #3, completed in 2015, included hydraulic modeling of the Carson River in Carson Valley, and MAS #4 included floodplain mapping in the Carson Valley was completed in 2016. MAS #5 mapped alluvial fan watersheds in Douglas County, and Eagle Valley Golf Courses A&B Drainages in Carson City, also completed in 2016. Non-regulatory projects included Identification and Mitigation studies in Douglas and Churchill County; Public Outreach and Education; and Inundation flood maps of the Upper Carson River. MAS # 6 mapped alluvial fan watersheds in Carson City and Lyon County. Non-regulatory projects completed were an Identification and

Mitigation project in Douglas County, Public Outreach and Education; and creation of Carson City Inundation maps. These MAS #6 projects were completed by September 2017. MAS #7 is in progress (9/25/2015-6/30/2019) and will update map the Saliman / Voltaire alluvial fan drainage; create a Johnson Area Drainage Master Plan in Douglas County; update the 2012 Discovery Report and 2013 Watershed Floodplain Management Plan. It also funded Public Outreach and Education. MAS #8, which has just gotten underway (9/1/2017-8/31/2019), will create a Dayton Valley Area Drainage Master Plan in portions of Lyon and Storey Counties; update floodplain ordinances in Alpine County in California, and Douglas, Carson City, and Lyon Counties in Nevada; and work with state and federal partners to continue Flood Outreach and Education.



MAP SYMBOLOGY

- Project Area
- Watershed
- Water Body
- Carson Sink
- Waterway
- State Boundary
- County Boundary
- Major Road

PROJECT LOCATOR

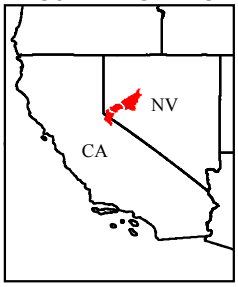


FIGURE 1.

NATIONAL FLOOD INSURANCE PROGRAM

Project Area Map

Carson River Watershed

HUC-8 Codes

16050201
16050202
16050203

FEMA

Discovery Report Release Date: 12/01/2017

3 WATERSHED STAKEHOLDER COORDINATION

Current efforts of the 2017 watershed stakeholder coordination phase of Discovery seek to expand and update the information obtained in the 2012 Discovery process. Extensive flooding has occurred since the 2012 Discovery; therefore, community needs and concerns are focused on addressing these additional and unique flood hazards.

The project team (Appendix A) conducted two outreach meetings with community officials and stakeholders as part of this process. In addition to the six jurisdictions within the Carson River Watershed, additional stakeholders were identified, generally consisting of associations and government agencies that are involved with the Carson River Watershed and the Carson River Coalition (CRC). The list of community and stakeholder contacts was gathered is included in Appendix B to this document.

In July 2017, community and additional stakeholders were invited to attend Discovery meetings as part of the CRC's Floodplain and River Management Working Group (formerly CRC River Corridor Working Group) meeting. On August 1, 2017, the communities and stakeholders were sent a memorandum that identified the upcoming meetings and data to be collected.

The Discovery Meetings were hosted by the Carson Water Subconservancy District (CWSD) as follows:

Tuesday, August 15, 2017, 1:00-3:00 pm
State of Nevada Governor's Mansion, Nevada Room
606 Mountain Street, Carson City, NV 89703

Tuesday, October 24, 2017, 3:00-5:00 pm
Sierra Room at Carson City Community Center
850 E. William Street, Carson City, NV 89703

The goals of the meetings were to:

- Provide an overview of the project
- Introduce new members and stakeholder agencies to the process
- Discuss the project scope
- Collect community feedback on:
    - Areas of growth
    - Need for additional flood studies
    - Areas where mitigation projects are needed
- Discuss ways in which flood risk can be reduced in the watershed
- Gather available technical data to support hydraulic and hydrologic studies; and
- Discuss the project timeline

August 15, 2017 Discovery Meeting:

An introduction to Risk MAP was presented and followed by discussion sessions with each jurisdiction. The presentation described Risk MAP program goals and objectives, the Discovery meeting goals and objectives, and the timeline moving forward. This meeting

introduced attendees new to the Discovery process to the type of information sought and outcomes to be expected. Stakeholders were given the opportunity to complete and discuss with project team members the Community Questionnaire and Community Fact Sheets (Appendix C); review maps; potential mitigation projects; and identify new areas of concern during break out session

Stakeholders unable to attend the meetings were also given additional time to review and comment on Discovery data collected. On September 1, 2017, digital copies of the Community Questionnaires filled out at the August 15 meeting were sent to each jurisdiction for review. Additional information was requested because of the stakeholder input. Proposed, current, and completed project information was also requested in an effort to update the lists for each community.

October 24, 2017 Discovery Meeting:
At the second Discovery meeting, individual jurisdictions reviewed the summaries from the first meeting. Next, they reviewed, updated and ranked potential flood mitigation projects with project team members for each county. Collected information is provided throughout this report. A list of Discovery meeting attendees, agenda, and handouts are provided in Appendix D.

4 DATA ANALYSIS

A list of the data collected is provided in Table 1. Table 1 outlines the data types, a short description, the source and how the data was delivered. The following sections (4.1 - 4.4) provide additional details about how the data can be used.

Table 1. Data Collection for the Carson River Watershed.

Data Types	Description	Source	Deliverable
Community Assistance Visits	Community Fact Sheet	Nevada Division of Water Resources, Local Agencies	Updated Fact Sheets
Community Boundaries	Location of jurisdictional boundaries	Prior Discovery maps	Discovery Map; Geodatabase
Community Rating System	Community Fact Sheet	FEMA's Community Rating System Communities and their Classes"	Updated Fact Sheets
County Boundaries	Location of County Boundaries	Prior Discovery maps	Discovery Map; Geodatabase
Dams	Location of dams	NDWR Inventory	Discovery Map; Geodatabase
Declared Disasters	Community Fact Sheet	NDEM	Updated Fact Sheets
Demographics, Industry	Community Fact Sheet	US Census Bureau QuickFacts, and American Fact Finder	Updated Fact Sheets
HUC 8 Watersheds	Watershed boundary	USGS Watershed Boundary Dataset	Discovery Map; Geodatabase
Insurance Policies and Claims	Community Fact Sheet	FEMA database	Updated Fact Sheets
Letters of Map Change (LOMCs)	Number and locations of letters of map change	FEMA National Flood Hazard Layer	Discovery Map; Geodatabase
Mitigation Plans Status	Community Fact Sheet	Community Website	Updated Fact Sheet
Mitigation Projects Obligated	Community Fact Sheet	Data.gov: FEMA Hazard Mitigation Program Summary	
Mitigation Projects: Recent, ongoing, planned, Desired		Community information, Discovery Meetings	Discovery Map; Geodatabase
Repetitive Loss	Community Fact Sheet	NDWR, Local Agencies	Updated Fact Sheet
Streams and Rivers	Stream centerlines based on USGS topo	USGS Watershed Boundary Dataset	Discovery Map; Geodatabase
Stream Gages		USGS	Discovery Map; Geodatabase
Major Roads	Location of interstates and major highways	TIGER, Data.gov	Discovery Map; Geodatabase
Special Flood Hazard Areas	Location of FEMA flood hazard areas	FEMA Digital Flood Insurance Rate Maps	Discovery Map; Geodatabase
Stream Gages	Location of stream gages operated by USGS	USGS National Hydrography Dataset	Discovery Map; Geodatabase
Study Needs: FEMA			
Topographic Availability	LiDAR	CWSD	Discovery Map: Geodatabase
Wetland	Wetland delineations	U.S. Fish and Wildlife Service	Discovery Map; Geodatabase

4.1 DATA THAT CAN BE USED FOR FLOOD RISK PRODUCTS

The Flood Risk Products available to a community are a Flood Risk Map (FRM), Flood Risk Report (FRR) or Flood Risk Database (FRD). These products are non-regulatory resources that supplement the flood hazard information produced by the regulatory Flood Insurance Rate Map (FIRM), Flood Insurance Study (FIS) and FIRM database products.

A Flood Risk Report presents:

- Background (purpose, methods, risk reduction practices)
- Project Results (changes since Last FIRM, Depth & Analysis Grids, Flood Risk Assessment, Enhanced Analyses), and
- Summarized by locations - communities and watersheds.

A FRM visually promotes risk awareness by showing results of Risk MAP project non-regulatory datasets, and promotes additional flood risk data not shown but located within the FRD.

A FRD shows:

- Changes Since Last FIRM
- Depth and Analysis Map
- Flood Risk Assessment (HAZUS)
- Areas of Mitigation Interest

Flood risk products help community members and officials view and visualize their local flood risk, allowing communities to make informed decisions about reducing flood loss and mitigating potential damage from flood hazards. These individuals may include property owners, emergency management officials, community planners and developers, real estate and insurance specialists and other professionals and community decision-makers.

4.1.1 Topographic Data

Local jurisdictions have worked diligently to improve flood risk data throughout the entire watershed; therefore, LiDAR has been collected on a flood-study-based effort (individual segments of the Carson River). LiDAR has been processed for areas shown in the Discovery Map (Appendix F). At the current time, LiDAR data is being processed for data collected in Lyon County, and will be available in 2018.

The topographic data that can be used for flood risk products in the Carson River watershed consists of the following LiDAR segments collected between 2011 and 2017 (Table 2).

Table 2. LiDAR Status for the Carson River Watershed.

Segment/Detailed Study Mapping	Date Acquired
Churchill County	2013
Lyon County	2011, 2017
Carson City	2011, 2017
Douglas County	2013

4.1.2 USGS Gages

The USGS stream gaging network is vital to the National Weather Service's river forecast and warning program and the goal to reduce flood damages and loss of life. The locations of USGS stream gages in the watershed are shown on the Discovery Maps and listed in Table 3. The seven sites that are active National Weather Service River Forecast sites are indicated. A number of sites have been discontinued since the 2012 Discovery, and are listed at the bottom of the table.

Table 3. USGS Stream Gages

No.	Gage Number	Station Name and Location	Forecast
1	10308783	LEVIATHAN C AB MINE NR MARKLEEVILLE, CA	
2	10308785	LEVIATHAN MINE PIT FLOW NR MARKLEEVILLE, CA	
3	10308784	LEVIATHAN MINE ADIT DRAIN NR MARKLEEVILLE, CA	
4	103087891	ASPEN C ABV LEVIATHAN MINE NR MARKLEEVILLE, CA	
5	103087887	LEVIATHAN MINE POND 4 NR MARKLEEVILLE, CA	
6	103087885	LEVIATHAN C CHANNEL UNDERDRAIN NR MARKLEEVILLE, CA	
7	103087889	4L C NR MARKLEEVILLE, CA	
8	103087892	ASPEN C OVERBURDEN SEEP NR MARKLEEVILLE, CA	
9	10308200	E.F. CARSON R BL MARKLEEVILLE C NR MARKLEEVILLE, CA	CEMC1
10	10308789	LEVIATHAN C AB ASPEN C NR MARKLEEVILLE, CA	
11	10308794	BRYANT CK BL MOUNTAINEER C NR MARKLEEVILLE, CA	
12	10308792	LEVIATHAN C AB MOUNTAINEER C NR MARKLEEVILLE, CA	
13	10310000	WEST FORK CARSON RIVER AT WOODFORDS, CA	WOOC1
14	10309000	EAST FORK CARSON RIVER NEAR GARDNERVILLE, NV	
15	10310400	DAGGETT CREEK NEAR GENOA, NV	
16	10310447	AMBROSETTI POND NR GENOA, NV	
17	10311000	CARSON RIVER NR CARSON CITY, NV	STWN2
18	10310500	CLEAR CREEK NR CARSON CITY, NV	
19	10311100	KINGS CANYON CREEK NR CARSON CITY, NV	
20	10311090	NORTH FORK KINGS CANYON CREEK NR CARSON CITY, NV	
21	10311200	ASH CANYON CK NR CARSON CITY, NV	
22	10311300	EAGLE VALLEY CREEK AT CARSON CITY, NV	
23	10311400	CARSON RIVER AT DEER RUN ROAD NR CARSON CITY, NV	
24	10311750	CARSON RIVER ABV SIXMILE CYN CK BLW DAYTON, NV	
25	10312000	CARSON RIVER NR FORT CHURCHILL, NV	FTCN2
26	10312150	CARSON RIVER BLW LAHONTAN RESERVOIR NR FALLON, NV	CBLN2
27	10351400	TRUCKEE CA NR HAZEN, NV	
28	103122190	S-LINE DIVERSION CANAL NEAR STILLWATER, NV	
29	10312275	CARSON RIVER AT TARZYN ROAD NR FALLON, NV	
30	10312277	PAIUTE DRAIN BL TJ DRAIN NR STILLWATER, NV	
31	10310407	CARSON R NR GENOA, NV (Daily data only)	
32	10311700	CARSON RIVER AT DAYTON, NV (Winter operations only)	
DISCONTINUED GAUGES (SINCE 2012 DISCOVERY)			
	10308800	BRYANT C NR GARDNERVILLE, NV	
	10312210	STILLWATER POINT RESERVOIR DIV CANAL NR FALLON, NV	

4.2 Other Data and Information

4.2.1 Mitigation Plans/Status, Mitigation Projects

Hazard Mitigation Plans (HMPs) are prepared to help communities reduce long-term risk to life and property from natural hazards. The plans include comprehensive mitigation strategies intended to promote flood-resilient communities. Table 4 lists the HMPs, their status, and their availability for review.

Table 4. HMPs Status and Availability

Jurisdiction	HMP	Issue Date	Expiration Date	Available for Review
Alpine County	Natural Hazard Mitigation Plan	2017	2022	Yes
Carson City	Hazard Mitigation Plan	August 4, 2016	August, 2021	Yes
Churchill County, City of Fallon	Multi-Jurisdictional Hazard Mitigation Plan	2012	2017	Yes
Douglas County	Hazard Mitigation Plan	2013	2018	Yes
Lyon County, City of Fernley, City of Yerington	Multi-Jurisdictional Hazard Mitigation Plan	July, 2013	July, 2018	Yes
Storey County	Hazard Mitigation Plan	2015	2020	Yes

4.2.2 Coordinated Needs Mapping Study (CNMS) and National Flood Insurance Program (NFIP) Mapping Study Needs

FEMA organizes, stores, and analyzes flood hazard mapping information for identifying and managing flood hazard mapping needs. The CNMS inventory contributes to the identification of risk in two important ways. The first is by indicating where the depiction of flood hazards on the FIRMs has been validated through detailed assessment. The second is by showing which previously studied or unstudied flooding sources inadequately represent flood hazards. In this way, CNMS leads to the improvement of flood hazard data.

For this Discovery update, flood hazard mapping needs data was provided to FEMA for inclusion in the CNMS database. These data both validate flood hazards with adequate detailed assessments, and flooding sources that are either unstudied or inadequate and require improvement of the flood hazard data.

4.2.3 Socio-Economic Analysis

Table 5 used US Census QuickFacts updated as of 2015. Community fact sheets for each jurisdiction containing more detailed demographic information are provided in Appendix C.

Table 5. Socio-economic analysis.

Jurisdiction	Population	Median Age	Median Household Income	Top Industry
Alpine County	1,071	39.3	$52,917	Educational services
Carson City	54,742	41.1	$47,668	Educational services
Churchill County	24,198	29	$47,415	Trade, transportation
Douglas County	48,020	47.4	$58,535	Educational services
Lyon County	53,179	40.9	$47,255	Retail trade
Storey County	4,051	44.5	$64,832	Manufacturing

4.2.4 Community Rating System (CRS)

The communities of Carson City, Douglas County, and Storey County participate in the CRS program as of October 1, 2017, as shown in Table 6.

Table 6. CRS Rating of participating communities.

Community	CRS Rating
Carson City	6
Douglas County	6
Storey County	8

4.2.5 Flood Control Structures

1. Levees

According to the 2012 Discovery Map, there are 9 levees, located in Carson City and Lyon County, as identified in Table 7. Lyon County levees are not identified on the FIRM panels, and none are certified as USACE levees or accredited by FEMA. According to the Lyon County FIS (2016), approximate analyses of "behind levee" flooding were conducted for all the levees in Table 7 to indicate the extent of the "behind levee" floodplains. The approximate levee analysis was conducted using information from existing hydraulic models (where applicable) and USGS topographic maps.

Table 7. Levees identified on FEMA FIRM panels.

Community	Flood Source	FIRM Panel
Carson City	Eagle Valley Creek	32001C0083F
Carson City	Eagle Valley Creek/Combs Canyon Creek	32001C0084F 32001C0092G
Carson City	H Tributary	32001C0092G
Lyon County	Unnamed Wash at Silver Springs	32019C0211E 32019C0213E
Lyon County	Unnamed Wash at Silver Springs	32019C0214E 32019C0212E
Lyon County	Carson River	32019C0289F
Lyon County	Carson River	32019C0452F
Lyon County	Undetermined	32019C0452F

2. Dams

The 2012 Discovery Report details the Lahontan Dam and Reservoir in Churchill County, and Eagle Valley Golf Course Dam and the Shenandoah Detention Basin in Carson City. According to the Nevada Division of Water Resources (NDWR), all High and Significant Hazard dams located within the Carson River Watershed are listed in Table 9. Dams for which an Emergency Action Plan (EAP) is active are also indicated in the table. High hazard dams indicate potential loss of life and economic damage; significant indicates economic damage.

Table 8. Hazard Potential Classification System for Dams (2004, Federal Guidelines for Dam Safety)

Hazard Potential Classification	Loss of Human Life	Economic, Environmental, Lifeline Losses
Low	None expected	Low and generally limited to owner
Significant	None expected	Yes
High	Probable. One or more expected.	Yes (but not necessary for this classification)

In the State of Nevada, the State Engineer is charged with dam safety pursuant to Nevada Revised Statutes (NRS) 535. The goal of Nevada's dam safety program is to avoid dam failure and thus prevent loss of life and destruction of property. This is accomplished by careful review of new dam applications, on-site inspection of the dams being built, review of as-built drawings and QA/QC reports and finally, through periodic visual inspections of the structures themselves. In each jurisdiction's CRS Annual Report is a section confirming that the State has in fact inspected the dams. While there are 26 dams in Alpine County, only three are within the Carson River Watershed boundary that are considered significant or high hazard.

Table 9. Dams considered significant or high hazard.

National ID	State ID	Name	Stream	Owner	Hazard	EAP
Alpine County						
CA01222	1062.003	Harvey Place		South Tahoe PUD	S	
CA00894	1062.000	Indian Creek		South Tahoe PUD	S	
CA00631	1.090	Red Lake		California Dept. of Fish and Wildlife (CDFW)	S	
CA00641	1.083	Heenan Lake		CDFW	L	
CA00634	513.000	Kinney Meadows		Alpine Land and Reservoir Company	L	
CA00635	513.002	Lower Kinney Lake		Alpine Land and Reservoir Company	L	
CA00638	513.006	Upper Kenny Lake		Alpine Land and Reservoir Company	L	
CA00640	513.008	Wet Meadows		Alpine Land and Reservoir Company	L	
CA00636	513.003	Lower Sunset		Alpine Land and Reservoir Company	L	
CA00639	513.007	Upper Sunset		Alpine Land and Reservoir Company	L	
CA00632	512.000	Lost Lake East		Carson Water Subconservancy District	L	
CA00633	512.002	Lost Lake West		Carson Water Subconservancy District	L	
Carson City						
NV00223	J-228	Carson City Treated Effluent Dam	Carson River-Tr	Carson City	H	Y
NV00231	J-244	Carson City Golf Course Detention Basin	Carson River-Tr	Carson City	S	Y
NV10635		Shenandoah Detention Basin	Eagle Creek-Tr	Carson City	H	Y
	Js-099	Vicee Canyon Infiltration Dams	Vicee Canyon Creek	Carson City	L	
	Js-162	V&T S23 Detention Basin	Carson River-Tr	TBD	L	
	Js-163	V&T Detention Basin 30	Carson River-Tr	TBD	L	
	Js-208	Tahoe Golf Club Interchange Detention Basin	Clear Creek-Os	Nevada DOT	L	
NV10623		Carson City Treatment Plant Drying Beds	Eagle Creek-Os	Carson City	L	
NV10624		Carson City South Storage Ponds	Clear Creek-Os	Carson City	L	

National ID	State ID	Name	Stream	Owner	Hazard	EAP
Churchill County						
NV10120		Carson River Diversion	Carson River	BOR*	S	Y
NV10123		Lahontan	Carson River	BOR	H	Y
NV00214		Sheckler Dam	Carson River-Os	BOR	S	
NV00085	XNV00085	Desert Gun Club	Carson Sink-Tr	Desert Gun Club	L	
NV00087		S Line Dam	Carson River-Os	Truckee-Carson Irrigation District	L	
NV10133		Stillwater Point Dam	Carson River-Os	U.S. Fish & Wildlife Service	L	
NV10466		Ollie's Pond	Carson River-Os	Truckee-Carson Irrigation District	L	
NV10467		Harmon Reservoir	Carson River-Os	Truckee-Carson Irrigation District	L	
NV10468		Sagouspie Diversion Dam	Carson River	Truckee-Carson Irrigation District	L	
Douglas County						
NV10441	XJ-187	Veta Grande Tails Dam	Carson River-Tr	Precious Metal Recovery System	H	
NV10469	XNV10469	Allerman #2 Dam	Carson River-Os	Allerman Upper Virginia Irrigation Co Inc	H	
NV10829	XNV10829	Ruhenstroth Power Dam	Carson River	Hussman, George G.	H	
NV10175	J-229	Sierra Springs	Carson River-Os	Sierra Reflections	S	
NV00092		Allerman #1 Dam	Carson River-Os	Allerman Upper Virginia Irrigation Co Inc	H	Y
NV00227	J-238	Minden-Gardnerville Sanitation District	Carson River-Os	Minden-Gardnerville Sanitation District	S	Y
NV10166	J-380	Buckeye Creek Lower Effluent Storage Pond	Buckeye Creek-Os	Douglas County Sewer Improvement Dist. #1	H	Y
NV10168	J-350	Indian Hills Effluent Pond #5	Carson River-Os	Indian Hills G. I. D.	S	Y
NV10435	J-411	Indian Hills Effluent Pond #6	Carson River-Os	Indian Hills G. I. D.	S	Y
NV10605	J-551	Bently Reservoir	Buckeye Creek-Tr	Bently Family Limited Partnership	H	Y
NV10665	J-594	North Carson Valley Treated Effluent Storage Dam	Carson River-Os	Douglas County	S	Y
NV10686	J-380	Buckeye Creek Middle Effluent Storage Pond	Buckeye Creek-Os	Douglas County Sewer Improvement Dist. #1	H	Y
NV10687	J-380	Buckeye Creek Upper Effluent Storage Pond	Buckeye Creek-Os	Douglas County Sewer Improvement Dist. #1	H	Y
NV00234	J-257	East Peak Lake	Daggett Creek	Heavenly Valley Limited Partnership	H	Y
NV10439	J-515	Mud Lake	Indian Creek-Os	West Fork Water Company	H	Y
NV10605	J-551	Bently Reservoir	Buckeye Creek-Tr	Bently Family Limited Partnership	H	Y
NV00091	XNV00091	Allerman #4 Dam	Carson River-Os	/-H Ranch	L	
NV10169	J-389	Lippincott Ski Dam	Carson River-Os	Lippincott, Doug H.	L	
NV10171	XJ-362	Mid-Valley WWTP	Carson River-Os	Bently Family Trust	L	
NV10455	J-419	Lippincott Ski Dam II	Carson River-Os	Lippincott, Doug H.	L	
NV10544	J-505	Ambrosetti Pond	Carson River-Os	Carson City	L	

National ID	State ID	Name	Stream	Owner	Hazard	EAP
	Js-005	Virginia Ditch/Rocky Slough Diversion	East Fork Carson River	TBD	L	
	Js-007	Allerman Diversion Dam	East Fork Carson River	Allerman Ditch Company	L	
	Js-109	Mulligan Reservoir	Carson River-Os	TBD	L	
	Js-144	Page Private Pond	West Fork Carson River-Os	NV ENERGY	L	
	Js-213	LIPPINCOTT SKI POND #3	Carson River-Os	Lippincott, Doug	L	
	Js-214	LIPPINCOTT SKI POND #4	Carson River-Os	Lippincott, Doug	L	
Lyon County						
NV00150	J-086	Eldorado Canyon Dam	Eldorado Canyon Creek	Wade Development Company Inc	H	Y
NV10313	Xj-264	North Dayton Valley Primary Pond 1	Carson River-Os	Lyon County Utilities	S	
NV10638		Sheep Camp Detention Dam	Carson River-Tr	Chase Property Group, LLC	H	
NV10727	Xj-264	North Dayton Valley Primary Pond 2	Carson River-Os	Lyon County Utilities	S	
NV10728	Xj-264	North Dayton Valley Secondary Pond	Carson River-Os	Lyon County Utilities	S	
NV10729	Xnv10729	North Dayton Valley Storage Pond	Carson River-Os	Lyon County Utilities	S	
NV10782	J-654	Rolling A WWTP Sludge Pond	Carson River-OS	Lyon County	L	

*U.S. Department of the Interior Bureau of Reclamation (BOR)

4.2.6 Floodplain Management/Community Assistance Visits (CAVs)

As the state coordinating agency for the National Flood Insurance Program, the NDWR conducts CAVs as part of their floodplain management programs. A CAV typically consists of a tour of the floodplain to assess any recent construction activities, a review of the local permitting process, and evaluation of the local floodplain ordinance. A meeting with the local floodplain official is held to discuss the NFIP, the local permitting process, any recent flood events, training opportunities, and any program deficiencies. Table 10 lists the communities in the watershed and the date of their latest CAV.

While CRS reviews are conducted annually, staff visits generally only occur every few years.

Table 10. Recent CAVs and CRS visits.

Community	CAV Meeting Date	CRS Meeting Date
Carson City	07/21/2011	2011
Douglas County	02/23/2012	Update
Lyon County	10/20/2009	Update
Storey County	9/20/2012	Update

4.2.7 Regulatory Mapping

As part of the CWSD's ongoing efforts to update the watershed FIRMs, many maps have been updated since the 2012 Discovery. The most recent FIRM updates for the communities in the Carson River Watershed became effective as shown in Table 11:

Table 11. FIRM updates through 2017 Discovery.

Jurisdiction	Effective Date	Description
Alpine County		No changes to FIRMs effective 11/19/1987
Carson City		
3200010083F 3200010084F 3200010091F	2/19/2014	Ash Canyon Creek, Kings Canyon Creek, Vicee Canyon Creek, Combs Canyon Creek, Eagle Valley Creek
3200010092G 3200010094F 3200010111G 3200010113F	12/22/2016	Combs Canyon Creek, Ash Canyon Creek, Kings Canyon Creek, Saliman Road Tributary, Voltaire Canyon Creek, H Tributary, I Tributary
Douglas County		
32005C0070H 32005C0090H 32005C0093H 32005C0232H 32005C0234H 32005C0235H 32005C0251H 32005C0252H 32005C0253H 32005C0254H 32005C0256H 32005C0258H 32005C0259H	6/15/2016	Remapping using detailed methods of 30 streams, five two-dimensional study areas (Airport Tributary Wash, Airport Wash, Buckbrush Wash, Johnson Lane Wash, Sunrise Pass Wash; and redelineations of 5 stream/river segments on the: Carson River, Clear Creek, Pine Nut Road Wash, Rocky Slough, and Smelter Creek
Churchill County		No changes to FIRMs effective 9/28/2008
Lyon County		
32019C0289F 32019C0291F 32019C0292F 32019C0293F 32019C0294F 32019C0311F 32019C0312F 32019C0316F 32019C0320F 32019C0340F 32019C0345F 32019C0350F 32019C0434F 32019C0451F 32019C0452F 32019C0453F	10/20/2016	Floodplain redelineation of the Carson River in Lyon County
Storey County		No changes to FIRMs effective 1/16/2009

4.3 Discovery Meetings

Before and during Discovery meetings the 2012 Discovery Report projects were reviewed for accuracy. Completed projects and projects that were no longer a priority were removed. New projects were identified based on recent flooding or changes in priority by representatives from Carson River Watershed stakeholders.

August 15, 2017 Discovery Meeting:

A Community Questionnaire was used to help jurisdictions identify areas where flood risk data is outdated. The following observations were made:

- Carson City identified numerous watersheds for which an area drainage master plan or flood study needs to be conducted. Many are subject to alluvial fan/flash flooding as a result of summertime cloudburst events.
- Churchill County's FIRM maps are from the 1970s, and new FIRMs are needed to show modern growth, new plans, and new water spillways (created as a result of the overwhelming 2017 inputs of the Carson River to Lahontan Reservoir).
- Lyon County is subject to flash flood potential and alluvial fan flooding from the surrounding steep hillslopes.
- Douglas County needs detailed flood studies for Pinenut Creek – from Jo Lane to Orchard Road (A flood zone), Sierra Country Estates, and the Ruhenstroth area (Smelter Creek).

October 24, 2017 Meeting:

Individual project staff members worked with each jurisdiction to fine-tune the information contained in the Community Fact Sheets, and potential mitigation projects. Potential projects were derived from the 2012 Discovery list, the 2017 draft Update of the Carson River Watershed plan, and discussions with jurisdiction staff.

4.4 DISCOVERY MAP

A Discovery Map (Appendix F) presents the current floodplain mapping extents, LiDAR coverage boundaries, and locations of potential mitigation projects within each jurisdiction. The content was derived by each jurisdiction at the Discovery meetings and follow-up. It is evident that the impacts due to flooding, the need for better or revised floodplain mapping, and the importance of project implementation are at the forefront of each jurisdiction's priorities. Alluvial fan and wash flash-flooding are increasingly a concern for jurisdictions. These are recognized by the number of such potential projects in each jurisdiction list.

4.5 MITIGATION PROJECTS

Community stakeholders identified locations where mitigation projects could reduce the impacts of flooding. Topics of mitigation interest included upstream storage, roads that frequently flood, and recent/future growth or development. Appendix E provides lists of projects Identified for potential mitigation for each community.

5 APPENDICES

List of Appendices

Appendix A Project Team Contact Information
Appendix B Stakeholder Contact Information
Appendix C Discovery Interviews

- Community Fact Sheets
- Community Interview Notes

Appendix D Discovery Meetings

August 15 Meeting

a. Notice
b. Agenda
c. Community Questionnaire
d. List of Attendees
e. Risk MAP Presentation

October 24 Meeting

a. Notice
b. Agenda
c. August Meeting Notes
d. List of Attendees/Sign-in sheet
e. Individual Jurisdiction Maps

Appendix E Community-wide Mitigation Projects
Appendix F Discovery Map
Discovery Geodatabase (to be completed)

3 WATERSHED STAKEHOLDER COORDINATION

This portion of the Discovery Report details the activities that occurred during the 2017 watershed stakeholder coordination phase of Discovery. The current effort seeks to expand and update the information obtained in the 2012 Discovery process. Notably, extensive flooding has occurred since the 2012 Discovery, bringing a focus on additional new and different flood hazards and community needs or issues.

The Discovery process includes outreach to community officials and stakeholders, a component conducted on two occasions by the project team (Appendix A). In addition to the six jurisdictions within the Carson River watershed, additional stakeholders were identified, generally consisting of associations and government agencies that are involved with the Carson River watershed. A list of community and stakeholder contacts was gathered and kept current throughout the Discovery process. This list is included in Appendix B to this document.

Communities and the additional identified stakeholders were contacted in July of 2017 to apprise appropriate individuals of the upcoming Discovery meetings to be held in conjunction with the Floodplain and River Management Working Group (formerly Carson River Coalition) meeting. On August 1, 2017, the communities and stakeholders were sent a memorandum that identified the upcoming meetings and data to be collected. During this time, Lyon County submitted its Multi-Jurisdictional Hazard Mitigation Plan.

The Discovery Meetings were hosted by the Carson Water Subconservancy District (CWSD) as follows:

Tuesday, August 15, 2017, 1:00-3:00 pm
State of Nevada Governor's Mansion, Nevada Room
606 Mountain Street
Carson City, NV 89703

Tuesday, October 24, 2017, 3:00-5:00 pm
Sierra Room at Carson City Community Center
William Street, Carson City, NV 89703

The goals of the meetings were to:

- Provide an overview of the project
- Introduce new staff and stakeholder agencies to the process
- Discuss the project scope
- Collect community feedback on:
    - Areas of growth
    - Need for additional flood studies
    - Areas where mitigation projects are needed
- Discuss ways in which flood risk can be reduced in the watershed
- Gather available technical data to support hydraulic and hydrologic studies; and
- Discuss the project timeline

The first Discovery Meeting consisted of an introductory Risk MAP presentation followed by discussion sessions with each jurisdiction. The presentation was given describing Risk MAP program goals and objectives, the Discovery meeting goals and objectives, and the timeline moving forward. A break-out session was held where maps were available for review with CWSD personnel at hand to answer questions. This meeting was intended to introduce attendees new to the Discovery process to the type of information sought and outcomes to be expected. Stakeholders were given the opportunity to complete and discuss with project team members the Community Questionnaire and Community Fact Sheets (Appendix C), review maps, potential mitigation projects, and identify new areas of concern.

A comment period was made available for stakeholders unable to attend the meetings. On September 1, 2017, digital copies of the Community Questionnaires filled out at the August 15 meeting were sent to each jurisdiction, with a subsequent request for additional information as a result of the information provided by the attending stakeholders. Information was sought to also update the proposed, current, and completed projects lists for each community.

The second Discovery meeting provided individual jurisdictions with time to review the summaries of information obtained in the first meeting, and review and update potential mitigation projects with project team members. The information collected is provided throughout this report. A list of meeting attendees, agenda, and handouts are provided in Appendix D, for both Discovery meetings.

4 DATA ANALYSIS

A list of the data collected, the deliverable or product in which the data are included, the source of the data, and any pertinent comments are provided in Table 1. Following Table 1, the information received is categorized by data that can be used for flood risk products and additional data that benefit the project.

Table 1. Data Collection for the Carson River Watershed.

Data Types	Description	Source	Deliverable
Community Assistance Visits	Community Fact Sheet	Nevada Division of Water Resources, Local Agencies	Updated fact sheets
Community Boundaries	Location of jurisdictional boundaries	Prior Discovery maps	Discovery Map; Geodatabase
Community Rating System	Community Fact Sheet	FEMA's Community Rating System Communities and their Classes"	Updated fact sheets
County Boundaries	Location of County Boundaries	Prior Discovery maps	Discovery Map; Geodatabase
Dams	Location of dams	NDWR Inventory	Discovery Map; Geodatabase
Declared Disasters	Community Fact Sheet	NDEM	Updated Fact Sheets
Demographics, Industry	Community Fact Sheet	US Census Bureau QuickFacts, and American Fact Finder	Updated Fact Sheets
HUC 8 Watersheds	Watershed boundary	USGS Watershed Boundary Dataset	Discovery Map; Geodatabase
Insurance Policies and Claims	Community Fact Sheet	FEMA database	Updated Fact Sheets
Letters of Map Change (LOMCs)	Number and locations of letters of map change	FEMA National Flood Hazard Layer	Discovery Map; Geodatabase
Mitigation Plans Status	Community Fact Sheet	Community Website	Updated Fact Sheet
Mitigation Projects Obligated	Community Fact Sheet	Data.gov: FEMA Hazard Mitigation Program Summary	
Mitigation Projects: Recent, ongoing, planned, Desired		Community information, Discovery Meetings	Discovery Map; Geodatabase
Repetitive Loss	Community Fact Sheet	NDWR, Local Agencies	Updated Fact Sheet
Streams and Rivers	Stream centerlines based on USGS topo	USGS Watershed Boundary Dataset	Discovery Map; Geodatabase
Stream Gages		USGS	Discovery Map; Geodatabase
Major Roads	Location of interstates and major highways		Discovery Map; Geodatabase
Special Flood Hazard Areas	Location of FEMA flood hazard areas	FEMA Digital Flood Insurance Rate Maps	Discovery Map; Geodatabase
Stream Gages	Location of stream gages operated by USGS	USGS National Hydrography Dataset	Discovery Map; Geodatabase
Study Needs: FEMA			
Topographic Availability	LiDAR	CWSD,	Discovery Map: Geodatabase
Wetland	Wetland delineations		Discovery Map; Geodatabase

4.1 DATA THAT CAN BE USED FOR FLOOD RISK PRODUCTS

4.1.1 Topographic Data

As a result of an intense focus on improving flood risk data across the entire watershed, LiDAR has been collected on a flood-study-based effort (individual segments of the Carson River). LiDAR has been processed for areas shown in the Discovery Map (Appendix F). At the current time, LiDAR data is being processed for data collected in Lyon County, and will be available in 2018.

The topographic data that can be used for flood risk products in the Carson River watershed consists of the following LiDAR segments collected between 2011 and 2017 (Table 2).

Table 2. LiDAR Status for the Carson River Watershed.

Segment/Detailed Study Mapping	Date Acquired
Churchill County	2013
Lyon County	2011, 2017
Carson City	2011
Douglas County	2013

4.1.2 USGS Gages

The locations of USGS stream gages in the watershed are shown on the Discovery Maps and listed in Table 3. The seven sites that are active National Weather Service River Forecast sites are indicated. A number of sites have been discontinued since the 2012 Discovery, and are listed at the bottom of the table.

Table 3. USGS Stream Gages

No.	Gage Number	Station Name and Location	Forecast
1	10308783	LEVIATHAN C AB MINE NR MARKLEEVILLE CA	
2	10308785	LEVIATHAN MINE PIT FLOW NR MARKLEEVILLE CA	
3	10308784	LEVIATHAN MINE ADIT DRAIN NR MARKLEEVILLE CA	
4	103087891	ASPEN C ABV LEVIATHAN MINE NR MARKLEEVILLE CA	
5	103087887	LEVIATHAN MINE POND 4 NR MARKLEEVILLE CA	
6	103087885	LEVIATHAN C CHANNEL UNDERDRAIN NR MARKLEEVILLE CA	
7	103087889	4L C NR MARKLEEVILLE CA	
8	103087892	ASPEN C OVERBURDEN SEEP NR MARKLEEVILLE CA	
9	10308200	E.F. CARSON R BL MARKLEEVILLE C NR MARKLEEVILLE CA	YES
10	10308789	LEVIATHAN C AB ASPEN C NR MARKLEEVILLE CA	
11	10308794	BRYANT CK BL MOUNTAINEER C NR MARKLEEVILLE CA	
12	10308792	LEVIATHAN C AB MOUNTAINEER C NR MARKLEEVILLE CA	
13	10310000	WEST FORK CARSON RIVER AT WOODFORDS, CA	YES
14	10309000	EAST FORK CARSON RIVER NEAR GARDNERVILLE, NV	
15	10310400	DAGGETT CREEK NEAR GENOA, NV	
16	10310447	AMBROSETTI POND NR GENOA, NV	
17	10311000	CARSON RIVER NR CARSON CITY, NV	YES
18	10310500	CLEAR CREEK NR CARSON CITY, NV	
19	10311100	KINGS CANYON CREEK NR CARSON CITY, NV	
20	10311090	NORTH FORK KINGS CANYON CREEK NR CARSON CITY, NV	
21	10311200	ASH CANYON CK NR CARSON CITY, NV	
22	10311300	EAGLE VALLEY CREEK AT CARSON CITY, NV	

No.	Gage Number	Station Name and Location	Forecast
23	10311400	CARSON RIVER AT DEER RUN ROAD NR CARSON CITY, NV	YES
24	10311750	CARSON RIVER ABV SIXMILE CYN CK BLW DAYTON NV	
25	10312000	CARSON RIVER NR FORT CHURCHILL, NV	YES
26	10312150	CARSON RIVER BLW LAHONTAN RESERVOIR NR FALLON, NV	YES
27	10351400	TRUCKEE CA NR HAZEN, NV	
28	103122190	S-LINE DIVERSION CANAL NEAR STILLWATER, NV	
29	10312275	CARSON RIVER AT TARZYN ROAD NR FALLON, NV	YES
30	10312277	PAIUTE DRAIN BL TJ DRAIN NR STILLWATER, NV	
DISCONTINUED GAUGES (SINCE 2012 DISCOVERY)			
	10308800	BRYANT C NR GARDNERVILLE NV	
	10310407	CARSON R NR GENOA, NV	
	10311700	CARSON RIVER AT DAYTON, NV	
	10312210	STILLWATER POINT RESERVOIR DIV CANAL NR FALLON, NV	

4.2 Other Data and Information

4.2.1 Mitigation Plans/Status, Mitigation Projects

Hazard Mitigation Plans (HMPs) are prepared to help communities reduce long-term risk to life and property from natural hazards. The plans include comprehensive mitigation strategies intended to promote flood-resilient communities. Table 4 lists the HMPs, their status, and their availability for review.

Table 4. HMPs Status and Availability

Jurisdiction	HMP	Issue Date	Expiration Date	Available for Review
Alpine County	Natural Hazard Mitigation Plan	2017	2022	Yes
Carson City	Hazard Mitigation Plan	August 4, 2016	August, 2021	Yes
Churchill County, City of Fallon	Multi-Jurisdictional Hazard Mitigation Plan	2012	2017	Yes
Douglas County	Hazard Mitigation Plan	2013	2018	Yes
Lyon County, City of Fernley, City of Yerington	Multi-Jurisdictional Hazard Mitigation Plan	July, 2013	July, 2018	Yes
Storey County	Hazard Mitigation Plan	2015	2020	Yes

4.2.2 CNMS and NFIP Mapping Study Needs

FEMA organizes, stores, and analyzes flood hazard mapping needs information for identifying and managing flood hazard mapping needs. The CNMS inventory contributes to the identification of risk in two important ways. The first is by indicating where the depiction of flood hazards on the FIRMs has been validated through detailed assessment. The second is by showing which previously studied or unstudied flooding sources inadequately represent flood hazards. In this way, CNMS leads to the improvement of flood hazard data.

For this Discovery update, flood hazard mapping needs data was provided to FEMA for inclusion in the CNMS database. These data both validate flood hazards with adequate detailed assessments, and flooding sources that are either unstudied or inadequate and require improvement of the flood hazard data.

4.2.3 Socio-Economic Analysis

The US Census QuickFacts (updated as of 2015) were used for this research and can be found in Table 5. Community fact sheets for each jurisdiction containing more detailed information are provided in Appendix C.

Table 5. Socio-economic analysis.

Jurisdiction	Population	Median Age	Median Household Income	Top Industry
Alpine County	1,071	39.3	$52,917	Educational services
Carson City	54,742	41.1	$47,668	Educational services
Churchill County	24,198	29	$47,415	Trade, transportation
Douglas County	48,020	47.4	$58,535	Educational services
Lyon County	53,179	40.9	$47,255	Retail trade
Storey County	4,051	44.5	$64,832	Manufacturing

4.2.4 Community Rating System (CRS)

The communities of Carson City, Douglas County, and Storey County participate in the CRS program as of October 1, 2017, as shown in Table 6.

Table 6. CRS Rating of participating communities.

Community	CRS Rating
Carson City	6
Douglas County	6
Storey County	8

4.2.5 Flood Control Structures

a. Levees

According to the 2012 Discovery Map, there are 9 levees, located in Carson City and Lyon County, as identified in Table 7. Lyon County levees are not identified on the FIRM panels, and none are certified as USACE levees. According to the Lyon County FIS (2016), approximate analyses of "behind levee" flooding were conducted for all the levees in Table 7 to indicate the extent of the "behind levee" floodplains. The approximate levee analysis was conducted using information from existing hydraulic models (where applicable) and USGS topographic maps.

Table 7. Levees identified on FEMA FIRM panels.

Community	Flood Source	FIRM Panel
Carson City	Eagle Valley Creek	32001C0083F
Carson City	Eagle Valley Creek/Combs Canyon Creek	32001C0084F 32001C0092G
Carson City	H Tributary	32001C0092G
Lyon County	Unnamed Wash at Silver Springs	32019C0211E 32019C0213E
Lyon County	Unnamed Wash at Silver Springs	32019C0214E 32019C0212E
Lyon County	Carson River	32019C0289F
Lyon County	Carson River	32019C0452F
Lyon County	Undetermined	32019C0452F

b. Dams

The 2012 Discovery Report details the Lahontan Dam and Reservoir in Churchill County, and Eagle Valley Golf Course Dam and the Shenandoah Detention Basin in Carson City. According to the Nevada Division of Water Resources, all High and Significant Hazard dams located within the Carson River watershed are listed in Table 8. Dams for which an Emergency Action Plan (EAP) is active are also indicated in the table. High hazard dams indicate potential loss of life and economic damage; significant indicates economic damage.

Table 8. Dams considered significant or high hazard.

National ID	State ID	Name	Stream	Owner	Hazard	EAP
Carson City						
NV00223	J-228	Carson City Treated Effluent Dam	Carson River-Tr	Carson City	H	Y
NV00231	J-244	Carson City Golf Course Detention Basin	Carson River-Tr	Carson City	S	Y
NV10635		Shenandoah Detention Basin	Eagle Creek-Tr	Carson City	H	Y
Churchill County						
NV10120		Carson River Diversion	Carson River	BOR*	S	Y
NV10123		Lahontan	Carson River	BOR	H	Y
NV00214		Sheckler Dam	Carson River-Os	BOR	S	
Douglas County						
NV10441	XJ-187	Veta Grande Tails Dam	Carson River-Tr	Precious Metal Recovery System	H	
NV10469	XNV10469	Allerman #2 Dam	Carson River-Os	Allerman Upper Virginia Irrigation Co Inc	H	
NV10529	XJ-305	Bodie Dam	East Fork Carson River	Carson Water Subconservancy District	H	
NV10829	XNV10829	Ruhenstroth Power Dam	Carson River	Hussman, George G.	H	
NV10175	J-229	Sierra Springs	Carson River-Os	Sierra Reflections	S	
NV00092		Allerman #1 Dam	Carson River-Os	Allerman Upper Virginia Irrigation Co Inc	H	Y
NV00227	J-238	Minden-Gardnerville Sanitation District	Carson River-Os	Minden-Gardnerville Sanitation District	S	Y
NV10166	J-380	Buckeye Creek Lower Effluent Storage Pond	Buckeye Creek-Os	Douglas County Sewer Improvement Dist. #1	H	Y
NV10168	J-350	Indian Hills Effluent Pond #5	Carson River-Os	Indian Hills G. I. D.	S	Y
NV10435	J-411	Indian Hills Effluent Pond #6	Carson River-Os	Indian Hills G. I. D.	S	Y
NV10605	J-551	Bently Reservoir	Buckeye Creek-Tr	Bently Family Limited Partnership	H	Y
NV10665	J-594	North Carson Valley Treated Effluent Storage Dam	Carson River-Os	Douglas County	S	Y
NV10686	J-380	Buckeye Creek Middle Effluent Storage Pond	Buckeye Creek-Os	Douglas County Sewer Improvement Dist. #1	H	Y
NV10687	J-380	Buckeye Creek Upper Effluent Storage Pond	Buckeye Creek-Os	Douglas County Sewer Improvement Dist. #1	H	Y
Lyon County						

National ID	State ID	Name	Stream	Owner	Hazard	EAP
NV00150	J-086	Eldorado Canyon Dam	Eldorado Canyon Creek	Wade Development Company Inc	H	Y
NV10313	*Xj-264*	*North Dayton Valley Primary Pond 1*	*Carson River-Os*	*Lyon County Utilities*	*S*	
NV10638		*Sheep Camp Detention Dam*	*Carson River-Tr*	*Chase Property Group, LLC*	*H*	
NV10727	*Xj-264*	*North Dayton Valley Primary Pond 2*	*Carson River-Os*	*Lyon County Utilities*	*S*	
NV10728	*Xj-264*	*North Dayton Valley Secondary Pond*	*Carson River-Os*	*Lyon County Utilities*	*S*	
NV10729	*Xnv10729*	*North Dayton Valley Storage Pond*	*Carson River-Os*	*Lyon County Utilities*	*S*	

*U.S. Department of the Interior Bureau of Reclamation (BOR)

4.2.6 Floodplain Management/Community Assistance Visits (CAVs)

As the state coordinating agency for the National Flood Insurance Program, the Nevada Division of Water Resources conducts Community Assistance Visits (CAVs) as part of their floodplain management programs. A CAV typically consists of a tour of the floodplain to assess any recent construction activities, a review of the local permitting process, and evaluation of the local floodplain ordinance. A meeting with the local floodplain official is held to discuss the NFIP, the local permitting process, any recent flood events, training opportunities, and any program deficiencies. Table 9 lists the communities in the watershed and the date of their latest CAV.

While Community Rating System reviews are conducted annually, a visit by staff generally only occurs every few years.

Table 9. Recent CAVs and CRS visits.

Community	CAV Meeting Date	CRS Meeting Date
Carson City	2014	2011
Douglas County	February 23, 2012 (update?)	
Lyon County	October 20, 2009 (update?)	
Storey County		

4.2.7 Regulatory Mapping

As part of the CWSD's ongoing efforts to update the watershed FIRMs, many maps have been updated since the 2012 Discovery. The most recent FIRM updates for the communities in the Carson River Watershed became effective as shown in Table 10:

Table 10. FIRM updates through 2017 Discovery.

Jurisdiction	Effective Date	Description
Douglas County		
32005C0070H 32005C0090H 32005C0093H 32005C0232H 32005C0234H 32005C0235H 32005C0251H 32005C0252H 32005C0253H 32005C0254H 32005C0256H 32005C0258H 32005C0259H	6/15/2016	Remapping using detailed methods of 30 streams, five two-dimensional study areas (Airport Tributary Wash, Airport Wash, Buckbrush Wash, Johnson Lane Wash, Sunrise Pass Wash; and redelineations of 5 stream/river segments on the: Carson River, Clear Creek, Pine Nut Road Wash, Rocky Slough, and Smelter Creek,
Carson City		
3200010083F 3200010084F 3200010091F	2/19/2014	Ash Canyon Creek, Kings Canyon CreekVicee Canyon Creek, Combs Canyon Creek, Eagle Valley Creek,
3200010092G 3200010094F 3200010111G 3200010113F	12/22/2016	Combs Canyon Creek, Ash Canyon Creek, Kings Canyon Creek, Saliman Road Tributary, Voltaire Canyon Creek, H Tributary, I Tributary,
Churchill County		
No changes to FIRMS effective 9/28/2008		
Lyon County		
32019C0289F 32019C0291F 32019C0292F 32019C0293F 32019C0294F 32019C0311F 32019C0312F 32019C0316F 32019C0320F 32019C0340F 32019C0345F 32019C0350F 32019C0434F 32019C0451F 32019C0452F 32019C0453F	10/20/2016	Floodplain redelineation of the Carson River in Lyon County
Alpine County		
No changes to FIRM effective 11/19/1987		

4.3 DISCOVERY MEETINGS

For the Discovery meetings, projects listed for each jurisdiction within the watershed as part of the 2012 Discovery Report and other sources were first reviewed for accuracy. Projects completed were removed from the list. Other projects that may have changed in status as no longer a priority were also removed. More importantly, however, new projects were identified based on recent flooding or changes in priority. These projects were identified through direct coordination with representatives from the various stakeholders in the Carson River watershed.

During the first Discovery meeting, the Community Questionnaire was used to help jurisdictions identify areas where flood risk data is outdated. In particular, the following observations were made:

- Carson City has identified numerous watersheds for which an area drainage master plan or flood study needs to be conducted. Many are subject to alluvial fan/flash flooding as a result of summertime cloudburst events.
- Churchill County's FIRM maps are from the 1970s, and new FIRMs are needed to show modern growth, new plans, and new water spillways (created as a result of the overwhelming inputs of the Carson River to Lahontan Reservoir).
- Lyon County is also subject to flash flood potential, alluvial fan flooding from the surrounding steep hillslopes.
- Douglas County needs detailed studies for Pinenut Creek – from Jo Lane to Orchard (A zone), as well as Sierra Country Estates, and the Ruhenstroth area (Smelter Creek).

At the second meeting, individual project staff members worked with each jurisdiction to fine-tune the information that is contained in the Community Fact Sheets, and potential mitigation projects. Potential projects were derived from the 2012 Discovery list, the Adaptive Stewardship Plan, and discussions with jurisdiction staff.

4.4 DISCOVERY MAP

A Discovery Map has been included as Appendix F that presents the current floodplain mapping extents, LiDAR coverage boundaries, and locations of potential mitigation projects within each jurisdiction, as identified by each jurisdiction at the Discovery meetings and follow-up. Please note: additional follow-up may occur during the final distribution of this Discovery Report; this will be incorporated in the Report and Map as applicable. It is evident that the impacts due to flooding, the need for better or revised floodplain mapping, and the importance of project implementation are at the forefront of each jurisdiction's priorities. Alluvial fan and wash flash-flooding are increasingly a concern for jurisdictions. These are recognized by the number of such potential projects in each jurisdiction list.

4.5 MITIGATION PROJECTS

In the Discovery meetings, community stakeholders were asked to identify locations in which mitigation projects could reduce the impacts of flooding. Topics of mitigation interest included upstream storage, roads that frequently flood, and recent/future growth or development. Appendix E provides lists of projects Identified for potential mitigation for each community.

Project identification initially consisted of a review of those identified in the 2012 Discovery process, the Stewardship Plan, and any new projects identified during the 2017 Discovery meetings.

5 APPENDICES

List of Appendices

Appendix A Project Team Contact Information
Appendix B Stakeholder Contact Information
Appendix C Discovery Interviews

- Community Fact Sheets
- Community Interview Notes

Appendix D Discovery Meetings

August 15 Meeting

a. Notice
b. Agenda
c. Community Questionnaire
d. List of Attendees
e. Risk MAP Presentation

October 24 Meeting

a. Notice
b. Agenda
c. August Meeting Notes
d. List of Attendees/Sign-in sheet
e. Individual Jurisdiction Maps

Appendix E Community-wide Mitigation Projects
Appendix F DRAFT Discovery Map
Discovery Geodatabase (to be completed)

APPENDIX A

PROJECT TEAM CONTACT INFORMATION

AGENCY	NAME	PHONE	EMAIL
Carson Water Subconservancy District	Brenda Hunt	(775) 887-9005	brenda@cwsd.org
	Debbie Neddenriep	(775) 887-1260	debbie@cwsd.org
	Ed James	(775) 887-7456	edjames@cwsd.org
Michael Baker International	Geoff Brownell	(775) 722-4713	gbrownell@mbakerintl.com
	Karin Peternel	(775) 412-4605	Karin.peternel@mbakerintl.com
FEMA	Bob Bezek	(510) 627-7274	Robert.Bezek@fema.dhs.gov

Carson Water Subconservancy District

777 E. William Street, Suite 110A

Carson City, NV 89701

Michael Baker International

5470 Kietzke Lane, Suite 208

Reno, NV 89511

Federal Emergency Management Agency (FEMA)

Region 9

1111 Broadway, Suite 1200

Oakland, CA 94607

APPENDIX B

STAKEHOLDER CONTACT INFORMATION

JURISDICTION	CONTACT	TITLE	PHONE	EMAIL
Alpine County	Brian Peters	Dir. Community Development	(530) 694-2140 x425	bpeters@alpinecountyca.gov
Carson City	Robb Fellows	Floodplain Manager	(775) 283-7370	rfellows@carson.org
Churchill County	Michael Johnson	Planning Manager	(775) 423-7627	Planning-director@churchillcounty
	Michael Heidemann	Emergency Manager	(775) 423-4188	mheidemann@churchillcounty.org
	Preston Denney	GIS Manager	(775) 423-7627	Planning-gis@churchillcounty.org
Nevada Division of Emergency Management	Caleb Cage	Chief – Homeland Security	(775) 687-0300	cscage@dps.state.nv.us
Nevada Division of Water Resources	Bunny Bishop	State Floodplain Manager	(775) 684-2834	bbishop@water.nv.gov
Dayton Valley Conservation District	Robert Holley	Manager	(775) 246-1999	Rholley.dvcd@yahoo.com
	Leah Hoover	Administrative Asst.	(775) 246-1999	Lkniffen.dvcd@yahoo.com
Douglas County	Mimi Moss	Floodplain Manager	(775) 782-6230	mmoss@douglasnv.us
	Erik Nilssen	County Engineer	(775) 782-9063	enilssen@douglasnv.us
	Courtney Walker	Stormwater Program Manager	(775) 782-6215	cwalker@douglasnv.us
Fallon	Mike Miller	Public Works Engineer	(775) 423-3040	mmiller@fallonnevada.gov
Federal Emergency Management Agency	Bob Bezek	CTP Lead	(510) 627-7274	Robert.bezek@fema.dhs.gov
Lyon County	Rob Pyzel	Planner	(775) 463-6535	rpyzel@lyon-county.org
	Chuck Reno	County Engineer	(775) 463-6535	chuck@farrwestengineering.com
Storey County	Austin Osborne	Senior Planner	(775) 847-0968	aosborne@storeycounty.org
Truckee Carson Irrigation District	Kate Rutan	Office Manager	(775) 423-2141	kate@tcid.org
U.S. Army Corps of Engineers	Kristine Ceragioli	Senior Project Manager	(775) 784-5304	Kristine.s.hansen@usace.army.mil
U.S. Bureau of Reclamation	Terri Edwards	Area Manager	(775) 884-8353	tedwards@usbr.gov
U.S. Geological Survey	Steven Berris	Data Chief	(775) 887-7693	snberris@usgs.gov

APPENDIX C

COMMUNITY INFORMATION

1. **Community Fact Sheets**
    a. Alpine County
    b. Carson City
    c. Churchill County
    d. Douglas County
    e. Lyon County
    f. Storey County

2. **Community Interview Notes**
    a. Alpine County
    b. Carson City
    c. Churchill County
    d. Douglas County
    e. Lyon County
    f. City of Fallon

Region 9 Discovery 2017: Carson River Watershed
Fact Sheet: Alpine County, California

CID:	60632	**FIS/FIRM**	Effective Date	11/19/1987
NFIP Participation Status:	Participating		Level of Study:	Zone D - Undetermined
			Last Community Meeting:	
LOMCs:			**Last CAV/CAC Date:**	

CRS Status

Class:		SFHA Discount:	
Effective:		Non-SFHA Discount:	

Demographics (US 2016 Census Data)		**Social Characteristics**	
Population	1,071	Non-English Speakers:	14.0%
Median Age	39.3	High School + Education:	89.5%
Elderly (65+):	23.2%	Bachelor's + Education	27.5%
Native:	96.6%		

Industrial (2015)

Population in labor force:	49.0%	
Median income:	$52,917	
Top 5 Industries:	1	Educational services, health care and social assistance
	2	Public Administration
	3	Arts, entertainment, recreation, accomodation and food services
	4	Professional, scientific and management, administrative, waste management
	5	Other services exempt from public administration

Presidentially-Declared Disasters

Flood related total:	
Recent flood related:	
Other hazards:	

Insurance

Total Premiums:		Variances	
Total Coverage:		Repetitive Losses:	
Total Policies:	98	Total Claims:	
A Zone Policies:		BXC Zone claims:	
BCX Policies:			

Mitigation Projects and Other Grants

Approved Mitigation Projects **Funding:**

Pending Mitigation Projects

Mitigation Plans:	Alpine County Natural Hazard Mitigation Plan	**Effective Date:**	2017
Other Plans	Alpine County General Plan		2009
	Carson River Watershed Regional Floodplain Management Plan		2013
	Floodplain Development Standards Code		2013

Region 9 Discovery 2017: Carson River Watershed
Fact Sheet: Carson City, Nevada

CID:	320001	**FIS/FIRM**	Effective Date	12/22/2016
NFIP Participation Status:	Participating		Level of Study:	Detailed
			Last Community Meeting:	
LOMCs:	8		**Last CAV/CAC Date:**	7/21/2011

CRS Status

Class:	6	SFHA Discount:	20%
Effective:	10/1/2009	Non-SFHA Discount:	10%

Demographics (US 2016 Census Data)		**Social Characteristics**	
Population	54,742	Non-English Speakers:	8.2%
Median Age	41.1	High School + Education:	86.8%
Elderly (65+):	20.3%	Bachelor's + Education	20.7%
Native:	88.3%		

Industrial (2015)

Population in labor force:	59.7%
Median income:	$47,668
Top 5 Industries:	1 Educational services, health care and social assistance
	2 Public Administration
	3 Arts, entertainment, recreation, accomodation and food services
	4 Retail trade
	5 Manufacturing

Presidentially-Declared Disasters

Flood related total:	$3,099,910	(2012 Discovery Report)
Recent flood related:	2/28/1986; 1/3/1997; 2/3/2006; 1/13/2017; 2/x/2017	
Other hazards:	8/27/2004	Waterfall Fire

Insurance

Total Premiums:	$301,195	Variances	0
Total Coverage:	$133,923,700	Repetitive Losses:	X
Total Policies:	638	Total Claims:	$578,249
A Zone Policies:	451	BXC Zone claims:	
BCX Policies:	187		

Mitigation Projects and Other Grants

Approved Mitigation Projects		**Funding:**	
Pending Mitigation Projects	Eagle Valley Golf Course		
	Shenandoah Basin		
	Silver Oak Golf Course Basins		
	Timberline/Combs Basins		
	Eagle Valley Creek Basins		
	Vicee Canyon Basin		
Mitigation Plans:	Carson City Hazard Mitigation Plan	**Effective Date:**	2016
Other Plans	Carson City Sandbagging Plan		2010
	Carson River Watershed Regional Floodplain Management Plan		2013
	Community Wildfire Protection Plan		2009
	Carson City Master Plan		2006
	Carson City Parks and Recreation Plan		2006
	Carson City Open Space Plan		2000
	Carson River Master Plan		1996

Region 9 Discovery 2017: Carson River Watershed
Fact Sheet: Churchill County, Nevada

CID:	320002, 320030	**FIS/FIRM**	Effective Date	9/26/2008
NFIP Participation Status:	Participating		Level of Study:	Detailed
			Last Community Meeting:	
LOMCs:	4		**Last CAV/CAC Date:**	

CRS Status

Class:		SFHA Discount:	
Effective:		Non-SFHA Discount:	

Demographics (US 2016 Census Data)		**Social Characteristics**	
Population	24,198	Non-English Speakers:	11.7%
Median Age	29	High School + Education:	89.6%
Elderly (65+):	18.7%	Bachelor's + Education	15.9%
Native:	93.6%		

Industrial (2015)

Population in labor force:	55.0%	
Median income:	$47,415	
Top 5 Industries:	1	Trade, transprotation (26%)
	2	Education and health services (20.7%)
	3	Leisure and hospitality (12.7%)
	4	Government (9.8%)
	5	Professional services (7.3%)

Presidentially-Declared Disasters

Flood related total:	$30,149	(2012 Discovery Report)
Recent flood related:	1/3/1997	
Other hazards:		

Insurance

Total Premiums:	$262,700	Variances	
Total Coverage:	$145,569,200	Repetitive Losses:	1
Total Policies:	487	Total Claims:	$9,850
A Zone Policies:	56	BXC Zone claims:	
BCX Policies:			

Mitigation Projects and Other Grants

Approved Mitigation Projects **Funding:**

Pending Mitigation Projects

Mitigation Plans:	Churchill County and City of Fallon Hazard Mitigation Plan	**Effective Date:**	2016
Other Plans	Churchill County Master Plan		2015
	Carson River Watershed Regional Floodplain Management Plan		2013
	Carson River Geographic Response Plan		
	Lahontan Dam Tabletop Flood Exercise		2009
	Design, Estimating and Construction Review Truckee Canal Risk Assessment		2008

Region 9 Discovery 2017: Carson River Watershed
Fact Sheet: Douglas County, Nevada

CID:	320008	**FIS/FIRM**	Effective Date	6/15/2016
NFIP Participation Status:	Participating		Level of Study:	Detailed
			Last Community Meeting:	
LOMCs:	43		**Last CAV/CAC Date:**	2/23/2012

CRS Status			
Class:	6	SFHA Discount:	20
Effective:	10/1/2004	Non-SFHA Discount:	10

Demographics (US 2016 Census Data)		**Social Characteristics**	
Population	48,020	Non-English Speakers:	10.2%
Median Age	47.4	High School + Education:	92.8%
Elderly (65+):	26.5%	Bachelor's + Education	25.2%
Native:	92.5%		

Industrial (2015)	
Population in labor force:	56.3%
Median income:	$58,535
Top 5 Industries:	1 Educational services, health care and social assistance
	2 Public Administration
	3 Arts, entertainment, recreation, accomodation and food services
	4 Construction
	5 Manufacturing

Presidentially-Declared Disasters		
Flood related total:	$969,760	(2012 Discovery Report)
Recent flood related:	2/28/1986; 1/3/1997; 2/3/2006; 2/15/2008	
Other hazards:		

Insurance			
Total Premiums:	$771,827	Variances	0
Total Coverage:	$145,569,200	Repetitive Losses:	4
Total Policies:	1,139	Total Claims:	$3,644,170
A Zone Policies:	640	BXC Zone claims:	
BCX Policies:	436		

Mitigation Projects and Other Grants

Approved Mitigation Projects	US Highway 395 Culvert (Cottonwood Slough)	**Funding:**	FEMA	$875,916
			Douglas County	$41,972
			NDOT	$250,000
Pending Mitigation Projects	State Route 88 Flood Mitigation	**Funding:**	FEMA	$1,605,500

Mitigation Plans:	Douglas County Natural Hazard Mitigation Plan	**Effective Date:**	2013
Other Plans	Douglas County Master Plan		2012
	Carson River Watershed Regional Floodplain Management Plan		2013
	Douglas County Open Space and Agricultural Lands Preservation Implementation Plan		2004
	Douglas County Code Title 20 Zoning Ordinance of Douglas County		1996

Region 9 Discovery 2017: Carson River Watershed
Fact Sheet: Lyon County, Nevada

CID:	320016, 320029, 320038	**FIS/FIRM**	Effective Date	10/20/2016
NFIP Participation Status:	Participating		Level of Study:	Detailed
			Last Community Meeting:	
LOMCs:	13		**Last CAV/CAC Date:**	10/20/2009
CRS Status				
Class:			SFHA Discount:	
Effective:			Non-SFHA Discount:	
Demographics (US 2016 Census Data)			**Social Characteristics**	
Population	53,179		Non-English Speakers:	13.6%
Median Age	40.9		High School + Education:	84.9%
Elderly (65+):	21.1%		Bachelor's + Education	16.6%
Native:	92.9%			
Industrial (2015)				
Population in labor force:	56.2%			
Median income:	$47,255			
Top 5 Industries:	1 Retail trade			
	2 Educational services, healthcare and social assistance			
	3 Manufacturing			
	4 Arts, entertainment, recreation, accomodation and food services			
	5 Construction			
Presidentially-Declared Disasters				
Flood related total:	$1,044,838 (2012 Discovery Report)			
Recent flood related:	2/28/1986; 1/3/1997; 2/3/2006; 2/15/2008			
Other hazards:				
Insurance				
Total Premiums:	$198,143		Variances	
Total Coverage:	$75,185,300		Repetitive Losses:	
Total Policies:	320		Total Claims:	$386,144
A Zone Policies:			BXC Zone claims:	
BCX Policies:				
Mitigation Projects and Other Grants				
Approved Mitigation Projects		**Funding:**		
Pending Mitigation Projects				
Mitigation Plans:	Lyon County Multi-Jurisdictional Hazard Mitigation Plan		**Effective Date:**	2013
Other Plans	Lyon County Comprehensive Master Plan			2010
	Carson River Watershed Regional Floodplain Management Plan			2013

Region 9 Discovery 2017: Carson River Watershed
Fact Sheet: Storey County, Nevada

CID:	320033	**FIS/FIRM**	Effective Date	1/16/2009
NFIP Participation Status:	Participating		Level of Study:	Detailed
			Last Community Meeting:	4/23/2008
LOMCs:	13		**Last CAV/CAC Date:**	9/6/2007
CRS Status				
Class:	8		SFHA Discount:	10%
Effective:	10/1/1999		Non-SFHA Discount:	5%
Demographics (US 2016 Census Data)			**Social Characteristics**	
Population	4,051		Non-English Speakers:	4.3%
Median Age	44.5		High School + Education:	92.4%
Elderly (65+):	30.1%		Bachelor's + Education	21.4%
Native:	97.7%			
Industrial (2015)				
Population in labor force:	56.2%			
Median income:	$64,832			
Top 5 Industries:	1 Manufacturing			
	2 Educational services, healthcare and social assistance			
	3 Construction			
	4 Arts, entertainment, recreation, accomodation and food services			
	5 Professional, scientific, management, Administrative and waste managemen			
Presidentially-Declared Disasters				
Flood related total:	$1,171,546 (2012 Discovery Report)			
Recent flood related:	2/28/1986; 1/3/1997; 2/3/2006; 2/15/2008			
Other hazards:				
Insurance				
Total Premiums:	$107,652		Variances	
Total Coverage:	$41,354,100		Repetitive Losses:	0
Total Policies:	216		Total Claims:	$40,962
A Zone Policies:			BXC Zone claims:	
BCX Policies:				
Mitigation Projects and Other Grants				
Approved Mitigation Projects		**Funding:**		
Pending Mitigation Projects				
Mitigation Plans:	Storey County Hazard Mitigation Plan		**Effective Date:**	2015
Other Plans	Emergency Operations Plan			
	Carson River Watershed Regional Floodplain Management Plar			2013

APPENDIX C

COMMUNITY INTERVIEW NOTES

APPENDIX C

ALPINE COUNTY - Community Questionnaire			
	Request	August 15, 2017 Discovery Meeting Response	Additional Comments
	PRESENT POTENTIAL FLOOD RISK PROJECTS FOR DISCOVERY UPDATE		
1	List any existing planned projects		
2	Provide any feedback regarding potential flood risk projects		
3	Discuss areas of growth in your community and state whether new flood hazard analyses is warranted for these areas		
4	Discuss areas where flood risk data may be outdated		Where do Zone D maps need to be updated?
5	Discuss any new flood risk projects you are considering:	Washington Fire area, especially along Highway 89 Analysis of Post-Fire Flood Mitigation Erosion Zone Analysis EF Carson River LIDAR Markleeville Creek LIDAR Map Markleeville Creek Drainage. Flooding at Markleeville Creeks blocks Public Works Access to Lift Station; explore flood mitigation options Potential Impact Analysis; Number & Location of residents with flood insurance as way to focus efforts.	
6	Briefly describe your mitigation capabilities		
7	Briefly describe any hazard risk assessments your community has completed since the last Discovery		
8	Describe any current or future mitigation activities planned in your community		
	DATA REQUESTS		
9	Do you have any high-water marks or photos from recent flood events?		
10	Will you be providing any storm water or floodplain data generated since the last Discovery?		
11	Has your community acquired any new aerial topography or LiDAR data since the last Discovery?		
12	Who should we contact for any community demographic data?		
13	Has your community recently completed a hazard mitigation plan, and if so whom should we contact?		
14	Do you know of any other flood hazard mitigation data not previously listed?		
	PLEASE ADD ANY ADDITIONAL COMMENTS OR CONCERNS RELATIVE TO YOUR JURISDICTION:		

APPENDIX C

CARSON CITY - Community Questionnaire			
	Request	August 15, 2017 Discovery Meeting Response	Additional Comments
	PRESENT POTENTIAL FLOOD RISK PROJECTS FOR DISCOVERY UPDATE		
1	List any existing planned projects	None – all projects are being considered	
2	Provide any feedback regarding potential flood risk projects	What method should be used to add projects to the plan in between the update process	
3	Discuss areas of growth in your community and state whether new flood hazard analyses is warranted for these areas	Current growth in the city is on the Schulz, Lompa and Anderson Ranches. These proposed developments are required to analyze and mitigate their flood impacts. Lompa Ranch development requires the realignment of existing flood channels within the proposed site. The channel design is currently going through the CLOMR process.	
4	Discuss areas where flood risk data may be outdated	Data within the Clear Creek watershed including Prison Hill area. Data within the Pinion Hills area from Deer Run bridge south to the city boundary and east of the Carson River.	
5	Discuss any new flood risk projects you are considering:	Look at the feasibility to adding flood control facilities to the Goni Canyon watershed as well as Prison Hill, Kings and Ash Canyons per Hazard Mitigation goal 5A (including maintenance costs).	Area Drainage Master Plans for several areas of Carson City: Eagle Valley A & B; Goni Wash; Area Between Goni Wash & Eagle Valley Creek (North of Highway 50, East of Highway 395, West of Goni); Ash Canyon; Kings Canyon; H & I tributary; Prison Hill Area; Pinion Hills Area (East of River & South of Deer Run Road) New projects to be considered which come out of any conducted Area Drainage Master Plan (sediment transport / flood mitigation projects/ costs) Future flood studies in the Clear Creek Watershed area.
	FLOOD RISK REDUCTION		
6	Briefly describe your mitigation capabilities	Currently the City has over 50% of the SFHA in open space. The City continues to find ways to expand their open space ownership to coincide with the SFHA. The City has developed a city-wide sand bagging plan that provides setup guidance prior to and during a flood event. Also, the City has constructed flood control facilities in different parts of the City. Detention and retention basins.	
7	Briefly describe any hazard risk assessments your community has completed since the last Discovery	The City has updated their Hazard Mitigation Plan in 2016. The document addresses all mitigation plans. Goni Canyon Wash Floodplain study; Eagle Valley Golf Course A&B Drainage/Floodplain Restudy/Remapping	
8	Describe any current or future mitigation activities planned in your community	The City's current effort involves feasibility studies for various future detention and sediment basins around the city, then looking for grant funds to construct the basins.	With so much open space in City, are there any studies / plan/ projects needed regarding trail's impacts during flood events? Is there language in policy's / ordinances to ensure trail infrastructure does not create flood hazards?
	DATA REQUESTS		
9	Do you have any high-water marks or photos from recent flood events?	Public works has flood photos	
10	Will you be providing any storm water or floodplain data generated since the last Discovery?	None	
11	Has your community acquired any new aerial topography or LiDAR data since the last Discovery?	None	

APPENDIX C

CARSON CITY - Community Questionnaire			
	Request	August 15, 2017 Discovery Meeting Response	Additional Comments
12	Who should we contact for any community demographic data?	Lee Plemel – Planning Director	
13	Has your community recently completed a hazard mitigation plan, and if so whom should we contact?	Yes, the document is on the City website at www.carson.org	
14	Do you know of any other flood hazard mitigation data not previously listed?	None known	
	PLEASE ADD ANY ADDITIONAL COMMENTS OR CONCERNS RELATIVE TO YOUR JURISDICTION:		

APPENDIX C

CHURCHILL COUNTY - Community Questionnaire			
	Request	August 15, 2017 Discovery Meeting Response	Additional Comments
	PRESENT POTENTIAL FLOOD RISK PROJECTS FOR DISCOVERY UPDATE		
1	List any existing planned projects	No current projects listed	
2	Provide any feedback regarding potential flood risk projects	New projects to be considered are: 1. Revised FIRM study 2. Carson River clearing and snagging program	
3	Discuss areas of growth in your community and state whether new flood hazard analyses is warranted for these areas		
4	Discuss areas where flood risk data may be outdated	The old FIRM maps are from the 1970s, we need a revised FIRM to show modern growth, new plans, and new water spillways	
5	Discuss any new flood risk projects you are considering:		Consider mapping and providing mitigation for areas at greater risk for flooding. Any plans to identify and maintain floodplain lands as open space or agricultural production? Any plans to elevate/buy back high flood hazard and/or repetitive loss properties within the floodplain?
6	Briefly describe your mitigation capabilities	Precautionary releases in accordance with the BOR Lahontan Dam Emergency Action Plan	
7	Briefly describe any hazard risk assessments your community has completed since the last Discovery	None	
8	Describe any current or future mitigation activities planned in your community		Are any studies/plans/projects to improve Bafford Lane Bridge to reduce flood hazard? Has community considered developing floodplain ordinances which recognize importance of floodplains and implementing flood mitigation ordinances and building standards within the floodplain? Has community considered transfer of development rights (TDRs), conservation easements, or other alternative to preserve floodplain?
	DATA REQUESTS		
9	Do you have any high-water marks or photos from recent flood events?	Yes, City of Fallon and TCID	
10	Will you be providing any storm water or floodplain data generated since the last Discovery?	See TCID and BOR concerning Churchill County	
11	Has your community acquired any new aerial topography or LiDAR data since the last Discovery?	Yes, see Preston Denney (GIS Coordinator for Churchill County)	
12	Who should we contact for any community demographic data?	Rex Massey is a consultant for Churchill County on demographics	
13	Has your community recently completed a hazard mitigation plan, and if so whom should we contact?	Mike Heidemann, updated in 2016/2017.	
14	Do you know of any other flood hazard mitigation data not previously listed?	Contact BOR and TCID – they should have more data based upon 2017 events	
	PLEASE ADD ANY ADDITIONAL COMMENTS OR CONCERNS RELATIVE TO YOUR JURISDICTION:		
	Completed projects: 1. Sagousi Dam Debris/Sediment Removal Flood Control and River Rehabilitation 2. Carson River Lahontan Dam Carson Sink – Debris Removal Flood Control		

APPENDIX C

DOUGLAS COUNTY - Community Questionnaire			
	Request	August 15, 2017 Discovery Meeting Response	Additional Comments
	PRESENT POTENTIAL FLOOD RISK PROJECTS FOR DISCOVERY UPDATE		
1	List any existing planned projects	Stephanie Way Detention Basin (may be included in JLADMP); Old Ruhenstroth Dam removal	
2	Provide any feedback regarding potential flood risk projects	Maintenance costs; timeline for building Smelter Creek Detention Basin may be long	
3	Discuss areas of growth in your community and state whether new flood hazard analyses is warranted for these areas	**Need to ask Planning or County Engineer	
4	Discuss areas where flood risk data may be outdated	Pinenut Creek - from Jo Lane to Orchard is A zone - needs a detailed study. Also Sierra Country Estates, Smelter Creek in Ruhenstroth.	What are creek names? Are there other alluvial drainages which need additional study in West Carson Valley, East Valley, or South Valley?
5	Discuss any new flood risk projects you are considering:	Floodplain Ordinances update; Area Drainage Master Plans for other areas of Douglas County; New projects to be considered will come out of JLADMP	
6	Briefly describe your mitigation capabilities	Building code is 1' higher than FEMA regulatations. Updated maps coming soon for Carson River Floodplain. Limitations for land division in SFHA. No parcels less than 19 acres unless . . (DC Code)	
7	Briefly describe any hazard risk assessments your community has completed since the last Discovery	Floodway is being remapped in Carson River floodplain. East Valley Washes FIRMs updated. LOMRS. Douglas County Flood Management Guide (12/28/2015)	
8	Describe any current or future mitigation activities planned in your community	Carson River Floodplain re-mapping in review; Johnson Lane ADMP; Smelter Creek Detention Basin; Alpine View Estates LOMR in review; SR88 Culvert expansion at Cottonwood Slough and East Fork of Carson River	TDRs? Conservation Easements?' Open Space Plans? Data requests?
9	Do you have any high-water marks or photos from recent flood events?	Yes, and HDR, weather service do as well	
10	Will you be providing any storm water or floodplain data generated since the last Discovery?	Yes, new FIRMs, JLADMP should be completed in mid-2018	
11	Has your community acquired any new aerial topography or LiDAR data since the last Discovery?	LiDAR of Johnson Lane area for ADMP; ask GIS when it was last done **	
12	Who should we contact for any community demographic data?	GIS? Assessor??	
13	Has your community recently completed a hazard mitigation plan, and if so whom should we contact?	Last one completed in 2013; contact Tod Carlini.	
14	Do you know of any other flood hazard mitigation data not previously listed?		
	PLEASE ADD ANY ADDITIONAL COMMENTS OR CONCERNS RELATIVE TO YOUR JURISDICTION:		

APPENDIX C

LYON COUNTY - Community Questionnaire			
	Request	August 15, 2017 Discovery Meeting Response	Additional Comments
	PRESENT POTENTIAL FLOOD RISK PROJECTS FOR DISCOVERY UPDATE		
1	List any existing planned projects		
2	Provide any feedback regarding potential flood risk projects	USA Parkway impacts to Silver Springs	
3	Discuss areas of growth in your community and state whether new flood hazard analyses is warranted for these areas	Silver Springs	"Dayton Valley, Moundhouse, & Stagecoach is expected to grow; Suggest listing ADMP projects for 1) Highway 50 Corridor from Moundhouse through Silver Springs for areas of current/planned future growth; and 2) Alluvial Fans South of Carson River in Dayton Valley (eg Eldorado Canyon) in areas of current/planned future growth; 3) Consider listing flood impact studies regarding bridge alternatives in East Dayton Valley; 4) Any flood data needs in relation to water/ wastewater treatment plant?
4	Discuss areas where flood risk data may be outdated	Flash flood potential Alluvial fan flooding	
5	Discuss any new flood risk projects you are considering:	Ramsay Canyon Study Special Improvement District for Storm Drainage that flows into Carson River along Carson River (design, construct, operate and maintain)	New studies and/or projects which may be identified by Dayton Valley ADMP and future ADMP's within the county to help reduce flood risk to communities within the county
6	Briefly describe your mitigation capabilities	Compliance with Title 12 (Flood Control) and work done by Dayton Conservancy District	
7	Briefly describe any hazard risk assessments your community has completed since the last Discovery	2012 Ramsey Canyon Study by Manhard Consulting of Highlands/Silver Springs	
8	Describe any current or future mitigation activities planned in your community	2017 Ramsay Canyon Study Title 15 – Low Impact Development Standards adoption Carson River Storm Water SID proposal	With so much open space in City, are there any studies / plan/ projects needed regarding trail's impacts during flood events? Is there language in policy's / ordinances to ensure trail infrastructure does not create flood hazards?
9	Do you have any high-water marks or photos from recent flood events?	Yes	Please provide on a flash drive at Discovery Meeting
10	Will you be providing any storm water or floodplain data generated since the last Discovery?	Yes	Please provide on a flash drive at Discovery Meeting
11	Has your community acquired any new aerial topography or LiDAR data since the last Discovery?	Yes	Yes, new LIDAR flown 9/2017 by USGS; will be available ~5/2018
12	Who should we contact for any community demographic data?	Planning department	
13	Has your community recently completed a hazard mitigation plan, and if so whom should we contact?	Emergency Manager	
14	Do you know of any other flood hazard mitigation data not previously listed?		
	PLEASE ADD ANY ADDITIONAL COMMENTS OR CONCERNS RELATIVE TO YOUR JURISDICTION:		

APPENDIX D

DISCOVERY MEETINGS

1. **August 15 Meeting**
    a. **Notice**
    b. **Agenda**
    c. **Community Questionnaire**
    d. **List of Attendees**
    e. **Risk MAP Presentation**

2. **October 24 Meeting**
    a. **Notice**
    b. **Agenda**
    c. **August Meeting Notes**
    d. **List of Attendees/Sign-in sheet**
    e. **Individual Jurisdiction Maps and Potential Mitigation Projects**

View this email in your browser

CWSD Meeting Invitation
for Carson River FEMA Discovery and Floodplain Management Plan Updates

August 1, 2017

Greetings!
The Carson Water Subconservancy District invites you to attend a Carson River Coalition Floodplain and River Management Working Group meeting:

August 15, 2017
1.30 pm to 4.30 pm
Nevada Room at the Governor's Mansion
606 Mountain Street, Carson City, NV 89703

The meeting will cover all areas of the Carson River watershed from Alpine County, California, to Lahontan Reservoir and downstream through Churchill

The bulk of this meeting, from **1:30 pm – 3:30 pm**, will be focused on a FEMA Discovery and Carson River Floodplain Management Plan Updates to discuss the Risk MAP Discovery process for the Carson River watershed. As part of FEMA's Risk Mapping, Assessment and Planning (Risk MAP) program, CWSD will be working with communities along the Carson River to enhance understanding of flood risk and mitigation efforts. Many of you participated in a similar effort in 2012 and understand the importance of identifying future restudies and projects.

Click this link for the full invite with data request.
Click here for the draft agenda.
Click here for more information on the FEMA Discovery process.

We thank you for supporting this effort and encourage you to attend this important meeting. County officials, floodplain managers, planners, engineers, emergency managers, GIS staff and any other representative you deem appropriate are all invited, and we ask that you pass along a copy of this invitation to whomever should attend this meeting. The partnership between FEMA and all communities is vital to our success in identifying flood risks and needs that may exist. To learn more, please contact Brenda Hunt, our Watershed Program Manager, brenda@cwsd.org (775.887.9005). Your continued partnership is critical to the successful completion of these floodplain management planning efforts! We look forward to seeing you at the meeting.

Sincerely,
Ed James,
CWSD General Manager
edjames@cwsd.org
775.887.7450

Floodplain and River Management Working Group Agenda

Tuesday, August 15, 2017
1:30 PM –4:30 PM

Location: ***N0TICE CHANGE OF VENUE and MEETING DURATION!!!***
Nevada Room at the Governor's Mansion
606 Mountain Street. Carson City, NV 89703

Contact: Questions? Brenda Hunt, 887-9005, brenda@cwsd.org

1. Welcome

2. 1:30 –3:30 pm ***Draft*** **Agenda FEMA Discovery and Floodplain Management Plan Update Meeting**

   A. Project Overview of Discovery and Floodplain Management Plan Updates
      1. Purpose and Background
      2. Recent Flood Events
      3. Project Timeline
   B. Present Potential Flood Risk Projects for Discovery Update
      1. Review existing projects
      2. Gather community feedback
      3. Discuss areas of growth;
      4. Discuss areas where flood risk data may be outdated
      5. Discuss potential new projects
   C. Flood Risk Reduction
      1. Understand local mitigation capabilities, hazard risk assessments, and current or future mitigation activities
   D. Prepare for Next Meeting
      1. Data request (Discovery Update):
         i. Photos and high-water marks from recent floods
         ii. Any storm water or floodplain activities since last Discovery
         iii. LiDAR and aerial topography acquired since last Discovery
         iv. Community demographics
         v. Most recent hazard mitigation plans
         vi. Any other flood hazard mitigation data
      2. Data request (Floodplain Mgmt. Plan Update)
         i. TBD
   E. Next Meeting Date

3. 3:30 -4:30 pm **Last meeting's unfinished business**

   A. Floodplain Management Plan Suggested Actions update:

      1. SA – 30
         i. Flood Awareness Week Update (Shane/Bunny)
         ii. Floodplains as Community Assets (Debbie) – Please Click the links below to view our four videos:

         Public Service Announcement (PSA) - Conserving the Carson River Floodplain as a Community Asset (:30)

         Agriculture's a Good Fit for Conserving the Carson River Floodplain as a Community Asset (4:31)

         A Case for Developers to Conserve the Carson River Floodplain as a Community Asset (3:13)

         Our Officials in Conserving the Carson River Floodplain as a Community Asset (4:19)

   B. Flood Damage Field Trip (John Coburn)
      1. Site Selection and Timing (August???)
      2. Types of damages
         i. Erosion/Channel Migration
         ii. Structures
         iii. Infrastructure/grade controls

   C. Finalized Stewardship Plan Submitted (Brenda)

   D. Other

4. Schedule Next Meeting

FEMA Discovery and Floodplain Management Plan Update Meeting – August 15, 2017
Carson River Watershed

Community Questionnaire

Community Name:_____

Present Potential Flood Risk Projects for Discovery Update

1. List any existing planned projects (2012 Discovery, 2008/2013 Regional Floodplain Management Plan) no longer being considered:_____
   _____
   _____

2. Provide any feedback regarding potential flood risk projects:_____
   _____
   _____

3. Discuss areas of growth in your community and state whether new flood hazard analyses is warranted for these areas:_____
   _____
   _____

4. Discuss areas where flood risk data may be outdated:_____
   _____
   _____

5. Discuss any new flood risk projects you are considering:_____
   _____
   _____
   _____

Flood Risk Reduction

6. Briefly describe your mitigation capabilities:_____
   _____
   _____
   _____

7. Briefly describe any hazard risk assessments your community has completed since the last Discovery:_____
   _____
   _____

8. Describe any current or future mitigation activities planned in your community:_____
   _____
   _____
   _____

Data Requests

9. Do you have any high-water marks or photos from recent flood events?
   _____

10. Will you be providing any storm water or floodplain data generated since the last Discovery?
    _____

11. Has your community acquired any new aerial topography or LiDAR data since the last Discovery?_____

12. Who should we contact for any community demographic data?
    _____

13. Has your community recently completed a hazard mitigation plan, and if so whom should we contact?_____

14. Do you know of any other flood hazard mitigation data not previously listed?_____
    _____
    _____

Please note any additional comments or concerns relative to your jurisdiction:

Thank you!

		Carson River Watershed Discovery, Floodplain Management Plan Updates				
		Attendees - August 15, 2017				
FirstName	**LastName**	**Company**	**Department**	**Job Title**	**EmailAddress**	**BusinessPhone**
Jeff	**Anderson**	Nevada NRCS Snow Survey		Water Supply Specialist	jeff.anderson@nv.usda.gov	775-857-8500 x152
Tim	**Bardsley**	National Weather Service-Reno		Senior	tim.bardsley@noaa.gov	775-673-8100 x228
Geoff	**Brownell**	Michael Baker Jr., Inc.			gbrownell@mbakercorp.com	
Craig	**Burnside**	Carson Valley Conservation District		Watershed Coordinator	craig.burnside@nv.nacdnet.net	775-782-9835
Kristine	**Ceragioli**	Army Corps of Engineers	Reno Regulatory Field Office	Senior Project Manager	Kristine.S.Hansen@usace.army.mil	775-784-5304
Katherine	**Clancey**	NV Div. of Water Resources		State Floodplain Mapping Coordinator	kclancey@water.nv.gov	775-684-2847
John	**Cobourn**	University of Nevada Cooperative Extension		Water Resource Specialist	cobournj@UNCE.unr.edu	775-339-0244
Preston	**Denny**	Churchill County		GIS	planning-gis@churchillcounty.org	
Steven	**Endacott**	City of Fallon		Emergency Management Director	endacottsteve@charter.net	775-427-5356
Brenda	**Hunt**	Carson Water Subconservancy District		Watershed Program Manager	brenda@cwsd.org	775-887-9005
Edwin	**James**	Carson Water Subconservancy District		General Manager	edjames@cwsd.org	775-887-7456
Michael	**Johnson**	Churchill County		Planning Director	planning-director@churchillcounty.org	775-423-7627
Steve	**King**			Attorney	kingmont@charter.net	775-427-5821
Steven	**Lewis**	University of Nevada Cooperative Extension		Extension Educator	lewisst@unce.unr.edu	(775) 782-9960
Debbie	**Neddenriep**	Carson Water Subconservancy District	Water Resource Specialist 2		debbie@cwsd.org	775-887-1260
Karin	**Peternel**	Michael Baker International			karin.peternel@mbakerintl.com	
Robert	**Pyzel**	Lyon County		Planner	rpyzel@lyon-county.org	
James	**Shell**	US Navy - Fallon NAS	Commanding Officer		James.shell@navy.mil	
Jeanmarie	**Stone**	NV Div. of Environmental Protection			jstone@ndep.nv.gov	
Mary Kay	**Wagner**	NV Div. of Environmental Protection	Bureau of Water Quality Planning		mkwagner@ndep.nv.gov	
Courtney	**Walker**	Douglas County	Public Works	Storm Water Program Manager	cwalker@douglasnv.us	775-782-6215
Zach	**Wood**	Alpine County			zach@pd.alpinecountyca.com	
Shane	**Fryer**	Carson Water Subconservancy District		Watershed Program Specialist	shane@cwsd.org	775-887-1260
Bryant	**Smith**	BLM	Sierra Front	Field Manager	bbsmith@blm.gov	775-885-6172
Barry	**Wood**	Fallon NAS	Emergency Management	Emergency Management Officer	barry.wood@navy.mil	775-426-3190
Leah	**Hoover**	DVCD		Administrative Assistant	lkniffen.dvcd@gmail.com	775-246-1999
Lyndsay	**Boyer**	Carson City	Open Space	Sr. Water Resourcve Specialist	lboyer@carson.org	775-283-7341
Dan	**Stucky**	Carson City	Public Works	City Engineer	dstucky@carson.org	
Anne	**Knowles**	Nevada Appeal		Reporter	aknowles@nevadaappeal.com	
Charles	**Reno**	Farr West Engineering	Lyon County	County Engineer	chuck@farrwestengineering.com	
Ken	**Gray**	Lyon County	BOCC		kgray@lyon-county.org	
Toni	**Leffler**	CWSD				

FEMA

Discovery and Floodplain Management Plan Updates

Carson River Watershed

August 15, 2017

RiskMAP
Increasing Resilience Together

Introductions

- **Project Team**
  - Carson Water Subconservancy District
  - Michael Baker International
- **Local Community partners and officials**
  - Alpine, Churchill, Douglas, Lyon, Storey, Carson CIty
- **State of Nevada partners and officials**
  - NDEM, NDWR, NDEP,
- **Other Federal Agencies partner representatives**
  - FEMA, USGS, U.S. Navy, National Weather Service
- **Associations**
- **Other Stakeholders**
  - Washoe Tribe, Fallon Tribe,

FEMA 2 RiskMAP

Agenda

- **A. Project Overview**
  - Discovery Update
  - Floodplain Management Plan Update
- **B. Present Potential Flood Risk Projects for Discovery Update**
- **C. Flood Risk Discussion**
- **D. Prepare for Next Meeting**
  - Data Request – Discovery
  - Data Request – Floodplain Management Plan
- **E. Next Meeting Date**

FEMA 3 RiskMAP

Project Overview

- **Why are we here today?**
- **Discovery Plan Update**
  - The Discovery of flood hazards and associated flood risk and mitigation activities
    - Data Collection
    - Stakeholder coordination
    - Meetings
- **Floodplain Management Plan Update**
  - Continue to create a long-term vision and strategies for floodplain management to reduce flood damage impacts

Understand the needs of communities in the watershed

- Discuss flood risk
- Balance local needs with FEMA's resources
- Plan for possible flood risk projects

FEMA 4 RiskMAP

Discovery

- **Discovery helps determine the areas within your watershed where a flood risk study is needed**
- **During Discovery, we work together to:**
  - Review local flood risk and hazards
  - Understand local mitigation capabilities, hazard risk assessments, and current or future mitigation activities
  - Collect information about flooding history, development plans, daily operations, and stormwater and floodplain management activities

FEMA 5 RiskMAP

Purpose and Background

- **Discovery Report (2013)**
  - Developed the framework for dealing with flood risk in the Carson River Watershed. As flood risk projects have been completed over the last several years, the community must re-evaluate the flood risks in the watershed, identify prioritized and sequenced new projects
- **Process:**
  - Evaluate regulatory mapping, risk assessment, mitigation planning technical assistance, and outreach and communications assistance.
- **Six main activities**:
  - Watershed Stakeholder Coordination
  - Data Analysis
  - Discovery Meeting
  - Post-Meeting Coordination
  - Database Updates
  - Project Refinement.
- **Updated Discovery Report Due November, 2017**

FEMA 6 RiskMAP

Purpose and Background

- **Floodplain Management Plan (2008, 2013)**
- In 2008, CWSD and the various counties along the Carson River adopted the Carson River Regional Floodplain Management Plan (Plan).
  - Plan developed a long-term vision and strategies for floodplain management to reduce flood damage impacts, benefitted by a regional approach
- **Suggested Actions**
  - 38 Suggested Actions were reviewed and summarized on a county and watershed-wide basis.
    - Many of the projects and programs have or are being implemented; Continuing work needed to address flooding
- **Recent Events**
  - Alluvial fan and stormwater flooding events, extended snowmelt runoff, available storage capacity issues
- **Updated Draft Plan due August, 2018**

FEMA 7 RiskMAP

Potential Flood Risk Projects for Discovery Update

GROUP DISCUSSION

- **Review existing projects**
- **Gather community feedback**
- **Discuss areas of growth**
- **Discuss areas where flood risk data may be outdated**
- **Discuss potential new projects**

FEMA 8 RiskMAP

Flood Risk Reduction

GROUP DISCUSSION TO UNDERSTAND:

- **Local mitigation capabilities**
- **Hazard risk assessments**
- **Current or future mitigation activities**

FEMA 9 RiskMAP

Next Meeting – Data Request

DISCUSSION - COMMUNITY QUESTIONNAIRE

- **Photos and high water marks from recent floods**
- **Storm water or floodplain activities since last Discovery (2012)**
- **LiDAR and aerial topography since last Discovery**
- **Community demographics**
- **Flood hazard mitigation plans**
  - Alpine County – under revision
  - Carson City Hazard Mitigation Plan – 2016
  - Churchill County/City of Fallon Hazard Mitigation Plan (2012)
  - Douglas County Natural Hazard Mitigation Plan - 2013
  - Lyon County Multi-jurisdictional Hazard Mitigation Plan July 2013
- **Any other flood hazard mitigation data**

FEMA 10 RiskMAP

Peternel, Karin

From: Brenda Hunt <brenda@cwsd.org>
Sent: Thursday, October 12, 2017 3:48 PM
To: Ann Bollinger (Abollinger@carson.org); Bob Bezek (Robert.Bezek@fema.dhs.gov); Bob Connor (bob@rskconsulting.biz); Brenda Hunt; Brian Peters (bpeters@alpinecountyca.gov); Bunny L. Bishop (bbishop@water.nv.gov); Charles Reno (chuck@farrwestengineering.com); Charlie Donohue (cdonohue@lands.nv.gov); Christy Sullivan (Christy.Sullivan@nv.nacdnet.net); Courtney Walker (cwalker@douglasnv.us); Craig Burnside (craig.burnside@nv.nacdnet.net); Dan Greytak (greytak@hotmail.com); Dan Kaffer (dkaffer@aol.com); Darwin Holyan (WT.WaterQA@washoetribe.us); Debbie Neddenriep; Duane Petite (dpetite@tnc.org); Ed James; Eric Simmons (eric.simmons@dhs.gov); Erik Nilssen (enilssen@douglasnv.us); Gavin Feiger (awg.gavin@gmail.com); Jack Dick; Jacques Etchegoyhen (jacques@legacylandandwater.com); Jeanmarie Stone (jstone@ndep.nv.gov); Jim Souba (jsouba@ci.fallon.nv.us); Joe Curtis (jcurtis@storeycounty.org); John Cobourn (cobournj@UNCE.unr.edu); Jon Paul Kiel (jpkiel@ndep.nv.gov); Lyndsey Boyer (lboyer@carson.org); Margaret Engesser (Margaret.C.Engesser@usace.army.mil); Mary Crawley (mcrawley@lands.nv.gov); Mary Kay Wagner (mkwagner@ndep.nv.gov); Michael K. Johnson (planning-director@churchillcounty.org); Mike Heidemann; Mike Miller (mmiller@fallonnevada.gov); Mike Workman (mworkman@lyon-county.org); Mimi Moss (mmoss@douglasnv.us); Mitch Blum (mitchell.blum@hdrinc.com); Rich Wilkinson (richard.wilkinson@nv.nacdnet.net); Rob Loveberg (rob.lovebergconsulting@gmail.com); Rob Pyzel (rpyzel@lyon-county.org); Robb Fellows (Rfellows@carson.org); Robert Holley (rholley.dvcd@yahoo.com); Sarah Green (awg.sarah@gmail.com); Shane Fryer; Sherman Swanson (sswanson@cabnr.unr.edu); Shyla Lemons (Slemons@carson.org); Steve Endacott; Steve Lewis (lewisst@unce.unr.edu); Susan E. Jamerson (SusanE.Jamerson@washoetribe.us); Todd Carlini (TCarlini@eastforkfire.org); Toni Leffler
Cc: Peternel, Karin; Brownell, Geoff
Subject: Next Floodplain and River Management Working Group, Oct. 24, 1-4pam
Attachments: 2017-10-24FRMWGFinal Agenda - FMP SAs.pdf; 8-15-17FRMWG mtg notes final.pdf

Hi all:
Here is the agenda for our next Discovery/Floodplain Management Plan Revision/Update combined with our Floodplain and River Management Working Group meeting scheduled for October 24, 2017, 1-4pm, Sierra Room, Carson City Community Center.

Also attached are the meeting notes from the Aug. 15th meeting.

If you have not already completed edits to the Discovery Process Data Sheets that were previously sent to you, please edit them and get them back to Debbie Neddenriep, debbie@cwsd.org.

Brenda Hunt
Carson River Watershed Program Manager
Carson Water Subconservancy District
777 E. William Street, Suite #110A
Carson City, NV 89701
775.887.9005 Office
775.887.7457 Fax
brenda@cwsd.org
www.cwsd.org
Sign-up for Carson River Coalition emails

Floodplain and River Management Working Group Agenda

Tuesday, October 24, 2017
1:00 PM – 4:00 PM

Location: **Sierra Room at Carson City Community Center**
William Street, Carson City, NV 89703

Contact: Direct questions to Brenda Hunt, 887-9005, brenda@cwsd.org

1. Welcome

2. 1:00 –3:00 pm **Agenda FEMA Discovery and Floodplain Management Plan Update Meeting**

   A. Project Overview of Discovery and Floodplain Management Plan Updates
      1. Purpose and Background
      2. Recent Flood Events
      3. Project Timeline

   B. Present Findings for Potential Flood Risk Projects for Discovery Update
      1. Review identified projects by jurisdiction (Carson City – Douglas County – Lyon County – Churchill County, Storey County, & Alpine County)
      2. Gather additional community feedback

   C. Table Top Map Review
      1. Breakout Session to review maps by jurisdiction

   D. Prepare for Next Meeting
      1. Comment on Draft Discovery Report (due December 15, 2017)
      2. Discuss Data Request (Floodplain Mgmt. Plan Update)

3. Next Floodplain Management Plan Revision/Update Meeting Date

4. 3:00-4:00 pm **CRC Floodplain & River Management Working Group - Regular Meeting:**

   A. CWSD is the Governor's designated Clean Water Act Section 208 Planning Agency – Discuss Planning needs with County reps regarding use of watershed level planning funding.

   B. Floodplain Management Plan Suggested Action Implementation (See Attached Table):
      i. *Higher Regulatory Standards* SA-11 -13:
         - Update on recent CWSD RFQ - Update Floodplain Ordinance Language for Alpine County, Douglas County, Carson City, and Lyon County

ii. *Flood Data Information and Maintenance* SA-17:
- ❖ Update on recent CWSD RFQ - Request for Qualifications for Dayton Valley Area Drainage Master Plan
- ❖ Update on Johnson Lane Area Drainage Master Plan study

iii. *Floodplain and Flood Hazard Outreach and Education* SA-33
- ❖ Update on meetings, website, media and planned events.

iv. *Protect Floodplain Natural Functions and Values* SA 1-10
- ❖ Determine next steps based on last meetings discussions (see meeting notes) and whether ideas can be incorporated into Floodplain Management Plan update.

C. Rotating Floodplain and River Management Working Group meeting with field trips – Y or N, next steps.

D. 3-minute Round Robin updates including:
- ❖ Carson Valley Floodplain Map – FEMA progress
- ❖ Jan/Feb 2017 damages and repair of grade control/diversion structures progress
- ❖ 319 awards and projects

5. Schedule Next Meeting

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 and 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

Plan Element	Suggested Action	Responsible (or suggested responsible) Party	Existing or Potential Funding Source
SA-9	Identify and promote options for landowner incentive programs, such as floodplain leasing program and conservation easements that provide compensation to landowners providing ecosystem services.	Local & tribal governments, NGOs, CWSD, CRC, landowners	Federal, State and local sources, Question 1, SNPLMA
SA-10	Promote and utilize best management practices as a means of protecting riparian habitat.	All entities	n/a
	Higher Regulatory Standards		
SA-11	Implement or enhance county ordinances that include floodplain protection as a purpose, 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 and encourage FEMA to update FIRMs with current and future conditions. Significant verification of topography and other variables should be conducted prior to release of draft FIRMs.	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 and 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 and maps should be updated after significant flooding events.	Local governments	All 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 a regular basis.	Local governments	n/a
SA-20	ERMs should be in the 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 should be 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 in combination with other proven methods.	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, conservation 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 the 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

Floodplain & River Management Working Group
Meeting Notes
August 15, 2017
1:30 PM – 4:30 PM

Location: Nevada Room at the Governor's Mansion, 606 Mountain St., Carson City, NV 89703
Contact: Brenda Hunt, 887-9005
Attendees:

Mitch Blum, HDR
Lyndsey Boyer, Carson City Parks, Rec., & Open Space
Craig Burnside, Carson Valley Conservation District (CVCD)
Aly Cheney, Alpine Watershed Group
John Cobourn, University of Nevada Cooperative Extension (UNCE)
Robb Fellows, Carson City Public Works (CCPW)
Shane Fryer, Carson Water Subconservancy District (CWSD)
Dan Greytak, private citizen
Rob Holley, Dayton Valley Conservation District (CVCD)
Brenda Hunt, CWSD
Ed James, CWSD
Michael Johnson, Churchill County
Toni Leffler, CWSD
Shyla Lemons, CCPW
Steve Lewis, UNCE
Brian Peters, Alpine County
Duane Petite, The Nature Conservancy
Rob Pyzel, Lyon County
Aaron Sever, The Nature Conservancy
Jean Stone, NV Div. of Environmental Protection (NDEP)
Sherman Swanson, University of Nevada-Reno
Courtney Walker, Douglas County

1. Welcome and Introductions (5 min)

2. 1:30 – 3:30 p.m. FEMA Discovery and Floodplain Management Plan Update Meeting:

    A. Project Overview of Discovery and Floodplain Management Plan Updates
        1. Michael Baker staff explained the purpose and background of meeting.
            i. Gather information to do the Discovery Plan Update, the Discovery of flood hazards and associated flood risk and mitigation activities through data collection, stakeholder coordination, and meetings.
            ii. Discuss the Floodplain Management Plan Update to continue to create a long-term vision and strategies for floodplain management to reduce flood damage impacts.
            iii. Understand the needs of communities in the watershed by discussing flood risk, balance local needs with FEMA's resources, and plan for possible flood risk projects.
        2. Discussed Recent Flood Events including Alluvial fan and stormwater flooding and how they need to be integrated into Updated Discovery Plan and Floodplain Management Plan

3. The project timeline was described and the goal is to submit an updated Draft of the Floodplain Management Plan by August, 2018.

Meeting	**Date**
Discovery Kick-Off	August 15, 2017
Discovery Meeting Roll out draft discovery report	October 24, 2018 **Comments due December 1, 2017**
Discovery Final Meeting Final discovery report	December 12 – 15, 2017 or January 2 -5, 2018 **Work with FRM WG to determine next meeting**
RFMP Stakeholder Meeting	~ March 2018
RFMP Draft Summary Meeting	~ June 2018 – still work toward this.
Submit finalized draft of RFMP	~ August 2018

B. Present Potential Flood Risk Projects for Discovery Update
    i. Review existing projects – Johnson Lane Stormwater Drainage Study is now being done for the Area Drainage Master Plan (ADMP); Stephanie Way Detention Basin; Old Ruhenstroth Dam removal; both Carson City projects are still being considered.
    ii. Gathered Community Feedback (see Appendix A)

C. Prepare for Next Meeting
    1. Working group members provided Data listed below for Discovery Update (See Appendix A for feedback results):
        i. Photos and high-water marks from recent floods – **please send all photos to Michael Baker (if you haven't already).**
            1. Data can be submitted via DVD or other removable storage, or by file transfer protocol (ftp). Data can be mailed or hand delivered to the 777 E. William Street, #110A, Carson City, NV 89701, or sent electronically using the following link: https://eftp.mbakerintl.com/
        ii. Any storm water or floodplain activities since last Discovery – Please explain those events
        iii. LiDAR and aerial topography acquired since last Discovery
        iv. Community demographics
        v. Most recent hazard mitigation plans
        vi. Any other flood hazard mitigation data
    2. Working group members provided data to be used in the Floodplain Management Plan Update (see Appendix B)

3. 3:30 – 4:30 p.m. CRC FRM Meeting - finished business from 5/11/2017 (See Appendix C)
A. Floodplain Management Plan Suggested Actions update:
    1. SA-30
        i. Flood Awareness Week Update - Katie Clancey explained that Flood Awareness Week (FAW) for 2017 is Nov. 12-17. Events include:

1. November 12 Meadowood Mall Flood Awareness Week Kickoff (Public);
2. November 13 Educational Event for River Wranglers Work Day at Carson River (Private)
3. November 14 Douglas County Community Center (Public)
4. November 16 – Yerington Event (TBD)
5. November 17 – Elko Event
6. October – November 2017 Posters/ Handouts at (Cal – Ranch / Sportsman Warehouse) in Carson City - arranged by Robb Fellows
7. Next, Katie described other outreach activities outside of that week –
    a. February 2017 - NDWR and NDEP went to Elementary Schools
    b. Spring 2017 Safety Day, Douglas County
    c. Spring 2017 Earth Day in Fallon
    d. August 2 National Night Out – Carson City
    e. October 7-8 Minden Air Show
    f. October 7-8 Alpine Aspen Festival.

ii. Debbie Neddenriep announced the Floodplains as Community Assets videos series were finalized. The next steps are to make them available on public access television, and to present them to counties and community groups. The videos were funded by a FEMA grant. Open floodplains have been an important CRC message. They are supporting conservation easements and ag producers who provide the service of keeping floodplains open. The videos underscore that our floodplains are nature's flood protection and provide a multitude of watershed health benefits. Developing our floodplains increases flood damages and risks, whereas keeping them open, limits risk, saving money and potentially lives. Feedback on the videos was very positive. It was suggested we send the videos to our local television stations. The videos will be integrated into the Carson Watershed-Literacy Campaign.

B. Flood Damage Field Trip (John Cobourn) –
Several sites were selected as possible sites. Possible ideas on how to theme the field trips included basing them on types of damages (Erosion/Channel Migration; Structures; and Infrastructure/grade controls). It was suggested that the Floodplain and River Management meetings could be held in different locations and include a field trip to a specific location. **Group needs to discuss who will plan and organize field trips** (See Appendix C for expanded notes).

C. Finalized Stewardship Plan Submitted (Brenda) – The Stewardship Plan is turned in to EPA and waiting for review and approval. Brenda invited questions and wants to make sure she has everyone's projects listed in the Plan. She would like to set up a digital tracking program in the future. She will ask for annual summary project update sheets. Maps are to be updated.

D. Other – Next year is the 20-year anniversary of the CRC, and we would like ideas for a celebration. Maybe a spring or fall party with music, perhaps at Silver Saddle Ranch with river

walks, a canoe trip, etc. Brewery Arts, Minden Centennial Park, TNC River Fork Ranch, and Dangberg are other possible venues.

Steve Lewis – Mitch Blum talked about how floodway delineation upstream from Genoa Lane is not feasible because of interaction between East and West Forks. Consider cost benefits of delineating the floodway farther upstream.

Vermont paper for keeping floodplains open and develop an incentive plan to reward those people accepting floodwaters on their property. Celebrate a living river concept. Come up with different goals for reach of the system.

Use Mitch's model to prioritize reaches that are in need of protection. Determine where the greatest flood potential is and prioritize to protect areas. Ed noted it was designed to meet FEMA's 100-year floodplain. We may be able to identify high velocity or high depth areas.

Diversions are accumulating sediment and need to accommodate sediment through structures to maintain the base level. Shane mentioned the Hwy 88 bridge with a high rock bar which is impeding sediment movement downstream. Look at passages from a sediment standpoint and a recreation standpoint and whether we can do something that can be done for both. Consider what could be the best method, perhaps different for each diversion. FEMA may help with redesign of public structures. It is in the Stewardship Plan to consider a sediment transport study feasibility.

Shane suggested inflatable dams which can be adjusted for various flows. Debbie asked if that would be a permit issue. Shane responded that it would probably require ACE and State Lands approval. Perhaps there could be a demonstration dam where a landowner is willing to have an inflatable dam.

Identify themes for various reaches, like living river. Rapid assessment of different river reaches needs to be updated; perhaps looking at this method. Living river in the context of a dichotomy of naturally moving and as a conveyance of water through populated areas. Protection and values of riparian area and environment, etc. Keep meander beltways that are as close to natural as we can keep it. Engineering with nature's goals, like the Carson City freeway interchange, rather than against nature.

4. Schedule next meeting – Discovery meeting on Oct. 24; location TBD. Floodplain & River Management WG meeting near then.

tl

SIGN IN SHEET Carson River Watershed – Discovery Meeting October 24, 2017		
Name	**Organization**	**Email/phone**
Norm Harry	Washoe Tribe	Norman.harry@washoetribe.us
Louise Thompson	CWSD	watershedtech@cwsd.org
Kayla Meyer	NDWR	kmeyer@water.nv.gov
Katherine Clancey	NDWR	Kclancey@water.nv.gov
Robb Fellows	Carson City	Rfellows@carson.org
Mitch Blum	HDR	Mitchell.blum@hdrinc.com
Jeanne Ruefer	TetraTech	Jeanne.reufer@tetratech.com
Rob Pyzel	Lyon County	Rpyzel@lyon-county.org
Michael Johnson	Churchill County	Planning-director@churchillcounty.org
Dean Patterson	Churchill County	Planning?as@churchillcounty.org
Steve Endacott	City of Fallon	sendacott@fallonnevada.com
Rob Loveberg	Consultant	Rob.lovebergconsulting@gmail.com
Brian Peters	Alpine County	bpeters@alpinecountyca.gov
Courtney Walker	Douglas County	cwalker@douglasnv.us
John Cobourn	UNCE	cobournj@unce.unr.edu
Nancy Hoffman		
Craig Burnside	CVSD	Craig.burnside@nv.nacdnet.net
Barry Wood	Fallon NAS	barry.wood@navy.mil
Brenda Hunt	CWSD	brenda@cwsd.org
Geoff Brownell	Michael Baker	gbrownell@mbakerintl.com
Deb Neddenriep	CWSD	debbie@cwsd.org
Ed James	CWSD	edjames@cws.org
Karin Peternel	Michael Baker	Karin.peternel@mbakerintl.com

SIGN IN SHEET
Carson River Watershed – Discovery Meeting
October 24, 2017

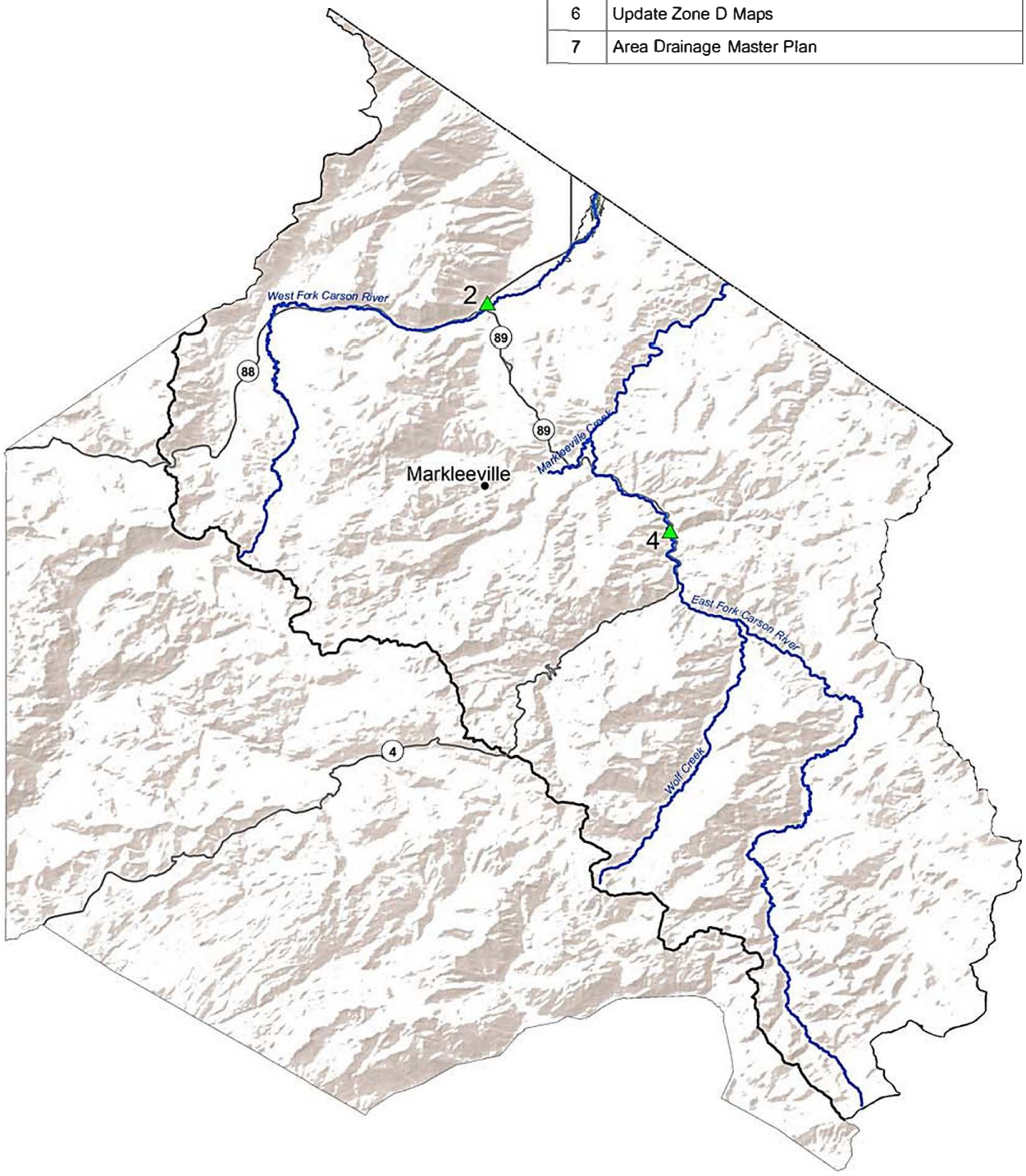
Name	Organization	Email/phone
Norm Harry	Washoe Tribe	Norman.Harry@washoetribe.us
Lorie Thompson	CVSD	watershedtech@cvsd.org
Kayla Meyer	NDWR	kmeyer@water.nv.gov
Katherine Cleary	NDWR	kcleary@water.nv.gov
Robb Fellows	Carson City	RFellows@carson.org
Mitch Blum	HDR	mitchell.blum@hdrinc.com
Jeanne Rueger	Tetra Tech	jeanne.rueger@tetratech.com
Rob Pyzel	Lyon County	rpyzel@lyon-county.org
Michael K Johnson	Churchill County	planning-director@churchillcounty.org
~~DEAN PATERSON~~	" "	planning-as@ " " "
Steve Endacott	City of Fallon	sendacott@fallonnevada.com
Rob Loveberg	Consultant	rob.lovebergconsulting@gmail.com
Brian Peters	Alpine Co.	bpeters@alpinecountyca.gov
Courtney Walker	Douglas	cwalker@douglascounty.us
JOHN COBOURN	UNCE	COBOURNJ@UNCE.UNR.EDU
Nancy Hoffman		
Craig Burnside	CVSD.	
Barry	Fallon NAS	

N

0 4 8 Miles

Project Locations

Label	Project
	Markleeville Creek Floodplain Restoration
2	Woodfords/Highway 88 Bridge
3	Various Mitigation Projects for roads prone to flooding
4	State Highway 89/4 - known flood damage
5	Update Alpine County Hazard Mitigation Plan
6	Update Zone D Maps
7	Area Drainage Master Plan



NATIONAL FLOOD INSURANCE PROGRAM

Discovery Map: Flood Risk

Carson River Watershed

Alpine County

FEMA

Discovery Report Release Date 11/1/2017

Location

Legend

- Project Location
- Cities
- River or Creek
- Levees
- State Highway
- County Boundary
- State Boundary
- HUC Watershed Boundary
- Lidar Capture Area
- **Effective Flood Data**
- **Flood Zone**
- 0.2 PCT ANNUAL CHANCE FLOOD HAZARD
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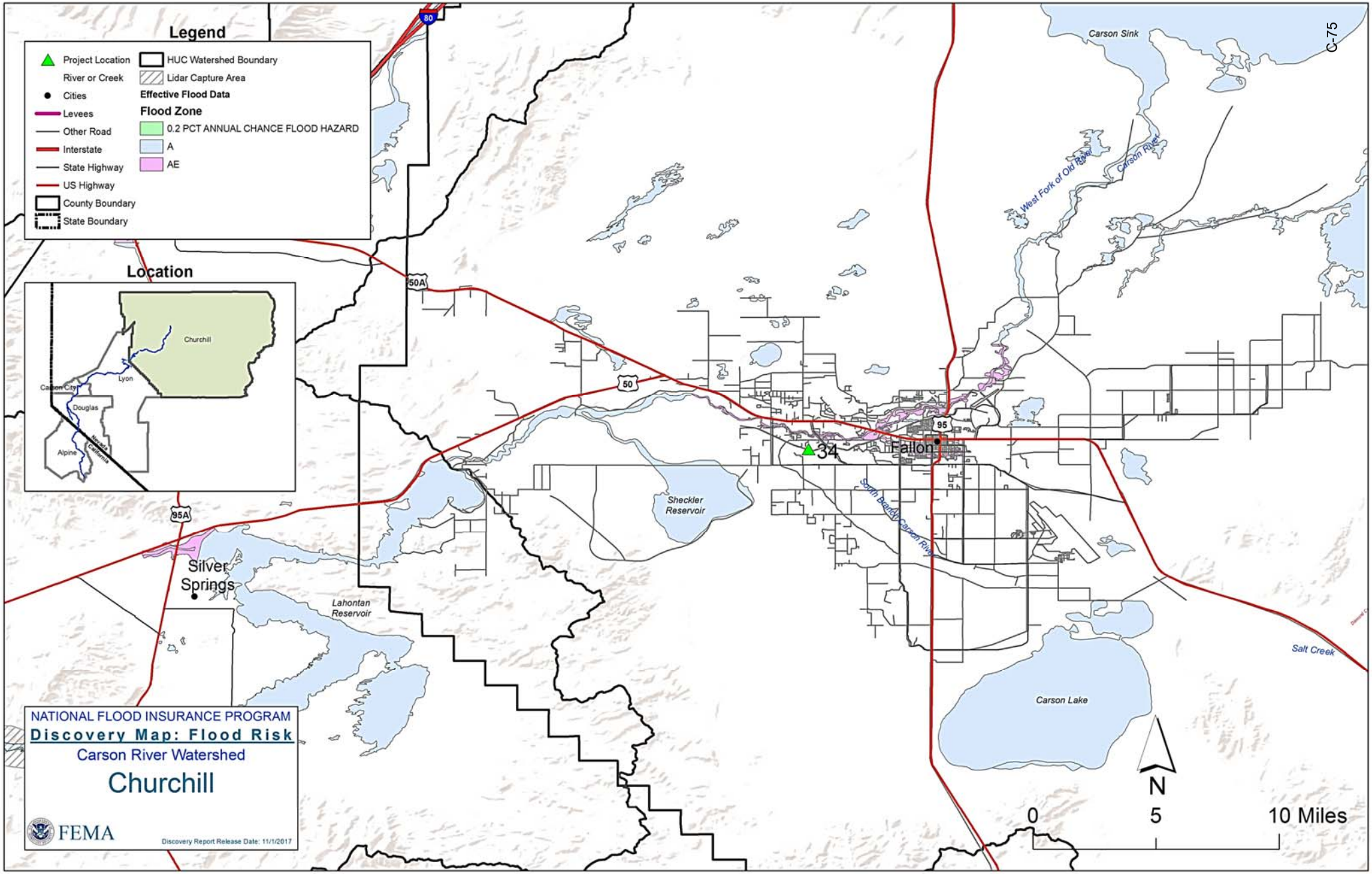
Legend
Project Location
River or Creek
Cities
Levees
Other Road
Interstate
State Highway
US Highway
County Boundary
State Boundary
HUC Watershed Boundary
Lidar Capture Area
Effective Flood Data
Flood Zone
0.2 PCT ANNUAL CHANCE FLOOD HAZARD
A
AE
Location
Churchill
Carson City
Lyon
Douglas
Alpine
Nevada
California
80
50A
50
95
95A
34
Fallon
Carson Sink
West Fork of Old River
Carson River
Sheckler Reservoir
South Branch Carson River
Silver Springs
Lahontan Reservoir
Salt Creek
Carson Lake
NATIONAL FLOOD INSURANCE PROGRAM
Discovery Map: Flood Risk
Carson River Watershed
Churchill
FEMA
Discovery Report Release Date: 11/1/2017
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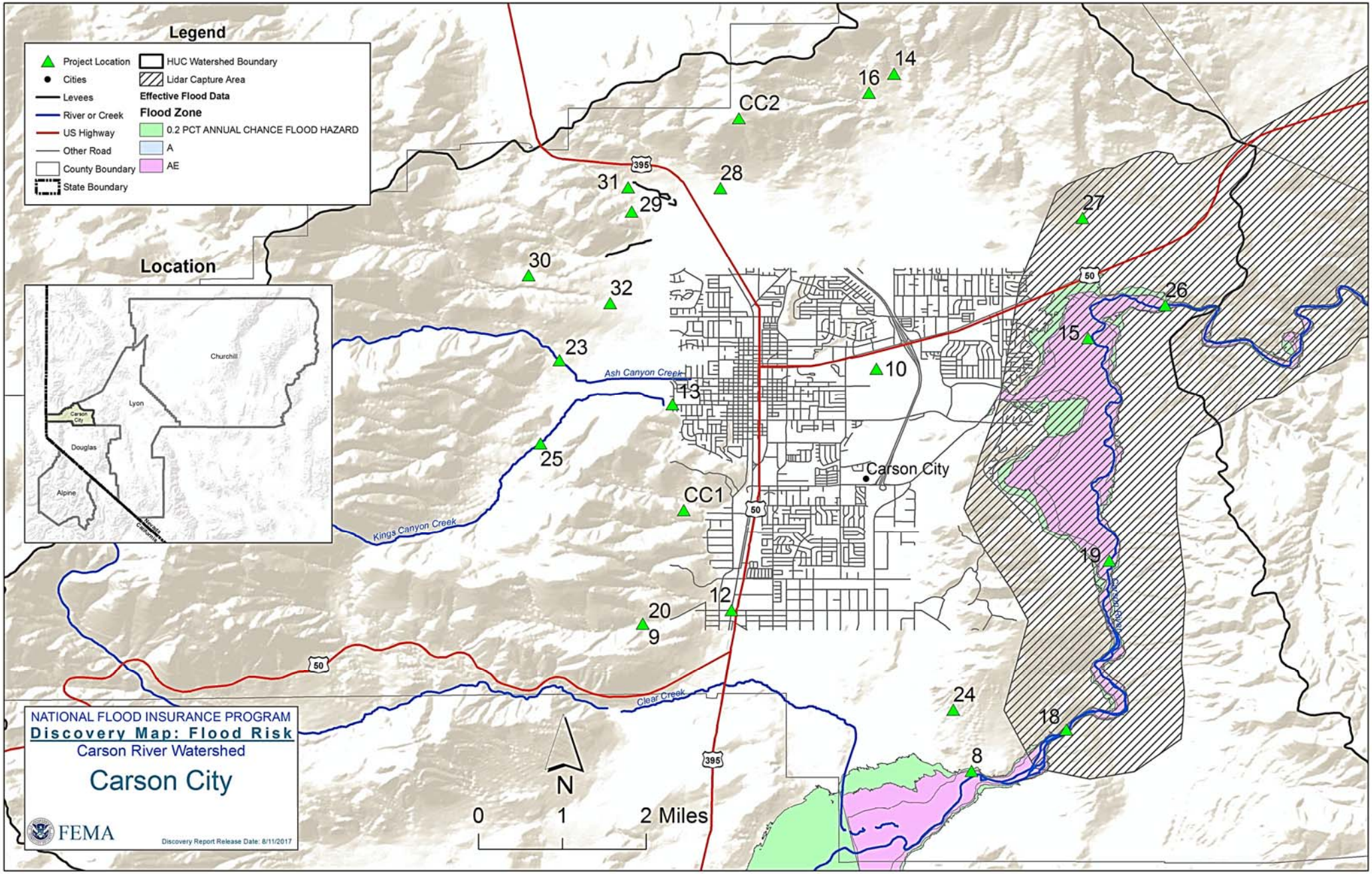
Legend
Project Location
Cities
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Other Road
County Boundary
State Boundary
HUC Watershed Boundary
Lidar Capture Area
Effective Flood Data
Flood Zone
0.2 PCT ANNUAL CHANCE FLOOD HAZARD
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Location
Churchill
Lyon
Carson City
Douglas
Alpine
Nevada
California
Ash Canyon Creek
Kings Canyon Creek
Clear Creek
Carson River
Carson City
CC1
CC2
50
395
NATIONAL FLOOD INSURANCE PROGRAM
Discovery Map: Flood Risk
Carson River Watershed
Carson City
FEMA
Discovery Report Release Date: 8/11/2017
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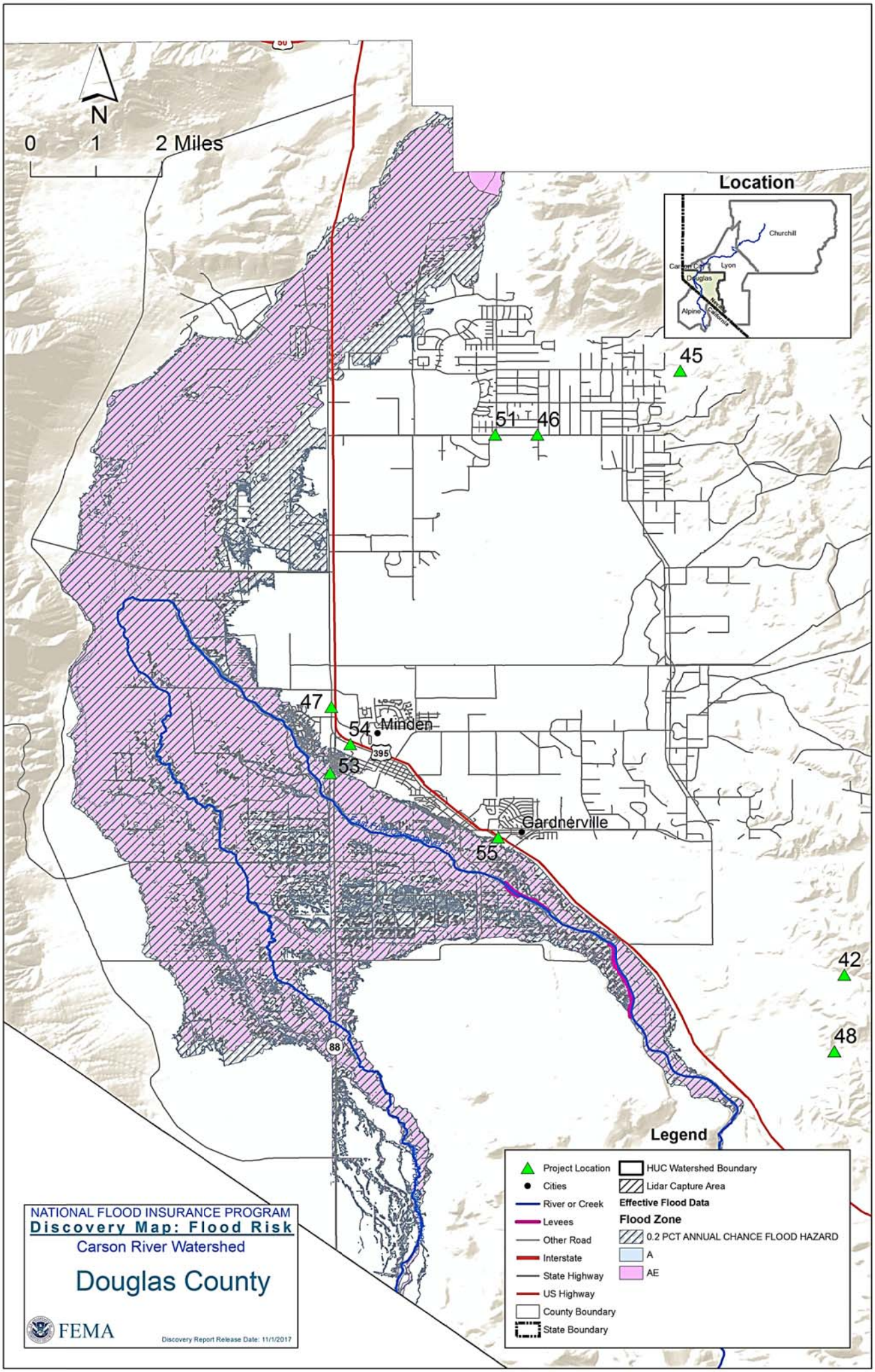
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Location
Churchill
Lyon
Douglas
Alpine
45
51
46
47
54
Minden
395
53
Gardnerville
55
42
48
88
Legend
Project Location
Cities
River or Creek
Levees
Other Road
Interstate
State Highway
US Highway
County Boundary
State Boundary
HUC Watershed Boundary
Lidar Capture Area
Effective Flood Data
Flood Zone
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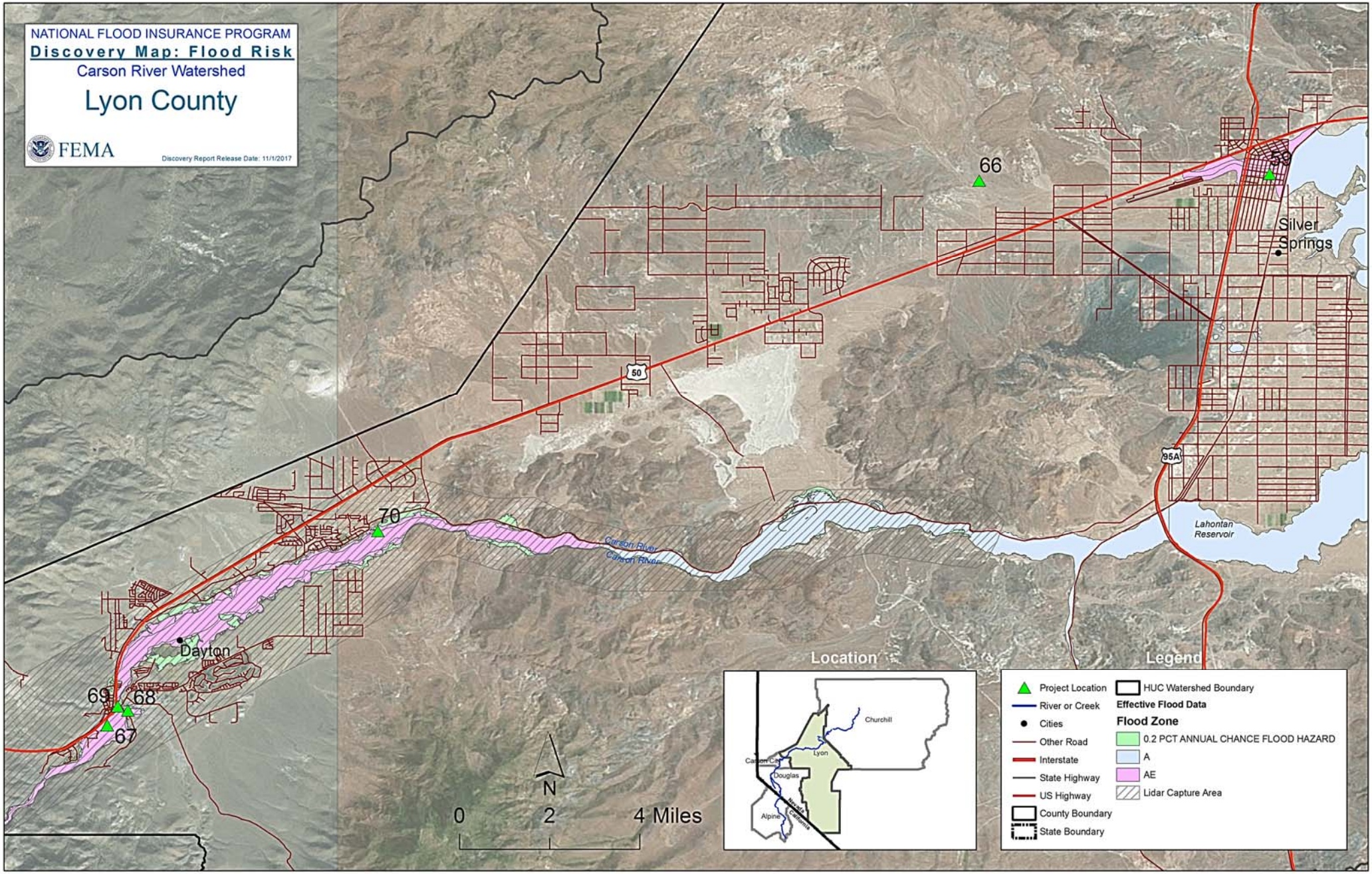
Discovery Map: Flood Risk
Carson River Watershed
Douglas County
FEMA
Discovery Report Release Date: 11/1/2017


NATIONAL FLOOD INSURANCE PROGRAM
Discovery Map: Flood Risk
Carson River Watershed
Lyon County
FEMA
Discovery Report Release Date: 11/1/2017
66
Silver Springs
50
95A
70
Carson River
Carson River
Lahontan Reservoir
Dayton
69
68
67
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2
4 Miles
Location
Churchill
Lyon
Douglas
Alpine
Legend
Project Location
River or Creek
Cities
Other Road
Interstate
State Highway
US Highway
County Boundary
State Boundary
HUC Watershed Boundary
Effective Flood Data
Flood Zone
0.2 PCT ANNUAL CHANCE FLOOD HAZARD
A
AE
Lidar Capture Area

APPENDIX E

POTENTIAL MITIGATION PROJECTS

Alpine County
Carson City
Churchill County
Douglas County
Lyon County
Community-wide

APPENDIX E

JURISDICTIONAL POTENTIAL MITIGATION PROJECTS

Alpine County					
NO.	**PROJECT**	**COMMENTS**	**JUR. PRIORITY**	**HMP MITIGATION GOAL**	**LOCATION**
1	Analysis of post-fire (Washington) flood mitigation; along Highway 89			Sec. 8, Goal	38.592 -119.752
2	East Fork Carson River LiDAR			Sec. 8, Goal 2C	38.664772, -119.707487
3	Erosion Zone Analysis	Between Markleeville and Wolf Creek			38.674587, -119.736088
4	Flooding at Markleeville Creeks blocks Public Works Access to Lift Station; explore flood mitigation options			Sec. 8, Goal 7G?	38.698041, -119.771424
5	Map Markleeville Creek Drainage			Sec. 8, Goal 2C	38.677836, -119.794713
6	Markleeville Creek Floodplain Restoration				38.697998, -119.777715
7	Markleeville Creek LiDAR			Sec. 8, Goal 2C	38.688665, -119.786605
8	Potential Impact Analysis; Number & Location of residents with flood insurance as way to focus efforts.			Sec. 8, Goal 2A	
9	State Highway 89/4 - known flood damage				38.660574, -119.726352
10	Update FIRM Panels?				
11	Various Mitigation Projects for roads prone to flooding				
12	Woodfords/Highway 88 Bridge - STPUD C-Line blowout			STPUD HMP Plan: Severe Storms Obj. #2: Minimize storm related damage from all types of severe storms that impact district facilities.	38.778781, -119.821539

APPENDIX E

Carson City					
NO.	PROJECT	COMMENTS	JUR. PRIORITY	HMP MITIGATION GOAL	LOCATION
1	Goni Wash Area Drainage Master Plan (ADMP), drainage system improvements, maintenance costs		H	Sec. 8 Goals 1, 5, 7, 10	39.208362, -119.725276
2	King Street drainage/flood protection improvements and maintenance costs		H	Sec. 8, Goals 5, 7, 9	39.164020, -119.780888
3	Kings Canyon Area Drainage Master Plan (ADMP) and flood control facility		H	Sec. 8, Goals 1, 5, 7, 9	39.157260, -119.803691
4	South Carson Street storm drain system improvements	Associated with South Carson Street Improvements; should be implmemented in 2019; will still need some funding so leave in	H	Sec. 8, Goals 5, 9	39.154540, -119.767018
5	South Carson Street/South Curry Street storm drain system improvements	Associated with South Carson Street Improvements; should be implmemented in 2019; will still need some funding so leave in	H	Sec. 8, Goal 1	39.141992, -119.768288
6	Voltaire Canyon Channel and Drainage system improvements		H	Section 8, Goals 1,5	39.126091, -119.786021
7	Voltaire Canyon Floodplain Restudy/Remapping	Ongoing	H	Section 8, Goals 1, 5, 7, 9	39.126091, -119.786021
8	Ash Canyon Area Drainage Master Plan (ADMP) and flood control facility and maintenance costs		M	Section 8, Goals 1, 5, 7, 9	39.171675, -119.800376
9	Carson River Channel Clearing and Snagging - Flood Protection	Mainstem Carson River to New Empire	M	Sec. 8, Goal 1?	Ongoing
10	Clear Creek Area Drainage Master Plan, Restudy, maintenance costs	See polygon	M	Sec. 8, Goals 1, 5, 7, 9,	39.112716, -119.760239
11	Eagle Valley Golf Course A&B Area Drainage Master Plan (ADMP) and drainage system improvements	Restudy done; Floodplain just revised; should go into effect 10/26/2017;	M	Sec. 8, Goals 1, 5, 7, 9	39.188645, -119.713521
12	Eagle Valley Golf Course basin and piping improvements	what could mitigate the impacts	M	Sec . 8, Goals 5,7	39.196268, -119.710076
13	Goni Wash Sediment and Detention basins and maintenance costs	make a polygon	M	Sec. 8, Goals 5, 7, 10	39.221218, -119.742620
14	Areas Between Goni Wash & Eagle Valley Creek Area Drainage Master Plan	see polygon	M	Sec. 8, Goals 1, 5, 6?, 7,	39.211756, -119.767808
15	H&I Tributary ADMP and subsequent sediment transport/flood mitigation projects/costs		M	Sec. 8, Goals 1, 5, 7, 9	39.143396, -119.779450
16	New Empire Drainage System Improvement	Substandard drainage system; make polygon	M	Sec. 8, Goals 5, 8	39.178885, -119.724824
17	Prison Hill Area Drainage Master Plan, restudy and remapping, flood control facility		M	Sec. 8, Goals 1, 5, 7, 9	39.131249, -119.741044
18	East Silver Saddle Ranch and Sierra Vista Lane drainage improvements; Pinion Hills from Deer Run Bridge south to City boundary - Study	See Polygon of 19 and 26	L	Sec. 8, Goals 1, 5, 7, 9	39.138384, -119.700372

APPENDIX E

Carson City					
NO.	PROJECT	COMMENTS	JUR. PRIORITY	HMP MITIGATION GOAL	LOCATION
19	Forest Legacy Project Old Woods Ranch/Schulz Invt. Cons. Easements Project	Clear Creek (Carson River Tributary)	L	Sec. 8, Goals 2, 6?, 7	39.115067, -119.845845
20	Golden Eagle Lane (Flood Protection, Rehabilitation / Stabilization)	Multiple segments of the river on which projects are necessary	L	Sec. 8, Goals 1, 5, 7	39.107734, -119.712887
21	Saliman and Carson High drainage system improvements	Install another pipe south to Robinson will alleviate flooding by High School	L	Sec. 8, Goals 5, 9	39.170173, -119.745684

Churchill County					
NO.	PROJECT	COMMENTS	JUR. PRIORITY	HMP MITIGATION GOAL	LOCATION
1	Revised FIRM study for Churchill County and City of Fallon		1	Sec. 8, 6.1	
2	Flood Water control and mitigation study report from V-line weir to Carson Lake		2	Sec. 8, 6.1,6.2	
3	Study to evaluate the Newlands Project infrastructure to increase flood water diversions to Stillwater NWR		2	Sec. 8, 6.1, 6.3	
4	Carson River watershed floodplain model update		3	Sec. 8, 6.1	
5	FIRM impact study of a levee along Casey or Bottom Roads		4	Sec. 8, 6.1, 6.3	39.469347, -118.853610
6	Inundation maps/stormwater area drainage master plan below Lahontan		5	Sec. 8, 6.1	
7	Improve flood control/release from VW to Carson Lake to reduce impact to US Navy Bravo 16 (Fallon NAS Comment)		Follow up	Sec. 8, 6.4, 6.7	

APPENDIX E

Douglas County					
NO.	**PROJECT**	**COMMENTS**	**JUR. PRIORITY**	**HMP MITIGATION GOAL**	**LOCATION**
1	Pinenut Wash attenuation study	Check status with Erik and Mimi; Lands Bill	H	Sec. 8, Goal 5	38.907443, -119.665535
2	Zone A BFE unknown restudies (Carson River PMR – almost complete)			Sec. 8, Goal 4	
3	Studies of other washes and sloughs		L		
5	Johnson Lane Area Drainage Master Plan	In progress; June 2018	H	Sec. 8, Goal 10	39.026845, -119.733462
6	Martin Slough (NDOT)	In progress	H		38.966682, -119.779105
7	Smelter Creek Flood Control Facility (detention basin)	Design completed; CBA needed revision. Needs to be re-submitted to FEMA for HMA funding	M	Sec. 8, Goal 5	38.890555, -119.667741
8	Floodplain ordinances update	Larger efforts to streamline changes, permits; include protocols/procedures to update model. Dovetail with Rob Loveberg's work	M	Sec. 8, Goal 12~	
9	ADMPs for other areas in the County	Alpine View Estates, Jacks Valley, Indian Hills; wildcat subdivisions where drainage is piecemealed	L	Sec. 8, Goal 4	
10	Projects as a result of Johnson Lane ADMP including Stephanie Way Flood Control Facility		H	Sec. 8, Goal 10	39.026887, -119.742770
11	Carson River Floodplain re-mapping	IN FEMA Review	H		
12	SR88 Culvert expansion Cottonwood Slough	In process; acquiring ROW through NDOT.	H	Sec. 8, Goal 6	38.952034, -119.779415
13	Countywide Stormwater master plan (Genoa, Minden, Gardnerville)	Add Tribal areas	L	Sec. 8, Goal 4	38.958451, -119.774839
14	Buckeye Creek Wash Study	May be zone A	L	Sec. 8, Goal 3	38.937797, -119.742127
15	Tracking between forks outside of floodway	Procedure for doing this in Dougals County	H		
16	Washoe Tribe - 395/Dresslerville - Indian Creek Bridge	Have been funded through BIA to fix/modify infrastructure. Flooding affects Tribal road	L		
17	Bank Stabilization project	90% Design - needs $340,000; $100,000 already received through EPA funding	M		
18	Carson River clearing and snagging projects	Proactive infrastructure/river maintenance and replacement	M		
19	Washoe Tribe - Storm water plans/updates				
20	LID	Design criteria, procedures, ordinances	M		

APPENDIX E

LYON COUNTY					
NO.	**PROJECT**	**COMMENTS**	**JUR. PRIORITY**	**HMP MITIGATION GOAL**	**LOCATION**
1	River Road Project		M	Sec. 7, Table 7-1, #1	
2	Superfund Site resolution		L		
3	Silver Springs/Ramsay Canyon Remapping	Study sent to FEMA for review; need planning study for improvements, possibly part of NDOT project	H	Sec. 7, Table 7-2 Item 17; Sec. 7, Table 7-1, #1	39.407934, -119.217702
4	TDR, incentivize floodplain protection deer run to New Empire to Lahontan		M	Sec. 7, Table 7-2 Item 3, 15; Sec. 7, Table 7-1, #1	
5	Bafford Lane Bridge Flood control	follow up	L	Sec. 7, Table 7-2 Item 15 (?); Sec. 7, Table 7-1, #1	39.511443, -118.744486
6	Phase 2 re-vegetation Fort Churchill State Park (Houghman Howard Diversion to Bucklands Station)	follow up	M	Sec. 7, Table 7-2 Item ?	
7	Phase 3 re-vegetation (Bucklands Station to Lahontan Res)	follow up	M	Sec. 7, Table 7-2 Item ?	
8	Title 15 - LID standard adoption		H	Sec. 7, Table 7-2 Item 1?	
9	Special Improvement District for Storm Drainage that flows into Carson River along Carson River (design, construct, operate and maintain); ADMP for Highway 50 Corridor from Moundhouse through Silver Springs (future growth)		H	Sec. 7, Table 7-1, #1	39.405824, -119.310962
10	Alluvial Fan ADMP for areas south of river in Dayton Valley (Eldorado Canyon); future growth		H	Sec. 7, Table 7-1, #1	39.235343, -119.584410
11	Bridge alternatives in East Dayton Valley	Flood impact and alignment study needed as a result of development pressure in area	M	Sec. 7, Table 7-2 Item 3, 15, 17; Sec. 7, Table 7-1, #1	39.236731, -119.587636
12	Wastewater treatment plant - any flood issues?	Pond in floodplain, needs mitigation	L	Sec. 7, Table 7-2 Item 15, 17?; Sec. 7, Table 7-1, #1	39.293079, -119.504058

APPENDIX E

COMMUNITY-WIDE		
NO.	**PROJECT**	**COMMENTS (10/15/2017)**
1	Early warning system to install gages to include a tipping bucket and reverse 911.	System is operational in Carson City with warnings issued by National Weather Service; however, gages are old, may be better systems now. Still very relevant.
2	Floodplain preservation (easements/open areas).	Floodplain and flood hazards should be considered with open space program objectives when selecting acquisition targets and establishing management strategies for open spaces. Still very relevant.
3	Develop Build Wisely! Codes	Implement or enhance county ordinances that include floodplain protection as a purpose, account for the loss of floodplain storage volume, and mitigate losses through a variety of methods. Floodplain ordinance update with Rob Loveberg an ongoing aspect of this.
4	Public awareness (Flood Awareness Week, etc.)	Ongoing, examples of which are as follows: • Develop watershed-wide outreach and education program about floodplain importance and flooding hazards. • Brochures should be developed for distribution on a watershed level with consistent messages and information for the general public. • Annual Flood Awareness Week will be established with the objective of providing information about flooding and flood hazards to the general public. • Special Events, River Work Days, and other outreach opportunities should be utilized to help raise awareness of flooding hazards and importance of floodplains.
5	Elevation Reference Marks (ERM) should be permanent monuments and updated on a regular basis.	ERMs should be in the 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. A master list of ERMs should be developed, maintained, and made available to interested parties. A gap analysis may need to be conducted. Douglas County needs updates, other jurisdictions as well. This is especially important since this round of discovery will implement alluvial fan plans, so even more important to understand gaps for those reference marks.
6	DFIRM updated procedure	Updating digital flood maps. Support FEMA's Map Modernization Program and encourage FEMA to update FIRMs with current and future conditions. Significant verification of topography and other variables should be conducted prior to release of draft FIRMs.
7	Flood hazard mitigation procedures and understanding how each community has been developing it.	Establish building set-backs in flood hazard areas, where appropriate, to reduce severe hazards from channel migration.
8	Photo monitoring	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. Important to have on record photos of past floods; pictures to see how system reacts. It will react differently now than it did in 1955 for example, as a result of growth, etc. Consider format or venue to submit anectodal evidence, pictures. "Report a Flood". Churchill flew lots of aerials during flooding; they have hundreds of pictures in a dropbox. Need a database/procedure to submit pictures.
9	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.	Explore potential for UAS technology of floodplain mapping.

10	Hazard areas - investigate areas for establishment of setbacks and buffer zones in highly hazardous areas.	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. This is ongoing with ordinance planning.
11	Infrastructure design/replacement-coordinate with NDOT and local jurisdictions to ensure infrastructure compatible/consistent with RFMP	Ongoing.
12	Groundwater quality impacts - evaluation of groundwater impact due to flooding	Ongoing; still sampling
13	Fluvial geomorphic assessment update (RFMP update 2013)	Very relevant; last done in 1996. New projects: put together a rapid response simulation model. River forecast constantly changing during an event, Following up on that, they found really limited number of forecast sites. Only 3 on Carson River that are reforecasting sites.
14	Sediment transport study	Still relevant. Impacts on water quality; impact flood hazards if changing invert elevation of river. Lateral migration, scour at bridges.
15	Leviathan mine monitoring. There were spills from ponds during winter. Beaver ponds were removed that caused heavy metals build up; water quality issues.	Some misconceptions about the extent of spills. Public outreach to address concerns if necessary.

APPENDIX F

DISCOVERY MAP

Dams

National ID	State ID	Name	Stream	Hazard	EAP
NV00223	I-228	Carson City Treated Effluent Dam	Carson River-Tr	H	Y
NV00231	I-244	Carson City Golf Course Detention Basin	Carson River-Tr	S	Y
NV10635		Shenandoah Detention Basin	Eagle Creek-Tr	H	Y
NV10120		Carson River Diversion	Carson River	S	Y
NV10123		Lahontan	Carson River	H	Y
NV00234		Sheckler Dam	Carson River-Os	S	
NV10470		Topaz Lake	West Fork Walker River-Os	H	
NV10441	XJ-187	Vista Grande Tails Dam	Carson River-Tr	H	
NV10469	XNV10469	Allerman #2 Dam	Carson River-Os	H	
NV10529	XJ-305	Bodie Dam	East Fork Carson River	H	
NV10829	XNV10829	Ruhenstroth Power Dam	Carson River	H	
NV10175	I-229	Sierra Springs	Carson River-Os	S	
NV00090		Allerman #1 Dam	Carson River-Os	H	Y
NV00227	J-238	Minden-Gardnerville Sanitation District	Carson River-Os	S	Y
NV10166	I-380	Buckeye Creek Lower Effluent Storage Pond	Buckeye Creek-Os	H	Y
NV10168	I-350	Indian Hills Effluent Pond #5	Carson River-Os	S	Y
NV10435	I-411	Indian Hills Effluent Pond #6	Carson River-Os	S	Y
NV10605	I-551	Bently Reservoir	Buckeye Creek-Tr	H	Y
NV10665	I-594	North Carson Valley Treated Effluent Storage Dam	Carson River-Os	S	Y
NV10686	I-380	Buckeye Creek Middle Effluent Storage Pond	Buckeye Creek-Os	H	Y
NV10687	I-380	Buckeye Creek Upper Effluent Storage Pond	Buckeye Creek-Os	H	Y
NV00150	I-086	Eldorado Canyon Dam	Eldorado Canyon Creek	H	Y
NV10313	XJ-264	North Dayton Valley Primary Pond 1	Carson River-Os	S	
NV10638		Sheep Camp Detention Dam	Carson River-Tr	H	
NV10727	XJ-264	North Dayton Valley Primary Pond 2	Carson River-Os	S	
NV10728	XJ-264	North Dayton Valley Secondary Pond	Carson River-Os	S	
NV10729	Xnv10729	North Dayton Valley Storage Pond	Carson River-Os	S	

FEMA FIS Status

County	Status	Effective Date
Alpine County	Unknown	11/19/1987
Carson City	Effective	12/20/2016
Churchill County	Effective	9/26/2008
Douglas County	Effective	6/15/2016
Lyon County	Effective	10/20/2016
Storey County	Effective	4/23/2008

Community Census Information

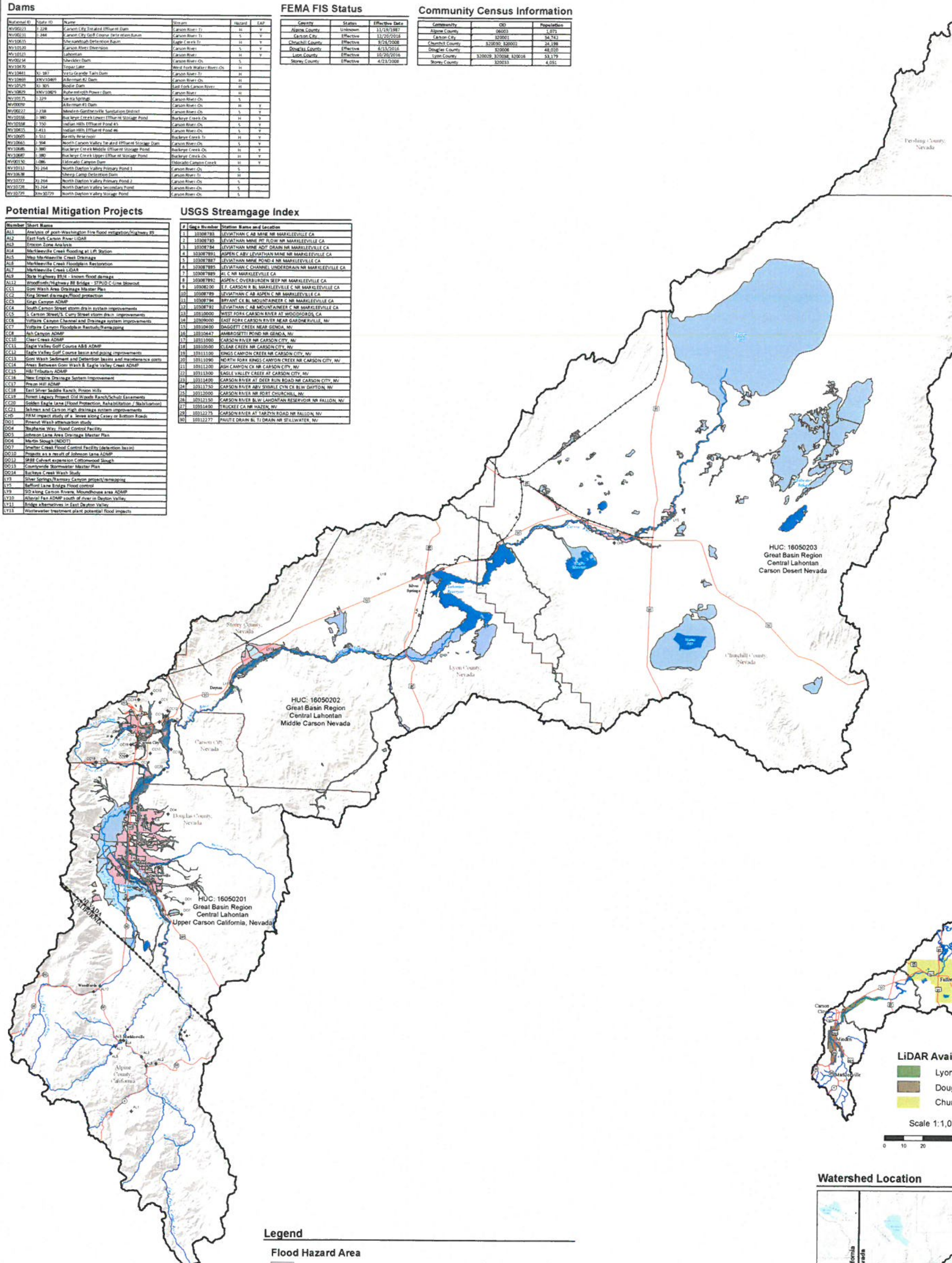
Community	CID	Population
Alpine County	06003	1,071
Carson City	320001	54,742
Churchill County	320030; 320002	24,198
Douglas County	320008	48,020
Lyon County	320029; 320038; 320016	53,179
Storey County	320033	4,051

Potential Mitigation Projects

Number	Short Name
AL1	Analysis of post-Washington Fire flood mitigation/Highway 89
AL2	East Fork Carson River LIDAR
AL3	Erosion Zone Analysis
AL4	Markleeville Creek flooding at Lift Station
AL5	Map Markleeville Creek Drainage
AL6	Markleeville Creek Floodplain Restoration
AL7	Markleeville Creek LIDAR
AL9	State Highway 89/4 - known flood damage
AL12	Woodfords/Highway 88 Bridge - STPUD C-Line blowout
CC1	Goni Wash Area Drainage Master Plan
CC2	King Street drainage/flood protection
CC3	Kings Canyon ADMP
CC4	South Carson Street storm drain system improvements
CC5	S. Carson Street/S. Curry Street storm drain improvements
CC6	Voltaire Canyon Channel and Drainage system improvements
CC7	Voltaire Canyon Floodplain Restudy/Remapping
CC8	Ash Canyon ADMP
CC10	Clear Creek ADMP
CC11	Eagle Valley Golf Course A&B ADMP
CC12	Eagle Valley Golf Course basin and piping improvements
CC13	Goni Wash Sediment and Detention basins and maintenance costs
CC14	Areas Between Goni Wash & Eagle Valley Creek ADMP
CC15	H&I Tributary ADMP
CC16	New Empire Drainage System Improvement
CC17	Prison Hill ADMP
CC18	East Silver Saddle Ranch; Pinion Hills
CC19	Forest Legacy Project Old Woods Ranch/Schulz Easements
CC20	Golden Eagle Lane (Flood Protection, Rehabilitation / Stabilization)
CC21	Saliman and Carson High drainage system improvements
CH5	FIRM impact study of a levee along Casey or Bottom Roads
DO1	Pinenut Wash attenuation study
DO4	Stephanie Way Flood Control Facility
DO5	Johnson Lane Area Drainage Master Plan
DO6	Martin Slough (NDOT)
DO7	Smelter Creek Flood Control Facility (detention basin)
DO10	Projects as a result of Johnson Lane ADMP
DO12	SR88 Culvert expansion Cottonwood Slough
DO13	Countywide Stormwater Master Plan
DO14	Buckeye Creek Wash Study
LY3	Silver Springs/Ramsey Canyon project/remapping
LY5	Bafford Lane Bridge Flood control
LY9	SID along Carson Rivers, Moundhouse area ADMP
LY10	Alluvial Fan ADMP south of river in Dayton Valley
LY11	Bridge alternatives in East Dayton Valley
LY13	Wastewater treatment plant potential flood impacts

USGS Streamgage Index

#	Gage Number	Station Name and Location
1	10308783	LEVIATHAN C AB MINE NR MARKLEEVILLE CA
2	10308785	LEVIATHAN MINE PIT FLOW NR MARKLEEVILLE CA
3	10308784	LEVIATHAN MINE ADIT DRAIN NR MARKLEEVILLE CA
4	103087891	ASPEN C ABV LEVIATHAN MINE NR MARKLEEVILLE CA
5	103087887	LEVIATHAN MINE POND 4 NR MARKLEEVILLE CA
6	103087885	LEVIATHAN C CHANNEL UNDERDRAIN NR MARKLEEVILLE CA
7	103087889	4L C NR MARKLEEVILLE CA
8	103087892	ASPEN C OVERBURDEN SEEP NR MARKLEEVILLE CA
9	10308200	E.F. CARSON R BL MARKLEEVILLE C NR MARKLEEVILLE CA
10	10308789	LEVIATHAN C AB ASPEN C NR MARKLEEVILLE CA
11	10308794	BRYANT CK BL MOUNTAINEER C NR MARKLEEVILLE CA
12	10308792	LEVIATHAN C AB MOUNTAINEER C NR MARKLEEVILLE CA
13	10310000	WEST FORK CARSON RIVER AT WOODFORDS, CA
14	10309000	EAST FORK CARSON RIVER NEAR GARDNERVILLE, NV
15	10310400	DAGGETT CREEK NEAR GENOA, NV
16	10310447	AMBROSETTI POND NR GENOA, NV
17	10311000	CARSON RIVER NR CARSON CITY, NV
18	10310500	CLEAR CREEK NR CARSON CITY, NV
19	10311100	KINGS CANYON CREEK NR CARSON CITY, NV
20	10311090	NORTH FORK KINGS CANYON CREEK NR CARSON CITY, NV
21	10311200	ASH CANYON CK NR CARSON CITY, NV
22	10311300	EAGLE VALLEY CREEK AT CARSON CITY, NV
23	10311400	CARSON RIVER AT DEER RUN ROAD NR CARSON CITY, NV
24	10311750	CARSON RIVER ABV SIXMILE CYN CK BLW DAYTON, NV
25	10312000	CARSON RIVER NR FORT CHURCHILL, NV
26	10312150	CARSON RIVER BLW LAHONTAN RESERVOIR NR FALLON, NV
27	10351400	TRUCKEE CA NR HAZEN, NV
29	10312275	CARSON RIVER AT TARZYN ROAD NR FALLON, NV
30	10312277	PAIUTE DRAIN BL TJ DRAIN NR STILLWATER, NV



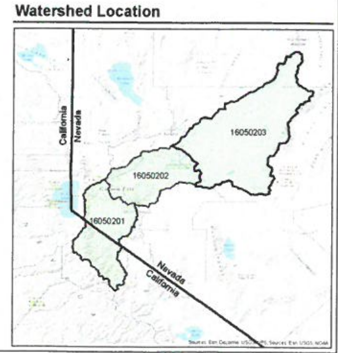
LiDAR Availability

- Lyon County 2011, 2017
- Douglas County 2013
- Churchill County 2013

Scale 1:1,000,000

0 10 20 40 60 Miles

Watershed Location



Legend

Flood Hazard Area

- Shaded Zone X
- A
- AE
- AH
- AO

Physical Features

- Major Highway
- Railroad
- County Boundaries
- State Boundaries

- Streamgage Location
- Project Location
- Levee
- Stream
- Water Body
- HUC 8 Boundaries

Scale
1:200,000

0 5 10 20 Miles

Projection Information

Universal Transverse Mercator
Zone 10
North American Datum 1983

NATIONAL FLOOD INSURANCE PROGRAM

Discovery Map: Flood Hazard

Carson River Watershed

HUC-8 Codes
16050201
16050202
16050203

FEMA

Discovery Report Release Date: 12/2017

Appendix D FEMA County Flood Insurance Rate Maps & CWSD Project Report Links, including:

D1: FEMA County Flood Insurance Rate Maps – Links Table

D2: CWSD Project Report with Links Table

- 2016 Floodplain Ordinance Draft Report and Mitigation Plan Table
- Hydraulic Modeling Documents
- CRS Annual Monitoring Reports

Appendix D FEMA County Flood Insurance Rate Maps & CWSD Project Report Links, including:

D1: FEMA County Flood Insurance Rate Maps – Links Table

Links to FEMA County Flood Insurance Rate Maps

JURISDICTION	LOCATION
Alpine County, California	https://msc.fema.gov/portal/availabilitySearch?addcommunity=060632&communityName=ALPINE%20COUNTY%20UNINCORPORATED%20AREAS# searchresultsanchor
Carson City, Nevada	https://msc.fema.gov/portal/availabilitySearch?addcommunity=320001&communityName=CARSON%20CITY,%20CITY%20OF#searchresultsanchor
Churchill County, Nevada	https://msc.fema.gov/portal/availabilitySearch?addcommunity=320001&communityName=CARSON%20CITY,%20CITY%20OF#searchresultsanchor
Douglas County, Nevada	https://msc.fema.gov/portal/availabilitySearch?addcommunity=320008&communityName=DOUGLAS%20COUNTY%20UNINCORPORATED%20AREA S#searchresultsanchor
Lyon County, Nevada	https://msc.fema.gov/portal/availabilitySearch?addcommunity=320001&communityName=CARSON%20CITY,%20CITY%20OF#searchresultsanchor
Storey County, Nevada	https://msc.fema.gov/portal/availabilitySearch?addcommunity=320033&communityName=STOREY%20COUNTY%20UNINCORPORATED%20AREAS#searchresultsanchor

Appendix D FEMA County Flood Insurance Rate Maps & CWSD Project Report Links, including:

D2: CWSD Project Report with Links Table – Refer to Project Table Links for the following reports:

2016 Floodplain Ordinance Draft Report and Mitigation Plan Table: See MAS 4 Section

Hydraulic Modeling Documents – In MAS 4 Section

CRS Annual Monitoring Reports – In Project Documents Section

7/1/2016-6/30/2017 CRS Report

7/1/2017-6/30/2018 CRS Report

FEMA MAS 1	Project Elements	Grant Performance Period: 9/2009-9/2011; 9/2009 -3/31/2012	Completed	Comments
FEMA Proj. #: EMF-2009-GR-0911	Carson River Remap and Restudy - Lahontan to Dayton Valley & Discovery		3/31/2012	Revision effective 10/16/2016
FEMA MAS 2	Project Elements	Grant Performance Period: 9/26/2011-9/25/2013; 9/26/2014	Completed	Comments
FEMA Proj. #: EMF-2011-GR-1114	Carson River Remap and Restudy - Dayton Valley - Carson City		7/30/2014	Submitted & Approved, expect 90-day comment this fall
FEMA MAS 3	Project Elements	Grant Performance Period: 9/21/2012-5/29/2015; 9/21/2012-9/30/2015	Completed	Comments
FEMA Proj. #: EMF-2012-GR-1211	Carson River Remap and Restudy - Carson Valley Phase 1 (H & H for Carson River)		9/30/2015	Amended USACE HEC-RAS 5.0 Delay; Submitted & Approved

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FEMA MAS 4	Project Elements	Grant Performance Period: 8/31/2013-9/1/2015; 8/31/2013-12/31/2016	Completed	Comments
FEMA Proj. #: EMF-2013-GR-2010	Carson River Remap and Restudy - Carson Valley Phase 2		12/31/2016	New Flood Map submitted to FEMA to for revew
	Community Engagement		12/31/2016	
	Evaluate Floodplain Ordinances based on new map			http://www.cwsd.org/cwsd-floodplainordreviewimprovement-interviewsummariesdraftords-12-22-2016/
	Stillwater Report Technical Assistance for Mitigation Actions		9/30/2016	http://www.cwsd.org/cwsd-flood-mitigation-final/
	Floodplain Model Protocol & Proceures for Updates		12/31/2016	http://www.cwsd.org/2017-3-29finaldrafthec-ras-modeling-management-protocol-report/

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FEMA MAS 5	Project Elements	Grant Performance Period: 9/26/2014-9/24/2016; 9/26/2014-12/31/2016	Completed	Comments
FEMA Proj. #: EMW-2014-CA-00170	Douglas County Smelter Creek Identification and Mitigation Project		8/8/2015	http://www.cwsd.org/smelter-creek-final-report-1-reduced/
	Churchill County Water Shunt Identification and Mitigation Project		10/20/2015	http://www.cwsd.org/0713-005-final_report_w_attaches/
	Public Outreach Flood Awareness Program 2016		12/22/2016	
	Inundation Flood Maps Upper Carson River Watershed Non-Regulatory Product		12/31/2016	https://water.weather.gov/ahps2/inundation/index.php?gage=stwn2
	Douglas County Alpine View Estates Restudy and Remapping Project		12/31/2016	LOMR submitted; Effective Date 6/7/2018
		created for use in Flood Awareness program.		Carson River Floodplain Inventory
	Carson City Restudy and Remapping - Eagle Valley Golf Course A & B		12/31/2016	LOMR submitted; Effective Date 12/26/2017

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FEMA MAS 6	Project Elements	Grant Performance Period: 9/25/2015-9/24/2017; 9/25/2015-6/30/2019	Completed	Comments
FEMA Proj. #: EMW-2015-CA-00087	Douglas County Stephanie Lane Drainage Identification and Mitigation Project		5/27/2016	http://www.cwsd.org/0713-008_stephanie_way_flood_control_project_feasibility_engineering_study_report_fnl_wetstamped/
	Public Outreach Flood Awareness Program - PSA Videos			
	Public Service Announcement (PSA) - Conserving the Carson River Floodplain as a Community Asset (:30)		7/31/2017	Completed
	Agriculture's a Good Fit for Conserving the Carson River Floodplain as a Community Asset (4:31)		7/31/2017	Completed
	A Case for Developers to Conserve the Carson River Floodplain as a Community Asset (3:13)		7/31/2017	Completed
	Our Officials in Conserving the Carson River Floodplain as a Community Asset (4:19)		7/31/2017	Completed
	Carson City Inundation Maps			https://water.weather.gov/ahps2/inundation/index.php?gage=stwn2
	Carson City Goni Wash Restudy and Remapping Project			
	Lyon County Ramsey Canyon Restudy and Remapping Project			

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FEMA MAS 7	Project Elements	Grant Performance Period: 9/19/2016-9/18/2018; extended to 6/30/2019	Completed	Comments
FEMA Proj. #: EMF-2016-CA-00005	Douglas County Johnson Lane Area Drainage Master Plan		8/31/2018	Completed
	Updates to the 2012 Discovery Report and Regional Floodplain Management Plan		8/15/2018	Approved by CWSD board; will take to County Boards for Adoption
	Carson City Voltaire Canyon Restudy and Remapping Project		In Progress	This project was delayed as it required USGS data.
	Northern Nevada Public Outreach Flood Awareness Program		1/15/2018	Completed
FEMA MAS 8	Project Elements	9/1/2017-8/31/2019	Completed	Comments
EMF-2017-CA-00002	(North) Dayton Valley Area Drainage Master Plan		In Progress	
	Floodplain Ordinances Update & Modification		In Progress	
	Northern Nevada Public Outreach Flood Awareness Program		In Progress	

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FEMA MAS 9 Application	Project Elements	Tentative: 10/1/2018-9/30/2020	Completed	Comments
EMF-2018-CA-APP-00005	South Dayton Valley Area Drainage Master Plan		Application	
	North Carson City Identification and Mitigation Plan		Application	
	Pine Nut Wash Letter of Map Review (LOMR)		Application	
	Northern Nevada Public Outreach Flood Awareness Program		Application	
Project / Document				
	See All Documents on page at http://www.cwsd.org/floodplain-management/			
	Signed CTP Charter		6/6/2005	
	Carson River Watershed Floodplain Management Plan		8/1/2008	
	2013 Update Carson River Watershed Floodplain Management Plan		10/1/2013	
	Discovery 2012		12/12/2012	
	Risk Map Charter		4/26/2012	

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Appendix E County Progress Reports

Refer to the 2013 Floodplain Management Plan Update, Appendix H for 2008-2013 County Progress.

E1: Alpine County Progress Report

E2: Carson City Progress Report

E3: Churchill County Progress Report

E4: Douglas County Progress Report

E5: Lyon County Progress Report

E6: Storey County Progress Report

Appendix E County Progress Reports

E1: Alpine County Progress Report

SA #		CRS	SUGGESTED ACTION	2018
PROTECT FLOODPLAIN NATURAL FUNCTION AND VALUE (1-8) - Refer also to Stewardship Plan Table 8.8				
PROTECT FLOODPLAIN NATURAL FUNCTION AND VALUE (1-8)	1	320 420 510	Maintain 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.	Alpine County will be presented with opportunity to adopt the 2018 Regional Floodplain Management Plan, as it has the 2008 and 2013 Plans, which states the Living River approach as one of its main goals. The county also participates in the Carson River Coalition (CRC) stakeholder process. Through Carson River Coalition (CRC) process, county worked with CWSD on the revision of the Regional Floodplain Management plan.
	2	350 410	Develop, support and implement a good neighbor floodplain management policy that recognizes cumulative impacts and actions by one property owner can impact upstream, adjacent and downstream property owners.	Alpine County will be presented with the opportunity to adopt the 2018 Regional Floodplain Management Plan, as in 2008 & 2013, which states a good neighbor floodplain management as one of it policies.
	3	420	Investigate, identify, and implement areas where stream zone buffers would provide multi-objective benefits for river system and downstream communities. (Previously SA # 4)	Alpine County shares their work at CRC meetings. Alpine Watershed Group works in coordination with the county. Between 2013 and 2018, AWG completed East Fork Carson River stabilization project and worked with American Rivers in Hope Valley to stabilize West Fork Carson River. Some SEZ that have more significant buffers than zoning requires, in the absence of regulatory requirements. Bear Valley (outside the Carson River Watershed) has open space areas and drainage easements where they have true buffer . This has all been part of overall master plan for last 40 years. However, CEQA is a challenge to meet for a small county with limited resources. A programmatic CEQA for various elements of work within the county would be a great option to pursue with the California DWR's Integrated Watershed Management program.
	4	310 410 530	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. (Previously SA # 6)	Markleeville Creek Restoration project design is 95% completed. This project would address flooding, stormwater runoff and its effects upon Markleeville's stormwater and sewer treatment systems.

SA #		CRS	SUGGESTED ACTION	2018
PROTECT FLOODPLAIN NATURAL FUNCTION AND VALUE (1-8)	5	320 450	Promote and utilize best management practices as a means of protecting riparian habitat. (Previously SA #10)	Alpine County works in coordination with Alpine Watershed Group, who installed stock fencing and bridge as BMPs on the Ace Hereford Ranch. Alpine County has drafted a grading ordinance approved that is heavily tilted to manage erosion control on projects.
	ECOSYSTEM SERVICES IMPORTANT to MAINTAINING LIVING RIVER APPROACH			
	6	350 420	Consider Floodplain and flood hazards ecosystem service objectives which preserve open floodplain lands when selecting acquisition targets and establishing management strategies for open spaces. (Previously SA #3)	> 95% of Alpine County land is public land and open space; however Alpine County doesn't have a formal open space program. Alpine County is working to secure funding for Markleeville Creek Guard Station. Property has been acquired, but it will cost millions of dollars to construct the project. Open spaces are actively managed considering ecosystem services.
	7	520	Identify and promote options for landowner incentive programs, such as floodplain leasing program and conservation easements that provide compensation to landowners providing ecosystem services and seek funding mechanisms. (Previously # SA 9)	One program in Alpine County that promotes agricultural preservation is the Williamson Act which reduces their property tax liability.
	8	420 520	Retain lands that preserve floodplain storage which maintain and/or restore connection of river with floodplain through land acquisition, conservation easements, local open space programs, TDR and PDR Programs, and other protection methods. Pursue protection of additional acreage in flood prone areas. (Previously # SA 7)	Alpine County General Plan encourages protection of floodplains and riparian areas. Conservation subdivision density bonus available for projects that protect these type of lands as permanent open space. Alpine County purchased the site of the former USFS Markleeville Guard Station located in the floodplain of Markleeville Creek. This is expected to be a multi-million dollar project; a million in sewer improvements, million in floodplain restoration. The project design is 95% complete and grant funds are being sought to restore the site to a more natural floodplain form and function. In addition, there are ongoing projects in Hope Valley to address incised banks so the West Fork Carson River can access its floodplain.

SA #		CRS	SUGGESTED ACTION	2018
HIGHER REGULATORY STANDARDS (9-11)				
HIGHER REGULATORY STANDARDS (9-11)	9	430	Periodically review county ordinances that include floodplain protection as a purpose, account for the loss of floodplain storage volume, and mitigate losses through a variety of methods. (Previously SA # 11)	Alpine County is currently working with CWSD with FEMA funding to update its floodplain ordinances to reduce flood risk.
	10	430	Investigate, promote, and implement of additional flood protection measures that go beyond minimum FEMA requirements, such as improving community rating system. (Previously SA # 12)	Topic has been discussed at length in CRC meetings. As part of Discovery, Alpine County identified multiple projects which are beyond FEMA requirements.
	11	430	Development and adoption of consistent floodplain management ordinance language and consistent use of hydraulic model of Carson River system. (Previously SA # 13)	Alpine County is working with CWSD to update its floodplain ordinance.
FLOOD DATA INFORMATION AND MAINTENANCE (12-21)				
FLOOD DATA INFORMATION AND MAINTENANCE (12-21)	12	410 440	Establish and adopt funding source, and protocol / procedures to consistently update watershed-wide unsteady state modeling to identify flood water storage requirements and to look at the cumulative effects of watershed development. (Previously SA #14)	MAS 4 funding mapped a portion of the West Fork Carson River in Alpine County, which is part of the Hydraulic Model of the Carson River. The County would benefit from a 'small' area drainage master plans, plans that affect only a few homes, because that is all that is generally affected, given the low density of the population.
	13	440	Support FEMA's Map Modernization Program and encourage FEMA to update FIRMs with current and future conditions. Significant verification of topography and other variables should be conducted prior to release of draft FIRMs. (Previously # SA 15)	This element is ongoing with FEMA.
	14		Participate in FEMA's Cooperating Technical Partner Program. (Previously SA#16)	CWSD continues to be a CTP and works with Alpine County through the CRC process to identify and projects which may be of assistance to the county.
FLOOD DATA INFORMATION AND MAINTENANCE (12-21)	15	410 440	Collect and Maintain up-to-date and consistent data collection which includes updating flood studies as needed and conducting new studies for significant water courses and alluvial fan areas. This data should be used to update FEMA maps and/or fill local data gaps. Complete delineation of the floodway throughout river system and incorporate into FIRMs. (Previously SA #17)	The mapping of West Fork Carson River was completed 12/31/2016 and is in review with FEMA. It is anticipated new FIRM map will be released in late 2018 - early 2019. Rain gage data and stream flow data are collected in other counties; groundwater data is collected in Alpine through CASGEM and a small study area of the Mesa is also monitoring groundwater. AWG also conducts Ambient and water-quality based monitoring if the Carson River.
	16	410 440	Update flood studies and maps after significant flooding events. (Previously SA #18)	That's not necessarily an easy task given the steep terrain, geology which promotes debris flows and post-fire flooding. The County has safety concerns with alluvial fan flooding and debris flows.
	17	410 440	Update and Maintain Elevation Reference Marks (ERM) as- permanent monuments using NAVD88 Datum which matches base flood elevations on FEMA FIRMs. (Previously SA #19 & #20)	The need for more ERMs was discussed in the Discovery process. Alpine County maps are NAVD 88 datum.

SA #		CRS	SUGGESTED ACTION	2018
FLOOD DATA INFORMATION AND MAINTENANCE (12-21)				
	18	410 440	Develop and maintain master list of ERMs provide to interested parties. (Previously SA #21)	The need for consistent photo-monitoring discussed in CRC River & Floodplain Working group meetings. A systematic plan to track flood events at specific sites needs to be created and implemented.
FLOOD DATA INFORMATION AND MAINTENANCE (19-21)	19	350 410 440	Develop and coordinate photo-monitoring program (on-the-ground and aerial) on a watershed level to consistently document flooding and flood hazards. (Previously SA #22)	The need for consistent photo-monitoring discussed in CRC River & Floodplain Working group meetings. A systematic plan to track flood events at specific sites needs to be created and implemented.
	20	350 410 440	Establish and maintain rain gage data network in each local jurisdiction.	New Suggested Action
	21		Evaluate potential impacts due to climate variability which could include changing storm patterns, rainfall amounts, and snow levels, adding uncertainty to future conditions.	New Suggested Action
CHANNEL MIGRATION AND BANK EROSION MONITORING (22-29)				
CHANNEL MIGRATION AND BANK EROSION MONITORING (22-29)	22	410	Document/map and update known and projected hazard areas including channel migration hazards and incorporated into planning processes. (Previously SA #23)	Alpine County has finished Multi-Jurisdictional Hazard Mitigation Plan which includes flood hazards. County is also participating in Rapid Evaluation of the River System as part of the 2018 Update to the Carson River Floodplain Management Plan.
	23	440	Conduct LiDAR and/or aerial photography (on a watershed level) on a 5-year basis, or as needed, to provide updated information on channel movement and floodplain condition. (Previously SA #24)	They have a need for countywide LiDAR for infrastructure.
	24	430	Conduct research and establish appropriate building set-backs in flood hazard areas to reduce severe hazards from channel migration. (Previously SA #25)	Topic discussed in CRC meetings but not acted upon to date by Alpine County. This is a flood ordinance issue, and not entirely relevant to Alpine County with so much public lands.
	25	410 440	Conduct and document channel cross-sectional surveys to track long term changes in river channel. (Previously SA #26)	Surveys were done as part of PMR under contract FEMA MAS-4.
	26	410 440	Identify unstable stream banks and areas with high potential for erosion. (Previously SA #27)	Alpine County coordinates with Alpine Watershed Group and American Rivers to identify unstable stream banks and areas with high potential for erosion. County is also participating in Rapid Evaluation of the River System as part of the 2018 Update to the Carson River Floodplain Management Plan. Identified locations to armor and protect road facilities include Hot Springs Road, Blue Lakes Road.
N AND NG (22-29)	27	510	Promote the use of non-structural, bio-engineering (soft-engineering utilizing natural materials) techniques in river restoration projects in combination with other proven methods. (Previously SA #28)	Alpine County coordinates with Alpine Watershed Group and American Rivers which tries to utilize non-structural, bio-engineering (soft-engineering utilizing natural materials) techniques in river restoration projects in combination with other proven methods.

	SA #	CRS	SUGGESTED ACTION	2018
CHANNEL MIGRATION Bank EROSION MONITORI	28	440 510	Update the 1996 Fluvial Geomorphic Assessment and create a sediment transport model of the Carson River. (Previously SA #29)	CWSD has identified FEMA Pre-Disaster Mitigation funding; USACE, and USBR Watershed grants as a possible source to update the 1996 Fluvial Geomorphic Assessment of the Carson River System. County would participate through CRC process to review and ground-truth its section of the river.
	29	440 510	Create a baseline study that informs management and project decisions regarding flood risks, damages, and ecosystem impacts.	New Suggested Action
FLOODPLAIN AND FLOOD HAZARD OUTREACH AND EDUCATION (30-34)				
FLOODPLAIN AND FLOOD HAZARD OUTREACH AND EDUCATION (30-34)	30	330	Continued implementation of watershed-wide outreach and education program about floodplain importance and flooding hazards.	Significant outreach and education has occurred. County participates in annual Flood Awareness Week (FAW) for outreach events. This ongoing program began in 2014 and continues throughout the watershed. Alpine County is adding education in schools funded by EPA. Alpine Watershed Group involved in education and outreach as
	31	330	Promote and participate in Annual Flood Awareness Week (FAW) and events throughout the year with the objective of providing information about protection of floodplains, flooding and flood hazards to the general public.	Carson River Watershed Map (printed and online); UNCE Brochures; Created Flood Awareness 4 -part Video Series for Public, Elected Officials, and Developers as well as one video that highlights how Agriculture is a good fit in Floodplains.
	32	330	Develop and update media in conjunction with FAW working group (social media, videos, brochures, web content, press releases etc.) for distribution throughout watershed with consistent messages and information for the general public.	Information posted on CWSD.org, Nevada Floods.org, National Weather Service - Reno; and County Websites and social media sites.
	33	330	Promote FAW partner websites (e.g., NevadaFloods.org, National Weather Service, CWSD, and county websites) which provide information on the Regional Floodplain Management Plan, floodplain protection, flood risk, emergency preparedness, and emergency contact information. Link to one another's websites and social media sites to amplify message.	In conjunction with Flood Awareness Campaign led by NDWR, CWSD, NOAA -NWS Reno specifically address flood risk and local jurisdictions have websites as well which also link to these websites. Information is also posted on County Websites and social media sites.
	34	330	Utilize special Events, River Work Days, and other outreach opportunities in conjunction with FAW working group to raise awareness of flooding hazards and importance of floodplains.	FAW Events occur throughout the year at such events. In Alpine County the floodplain model has been highlighted at the Alpine Aspen Festival.

SA #		CRS	SUGGESTED ACTION	2018
REDUCE INFRASTRUCTURE IMPACTS (35-39)				
REDUCE INFRASTRUCTURE IMPACTS (35-39)	35	510 540	Investigate opportunities and implement actions when feasible to remove existing restrictions, such as berms or uncertified levees, to allow flood waters to access floodplain.	Alpine County works in coordination with Alpine Watershed Group, to monitor and act upon strategic activities to remove existing restrictions to allow flood waters to access floodplain
	36	510	Limit the use of future management measures such as dams, levees, and floodwalls.	Alpine County, through CRC process, supports limiting the use of future management measures such as dams, levees, and floodwalls.
	37	540	Design future bridges and roads to protect floodplain and accommodate rather than restrict river course changes, and minimize back up of flood water.	Alpine County, through CRC process, supports bridge and road designs which protects floodplain, accommodates storage, does not restrict river course, and minimized back up of flood waters.
	38		Investigate opportunities to enhance grade control structures.	Alpine County, through CWSD board and CRC process, supports investigation of opportunities to enhance grade control structures.
	39		Inventory, categorize, and house data regarding public and private drainage and flood control infrastructure in the Carson River Watershed.	New Suggested Action
ALLUVIAL FAN HAZARD REDUCTION (40-43)				
ALLUVIAL FAN HAZARD REDUCTION (40-43)	40	440	Investigate extent of potential alluvial fan flood damage and include on maps.	New Suggested Action
	41	440	Conduct Area Drainage Master Plans for alluvial fans which examines infrastructure, land use, sediment transport to identify & identify alternative to mitigate and/or reduce risk.	New Suggested Action
	42	440 530	Implement studies to inform and motivate land use planning & development which protects high risk areas, and/or allows flood waters and debris flows to safely move through fan flood zones;	New Suggested Action
	43		Define and implement means to protect existing open alluvial fans, implement recommendations associated with SA#'s 38-40 to limit further development and/or alleviate hazards in high risk areas.	New Suggested Action

SA #		CRS	SUGGESTED ACTION	2018
MINIMIZE STORMWATER IMPACTS (44-48)				
MINIMIZE STORMWATER IMPACTS (44-48)	44	450	Promote stormwater infiltration rather than direct outflow to urban infrastructure, ditches, creeks, rivers to capture groundwater, improve water quality, and reduce flood risk.	New Suggested Action
	45	450	Plan for and mitigate cumulative effects of watershed urbanization, including stormwater runoff, to reduce flood hazards. (Previously SA #5)	Topic is discussed in CRC meetings; and potential projects throughout the county have been discussed in the process of updating Discovery report. Alpine County suffers the greatest costs due to urban flooding in Bear Valley and Kirkwood; which are outside the Carson River Watershed.
	46	450	Encourage and incorporate low impact development (LIDs) principles into all development proposals to decrease stormwater run-off, improve water quality, and promote groundwater recharge. (Edited from Former SA #8)	No requirements for LID in Alpine County. Through CRC process, county worked with CWSD to create the report Low Impact Development in the Carson River Watershed. http://www.cwsd.org/wp-content/uploads/2015/07/2015-04-07-LID-Carson-Watershed.pdf.
	47	450	Encourage adoption of model LID ordinances created for Watershed.	LID Ordinance being conducted through CWSD with 208 Funding.
	48	320 450	Promote and utilize best management practices to reduce urban runoff (Refer to SA #5)	New Suggested Action

Appendix E County Progress Reports

E2: Carson City Progress Report

SA #		CRS	SUGGESTED ACTION	2018
PROTECT FLOODPLAIN NATURAL FUNCTION AND VALUE (1-8) - Refer also to Stewardship Plan Table 8.8				**Carson City Progress**
PROTECT FLOODPLAIN NATURAL FUNCTION AND VALUE (1-8)	1	320 420 510	Maintain 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.	The 2018 Regional Floodplain Management Plan will be presented to Carson City for possible adoption. The Living River approach is one of the main goals of the plan. Carson City provides an example to other watershed counties by funding the purchase of floodplain lands as open space and throughout the county. The county also participates in the Carson River Coalition (CRC) stakeholder process.
	2	350 410	Develop, support and implement a good neighbor floodplain management policy that recognizes cumulative impacts and actions by one property owner can impact upstream, adjacent and downstream property owners.	Carson City will adopt the 2018 Regional Floodplain Management Plan which states a good neighbor floodplain management as one of it policies. Carson City plans on using the new floodplain hydraulic model of the river reach which will track cumulative development along the river.
	3	420	Investigate, identify, and implement areas where stream zone buffers would provide multi-objective benefits for river system and downstream communities. (Previously SA # 4)	Carson City has developed and maintains many parks and open space areas that meet multi-objective goals; refer to item SA #6.
	4	310 410 530	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. (Previously SA # 6)	Several areas have been remapped (Goni Wash, Eagle Valley Wash, Saliman / Voltaire Drainage). PMR map revision of the Carson River including a mapped floodway; also updating Floodplain Ordinances.

SA #		CRS	SUGGESTED ACTION	2018
PROTECT FLOODPLAIN NATURAL FUNCTION AND VALUE (1-8)	5	320 450	Promote and utilize best management practices as a means of protecting riparian habitat. (Previously SA #10)	Carson City owns and manages most of the Carson River Riparian Habitat; it is maintained by Carson City Parks and open space.
	ECOSYSTEM SERVICES IMPORTANT to MAINTAINING LIVING RIVER APPROACH			
	6	350 420	Consider Floodplain and flood hazards ecosystem service objectives which preserve open floodplain lands when selecting acquisition targets and establishing management strategies for open spaces. (Previously SA #3)	Carson City has developed and maintains open space and parks along the River Corridor: Morgan Mill Park, Ambrose Natural Area, Carson River Park, Silver Saddle Ranch, Riverview Park, Mexican Ditch Trail, & Linear Ditch Trail, Deer Run Natural area, and Carson City Canyon from Deer Run Roads to Lyon County Line. At Fuji Park, Carson City worked with non-profits, NDEP, CWSD, and others to develop Baily Pond which not only provides a place for people to fish who could not do so otherwise; it also is designed to catch stormwater, channel sediment to adjacent catch basins and filters the water before returning to Clear Creek. Clear Creek is the only tributary of the Carson River in Nevada that flows year-round. Question 18 provides funds acquisition, development, and maintenance of open space through a local tax.
	7	520	Identify and promote options for landowner incentive programs, such as floodplain leasing program and conservation easements that provide compensation to landowners providing ecosystem services and seek funding mechanisms. (Previously # SA 9)	N/A in Carson City since majority of floodplain land is owned by city.
	8	420 520	Retain lands that preserve floodplain storage which maintain and/or restore connection of river with floodplain through land acquisition, conservation easements, local open space programs, TDR and PDR Programs, and other protection methods. Pursue protection of additional acreage in flood prone areas. (Previously # SA 7)	Carson City is the exemplary in fulfilling this suggested action. Refer to SA #6. Carson City has acted on acquisition of floodplain as open space. Currently there is 4,192 acres of SFHA, 55% is open space or 2,288 acres.

SA #		CRS	SUGGESTED ACTION	2018
HIGHER REGULATORY STANDARDS (9-11)				Carson City
HIGHER REGULATORY STANDARDS (9-11)	9	430	Periodically review county ordinances that include floodplain protection as a purpose, account for the loss of floodplain storage volume, and mitigate losses through a variety of methods. (Previously SA # 11)	Floodplain Ordinance update in process (2018)
	10	430	Investigate, promote, and implement of additional flood protection measures that go beyond minimum FEMA requirements, such as improving community rating system. (Previously SA # 12)	Carson City still has a 2 ft above BFE requirement. Floodplain Ordinance update in process (2018)
	11	430	Development and adoption of consistent floodplain management ordinance language and consistent use of hydraulic model of Carson River system. (Previously SA # 13)	Floodplain Ordinance update in process (2018)
FLOOD DATA INFORMATION AND MAINTENANCE (12-21)				
FLOOD DATA INFORMATION AND MAINTENANCE (12-21)	12	410 440	Establish and adopt funding source, and protocol / procedures to consistently update watershed-wide unsteady state modeling to identify flood water storage requirements and to look at the cumulative effects of watershed development. (Previously SA #14)	Using FEMA grant funds, CWSD an unsteady state model of the Carson River System upstream of Lahontan Reservoir was created. Draft protocol for updating said model was included in this effort.
	13	440	Support FEMA's Map Modernization Program and encourage FEMA to update FIRMs with current and future conditions. Significant verification of topography and other variables should be conducted prior to release of draft FIRMs. (Previously # SA 15)	This element is ongoing with FEMA.
	14		Participate in FEMA's Cooperating Technical Partner Program. (Previously SA#16)	CWSD continues to be a Cooperating Technical Partner & Counties provide input through CRC stakeholder process.
	15	410 440	Collect and Maintain up-to-date and consistent data collection which includes updating flood studies as needed and conducting new studies for significant water courses and alluvial fan areas. This data should be used to update FEMA maps and/or fill local data gaps. Complete delineation of the floodway throughout river system and incorporate into FIRMs. (Previously SA #17)	MAS 1,2,5: 2/19/2014 FIRM Update: Ash Canyon Creek, Kings Canyon Creek, Vicee Canyon Creek, Combs Canyon Creek, Eagle Valley Creek; 12/22/2016 FIRM Updates to Combs Canyon Creek, Ash Canyon Creek, Kings Canyon Creek, Saliman Road Tributary, Voltaire Canyon Creek, H Tributary, I Tributary
FLOOD DATA INFORMATION AND MAINTENANCE (12-21)	16	410 440	Update flood studies and maps after significant flooding events. (Previously SA #18)	Flash flooding in 2014-2016; riverine flooding 2017; Carson City identified numerous watersheds for which an area drainage master plan or flood study needs to be conducted. Many are subject to alluvial fan/flash flooding as a result of summertime cloudburst events.
	17	410 440	Update and Maintain Elevation Reference Marks (ERM) as- permanent monuments using NAVD88 Datum which matches base flood elevations on FEMA FIRMs. (Previously SA #19)	Carson City has 99 ERMs throughout the city. Verification is scheduled every five years. Carson City's ERM are in NAVD 88 datum.
	18	410 440	Develop and maintain master list of ERMs provide-to interested parties. (Previously SA #21)	Carson City's ERM are available through Floodplain Management / Stormwater page on its website at http://www.carsonsw.org/

SA #		CRS	SUGGESTED ACTION	2018
FLOOD DATA INFORMATION AND MAINTENANCE (19-21)			**FLOOD DATA INFORMATION AND MAINTENANCE (12-21)**	
	19	350 410 440	Develop and coordinate photo-monitoring program (on-the-ground and aerial) on a watershed level to consistently document flooding and flood hazards. (Previously SA #22)	The need for consistent photo-monitoring discussed in CRC River & Floodplain Working group meetings. Carson City has an app, Carson City Connect, that allows for residents to take pictures of areas of concern. It might be a prototype for collecting data?
	20	350 410 440	Establish and maintain rain gage data network in each local jurisdiction.	New Suggested Action
	21		Evaluate potential impacts due to climate variability which could include changing storm patterns, rainfall amounts, and snow levels, adding uncertainty to future conditions.	New Suggested Action
CHANNEL MIGRATION AND BANK EROSION MONITORING (22-29)			**CHANNEL MIGRATION AND BANK EROSION MONITORING (22-29)**	
	22	410	Document/map and update known and projected hazard areas including channel migration hazards and incorporated into planning processes. (Previously SA #23)	County Hazard Mitigation Plan (2013) includes flood hazards. County is also participating in Rapid Evaluation of the River System as part of the 2018 Update to the Carson River Floodplain Management Plan. (Plan Appendix C)
	23	440	Conduct LiDAR and/or aerial photography (on a watershed level) on a 5-year basis, or as needed, to provide updated information on channel movement and floodplain condition. (Previously SA #24)	The latest survey of alluvial fan areas was conducted by USGS in Carson City, Lyon County, and Storey County in 2017.
	24	430	Conduct research and establish appropriate building set-backs in flood hazard areas to reduce severe hazards from channel migration. (Previously SA #25)	Topic discussed in CRC meetings; also identified areas during 2018 Rapid Evaluation of Carson River (Plan Appendix C).
	25	410 440	Conduct and document channel cross-sectional surveys to track long term changes in river channel. (Previously SA #26)	Surveys were done as part of PMR under contracts FEMA MAS-1, 2 and 3.
	26	410 440	Identify unstable stream banks and areas with high potential for erosion. (Previously SA #27)	Topic discussed in CRC meetings; also identified areas during 2018 Rapid Evaluation of Carson River (Plan Appendix C).
	27	510	Promote the use of non-structural, bio-engineering (soft-engineering utilizing natural materials) techniques in river restoration projects in combination with other proven methods. (Previously SA #28)	Bio-engineering techniques are being used on river restoration projects being accomplished by the Conservation District and their partners.
	28	440 510	Update the 1996 Fluvial Geomorphic Assessment and create a sediment transport model of the Carson River. (Previously SA #27)	CWSD has identified FEMA Pre-Disaster Mitigation funding; USACE, and USBR Watershed grants as a possible source to update the 1996 Fluvial Geomorphic Assessment of the Carson River System. County would participate through CRC process to review and ground-truth its section of the river.
CHANNEL MIGRATION AND Bank EROSION MONITORING (22-29)	29	440 510	Create a baseline study that informs management and project decisions regarding flood risks, damages, and ecosystem impacts. (Previously SA #28)	New Suggested Action

SA #		CRS	SUGGESTED ACTION	2018
FLOODPLAIN AND FLOOD HAZARD OUTREACH AND EDUCATION (30-34)				
FLOODPLAIN AND FLOOD HAZARD OUTREACH AND EDUCATION (30-34)	30	330	Continued implementation of watershed-wide outreach and education program about floodplain importance and flooding hazards.	This program was developed in 2014 and continues throughout the watershed. (See SA #31). Significant outreach and education has occurred. Carson City staff participates in Flood Awareness outreach efforts throughout the year.
	31	330	Promote and participate in Annual Flood Awareness Week (FAW) and events throughout the year with the objective of providing information about protection of floodplains, flooding and flood hazards to the general public.	NV Department of Water Resources leads FAW Working group which includes CWSD, Federal, State and Local Jurisdictions. Significant outreach and education has occurred. Flood Awareness planning and outreach efforts are ongoing.
	32	330	Develop and update media in conjunction with FAW working group (social media, videos, brochures, web content, press releases etc.) for distribution throughout watershed with consistent messages and information for the general public.	Information posted on CWSD.org and Nevada Floods.org, and County Websites and social media sites.
LOODPLAIN AND FLOOD HAZARD OUTREACH AND EDUCATION (30-34)	33	330	Promote FAW partner websites (e.g., NevadaFloods.org, National Weather Service, CWSD, and county websites) which provide information on the Regional Floodplain Management Plan, floodplain protection, flood risk, emergency preparedness, and emergency contact information. Link to one another's websites and social media sites to amplify message.	In conjunction with Flood Awareness Campaign led by NDWR, CWSD, NOAA -NWS Reno specifically address flood risk and local jurisdictions have websites as well which also link to these websites. Information is also posted on County Websites and social media sites.
	34	330	Utilize special Events, River Work Days, and other outreach opportunities in conjunction with FAW working group to raise awareness of flooding hazards and importance of floodplains.	FAW Events occur throughout the year at such events as National Night Out, Agricultural Safety Day at the Carson City Fair, CWSD school outreach program, and during outreach presentations about new flood studies. Also provide flood information at county offices, local businesses, community center. A flood awareness display will be at library 12/2018, 11/2018 and scheduled for October, November, or December in 2020,2021 & 2022.
REDUCE INFRASTRUCTURE IMPACTS (35-39)				
UCE INFRASTRUCTURE IMPACTS (35-39)	35	510 540	Investigate opportunities and implement actions when feasible to remove existing restrictions, such as berms or uncertified levees, to allow flood waters to access floodplain.	No action
	36	510	Limit the use of future management measures such as dams, levees, and floodwalls.	No action
	37	540	Design future bridges and roads to protect floodplain and accommodate rather than restrict river course changes, and minimize back up of flood water.	No action
	38		Investigate opportunities to enhance grade control structures.	No action

SA #		CRS	SUGGESTED ACTION	2018
RED	39		Inventory, categorize, and house data regarding public and private drainage and flood control infrastructure in the Carson River Watershed.	New Suggested Action
ALLUVIAL FAN HAZARD REDUCTION (40-43)				
ALLUVIAL FAN HAZARD REDUCTION (40-43)	40	440	Investigate extent of potential alluvial fan flood damage and include on maps.	New Suggested Action
	41	440	Conduct Area Drainage Master Plans for alluvial fans which examines infrastructure, land use, sediment transport to identify & identify alternative to mitigate and/or reduce risk.	New Suggested Action
	42	440 530	Implement studies to inform and motivate land use planning & development which protects high risk areas, and/or allows flood waters and debris flows to safely move through fan flood zones;	New Suggested Action
	43		Define and implement means to protect existing open alluvial fans, implement recommendations associated with SA#'s 38-40 to limit further development and/or alleviate hazards in high risk areas.	New Suggested Action
MINIMIZE STORMWATER IMPACTS (44-48)				
MINIMIZE STORMWATER IMPACTS (44-48)	44	450	Promote stormwater infiltration rather than direct outflow to urban infrastructure, ditches, creeks, rivers to capture groundwater, improve water quality, and reduce flood risk.	New Suggested Action
	45	450	Plan for and mitigate cumulative effects of watershed urbanization, including stormwater runoff, to reduce flood hazards. (Previously SA #5)	Carson City Inundation map were created in cooperation with the National Weather Service.
	46	450	Encourage and incorporate low impact development (LIDs) principles into all development proposals to decrease stormwater run-off, improve water quality, and promote groundwater recharge. (Edited from Former SA #8)	CWSD prepared an LID report; the CRC Floodplain and River Management working groups selected updating LID ordinances with 208 funding. Once LID ordinance update is completed, the CRC FRM working group chose to conduct pilot projects with future Clean Water 208 funding.
	47	450	Encourage adoption of model LID ordinances created for Watershed.	LID Ordinance being conducted through CWSD with 208 Funding.
	48	320 450	Promote and utilize best management practices to reduce urban runoff (Refer to SA #5)	New Suggested Action

Appendix E County Progress Reports

E3: Churchill County Progress Report

SA #		CRS	SUGGESTED ACTION	2018
PROTECT FLOODPLAIN NATURAL FUNCTION AND VALUE (1-8) - Refer also to Stewardship Plan Table 8.8				
PROTECT FLOODPLAIN NATURAL FUNCTION AND VALUE (1-8)	1	320 420 510	Maintain 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.	Churchill County adopted the 2013 Regional Floodplain Management Plan Update which states the Living River approach as one of its main goals. Churchill County will be presented with opportunity to adopt the 2018 Regional Floodplain Management Plan The county also participates in the Carson River Coalition (CRC) stakeholder process.
	2	350 410	Develop, support and implement a good neighbor floodplain management policy that recognizes cumulative impacts and actions by one property owner can impact upstream, adjacent and downstream property owners.	Churchill County will be presented with opportunity to adopt the 2018 Regional Floodplain Management Plan which states a good neighbor floodplain management as one of it policies.
	3	420	Investigate, identify, and implement areas where stream zone buffers would provide multi-objective benefits for river system and downstream communities. (Previously SA # 4)	Churchill County has participated in discussions of this topic in CRC meetings but has not acted on to date.
	4	310 410 530	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. (Previously SA # 6)	Topic discussed in CRC meetings but not acted on to date by Churchill County.

SA #		CRS	SUGGESTED ACTION	2018
PROTECT FLOODPLAIN NATURAL FUNCTION AND VALUE (1-8)	5	320 450	Promote and utilize best management practices as a means of protecting riparian habitat. (Previously SA #10)	Topic discussed in CRC meetings as possible landowner stock fencing and watering incentives.
	ECOSYSTEM SERVICES IMPORTANT to MAINTAINING LIVING RIVER APPROACH			
	6	350 420	Consider Floodplain and flood hazards ecosystem service objectives which preserve open floodplain lands when selecting acquisition targets and establishing management strategies for open spaces. (Previously SA #3)	Section 16.12.040.3 of Churchill County Code explains planned unit developments, a specialized kind of subdivision. The Planning Commission may allow up to five units per acre if the developer provides benefits to the community such as protection and access to the Carson River corridor or protection of agriculture through the Transfer of Development Rights program.
	7	520	Identify and promote options for landowner incentive programs, such as floodplain leasing program and conservation easements that provide compensation to landowners providing ecosystem services and seek funding mechanisms. (Previously # SA 9)	
	8	420 520	Retain lands that preserve floodplain storage which maintain and/or restore connection of river with floodplain through land acquisition, conservation easements, local open space programs, TDR and PDR Programs, and other protection methods. Pursue protection of additional acreage in flood prone areas. (Previously # SA 7)	Section 16.12.040.3 of Churchill County Code explains planned unit developments, a specialized kind of subdivision. The Planning Commission may allow up to five units per acre if the developer provides benefits to the community such as protection and access to the Carson River corridor or protection of agriculture through the Transfer of Development Rights program.

SA #		CRS	SUGGESTED ACTION	2018
HIGHER REGULATORY STANDARDS (9-11)				
HIGHER REGULATORY STANDARDS (9-11)	9	430	Periodically review county ordinances that include floodplain protection as a purpose, account for the loss of floodplain storage volume, and mitigate losses through a variety of methods. (Previously SA # 11)	No action to date by Churchill County
	10	430	Investigate, promote, and implement of additional flood protection measures that go beyond minimum FEMA requirements, such as improving community rating system. (Previously SA # 12)	Topic discussed in CRC meetings but not acted on by Churchill County to date.
	11	430	Development and adoption of consistent floodplain management ordinance language and consistent use of hydraulic model of Carson River system. (Previously SA # 13)	Topic discussed in CRC meetings but not acted on by Churchill County to date.
FLOOD DATA INFORMATION AND MAINTENANCE (12-21)				
FLOOD DATA INFORMATION AND MAINTENANCE (12-21)	12	410 440	Establish and adopt funding source, and protocol / procedures to consistently update watershed-wide unsteady state modeling to identify flood water storage requirements and to look at the cumulative effects of watershed development. (Previously SA #14)	River dynamics downstream of Lahontan Reservoir preclude unsteady state modeling. However, the need for current flood data is ongoing.
	13	440	Support FEMA's Map Modernization Program and encourage FEMA to update FIRMs with current and future conditions. Significant verification of topography and other variables should be conducted prior to release of draft FIRMs. (Previously # SA 15)	Churchill County most recent FIRM date was 2008; maps were digitized from 1970s mapping.
	14		Participate in FEMA's Cooperating Technical Partner Program. (Previously SA#16)	CWSD participates in FEMA's Cooperating Technical Partner Program. Churchill County participates through the CRC process in the Floodplain and River Management Working Group.
	15	410 440	Collect and Maintain up-to-date and consistent data collection which includes updating flood studies as needed and conducting new studies for significant water courses and alluvial fan areas. This data should be used to update FEMA maps and/or fill local data gaps. Complete delineation of the floodway throughout river system and incorporate into FIRMs. (Previously SA #17)	In 2015, a Flood Relief Alternatives for Carson River downstream from Lahontan Reservoir report was created. This report explored flood mitigation in the event Lahontan Reservoir was full and the community received additional precipitation.

SA #		CRS	SUGGESTED ACTION	2018
FLOOD DATA INFORMATION AND MAINTENANCE (12-21)			**FLOOD DATA INFORMATION AND MAINTENANCE (12-21)**	
	16	410 440	Update flood studies and maps after significant flooding events. (Previously SA #18)	In 2017, there was a significant flooding event as a record snow pack of ~ 917 AF would have to be moved through Lahontan Reservoir (~300 AF capacity) without flooding downstream communities. Churchill County declared an emergency to deal with record snow pack. The county worked with the US Bureau of Reclamation, City of Fallon, Nevada Department of Transportation, and the Truckee Carson Irrigation District to move water through the system. To do so, an emergency spillway was created off the V- Line Canal. The Carson River channel was cleared in order to create more water carrying capacity. NDOT upgraded the culverts on Highway 95 and Highway 50 to more effectively move water through communities toward the Carson Sink. Churchill County, City of Fallon, and TCID created a ditch to move water from Carson Lake toward Stillwater.
	17	410 440	Update and Maintain Elevation Reference Marks (ERM) as- permanent monuments using NAVD88 Datum which matches base flood elevations on FEMA FIRMs. (Previously SA #19& 20)	At January 23, 2018 Floodplain and River Management working group reaffirmed the need for updated ERMs.
	18	410 440	Develop and maintain master list of ERMs provide-to interested parties. (Previously SA #21)	The need for master list of ERMs was affirmed in the CRC process.

SA #		CRS	SUGGESTED ACTION	2018
FLOOD DATA INFORMATION AND MAINTENANCE (12-21)				
FLOOD DATA INFORMATION AND MAINTENANCE (19-21)	19	350 410 440	Develop and coordinate photo-monitoring program (on-the-ground and aerial) on a watershed level to consistently document flooding and flood hazards. (Previously SA #22)	The need for consistent photo-monitoring discussed in CRC River & Floodplain Working group meetings. A systematic plan to track flood events at specific sites needs to be created and implemented.
	20	350 410 440	Establish and maintain rain gage data network in each local jurisdiction.	New Suggested Action
	21		Evaluate potential impacts due to climate variability which could include changing storm patterns, rainfall amounts, and snow levels, adding uncertainty to future conditions.	New Suggested Action
CHANNEL MIGRATION AND BANK EROSION MONITORING (22-29)				
CHANNEL MIGRATION AND BANK EROSION MONITORING (22-29)	22	410	Document/map and update known and projected hazard areas including channel migration hazards and incorporated into planning processes. (Previously SA #23)	Topic discussed in CRC meetings but not acted on to date.
	23	440	Conduct LiDAR and/or aerial photography (on a watershed level) on a 5-year basis, or as needed, to provide updated information on channel movement and floodplain condition. (Previously SA #24)	See SA 17
	24	430	Conduct research and establish appropriate building set-backs in flood hazard areas to reduce severe hazards from channel migration. (Previously SA #25)	Topic discussed in CRC meetings but not acted on to date.
	25	410 440	Conduct and document channel cross-sectional surveys to track long term changes in river channel. (Previously SA #26)	Topic discussed in CRC meetings but not acted on to date in Churchill County.
	26	410 440	Identify unstable stream banks and areas with high potential for erosion. (Previously SA #27)	Topic discussed in CRC meetings but not acted on to date.
	27	510	Promote the use of non-structural, bio-engineering (soft-engineering utilizing natural materials) techniques in river restoration projects in combination with other proven methods. (Previously SA #28)	In January & February 2017, water flow at Bafford Road was so great the temporary bridge was removed to accommodate flood water which was backing up and threatening flood homes.
	28	440 510	Update the 1996 Fluvial Geomorphic Assessment and create a sediment transport model of the Carson River. (Previously SA #27)	CWSD has identified FEMA Pre-Disaster Mitigation funding; USACE, and USBR Watershed grants as a possible source to update the 1996 Fluvial Geomorphic Assessment of the Carson River System. County would participate through CRC process to review and ground-truth its section of the river.
	29	440 510	Create a baseline study that informs management and project decisions regarding flood risks, damages, and ecosystem impacts.	New Suggested Action

	SA #	CRS	SUGGESTED ACTION	2018
FLOODPLAIN AND FLOOD HAZARD OUTREACH AND EDUCATION (30-34)				
FLOODPLAIN AND FLOOD HAZARD OUTREACH AND EDUCATION (30-34)	30	330	Continued implementation of watershed-wide outreach and education program about floodplain importance and flooding hazards.	This program was developed in 2014 and continues throughout the watershed. (See SA #31). Significant outreach and education has occurred. The County participates in Flood Awareness outreach efforts throughout the year.
	31	330	Promote and participate in Annual Flood Awareness Week (FAW) and events throughout the year with the objective of providing information about protection of floodplains, flooding and flood hazards to the general public.	NV Department of Water Resources leads FAW Working group which includes CWSD, Federal, State and Local Jurisdictions. Significant outreach and education has occurred. Flood Awareness planning and outreach efforts are ongoing.
	32	330	Develop and update media in conjunction with FAW working group (social media, videos, brochures, web content, press releases etc.) for distribution throughout watershed with consistent messages and information for the general public.	Information posted on CWSD.org, Nevada Floods.org, National Weather Service - Reno; and County Websites and social media sites.
	33	330	Promote FAW partner websites (e.g., NevadaFloods.org, National Weather Service, CWSD, and county websites) which provide information on the Regional Floodplain Management Plan, floodplain protection, flood risk, emergency preparedness, and emergency contact information. Link to one another's websites and social media sites to amplify message.	In conjunction with Flood Awareness Campaign led by NDWR, CWSD, NOAA -NWS Reno specifically address flood risk and local jurisdictions have websites as well which also link to these websites. Information is also posted on County Websites and social media sites.
	34	330	Utilize special Events, River Work Days, and other outreach opportunities in conjunction with FAW working group to raise awareness of flooding hazards and importance of floodplains.	FAW Events occur throughout the year at such events as the Cantaloupe Festival, CWSD is developing Flood Awareness program and will work with River Wranglers to implement flood awareness education program in schools in the watershed, including those in Churchill County.
REDUCE INFRASTRUCTURE IMPACTS (35-39)				
REDUCE INFRASTRUCTURE IMPACTS (35-39)	35	510 540	Investigate opportunities and implement actions when feasible to remove existing restrictions, such as berms or uncertified levees, to allow flood waters to access floodplain.	Topic discussed in CRC meetings but not acted on to date.
	36	510	Limit the use of future management measures such as dams, levees, and floodwalls.	Topic discussed in CRC meetings but not acted on to date beyond the existing outreach brochures.
	37	540	Design future bridges and roads to protect floodplain and accommodate rather than restrict river course changes, and minimize back up of flood water.	Topic discussed in CRC meetings but not acted on to date.
	38		Investigate opportunities to enhance grade control structures.	Topic discussed in CRC meetings but not acted on to date.
	39		Inventory, categorize, and house data regarding public and private drainage and flood control infrastructure in the Carson River Watershed.	New Suggested Action

SA #		CRS	SUGGESTED ACTION	2018
ALLUVIAL FAN HAZARD REDUCTION (40-43)				
ALLUVIAL FAN HAZARD REDUCTION (40-43)	40	440	Investigate extent of potential alluvial fan flood damage and include on maps.	New Suggested Action
	41	440	Conduct Area Drainage Master Plans for alluvial fans which examines infrastructure, land use, sediment transport to identify & identify alternative to mitigate and/or reduce risk.	New Suggested Action
	42	440 530	Implement studies to inform and motivate land use planning & development which protects high risk areas, and/or allows flood waters and debris flows to safely move through fan flood zones;	New Suggested Action
	43		Define and implement means to protect existing open alluvial fans, implement recommendations associated with SA#'s 38-40 to limit further development and/or alleviate hazards in high risk areas.	New Suggested Action
MINIMIZE STORMWATER IMPACTS (44-48)				
MINIMIZE STORMWATER IMPACTS (44-48)	44	450	Promote stormwater infiltration rather than direct outflow to urban infrastructure, ditches, creeks, rivers to capture groundwater, improve water quality, and reduce flood risk.	New Suggested Action
	45	450	Plan for and mitigate cumulative effects of watershed urbanization, including stormwater runoff, to reduce flood hazards. (Previously SA #5)	Regional efforts through CWSD are in process. See SA – 12.
	46	450	Encourage and incorporate low impact development (LIDs) principles into all development proposals to decrease stormwater run-off, improve water quality, and promote groundwater recharge. (Edited from Former SA #8)	No requirements for LID in Churchill County; however, recent development of Maverick Gas Station is a prime example of LIDs. Through CRC process, CWSD created Low Impact Development in the Carson River Watershed. http://www.cwsd.org/wp-content/uploads/2015/07/2015-04-07-LID-Carson-Watershed.pdf
	47	450	Encourage adoption of model LID ordinances created for Watershed.	LID Ordinance being conducted through CWSD with 208 Funding.
	48	320 450	Promote and utilize best management practices to reduce urban runoff (Refer to SA #5)	New Suggested Action

Appendix E County Progress Reports

E4: Douglas County Progress Report

SA #		CRS	SUGGESTED ACTION	2018
PROTECT FLOODPLAIN NATURAL FUNCTION AND VALUE (1-8) - Refer also to Stewardship Plan Table 8.8				**Douglas County Progress**
PROTECT FLOODPLAIN NATURAL FUNCTION AND VALUE (1-8)	1	320 420 510	Maintain 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.	The 2018 Regional Floodplain Management Plan will presented to Douglas County for possible adoption in November 2018. The Living River approach is one of the main goals of the plan. Through Carson River Coalition (CRC) process, county worked with UNCE to create brochure FS 123-06 *The Important of Floodplains in Our Communities for use throughout the watershed.* https://www.unce.unr.edu/publications/files/nr/2012/fs1206.pdf
	2	350 410	Develop, support and implement a good neighbor floodplain management policy that recognizes cumulative impacts and actions by one property owner can impact upstream, adjacent and downstream property owners.	Douglas County will adopt the 2018 Regional Floodplain Management Plan which states a good neighbor floodplain management as one of it policies. Carson City plans on using the new floodplain hydraulic model of the river reach which will track cumulative development along the river.
	3	420	Investigate, identify, and implement areas where stream zone buffers would provide multi-objective benefits for river system and downstream communities. (Previously SA # 4)	Douglas County requires 50 foot setbacks from the bank of any river (minimum) for development. 20.690.030.Y.5.e.i.
	4	310 410 530	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. (Previously SA # 6)	Remapping using detailed methods of 30 streams, (Airport Tributary Wash, Airport Wash, Buckbrush Wash, Johnson Lane Wash, Sunrise Pass Wash; and redelineations of 5 stream/river segments on the: Carson River, Clear Creek, Pine Nut Road Wash, Rocky Slough, and Smelter Creek). Floodway is being remapped in Carson River floodplain. East Valley Washes FIRMs updated. LOMRS. Douglas County Flood Management Guide (12/28/2015); LOMR for Alpine View Estates, effective June 2018

SA #		CRS	SUGGESTED ACTION	2018
PROTECT FLOODPLAIN NATURAL FUNCTION AND VALUE (1-8)	5	320 450	Promote and utilize best management practices as a means of protecting riparian habitat. (Previously SA #10)	Currently not adopted; is not priority since most riparian habitat is private property.
	ECOSYSTEM SERVICES IMPORTANT to MAINTAINING LIVING RIVER APPROACH			
	6	350 420	Consider Floodplain and flood hazards ecosystem service objectives which preserve open floodplain lands when selecting acquisition targets and establishing management strategies for open spaces. (Previously SA #3)	Actions continued as of 2013, 2018; Chapter 20.714 Division of Agricultural Land for Conservation Purposes addresses preservation of open space to protect floodplains from development, thereby maintaining a passive flood control, drainage, and ground water recharge system.
	7	520	Identify and promote options for landowner incentive programs, such as floodplain leasing program and conservation easements that provide compensation to landowners providing ecosystem services and seek funding mechanisms. (Previously # SA 9)	Need to identify funding sources; options are identified, just not funding. Refer to Plan Section 4.1.2
	8	420 520	Retain lands that preserve floodplain storage which maintain and/or restore connection of river with floodplain through land acquisition, conservation easements, local open space programs, TDR and PDR Programs, and other protection methods. Pursue protection of additional acreage in flood prone areas. (Previously # SA 7)	Through CRC process, Douglas County worked with UNCE to develop the Carson River Floodplain Inventory. There have been a lot of conservation easements dedicated in Douglas County. (See UNCE 2015, Floodplain Protection Inventory for the Carson River.) Douglas County has Transfer of Development Rights in the Code section 20.500.

SA #		CRS	SUGGESTED ACTION	2018
HIGHER REGULATORY STANDARDS (9-11)				
HIGHER REGULATORY STANDARDS (9-11)	9	430	Periodically review county ordinances that include floodplain protection as a purpose, account for the loss of floodplain storage volume, and mitigate losses through a variety of methods. (Previously SA # 11)	Building code is 1' higher than FEMA regulations. Updated maps coming soon for Carson River Floodplain. Limitations for land division in SFHA. No parcels in the floodplain can be divided smaller than 19 acres unless DC code 20.50.170 is met. Floodplain Ordinance update completed October 2018. Additional revisions will occur in 2019 with CWSD.
	10	430	Investigate, promote, and implement of additional flood protection measures that go beyond minimum FEMA requirements, such as improving community rating system. (Previously SA # 12)	Building code is 1' higher than FEMA regulations. Updated maps coming soon for Carson River Floodplain. Limitations for land division in SFHA. No parcels in the floodplain can be divided smaller than 19 acres unless DC code 20.50.170 is met. Floodplain Ordinance update completed October 2018. Additional revisions will occur in 2019 with CWSD. Additional activities for the community rating system are being explored to work to improve CRS score.
	11	430	Development and adoption of consistent floodplain management ordinance language and consistent use of hydraulic model of Carson River system. (Previously SA # 13)	Douglas County is working with CWSD to update its floodplain ordinance; Floodplain Ordinance update to improve clarity was approved in October 2018; will utilize information from 2016 Draft Model Management Distribution, and Update Guide; and Carson River Mitigation Plan (Refer to Plan Appendix D)
FLOOD DATA INFORMATION AND MAINTENANCE (12-21)				
FLOOD DATA INFORMATION AND MAINTENANCE (12-21)	12	410 440	Establish and adopt funding source, and protocol / procedures to consistently update watershed-wide unsteady state modeling to identify flood water storage requirements and to look at the cumulative effects of watershed development. (Previously SA #14)	Using FEMA grant funds, CWSD completed unsteady state model and created draft protocol for updating said model. (see link above). Unsteady state model done, compensatory flood storage a priority
	13	440	Support FEMA's Map Modernization Program and encourage FEMA to update FIRMs with current and future conditions. Significant verification of topography and other variables should be conducted prior to release of draft FIRMs. (Previously # SA 15)	This element is ongoing with FEMA. Exploring funding to acquire LiDAR data coverage throughout entire County.
	14		Participate in FEMA's Cooperating Technical Partner Program. (Previously SA#16)	CWSD continues to be a Cooperating Technical Partner & Counties provide input through CRC stakeholder process.

SA #		CRS	SUGGESTED ACTION	2018
FLOOD DATA INFORMATION AND MAINTENANCE (12-21)	15	410 440	Collect and Maintain up-to-date and consistent data collection which includes updating flood studies as needed and conducting new studies for significant water courses and alluvial fan areas. This data should be used to update FEMA maps and/or fill local data gaps. Complete delineation of the floodway throughout river system and incorporate into FIRMs. (Previously SA #17)	Carson River Floodplain re-mapping in review and floodway mapping has been holding up the FEMA review; Johnson Lane ADMP; Smelter Creek Detention Basin; Alpine View Estates LOMR in review; SR88 Culvert expansion at Cottonwood Slough and East Fork of Carson River. 6/15/2016: Remapping using detailed methods of 30 streams, five two-dimensional study areas (Airport Tributary Wash, Airport Wash, Buckbrush Wash, Johnson Lane Wash, Sunrise Pass Wash; and redelineations of 5 stream/river segments on the: Carson River, Clear Creek, Pine Nut Road Wash, Rocky Slough, and Smelter Creek.
	16	410 440	Update flood studies and maps after significant flooding events. (Previously SA #18)	Flash flooding in 2014-2016; riverine flooding 2017; Douglas County identified numerous watersheds for which an area drainage master plan or flood study needs to be conducted. Many are subject to alluvial fan/flash flooding as a result of summertime cloudburst events. They are always updating flood studies and maps; however it is funding limited.
	17	410 440	Update and Maintain Elevation Reference Marks (ERM) as- permanent monuments using NAVD88 Datum which matches base flood elevations on FEMA FIRMs. (Previously SA #19)	There are actually quite a few in Douglas County; NDOT website very useful. The need for more ERMs was discussed in the Discovery process. However, the County does not maintain ERMs.
	18	410 440	Develop and maintain master list of ERMs provide-to interested parties. (Previously SA #21)	There are actually quite a few in Douglas County; NDOT website very useful. The need for more ERMs was discussed in the Discovery process. However, the County does not maintain ERMs.

	SA #	CRS	SUGGESTED ACTION	2018
FLOOD DATA INFORMATION AND MAINTENANCE (12-21)				
FLOOD DATA INFORMATION AND MAINTENANCE (19-21)	19	350 410 440	Develop and coordinate photo-monitoring program (on-the-ground and aerial) on a watershed level to consistently document flooding and flood hazards. (Previously SA #22)	The need for consistent photo-monitoring discussed in CRC River & Floodplain Working group meetings. A systematic plan to track flood events at specific sites needs to be created and implemented. Douglas County set this up in the Johnson Lane area for the ADMP. During flood events certain problem areas are photo documented and needs to be repeated.
	20	350 410 440	Establish and maintain rain gage data network in each local jurisdiction.	New Suggested Action. Douglas County has explored this idea with the National Weather Service in Reno and it is a priority.
	21		Evaluate potential impacts due to climate variability which could include changing storm patterns, rainfall amounts, and snow levels, adding uncertainty to future conditions.	New Suggested Action
CHANNEL MIGRATION AND BANK EROSION MONITORING (22-29)				
CHANNEL MIGRATION AND BANK EROSION MONITORING (22-29)	22	410	Document/map and update known and projected hazard areas including channel migration hazards and incorporated into planning processes. (Previously SA #23)	County Hazard Mitigation Plan (2013) includes flood hazards. County is also participating in Rapid Evaluation of the River System as part of the 2018 Update to the Carson River Floodplain Management Plan. Martin Slough and SR88 Culvert Expansion projects in the works. Hazard Mitigation Plan will be updated in early 2019.
	23	440	Conduct LiDAR and/or aerial photography (on a watershed level) on a 5-year basis, or as needed, to provide updated information on channel movement and floodplain condition. (Previously SA #24)	LiDAR for Johnson Lane ADMP. Looking into County-wide LiDAR; grant funding, cost share; USGS 3DEP
	24	430	Conduct research and establish appropriate building set-backs in flood hazard areas to reduce severe hazards from channel migration. (Previously SA #25)	Douglas County requires 50 foot setbacks from the bank of any river (minimum) for development. 20.690.030.Y.5.e.i. Need to evaluate if that is sufficient.
	25	410 440	Conduct and document channel cross-sectional surveys to track long term changes in river channel. (Previously SA #26)	Douglas County is working with the local conservation district.
	26	410 440	Identify unstable stream banks and areas with high potential for erosion. (Previously SA #27)	Washoe Tribe, mostly private land
	27	510	Promote the use of non-structural, bio-engineering (soft-engineering utilizing natural materials) techniques in river restoration projects in combination with other proven methods. (Previously SA #28)	Carson Valley Conservation District utilizes these practices when appropriate.
L MIGRATION AND K EROSION ORING (22-29)	28	440 510	Update the 1996 Fluvial Geomorphic Assessment and create a sediment transport model of the Carson River. (Previously SA #27)	CWSD has identified FEMA Pre-Disaster Mitigation funding; USACE, and USBR Watershed grants as a possible source to update the 1996 Fluvial Geomorphic Assessment of the Carson River System. County would participate through CRC process to review and ground-truth its section of the river.

	SA #	CRS	SUGGESTED ACTION	2018
CHANNEL Ban MONITO	29	440 510	Create a baseline study that informs management and project decisions regarding flood risks, damages, and ecosystem impacts. (Previously SA #28)	New Suggested Action
FLOODPLAIN AND FLOOD HAZARD OUTREACH AND EDUCATION (30-34)				
FLOODPLAIN AND FLOOD HAZARD OUTREACH AND EDUCATION (30-34)	30	330	Continued implementation of watershed-wide outreach and education program about floodplain importance and flooding hazards.	This program was developed in 2014 (See SA #31). Significant outreach and education has occurred. Douglas County staff participates in Flood Awareness outreach efforts throughout the year. Annual events that the County participates in are Safety Day, Washoe Tribe Earth Day, Business Expo, Aviation Round-up, and River Wranglers work days.
	31	330	Promote and participate in Annual Flood Awareness Week (FAW) and events throughout the year with the objective of providing information about protection of floodplains, flooding and flood hazards to the general public.	NV Department of Water Resources leads FAW Working group which includes CWSD, Federal, State and Local Jurisdictions. Significant outreach and education has occurred. Douglas County staff participates in Flood Awareness planning and outreach efforts. This ongoing program began in 2014 and continues throughout the watershed. Annual events that the County participates in are Safety Day, Washoe Tribe Earth Day, Business Expo, Aviation Round-up, and River Wranglers work days to provide information about floodplain protection and flood hazards.
	32	330	Develop and update media in conjunction with FAW working group (social media, videos, brochures, web content, press releases etc.) for distribution throughout watershed with consistent messages and information for the general public.	Information posted on CWSD.org and Nevada Floods.org, and County Websites and social media sites.
LOODPLAIN AND FLOOD HAZARD OUTREACH AND EDUCATION (30-34)	33	330	Promote FAW partner websites (e.g., NevadaFloods.org, National Weather Service, CWSD, and county websites) which provide information on the Regional Floodplain Management Plan, floodplain protection, flood risk, emergency preparedness, and emergency contact information. Link to one another's websites and social media sites to amplify message.	In conjunction with Flood Awareness Campaign led by NDWR, CWSD, NOAA -NWS Reno specifically address flood risk and local jurisdictions have websites as well which also link to these websites. Information is also posted on County Websites and social media sites.
	34	330	Utilize special Events, River Work Days, and other outreach opportunities in conjunction with FAW working group to raise awareness of flooding hazards and importance of floodplains.	FAW Events occur throughout the year at such events as Safety Day, Aviation Round Up, CWSD school outreach program, and during outreach presentations about new flood studies. Also provide flood information at county offices, libraries and community centers.
REDUCE INFRASTRUCTURE IMPACTS (35-39)				
RE	35	510 540	Investigate opportunities and implement actions when feasible to remove existing restrictions, such as berms or uncertified levees, to allow flood waters to access floodplain.	N/A for county. Could possibly be done by Carson Valley Conservation District.

SA #		CRS	SUGGESTED ACTION	2018
REDUCE INFRASTRUCTURE IMPACTS (35-39)	36	510	Limit the use of future management measures such as dams, levees, and floodwalls.	N/A for county. Could possibly be done by Carson Valley Conservation District.
	37	540	Design future bridges and roads to protect floodplain and accommodate rather than restrict river course changes, and minimize back up of flood water.	Culvert crossing on the Martin Slough and US395 upsize completed in 2018 to allow additional passing of floodwater. SR88 culvert expansion is in the planning stage.
	38		Investigate opportunities to enhance grade control structures.	N/A for county. Could possibly be done by Carson Valley Conservation District.
	39		Inventory, categorize, and house data regarding public and private drainage and flood control infrastructure in the Carson River Watershed.	New Suggested Action. This work has begun to be inventoried and housed in County GIS database.
ALLUVIAL FAN HAZARD REDUCTION (40-43)				
ALLUVIAL FAN HAZARD REDUCTION (40-43)	40	440	Investigate extent of potential alluvial fan flood damage and include on maps.	New Suggested Action
	41	440	Conduct Area Drainage Master Plans for alluvial fans which examines infrastructure, land use, sediment transport to identify & identify alternative to mitigate and/or reduce risk.	New Suggested Action. This has been completed in the Johnson Lane area. Additional areas include Jacks Valley, Alpine View Estates, and Genoa.
	42	440 530	Implement studies to inform and motivate land use planning & development which protects high risk areas, and/or allows flood waters and debris flows to safely move through fan flood zones;	New Suggested Action
	43		Define and implement means to protect existing open alluvial fans, implement recommendations associated with SA#'s 38-40 to limit further development and/or alleviate hazards in high risk areas.	New Suggested Action
MINIMIZE STORMWATER IMPACTS (44-48)				
MINIMIZE STORMWATER IMPACTS (44-48)	44	450	Promote stormwater infiltration rather than direct outflow to urban infrastructure, ditches, creeks, rivers to capture groundwater, improve water quality, and reduce flood risk.	New Suggested Action
	45	450	Plan for and mitigate cumulative effects of watershed urbanization, including stormwater runoff, to reduce flood hazards. (Previously SA #5)	Still applicable; same detention/retention requirements
	46	450	Encourage and incorporate low impact development (LIDs) principles into all development proposals to decrease stormwater run-off, improve water quality, and promote groundwater recharge. (Edited from Former SA #8)	DCIS Section 6.1.4.7 – Low Impact Design encourages Low Impact Design, but does not require it. CWSD has 208 funding to create consistent LID ordinances in each jurisdiction.
	47	450	Encourage adoption of model LID ordinances created for Watershed.	LID Ordinance being conducted through CWSD with 208 Funding.
	48	320 450	Promote and utilize best management practices to reduce urban runoff (Refer to SA #5)	New Suggested Action

Appendix E County Progress Reports

E5: Lyon County Progress Report

2018 Lyon County Suggested Action Progress

SA #		CRS	SUGGESTED ACTION	2018
PROTECT FLOODPLAIN NATURAL FUNCTION AND VALUE (1-8) - Refer also to Stewardship Plan Table 8.8				
PROTECT FLOODPLAIN NATURAL FUNCTION AND VALUE (1-8)	1	320 420 510	Maintain 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.	The 2018 Regional Floodplain Management Plan will be presented to Lyon County for possible adoption. The Living River approach is one of the main goals of the plan. The county also participates in the Carson River Coalition (CRC) stakeholder process.
	2	350 410	Develop, support and implement a good neighbor floodplain management policy that recognizes cumulative impacts and actions by one property owner can impact upstream, adjacent and downstream property owners.	Lyon County will adopt the 2018 Regional Floodplain Management Plan which states a good neighbor floodplain management as one of it policies. Carson City plans on using the new floodplain hydraulic model of the river reach which will track cumulative development along the river.
	3	420	Investigate, identify, and implement areas where stream zone buffers would provide multi-objective benefits for river system and downstream communities. (Previously SA # 4)	Lyon County shares their work at CRC meetings. The County also works with Dayton Valley Conservation District to meet multiple objectives by doing river rehab, channel clearing and bank stabilization projects on the Carson River.
	4	310 410 530	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. (Previously SA # 6)	Lyon County section of the Carson River was remapped using detailed methods from upstream of Weeks Bridge to Carson City / Lyon County line during Physical Map Revision (PMR), and includes a mapped floodway. Ramsey Canyon two-dimensional study was also conduction in Lyon County. Lyon County is also updating Floodplain Ordinances.

2018 Lyon County Suggested Action Progress

SA #		CRS	SUGGESTED ACTION	2018
PROTECT FLOODPLAIN NATURAL FUNCTION AND VALUE (1-8)	5	320 450	Promote and utilize best management practices as a means of protecting riparian habitat. (Previously SA #10)	Topic discussed in CRC meetings as possible landowner stock fencing and watering incentives.
	ECOSYSTEM SERVICES IMPORTANT to MAINTAINING LIVING RIVER APPROACH			
	6	350 420	Consider Floodplain and flood hazards ecosystem service objectives which preserve open floodplain lands when selecting acquisition targets and establishing management strategies for open spaces. (Previously SA #3)	Lyon County's Comprehensive Master Plan places high priority on moving development density out of the floodplain; open space program to be developed in the future. Rolling A Ranch is an area preserved as a natural open space area in Dayton, Nevada.
	7	520	Identify and promote options for landowner incentive programs, such as floodplain leasing program and conservation easements that provide compensation to landowners providing ecosystem services and seek funding mechanisms. (Previously # SA 9)	
	8	420 520	Retain lands that preserve floodplain storage which maintain and/or restore connection of river with floodplain through land acquisition, conservation easements, local open space programs, TDR and PDR Programs, and other protection methods. Pursue protection of additional acreage in flood prone areas. (Previously # SA 7)	Lyon County's Comprehensive Master Plan places high priority on moving development density out of the floodplain; incentive programs proposed for new development code.

2018 Lyon County Suggested Action Progress

	SA #	CRS	SUGGESTED ACTION	2018
			HIGHER REGULATORY STANDARDS (9-11)	
HIGHER REGULATORY STANDARDS (9-11)	9	430	Periodically review county ordinances that include floodplain protection as a purpose, account for the loss of floodplain storage volume, and mitigate losses through a variety of methods. (Previously SA # 11)	Lyon County is currently working with CWSD with FEMA funding to update its floodplain ordinances to reduce flood risk.
	10	430	Investigate, promote, and implement of additional flood protection measures that go beyond minimum FEMA requirements, such as improving community rating system. (Previously SA # 12)	Topic has been discussed at length in CRC meetings and Lyon County has 1ft. above BFE requirement. As part of Discovery, Lyon County identified multiple projects which are beyond FEMA requirements.
	11	430	Development and adoption of consistent floodplain management ordinance language and consistent use of hydraulic model of Carson River system. (Previously SA # 13)	Lyon County is working with CWSD to update its floodplain ordinance.
			FLOOD DATA INFORMATION AND MAINTENANCE (12-21)	
FLOOD DATA INFORMATION AND MAINTENANCE (12-21)	12	410 440	Establish and adopt funding source, and protocol / procedures to consistently update watershed-wide unsteady state modeling to identify flood water storage requirements and to look at the cumulative effects of watershed development. (Previously SA #14)	Using FEMA grant funds through CWSD, Lyon County completed unsteady state model and created draft protocol for updating said model when the Physical Map Revision of the Carson River was completed as part of Mas 2-3.
	13	440	Support FEMA's Map Modernization Program and encourage FEMA to update FIRMs with current and future conditions. Significant verification of topography and other variables should be conducted prior to release of draft FIRMs. (Previously # SA 15)	Physical Map Revision became effective 10-2016.
	14		Participate in FEMA's Cooperating Technical Partner Program. (Previously SA#16)	CWSD continues to be a CTP and works with Lyon County to identify projects in the Carson River Watershed which may be of assistance to the county.
	15	410 440	Collect and Maintain up-to-date and consistent data collection which includes updating flood studies as needed and conducting new studies for significant water courses and alluvial fan areas. This data should be used to update FEMA maps and/or fill local data gaps. Complete delineation of the floodway throughout river system and incorporate into FIRMs. (Previously SA #17)	Physical Map Revision became effective 10-2016. Through CRC process, county is working to identify alluvial fans. County received funding to conduct Area Drainage Master Plan in the Dayton Valley area to mitigate flood hazards and implement a plan to avoid flood hazards.
	16	410 440	Update flood studies and maps after significant flooding events. (Previously SA #18)	In January and February 2017, Lyon County experienced flooding which were federally declared disasters. Flood damage affected the Carson River and alluvial fan drainages in Lyon County.
	17	410 440	Update and Maintain Elevation Reference Marks (ERM) as- permanent monuments using NAVD88 Datum which matches base flood elevations on FEMA FIRMs. (Previously SA #19& 20)	The need for more ERMs was affirmed in the Discovery process. Lyon County ERM are in NAVD 88 datum.

2018 Lyon County Suggested Action Progress

	SA #	CRS	SUGGESTED ACTION	2018
			FLOOD DATA INFORMATION AND MAINTENANCE (12-21)	
	18	410 440	Develop and maintain master list of ERMs provide to interested parties. (Previously SA #21)	The need for more ERMs was affirmed in the Discovery process.
FLOOD DATA INFORMATION AND MAINTENANCE (19-21)	19	350 410 440	Develop and coordinate photo-monitoring program (on-the-ground and aerial) on a watershed level to consistently document flooding and flood hazards. (Previously SA #22)	The need for consistent photo-monitoring discussed in CRC River & Floodplain Working group meetings. A systematic plan to track flood events at specific sites needs to be created and implemented.
	20	350 410 440	Establish and maintain rain gage data network in each local jurisdiction.	New Suggested Action
	21		Evaluate potential impacts due to climate variability which could include changing storm patterns, rainfall amounts, and snow levels, adding uncertainty to future conditions.	New Suggested Action
			CHANNEL MIGRATION AND BANK EROSION MONITORING (22-29)	
CHANNEL MIGRATION AND BANK EROSION MONITORING (22-29)	22	410	Document/map and update known and projected hazard areas including channel migration hazards and incorporated into planning processes. (Previously SA #23)	Topic discussed in CRC meetings. Through Lyon County's 2018 update to their Multi-jurisdictional Hazard Mitigation Plan, new mitigation actions were added to the plan specifically for addressing low points along river banks at critical areas along the Carson River.
	23	440	Conduct LiDAR and/or aerial photography (on a watershed level) on a 5-year basis, or as needed, to provide updated information on channel movement and floodplain condition. (Previously SA #24)	The latest survey of alluvial fan areas was conducted by USGS in Carson City, Lyon County, and Storey County in 2017.
	24	430	Conduct research and establish appropriate building set-backs in flood hazard areas to reduce severe hazards from channel migration. (Previously SA #25)	Topic discussed in CRC meetings; also identified areas during 2018 Rapid Evaluation of Carson River (Plan Appendix C).
	25	410 440	Conduct and document channel cross-sectional surveys to track long term changes in river channel. (Previously SA #26)	Surveys were done as part of PMR under contracts FEMA MAS-1, 2 and 3.
	26	410 440	Identify unstable stream banks and areas with high potential for erosion. (Previously SA #27)	Topic discussed in CRC meetings; also identified areas during 2018 Rapid Evaluation of Carson River (Plan Appendix C).
	27	510	Promote the use of non-structural, bio-engineering (soft-engineering utilizing natural materials) techniques in river restoration projects in combination with other proven methods. (Previously SA #28)	Bio-engineering techniques are being used on river restoration projects being accomplished by the Conservation District and their partners.
CHANNEL GRATION AND nk EROSION	28	440 510	Update the 1996 Fluvial Geomorphic Assessment and create a sediment transport model of the Carson River. (Previously SA #27)	CWSD has identified FEMA Pre-Disaster Mitigation funding; USACE, and USBR Watershed grants as a possible source to update the 1996 Fluvial Geomorphic Assessment of the Carson River System. County would participate through CRC process to review and ground-truth its section of the river.

2018 Lyon County Suggested Action Progress

	SA #	CRS	SUGGESTED ACTION	2018
MIC Ba	29	440 510	Create a baseline study that informs management and project decisions regarding flood risks, damages, and ecosystem impacts.	New Suggested Action
FLOODPLAIN AND FLOOD HAZARD OUTREACH AND EDUCATION (30-34)				
FLOODPLAIN AND FLOOD HAZARD OUTREACH AND EDUCATION (30-34)	30	330	Continued implementation of watershed-wide outreach and education program about floodplain importance and flooding hazards.	This program was developed in 2014 and continues throughout the watershed. (See SA #31). Significant outreach and education has occurred. The County participates in Flood Awareness outreach efforts throughout the year.
	31	330	Promote and participate in Annual Flood Awareness Week (FAW) and events throughout the year with the objective of providing information about protection of floodplains, flooding and flood hazards to the general public.	NV Department of Water Resources leads FAW Working group which includes CWSD, Federal, State and Local Jurisdictions. Significant outreach and education has occurred. Flood Awareness planning and outreach efforts are ongoing.
	32	330	Develop and update media in conjunction with FAW working group (social media, videos, brochures, web content, press releases etc.) for distribution throughout watershed with consistent messages and information for the general public.	Information posted on CWSD.org, Nevada Floods.org, National Weather Service - Reno; and County Websites and social media sites.
LOODPLAIN AND FLOOD HAZARD OUTREACH AND EDUCATION (30-34)	33	330	Promote FAW partner websites (e.g., NevadaFloods.org, National Weather Service, CWSD, and county websites) which provide information on the Regional Floodplain Management Plan, floodplain protection, flood risk, emergency preparedness, and emergency contact information. Link to one another's websites and social media sites to amplify message.	In conjunction with Flood Awareness Campaign led by NDWR, CWSD, NOAA -NWS Reno specifically address flood risk and local jurisdictions have websites as well which also link to these websites. Information is also posted on County Websites and social media sites.
	34	330	Utilize special Events, River Work Days, and other outreach opportunities in conjunction with FAW working group to raise awareness of flooding hazards and importance of floodplains.	FAW Events occur throughout the year at such events as Oodles of Noodles, , CWSD school outreach program, and during outreach presentations about new flood studies. Also provide flood information at county offices, local businesses, community center.
REDUCE INFRASTRUCTURE IMPACTS (35-39)				
UCE INFRASTRUCTURE IMPACTS (35-39)	35	510 540	Investigate opportunities and implement actions when feasible to remove existing restrictions, such as berms or uncertified levees, to allow flood waters to access floodplain.	Topic discussed in CRC meetings but not acted on to date.
	36	510	Limit the use of future management measures such as dams, levees, and floodwalls.	Topic discussed in CRC meetings but not acted on to date.
	37	540	Design future bridges and roads to protect floodplain and accommodate rather than restrict river course changes, and minimize back up of flood water.	Topic discussed in CRC meetings but not acted on to date.
	38		Investigate opportunities to enhance grade control structures.	Topic discussed in CRC meetings but not acted on to date.

2018 Lyon County Suggested Action Progress

SA #		CRS	SUGGESTED ACTION	2018
RED	39		Inventory, categorize, and house data regarding public and private drainage and flood control infrastructure in the Carson River Watershed.	New Suggested Action
ALLUVIAL FAN HAZARD REDUCTION (40-43)				
ALLUVIAL FAN HAZARD REDUCTION (40-43)	40	440	Investigate extent of potential alluvial fan flood damage and include on maps.	New Suggested Action
	41	440	Conduct Area Drainage Master Plans for alluvial fans which examines infrastructure, land use, sediment transport to identify & identify alternative to mitigate and/or reduce risk.	New Suggested Action
	42	440 530	Implement studies to inform and motivate land use planning & development which protects high risk areas, and/or allows flood waters and debris flows to safely move through fan flood zones;	New Suggested Action
	43		Define and implement means to protect existing open alluvial fans, implement recommendations associated with SA#'s 38-40 to limit further development and/or alleviate hazards in high risk areas.	New Suggested Action
MINIMIZE STORMWATER IMPACTS (44-48)				
MINIMIZE STORMWATER IMPACTS (44-48)	44	450	Promote stormwater infiltration rather than direct outflow to urban infrastructure, ditches, creeks, rivers to capture groundwater, improve water quality, and reduce flood risk.	New Suggested Action
	45	450	Plan for and mitigate cumulative effects of watershed urbanization, including stormwater runoff, to reduce flood hazards. (Previously SA #5)	Topic is discussed in CRC meetings; and potential projects throughout the county have been discussed in the process of updating Discovery report. Dayton Valley ADMP will identify alluvial fan flooding as it relates to urbanization.
	46	450	Encourage and incorporate low impact development (LIDs) principles into all development proposals to decrease stormwater run-off, improve water quality, and promote groundwater recharge. (Edited from Former SA #8)	No requirements for LID in Lyon County; however, Lyon County will be considering adding LID language to their floodplain ordinance. Through CRC process, county worked with CWSD to create Low Impact Development in the Carson River Watershed. http://www.cwsd.org/wp-content/uploads/2015/07/2015-04-07-LID-Carson-Watershed.pdf
	47	450	Encourage adoption of model LID ordinances created for Watershed.	LID Ordinance being conducted through CWSD with 208 Funding.
	48	320 450	Promote and utilize best management practices to reduce urban runoff (Refer to SA #5)	New Suggested Action

Appendix E County Progress Reports

E6: Storey County Progress Report

SA #		CRS	SUGGESTED ACTION	2018
PROTECT FLOODPLAIN NATURAL FUNCTION AND VALUE (1-8) - Refer also to Stewardship Plan Table 8.8				
PROTECT FLOODPLAIN NATURAL FUNCTION AND VALUE (1-8)	1	320 420 510	Maintain 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.	The 2018 Regional Floodplain Management Plan will be presented to Storey County for possible adoption. The Living River approach is one of the main goals of the plan. The county also participates in the Carson River Coalition (CRC) stakeholder process.
	2	350 410	Develop, support and implement a good neighbor floodplain management policy that recognizes cumulative impacts and actions by one property owner can impact upstream, adjacent and downstream property owners.	Storey County will adopt the 2018 Regional Floodplain Management Plan which states a good neighbor floodplain management as one of it policies. Carson City plans on using the new floodplain hydraulic model of the river reach which will track cumulative development along the river.
	3	420	Investigate, identify, and implement areas where stream zone buffers would provide multi-objective benefits for river system and downstream communities. (Previously SA # 4)	Storey County has identified open space areas that meet multi-objective goals; refer to item SA #6.
	4	310 410 530	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. (Previously SA # 6)	Conducting Dayton Valley ADMP in Mark Twain area of Storey County; also updating Floodplain Ordinances.

SA #		CRS	SUGGESTED ACTION	2018
PROTECT FLOODPLAIN NATURAL FUNCTION AND VALUE (1-8)	5	320 450	Promote and utilize best management practices as a means of protecting riparian habitat. (Previously SA #10)	While not in the Carson River Watershed, Storey County has worked with The Nature Conservancy to restore and maintain the McCarren Ranch Preserve. This preserves encompasses 11 and over 800 acres along the Truckee River. This project demonstrates the County's work to utilize BMPs as a means of protecting riparian habitat.
	ECOSYSTEM SERVICES IMPORTANT to MAINTAINING LIVING RIVER APPROACH			
	6	350 420	Consider Floodplain and flood hazards ecosystem service objectives which preserve open floodplain lands when selecting acquisition targets and establishing management strategies for open spaces. (Previously SA #3)	See response in SA #5 above.
	7	520	Identify and promote options for landowner incentive programs, such as floodplain leasing program and conservation easements that provide compensation to landowners providing ecosystem services and seek funding mechanisms. (Previously # SA 9)	N/A in Storey County
	8	420 520	Retain lands that preserve floodplain storage which maintain and/or restore connection of river with floodplain through land acquisition, conservation easements, local open space programs, TDR and PDR Programs, and other protection methods. Pursue protection of additional acreage in flood prone areas. (Previously # SA 7)	In Storey County, there is a conservation easement for McCarren Ranch Preserve. See SA #5

SA #		CRS	SUGGESTED ACTION	2018
HIGHER REGULATORY STANDARDS (9-11)				
HIGHER REGULATORY STANDARDS (9-11)	9	430	Periodically review county ordinances that include floodplain protection as a purpose, account for the loss of floodplain storage volume, and mitigate losses through a variety of methods. (Previously SA # 11)	Floodplain Ordinance update in process (2019)
	10	430	Investigate, promote, and implement of additional flood protection measures that go beyond minimum FEMA requirements, such as improving community rating system. (Previously SA # 12)	Floodplain Ordinance update in process (2019)
	11	430	Development and adoption of consistent floodplain management ordinance language and consistent use of hydraulic model of Carson River system. (Previously SA # 13)	Floodplain Ordinance update in process (2019)
FLOOD DATA INFORMATION AND MAINTENANCE (12-21)				
FLOOD DATA INFORMATION AND MAINTENANCE (12-21)	12	410 440	Establish and adopt funding source, and protocol / procedures to consistently update watershed-wide unsteady state modeling to identify flood water storage requirements and to look at the cumulative effects of watershed development. (Previously SA #14)	N/A in Storey County portion of the Carson River Watershed, as the Carson River does not flow through the County.
	13	440	Support FEMA's Map Modernization Program and encourage FEMA to update FIRMs with current and future conditions. Significant verification of topography and other variables should be conducted prior to release of draft FIRMs. (Previously # SA 15)	This element is ongoing with FEMA.
	14		Participate in FEMA's Cooperating Technical Partner Program. (Previously SA#16)	CWSD continues to be a Cooperating Technical Partner & Counties provide input through CRC stakeholder process.
	15	410 440	Collect and Maintain up-to-date and consistent data collection which includes updating flood studies as needed and conducting new studies for significant water courses and alluvial fan areas. This data should be used to update FEMA maps and/or fill local data gaps. Complete delineation of the floodway throughout river system and incorporate into FIRMs. (Previously SA #17)	N/A in Storey County portion of the Carson River Watershed, as the Carson River does not flow through the County.
	16	410 440	Update flood studies and maps after significant flooding events. (Previously SA #18)	Flash flooding in 2017; Mark Twain Community in Dayton Valley is part of the North Dayton Valley Area Drainage Master Plan is being conducted. Throughout the county, there are many alluvial fan subject to flash flooding as a result of summertime cloudburst events.
	17	410 440	Update and Maintain Elevation Reference Marks (ERM) as- permanent monuments using NAVD88 Datum which matches base flood elevations on FEMA FIRMs. (Previously SA #19)	The need for more ERMs was discussed in the Discovery process.

	SA #	CRS	SUGGESTED ACTION	2018
			FLOOD DATA INFORMATION AND MAINTENANCE (12-21)	
FLOOD DATA INFORMATION AND MAINTENANCE (19-21)	18	410 440	Develop and maintain master list of ERMs provide to interested parties. (Previously SA #21)	The need for consistent photo-monitoring discussed in CRC River & Floodplain Working group meetings. A systematic plan to track flood events at specific sites needs to be created and implemented.
	19	350 410 440	Develop and coordinate photo-monitoring program (on-the-ground and aerial) on a watershed level to consistently document flooding and flood hazards. (Previously SA #22)	The need for consistent photo-monitoring discussed in CRC River & Floodplain Working group meetings. A systematic plan to track flood events at specific sites needs to be created and implemented.
	20	350 410 440	Establish and maintain rain gage data network in each local jurisdiction.	New Suggested Action
	21		Evaluate potential impacts due to climate variability which could include changing storm patterns, rainfall amounts, and snow levels, adding uncertainty to future conditions.	New Suggested Action
			CHANNEL MIGRATION AND BANK EROSION MONITORING (22-29)	
CHANNEL MIGRATION AND BANK EROSION MONITORING (22-29)	22	410	Document/map and update known and projected hazard areas including channel migration hazards and incorporated into planning processes. (Previously SA #23)	N/A in Storey County portion of the Carson River Watershed, as the Carson River does not flow through the County.
	23	440	Conduct LiDAR and/or aerial photography (on a watershed level) on a 5-year basis, or as needed, to provide updated information on channel movement and floodplain condition. (Previously SA #24)	N/A in Storey County portion of the Carson River Watershed, as the Carson River does not flow through the County.
	24	430	Conduct research and establish appropriate building set-backs in flood hazard areas to reduce severe hazards from channel migration. (Previously SA #25)	N/A in Storey County portion of the Carson River Watershed, as the Carson River does not flow through the County.
	25	410 440	Conduct and document channel cross-sectional surveys to track long term changes in river channel. (Previously SA #26)	N/A in Storey County portion of the Carson River Watershed, as the Carson River does not flow through the County.
	26	410 440	Identify unstable stream banks and areas with high potential for erosion. (Previously SA #27)	N/A in Storey County portion of the Carson River Watershed, as the Carson River does not flow through the County.
	27	510	Promote the use of non-structural, bio-engineering (soft-engineering utilizing natural materials) techniques in river restoration projects in combination with other proven methods. (Previously SA #28)	N/A in Storey County portion of the Carson River Watershed, as the Carson River does not flow through the County.
	28	440 510	Update the 1996 Fluvial Geomorphic Assessment and create a sediment transport model of the Carson River. (Previously SA #27)	N/A in Storey County portion of the Carson River Watershed, as the Carson River does not flow through the County.

SA #		CRS	SUGGESTED ACTION	2018
	29	440 510	Create a baseline study that informs management and project decisions regarding flood risks, damages, and ecosystem impacts. (Previously SA #28)	New Suggested Action
FLOODPLAIN AND FLOOD HAZARD OUTREACH AND EDUCATION (30-34)				
FLOODPLAIN AND FLOOD HAZARD OUTREACH AND EDUCATION (30-34)	30	330	Continued implementation of watershed-wide outreach and education program about floodplain importance and flooding hazards.	This program was developed in 2014 and continues throughout the watershed. (See SA #31). Significant outreach and education has occurred. Carson City staff participates in Flood Awareness outreach efforts throughout the year.
	31	330	Promote and participate in Annual Flood Awareness Week (FAW) and events throughout the year with the objective of providing information about protection of floodplains, flooding and flood hazards to the general public.	NV Department of Water Resources leads FAW Working group which includes CWSD, Federal, State and Local Jurisdictions. Significant outreach and education has occurred. Flood Awareness planning and outreach efforts are ongoing.
	32	330	Develop and update media in conjunction with FAW working group (social media, videos, brochures, web content, press releases etc.) for distribution throughout watershed with consistent messages and information for the general public.	Information posted on CWSD.org and Nevada Floods.org, and County Websites and social media sites.
	33	330	Promote FAW partner websites (e.g., NevadaFloods.org, National Weather Service, CWSD, and county websites) which provide information on the Regional Floodplain Management Plan, floodplain protection, flood risk, emergency preparedness, and emergency contact information. Link to one another's websites and social media sites to amplify message.	In conjunction with Flood Awareness Campaign led by NDWR, CWSD, NOAA -NWS Reno specifically address flood risk and local jurisdictions have websites as well which also link to these websites. Information is also posted on County Websites and social media sites.
	34	330	Utilize special Events, River Work Days, and other outreach opportunities in conjunction with FAW working group to raise awareness of flooding hazards and importance of floodplains.	FAW Events occur throughout the year at such events as National Night Out, Agricultural Safety Day at the Carson City Fair, CWSD school outreach program, and during outreach presentations about new flood studies. Also provide flood information at county offices, local businesses, community center. A flood awareness display will be at library 12/2018, 11/2018 and scheduled for October, November, or December in 2020,2021 & 2022.
REDUCE INFRASTRUCTURE IMPACTS (35-39)				
UCTURE -39)	35	510 540	Investigate opportunities and implement actions when feasible to remove existing restrictions, such as berms or uncertified levees, to allow flood waters to access floodplain.	N/A in Storey County
	36	510	Limit the use of future management measures such as dams, levees, and floodwalls.	N/A in Storey County

	SA #	CRS	SUGGESTED ACTION	2018
REDUCE INFRASTR IMPACTS (35-	37	540	Design future bridges and roads to protect floodplain and accommodate rather than restrict river course changes, and minimize back up of flood water.	N/A in Storey County
	38		Investigate opportunities to enhance grade control structures.	N/A in Storey County
	39		Inventory, categorize, and house data regarding public and private drainage and flood control infrastructure in the Carson River Watershed.	New Suggested Action; Storey County is conducting area drainage master plan for Mark Twain Community in Dayton Valley. Storey County has also recently completed an overhaul of the Stormwater System in Virginia City with USDA funding.
ALLUVIAL FAN HAZARD REDUCTION (40-43)				
ALLUVIAL FAN HAZARD REDUCTION (40-43)	40	440	Investigate extent of potential alluvial fan flood damage and include on maps.	New Suggested Action
	41	440	Conduct Area Drainage Master Plans for alluvial fans which examines infrastructure, land use, sediment transport to identify & identify alternative to mitigate and/or reduce risk.	New Suggested Action
	42	440 530	Implement studies to inform and motivate land use planning & development which protects high risk areas, and/or allows flood waters and debris flows to safely move through fan flood zones;	New Suggested Action
	43		Define and implement means to protect existing open alluvial fans, implement recommendations associated with SA#'s 38-40 to limit further development and/or alleviate hazards in high risk areas.	New Suggested Action
MINIMIZE STORMWATER IMPACTS (44-48)				
MINIMIZE STORMWATER IMPACTS (44-48)	44	450	Promote stormwater infiltration rather than direct outflow to urban infrastructure, ditches, creeks, rivers to capture groundwater, improve water quality, and reduce flood risk.	New Suggested Action
	45	450	Plan for and mitigate cumulative effects of watershed urbanization, including stormwater runoff, to reduce flood hazards. (Previously SA #5)	Storey County has also recently completed an overhaul of the Water and Stormwater System in Virginia City with USDA funding. Prior to the overhaul, they were on one system.
	46	450	Encourage and incorporate low impact development (LIDs) principles into all development proposals to decrease stormwater run-off, improve water quality, and promote groundwater recharge. (Edited from Former SA #8)	CWSD prepared an LID report; the CRC Floodplain and River Management working groups selected updating LID ordinances with 208 funding. Once LID ordinance update is completed, the CRC FRM working group chose to conduct pilot projects with future Clean Water 208 funding.
	47	450	Encourage adoption of model LID ordinances created for Watershed.	LID Ordinance being conducted through CWSD with 208 Funding.
	48	320 450	Promote and utilize best management practices to reduce urban runoff (Refer to SA #5)	New Suggested Action

Appendix F Risk MAP Charter & FEMA CTP Agreement

F1: Risk MAP Charter

F2: FEMA CTP Agreement

Appendix F Risk MAP Charter & FEMA CTP Agreement

F1: Risk MAP Charter

Risk MAP Charter for the Carson River Watershed

Purpose:
Working in a close collaborative effort, Carson Water Subconservancy District (CWSD), FEMA Region IX (FEMA), U.S. Army Corps of Engineers (USACE), U.S. Geological Survey (USGS), U.S. Department of the Interior Bureau of Reclamation (USBR), State NFIP Coordinator, State Hazard Mitigation Office, and other partners (as listed on page 5) will identify, assess, communicate, and plan for flood risk within the Carson River Watershed (watershed), which includes portions of Alpine County in California and Douglas, Carson City, Storey, Lyon, and Churchill Counties in Nevada. The flood risk information provided can be used to enhance hazard mitigation plans, make informed decisions to improve resilience after flooding, protect the beneficial functions of floodplains, and raise awareness about local flood risks.

This charter:

- Details the long-term flood hazard mapping vision for the watershed;
- Describes the desired mapping, assessment, planning information, and planning products;
- Describes the assistance that CWSD and FEMA will provide;
- Summarizes local flooding concerns and indicates areas where floodplain changes are expected; and
- Describes the roles and responsibilities of the CWSD, FEMA, and other signatory partners.

Watershed Vision:
In 2008, all counties along the Carson River adopted the "Carson River Watershed Floodplain Management Plan" (FPM Plan) that describes the long-term goals and objectives for floodplain management. These goals are based on identification and mapping of floodplains to create a broad-based awareness of flood hazards and provide the data necessary to support community floodplain management programs. The mapping program will provide many benefits to watershed communities, property owners, and citizens. These include:

- Increased public awareness and action to reduce risk to life and property;
- Ability to build upon flood hazard data and maps produced during the Flood Map Modernization (Map Mod) program;
- Assess present and future risk;
- Address gaps in flood hazard data to form a solid foundation for risk assessment and floodplain management and provide entities with information needed to mitigate flood-related risk;
- Protection of the natural and beneficial function of drainage-ways and floodplains, including trail corridors, parks, recreational areas, wildlife habitat, flood storage, and groundwater recharge; and,
- Encouraging "Good Neighbor Policies" throughout all communities within the watershed.

Mapping and Assessment:
The watershed experiences flooding incidents on an average of every five years. Types of flood hazards include riverine and alluvial fan flooding and debris flows. Major flood events are typically the result of rain-on-snow events. Flood storage in the upper watershed is limited and available storage is not regulated. Therefore, flood flows are not actively managed and large flows can occur downstream. The watershed contains areas of open floodplains that are continually under threat of change and development. The FPM Plan calls for the protection of the natural function of these floodplains, especially lands within Carson Valley, which provide the bulk of the flood storage for the entire watershed.

Based on previous studies, information obtained during community public meetings for the development of the FPM Plan, and discovery meetings for mapping activity statements, a Five-Year Master Mapping Plan was developed for the watershed. The plan identifies the sequence of work to be performed in order to meet the goals and objectives for floodplain mapping and associated assessments and is consistent with the community goals described in the FPM Plan.

Regulatory Products:
FEMA will provide Alpine, Douglas, Carson City, Lyon, and Churchill Counties with the following updated regulatory products to support floodplain management and flood insurance administration.

- **Flood Insurance Study (FIS) Report:** The FIS describes the county's flood history and provides technical information on the study.
- **Flood Insurance Rate Map (FIRM):** The FIRM identifies the county's flood hazard zones, base flood elevations, and floodway boundaries. This map is also used to determine where flood insurance may be required.

Flood Risk Products:
CWSD and partners will work closely with FEMA to produce the products listed below which identify locations and causes of flood hazard changes and quantify the risks associated with those changes. This will allow Alpine, Douglas, Carson City, Lyon, and Churchill Counties to use these updated data and products to make informed hazard mitigation, land use and development, and emergency management decisions.

- **Changes Since Last Flood Insurance Rate Map (FIRM):** Changes since the last FIRM identify areas where the floodplain, floodway, and/or flood zone designations have changed since the previous flood study. Engineering factors that may have contributed to any changes will also be identified.
- **Areas of Mitigation Interest:** Areas of mitigation interest identifies areas where conditions may contribute to the severity of the flood hazard and associated losses. These include areas with a history of flood claims, hydraulic or other structures that contribute to backwater impacts, and areas experiencing land use change or development.

FEMA Resources to Support Flood Mitigation Actions:
FEMA encourages floodplain management activities that exceed minimum requirements through programs such as the Community Rating System (CRS). The watershed currently has two CRS communities, Douglas County and Carson City. FEMA also offers Hazard Mitigation Assistance grant programs that fund eligible mitigation activities which reduce disaster losses and protect life and property from future disaster damage. Information on these programs will be provided, along with other related State, Federal, and association resources throughout the project.

Communication and Coordination:
FEMA, CWSD, and partners will work together to establish a consistent flow of information about project status, timelines, and next steps. In addition to regular status reports, CWSD will coordinate with the counties, cities, and other entities in the watershed. CWSD will establish a Flood Mapping Project Management Team (PMT) that will meet on a regular basis to ensure that the goals of this charter are implemented in a coordinated manner. The PMT includes representatives from all counties, cities, Federal, State, and other governmental entities throughout the watershed. CWSD is also the coordinating entity for the Carson River Coalition (CRC), a large watershed-wide stakeholder group. The CRC will be provided opportunities to review and comment on mapping programs and the implementation of the living river concept as described in the adopted Carson River Watershed Regional Floodplain Management Plan.

FEMA will work with Alpine, Douglas, Carson City, Lyon, and Churchill Counties to enhance their ability to communicate flood hazards and associated risk to people who live and work within the watershed.

Specific meetings for each phase of mapping include:

- **PMT Meetings**: These meetings will focus on setting project expectations, roles and responsibilities of the PMT, and on validating and gathering data.
- **Community Coordination Officer (CCO) Meeting/Open House**: Local officials will be provided with FIS and FIRM information and requirements for map adoption. Meetings will be closely followed by open house meetings where FEMA, CWSD, and local community officials will present project results to local citizens and explain the impact that the results will have on development, planning, and flood insurance.
- **Flood Study Review Meeting**: Local officials, State, Federal, Tribal, and non-governmental entities will be provided the opportunity to view and comment on drafts of the engineering analyses and flood risk data. This meeting may also include highlights of hazard mitigation planning and implementation of best management practices to reduce flood hazards in the watershed.

Roles and Responsibilities:
This Risk MAP Charter represents a good-faith effort by all parties to share data, communicate findings, and plan mitigation activities to protect the communities within the watershed from flood risk. It is not legally binding nor does it preclude a community from participating in the FIRM appeal process. The parties listed in the signature block

below agree to collaborate on flood hazard identification activities, risk analysis products, and will consult with each other to integrate contributions into flood hazard identification efforts. It is intended to provide a common "Good Neighbor" strategy to address flood hazards and increase resilience within the watershed.

FEMA and CWSD will provide local officials with regular updates on project status, the data and products described above, and outreach guidance to include local awareness of flood risk. These efforts will better enable local communities to take action to reduce risk, through the adoption of the maps, development or enhancement of mitigation plans, and increased communication with citizens to inform them of their risk and the steps that they can take to mitigate that risk.

Alpine, Douglas, Carson City, Lyon, and Churchill Counties, and other entities will provide input and updates throughout the study process to verify data and ensure that the information accurately represents their communities.

CWSD, FEMA, and local officials agree to communicate as needed over the course of each project outlined in the mapping program to review project milestones, outcomes, and impacts. CWSD and the PMT will meet at least twice a year to discuss, plan, and coordinate all mapping program projects.

If for any reason an entity who is a signatory to this document wishes to withdraw their participation from the Risk MAP Charter, they may do so at any time by submitting a written request to CWSD.

We, the undersigned, agree to work together to implement this Risk MAP Charter for the Carson River Watershed to the best of our abilities and within our legal authorities and delegations.

Chuck Roberts, Chairman
Carson Water Subconservancy District
Date Signed: 2/28/12

Sally Ziolkowski, Director
FEMA Region IX Mitigation Division
Date Signed: 2/13/2012

Alicia Kirchner, Chief
USACE Sacramento District,
Planning Division
Date Signed: 3-15-12

Kim Davis, NFIP Coordinator
Jason King, State Engineer
Nevada Division of Water Resources
Date Signed: 12/28/12

Elizabeth Ashby
Nevada Department of Public Safety
State Hazard Mitigation Office
Date Signed: 23 Feb 2012

Henry Skip Veatch, Chairman
Board of Supervisors
Alpine County, California
Date Signed: 2/21/2012

Lee Bonner, Chairman
Board of Commissioners
Douglas County, Nevada
Date Signed: 3/9/12

Bob Crowell, Mayor
Carson City, Nevada
Date Signed: 2/14/2012

Chuck Roberts, Chairman
Board of Commissioners
Lyon County, Nevada
Date Signed: 2/23/12

Norman Frey, Chairman
Board of Commissioners
Churchill County, Nevada
Date Signed: February 15, 2012

Kenneth Parr, Area Manager
U.S. Bureau of Reclamation
Lahontan Regional Office
Date Signed: 04/16/12

Ernest Schank, President of the Board of Directors, Truckee-Carson Irrigation District
Date Signed: 4/11/2012

Jon Mittelstadt, Meteorologist in Charge
National Oceanic & Atmospheric Administration
National Weather Service - Reno, NV
Date Signed: 4-26-2012

Alpine, Douglas, Carson City, Lyon, Storey, and Churchill Counties, and other entities will provide input and updates throughout the study process to verify data and ensure that the information accurately represents their communities.

CWSD, FEMA, and local officials agree to communicate as needed over the course of each project outlined in the mapping program to review project milestones, outcomes, and impacts. CWSD and the PMT will meet at least twice a year to discuss, plan, and coordinate all mapping program projects.

If for any reason an entity who is signatory to this document wishes to withdraw their participation from the Risk MAP Charter, they may do so at any time by submitting a written request to CWSD.

We, the undersigned, agree to work together to implement this Risk MAP Charter for the Carson River Watershed to the best of our abilities and within our legal authorities and delegations.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be signed and intend to be legally bound thereby.

STOREY COUNTY

Marshall McBride, Chairman — Date
Storey County Board of County Commissioners

10-4-16

ATTEST:

Vanessa Stephens, Clerk-Treasurer

Appendix F Risk MAP Charter & FEMA CTP Agreement

F2: FEMA CTP Agreement

Cooperating Technical Partners
Memorandum of Agreement

FEDERAL EMERGENCY MANAGEMENT AGENCY

and the

CARSON WATER SUBCONSERVANCY DISTRICT, NEVADA

AGREEMENT is made on *(date)* June 6, 2005, by these parties: Carson Water Subconservancy District and the Federal Emergency Management Agency (FEMA).

BECAUSE the National Flood Insurance Program (NFIP) established by the National Flood Insurance Act of 1968 has several purposes, the most significant being

- To better indemnify individuals from losses through the availability of flood insurance;
- To reduce future flood damages through community floodplain management regulations; and
- To reduce costs for disaster assistance and flood control.

BECAUSE a critical component of this program is the identification and mapping of the nation's floodplains to create a broad-based awareness of the flood hazard and to provide the data necessary for community floodplain management programs and to actuarially rate flood insurance;

BECAUSE the Federal Emergency Management Agency (FEMA) administers the National Flood Insurance Program (NFIP) and is authorized by §1360 of the National Flood Insurance Act of 1968, as amended (42 U.S.C. 4101), to establish and update flood-risk zone data in floodplain areas. Further, in the identification of flood-prone areas, FEMA is authorized to consult with, receive information from, and enter into agreements or other arrangements with the head of any State, regional, or local agency;

BECAUSE FEMA encourages strong Federal, State, regional, and local partnerships for the purposes of reducing flood losses and disaster assistance; and FEMA and its State, regional, and local partners have determined that it is advantageous to encourage and formalize greater cooperation in the flood hazard identification and mapping processes; and many communities and the agencies that serve them have developed considerable technical capabilities and resources that provide the opportunity to improve and expand the collection, development, and evaluation of flood hazard data; and

BECAUSE the Carson Water Subconservancy District has expressed a desire to perform certain functions in the flood hazard identification process and has provided evidence that it has sufficient technical capability and will dedicate the resources necessary to perform those functions.

NOW THEREFORE, it is mutually agreed that the parties enter into this agreement to work together to create and maintain accurate, up-to-date flood hazard data for the counties of Douglas, Carson City, Churchill and Lyon, Nevada and Alpine, California, subject to the terms and conditions recited below.

1. CONSULTATIONS

The parties shall collaborate on flood hazard identification activities and shall consult with each other to fully integrate each other's contributions into flood hazard identification efforts.

2. EVALUATION AND REPORTING

The parties shall annually review the partnership created by the agreement to determine and document the activities undertaken to maintain accurate flood hazard data.

3. RESOURCE COMMITMENT

The parties agree to commit the appropriate human, technical, and available financial resources sufficient to coordinate effectively with all entities impacted by flood hazard identification efforts to implement this agreement.

4. STANDARDS

Unless otherwise agreed to by the parties, all flood hazard identification activities will be accomplished in accordance with the standards documented in *Guidelines and Specifications for Flood Hazard Mapping Partners*, dated April 2003, and all subsequent revisions.

5. SPECIFIC INITIATIVES

When specific initiatives, projects, or activities are to be performed, they will be forward through and negotiated by the Carson Water Subconservancy District and shall be attached as negotiated Mapping Activity Statement (MAS) items. For this Memorandum of Agreement to go into effect, no MAS items are required.

6. TERM

The respective duties, responsibilities and commitments of the parties in this agreement shall begin on the date this Agreement is signed by the parties and may be periodically renewed, revised, or terminated at the option of any of the parties. The parties agree that a 60-day notice shall be given prior to the termination of this agreement.

THEREFORE, each party has caused this Agreement to be executed by its duly authorized representatives on the date mentioned above.

Carson Water Subconservancy, Authorized Representative*

4/21/2005
Date

FEMA authorized representative

06/6/05
Date

* The Carson Water Subconservancy District is composed of the following entities:

Carson City, Nevada
Churchill County, Nevada
Douglas County, Nevada
Lyon County, Nevada
Alpine County, California

Appendix G Adoption of RFMP

2013 Adoption Documents are attached.

2018 Adoption Documents will be added once adopted by each County.

11.2 9:30 am Discussion and possible action regarding approval and adoption of the 2013 updates to the Carson River Watershed Regional Floodplain Management Plan (RFMP).– Supervisor District 1

Supervisor Jardine introduced Carson Water Subconservancy District Executive Director Ed James.

James reported that the Regional Management Floodplain Management Plan was adopted in 2008 and would be periodically updated every five years; the focus of the plan was to avoid nonstructural projects and to keep the rivers natural. James reported that the charter identified working with FEMA from the ground workers to the policy makers; an appendix that includes emergency impacts will be included with the charter.

In response to Supervisor Rakow's question regarding the Pinenut Range area hazard mitigation plan, James reported that it was the responsibility of the Town of Gardnerville and he was unsure of the involvement of the Town of Gardnerville communicating with the Washoe Tribe.

MOTION Jardine / SECOND Rawson approving Contract No. CC2013-89 adoption of the 2013 updates to the Carson River Watershed Regional Floodplain Management Plan (RFMP).
ALL AYES; MOTION CARRIED.

11.3 9:30 am Discussion regarding the Comprehensive Regional Water System Report and overview of the Bureau of Reclamation Plan of Study by Carson Water Subconservancy District Staff. – Supervisor District 1

Carson Water Subconservancy District Executive Director Ed James reported that the report examined future water demands that did not impact the environment and agriculture; maximizing the water resource through the cheapest alternative; meeting the water quality standards. James reported that Desert Research Institute (DRI) would be conducting the analysis; the planning study will be completed and then a more in depth basin study.

11.4 9:30 am Discussion and possible direction regarding the future utilization of Lost Lakes water rights. – Supervisor District 1

Carson Water Subconservancy District Executive Director Ed James reported that the Carson Water Subconservancy District purchased Lost Lakes water rights in 2001; this allows the District to store water in the summer for recreation and during the fall release water for agriculture; the District invested over $330,000 for water rights and $160,000 in operation costs. James reported that the annual safety fees have jumped from $1,100 to $5,000.

James reported that the District was looking at several options: keep the system as it is (research how to lower cost); submit to the Nevada Legislature that the District was an environmental exemption; move the water rights downstream to Indian Creek Reservoir (contact South Tahoe Public Utility District); possibly selling. James reported that the District would discuss at their 10/16 meeting.

In response to Supervisor Rawson question regarding support, James reported that it would be helpful if the Board would appeal to legislatures and contacts.

Supervisor Jardine requested that this item be placed on the next agenda.

11.5 Request adoption of resolution establishing the position of Alpine County Chief Probation Officer to be a critically needed position and approval of a contract employee agreement by and between Alpine County and Gordon Morse, Chief Probation Officer effective October 16, 2013 through October 16, 2014 and direction to auditor to make budget appropriations. - Management Analyst

Management Analyst Sarah Simis requested to continue this item to address fiscal impact.

This item was continued.

extension is being requested at the last minute. He indicated they will file a lawsuit once the tolling agreement expires. He does not think Max Baer has anything to do with the dirt and we should not be waiting for him to resolve the issue with the casino site.

Chairman Lynn cannot make the connection between extension of the tolling agreement and the dust problem. The tolling agreement and the dust issue are two separate issues.

Commissioner Bonner mentioned there is really not a project to go on there yet. Nothing is in the works; the county has not seen any plans. Everyone would like to see something go up there for a variety of reasons. Michael Hohl is trying to work with the county in good faith so possibly raising the dust issue with him would help.

Commissioner McDermid does not want to see the dust continue either. NDEP is the regulating agency and that puts the county second. Everyone would have liked to have the tolling agreement deadline met but the complications with the other lawsuits has made that impossible thus the request to extend the agreement.

Ms. Gregory added not extending the tolling agreement would not mean something would be developed there. At the end of the tolling agreement, the county would look at options including pursuing litigation. As part of that litigation, the county would ask the court to void the Development Agreement at which point they could develop at any point in time they wanted. The tolling agreement does not force development which addresses the dust issues that are being raised. It would not address the dust issues.

MOTION by Johnson/McDermid to authorize the District Attorney's Office and Mark Bruce, Esq., on behalf of the County and RDA to negotiate an amendment to the current Tolling Agreement, with the Riverwood Parties, including extending the period of time the Riverwood Development Agreement litigation claims would be tolled and authorize the County Manager to execute any and all documents reasonably necessary to amend the Tolling Agreement; carried unanimously.

COMMUNITY DEVELOPMENT

8. For possible action. Discussion to approve an update to the Carson River Watershed Regional Floodplain Management Plan.

Brenda Hunt, CWSD Watershed Coordinator, provided an update and progress report on the plan including a history of the plan, strategies in the document, revisions to the original document, and the update process followed.

No public comment.

MOTION by Penzel/McDermid to approve an update to the Carson River Watershed Regional Floodplain Management Plan, based on the discussion in the attached memorandum from the Carson Water Subconservancy District staff; carried unanimously.

9. For possible action. Discussion on adoption of Ordinance 2013-1399 amending Douglas County Code Chapters 20.800, 20.820, and Title 20 – Appendix B of the Consolidated Development Code by adopting with stated revisions the 2012 International Building Code, the 2012 International Residential Code, the 2012 Uniform Mechanical Code, the 2012 Uniform Plumbing Code, the 2011 National Electrical Code, the 2009 International Energy Conservation Code, and providing for other properly related matters. (2nd reading)

Dave Lundergreen, Building Official, stated there have been no changes to the Ordinance since its introduction. He summarized the significant changes in the new Codes. Outreach to contractors, builders, and government officials took place to review the changes. These changes will become effective October 1, 2013 if this is adopted by the Board today.

No public comment.

MOTION by McDermid/Penzel to adopt Ordinance 2013-1399 amending Douglas County Code Chapters 20.800, 20.820, and Title 20 – Appendix B of the Consolidated Development Code by adopting with stated revisions the 2012 International Building Code, the 2012 International Residential Code, the 2012 Uniform Mechanical Code, the 2012 Uniform Plumbing Code, the 2011 National Electrical Code, the 2009 International Energy Conservation Code, and providing for other properly related matters; carried unanimously.

10. For possible action. Discussion to approve an amendment to a Grant of Conservation Easement between John C. and Virginia S. Henningsen Nevada Trust of 1996, the Frensdorff Trust, and Douglas County (ref. DA 12-010), the First Amendment to Document #0605596, Bk 0204, Pg(s) 10905-10906 to relocate 0.76 acres of the existing 100.48 acre Conservation Easement. The subject easement is near 1140 Waterloo Lane, located on a total of five parcels (APNs: 1220-05-000-003, -004, -005, -006, & -007) in the South Agricultural Community Plan, and zoned A-19 (Agriculture – 19 acre minimum parcel size). The Board of Commissioners may approve, approve with modifications, or deny the request.

RESOLUTION NO. 2013-R-40

A RESOLUTION TO ADOPT THE CARSON RIVER WATERSHED REGIONAL FLOODPLAIN MANAGEMENT PLAN SUPPLEMENTAL UPDATE

WHEREAS, the Carson River flows through Carson City and is a valuable natural resource; and

WHEREAS, Carson City recognizes that flooding has and will continue to cause economic losses and threats to human life and health throughout the entire Carson River Watershed; and

WHEREAS, allowing the Carson River to access its floodplain provides public safety, slows flood waters, reduces peak flows, provides recharge to groundwater basins, and protects wildlife habitat; and

WHEREAS, a regional approach to floodplain management benefits Carson City and all other communities in the Carson River Watershed; and

WHEREAS, the Carson River Watershed Regional Floodplain Management Plan Supplemental Update provides a variety of strategies for floodplain management and protection of floodplain function.

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NOW, THEREFORE, the Board of Supervisors hereby resolves to adopt the Carson River Watershed Regional Floodplain Management Plan Supplemental Update and will strive to work cooperatively with the Carson Water Subconservancy District and other organizations and communities to continue to implement the suggested actions presented in the Plan.

Upon motion by Supervisor John McKenna, seconded by Supervisor Brad Bonkowski, the foregoing Resolution was passed and adopted this 17th day of October, 2013, by the following vote:

AYES:	Supervisor John McKenna Supervisor Brad Bonkowski Supervisor Karen Abowd Supervisor Jim Shirk Mayor Robert Crowell
NAYS:	None
ABSENT:	None
ABSTAIN:	None

ROBERT L. CROWELL, Mayor

ATTEST:

For: ALAN GLOVER, Clerk - Recorder

22. For Possible Action: Presentation of the Comprehensive Regional Water System Report and overview of the Bureau of Reclamation Plan of Study by Carson Water Subconservancy District Staff

Ed James of the Carson Water Subconservancy District presented. He explained this will not supersede any master plan. He presented a brief overview of the comprehensive regional water management plan they have been working on. The focus of this plan concentrated on the municipal water supply. With the grant funds, they were looking at developing a comprehensive regional water conservation plan. He also discussed the water shed. Our largest water storage facility is located at Lahontan Reservoir. He explained that current water needs are being met. He also discussed threats and other impacts to our water supplies. He discussed tying water lines together for efficiency. He explained they will continue providing information to our utilities.

There was no action taken.

23. For Possible Action: Regarding approval and adoption of the 2013 updates to the Carson River Watershed Regional Floodplain Management Plan (RFMP) (requested by Carson Water Subconservancy District)

Brenda Hunt of Carson Water Subconservancy District presented power point on the regional Floodplain Management Plan. Staff anticipates update within the next three years.

Comm. Fierro made a motion for the approval and adoption of the 2013 updates to the Carson River Watershed Regional Floodplain Management Plan. Comm. Hastings seconded and the motion passed unanimously 5 – 0.

24. For Possible Action: Appeal of Planning Director's denial of an application for an administrative variance and also appeal of subsequent denial of appeal to the Lyon County Planning Commission for property, owned by Jack F. & Maria S. Staten, APN 016-311-08 (requested by applicants)

Jack Staten wants to divide a parcel to allow him to build a home for employees that relocated from Texas.

Comm. Fierro asked Rob Loveberg why planning was not in favor.

Rob Loveberg explained that county code requires that with an administrative variance application, the planning director need to find there is self-evident undue hardship. That is a higher standard than is required for a general variance that can be granted by the planning commission. Rob Loveberg submitted a letter stating reasons for the denial. He discussed the county code with the District Attorney. Rob Loveberg was unable to find an undue hardship.

The Planning Commission made a decision to uphold the denial.

The commissioners had discussion and questions.

Comm. Fierro said we need to stick to the hardship provision addressed in Lyon County Code. In his opinion there is no hardship.

District Attorney Bob Auer explained that the term hardship as it relates to a variance has to relate to the piece of property. There has to be something about the property itself that creates the hardship.

Mr. Staten showed a boundary line adjustment map signed by Rob Loveberg in 2009.

Comm. Fierro moved to deny the appeal of the administrative variance for Jack & Maria Staten, due to the following findings: A. That there are sufficient reasons presented to support the Planning Director's finding that undue hardship is not self-evident. B. That there is sufficient evidence presented to support the Planning Director's decision of denial of the requested Administrative Variance. C. That there are not special circumstances or conditions applying to the property under consideration which makes compliance with the provisions of this Title

DOC # 437853
10/24/2013 10:13 AM
Official Record
Recording requested By
CHURCHILL COUNTY
Churchill County - NV
Joan Sims - Recorder
Page 1 of 19 Fee
Recorded By. TH RPTT
437853

RESOLUTION 30-2013

A RESOLUTION ADOPTING THE CARSON RIVER WATERSHED REGIONAL FLOODPLAIN MANAGEMENT PLAN SUPPLEMENTAL UPDATE 2013.

WHEREAS, the Carson River flows through Churchill County and is a valuable natural resource; and

WHEREAS, Churchill County recognizes that flooding has and will continue to cause economic losses and threats to human life and health throughout the entire Carson River Watershed; and

WHEREAS, allowing the Carson River to access its floodplain provides public safety, slows flood waters, reduces peak flows, provides recharge to groundwater basins, and protects wildlife habitat; and

WHEREAS, a regional approach to floodplain management benefits Churchill County and all other communities in the Carson River Watershed; and

WHEREAS, the Carson River Watershed Regional Floodplain Management Plan provides a variety of strategies for floodplain management and protection of floodplain function.

NOW, THEREFORE, the Churchill County Board of Commissioners hereby resolve to adopt the Carson River Watershed Regional Floodplain Management Plan Supplemental Update

2013 and will strive to work cooperatively with Carson Water Subconservancy District and other organizations and communities to implement the suggested actions presented in the plan.

ADOPTED this 16th day of October, 2013.

THOSE VOTING AYE: Pete Olsen
Harry Scharmann
Carl Erquiaga

THOSE VOTING NAY: N/A
N/A
N/A

CHURCHILL COUNTY BOARD OF COMMISSIONERS

Carl Erquiaga
Chairman Carl Erquiaga

ATTEST:

Pamela D Moore
Deputy Clerk of the Board