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EXECUTIVE SUMMARY

This Flood Mitigation Plan (FMP) was prepared on behalf of the Tehama County Flood Control and Water Conservation District (District).

The purpose of this FMP is to identify and characterize hazards and risks associated with flooding in Tehama County and to develop an Action Program comprised of mitigation measures to reduce or eliminate long-term risks to people and property. This FMP has been prepared to facilitate serving the flood hazard element of a Multi-Hazard Mitigation Plan that Tehama County may prepare in the future to meet the requirements of the Disaster Mitigation Act of 2000 (DMA 2000), and to qualify the County for flood mitigation project funding through the Federal Emergency Management Agency (FEMA). The FMP and implementation thereof will provide the opportunity for Tehama County to participate in FEMA's Community Rating System (CRS) Program.

Since 1950, the State of California has proclaimed Tehama County in nine states of emergency due to flooding and residents have received nearly \$2 million in flood insurance claims during the period 1978 to 2005, within the incorporated and unincorporated areas of Tehama County. Repetitive losses associated with 93 repetitive loss properties amount to nearly \$1.2 million. The amount paid through documented Damage Survey Reports (DSRs) associated with declared disasters amounts to nearly \$3 million. Although not documented, damages incurred by citizens of Tehama County are known to be substantial; however, the individual property owners have borne the entire cost of repair, thus the amount cannot be quantified.

The type and rate of flooding experienced in Tehama County varies. Along the Sacramento River the depth and timing of flooding is somewhat predictable with information from the forecast in flood releases from Shasta Dam and stream flow gages on major tributaries between Shasta Dam and Tehama County. On the valley floor, however, the flooding occurs quickly both east and west of the Sacramento River without advance warning, which causes widespread flooding of property and primary transportation routes. This renders ingress and egress problematic for extended periods of time.

The process followed in preparing the FMP and the FMP itself follows the approach and guidelines prescribed by FEMA. A steering committee comprised of representatives of Tehama County, the Sheriff's Office, the California Department of Water Resources (DWR), the California Department of Forestry and Fire Protection, the Sacramento River Conservation Area Forum, and the cities of Tehama and Corning. The main function of the steering committee was to provide background data and information, guidance in planning and conducting the public meetings, and input and review of the FMP. Public meetings and presentations were conducted to obtain input and concerns on flood-related issues with follow-up reconnaissance to observe field conditions within flood prone areas.





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The FMP addresses the flooding hazards in Tehama County by providing the following:

- A risk assessment component, which characterizes the flooding hazards.
- A vulnerability assessment to flooding, which includes an inventory of critical facilities and the values of improvements in areas prone to flooding but not necessarily within a FEMA designated Special Flood Hazard Areas (SFHAs).
- An Action Program comprised of flood hazard mitigation measures to mitigate the source of flooding that cause repetitive losses and to prevent the occurrence of flood damage to other existing structures and new structures as well.
- A process to implement, monitor, evaluate, and update the FMP; continue public involvement; and to refine and implement flood hazard mitigation measures and determine appropriate timing for Corning, Red Bluff and Tehama County to participate in FEMA's CRS Program.

The Action Program presented in the FMP consists of the following:

High Priority

- Action No. 1 Formulate and Implement an "Elevation" Project to Identify Homes and Structures that Should be Elevated and Homeowners that Would be Interested in Participating in the Project
- Action No. 2 Investigate and Implement Debris Management at Bridges
- Action No. 3 Formulate and Implement Invasive Plant Species Removal and Maintenance Program
- Action No. 4 Establish a Flood Hazard Mitigation Coordinating Committee (FHMCC)
- Action No. 5 Formulate and Implement a Flood Hazard Public Outreach Program
- Action No. 6 Formulate Design Criteria and Standards to Handle Storm Runoff Quantity and Quality
- Action No. 7 Prepare Topographic Mapping of the Valley Area of Tehama County
- Action No. 8 Review, Update, and Implement Existing and/or New Ordinances
- Action No. 9 Perform a Detailed Floodplain Analysis for the Antelope-Dairyville Area to Determine Drainage Patterns, the Extent and Cause of Flooding, and to Establish BFEs to Administer the NFIP and Floodplain Management Regulations





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- Action No. 10 Formulate a Flood Hazard Mitigation Plan and Perform a Feasibility Study for the Antelope-Dairyville Area
- Action No. 11 Formulate a Flood Management Plan for Jewett and Burch Creeks in the Vicinity of Corning

Medium Priority

- Action No. 12 Determine the 100-Year Floodplain Along the Sacramento River to be Used for the NFIP – FEMA FIRM vs. USACE Comprehensive Study
- Action No. 13 Perform a Detailed Floodplain Analysis for the Gerber and Los Molinos Areas to Determine Drainage Patterns, the Extent and Cause of Flooding, and to establish BFEs to Administer the NFIP and Floodplain Management Regulations
- Action No. 14 Develop an Early Warning and Flood Alert System





ACRONYMS

BFE	Base Flood Elevation
Comp Study	Sacramento and San Joaquin River Basins Comprehensive Study (DWR)
CRS	Community Rating System
District	Tehama County Flood Control & Water Conservation District
DMA 2000	Disaster Mitigation Act of 2000
DSR	Damage Survey Reports
DWR	California Department of Water Resources
EWP	Emergency Watershed Protection Program
FEMA	Federal Emergency Management Agency
FHMCC	Flood Hazard Mitigation Coordinating Committee
FIRM	Flood Insurance Rate Map (FEMA)
FMA	Flood Mitigation Assistance
FMP	Flood Mitigation Plan
HMGP	Hazard Mitigation Grant Program
LHMP	Local Hazard Mitigation Plan
NFIP	National Flood Insurance Program
NRCS	Natural Resources Conservation Service
OES	Office of Emergency Services
PA	Public Assistance
PDM	Pre-Disaster Mitigation
RCD	Resource Conservation District
SFHA	Special Flood Hazard Areas
USACE	U.S. Army Corps of Engineers





SECTION 1.0 – INTRODUCTION

1.1 Background

Tehama County is located in the Sacramento Valley midway between the city of Sacramento and the Oregon border. The County Seat, Red Bluff, is located on Interstate 5 and the Sacramento River, and is approximately 135 miles north of Sacramento, and is one of three incorporated cities in Tehama County along with the cities of Corning and Tehama (Map 1). Tehama County encompasses an area of nearly 3,000 square miles and is divided by the Sacramento River, which flows through the county from north to south. Approximately 35 percent of the county is west of the Sacramento River and 65 percent is east. The county is bordered on the west by Trinity and Mendocino Counties along the Pacific Coast Range, Shasta County on the north, Plumas County on the east along the ridgeline of the Sierra Nevada—Cascade Mountains, and on the south by Butte and Glenn Counties.

Climate

The climate of Tehama County is characterized by warm to hot dry summers and cool wet winters. The precipitation pattern for the northern part of the Sacramento Valley is one of large cyclonic storms in the winter months and infrequent thunderstorms in the summer months. Almost all precipitation occurs in the winter months, which extends from November to April. Precipitation usually occurs as rain below the 4,000-foot elevation and as snow above 4,000 feet. The lower edge of the normal semi-permanent snow pack is approximately 5,000 feet.

The average annual precipitation in the central part of Tehama County, along the Sacramento River, is about 20 inches. The average annual precipitation along the west side and east side of the county is approximately 50 inches and 70 inches, respectively.

Physical Features

The topography of Tehama County is predominantly foothills and mountains in its eastern and western portions, and the Sacramento Valley occupies most of the area in between. The topography on the west side varies significantly from the flat valley areas of the Sacramento Valley to the mountainous upper reaches. The lowest elevation at the Sacramento River is approximately 150 feet msl increasing to the highest elevation of 8,094 feet msl at the South Yolla Bolly Mountain.

The east side of Tehama County is a wide fertile valley bordered by rolling foothills and by the Sierra Nevada—Cascade Mountains reaching an elevation of approximately 7,000 feet. The area is typified by streams that originate in the mountains and flow westerly into the Sacramento River. The stream channels are sharply incised in the narrow valley bottoms above the foothill line.





The ownership of land within Tehama County is shown on Map 2.

Population

According to the 2000 U.S. Census, the population of the unincorporated area of Tehama County had a reported population of 35,719. The county's estimated total population in 2004 was approximately 58,175, of which 37,865 resided in the unincorporated area of the county. By 2020, the population is projected to increase to 68,323 residents with approximately 47,300 residing in the unincorporated area. It is recognized that the proposed developments—Del Webb Sun City Tehama and Morgan Ranch—and the prospects of others, could alter these growth projections. The general distribution and density of the current population is shown on Map 3. Presented on Map 4 is the change in land use between 1994 and 1999, with the change in residential or urban areas highlighted.

Employment

Tehama County's unemployment rate has been higher than that of the state overall. This pattern is typical of rural counties in which agriculture has a predominant role in the economy. The unemployment rate between 1999 and 2003 ranged from 6.4 to 7.2 percent. Presented in Table 1 is the composition of the employment by industry.

Rivers and Streams

Presented on Map 5 are the principal watersheds within Tehama County. Except for small drainage areas that drain to Black Butte Reservoir and Stony Creek on the west side and Pine Creek on the east side, all water originating in Tehama County drains to the Sacramento River within the county or on the county's boundary. Cottonwood Creek and Battle Creek form the boundary between Tehama and Shasta Counties. The Sacramento River at the Red Bluff Diversion Dam drains approximately 9,150 square miles. Shasta Dam, an important flood control structure on the Sacramento River, is approximately 69 miles upstream of Red Bluff and controls runoff from approximately 6,670 square miles, or 73 percent of the Sacramento River watershed upstream of Red Bluff. Presented on Map 6 are the stream flow and precipitation stations in the county.

The principal tributaries to the Sacramento River from the west and from the east are shown on Map 5 and are listed below. In addition, there are several smaller tributaries that enter the Sacramento River in between the principal watersheds noted. Generally, the tributaries whose watersheds originate in the higher elevations in both the west and east side of the Sacramento River are perennial, whereas those originating at lower elevations are generally seasonal. The watersheds originating at the higher elevations can be seen on Map 5 and are noted as perennial in the list presented below.





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West Side Tributaries

- Cottonwood Creek (P)*
- Reeds Creek
- Red Bank Creek(P)
- Oat Creek
- Elder Creek(P)
- McClure Creek
- Thomes Creek(P)
- Jewett Creek
- Burch Creek
- Hall Creek

East Side Tributaries

- Battle Creek(P)*
- Salt Creek
- Antelope Creek(P)
- Craig Creek
- Butler Slough
- Dye Creek
- Mill Creek(P)*
- Dry Creek
- Deer Creek(P)*
- Pine Creek **

*Creeks for which a Watershed Conservancy has been formed.

**Pine Creek discharges into the Sacramento River in Butte County.

(P) Perennial Creek.

Runoff from watersheds on the west side is mostly influenced by precipitation as rain and, as a consequence, tends to be more “flashy” than runoff from streams on the east side, which are influenced to a greater extent by precipitation as snow. Nevertheless, storm runoff frequently exceeds the capacity of the stream channels. The result is widespread overland/sheet flow that floods numerous roads and mobile home parks thereby requiring the evacuation of people and moving mobile homes.

The flooding resulting from high tributary flow is exacerbated when it is coincident with high stages in the Sacramento River.

1.2 Purpose and Need

The State of California has proclaimed nine states of emergencies including Tehama County due to flooding since 1950 (Office of Emergency Services [OES], 1998). Major recorded floods occurred in December 1937, December 1955, December 1963, February 1986, January 1995, and January 1997, ranging from a 20-year to more than a 100-year storm event causing millions of dollars in property damage. Numerous road closures occur during these high runoff events, thereby isolating people and rendering access by ambulatory vehicles marginal at best.



FEMA, now a part of the Department of Homeland Security, has targeted reducing losses from natural disasters as one of its primary goals. In Northern California, flooding and





TEHAMA COUNTY FLOOD MITIGATION PLAN

fire are major natural disasters; however, the Tehama County FMP deals with flooding only, except to the extent that fire can result in exacerbating flooding. Accordingly, the District initiated the preparation of this FMP to assess flood hazards and establish strategies to reduce flood hazards and repetitive losses within the County by accomplishing the following:

- Providing a valuable planning document for use, continual update, and implementation through county programs to reduce threats to life and property and minimize repetitive losses.
- Assembling and assessing flooding hazard information within the county's watersheds. The sources of this information include the FEMA Flood Insurance Rate Maps (FIRMs), available DSRs for one time and repetitive losses, local residents, agencies, organizations, and county staff.
- Clarifying the fact that FEMA FIRMs do not necessarily reflect all the flooding hazards within the county, since they were mainly developed for flood insurance purposes and to guide the elevations of new development within the SFHAs.
- Qualifying the county to benefit from mitigation projects funding under the Flood Mitigation Assistance (FMA) Program once this FMP is approved by FEMA.
- Utilizing the information and analyses in this FMP to fulfill the flood element requirements of the Tehama County Local Hazard Mitigation Plan (LHMP). In 2001, FEMA promulgated hazard mitigation planning regulations pursuant to DMA 2000. Subsequent to November 1, 2004, FEMA requires a LHMP as a prerequisite to be eligible for hazard mitigation funding. (Detailed information about the DMA 2000 and the grants available under the program can be obtained from the FEMA Website:
<http://www.fema.gov/fima/dma2k.shtm>)
- Qualifying the county to participate in FEMA's NFIP CRS Program, and allowing county residents to be eligible for flood insurance premium reductions. The CRS gives credit points for preparing and adopting a comprehensive floodplain management plan. Additional discussion and information about FEMA's CRS Program is available at FEMA's Website:
<http://www.fema.gov/nfip/crs.shtm>)





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- Positioning the county to receive funding from the U.S. Army Corps of Engineers (USACE) for projects designed to reduce local flood damage. The USACE requires preparing a flood mitigation plan within one year of signing a project cooperation agreement and to implement the floodplain management plan no later than one year after the project is constructed. A floodplain management plan that is approved in the FEMA CRS Program is considered sufficient for being considered for funding by the USACE (USACE, 1997).





SECTION 2.0 – PLAN ADOPTION

The District, by resolution of its Board of Directors, is the entity to adopt the FMP. Presented in Appendix A is the form of the resolution that would be passed at the time the Board of Directors adopts the FMP. The general schedule for adopting the FMP is as noted below:

Review and comment of the draft FMP by the Steering Committee: August 19, 2006

Present Preliminary FMP to Board of Directors: August 22, 2006

Public meetings on the draft FMP: August 29, 2006 and August 31, 2006

Review and comment of the draft FMP by the public from August 28 through Sept. 15

Transmit FMP for review to FEMA/OES: October 20, 2006

Review and Respond to FEMA/OES Comments: (to be determined)

FMP Adoption by Board of Directors: (to be determined)





SECTION 3.0 – PLANNING PROCESS

3.1 Documentation of Planning Process

At the onset of the planning process, the District formed a Steering Committee with the purpose of:

- Monitoring and coordinating the planning process.
- Coordinating and providing input into the public involvement/meetings.
- Providing data and information to develop the FMP.

The Steering Committee was formed with the following representatives:

Brandon Konicke	Tehama County Flood Control & Water Conservation District
Burt Bundy	Sacramento River Conservation Area Forum
Carolyn Steffan	City of Tehama
Dan Burns	California Department of Forestry and Fire Protection
Dave Hayward	Tehama County Public Works Department
Dennis Garton	Tehama County Sheriffs Department
Ernie Ohlin	Tehama County Flood Control & Water Conservation District
James Little	Tehama County Building & Safety Department
Jim Troehler	California Department of Forestry and Fire Protection/Tehama County Fire Department
Todd Hillaire	California Department of Water Resources

Subsequent to the planning process being initiated and the two public meetings, the following persons joined as representatives of the Steering Committee:

John Brewer	City of Corning
Steve Kimbrough	City of Corning





Consultant representatives on the Steering Committee:

Francis Borcalli, Wood Rodgers, Inc.
Muawieh (Mike) Radaideh, Wood Rodgers, Inc.

To ensure a meaningful public involvement process, the members of the Steering Committee drafted, reviewed, and finalized the schedule, location, and notices for two public meetings that were conducted early in the planning process and one that was conducted to receive comments on the draft FMP. Presented below is a summary of the planning process and public involvement:

- Four meetings of the Steering Committee were conducted to discuss the elements of the FMP and hazards related to flooding within Tehama County, to plan the public meetings, and to review and comment on the draft FMP.
- The public meetings were publicized through different media including spot announcements on Channel 12, the District's Website, and public information notices in local newspapers.
- Two public meetings were organized and conducted to receive input on flooding and flood hazards. Input received from the meetings is summarized on Map 7. These meetings were held on:

January 19, 2006, Lassen View School in the Antelope-Dairyville Area

January 24, 2006, Veterans Hall in Corning

Copies of the PowerPoint presentations and sign-in sheets are included in Appendix B, along with a summary of written input received from meeting participants. Also enclosed is a copy of the notices that were distributed for the public meetings.

- As a follow up to the public meetings and in response to concerns expressed at the meetings, one-on-one field reconnaissance visits were conducted in the Dairyville and Corning areas affected by Jewett and Burch Creeks.
- Presentation of the draft FMP to the Board of Directors of the Tehama County Flood Control and Water Conservation District the Tehama County Board of Supervisors was made on August 22, 2006.





- Public meetings to present draft FMP and to receive comments were held on:

August 29, 2006: Lassen View School in the Antelope-Dairyville Area

August 31, 2006: Veterans Hall in Corning

Copies of the PowerPoint presentations and sign-in sheets are included in Appendix B, together with comments received at the meeting.

3.2 Local Capabilities Assessment

By virtue of an act of the State Legislature in 1957, together with amendments, the District has broad authority to perform and to collect fees and assessments to plan, design, construct, maintain, and operate facilities to minimize the risks associated with flood and storm waters. A copy of the act is included in Appendix C. By Resolution No. 7-1995, the District established a policy for repair of damaged levees and stream bank repair projects. A copy of this resolution is included in Appendix D. The District does, however, maintain federal levees along Salt and McClure Creeks (Map 8), clean creeks as a public service, and coordinate its activities with other local agencies and state and federal agencies to facilitate planning and investigative work as well as maintenance work. The District has been very active in working with FEMA and OES to address post-disaster repairs and remediation; however, there is insufficient funding to address pre-disaster planning and mitigation projects.

Technical and Human Resources

The principal local, state, and federal agencies that the District coordinates activities with to broaden the base of technical and human resources to plan hazard mitigation projects, provide flood fighting assistance, and minimize flood risks include the following:

Local Agencies

Tehama County Planning and Safety Department
Tehama County Public Works Department
Tehama County Resource Conservation District
Tehama County Sheriffs Department
Vina Resource Conservation District

State Agencies

California Department of Forestry and Fire Protection
California Department of Water Resources
California Office of Emergency Services





Federal Agencies

Federal Emergency Management Agency
U.S. Department of Agriculture, Natural Resource Conservation Service
U.S. Army Corps of Engineers

Financial Resources

Budgetary constraints have limited the availability of funding for various floodplain management, mitigation, and preparedness activities. However, this FMP and the Tehama County LHMP, which is anticipated to be developed soon, establishes eligibility for funding under several programs, including FEMA's Pre-Disaster Mitigation (PDM) Program, the FMA Program, the Hazard Mitigation Grant Program (HMGP), the Public Assistance (PA) Program, the California Resources Agency's Urban Streams Restoration Program, and the Natural Resources Conservation Service (NRCS) EWP Program. Presented below is a brief description of each program.

PDM Program – Authorized by DMA 2000, this program can provide funding to states, public agencies, communities, and tribes for cost-effective hazard mitigation planning activities that complement a comprehensive mitigation program and reduce injuries, loss of life, and property.

FMA Program – Provides funding to assist states and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other insurable structures. The three types of grants available through the FMA Program are planning, project, and technical assistance grants. Only communities that participate in the NFIP can apply for project and technical assistance grants. Planning grants are available to states and communities that prepare flood mitigation plans.

HMGP – Provides grants to local, state, and tribal governments to implement long-term hazard mitigation measures after a major disaster declaration (up to 15 percent of the FEMA disaster funds they receive is for hazard mitigation planning and projects).

PA Program – Provides funding, following a disaster declaration, for repairing, restoring, or replacing damaged facilities belonging to governments and to private nonprofit entities, and for other associated expenses, including emergency protective measures and debris removal. The program also funds mitigation measures related to repairing damaged public facilities.

Urban Streams Restoration Program – Supports activities that minimize property damage caused by flooding and bank erosion, restores the natural value of streams, and promotes community stewardship. This program funds projects that have flood management or erosion control as a primary objective, and maintains or improves the environmental characteristics of a stream or restores a stream to function naturally.





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NRCS EWP – Assists sponsors and individuals in implementing emergency measures to relieve imminent hazards to life and property created by a natural disaster. Activities include providing financial and technical assistance to remove debris from streams, protecting destabilized stream banks, establishing cover on critically eroding lands, implementing conservation practices, and purchasing floodplain easements. The program is designed for recovery measures, and it is not necessary for a national emergency to be declared for an area to be eligible for assistance.

Regulatory

Tehama County adopted Floodplain Management Regulations (Code Chapter 15.52) effective July 1, 1999 (Appendix E). These regulations are administered by the Tehama County Building and Safety Department. The purpose of the regulations is to promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions in specific areas. The methods and provisions of reducing flood losses through the regulations include the following:

- Restrict or prohibit uses which are dangerous to health, safety, and property due to water or erosion hazards, or which result in damaging increases in erosion or flood heights or velocities.
- Require that uses vulnerable to floods, including facilities that serve such uses, be protected against flood damage at the time of initial construction.
- Control the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel flood waters.
- Control filling, grading, dredging, and other development that may increase flood damage.
- Prevent or regulate the construction of flood barriers that unnaturally divert floodwaters or that may increase flood hazards in other areas.





SECTION 4.0 – RISK ASSESSMENT

4.1 Hazard Identification

Tehama County is subject to a variety of natural hazards and from 1950 to 1997, it has been included in 19 states of emergency as proclaimed by the State of California. Of the 19 emergencies, nine were related to flooding (four were within 15 years), five were related to storms, three were related to wildland fires, and two were related to drought.



For purposes of this FMP, the flood-related hazards are addressed; however, it is recognized that wildland fires within a watershed can exacerbate the flood hazard by virtue of increased rate and volume of runoff and attendant erosion and sediment discharge.

With respect to identifying flood hazards, the majority of the areas mapped on the FEMA FIRMs are shown as having no BFE mapped (Map 8). Also shown on Map 8 are areas that have been mapped from “approximate studies” performed by DWR. The potential floodplain associated with a catastrophic failure of Shasta Dam is shown on Map 9.

With respect to the floodplain delineated along the Sacramento River, it is important to note that the results of the work completed by DWR in February 2002 for the Sacramento and San Joaquin River Basins Comprehensive Study (Comp Study) show a broader floodplain in Tehama County than the FEMA FIRMs in some areas. The areas where the 100-year floodplain is less than that shown on the floodplain maps developed for the Comp Study are presented on Map 10. The areas where the 100-year floodplain is greater include Antelope, Dye Creek, Los Molinos, and Vina. The assessed values of the improvements within these areas are presented on Table 1, and on Map 11. This information is presented to provide an order of magnitude of the value of property improvements within the affected areas. The basis for the hydrologic modeling was different in the respective studies; nevertheless, the difference needs to be understood to determine which of the two 100-year floodplains should be adopted for administering the NFIP. The FEMA FIRMs are the current regulatory maps; however, the “best” available information could be used as well.

The available documentation of the hazard associated with flooding is best captured in DSRs filed in years of disasters declared by the state and federal governments, and in claims processed under policies administered through the NFIP. The DSRs account for the repair of damage related to public works such as roads, bridges, channels, etc. The claims processed under the NFIP account for repairs to residential, commercial, industrial, or agricultural buildings. It was indicated by county officials that several





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residences and structures sustained flood damage; however, the damage is not documented since the cost of the repairs was paid by the owners.

Presented on Table 2 is a summary of the DSRs for which flood damage repairs were implemented in 1993, 1995, 1997, and 1998. The general geographic location and distribution of the DSRs is shown on Map 12. The DSRs, in relation to the FEMA SFHAs, are shown on Map 13. The funding for repair of the damages related to public property was provided by FEMA, whereas the funding for repair of damage to private property has been handled largely through the NRCS.

Presented on Table 3 is a summary of the total claims or losses and repetitive losses administered through the NFIP. Repetitive losses are losses that have accrued to the same property within a 10-year period. Presented on Table 4 is a breakdown of the repetitive losses. The general geographic location and distribution of the claims paid under the NFIP for repetitive losses are presented on Map 14. All claims are regarded as repetitive loss properties in that they have encountered multiple claims ranging from two to as many as seven events. As shown on Table 4, the average payment per claim for the respective losses ranges from about \$3,600 to \$14,500, with the countywide average being approximately \$12,500 per claim. Additionally, there have been 52 single event claims paid by FEMA since October 1, 1995 that amount to approximately \$370,000 as shown on Table 5. These single event claims have the potential of becoming repetitive losses if measures are not implemented to mitigate the hazard. These single event claims are located on Map 14 generally.

An important aspect of both the DSRs and claims under the NFIP is that a large number of the events are outside areas designated as a flood hazard zone on the current FIRMs prepared by FEMA. This situation is illustrated on Map 13, although it is worthy to note that the information related to the location of NFIP claims is approximate.

It is important to highlight the fact that the majority of the claims thus far are not regarded as repetitive. In view of the conditions in Tehama County, it is highly likely that a significant number of the single-event claims could become a repetitive loss in a future storm event.

As noted previously, overland and sheet flooding is widespread causing flood damage in areas that are not currently mapped as floodplains. At the same time, road flooding and closures are widespread as well. Shown on Map 15 are county roads that flood frequently.





4.2 Profiling Hazards

Critical facilities, as identified by FEMA and presented in its HAZUS Database, are shown on Map 16. Located on the back of Map 16 are the names and locations of the respective facilities. Inspection of the critical facilities in relation to the FEMA SFHAs indicates that most critical facilities are outside the delineated zones, except for historic features, parks, and hazardous material sites. In summary, the hazards are best profiled by the information compiled for DSRs and NFIP claims, as discussed above. A greater hazard is likely associated with potential risks that could be encountered unless the basic land use “tools” are developed.

4.3 Vulnerability Assessment

Overview

Vulnerability with respect to flooding is the primary consideration for this FMP. For this assessment the baseline information utilized included:

- Critical facilities inventory.
- Repetitive loss data.
- Assessor’s data.
- Development trends.

Critical Facilities Inventory

Critical facilities as defined by FEMA include the following:

- Essential Facilities – Medical care facilities, emergency response facilities, schools, shelters, and any facility vital to emergency response and recovery following a disaster.
- Transportation Lifeline Systems – Highways, railways, light rail, bus systems, ports, ferry systems, and airports.
- Utility Lifeline Systems – Potable water, electric power, wastewater, communications, and liquid fuels.
- Hazardous Materials Facilities – Facilities housing industrial/hazardous materials, such as corrosives, flammable materials, radioactive materials, and toxins.

Facilities that are considered high potential loss facilities such as dams, natural gas facilities, and large unique residential or commercial structures were not considered for potential loss estimation in the FMP. As noted previously, a list of the critical facilities with an identification number that corresponds to a location is presented on Map 16.





Potential Losses – Residential, Commercial, and Critical Facilities

As indicated in an earlier section there are damages incurred on structures that are not within a mapped flood hazard zone. Accordingly, for purposes of estimating potential losses, information was compiled for structures within the mapped floodplain as well as outside the mapped floodplain for the reason stated. For areas outside of a mapped floodplain, an area was circumscribed based upon information obtained from the public meetings, the mapping of NFIP claims, and visual observations in the field. These areas are identified on Map 14.



The approach utilized in valuing the potential losses involved the following steps:

1. Obtaining the assessed value of all residential, commercial, and industrial structures or improvements within respective geographic areas both within and outside the mapped floodplains.
2. Identifying critical facilities located in the mapped flood hazard areas.
3. Determining the potential loss amounts for the structures identified in items 1 and 2 above for depths of flooding of one and two feet using FEMA parameters.
4. Calculating the potential flood loss using the information obtained in items 1, 2, and 3 above.

Presented on Table 6 is the value for the improvements located within the mapped floodplain. In addition, the potential damage to the improvements and contents were estimated using U.S Army Corps of Engineers flood depth-damage relationships. This was done for flood depths of one and two feet above finished floor. Also, recognizing that the area contains agricultural land, the values for land within the Williamson Act was removed, and the results are presented in Table 7.

Potential Losses – Future Development

Based upon the Tehama County Draft Housing Element, the population of Tehama County is projected to grow from 58,175 in 2004 to 68,323 in 2020, representing an overall increase of approximately 17 percent over the 17-year period. The population in the unincorporated area represented about 65 percent of the total county population and is projected to grow from a population of 37,865 in 2004, to 47,298 in 2020. This represents an increase of about 25 percent and approximately 69 percent of the total county population. It is recognized that these forecasts of population growth can be





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altered substantially through the proposed Del Webb Sun City Tehama and the proposed Morgan Ranch developments. The Bowman area in the north part of the county and the Antelope area east of Red Bluff are the most populous areas. The Bowman area along with the Gerber and Los Molinos areas reportedly represent the fastest growing areas in the county.

Information received from the public meetings reflected existing and potential problems related to flooding in the Antelope-Dairyville area and the area south and adjacent to the



city of Corning. The data documenting claims under the NFIP confirms existing problems in the Antelope-Dairyville area; however, it does not reflect existing problems in the south Corning area. The FIRMs for the south Corning area do show a significant floodplain; however, photographs taken by residents show the flooding to be of a much greater extent than what is shown on the FIRMs. Accordingly, planning for development or building structures within the south Corning area is somewhat

problematic in view of the apparent discrepancy between the FIRMs and observed flooding, and a difference of about one foot in the BFE between the FIRM for the city in relation to the FIRM for the county at the city along its south boundary.

Based upon the information presented in the Tehama County Housing Element, the majority of the population growth in the county through 2020 is anticipated to occur in the unincorporated areas. Using the historic figures of approximately 2.3 people per housing unit indicates that by 2020 an additional 4,000 housing units would be constructed in the unincorporated area of the county. This represents a 25 percent increase in the number of residential units and does not reflect new commercial buildings that would undoubtedly accompany the population growth.

Tehama County is currently updating its General Plan; however, it appears that the update of the General Plan will not address or develop policies related to storm drainage and flooding or flood risk reduction. Thus, the process for permitting and constructing new structures will continue without the benefit of any guidelines or criteria to achieve consistency with time and to facilitate addressing the cumulative impact of building and development.

In view of the situation and conditions related to accommodating the increase in population projected for the unincorporated area of the county and the uncertainty in relation to time and location, no estimate is made of potential losses associated with future development. However, the risk will increase within the respective flood hazard mitigation areas identified for this FMP, unless data and information is developed to facilitate sound decisions for future building.





SECTION 5.0 – MITIGATION STRATEGY

An effective mitigation strategy must involve the communities working as a partnership with common goals, objectives, and criteria or standards. Within Tehama County there are three incorporated communities (Corning, Red Bluff, and Tehama) and several unincorporated communities or areas (Antelope-Dairyville, Gerber, Los Molinos, and Vina). Although the county and respective incorporated communities could pursue flood hazard mitigation on their own, the benefits of a collaborative effort would be more effective. Additionally, consistency in the criteria and methodology employed would be enhanced and prove to be beneficial for the residents.

Administering the NFIP in a manner that protects existing and future residents and property is extremely difficult at both the county and city levels of government if adequate information is not available. Accordingly, the overall strategy for mitigating flood-related risks is to develop the “tools” necessary to facilitate planning and permitting development whether it is a single structure or subdivision consistent with adopted floodplain management regulations. More importantly, flood-related damages are experienced in areas that are not designated as a flood hazard area, thus compromising the security of future development.



As the population of Tehama County grows, it becomes more important to take steps to inform new residents as well as existing residents of flood hazard related risks.

5.1 Hazard Mitigation Goals

Hazard mitigation goals were identified based upon comments received at the public meetings on January 19 and January 24, 2006, from follow-up field reconnaissance of flood prone areas, and from discussions among the Steering Committee. Embedded in these goals and objectives is a philosophy of “no adverse impact” toward floodplain management. The following goals and objectives provide the general direction for identifying actions to mitigate existing and future flood hazard related losses.

Goal 1: Prevent Future Flood Hazard Related Losses of Life and Property

Objective 1.1 – Minimize or eliminate losses to repetitive loss properties.

Objective 1.2 – Prevent future development or buildings within or outside a SFHA from incurring flood hazard related losses.





Objective 1.3 – Prevent future development or buildings from causing flood hazard related losses to other properties.

Objective 1.4 – Enhance interagency coordination.

Goal 2: Increase Public Awareness to Flood Hazard Related Risks

Objective 2.1 – Establish and implement a flood hazard outreach program.

Goal 3: Improve Emergency Services and Response Capability

Objective 3.1 – Develop an early warning and flood alert system.

Goal 4: Participate in FEMA’s CRS Program

Objective 4.1 – Monitor Mitigation Plan Implementation and seek participation in the Community Rating System Program.

5.2 Identification and Analysis of Mitigation Actions

This FMP will establish eligibility and a mechanism for the District to seek mitigation funding through the established programs. The actions identified for the FMP will be rated in relation to criteria established by the state to prioritize mitigation activities for funding. This criteria is as follows:

- Percent of population at risk
- Frequency and likelihood of hazard
- Repetitive loss areas
- Small/impooverished communities
- Planning resources available
- Types/percent of land areas at risk
- Development pressure rating
- Project urgency and C/B analysis
- Cost-effectiveness of measure

The application of these criteria will be through an assignment of low, medium, and high priority. In view of the state of conditions in Tehama County and the type and extent of the flood hazards, certain actions are regarded as “foundational” actions as they are a prerequisite to other actions.

5.3 Implementation of Mitigation Actions

Actions have been identified consistent with the FMP goals and objectives to reduce the flood hazard related risks to people, property, and infrastructure.





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Formulation of Actions

An Action Program has been formulated to address the FMP goals and objectives. Listed on the following page are the respective actions that are recommended for implementation to mitigate and avoid the adverse impacts from flooding in Tehama County. The actions are grouped by priority—high and medium—from the standpoint of mitigating repetitive losses and providing the tools necessary for Tehama County to be more effective in guiding development and administering the NFIP. A description of each action is provided on subsequent pages.





ACTION PROGRAM

High Priority

- Action No. 1 Formulate and Implement an “Elevation” Project to Identify Homes and Structures that Should be Elevated and Homeowners that Would be Interested in Participating in the Project
- Action No. 2 Investigate and Implement Debris Management at Bridges
- Action No. 3 Formulate and Implement Invasive Plant Species Removal and Maintenance Program
- Action No. 4 Establish a Flood Hazard Mitigation Coordinating Committee (FHMCC)
- Action No. 5 Formulate and Implement a Flood Hazard Public Outreach Program
- Action No. 6 Formulate Design Criteria and Standards to Handle Storm Runoff Quantity and Quality
- Action No. 7 Prepare Topographic Mapping of the Valley Area of Tehama County
- Action No. 8 Review, Update, and Implement Existing and/or New Ordinances
- Action No. 9 Perform a Detailed Floodplain Analysis for the Antelope-Dairyville Area to Determine Drainage Patterns, the Extent and Cause of Flooding, and to Establish BFEs to Administer the NFIP and Floodplain Management Regulations
- Action No. 10 Formulate a Flood Hazard Mitigation Plan and Perform a Feasibility Study for the Antelope-Dairyville Area
- Action No. 11 Formulate a Flood Management Plan for Jewett and Burch Creeks in the Vicinity of Corning

Medium Priority

- Action No. 12 Determine the 100-Year Floodplain Along the Sacramento River to be Used for the NFIP – FEMA FIRM vs. USACE Comprehensive Study
- Action No. 13 Perform a Detailed Floodplain Analysis for the Gerber and Los Molinos Areas to Determine Drainage Patterns, the Extent and Cause of Flooding, and to establish BFEs to Administer the NFIP and Floodplain Management Regulations
- Action No. 14 Develop an Early Warning and Flood Alert System





Action No. 1 Formulate and Implement an “Elevation” Project to Identify Homes and Structures that Should be Elevated and Homeowners that Would be Interested in Participating in the Project

Background

The greatest concentration of repetitive-loss properties is within the city of Tehama; however, this community is currently involved in an “elevation” project sponsored by the USACE and State Reclamation Board. Within the city there were about 125 houses below the USACE 100-year BFE for the Sacramento River. Thirty six houses have been elevated; it remains uncertain as to how many additional structures will be elevated. The depth of flooding and local ordinance require that the finished floor be at least two feet above the 100-year BFE. The cost to elevate homes in the city has ranged from \$60,000 to \$100,000. By comparison, the elevation of homes in areas subject to shallow flooding (one to two feet) reportedly cost approximately \$50,000 to \$60,000. The amount of cost-sharing to be provided by the local sponsor is 35 percent and the homeowner would be responsible for 10.5 percent of the 35 percent. The State Reclamation Board has been the sponsor in most projects.

The information developed from Action No. 7 will facilitate formulation of an “elevation” project.

Lead and Cooperating Agencies

The Tehama County Flood Control & Water Conservation District in cooperation with the Planning and Public Works Departments of the county and cities.

Estimated Cost

The initial cost to formulate the guidelines and criteria for the project is estimated at \$25,000, plus \$25,000 to address each of the five hazard mitigation areas as the detailed information is prepared and available from Action No. 7. The cost to implement the “elevation” project will be approximately \$50,000 to \$60,000 per structure with approximately 35 percent paid by the homeowner.

Benefit

Reduction in property loss.

Potential Funding

PDM, HMGP.

Schedule

Within three years of developing the detailed floodplain analyses for the respective areas.





Action No. 2 Investigate and Implement Debris Management at Bridges

Background

During periods of high runoff, the lodging of debris on bridge or culvert piers can and does seriously reduce their hydraulic capacity and at bridges can exacerbate scour in the streambed. Residents in the vicinity of the various streams and personnel from the County Public Works Department and Caltrans have a very good understanding of the structures that are most prone to adversely impact property and transportation routes as a result of blockage by debris on the piers. This knowledge base provides a valuable resource from which to inventory and prioritize bridges and culverts from the standpoint of hazards or adverse impacts.

Various technologies are available that can be retrofit to existing structures to alleviate or minimize the buildup of debris on bridge piers. To the extent they can prove to be successful in Tehama County, they can be a cost-effective way of maintaining hydraulic capacity when needed the most and also to minimize maintenance costs.

The work to be performed under this action is to inventory and prioritize the bridges and culverts that have one or more sets of piers and are adversely impacted by debris during high runoff events. For the top two structures, implement one or more applicable technologies to determine the effectiveness of such installations. Pending the results from this action, the program could be expanded.

Lead and Cooperating Agencies

Tehama County Public Works Department in cooperation with the Tehama County Flood Control & Water Conservation District and Caltrans.

Estimated Cost

The inventory and prioritization of the bridges and culverts would be performed by Tehama County personnel and the systems to retrofit to the existing structures (2) are estimated to cost approximately \$40,000.

Benefit

If the systems are effective, significant benefits would accrue from the standpoint of maintaining hydraulic capacity when it is needed most and would reduce the cost and burden on maintenance personnel when resources are limited.

Potential Funding

In-house personnel for the investigative work and PDM, FMA, and Caltrans.

Schedule

Within two years.





Action No. 3 Formulate and Implement an Invasive Plant Species Removal and Maintenance Program

Background

Invasive plant species such as *Arundo* and *Tamarisk* are widespread throughout the Sacramento Valley including several streams in Tehama County. The RCD has experience in removing *Arundo* and other non-native species and pursues funding on an ongoing basis. The establishment of *Arundo* in the streams in Tehama County has seriously limited their conveyance capacity. Although the RCD has done some field identification of invasive plant species, it would be appropriate to complete and inventory the extent and location of the invasive plants and develop a GIS based inventory that could be utilized to prepare a prioritized list of projects. Once the plants are removed, an ongoing program would be required for maintenance to control the reemergence of the species.

Lead and Cooperating Agencies

The Tehama County Resource Conservation District in coordination with the Tehama County Flood Control & Water Conservation District, cities, and Agricultural Commissioners Office.

Estimated Cost

Approximately \$20,000 to complete the preparation of an inventory of streams to which *Arundo* or other invasive species have seriously impacted the hydraulic capacity of the channels, and then to prioritize the streams for purposes of mitigating the flood capacity reduction. Approximately \$50,000 per year would be needed for plant removal for five years, and \$10,000 per year for maintenance thereafter.

Benefit

Restore the hydraulic conveyance capacity of streams in Tehama County and significantly reduce the supply of debris that collects at hydraulic structures, which reduces their capacity during high runoff events.

Potential Funding

State Water Resources Control Board, FMA, PDM.

Schedule

Complete the inventory in 2007 and initiate program for plant removal in 2008.





Action No. 4 Establish a Flood Hazard Mitigation Coordinating Committee

Background

The activities of the Steering Committee established for preparing the FMP illustrated the value and utility of communication on the subject of flood-related risks. This communication does not necessarily have to be frequent; however, it should be accomplished on a regular basis and at an interval so that the aspect of flood hazard mitigation becomes common in both thought and function for the respective committee members. Accordingly, transitioning the Steering Committee to a FHMCC is recommended. At a later date this Committee could transition to a Multi-Hazard Mitigation Coordination Committee.

An important function of the FHMCC would be to oversee the implementation and maintenance of this FMP.

Lead and
Cooperating
Agencies

The Tehama County Flood Control & Water Conservation District as the lead agency along with the cities of Corning, Red Bluff, and Tehama; Sheriff's Department; the Tehama County Building and Safety and Planning Departments; the Tehama County Resource Conservation District; State OES; and the California Departments of Fish and Game, Forestry, and Water Resources; Caltrans; and Watershed Groups.

Estimated Cost

In-house personnel cost.

Benefit

Developing and maintaining a core group of individuals that are informed of the FMP on an ongoing and regular basis.

Potential
Funding

Agency budget process.

Schedule

Within 2007.





Action No. 5 Formulate and Implement a Flood Hazard Public Outreach Program

Background

The successful implementation of projects, programs, and policies related to mitigating or avoiding flood-related risks is best accomplished with an informed public. The regular activities of the recommended FHMCC (Action No. 4) can be an effective part of a deliberate public outreach program. This can be accomplished through regular meetings of the committee with noticed agendas and meeting notes, and maintaining a website of related activities and relevant information. Pertinent information can be posted on selected websites with appropriate links to relevant information. An important part of the outreach program will be advising property owners of the merits of flood insurance.

Lead and
Cooperating
Agencies

The Tehama County Building and Safety Committee in coordination with the FHMCC.

Estimated Cost

In-house personnel cost.

Benefit

Greatly enhance community relationship and overall awareness of the flood hazard mitigation effort.

Potential
Funding

In-house personnel costs.

Schedule

Incorporate as an activity with Action No. 4.





**Action No. 6 Formulate Design Criteria and Standards to Handle Storm Runoff
Quantity and Quality**

Background

There is a lack of detailed information regarding existing drainage patterns and floodplains in areas of existing development and, in most cases, areas where future development will likely occur. As a consequence, implementation of a “no adverse impact” management policy is problematic. Even where FEMA has identified SFHAs, the BFEs are not always available. In order for the administrators of the NFIP and county/city building departments to discharge their duties responsibly, it is important that the basis for design of infrastructure for storm runoff be consistent throughout the county in both the incorporated and unincorporated areas. Furthermore, it is important that the jurisdictional entities provide the basis for design and standards to the public to achieve consistency throughout the community over time rather than reviewing material offered by the development community whether it is for a single structure or several structures.

Lead and
Cooperating
Agencies

The Tehama County Flood & Water Conservation District in cooperation with the Tehama County Building and Safety Department and the Planning and Public Works Departments of county and cities.

Estimated Cost

The cost to develop design criteria for handling storm runoff in terms of both quantity and quality is estimated to cost \$50,000.

Benefit

Consistency in directing future improvements of adequate capacity and configuration throughout the community.

Potential
Funding

PDM, FMA.

Schedule

Within one year.





Action No. 7 Prepare Topographic Mapping of the Valley Area of Tehama County

Background

A significant number of the DSRs and NFIP claims are outside of FEMA-designated SFHAs. The determination of the causes of flooding on existing structures and the siting of new facilities, so as not to be adversely impacted by flooding or adversely impacting adjacent or neighboring properties, is problematic due to the lack of topographic data and mapping. Detailed topographic mapping is a prerequisite to implementing several of the actions recommended in this FMP. Accordingly, it is recommended that the central portion of Tehama County be mapped to provide the foundational information for administering the NFIP and for the review of improvement plans and issuing building permits. It is deemed to be more cost-effective to provide the continuity in the mapping throughout the central area of the county rather than for a number of site-specific areas. The utility afforded by this information will be extremely beneficial to the county and its citizens. The mapping should be developed with a minimum specification for a 2-foot contour interval.

Lead and
Cooperating
Agencies

The Tehama County Flood Control & Water Conservation District should take the lead; however, this should be a collaborative activity with Tehama County and the cities with participation by the Tehama County Resource Conservation District (RCD) and watershed groups.

Estimated Cost \$300,000.

Benefit It will facilitate sound planning and evaluation of measures to mitigate existing flood hazards and avoid creating new flood hazards in the future.

Potential
Funding PDM, FMA.

Schedule Completed in 2007.





Action No. 8 Review, Update, and Implement Existing and/or New Ordinances

Background

A significant number of NFIP claims are associated with properties that are not included in the FEMA SFHAs. Placing fill, constructing levees or berms, modifying drainage channels and streams, constructing and maintaining private and public roads, and grading property without regard or the understanding of the potential impact to drainage or the risk from flooding can be exacerbated or in some cases can create problems where none existed previously. With the anticipated increase in population in the unincorporated area of the county there is the potential for increasing the extent of flood-related risks unless the means and methods for preventing such occurrences are available. The benefits from implementing actions to mitigate or avoid flood-related risks can be minimized or negated. It is critical to perform a comprehensive review of existing ordinances and to update, modify, or adopt a new ordinance to be used with the information provided by implementing other actions in order to have the “tools” necessary to minimize the potential to adversely impact storm runoff in the future. Absent some means of regulating changes in grading, filling, etc. the investment made to correct or prevent risks may be negated. In essence, this action becomes a prerequisite to investment in several other actions.

Lead and
Cooperating
Agencies

Tehama County Public Works Department as the lead agency in cooperation with the Tehama County Building and Safety Department, the Tehama County Flood Control & Water Conservation District, and the Agricultural Commissioners Office.

Estimated Cost \$25,000.

Benefit Minimize the opportunity for future construction, maintenance, and grading to create new or adversely impact existing flood-related risks.

Potential
Funding In-house personnel costs.

Schedule One to two years once the information available from other FMP actions is available to facilitate implementation of the ordinance.





Action No. 9 Perform a Detailed Floodplain Analysis for the Antelope-Dairyville Area to Determine Drainage Patterns, the Extent and Cause of Flooding, and to Establish BFEs to Administer the NFIP and Floodplain Management Regulations

Background

Referring to Table 3, there are a total of 37 documented repetitive loss properties in Tehama County that range from two incidents up to seven. In addition, there are 217 documented claims that are not repetitive losses at this time; however, there is no evidence available to suggest that these properties may not become a repetitive loss property in the future. These respective properties appear to be spread throughout the county with some incidences occurring in specific geographic areas. From a review of the data, four areas were delineated for special consideration from the standpoint of mitigating documented problems and avoiding new properties from being impacted. These areas, identified as Antelope, Dairyville, Los Molinos, and Corning, are shown on Map 17 along with the value of property within the respective areas based upon Assessor parcel data. In addition, the Gerber area is afforded some protection by levees; however, its internal drainage system appears deficient and warrants investigation. The Corning area is included in the development of a flood management plan for Jewett and Burch Creeks in Action No. 11. The City of Tehama contributed 50 percent toward a detailed study to determine structure specific elevations for flood mitigation purposes. As shown on Map 12, certain repetitive loss properties are in mapped flood hazard zones whereas others are not. The Dairyville area is an example where several repetitive loss properties are not within a mapped flood zone.

Based upon information presented during a field reconnaissance of the Dairyville and Corning areas, it appears there are properties in the general area that have sustained flood damage; however, they were not covered under the NFIP. Therefore, the owner paid for the repairs. Most of the areas are encountering some increase in residences being constructed, the most notably being the Antelope/Dairyville areas.

As noted earlier in this report, a significant amount of the projected increase in population in Tehama County is expected to occur in the unincorporated areas of the county. The unincorporated areas of the county are also where the greatest amount of flood damage has occurred, and account for 65 percent of the total losses and 82 percent of the repetitive losses claimed under the NFIP. The prospects for the amount of losses to increase are high under present conditions as the information required to properly advise citizens and to administer sound regulations or policies is seriously lacking. The county and cities do not have consistent design criteria or standards to address storm runoff and as a consequence Action No. 6 is very important and is a prerequisite to performing Action No. 9. Performing the analyses will require detailed topographic mapping in accordance with Action No. 7, and potential supplemental surveys along with hydrologic and hydraulic modeling using





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parameters set forth in the design criteria. An important part of this work will be to inventory privately-owned levees and evaluate their relative importance in managing flooding in the respective areas.

Lead and Cooperating Agencies

The Tehama County Flood Control & Water Conservation District in cooperation with the Planning, Building and Safety, and Public Works Departments of the cities.

Estimated Cost

The estimated cost for performing the detailed analyses for the respective areas assumes that the topographic information from Action No. 7 is available. The estimated costs for the respective areas assume some additional field surveys would be required for determining the geometry of creeks and channels.

- Antelope (\$300,000)
- Dairyville (\$300,000)
- Gerber (\$75,000)
- Los Molinos (\$200,000)

Benefit

Provides foundational information for administering the NFIP and floodplain management regulations and facilitates mitigating existing and potential repetitive losses, which could be substantial if the current process is not interrupted.

Potential Funding

PDM, FMA, Urban Streams Restoration Program.

Schedule

- Antelope and Dairyville area within three years.
- Gerber area within five years.
- Los Molinos area within five to eight years.





Action No. 10 Formulate a Flood Hazard Mitigation Plan and Perform a Feasibility Study for the Antelope-Dairyville Area

Background

As noted under Action No. 9, in the Antelope-Dairyville area there are single event and repetitive loss properties within and outside the FEMA SFHAs. The NRCS, in its Technical Report dated September 2005, notes that property damage in the area resulted from extreme rainfall events in 1937, 1940, 1958, 1983, 1986, 1995, and 1997. The updated models to support floodplain mapping recommended under Action No. 9 will facilitate identifying existing flood hazards and provide the foundational information to determine the effectiveness of alternative hazard mitigation to alleviate existing as well as future flooding.

A flood hazard mitigation plan is to be prepared with a preferred alternative or alternatives identified. Once the alternative or alternatives are identified a detailed feasibility study should be performed. Depending upon the results of the feasibility study and the magnitude of the mitigation measures and the relative benefits, sources of funding should be identified and pursued for implementation of the most effective measures.

Lead and Cooperating Agencies

The Tehama County Flood Control & Water Conservation District in cooperation with the County Planning, Building and Safety, and Public Works Departments, DWR, Caltrans, and FEMA.

Estimated Cost

The estimated cost for preparing a flood hazard mitigation plan and a detailed feasibility study for the Antelope-Dairyville area assumes the topographic information from Action No. 7 is available as well as the results of the detailed floodplain mapping described in Action No. 9. Accordingly, the estimated cost to complete this action is \$200,000 and assumes some supplemental field surveys will be required.

Benefit

The results of this action will provide Tehama County and its residents with information that can be used to pursue funding for construction and maintenance through a variety of programs including the formation of an assessment district at least for the maintenance. Equally important is that it provides information for administering the NFIP and floodplain management regulations and facilities mitigating existing and future repetitive losses.

Potential Funding

PDM, FMA, Urban Streams Restoration Program, Assessment District.

Schedule

Within two to five years depending upon the completion of Action No. 7 and Action No. 9.





Action No. 11 Formulate a Flood Management Plan for Jewett and Burch Creeks in the Vicinity of Corning

Background

Widespread flooding has been experienced in the southern part of the city and adjacent land outside the city due to a combination of factors ranging from significant restrictions in the channel capacity resulting from invasive plants, to inadequate capacity of road and railroad crossings. This is an area where significant interest is being expressed for development and the information by which to assess development proposals is inadequate and implementing a “no adverse impact” policy is problematic. There are discrepancies in the FIRMS at the boundary between the incorporated area and unincorporated areas thereby complicating the administration of the NFIP and responsible planning. Known repetitive losses are currently low; however, the risk for these to increase is high because of the deficiencies in the available information. DSRs related to repairing public infrastructure are widespread particularly in the storm events of 1995 and 1998. The repairs associated with these events are in the order of \$90,000. Accordingly, the formulation of a flood management plan for both Jewett and Burch Creeks is recommended so that a comprehensive evaluation can be made of the constraints and opportunities for managing floodwater from the watersheds. The consideration of detention storage and other flood management facilities was first investigated in 1969 by the California Department of Conservation. Although nothing materialized from that effort, the concept could offer opportunity to mitigate damage to public infrastructure and provide floodplain information to facilitate sound land use planning and a basis for administering the NFIP for the area.

Lead and Cooperating Agencies

A collaborative effort on the part of the Tehama County Flood Control & Water Conservation District and the city of Corning.

Estimated Costs

Approximately \$300,000 including the cost to develop detailed topographic mapping and surveys of Jewett and Burch Creeks, augment the topographic mapping included in Action No. 7, update hydrologic and hydraulic analyses, update mapping of the existing floodplains, and perform preliminary engineering designs and cost estimates. This work would be performed consistent with the criteria developed from Action No. 6.

Benefit

Provides foundational information for land use planning and floodplain management and guidance toward mitigating repetitive damage to public infrastructure.

Potential Funding

PDM, FMA, Urban Streams Restoration Program.

Schedule

Within two years.





Action No. 12 Determine the 100-Year Floodplain Along the Sacramento River to be Used for the NFIP – FEMA FIRM Vs. USACE Comprehensive Study

Background

The 100-year floodplain along the Sacramento River that has been delineated by the USACE, based upon its Comprehensive Study of the Sacramento and San Joaquin Rivers, is broader than that delineated on the FEMA FIRMs. The differences and the reasons for the differences between these maps and any other 100-year flood stage designations should be reviewed in order that Tehama County, in administering the NFIP, can be certain the new information can and should be used as the “best available” information. The County should conduct a workshop with FEMA, the USACE, the State Reclamation Board, and DWR to address this matter.

Lead and Coordinating Agencies

Tehama County Building and Safety Department in coordination with the County Planning Department; the cities of Corning, Red Bluff, and Tehama; DWR, the State Reclamation Board, USACE, and FEMA.

Estimated Cost

The cost to research and review the documentation for the respective work products and formulate a recommendation for consideration by Tehama County is approximately \$25,000.

Benefit

More appropriate communication of the flood-related risks and administration of the NFIP.

Potential Funding

FMA.

Schedule

Within two years.





Action No. 13 Perform a Detailed Floodplain Analysis for the Gerber and Los Molinos Areas to Determine Drainage Patterns, the Extent and Cause of Flooding, and to Establish BFEs to Administer the NFIP and Floodplain Management Regulations

Background

Referring to Table 3, there are a total of 37 documented repetitive loss properties in Tehama County that range from two incidents up to seven. In addition, there are 217 documented claims that are not repetitive losses at this time; however, there is no evidence available to suggest that these properties may not become a repetitive loss property in the future. These respective properties appear to be spread throughout the county with some incidences occurring in specific geographic areas. From a review of the data, four areas were delineated for special consideration from the standpoint of mitigating documented problems and avoiding new properties from being impacted. These areas, identified as Antelope, Dairyville, Los Molinos, and Corning, are shown on Map 17 along with the value of property within the respective areas based upon Assessor parcel data. In addition, the Gerber area is afforded some protection by levees; however, its internal drainage system appears deficient and warrants investigation. The Corning area is included in the development of a flood management plan for Jewett and Burch Creeks in Action No. 11. The City of Tehama contributed 50 percent toward a detailed study to determine structure specific elevations for flood mitigation purposes. As shown on Map 12, certain repetitive loss properties are in mapped flood hazard zones whereas others are not. The Dairyville area is an example where several repetitive loss properties are not within a mapped flood zone.

Based upon information presented during a field reconnaissance of the Dairyville and Corning areas, it appears there are properties in the general area that have sustained flood damage; however, they were not covered under the NFIP. Therefore, the owner paid for the repairs. Most of the areas are encountering some increase in residences being constructed, the most notably being the Antelope/Dairyville areas.

As noted earlier in this report, a significant amount of the projected increase in population in Tehama County is expected to occur in the unincorporated areas of the county. The unincorporated areas of the county are also where the greatest amount of flood damage has occurred, and account for 65 percent of the total losses and 82 percent of the repetitive losses claimed under the NFIP. The prospects for the amount of losses to increase are high under present conditions as the information required to properly advise citizens and to administer sound regulations or policies is seriously lacking. The county and cities do not have consistent design criteria or standards to address storm runoff and as a consequence Action No. 6 is very important and is a prerequisite to performing Action No. 13. Performing the analyses will require detailed topographic mapping in accordance with Action No. 7, and potential supplemental surveys along with hydrologic and hydraulic modeling





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using parameters set forth in the design criteria. An important part of this work will be to inventory privately-owned levees and evaluate their relative importance in managing flooding in the respective areas.

Lead and Cooperating Agencies

The Tehama County Flood Control & Water Conservation District in cooperation with the Planning, Building and Safety, and Public Works Departments of the cities.

Estimated Cost

The estimated cost for performing the detailed analyses for the respective areas assumes that the topographic information from Action No. 7 is available. The estimated costs for the respective areas assume some additional field surveys would be required for determining the geometry of creeks and channels.

- Antelope (\$300,000)
- Dairyville (\$300,000)
- Gerber (\$75,000)
- Los Molinos (\$200,000)

Benefit

Provides foundational information for administering the NFIP and floodplain management regulations and facilitates mitigating existing and potential repetitive losses, which could be substantial if the current process is not interrupted.

Potential Funding

PDM, FMA, Urban Streams Restoration Program.

Schedule

- Antelope and Dairyville area within three years.
- Gerber area within five years.
- Los Molinos area within five to eight years.





Action No. 14 Develop an Early Warning and Flood Alert System

Background

The primary creeks and channels in the Antelope and the Corning areas overtop during high runoff events causing the respective areas to be plagued with widespread overland flooding that adversely impacts roadways and properties. These problems are attributed largely to Antelope, Jewett, and Burch Creeks for the two areas, respectively. These areas do not have active stream flow stations. A precipitation station is located at the Corning airport. The respective areas would benefit from having access to real-time data and flood forecasting information in view of the “flashy” hydrology of the systems. It is recommended that both watersheds be equipped with real-time data monitoring stations and data acquisition systems for stream flow and precipitation. Information can be obtained for selected stations through the website of Tehama County Flood Control & Water Conservation District.

<http://www.tehamacountywater.ca.gov/links.htm>

Lead and
Cooperating
Agencies

Tehama County Flood Control & Water Conservation District working in close coordination with DWR and the Sheriff’s Department.

Estimated Cost

\$150,000.

Benefit

Facilitates implementing an effective early warning and flood alert system could allow citizens to take remedial actions to evacuate people or livestock and implement other measures to avoid or minimize flood damage.

Potential
Funding

FMA, DWR Local Assistance Program.

Schedule

Within three years.





SECTION 6.0 – PLAN MAINTENANCE PROCESS

Mitigation Action No. 4 recommends transitioning the Steering Committee to a FHMCC. The FHMCC would not be an implementing entity and would not have any authority over staff of the participating entities. It would function in an advisory capacity to the County Board of Supervisors, coordinate activities of the participating entities with respect to flood hazard mitigation activities, and collectively seek funding to implement the Action Program and related activities.

6.1 Monitoring, Evaluating, and Updating the Plan

Without implementation, the usefulness of the FMP is limited. However, it is recognized that implementation of the actions recommended in this FMP will be constrained by limitations in funding. Nevertheless, it is important that the FHMCC meet at least quarterly to review opportunities for funding and the means of positioning the high-priority actions to improve their opportunity for implementation. Equally important is that from meeting on a regular basis to reviewing the action program and discussing hazards related to flooding, the potential exists for actions to be refined or reconfigured so that progress can be made incrementally on parts of the program. Monitoring and evaluating the action program on a regular basis will result in an elevated awareness among the group of agency representatives that, over time, will facilitate hazard mitigation being incorporated into the day-to-day activities of the local agencies.

Important aspects of the monitoring effort is to constantly seek and identify funding opportunities that can be leveraged to implement FMP actions. This will include creating a portfolio of options on how matching funds may be provided to capitalize on funding opportunities as they become available. Additionally, the FHMCC should monitor the progress made in implementing the mitigation plan and coordinate with FEMA to determine the appropriate time to request participation in FEMA's CRS Program.

6.2 Incorporation Into Existing Planning

It is important that goals, objectives, and policies of the planning processes and documents prepared by the respective jurisdictions having land use responsibility incorporate goals, objectives, and policies that are consistent with and facilitate implementation of actions identified in this FMP and their underlying principles. The long-term success toward mitigation of flood-related hazards is most successful when the foundation for mitigation is incorporated within the day-to-day functions and priorities of government and development. This is best accomplished by constant and well directed efforts that can be achieved through the routine actions of the FHMCC and its networking and communication with colleagues and respective governing bodies.





6.3 Continued Public Involvement

Public participation, particularly from residents of the Dairyville and Corning areas, reflected a very high degree of interest in dealing with the existing problems and measures to avoid future flood-related problems. It is important to keep the community informed of the efforts of the FHMCC. This can be accomplished by scheduling and posting agendas of regular meetings, maintaining a website of pertinent information, and possibly conducting a public workshop on an annual basis to share information. More importantly, this would be a way to gather meaningful input that can assist in refining identified actions or new actions and to judge the effectiveness of the overall effort from the public's perspective.





SECTION 7.0 – REFERENCES

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