Executive Summary

ES.1 Background

The Mid & Upper Sacramento River Regional Flood Management Plan (MUSR RFPM) is a locally-driven assessment of regional flood management issues within the Mid Sacramento Region and the Upper Sacramento River Region (collectively referred to as the Planning Area or Regions). The Mid and Upper Sacramento River regions comprises portions of Butte, Colusa, Glenn, Lake, Sutter, Tehama, and Yolo counties (see Figure ES-1), and contain a diverse set of stakeholder groups in urban cities, small communities, and rural areas. The MUSR RFMP is a follow up to the 2012 Central Valley Flood Protection Plan (CVFPP) and will be used to inform the 2017 update of the CVFPP. The MUSR RFMP outlines the long-term vision for flood management in the Regions and includes among other things, a description of the current flood management conditions, opportunities for improving flood management within the Planning Area, needed projects based upon priority, and a preliminary financing plan.

ES.2 MUSR RFMP Purpose, Goals, and Objectives

The MUSR RFMP is intended to provide the framework for the Mid and Upper Sacramento River Regions' vision for managing flood risk, and was developed using local experience, knowledge and expertise. It provides a reconnaissance-level assessment of regional flood risks, and presents a list of short-term and long-term flood risk reduction projects and actions for the Regions. The Regions intend for the MUSR RFMP to be used by DWR to inform the Sacramento River Basin-Wide Feasibility Study (BWFS), Central Valley Flood System Conservation Strategy (Conservation Strategy), and 2017 update to the CVFPP.

The goals and objectives of the MUSR RFMP include:

- Assemble, coordinate, inform, and direct the regional participants for the organization, preparation, and completion of the MUSR RFMP using available financial and technical resources.
- Define opportunities and problems concerning flood management and protection issues within the Regions to be addressed in the MUSR RFMP.
- Cooperatively and collaboratively determine appropriate regional flood management/protection actions and projects that meet priority benefits and needs, and provide public safety and reduced flood risks for the Regions.
- Identify funding needs and resources in order to implement flood management/protection actions and projects included in the MUSR.
- Using local expertise and knowledge create a thoughtful flood management plan for the future in a directed, consistent, and sustainable manner to allow better economic and social certainty for the Regions and the State.

- Protect the agricultural, environmental, and urban infrastructure and resources of the Regions in an integrated and practical way that improves and benefits all sectors in the future.
- Assist the State in moving forward in its path of continuing to develop and implement a workable and progressive CVFPP that is in the best interest of the Regions and State.

ES.3 MUSR RFMP Development Process

The Mid Sacramento River and Upper Sacramento River Regions joined together in this planning effort because the Regions share common interests and goals, along with interconnected flood control facilities and systems. The MUSR RFMP was developed by participants from the Regions' counties, cities, local levee maintaining agencies (LMAs), water agencies, emergency response agencies, citizen groups, tribes, resource agencies, nongovernmental organizations (NGOs), and other interested stakeholders. The MUSR RFMP effort was funded by a Proposition 1E grant through the California Department of Water Resource (DWR).

The MUSR RFMP Planning Area consists of portions of seven counties: Butte, Colusa, Glenn, Lake, Sutter, Tehama, and Yolo; the cities of Chico and Colusa; the smaller communities of Gerber, Hamilton City, Nord, Durham, Dayton, Nelson, Richvale, Glenn, Ord Bend, Butte City, Princeton, Meridian, Grimes, Robbins, and Afton; Levee Districts 1, 2, and 3; the Sacramento West Side Levee District; and eight Reclamation Districts (RDs): Lake County Watershed Protection District, Tehama County Flood Control & Water Conservation District, the Colusa Basin Drainage District, the Colusa Rancheria, and four DWR Maintenance Areas. An overview of the area defined as the Mid and Upper Sacramento Region is shown in Figure ES-1

The approach for developing the MUSR RFMP consisted of first, conducting a series of individual small group meetings with all of the participating local levee maintaining agencies, cities, counties, small communities, and interested stakeholders within the region. The series of small group meetings were intended to reach all interested parties within the Planning Area. The initial small group meetings presented the background, purpose, and objectives of the MUSR RFMP and solicited input from attendees on their thoughts and ideas for flood management within the region.

The small group meetings were followed up with a series of meetings of the Focus Area Workgroups. Given the scale and complexity of the issues at hand, the Focus Area Workgroups were established to make it easier for locals to have direct involvement in the parts of the MUSR RFMP that they cared about the most. A group was established for each of the following Focus Areas: Urban Areas, Operations & Maintenance, Emergency Response, Rural Areas, Small Communities, System Improvements, and Multi-Benefit. To facilitate development of multi-benefit strategies, partnerships and collaborations, two workshops were held in the fall of 2014. The workshops provided the opportunity for stakeholders to learn about each other's projects and work together on envisioning how projects may be refined to be best positioned for future funding. The workshop forum initiated dialogue on the next steps needed to develop and implement mutually beneficial projects. The workshops also helped identify a framework for

establishing partnerships and collaborations with the goal of packaging priority projects to enhance opportunities for implementation.

A MUSR RFMP webpage was created to provide information on meetings and study progress to all stakeholders (http://musacrfmp.com/), and a Project Outreach Coordinator with a telephone hotline (530-809-9317) was established to provide a single point of contact for all parties. Any and all interested parties within the Regions were encouraged to be a part of the MUSR RFMP planning effort. As of 2014, the stakeholder database included over 450 members.

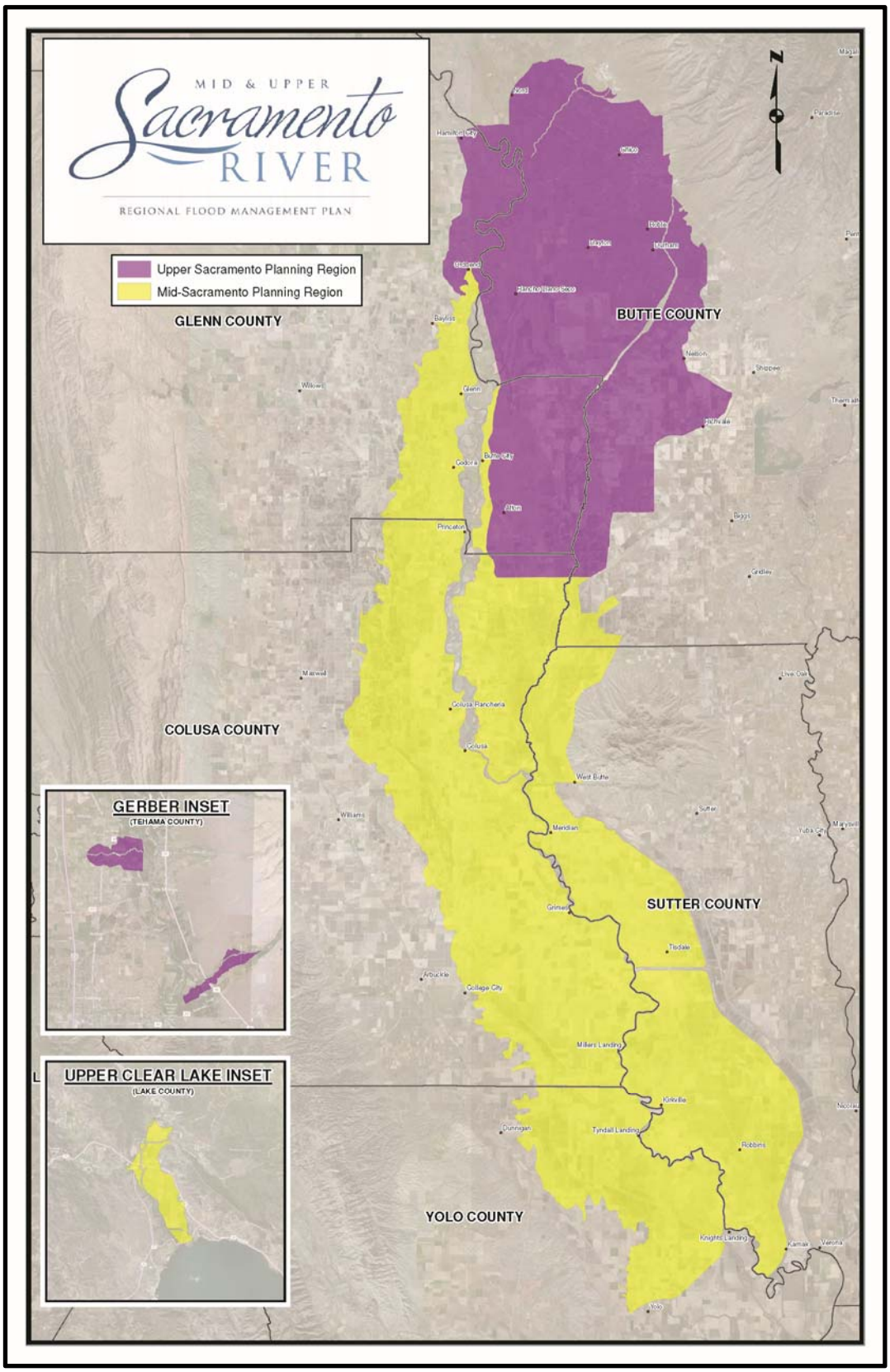
A draft of the MUSR RFMP was issued for public and stakeholder review during the summer of 2014. Comments received were addressed and incorporated into the Final MUSR RFMP as deemed appropriate by the RFMP Administration Committee.

ES.4 Organization of the Planning Team

Reclamation District 108 was the grant recipient and lead agency for preparing the MUSR RFMP. RD 108 retained Peterson Brustad, Inc. as the lead consultant to assist in the research, planning, and preparation of the RFMP. A Steering Committee was formed to help guide and assist the MUSR RFMP team with plan development. The Steering Committee consisted of representatives from the participating counties, cities, reclamation districts, levee districts, and other levee maintaining agencies. Additionally, all tribal groups, NGOs, agricultural interests, and landowners within the MUSR RFMP Planning Area were encouraged to be involved.

In addition to the Steering Committee, a smaller Administration Committee with representatives from the Mid Sacramento and the Upper Sacramento regions was formed in order to guide the day-to-day activities of the planning team. The Administration Committee members were elected by the Steering Committee in November 2012, and additional members were added in 2014.

Figure ES-1. Mid and Upper Sacramento Planning Region



ES.5 Regional Setting

The Mid and Upper Sacramento River (MUSR) Regions contain a diverse set of stakeholder groups in urban and rural-agricultural areas. Combined, the two regions encompass approximately 640,000 acres throughout seven counties (Tehama, Glenn, Lake, Colusa, Butte, Sutter, and Yolo). The major part of the Sacramento River Flood Control Project bypass system is located in the region, including the Sutter and Tisdale bypasses. About 68 percent of the Regions' area is classified as Prime and Statewide Importance Farmland. Large areas of the Regions are within the 100-year (1 percent annual chance) floodplain.

The Regions (except for the Lake County portion) is located within the north-central portion of the Sacramento River Valley. The Regions extend about 90 miles from north to south and approximately 25 miles from east to west. This portion of the Planning Area is dominated by the Sacramento River and its numerous tributaries, which originate from the foothills of the Coastal Range west of the region and the Sierra Nevada Mountains to the north and east of the region. . Some of the primary tributaries of the Upper Sacramento River within the region include: Cottonwood Creek, Elder Creek, Deer Creek, Stony Creek, Mud Creek, and Butte Creek. Nearly all of these tributaries have at least one State Plan of Flood Control (SPFC) levee system protecting existing development, and the Planning Area is generally defined as areas protected by these SPFC levees. The Regions are primarily dominated by farmland and a number of small communities, along with the cities of Colusa and Chico. The list of small communities within the Regions includes: Gerber, Glenn, Butte City, Princeton, Meridian, Grimes, Robbins, Hamilton City, Ord Bend, Afton, Richvale, Nelson, Durham, Dayton and Nord.

Per the 2010 U.S. Census Bureau Information, the population within the Upper Sacramento River Region is approximately 108,000. The population within the Mid-Sacramento River Region is approximately 14,000. The only urban area of 10,000 people or more in the Upper Sacramento River Region is Chico. In general, growth rates for the Regions are estimated to average around 0.6 to 1.0 percent per year for the next five years. A breakdown of population for areas with the Regions is shown below in Table ES-1.

Table ES-1. Mid and Upper Sacramento River Region 2013 Population Estimates

County/City/Small Community	2010 Total Population	Population within Upper Sacramento River Region	Population within Mid Sacramento River Region
Tehama County	**63,463**	**1,627**	**0**
Tehama[1]	418		
Gerber	1,060		
Vina[1]	237		
Glenn County	**28,122**	**3,177**	**867**
Hamilton City	1,759		
Ord Bend	37		
Glenn	42		
Butte City	107		
Afton	18		
Lake County	**64,665**	**0**	**1,396**
Lakeport[1]	4,753		
Upper Lake	1,052		
Butte County	**220,000**	**102,893**	**97**
Chico	86,187		
Nord	320		
Durham	5,518		
Nelson	88		
Richvale	244		
Colusa County	**21,419**	**86**	**9,067**
Colusa	7,380		
Princeton	303		
Grimes	391		
Sutter County	**94,737**	**0**	**1,722**
Meridian	358		
Robbins	323		
Yolo County	**201,311**	**0**	**183**

** Source: 2010 U.S. Census Bureau*

1. Located outside MUSR Regional Boundary

Land use in the MUSR Regions is primarily Prime and Statewide Importance Farmland with some large areas of Local and Unique Farmland and Native Vegetation and Grazing Land.

Table ES-2. Mid and Upper Sacramento River Regions Land Use

Land Type Category	Acres in Mid-Sac Region	Total % of Mid-Sac Region	Acres in Upper-Sac Region	Total % of Upper-Sac Region
Urban and Built-Up Land	3,293	1%	15,956	7%
Native Vegetation and Grazing Land	58,589	14%	34,453	16%
Local and Unique Farmland	72,476	18%	13,514	6%
Prime and Statewide Importance Farmland	277,778	67%	152,381	71%
Total	**412,135**	**100%**	**216,304**	**100%**

The dominant industry in the MUSR Regions is agriculture and it plays a significant role in the economies for each of the encompassing counties. Rice, almonds and walnuts are the major

crops. In 2011, total crop production was valued at more than $657 million for Colusa County (ranked 16th in the State in terms of gross value), $635 million for Butte County (ranked 17th in the State), $611 million for Glenn County (ranked 18th), $549 million for Yolo County (ranked 21st), $547 million for Sutter County (ranked 22nd), $245 million for Tehama County (ranked 29th), and $67 million for Lake County (ranked 42nd). In total, the farming and agriculture industry accounts for more than $3.3 billion of the economies within the MUSR Regions. Note that this does not account for the indirect impacts from local "business-to-business" transactions necessary to support the agricultural industry (i.e., the local purchase of farm machinery, pesticides etc.), nor does it account for the induced impacts generated by the direct and indirect economic activity (i.e., when agricultural laborers or farm proprietors use earnings to purchase food, clothing, automobiles, real estate, education, and health and social services).

The Regions also have significant natural resources such as: aquatic habitats, wetlands, riparian habitats, and wildlife foraging areas. Many of the habitat resources are located within wildlife refuge areas within the Regions, and a diversity of habitat resources are also located outside of the wildlife refuge area boundaries. Agricultural areas and private lands also provide valuable habitat for some species. For example, rice fields provide habitat for wintering waterfowl, and giant garter snake, and alfalfa fields provide foraging habitat for Swainson's hawk.

Table ES-3 provides an overview of the managed wildlife lands within the Regions.

Table ES-3. Summary of Conversation Lands within the Regions

Conservation Lands and Easements in Plan Regions	Acres	% of Total Planning Area
The Nature Conservancy Easements and Properties	9,526	6%
U.S. Fish and Wildlife Service Easements and Properties	37,740	3%
Department of Fish and Wildlife Service Easements and Properties	15,201	2%
Natural Resources Conservation Service Easements	17,214	1%
Other Easement Holders (Land Trusts and Ducks Unlimited)	4,950	1%
Total	**84,632**	**13%**

Source: Regional Flood Atlas Database, California Department of Water Resources, 2013 and National Conservation Easement Database, 2013.

Table ES-4 Summary of Habitats within Conservation Lands-California Wildlife Habitat Relationship (CWHR) Types

CWHR TYPE	Acres	% of Conservation Lands Area
Fresh Emergent Wetland	43,190	51.0%
Cropland	14,029	16.6%
Valley Foothill Riparian	10,130	12.0%
Annual Grassland	10,038	11.9%
Riverine	1,246	1.5%
Barren	485	0.6%
Blue Oak Woodland, Blue Oak-Foothill Pine	311	0.4%
Urban	62	0.1%
Scrub	44	0.1%
Eucalyptus, Urban	5	0.0%
No Data (Conservation areas without habitat data)	5,092	6.0%
Total	**84,632**	**100.0%**

Source: Regional Flood Atlas Database, California Department of Water Resources, 2013

ES.6 The Regional Flood Management System

The Mid and Upper Sacramento Regions lie within the Sacramento River Watershed, the State's largest watershed. At the core of this watershed is the Sacramento River, which collects water from over 27,000 square miles and discharges through the Sacramento-San Joaquin Delta into the San Francisco Bay. California's climate patterns produce distinct wet and dry seasons that result in high volumes of water coming in short periods of time. The Sacramento River and its tributaries experience short-lived but periodic peak flows that can strain or overwhelm their natural flow channels. The state and federal governments, along with local stakeholders, have constructed and implemented a vast and complex system to manage and provide flood control for both urban and non-urban areas in the Mid and Upper Sacramento River Regions. Within the Mid and Upper Sacramento River Regions, the integrated structural system of flood protection includes reservoirs with active flood control space (upstream of the Planning Area boundaries), hundreds of miles of levees, multiple weirs, an outfall structure, diversion channels, massive bypasses, and drainage facilities, which pump interior runoff and seepage from levee protected areas back into the flood control channels. These structural elements work together to contain high flows within the main river channel, and when necessary, divert water out of the main river channel into the bypass system. In recent times, major floods have occurred on the Sacramento River in 1982-83, 1986, 1995, 1997 and 2006.

ES.7 Challenges Facing the Regions

Levee Deficiencies

The primary structural component of the Regions' flood protection system are levees of which there are nearly 400 miles. Although the regional flood management system has prevented millions of dollars in flood damages since its construction, a better understanding of the risk assessment and engineering standards has made it clear that some of the regional levee segments face an unacceptably high chance of failure. These levees were for the most part originally constructed to protect agricultural areas, and generally are inadequate to protect urban areas and the small rural communities within the Regions. This, combined with growth within the Regions has increased the estimated level of flood risk, and increased the urgency to improve the levee systems within the Regions.

System Maintenance

During development of the MUSR RFMP one of the most deliberated issues was the growing challenges local levee maintaining agencies (LMAs) must deal with to effectively operate and maintain the current flood control system to provide the flood control benefit it was originally designed to provide. The current flood system of levees, weirs, and bypasses was largely developed as a 'single purpose' system with the goal to reduce flooding and flood damages. The system development did not necessarily account for or accommodate the natural environment. Since development of the system new laws such as the Endangered Species Act, and changes in societal aspirations for the preservation of the natural environment, have created challenges and conflicts in managing, and operating the flood control system. This has particularly become an issue for rural levee maintaining agencies as they are not sufficiently funded to manage these emerging challenges. In the MUSR Regions, 19 out of the 21 federal "Project Levee" systems have been placed on "inactive status" in the federal Rehabilitation Inspection Program (RIP) by the U.S. Army Corps of Engineers due to levee deficiencies. These systems are now ineligible for federal post disaster recovery (PL84-99) funding.

In addition, insufficient maintenance of channels, banks, and bypasses of the flood control system is adversely impacting its carrying capacity and performance. Barriers to performing adequate maintenance include: insufficient funding and resources; timing and costs associated with environmental and regulatory restrictions; competing maintenance priorities; and completing interests and mandates of federal and state regulatory and resource agencies, and flood system maintenance agencies.

Flood Emergency Responses Readiness

The flood emergency readiness of the Mid and Upper Sacramento River Regions' levee maintaining agencies ranges widely. Overall, the readiness of the LMAs as a group to conduct effective flood fight operations is below optimal. Even among the State maintenance areas, where a high level of readiness is evident, there are indications that coordination or the potential for mutual aid with local governments is informal, lacks written policies, and could be further clarified, in particular, as to how State staff operating in their maintenance area could access

assistance from other jurisdictions as opposed to other levels of the Department of Water Resources.

LMAs either have no written plans for conducting flood fight operations or have plans that do not share a common format or content with the plans of other LMAs. Local governments, other than levee maintaining entities, do not maintain stockpiles of flood fight materials to support potential flood fight operations on the levees and do not have clear policies in regard to providing such support to the LMAs. Local governments also do not have clear and pre-determined field command protocols for inter-agency coordination in the field except in a few cases. Levee maintaining agencies and public safety jurisdictions that would be operating in the same area do not conduct regular exercises to identify gaps in the development of an optimal response capability.

Balancing the need for Flood Systems Improvement with 2012 CVFPP Conservation goals

The MUSR RFMP recognizes that fisheries and wildlife habitat have been substantially altered and degraded over the past 160 years through the construction of flood control levees, dams, and diversion structures, as well as land use changes across the regions. The RFMP discusses the numerous challenges associated with balancing the conservation goals outlined in the 2012 CVFPP, with the need to make improvements to the flood management system, while sustaining existing land uses essential to the economic viability of the regions. The MUSR RFMP has identified opportunities to improve habitat as part of multi-objective flood risk management projects, consistent with the goals of the 2012 CVFPP and the regions' objectives. The regions are interested in promoting projects which integrate agricultural land preservation, habitat enhancement, and restoration opportunities where feasible. The MUSR RFMP describes strategies for preserving agricultural lands along flood corridors in ways that are wildlife friendly, describes habitat enhancement and restoration opportunities, and explores environmental compliance and mitigation solutions. The MUSR RFMP discusses Corridor Management Plans (CMP) which offer potentially effective solutions to the current piecemeal approach to enhancing and mitigating effects on fisheries and wildlife habitats.

System Expansion Concerns

In the Sacramento River Basin-Wide Feasibility Study, DWR intends to analyze expansion of the Sutter Bypass, and construction of a new Feather River Bypass (Cherokee Canal extension and expansion). Serious concerns have been raised by local stakeholders during MUSR RFMP development regarding the potential for redirected hydraulic impacts and impacts to local land-use, from these proposed system expansions.. MUSR RFMP local stakeholders have strongly urged DWR to fully evaluate other alternatives to system expansion the Basin-Wide Feasibility Study such as expanding surface water storage, developing and implementing a plan for effective operation and maintenance of the Sutter Bypass and Cherokee Canal, and implementing Forecast-Coordinated Reservoir Operations to improve system flexibility.

Protecting and Sustaining Small Communities

For rural-agricultural areas, the 2012 CVFPP describes improving flood protection to provide for the preservation of rural-agricultural activities and viable local economies. In the MUSR Regions

a significant portion of the rural-agricultural areas and small communities are mapped as FEMA Special Flood Hazard Areas (SFHA). In general, rural areas and small communities within the MUSR regions alone cannot afford the necessary capital improvements that are needed to achieve a 100-year level of flood protection. Many rural areas and small communities are categorized as economically disadvantaged communities. Out of the 16 identified small communities within the Regions, half of them are classified as economically disadvantaged, and will need significant levels of outside assistance to achieve 100-year levels of flood protection.

ES.8 Implementation Strategies

To address the challenges identified in the RFMP, a number of implementation strategies have been proposed including:

System-Wide Improvement Frameworks (SWIFs): The majority of levees systems within the Regions are ineligible for PL 84-99 rehabilitation assistance due to deficiencies identified by USACE. SWIFs provide an avenue to maintain eligibility in the RIP and thus receive rehabilitation assistance while addressing long-term maintenance or repair deficiencies. Several LMAs in the Regions have indicated their willingness to pursue SWIFs in order to regain PL84-99 eligibility. SWIFs have the added benefit of providing the opportunity for LMAs to engage at the federal, and state levels to address complex system issues in a more long-term, comprehensive approach. It provides a process to identify solutions that optimize resources by prioritizing improvements and corrective actions based on risk; and to coordinate overlapping or competing programs and requirements. This comprehensive assessment and approach would also provide more opportunities to package flood system repairs with habitat enhancement projects. Therefore, if allowed by DWR, the next phase of RFMP funding should be utilized to advance the SWIF process.

Governance: The MUSR Regions lack strong regional and sub-regional governance entities equipped to lead the implementation of needed flood risk reduction projects. The next phase of RFMP should explore the viability of establishing governance framework(s) which could lead to the formation of regional planning and implementation entities designed to effectively engage in regional flood management issues. An important governance issue which should be addressed during this process is whether consolidation or amalgamation of LMAs could provide an enhanced approach to system maintenance and operations. During the RFMP process we heard loudly that rural LMAs lack the resources and expertise to deal with the growing regulatory oversight of O&M activities. This discussion should occur in parallel with SWIF development because a comprehensive assessment of O&M issues is needed to facilitate dialogue on LMA regional governance. Without that information, the 'fear of the unknown' will stymie attempts to create a regional approach to system operations and maintenance.

Improve Regional Flood Emergency Preparedness: Create a sustainable, regional, integrated response structure and partnership, the foundation of which is high quality, thorough, and user friendly local flood emergency action plans to guide field response to an incipient flood problem

or threat. Implementation steps should include:

- Develop a set of GIS-based local flood safety plans for the region with a common standard and mapping format.
- Create a region-wide unified command structure and enhanced multi-agency communication and coordination system.
- Develop and implement a regional flood response training and exercise program.
- Implement a regional stockpile system using breach scenario analysis to supplement criteria for standard resource inventory.

Corridor Management Plans: Chapter 6 discusses a range of challenges associated with balancing the conservation goals outlined in the 2012 CVFPP, with the need to make improvements to the flood management system while sustaining existing land uses. Corridor Management Plans (CMP) could be utilized to build upon the vision and strategies developed during the RFMP process, and move them forward. CMPs would incorporate the MUSR RFMP strategies for managing flood protection facilities, conveyance channels, and floodplains, and could include components such as a maintenance plan; a restoration plan; and policies for compatible land uses such as agriculture and recreation within the corridor. In addition to addressing habitat restoration and flood facility maintenance, CMPs can be a foundation for securing programmatic regulatory agency approvals for ongoing maintenance activities and habitat restoration. For MUSR, CMPs would build upon the coordination, collaboration, and cooperative working relationships developed during the RFMP between interested parties and stakeholders, State, federal, and local agencies, NGOs, maintenance districts, agricultural interests, and landowners,.

Comprehensive Bypass Management Plan: The MUSR RFMP identified the need to improve management of the system flood bypasses and it calls for development of a long-term Comprehensive Bypass Management Plan which at a minimum would:

- Establish a program for regular sediment removal;
- Establish a program for managing vegetation with the bypass system. The vegetation management program should assess the value of maintaining trees parallel to the levees to act as wave breaks to reduce wave action;
- Establish an active enforcement program to ensure compliance with existing flood flowage easements;
- Identifies strategies for providing operations and maintenance funding;
- Recognize and protect the benefits and value of existing habitat provided by adjacent private property agricultural lands. This habitat should be considered when evaluating impacts from managing the bypass to convey flood flows;
- Promote ‘flood bypass appropriate’ habitat enhancement which maximizes habitat values without adversely impacting flood flow conveyance; and.
- Incentivize and encourage wildlife-friendly, flood flow neutral, farming practices within the Sutter Bypass since the majority of the Bypass is privately-owned and actively farmed.

Small Community Flood Control Improvements
The MUSR RFMP identifies potential projects which if implemented would provide small communities with 100-Year levels of flood protection. However, small communities within the regions lack the resources to plan and implement these projects. Recent updates from DWR have indicated that future grant funding will be available for small community flood control improvements through Proposition 1E. Currently, draft guidelines for the Small Communities funding program are scheduled to be released by DWR in late 2014/ early 2015. While the proposed Small Communities funding program won't be able to provide enough funding to solve all the small communities issues identified, it can help further the goal of achieving 100-Year levels of flood protection.

Enhanced Inundation Mapping to Facilitate Development of Nonstructural Alternatives: The MUSR regions are largely rural, with the at-risk populations and critical facilities and infrastructure widely dispersed throughout the Regions. Therefore implementing non-structural solutions will be an integral component of the overall regional suite of flood risk reduction measures. Currently the Regions lack reliable inundation mapping data which hinders development of non-structural alternatives. It is recommended that the next phase of the RFMP include funding to develop inundation mapping (base flood elevations) using the tools developed by DWR through its CVFED program.