Regional Governance of Flood Management in the Central Valley:

An analysis of the Integrated Regional Water Management and Regional Flood Management Planning processes

May 2014

Esther Conrad

Dept. of Environmental Science, Policy and Management
University of California Berkeley

Acknowledgements

This study was carried out with support from the Climate Change Program at the California Department of Water Resources (DWR), under Agreement No. 4600008548 between DWR and the Office of the President, Regents of the University of California. The author is a PhD candidate in the Department of Environmental Science, Policy and Management (ESPM) at the University of California Berkeley, working under the guidance of Professor Jeffrey Romm. Views expressed in this report are those of the author, and do not necessarily represent those of ESPM, the University of California, or the Department of Water Resources. Please contact the author at estherconrad@berkeley.edu with any questions or comments.

The author would like to thank the following people for their valuable input and/or comments on this report:

Michael Anderson, DWR – Division of Flood Management
John Andrew, DWR – Executive Branch
John Cain, American Rivers
Erin Chappell, DWR – North Central Region Office
Hong Lin, DWR – North Central Region Office
Elissa Lynn, DWR – Division of Integrated Water Management
Clyde Macdonald, Central Valley Flood Protection Board
Jennifer Marr, DWR – Division of Statewide Integrated Water Management
Ricardo Pineda, DWR – Division of Flood Management
Jay Punia, Central Valley Flood Protection Board
Julie Rentner, River Partners
Michael Sabbaghian, DWR – Division of Flood Management
Andrew Schwarz, DWR – Division of Integrated Water Management
Katy Spanos, DWR – Chief Counsel's Office
Chris Unkel, American Rivers

Cover photos: California Department of Water Resources

Table of Contents

Figures and Tables

Acronyms

ARB	American River Basin
CNRA	California Natural Resources Agency
CVFPP	Central Valley Flood Protection Plan
CVFPB	Central Valley Flood Protection Board
CWC	California Water Code
DWR	California Department of Water Resources
EPA	United States Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FESSRO	FloodSAFE Environmental Stewardship and Statewide Resources Office
GCM	global climate model
GHG	greenhouse gas
IRWM	Integrated Regional Water Management
JPA	Joint Powers Authority
LMA	local maintaining agency
MOU	Memorandum of Understanding
NGO	non-governmental organization
NSV	North Sacramento Valley
PMP	Project Management Plan
PRC	Public Resources Code
RAMP	Regional Advance Mitigation Program
RAP	Regional Acceptance Process
RD	reclamation district
RFMP	Regional Flood Management Plan
RMS	Resource Management Strategy
RWMG	Regional Water Management Group
SBFCA	Sutter-Butte Flood Control Agency
SPFC	State Plan of Flood Control
SSIA	State Systemwide Investment Approach
SWFM	Stormwater and Flood Management
SWRCB	State Water Resources Control Board
USACE	United States Army Corps of Engineers
USJR	Upper San Joaquin River
WEF	Water Education Foundation

Executive Summary

California faces significant challenges in managing its highly variable water resources, particularly as climate change and a growing population exacerbate drought and flood risks. The California Department of Water Resources (DWR) and other state agencies have been encouraging integrated approaches to water management, taking into account the connections between water supply, water quality, flood protection, and ecosystem health. The recent California Water Action Plan calls for improved coordination between local, state and federal agencies and tribal governments in order to develop multi-benefit water management strategies. Regional-scale planning has become a crucial avenue for advancing these efforts. Initiated in 2002, the Integrated Regional Water Management Planning (IRWM) process has led to the formation of 48 water planning regions statewide, in which diverse local agencies have developed integrated plans for managing all aspects of a region's water management. More recently, a Regional Flood Management Planning (RFMP) process was created in the context of the Central Valley Flood Protection Plan to advance integrated approaches to reducing flood risks. Six flood planning regions, overlapping with nine IRWM regions, were formed in 2012.

This study analyzes the origins and functioning of the IRWM and RFMP processes, and the degree of coordination between them to address flood risks in the Central Valley. In particular, it examines how each is working to generate multi-benefit strategies, and how they account for climate change. It also discusses opportunities for future coordination between the IRWM and RFMP processes, and DWR's role in supporting this.

This study is primarily based upon an analysis of publicly available documents related to the IRWM and RFMP processes. It is also informed by meeting observations and conversations with staff at DWR and the Central Valley Flood Protection Board, and participants in IRWM and RFMP processes. Since RFMPs were not yet completed at the time of this writing, this study's findings are preliminary. Nonetheless, this report provides an indication of the overall functioning of these RFMP and IRWM regions, and some general considerations for DWR as it assesses next steps in supporting these programs.

Overview of the IRWM and RFMP processes

Although the IRWM and RFMP processes are both regional efforts to promote multi-benefit approaches to water management, they differ in critical ways. The IRWM program emerged from a recognized need for greater coordination among local water agencies in the context of improving water supply reliability. In 2002, the Integrated Regional Water Management Planning Act established a process for local agencies to form "regional water management groups," which were eligible to apply for certain state grants after preparing a regional-scale plan for managing their water resources. Supported by approximately $1.5 billion in bond funds, there are now 48 IRWM regions statewide. Initially, the program focused primarily on improving water supply reliability, but following a 2008 legislative update, the IRWM process has explicitly emphasized integration across multiple water management objectives and broad stakeholder engagement. In keeping with California's long tradition of local control over water management, the IRWM process is a voluntary one, and provides

local agencies with considerable flexibility in determining regional boundaries and partnerships. DWR's role in the IRWM process has been primarily focused on ensuring compliance with grant program requirements and offering process-oriented technical assistance. The California Water Plan Update process, which has emphasized the importance of IRWM for promoting multi-benefit approaches since 2005, provides an overall framework for the development of IRWM plans. However, IRWM regions determine their own priorities and implementation strategies.

The Regional Flood Management planning (RFMP) process is part of the Central Valley Flood Protection Plan (CVFPP), which was adopted in 2012 by the Central Valley Flood Protection Board (the Board) and will be updated every five years. While local entities have long played an important role in flood management, the risks in the Central Valley have proved significant enough to require involvement from the state and federal government. The CVFPP is primarily driven by the state's interest in reducing flood risks in areas protected by the State Plan of Flood Control (SPFC), for which the Board and DWR have special responsibilities to assure adequate flood protection. The RFMP process was created to engage local entities in the development of implementation plans for the CVFPP, particularly in identifying local flood protection efforts that could also contribute to achieving systemwide reductions in flood risks. The need to reduce state liability for flood risks and to achieve specific CVFPP goals helps explain why DWR saw a need to create a separate set of flood planning regions, distinct from the IRWM regions that already existed in the Central Valley. DWR defined RFMP regional boundaries along flood protection zones of the SPFC, and issued small grants to six local flood management agencies to develop regional plans identifying flood risks, proposed solutions, and financing strategies. The Board has sought to build a sustained dialogue between RFMP regions, DWR, and Board members through monthly Coordinating Committee meetings.

Governance and participation in IRWM and RFMP processes

In accordance with the IRWM Planning Act, IRWM regions are governed by "regional water management groups" (RWMGs) whose membership is usually formalized through a Memorandum of Understanding (MOU) or a Joint Powers Agreement (JPA). An analysis of RWMG members in the nine IRWM regions in the Central Valley reveals that a majority are agencies with responsibility for water supply. Cities and counties also have a significant presence. IRWM regions engage a broader set of stakeholders through advisory committees and public meetings. However, relatively few flood management agencies are involved. On the other hand, the working groups formed to lead the development of six RFMPs are composed primarily of local flood implementing or maintaining agencies, along with a number of cities and counties. A wider range of stakeholders has participated in stakeholder meetings and workshops. An analysis of the overlap of participants indicates that cities and counties represent important connections between the two processes, along with special districts that have water supply and flood protection responsibilities.

Flood management in IRWM plans and RFMPs

IRWM plans are intended to provide a comprehensive view of a region's water resource issues, and identify opportunities for integrated water management. The six updated IRWM plans in the Central Valley each include flood protection among their objectives. Most

contain a basic overview of flood risks, and two regional plans (Yuba County and Merced) include a more detailed analysis. Each IRWM plan contains a list of projects that contribute to achieving IRWM objectives. Projects with flood management as a primary benefit represent from 4-39% of all projects included these IRWM plans. The goals of RFMPs are aligned with those of the CVFPP, with some differences in emphasis depending upon regional context. Each plan contains a relatively detailed assessment of flood risks, drawing upon a draft Regional Flood Atlas provided by DWR and locally available data. Currently, RFMP regions are still in the process of developing project lists and financing strategies.

At the state level, coordination within DWR regarding management of the IRWM and RFMP processes appears to have been limited so far. This may be partly explained by the different institutional contexts for these processes, and DWR's role in each. DWR's Division of Flood Management plans to integrate outcomes of the RFMP process into implementation of the CVFPP, while the Division of Integrated Regional Water Management has primarily sought to support IRWM regions in developing their own goals and governance structures. The level of coordination between IRWM and RFMP regions varies, and appears to be greater when there is more overlap between participants, and when the timing of the two processes have been aligned. Challenges for coordination include different planning requirements and timing. In addition, while RFMPs are more focused on projects related to the SPFC, IRWM regional plans mainly include non-SPFC projects.

Multi-benefit approaches to flood management

Among the key purposes of the RFMP and IRWM regional planning processes is to support the development and implementation of integrated, multi-benefit approaches to water management. Multi-benefit projects in the IRWM process that involve flood protection are quite likely to include some water supply benefits, as well as ecosystem benefits. To date, ten projects with flood protection benefits have been funded through IRWM Implementation grants in the Central Valley. Of these, eight also claim benefits to water supply through groundwater recharge and other means. Further, the three Stormwater and Flood Management projects funded in the Central Valley claim water supply benefits as well as reduced flood risk. In contrast, much of the dialogue about multi-benefit projects within the CVFPP and RFMPs focuses on incorporating conservation elements into flood projects. This emphasis is reflected in the CVFPP's goals, which include conservation, and in strong participation from environmental organizations in the development of all six RFMPs. Projects with water supply benefits are not entirely absent, however. The preliminary project list of the Upper San Joaquin RFMP includes a number of projects that generate benefits in terms of water supply as well as the environment. This may reflect the involvement of irrigation districts and other water supply interests in this RFMP region.

Climate change in IRWM plans and RFMPs

The California Water Plan Update process and the Central Valley Flood Protection Plan both emphasize the need to build resilience to the future impacts of climate change. The IRWM and RFMP processes take different approaches to accounting for climate change. Each IRWM region is required to conduct an assessment of climate change vulnerabilities, prioritize these vulnerabilities, and outline a plan for further analysis of prioritized risks. Each of the six updated IRWM plans in the Central Valley include a vulnerability

assessment, and most revealed increased risk of flooding to be a high priority climate change vulnerability. RFMPs, on the other hand, are not required to address climate change risks. Instead, DWR is conducting an analysis of how climate change may affect flood risks throughout the Central Valley for the 2017 CVFPP update. Once complete, DWR's analysis may have considerable value for informing future updates of IRWM plans and RFMPs.

Opportunities for coordination between IRWM and RFMP processes

This study finds that, despite their geographical and substantive overlaps, coordination to date between the IRWM and RFMP processes has been relatively limited. However, improved coordination may provide some straightforward and low-cost opportunities to advance integrated water management and build resilience to climate change in the Central Valley. These opportunities include:

- RFMPs may be a valuable source of information about flood risks and management strategies for IRWM plans
- Project lists could be shared across IRWM and RFMP regions to identify common or complementary strategies
- Dialogue between RFMP and IRWM regional participants could stimulate new partnerships that can help identify multi-benefit flood projects that address water supply, water quality, and environmental needs
- The climate change analyses being undertaken by DWR for the CVFPP could benefit IRWM and RFMP regions in the Central Valley
- The CVFPP Conservation Strategy, Regional Advance Mitigation Program (RAMP), and basin-wide feasibility studies would be valuable resources for IRWM planning in the Central Valley
- In some cases, IRWM regions may be able to offer organizational capacity to help sustain RFMP planning in the future

DWR could help support such coordination by continuing to provide resources to IRWM and RFMP regions to support on-going stakeholder engagement at regional scales. DWR could also encourage IRWM and RFMP regions to explore the possibility of consolidating their staff support for regional coordination. DWR could also work to improve alignment between future IRWM and RFMP planning and grant application requirements.

Finally, this study raises several considerations for DWR's approach to statewide flood planning. The recent Flood Future Report recommends that flood planning regions should be developed across the state. This study has demonstrated that separate flood planning regions were created in the Central Valley in large part because DWR and the Central Valley Flood Protection Board have special responsibilities for ensuring adequate flood protection within the State Plan of Flood Control. In other parts of the state, DWR's role may be slightly different with respect to local flood management agencies. DWR should consider whether it is more effective to support expanded engagement by flood management entities in the IRWM process, rather than to start anew. Although working through the IRWM process may not be appropriate in all situations, when feasible it could consolidate DWR's investments in the development of regional water planning capacity, and help enable the partnerships needed to develop multi-benefit flood management projects.

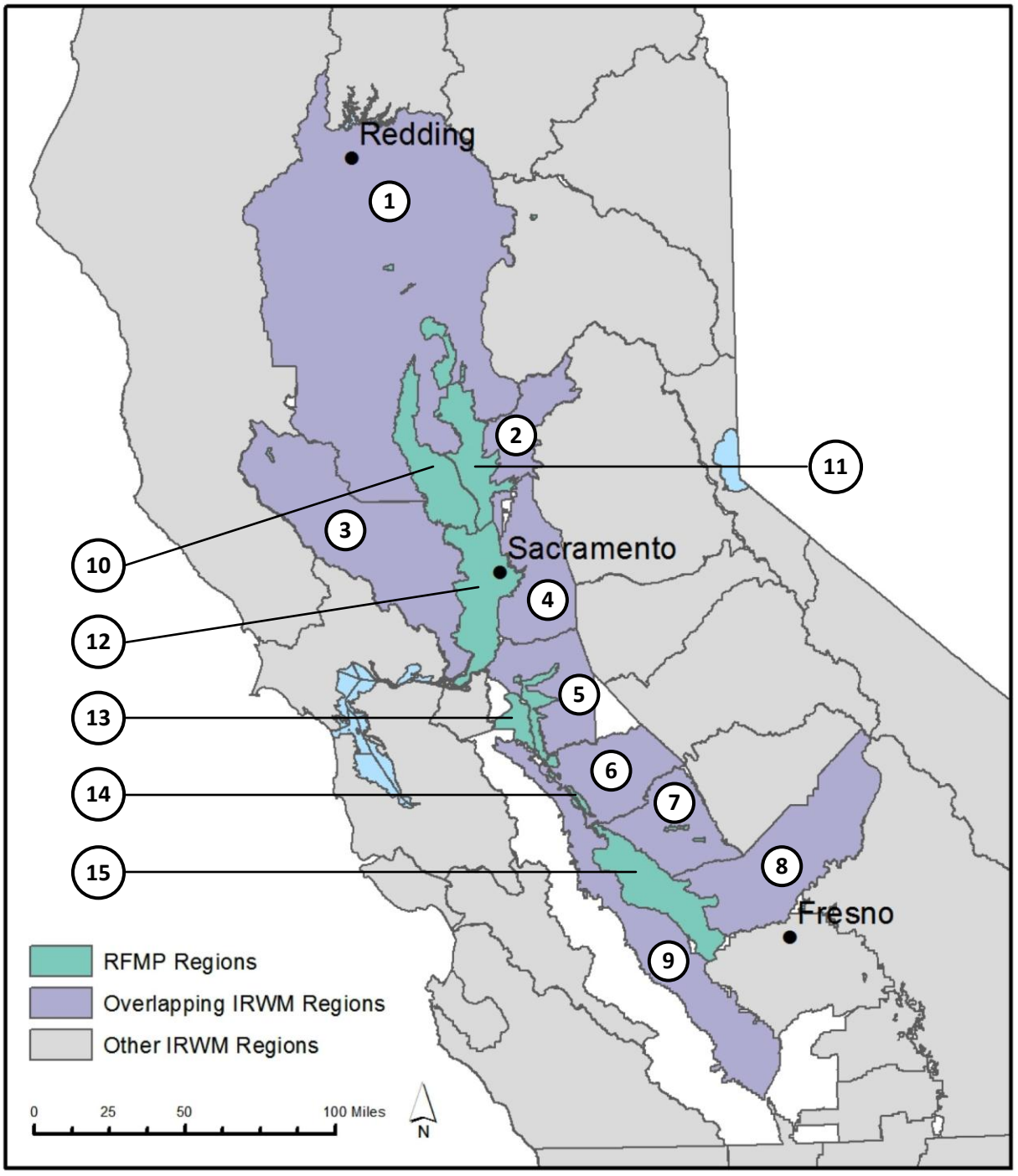
1. Introduction

Over the past decade, California has been seeking new ways to handle its significant water management challenges. Water demand to meet human and environmental needs is growing, but – as the current drought makes abundantly clear – the supply of water is not. At the same time, an over-supply of water is also a threat; more than 7 million Californians live in a floodplain and $580 billion in assets are at risk, with the Central Valley subject to significant impacts (DWR and USACE 2013). Furthermore, both drought and flood risks are likely to be exacerbated by climate change. Although the magnitude of these effects is uncertain, research indicates that we may expect longer and more severe dry periods, as well as more extreme precipitation events (Cayan et al. 2012, Dettinger 2011). In order to address these challenges, the California Department of Water Resources (DWR) and other state agencies have been encouraging integrated approaches to water management, taking into account the connections between water supply, water quality, flood protection, and ecosystem health. The recent California Water Action Plan calls for an integrated water management approach, emphasizing the need for improved coordination between local, state and federal agencies and tribal governments to advance strategies that address multiple benefits (CNRA et al., 2014).

Regional-scale planning has become a crucial avenue for advancing multi-benefit approaches to water management. In 2002, the Integrated Regional Water Management (IRWM) Planning Act established a process through which local agencies could work together to develop integrated plans for managing their region's water resources. Supported by approximately $1.5 billion in bond funds, there are now 48 IRWM regions statewide, covering 87% of the state's area and 99% of the population (WEF 2013). Beginning in 2005, updates to the California Water Plan have highlighted IRWM planning as a crucial framework for improving water supply reliability across the state, as well as building resilience to climate change impacts (DWR 2009a). More recently, another regional planning process has begun in the context of the Central Valley Flood Protection Plan (CVFPP), a major initiative to reduce flood risks in the Sacramento and San Joaquin river basins. This has led to the creation of six Regional Flood Management Planning (RFMP) regions, which overlap with nine existing IRWM regions (see Figure 1). Initiated in 2012, the RFMP process is intended to engage diverse local interests in the development of integrated, multi-benefit approaches to reducing flood risks in the Central Valley (DWR 2012a).

How do these regional planning processes function, and what can they deliver in terms of the development of multi-benefit strategies and improved resilience to climate change and other risks? What coordination is occurring between these processes, or may be possible in the future? Finally, what is the role of DWR and other state agencies in supporting these regional planning processes? This study seeks to address these questions, and to help inform current thinking about the role for regional planning in California's water future. DWR is currently preparing a strategic plan to map out the future of the IRWM process (DWR 2012b), and is also considering future support for the RFMP process. In addition, DWR's recent Flood Future Report recommends expanding regional flood planning across

Figure 1. IRWM and RFMP Regions in the Central Valley



IRWM Regions

1. North Sacramento Valley
2. Yuba County
3. Westside Sacramento
4. American River Basin
5. Eastern San Joaquin
6. East Stanislaus
7. Merced
8. Madera
9. Westside San Joaquin

RFMP Regions

10. Upper-Mid Sacramento River
11. Feather River
12. Lower Sacramento-Delta North
13. Lower San Joaquin-Delta South
14. Mid-San Joaquin River
15. Upper San Joaquin River

the state, potentially in coordination with the IRWM process (DWR and USACE 2013). Understanding how IRWM and RFMP planning has functioned in practice in the Central Valley may help in determining the future role of regional planning in building more sustainable, resilient water management strategies in California.

Specifically, this study seeks to address the following questions:

1. Why was a new regional flood planning process initiated in the Central Valley, overlapping with the IRWM process, and what are the key policy and institutional underpinnings of both processes?
2. Who participates in the RFMP and IRWM planning processes, and what regional-level governance arrangements have emerged?
3. How are flood management issues addressed in both processes, and what coordination has occurred between them so far regarding flood planning in the Central Valley?
4. How do the IRWM and RFMP processes promote multi-benefit approaches to water management, particularly with regard to flood protection?
5. How is climate change accounted for in both processes?
6. What opportunities exist for further coordination between the IRWM and RFMP processes, and what support might be needed from DWR?

This report is structured as follows. Section 2 describes the origins of the IRWM and RFMP processes, which each emerged from quite different institutional and policy contexts. Section 3 briefly introduces the set of six RFMP and nine IRWM regions whose planning processes are discussed in this report, and describes the data sources and methods used. Section 4 discusses the governance arrangements and stakeholder participation in the IRWM and RFMP processes. Section 5 reviews the current status and content of IRWM and RFMP plans, particularly with regard to flood management, and summarizes evidence of coordination so far between the two planning processes. Section 6 provides a preliminary look at how the IRWM and RFMP processes differ in the kinds of multi-benefit approaches that they promote. Section 7 describes the different approaches that these two regional processes take to incorporating climate change. Finally, Section 8 summarizes key findings, outlines possible opportunities for further coordination between the IRWM and RFMP processes, and offers some suggestions for how DWR might best support this.

2. Overview of IRWM and RFMP Processes

This section provides background regarding the origins of the IRWM and RFMP planning processes, and describes their overall functioning according to legislative requirements and DWR guidelines. As this section will demonstrate, these two planning processes have emerged from different institutional and policy contexts, and this has an important influence on how they are structured, the types of agencies involved and their expectations, and DWR's role in managing the two processes. This background helps explain why a new

regional flood planning process was initiated in the Central Valley even though IRWM planning, which is intended to incorporate flood management, was already underway.

2.1. Integrated Regional Water Management Planning

2.1.1. Institutional Context

The Integrated Regional Water Management (IRWM) process emerged out of a growing recognition over the past several decades that assuring reliable water supplies would require significant changes to California's fragmented approach to water management. Responsibility for most aspects of water management lies with local entities, including cities, counties, and over one thousand special districts with specific mandates related to urban and agricultural water supply, hydroelectricity, flood control and sanitation (Hundley 2001, p. 534-6). This responsibility is reflected in the fact that most spending on water management is local. From 1995 to 2010, local water agencies spent an average of $18 billion per year, while state agencies spent $1.9 billion and federal agencies $805 million (DWR 2013, Vol. 1, p. 3-22). However, local agencies, many of which have narrow mandates, have tended to work independently from one another, sometimes leading to duplicated, and even conflicting efforts (Spanos, forthcoming). The structure of many state policies and grant programs has encouraged this. For example, state grant programs focused on specific issues, such as groundwater supply or water quality, have encouraged separate planning for each. Efforts to address complex problems that require action on the part of multiple local entities have often been bogged down in administrative procedures or legal battles.

The IRWM process represents an effort to overcome this fragmentation and encourage local agencies to undertake more holistic planning and promote integrated solutions. At the same time, the IRWM program's design is in keeping with California's long tradition of local control over water management. Local agencies are not mandated to participate, and have considerable flexibility in determining their boundaries, partnerships, and regional water management goals. The Integrated Regional Water Management Planning Act of 2002 established a process for local agencies to form "regional water management groups," which would be eligible to apply for certain state grants after preparing a regional-scale plan for managing water resources. Propositions 50 and 84 (approved in 2002 and 2006 respectively) have provided a total of $1.5 billion in bond funding for RWMGs to develop and implement these "integrated regional water management plans." The State Water Resources Control Board (SWRCB) and DWR jointly administered the $500 million allocated by Proposition 50, and DWR has managed the $1 billion approved under Proposition 84. An additional $300 million was allocated in Proposition 1E (2006) for IRWM regions to address stormwater and flood management (SWFM) issues. Unlike previous, single-purpose funding opportunities, IRWM and SWFM projects must address multiple water management goals.

The 2002 IRWM Planning Act and Proposition 50 largely emphasized improvements to water supply reliability, and the initial participants in the IRWM process were primarily special districts, cities and counties focused on water supply issues. However, Proposition 84, and a revision to the IRWM Planning Act in 2008, more explicitly emphasized that

IRWM planning is intended to address multiple water management objectives. As stated in Proposition 84, IRWM plans must "use an integrated, multi-benefit approach to project selection and design," (Public Resources Code §75026(a)). The 2008 legislative update contains very similar language, and includes a number of provisions designed to implement this multi-benefit approach, such as guidance for defining IRWM boundaries and identifying stakeholders to participate in developing IRWM plans. These requirements, along with funding priorities laid out in Propositions 84 and 1E, shape the way the IRWM process operates today, as described in the rest of this section.

2.1.2. Relationship with the California Water Plan Update

The IRWM process is integrally linked with the California Water Plan Update process. Around the same time as the IRWM process was being launched, the California Water Plan Update was transforming from a DWR-led analysis of supply and demand into a statewide, collaborative planning process that lays out broad strategies and recommendations for sustainable water management (Ambruster 2008). In his introduction to the 2005 Update to the California Water Plan, former DWR director Lester Snow writes, "California's regions cannot meet all of their objectives with a single water strategy…[I]ntegrated regional water management enables regions to implement actions with multiple benefits and helps them become more self-sufficient," (DWR 2005). In the 2009 and 2013 updates, the emphasis on the IRWM process in shaping California's water future has continued. For example, Update 2009 states, "IRWM provides an effective forum and a critical framework for actions to address the uncertainties presented by climate change as well as other risks to California's water future," (DWR 2009, Highlights, p. 20). While the contents of IRWM plans themselves are not systematically rolled into the California Water Plan Update, participants in IRWM regions have been involved in the broad collaborative effort to develop the Water Plan, and many have contributed to the Water Plan's regional reports. Furthermore, the water plan process provides an overall framework for IRWM plans, which must discuss the applicability of the Resource Management Strategies (RMSs) outlined in the Water Plan to their region's water management efforts. However, the Water Plan provides recommendations, not requirements, and IRWM regions have flexibility in determining their own priorities.

2.1.3. IRWM Regional Boundaries

During its initial phases, the IRWM program had no specific guidelines for how regions should be formed. Local agencies could determine their own partners and boundaries, which resulted in a number of regions with a relatively narrow focus on infrastructure-based water supply efforts. The 2008 IRWM Planning Act, however, requires DWR to develop criteria for the acceptance of regions into the IRWM program. The Act provides considerable flexibility for how regional boundaries can be determined, stating, "at a minimum, a region shall be a contiguous geographic area encompassing the service areas of multiple local agencies, and shall be defined to *maximize opportunities for integration of water management activities*," (California Water Code §10541(f), emphasis added). The Regional Acceptance Process (RAP) developed by DWR follows this approach. While RAP guidelines discourage the formation of regions solely based on administrative boundaries, they also do not mandate the use of watershed boundaries, emphasizing that a region is "also defined by water management issues, stakeholders, and water-related conflicts,"

(DWR 2009b, p. 2). Today, there are 48 approved regions covering 87% of the state's area and 99% of the state's population (WEF 2013). Regions range in size from 170,000 to 12.5 million acres, and follow a mix of watershed, groundwater basin, jurisdictional, and administrative boundaries. Because regions are still largely self-organized and follow different boundary types, some IRWM regions overlap with one another. In these cases, IRWM regions often work out agreements with their neighbors as to how planning and projects will be conducted in overlap areas.

2.1.4. Governance and Participation

The 2002 IRWM Planning Act defined the governing body of an IRWM region as a "regional water management group" (RWMG), composed of three local agencies, two of which must have water management responsibilities. The 2008 legislative update added new requirements for how RWMGs should engage stakeholders in the process of developing an IRWM plan. First, it required that integrated regional water management plans be developed through a collaborative process with public decision-making procedures (CWC §10541(h)). Further, the Act includes a list of 13 types of stakeholder groups that must be consulted in developing the plan. In addition to water supply stakeholders, it includes water treatment, flood management, county and city governments, conservation organizations, disadvantaged communities, relevant state and federal agencies, and tribes (CWC §10541(g)). Section 4.1 of this report examines the governance structures and participation that have emerged in nine IRWM regions in the Central Valley.

2.1.5. IRWM Funding

In total, Propositions 50, 84 and 1E allocated $1.8 billion in bond funds for planning and projects undertaken through the IRWM process. Funds from Proposition 50 have largely been expended, supporting approximately 225 projects statewide with $372 million in grant funds. In 2010 and 2011, after issuing new IRWM plan guidelines to comply with the 2008 Planning Act and requirements in Propositions 84 and 1E, DWR awarded IRWM planning grants to 42 regions statewide to develop or update previous plans, totaling approximately $35 million. There have been two rounds of Implementation funding under Proposition 84, totaling $358 million in grants to IRWM regions across the state. DWR is required to ensure that 10% of these funds go toward projects addressing critical water supply and water quality needs of disadvantaged communities.[1] In addition, there have been two rounds of SWFM funding, totaling $270 million. The IRWM and SWFM grant programs require that projects yield multiple benefits (see Section 6.1 of this report for further details on the types of multi-benefit projects undertaken in the Central Valley). Currently, approximately $473 million of Implementation funds remain. An expedited grant process is being developed to award $200 million of these funds to IRWM regions to support drought-related projects. The remaining $273 million will likely be awarded through a final round of Implementation funding in 2015.

[1] A "disadvantaged community" is a community with a median household income of less than 80% of the statewide average (PRC §75005(g)).

2.1.6. IRWM Plans and Projects

The 2008 Act specifies that at a minimum, an IRWM plan:

> [D]escribes the major water-related objectives and conflicts within a region, considers a broad variety of water management strategies, identifies the appropriate mix of water demand and supply management alternatives, water quality protections, and environmental stewardship actions to provide long-term, reliable, and high-quality water supply and protect the environment, and identifies disadvantaged communities in the region and takes the water-related needs of those communities into consideration. (CWC §10534; see also §10540(c))

Interestingly, flood management actions are not mentioned here. However, the Act does include flood management among the types of projects that can be promoted by IRWM regions (§10537), and IRWM plans usually include flood risks in discussing the region's critical water management issues. Section 5.1 of this report discusses the extent to which flood management issues are addressed in six updated IRWM plans in the Central Valley. In its 2012 guidelines, DWR outlines 16 "standards" that each IRWM plan must meet in order to be eligible for IRWM grant funding (see Box 1). DWR is currently reviewing IRWM plans to ensure they meet these standards prior to receiving further Implementation grant funding.

Box 1. IRWM Plan Standards *(DWR 2012c)*

1. Governance
2. Region Description
3. Objectives
4. Resource Management Strategies
5. Integration
6. Project Review Process
7. Impact and Benefit
8. Plan Performance and Monitoring
9. Data Management
10. Finance
11. Technical Analysis
12. Relation to Local Water Planning
13. Relation to Local Land Use Planning
14. Stakeholder Involvement
15. Coordination
16. Climate Change

Each IRWM plan also includes a list of projects to meet the region's water management goals. As part of the process of developing an IRWM plan, a RWMG usually puts out a call for projects to local entities in the region, and then conducts a Project Review Process to rank the projects according to how well they meet the IRWM plan's objectives, along with a number of other factors. This plan review process is discussed in Section 5.1, in the context of IRWM regions in the Central Valley that have recently updated their IRWM plans.

2.1.7. Role of DWR

As is evident from recent Water Plan Updates, the IRWM process is integral to how DWR envisions the future of water management in California. In 2009, DWR created the Division of Integrated Regional Water Management with overall responsibility for managing the IRWM process. Within this division, the Financial Assistance Branch establishes guidelines

and manages grant programs, and the Regional Planning Branch provides strategic direction, and technical and facilitation assistance. Much of the interaction with IRWM regions occurs through DWR's four region offices, and its regional coordination program. Each region's "Regional Coordinator" serves as the primary point of contact for each IRWM region, helping to ensure consistent messages between DWR and water management stakeholders. "Regional Service Representatives" provide information and support to IRWM regions, and manage grant funds. In addition, DWR's four regional climate change specialists are based in the region offices, and provide IRWM regions with resources and technical support related to climate change.

In keeping with the non-regulatory, voluntary nature of the IRWM process, DWR has sought to allow IRWM regions to define their own approaches and priorities. However, regions must follow IRWM plan standards and grant program guidelines, and ensuring compliance has been the primary focus of DWR's engagement with IRWM regions. DWR's assistance to the regions has mostly been oriented toward helping regions implement a collaborative planning process. For example, through a facilitation support service contract with the Center for Collaborative Policy based at California State University at Sacramento, DWR has provided a number of IRWM regions with facilitation services to help initiate dialogue between stakeholders and establish governance structures to support on-going regional collaboration.

2.1.8. Future of IRWM Planning

The public draft of the 2013 California Water Plan Update stresses the continued importance of integrated regional water management (DWR 2013). DWR is currently preparing a Strategic Plan for the IRWM process, and preliminary documents clearly indicate that DWR would like to help ensure that IRWM planning continues to function across the state (DWR 2012b). IRWM plans are intended to be updated periodically, and the current set of IRWM plans are required to "document a governance structure that ensures the IRWM plan will be updated and implemented beyond existing State grant programs," (DWR 2012c, p. 18). However, beyond the recently released 2014 drought funding and the upcoming final round of Implementation grants anticipated in 2015, future funding for the IRWM grant program is uncertain. Furthermore, now that most regions have completed their IRWM plan updates, no further state funding is available to pay for the staff time required to sustain the governance structures created by IRWM regions. Many IRWM regions are now exploring how to continue the necessary coordination tasks such as organizing RWMG and advisory committee meetings, conducting outreach, managing project databases, and maintaining a website. In some region with limited resources, finding these resources and organizational capacity for this is a challenge. A recent document released by DWR notes the need for continued state investment to support the on-going operations of RWMGs (DWR 2014a).

2.2. Regional Flood Management Planning

2.2.1. Institutional context

The Regional Flood Management planning process is part of the Central Valley Flood Protection Plan (CVFPP), which represents the latest phase in the long history of efforts to

manage this region's significant flood risks. Similar to other areas of the state, local agencies have played a crucial role in flood management in the Central Valley, but over the years, the severity of flood risks in this region has necessitated significant state and federal involvement. Farmers began forming reclamation districts in the 1860s as a means to drain land for agriculture and finance the construction of levees (Kelley 1989). However, severe floods overwhelmed their capacity to provide sufficient protection for communities and agriculture. In 1911, the State Reclamation Board (now known as the Central Valley Flood Protection Board, also referred to here as the Board) was created to regulate the activities of reclamation districts and other local maintaining agencies (LMAs), and since 1913 has held this authority throughout the Sacramento-San Joaquin Drainage District (CVFPB 2013, p. 10). Eventually, the United States Army Corps of Engineers (USACE), in partnership with the state of California, led the development of significant flood management infrastructure, including a set of reservoirs, bypasses, and over 1,600 miles of levees now known as the State Plan of Flood Control (SPFC). As part of the cost-sharing arrangement, California has provided assurances for the on-going maintenance of these facilities (DWR 2010, p. 1). The Board and DWR accomplish this by working closely with the many local flood implementing and maintaining agencies that continue to build, operate and maintain levees and other SPFC elements. These local entities must comply with maintenance standards laid out by DWR as well as the Army Corps, designed to ensure a certain level of system performance as well as complying with federal and state environmental laws.

In the early 2000s, several events led to greater concern over flood risks in the Central Valley. In 2003, a California appellate court ruling, referred to as the Paterno decision, found that the state of California was liable for flood damages resulting from the failure of levees managed by another entity, in this case a reclamation district in Yuba County. After paying over $400 million in damages, state government agencies have sought to strengthen their flood planning efforts (Aquapedia, 2014). In 2005, Hurricane Katrina brought heightened awareness of the fact that the Central Valley faces some of the most serious flood risks in the nation. Over 1 million people and $70 billion in assets fall within the State Plan of Flood Control, but its flood protection levels are inadequate (DWR 2012a, p. 1-1). Currently, over half of SPFC levees do not meet current Army Corps standards, which places many levees of the Central Valley at risk of losing accreditation under Federal Emergency Management Agency (FEMA)'s National Insurance Program and jeopardizes access to federal levee rehabilitation funds under Public Law 84-99 (DWR 2012a, p. 1-15). Furthermore, many local implementing and maintaining agencies, which often have limited resources and operate with volunteer boards, have struggled to keep up with state and federal standards for levee maintenance and environmental compliance. Finally, legacy flood control projects along with a growing population have degraded ecosystem functions and the habitats of many protected species throughout the Central Valley (DWR 2012a, p. 1-14).

Efforts to reduce flood risks in the Central Valley must be undertaken within this complex institutional landscape, requiring close coordination between federal, state and local actors. Furthermore the nature of flood risks in the Sacramento and San Joaquin river basins is such that changes to levees or reservoir operations upstream can have significant effects on flood risks downstream. Thus, DWR plays a crucial role in analyzing the

interconnections between different elements of the Central Valley's flood management system, and ensuring that the state's interest in assuring adequate flood protection is upheld. This need for a systemwide perspective, in addition to the state's special responsibilities to assure adequate flood protection within the State Plan of Flood Control, has important implications for DWR's role with respect to local agencies and the Regional Flood Management Planning process, which is described below.

2.2.2. The Central Valley Flood Protection Plan and Regional Flood Planning

In 2006, DWR launched FloodSAFE California, a long-term initiative to reduce flood risks across the state, and voters approved Propositions 84 and 1E, which allocated approximately $3 billion to address flood risks in the Central Valley. These funds have supported the development of the CVFPP, as required by the Central Valley Flood Protection Act (Senate Bill 5, CWC §9600-9625). The Act required DWR to prepare, and the Central Valley Flood Protection Board to adopt, a plan for reducing flood risks in the Central Valley, to be updated every five years. The CVFPP's primary goal is to improve flood management in urban and rural areas protected by the State Plan of Flood Control (SPFC). The plan also has several supporting goals, including improving operations and maintenance, promoting ecosystem functions, improving institutional support, and promoting multi-benefit projects (DWR 2012a, p. 1-26). The plan seeks to provide a comprehensive approach to reducing flood risks, outlining a State Systemwide Investment Approach (SSIA) that is designed to meet primary and secondary goals in a way that manages costs and increases resilience in light of more extreme flood events due to climate change (DWR 2012a, p. III). The 2012 CVFPP lays out the SSIA in broad terms, and will be further elaborated in the 2017 update.

At the center of DWR's efforts to develop this implementation plan are two Basin-Wide Feasibility Studies for the Sacramento and San Joaquin River basins. These feasibility studies will outline potential improvements to the SPFC in order to achieve systemwide benefits in terms of flood protection. In parallel, the six Regional Flood Management Plans are being developed by local agencies, as described throughout this report. The solutions and priorities identified in these plans will inform DWR's Basinwide Feasibility Studies. At the same time, the Army Corps is undertaking the Central Valley Integrated Flood Management Study, and DWR's feasibility studies are being closely coordinated with this process (DWR 2012a, p. 4-23). At the same time, DWR is also leading several other efforts that will inform CVFPP implementation. For example, a Conservation Strategy is being developed to address the CVFPP's conservation objectives, consistent with a Conservation Framework laid out in the 2012 CVFPP (DWR 2012a, p. 4-7). DWR is also undertaking an analysis of how climate change is likely to affect flood risks in the Central Valley (DWR 2012a, p. 3-22).

The Regional Flood Management Planning process was created in response to concerns regarding stakeholders input into CVFPP implementation plans. DWR completed the CVFPP in December 2011, and submitted it to the Central Valley Flood Protection Board for adoption. During the Board's public hearings regarding the plan, stakeholders expressed concern about the consultation process for developing the SSIA, and sought avenues for further input. In response, DWR proposed the Regional Flood Management Planning

(RFMP) process in order to provide a forum for discussing local needs and proposed solutions for flood management in specific sub-regions of the Central Valley, and to inform the implementation of the CVFPP.

In creating the RFMP process, DWR broadly sought to follow the integrated water management approach in the California Water Plan, emphasizing the need for multi-benefit approaches to solving the Central Valley's flood management challenges. However, DWR determined that working with existing IRWM regions would not be appropriate, and that a distinct regional planning process was needed. In a presentation made to the Central Valley Flood Protection Board in April 2012, DWR acknowledged the IRWM planning already underway, but noted that IRWM regions "tend to have more water management and ecosystem goals," and less focus on flood management (Board meeting transcript, April 27, 2012, p. 111). Second, DWR noted that its role in working with IRWM regions has been relatively limited, whereas it expected to be more directly engaged with RFMP regions in terms of technical assistance and project finance, given statewide interests in flood management (p. 111). In response to questions from Board members about why new regions had to be created instead of using the existing IRWM regions, DWR cited concerns that the broad focus of many IRWM regions might lead to delays in identifying and acting upon flood risks (p. 116). DWR and Board members did note, however, that in the longer term RFMP efforts would need to be integrated with IRWM and other on-going planning efforts in the Central Valley (p. 147-8).

Unlike in the IRWM process, DWR was not legislatively required to establish a regional flood planning process. Rather, DWR's Flood Management Division laid out the structure of the RFMP process in a Project Management Plan (PMP) in 2012 (DWR 2012d) and its implementation has subsequently been discussed and refined in consultation with local flood management entities and the Central Valley Flood Protection Board. The basic elements of the RFMP process are described below.

2.2.3. RFMP Regional Boundaries

In contrast to the IRWM process, the boundaries of RFMP regions have been largely defined by DWR with respect to the SPFC. Initially, DWR outlined nine regions representing "flood protection zones," or areas protected by specific elements of the SPFC. DWR also identified flood implementing agencies that would likely lead the development of these regions plans, and would ultimately be responsible for managing flood projects in these areas (Board Meeting transcript, April 27, 2012, p. 119). Discussions with these agencies led to the consolidation of some of these flood protection zones into single regions, resulting in a total of six planning regions (see Figure 1). Not all of these regions are contiguous; this is because the regions only include areas protected by SPFC facilities.

2.2.4. Governance and Participation

DWR's requirements for governance of the RFMP process are significantly less detailed than those applicable to IRWM regions. It appears that DWR sought to avoid creating new organizational structures, and instead to rely upon existing local flood management agencies to lead the development of RFMPs, allowing them to determine locally appropriate governance structures (Board meeting transcript, April 27, 2012, p. 119).

Thus, DWR's PMP specifies only that RFMPs should be developed by a Regional Working Group, in which the following interests should be represented (DWR 2012d, p. 11):

- Flood implementing, operating and maintaining agencies
- Land use agencies (cities and counties)
- Agricultural interests
- Environmental interests
- Permitting/resource agencies
- Local emergency responders
- Tribal interests

Disadvantaged communities are not specifically mentioned in this list, as they are in the IRWM process. However, the CVFPP notes that low-income populations are among the most vulnerable to flooding risks in the Central Valley, and that is important for the RFMP process to take these issues into account (DWR 2012a, p. 4-2). DWR's PMP also indicates that in prioritizing projects for state investment, DWR may include "consideration of disadvantaged communities, tribal interests, and environmental justice," (DWR 2012d, p. 6).

2.2.5. RFMP Funding

In 2006, voters approved Propositions 84 and 1E, which included a total of approximately $3 billion for reducing flood risks in areas protected by the State Plan of Flood Control (DWR 2012a, p. 4-38). DWR provided a total of approximately $9 million to the six local flood management agencies for the development of RFMPs. With these funds, the lead agency for each RFMP has hired consultant teams and organized meetings and workshops to develop the plans. Upon completion of these plans, regional projects that align with the SSIA may be included in plans to implement the CVFPP, and may receive state funding. In particular, regional projects that employ an integrated, multi-benefit approach consistent with the SSIA may be prioritized (DWR 2012d, p. 4-5). At the time of the completion of the CVFPP in June 2012, the state had approximately $1.5 billion in bond funding remaining for flood risk reduction associated with the SPFC, some of which will likely be used to fund an initial round of priority projects. Full CVFPP implementation is estimated at $14-17 billion over the next 20-25 years (DWR 2012a, p. 4-34). DWR is currently developing a financing strategy that will involve a combination of federal, state and local sources.

2.2.6. Regional Flood Management Plans and Projects

Compared to the 16 IRWM plan standards (see Box 1), DWR's requirements for RFMPs are less extensive. Broadly, each RFMP is to include the following three components: 1) an assessment of flood risks in the region; 2) a prioritized list of solutions and projects to address these risks; and 3) a financing plan for implementation. More specifically, the minimum elements required by DWR include (summarized from DWR 2012d, p. 14):

- Description of participants in developing the RFMP
- Characterization of flood risks and assets in the region
- Description of regional solutions and strategies, including a prioritized list of proposed solutions

- Description of and rationale for ranking of proposed solutions
- Assessment of opportunities for developing multi-objective solutions
- Potential sources of financing and a Regional Financing Plan
- Residual risk management strategies

In addition, regions must also include a Regional Flood Atlas, which provides a graphic depiction of the region's resources and assets, as well as its flood risk characteristics (DWR 2012d, p. 13). In June 2013, DWR provided each region with a draft Regional Flood Atlas, which regions are updating with locally available information, and will include in their final RFMPs. The development of RFMPs began in early and mid-2013, and plans are scheduled to be completed by late 2014.

2.2.7. Role of DWR and the Central Valley Flood Protection Board

As already discussed, DWR's role in developing RFMPs differs considerably from its role in the IRWM process. Ultimately, DWR hopes that the RFMP process will generate projects and solutions that will both meet regional needs and help achieve the systemwide improvements necessary to reduce overall flood risks in the Central Valley. To help accomplish this, DWR's Flood Management Division assigned a contact person to each of the RFMP regions, who participates in regional meetings and workshops, providing information and updates regarding DWR's systemwide studies and other efforts to implement the CVFPP. As described earlier, these include CVFPP basin-wide feasibility studies for the Sacramento and San Joaquin rivers, a Conservation Strategy outlining systemwide opportunities to achieve environmental objectives, an analysis of the effects of climate change on flood risks in the Central Valley, and others. Further details about the Conservation Strategy and climate change analysis are provided later in this report in Sections 6 and 7.

The Central Valley Flood Protection Board plays an important role in facilitating dialogue between DWR and participants in the RFMP process. Having acted in a regulatory capacity with respect to land use and levee maintenance in Central Valley for the past 100 years, the Board has developed long-standing relationships with LMAs, which are crucial stakeholders in the implementation of the CVFPP. Although it is connected with DWR in terms of its budget and staff, the Board is an independent entity, led by seven governor-appointed Board members and two ex-officio members of the California Legislature. In the context of the CVFPP, the Board's public meetings have provided an important forum for local agencies to express their views. In fact, stakeholder concerns about the need for greater local involvement in implementing the CVFPP surfaced during Board meetings, which helped spur the creation of the RFMP process.

With the launch of the RFMP process, the Board established a new body called the "Coordinating Committee" to promote communication between RFMPs, DWR, and the Board. The Coordinating Committee does not hold decision-making authority, but rather serves as a forum for information exchange, including updates and lessons learned in the development of RFMPs, the status of DWR's systemwide efforts to implement the CVFPP, and other relevant topics. Led by the Chair of the Board, these monthly public meetings are usually well-attended by additional Board members and staff, RFMP participants, staff from

DWR and other state agencies, NGO representatives, and other interested parties. Given the interconnectedness of state, federal, and local roles in implementing the CVFPP, there is a strong need for dialogue across these entities, and the Coordinating Committee appears to have been relatively successful at promoting this.

2.2.8. The future of RFMP planning

DWR's PMP emphasizes that the RFMP process is intended to develop a "region's long-term vision for flood management, and prepare strategies for implementation over the long-term (next 25 years or so)," (DWR 2012d, p. 3). The intention of the RFMPs is to develop projects that address systemwide as well as regional needs, and DWR anticipates that regions will compete for available state funding to implement priority projects (DWR 2012d, p. 7). However, current funding for the RFMP process is only intended to cover an 18-month period. It is not yet clear whether DWR will make additional funds available for sustaining these regional planning processes in the future. Since the governing structure of many RFMPs is relatively informal and accomplished through consultant contracts, it is also not clear how they will be sustained organizationally, particularly without additional funding.

3. Overlapping IRWM and RFMP Regions

The remaining sections of this report focus specifically on the six RFMP regions and the nine IRWM regions in the Central Valley with which they overlap, as shown in Figure 1. As discussed in the previous section, the IRWM and RFMP processes followed quite different approaches in determining their boundaries, largely reflecting the purposes and institutional contexts of these processes. RFMP regional boundaries were selected by DWR to follow flood protection zones within the State Plan of Flood Control, while IRWM boundaries follow a combination of watershed, groundwater, and jurisdictional boundaries, largely determined by regional participants. As Table 1 indicates, RFMP regions overlap with anywhere from one to three IRWM regions.

As already discussed, the RFMP process was launched relatively recently, and these plans are still in development. On the other hand, some IRWM regions have been in existence since 2005, and many have recently completed an update of their IRWM plan to reflect the 2012 IRWM guidelines issued by DWR. Table 1 summarizes the current status of RFMP plans and the IRWM plans with which they overlap. One RFMP region – the Feather River – has a draft plan that is largely complete, while most others have partial drafts available. Of the nine IRWM regions, four have completed their IRWM plan updates, one has completed a draft plan, and another has a partial draft available. At the time of this writing, no updated plan materials were available for Westside San Joaquin, Eastern San Joaquin, and Madera regions, although the latter two regions are in the process of a plan update.

This study is largely based upon the available plan documents listed in Table 1. Since no RFMPs have been completed yet, draft plan materials were consulted instead. With regard to IRWM plans, this report primarily relies upon plans that have been updated to comply

Table 1. Status of RFMPs and overlapping IRWM plans

RFMP Region	RFMP Status (Apr. 1, 2014)	Overlapping IRWM regions	IRWM Plan Update Status (Apr. 1, 2014)
Upper/Mid-Sacramento River	Planning underway	North Sacramento Valley	Completed plan, April 2014
		Westside Sacramento	Completed plan, June 2013
Feather River	Draft plan, Oct. 2013	North Sacramento Valley	Completed plan, April 2014
		Yuba County	Partial draft plan, March 2014
Lower Sacramento-Delta North	Partial draft plan, Jan. 2014	North Sacramento Valley	Completed plan, April 2014
		American River Basin	Completed plan, June 2013
		Westside Sacramento	Completed plan, July 2013
Lower San Joaquin-Delta South	Partial draft plan, Jan. 2014	Eastern San Joaquin	Plan update underway, draft not yet available
		Westside San Joaquin	No plan update
Mid-San Joaquin	Partial draft plan, July 2013	East Stanislaus	Draft plan, June 2013
		Westside San Joaquin	No plan update
Upper San Joaquin	Partial draft plan, Sept. 2013	Madera	Plan update underway, draft not yet available
		Merced	Completed plan, August 2013
		Westside San Joaquin	No plan update

Table 2. Governance Arrangements for 9 IRWM regions in the Central Valley

IRWM Region	Date formed	Agreement	RWMG Size	Advisory Committee?
North Sacramento Valley	2011	MOU	6	Yes
Yuba County	2005	MOU	11	No
Westside Sacramento	2009	MOU	4	No
American River Basin	2004	JPA	22	Yes
Eastern San Joaquin	2005	JPA	10	No
East Stanislaus	2010	MOU	4	Yes
Merced	2008	MOU	3	Yes
Madera	2006	MOU	14	No
Westside San Joaquin	2005	JPA	16	No

Sources: RAP Applications, IRWM plans

Table 3. Regional Water Management Group Members - 9 IRWM Regions in the Central Valley

Region	Water supply agencies**	Cities and counties	Flood mgmt agencies***	Resource Conservation Districts	Tribes	NGOs
North Sacramento Valley		6				
Yuba County*	5	4	2	1		
Westside Sacramento*	3		2			1
American River Basin	17	5				
Eastern San Joaquin*	8	2	1			
East Stanislaus		4				
Merced	1	2				
Madera	6	3		2	1	1
Westside San Joaquin	15		1			
Total	**55**	**26**	**6**	**3**	**1**	**2**

* Indicates that at least one RWMG member has both water supply and flood control responsibilities, and is counted twice.
** Includes water and irrigation districts, county water agencies, private water companies, and other special districts
*** Includes flood implementing agencies, local maintaining agencies, and flood control districts

Sources: IRWM plans, RAP applications, IRWM region websites. Plan updates are still underway in Yuba County, Eastern San Joaquin, Westside San Joaquin, and Madera, so data for these regions are from earlier plan versions.

Table 4. Advisory Committee members in four IRWM regions in the Central Valley

Region*	Water supply agencies*	Cities and counties	Flood mgmt agencies**	Resource Conservation Districts	Tribes	NGOs, universities	State, federal agencies	Private farm or landowner	Businesses, individuals
North Sacramento Valley	4	3		2	1		1	6	
American River Basin	9	9	2	4		20	4		9
East Stanislaus		1				4	1		2
Merced	3	2				3		6	5
Total	**16**	**15**	**2**	**6**	**1**	**27**	**6**	**12**	**16**

* The four IRWM regions included here are those that have standing advisory committees with a defined membership. These and other IRWM regions also provide other opportunities for stakeholder participation, such as public workshops, which are not analyzed here.
** Includes water and irrigation districts, county water agencies, private water companies, and other special districts
*** Includes flood implementing agencies, local maintaining agencies, and flood control districts

Sources: IRWM plans, RAP applications, IRWM region websites.

with DWR's 2012 guidelines. As described in Section 2, these guidelines required significant changes to IRWM plans in terms of plan scope, participation, and governance, so previous IRWM plans are not comparable. In addition to RFMP and IRWM plans, other data sources include information on these regions' websites, project lists included with IRWM plans, grant applications available on DWR's IRWM website, DWR's guidelines, and other programmatic documents. This report was also informed by attending several Coordinating Committee meetings hosted by the Central Valley Flood Protection Board, held in West Sacramento between September 2013 and April 2014. In addition, some of the information in this report was confirmed through conversations with individuals who have been involved with RFMP and IRWM planning. These informal conversations provided valuable context and background information.

Since the RFMP process is still underway and some IRWM plans have yet to be updated, this study's findings should be considered as preliminary. Nonetheless, this report provides an indication of the overall functioning of these RFMP and IRWM regions, and some general considerations for DWR as it assesses next steps in supporting these programs.

4. Governance and participation in IRWM and RFMP processes

The outcomes of a planning process are strongly influenced by who participates and how decisions are made. As described in Section 2, DWR provides guidance for both the IRWM and RFMP processes, but regions have considerable flexibility in designing their approach. This section discusses the specific experiences of the nine IRWM and six RFMP regions considered in this report. Broadly, governance arrangements tend to be more formal in IRWM planning than in RFMPs, in part due to greater specificity in the requirements contained in the IRWM Planning Act. In addition, the nine IRWM regions tend to have greatest participation from water supply agencies, while the primary stakeholders in RFMP regions are flood implementing and maintaining agencies.

4.1. Governance and stakeholder participation in IRWM regions

As described earlier, the decision-making body for an IRWM region is a "regional water management group" (RWMG), consisting of at least three agencies, two of which must have statutory authority over some aspect of water management (DWR 2012c). RWMG member agencies usually sign an agreement to participate, and may also pay membership dues. As Table 2 shows, the nine RWMGs being analyzed here operate under either a Memorandum of Understanding (MOU) or as a Joint Powers Authority (JPA), and range in size from three to 22 members. Table 3 shows that a majority of RWMG members are agencies with responsibility for water supply. Cities and counties, which are sometimes involved in water delivery as well as playing a critical role in land use, are frequent participants. Relatively few flood implementing or maintaining agencies are members of a RWMG. One tribe is represented in the Madera RWMG.

Participation in IRWM regional planning is not limited to RWMG members, however. Under IRWM legislation and DWR's guidelines, RWMGs must consult a wide range of stakeholders

in developing an IRWM plan. In order to accomplish this, most IRWM regions hold a series of public meetings and workshops to gather input on the priorities and projects to be reflected in the IRWM plan. Some regions have also formed standing advisory committees to provide recommendations to the RWMG. Among the nine IRWM regions studied here, four have formal advisory committees. While a full assessment of participation would include all those who attend public meetings, this data is difficult to obtain for all nine IRWM regions. Instead, participation in the four standing advisory committees is analyzed here. Table 4 lists the number and type of agencies participating in these advisory bodies. Compared to RWMG members, advisory committee participants represent a broader range of water management stakeholders, including environmental non-governmental organizations (NGOs), a tribal representative, additional cities and counties, state or federal agencies, private farms and landowners, and local businesses. Some cities, counties, and NGOs may also represent disadvantaged communities. However, there are still relatively few flood management agencies involved. One possible reason for this is that flood implementing and maintaining agencies in the Central Valley have long focused their energies on engaging with the Central Valley Flood Protection Board and the Division of Flood Management at DWR, and as a result have not participated as much in the IRWM process. Further research would be needed to determine if this pattern differs for IRWM regions in other parts of the state.

Some of these advisory committees are quite active, serving as a crucial forum for discussion and development of the IRWM region's overall direction. For example, membership in American River Basin's RWMG is limited to entities with authority over water supply, but agencies who are not RWMG members can participate in the Planning Forum, a broad stakeholder group with over 70 participants that meets periodically to inform the IRWM process (ARB IRWMP 2013, p. 4-3). Similarly, the Technical Advisory Committee (TAC) of the North Sacramento Valley (NSV) IRWM region meets regularly, providing comments and recommendations to that region's Board. Both the TAC and Board of the NSV region have by-laws, and members are appointed to each by the Board of Supervisors of each of the six counties that are members of the RWMG (NSV IRWM plan, March 2014, p. 1-3). Of course, these advisory committees are not the only avenue for public participation in the nine IRWM regions; all have held public workshops and some have conducted specific outreach to disadvantaged communities and tribes. Since a full analysis of public participation in IRWM regions is beyond the scope of this report, participation in these four standing advisory committees is being used here as a rough indicator of the types of participants in IRWM planning.

Maintaining robust engagement among RWMG members and advisory committee members requires a certain degree of organizational capacity and staff time to perform coordination and outreach functions. During the development of an IRWM plan, planning grant funds from DWR help to cover these costs, but DWR's guidelines require that RWMGs demonstrate how their governance arrangements will be sustained beyond the planning period (DWR 2012c, p. 18). Regions vary in how they approach this. For example, the North Sacramento Valley IRWM region has chosen to divide these tasks among the six counties that are RWMG members (NSV IRWM Plan, March 2014, Chapter 6). The Westside Sacramento region, on the other hand, has contracted with the Yolo County Resources

Conservation District to coordinate the activities of the RWMG, funded by contributions from RWMG members (Westside Sacramento Coordinating Committee meeting notes, December 3, 2013).

4.2. Governance and stakeholder participation in RFMP regions

As discussed earlier, the six RFMPs are intended to be prepared by a local flood management agency with input from a Regional Working Group, representing flood, agriculture, land use, environmental, and tribal interests, along with permitting and emergency response agencies (DWR 2012, p. 11). Table 5 summarizes the decision-making arrangements that have been developed in each region. In most cases, the lead agency has formed a small committee involving other local agencies to provide overall guidance to the consultants hired to prepare the plan. These committees vary in their degree of formality. In the Feather River and Mid-San Joaquin regions, an MOU has been signed outlining the roles and responsibilities of committee members. However, MOUs do not appear to have been developed in the Upper-Mid Sacramento and Lower Sacramento-Delta North regions. The Upper San Joaquin region formed a new JPA to develop their plan, and the Lower San Joaquin – Delta South regional plan is led by the San Joaquin Area Flood Control Agency, an already existing JPA.

As Table 6 shows, the majority of participants in the committees leading the development of RFMPs are local flood implementing or maintaining agencies. Counties and cities are also involved, and in the Upper-Mid Sacramento region, three private landowners are involved in the region's Administrative Committee. Relatively few agencies with responsibility for water supplies are involved. Three of these agencies – Yuba County Water Agency, Reclamation District 108, and the San Joaquin County Flood Control and Water Conservation District – also have significant flood management responsibilities. The fourth agency with water supply interests, the San Joaquin River Exchange Contractors Authority, is one of two primary participants in a JPA formed to prepare the Upper San Joaquin RFMP, and is itself a JPA involving four agencies with irrigation water rights along the San Joaquin River.

Although the leadership of these RFMP processes largely reflects flood management and agricultural interests, stakeholder participation in the development of these plans is broader. Each region has developed a process for stakeholder engagement, involving a series of public meetings, workshops, and small group meetings through which input is solicited on particular aspects of the plan (see the last column in Table 5). Because the plans are still in development, relatively limited information is available about who has participated in stakeholder meetings. The data in Table 7 presents available information about participation in meetings and workshops in three of the six RFMPs. These data should be viewed as preliminary, but overall they indicate that a wider range of participants is represented in these meetings than is involved the leadership committees for these regions. Local flood management agencies continue to be well represented, but this largely reflects high participation in the Lower Sacramento-Delta North region, the most densely populated of the six RFMP regions. Cities and counties also have a significant presence, and water supply agencies are particularly well represented in the Upper San Joaquin RFMP. Environmental organizations, including American Rivers, the Nature

Table 5. Governance Arrangements for Regional Flood Management Planning

RFMP Region	Lead/Administrator	Agreement?	Decision-making structure	Decision-making participants	Stakeholder engagement
Upper/Mid-Sacramento River	Reclamation District 108	None	Joint Admin Committee, representing Upper and Mid-Sacramento regions	Reclamation District 108 Butte County M&T Ranch City of Chico RD 1500 Benden Farms Landowner	Steering Committee, plus eight Focus Area Workgroups (e.g., small communities, urban communities, O&M, multi-benefit)
Feather River	Sutter-Butte Flood Control Agency	MOU	Six-member coordinating committee representing the four agencies	Yuba County Water Agency Three Rivers Levee Improvement Authority Sutter-Butte Flood Control Agency Marysville Levee Commission	Public workshops, small group meetings
Lower Sacramento-Delta North (FloodProtect)	West Sac Area Flood Control Agency	None	Joint Administrative Committee, representing eastern and western sides of the Sacramento River	Rep for East side reclamation districts Sacramento County (East) Sacramento Area Flood Control Agency (East) West Sacramento Area Flood Control Agency RD 2068 (west) Knights Landing Ridge Drainage District (West) RD 785 (West)	Eastern and Western Committees, pllus workshops and small group meetings
Lower San Joaquin-Delta South	San Joaquin Area Flood Control Agency (SJAFCA)	JPA	Board of the San Joaquin Area Flood Control Agency	City of Stockton San Joaquin County San Joaquin County Flood Control and Water Conservation District	San Joaquin County Flood Protection Technical Advisory Committee, small group meetings
Mid-San Joaquin	RD 2092	MOU	RD 2092 and Stanislaus County, Dept of Public Works	RD 2092 Stanislaus County	At least ten workshops during plan development, small group meetings
Upper San Joaquin	San Joaquin River Flood Control Project Agency	JPA	Board of San Joaquin River Flood Control Project Agency	Lower San Joaquin Levee District San Joaquin River Exchange Contractors Water Authority Merced County (auditor/controller)	Public workshops, small group meetings

Sources: draft RFMPs, RFMP websites

Table 6. Types of agencies involved in RFMP decision-making

Region	Flood mgmt agencies	Cities, counties	Water agencies	Private landowners
Upper/Mid-Sacramento River*	2	2	1	3
Feather River*	4		1	
Lower-Sac Delta North	6	1		
Lower San Joaquin Delta South*	1	2	1	
Mid-San Joaquin	1	1		
Upper San Joaquin	1	1	1	
Total	**13**	**5**	**3**	**3**

* Indicates that at least one member has both water supply and flood management responsibilities, and is counted twice.

Sources: RFMP draft plans, documents from RFMP websites

Table 7. Stakeholder Participation in three RFMP Processes

Region*	Flood mgmt agencies	Water supply agencies	Cities, counties	State, federal agencies	Tribes	Agricultural interests	Env. NGOs	Development interests
Lower-Sac Delta North	40	4	9	5	1	2	6	1
Mid-San Joaquin	6	6	8	7	0	7	7	0
Upper San Joaquin	3	15	10	8	0	3	5	1
Total	**49**	**25**	**27**	**20**	**1**	**12**	**18**	**2**

* Meeting participation data was not available for the other three RFMP regions at the time of this writing.

Sources: compiled from participating organizations named in the documents below. This anlaysis is preliminary, since planning is still underway.
Lower Sac/Delta North: Organizational Chart, April 2013; Participant list for Problem Definition Workshop #1, July 29, 2013.
Mid-San Joaquin: participant list as of December 2013, obtained from River Partners.
Upper San Joaquin: Stakeholder List in Appendix B of the Coordination and Collaboration Plan, May 2013.

Conservancy, the Natural Resources Defense Council, Trout Unlimited, and others, have coordinated amongst themselves to participate in each of the six RFMP regions (Coordinating Committee discussion, April 23, 2014). NGOs focusing specifically on the needs of low-income communities do not appear to have been involved so far. Two tribes – Enterprise Rancheria (Estom Yumeka Maidu tribe) and the Yoche Dehe Wintun Nation – have participated in meetings of the Feather River and Lower Sacramento-Delta North RFMP regions, respectively.

So far, coordination of the governance and participation arrangements for RFMPs has been carried out by the consulting firms hired to prepare the plans, and funding for this has come from DWR's grants to the lead agencies for each region. Once these grant funds end, it is not clear whether the agencies leading the RFMPs will continue to provide the leadership and coordination needed to sustain dialogue amongst the participants in the RFMP process. Some lead agencies may have sufficient capacity to do this, especially if clear opportunities for project funds are available. Regions with more limited organizational capacity may need to find other options. The Mid-San Joaquin RFMP, led by RD 2092 (represented by River Partners) has been exploring the possibility that an ad-hoc group called the San Joaquin Area Flood Control Association might be able to take on this role (J. Rentner, personal communication, January 2014). However, continued DWR support for coordination activities may be needed.

4.3. Overlapping participation between RFMP and IRWM processes

In assessing the potential for coordination between the RFMP and IRWM processes, it is important to understand the degree of overlap between participants. Although it appears that each has a different core set of participants – water supply agencies in the IRWM process and flood management agencies in the RFMP process – there is some overlap. As already noted, counties and cities often have some role in water supply, as well as in flood management, so we might expect them to be represented in both processes.

Table 8 provides a general indication of the degree of overlap with participants in IRWM planning, based on available information. The first column shows how many members of an RFMP region's leadership committee are also involved in an IRWM region (either as a member of a RWMG or a participant in an IRWM advisory committee). This indicates that in all but one region, at least one lead member of an RFMP is also engaged in IRWM planning. This includes eight agencies across five RFMPs: Butte County, Reclamation District 108, the city of Chico, Yuba County Water Agency, Sacramento County, Sacramento Area Flood Control Agency, the city of Stockton, San Joaquin County Flood Control and Water Conservation District, and Merced County. As anticipated, counties and cities represent important connections between the two processes, along with several special districts that have both water supply and flood protection responsibilities. However, different departments within city or county governments may participate in IRWM and RFMP processes.

The second column in Table 8 shows the cross-over between the IRWM process and the stakeholders involved in the three RFMP regions for which data on meeting participants was available. Between 10-33% of agencies that have been documented as having

Table 8. Overlapping membership between RFMP and IRWM regions

RFMP Region	No. (%) of RFMP steering committee members also involved in an IRWM region*	No. (%) of participants in RFMP planning also involved in an IRWM region**
Upper/Mid-Sacramento River	3 (43%)	data not available
Feather River	1 (25%)	data not available
Lower-Sac Delta North	2 (29%)	8 (10%)
Lower San Joaquin Delta South	2 (66%)	data not available
Mid-San Joaquin	0 (0%)	8 (19%)
Upper San Joaquin	1 (33%)	16 (33%)

* Entities counted as being "involved in an IRWM region" include RWMG members (see Table 3) and participants in IRWM advisory committees (see Table 4). For RFMP steering committee members, see Table 5.

**"Participants" in RFMPs refers to those who attended meetings. This data was only available for three RFMP regions, as specified in the sources listed under Table 7.

Sources: IRWM plans, RAP applications, IRWM region websites, draft RFMPs, RFMP websites, RFMP meeting participation lists (see Table 7).

Table 9. Flood Projects in IRWM Plans

IRWM Region*	No. of projects in IRWM plan	No. with flood mgmt as primary benefit	% of flood mgmt projects in top 50% of project ranking
North Sacramento Valley	113	11 (10%)	No data**
Westside Sacramento	141	23 (16%)	48%
American River Basin	184	19 (10%)	No data
East Stanislaus	27	1 (4%)	0%
Merced	74	29 (39%)	28%

Notes

* The four IRWM regions not listed here (Yuba County, Eastern San Joaquin, Westside San Joaquin, and Madera) did not have project lists available.

** NSV's projects are ranked as Tier I, II and III, with Tier I projects having the highest rank. The 11 flood projects fall into Tiers II and III.

participated in meetings related to the RFMP process are also either a member of a RWMG or serve on an advisory committee for an IRWM region. These common participants include several counties and cities, irrigation and water districts, and environmental NGOs. In particular, of the 16 participants in the Upper San Joaquin RFMP that also participate in overlapping IRWM regions, 10 are irrigation or water districts, with an interest in water supply. If participation is any indication of the types of efforts that might emerge in RFMP planning, we might expect to find some projects with water supply benefits. Indeed, as will be discussed in Section 6.2 on multi-benefit approaches, this appears to be the case in the Upper San Joaquin RFMP.

5. Flood management in IRWM Plans and RFMPs

The primary focus of RFMP and IRWM regional groups is to prepare and implement a regional plan. This section summarizes the current status and contents of these plans, with a focus on how flood management issues are addressed, and the degree to which these planning processes have been coordinated with one another. While the RFMP process focuses primarily on improving flood protection within the SPFC, IRWM plans address a wide range of water management issues, including flood risks beyond the SPFC. This overview provides the context for a more focused discussion in Sections 6 and 7 of how multi-benefit approaches to flood management and climate change are addressed in these plans.

As summarized earlier in Table 1, RFMPs are still in development, and are expected to be completed in 2014. Partial drafts are available for four regions, in addition to the Feather River's completed draft, and these form the basis for the discussion of RFMPs in this section. This analysis of IRWM plans is based on five IRWM plans that have been updated to meet DWR's 2012 IRWM Plan Guidelines, as well as the partial draft of an updated plan for Yuba County. Some earlier versions of plans addressed flooding issues, but since the Proposition 84 guidelines more specifically required IRWM plans to address a range of water management issues, for consistency only updated plans are considered here.

5.1. IRWM Plans

IRWM plans are intended to provide a comprehensive view of a region's water resource issues, and to identify priorities and opportunities for integrated approaches to addressing the region's water management needs. Thus, flooding is one of many water management issues discussed. This section highlights how flood management is reflected in the critical components of the six updated IRWM plans included in this study.

5.1.1. Goals and Objectives

The goals and objectives of IRWM plans encompass diverse aspects of water resource management, usually including improvements to water supply and demand, water quality, flood management, and ecosystem protection. Flood management is reflected in the objectives of each of the six updated plans considered here. Each region organizes and prioritizes its plan's objectives differently, making it difficult to assess which regions place

the greatest emphasis on flooding. For example, the Westside Sacramento region organizes its objectives under ten "focus areas," and ranks each objective according to its "importance" and "urgency". The objective "provide adequate flood protection" is included in the "Risk Management" focus area, and is ranked as "high" importance and "medium" urgency (Westside Sacramento IRWMP, 2013, p. 6-5). On the other hand, the Merced IRWM plan has 12 objectives, and identifies the following three as having the highest priority: "A) manage flood flows for public safety, water supply, recharge and natural resource management; B) meet demands for all uses; and C) correct groundwater overdraft conditions" (Merced IRWMP 2013, p. 4-8).

5.1.2. Assessment of flood risks

Given their broad scope, most IRWM plans discuss flooding risks in fairly general terms. Each of the six updated plans being analyzed here include FEMA's 100-year floodplain map for the region, and contain a brief discussion of the areas, populations, and infrastructure most subject to flooding risks, including areas both inside and outside of the State Plan of Flood Control.

Two IRWM plans – Yuba County and Merced – contain additional detail regarding flooding. The Yuba County IRWM plan, currently in draft form, contains an entire chapter dedicated to flood management, which draws heavily upon the draft Feather River RWMP. It reviews Yuba County's flood management infrastructure and systems, the role of LMAs, flooding impacts, and critical challenges and opportunities (Yuba County IRWM plan draft, Chapter 8, January 2014). The finalized Merced IRWM plan contains a discussion of flood risks, along with FEMA floodplain maps (Merced IRWMP, Section 2.3.8). In addition, the Merced plan includes a technical memorandum (Appendix B) focused on flood management, providing a specific discussion of existing regional flood projects, previous flood management studies, known system deficiencies, and descriptions of flood management projects that have been reviewed and prioritized by the Merced IRWM's Regional Advisory Committee.

5.1.3. Management strategies

In IRWM plans, strategies for managing floods, as well as all other aspects of water resources, are framed in terms of the "resource management strategies" outlined in the California Water Plan Update. First introduced in Water Plan Update 2005, a resource management strategy (RMS) is a "project, program or policy that helps local agencies and governments manage their water and related resources," (DWR 2009, Vol. 2, p. 1-5). Examples include "urban water use efficiency," "ecosystem restoration, and "agricultural land stewardship." The intent is for IRWM plans to incorporate a range of RMSs, representing a diversified portfolio of strategies for managing the region's water resources that can yield benefits across multiple water management objectives (DWR 2009 Vol. 2, p. 1-7). In the 2009 Update, there is only one flood-related RMS, called "flood risk management."[2] It includes three broad strategies: structural approaches, land

[2] The Public Review Draft of the 2013 Update takes a similar approach. There are 30 RMSs in the 2013 Update, and only one, "Flood Management," addresses the objective of improving flood management. However, more flood-related RMSs may be introduced in the future (Vol. 3, p. 4-1).

management, and disaster preparedness, response and recovery (Vol. 2, p. 28-5). However, 16 other RMSs are listed as providing secondary flood risk reduction benefits (Vol. 2, p. 1-10).

DWR's guidelines require that IRWM regions consider all RMSs outlined in the California Water Plan Update 2009, and identify those that are relevant to their region (DWR 2012c, p. 20). Among the six updated IRWM plans considered here, all indicate the relevance of the Flood Risk Management RMS. In most cases, the discussion of RMSs in IRWM plans is fairly general, but some regions are more specific about the types of flood management strategies that are relevant to their region. For example, the American River Basin has developed its own framework, informed by RMSs, with specific strategies informed by the CVFPP and relevant RFMP processes (See Box 2).

BOX 2. Flood management strategies in the American River Basin IRWM plan.
The American River Basin IRWM region has developed its own set of 33 strategies, informed by the RMSs, addressing water resources, water quality, environmental resources, flood management, and community stewardship. Included are six flood management strategies specific to the ARB regional setting. Many of these are informed by goals of the CVFPP, and reference the RFMP process. They include (see American River Basin's 2013 plan, pp. 5-19 to 5-22):

- Provide a 200-year level of flood protection for urban areas by 2025, where feasible
- Improve level of flood protection for levee-protected small communities, and agricultural lands in the region, where feasible
- Promote restoration and conservation of floodplain function
- Support a Folsom Dam Water Control Manual update that balances flood control, water, environmental and recreational needs
- Coordinate with inter-jurisdictional, regional flood management efforts
- Coordinate flood emergency planning and response efforts

5.1.4. Project prioritization and financing

The identification and prioritization of projects is a crucial element of the IRWM process. According to DWR guidelines, regions must develop a "Project Review Process" by which projects are proposed, reviewed and prioritized for inclusion in the IRWM plan. Only projects in the IRWM plan can be included in funding requests for Propositions 84 Implementation grants and 1E Stormwater and Flood Management (SWFM) grants. Regions can design their own review process, but DWR's 2012 guidelines specify a number of factors that must be considered, including how the project relates to IRWM plan objectives and the selected RMSs, technical and economic feasibility, and project cost and financing (DWR 2012b, p. 20). In addition, DWR requires that IRWM regions consider whether projects address environmental justice considerations and the needs of disadvantaged communities (DACs), and how the project may contribute to climate change and the mitigation of greenhouse gas emissions (GHGs), as well as how it will adapt to the

Table 10. Summary of Propositions 50, 84 and 1E funding received by 9 IRWM regions in the Central Valley.

	Planning Grants ($)		Project Grants (IRWM Implementation & SWFM)			
IRWM Region	**Prop 50**	**Prop 84**	**Prop 50**	**Prop 84**	**Prop 1E**	**TOTAL ($)**
North Sacramento Valley	499,980	900,000	12,500,000			13,899,980
Yuba County	499,460	603,106				1,102,566
Westside Sacramento	500,000	1,000,000				1,500,000
American River Basin	500,000	403,848	25,000,000	16,030,766	9,096,834	51,031,448
Eastern San Joaquin*	498,468	545,925				1,044,393
East Stanislaus						0
Merced		719,010		2,386,324		3,105,334
Madera	500,000	271,438		9,413,947		10,185,385
Westside San Joaquin			25,000,000			25,000,000
TOTAL	**2,997,908**	**4,443,327**	**62,500,000**	**27,831,037**	**9,096,834**	**106,869,106**

*In collaboration with the neighboring Mokelumne Amador Calaveras (MAC) region, Eastern San Joaquin was also awarded an inter-regional planning project under Prop 84, totaling $878,605.

Source: DWR

effects of climate change. Each IRWM region's review process weighs these factors differently, and may include additional elements.

Project lists were available for five out of the nine IRWM regions being considered in this report. As Table 9 indicates, in most regions, projects that are primarily focused on flood management represent between 4 – 39% of all projects. Data on project ranking was available for only three IRWM regions, and this limited sample suggests that regions vary in how they rank flood management projects. Merced IRWM region's project list includes the largest proportion of flood projects at 39%, but only 28% of these 29 projects are ranked in the top 50% of prioritized projects. On the other hand, 16% of Westside Sacramento's projects are primarily focused on flood management, and about half of these are ranked in the top 50%. However, these figures underestimate the flood-related benefits of projects in IRWM plans, because they do not reflect the secondary flood protection benefits provided by projects that are primarily focused on water supply, water quality, or the environment (see Section 6.1 for further discussion).

In developing proposals for Proposition 84 IRWM implementation grants or Proposition 1E SWFM grants, regions usually conduct an additional project review to identify which projects on the IRWM region's list will be included in a grant proposal. In doing so, regions consider how their proposed projects meet DWR's Program Preferences, which generally encourage the development of regional, multi-benefit projects that take an integrated approach to water management. Flood management is reflected in two main ways. For SWFM grants, there is a specific preference for projects that are <u>not</u> related to the State Plan of Flood Control, and that provide multiple benefits (DWR 2012c, p. 12). In addition, DWR gives preference to projects that address Statewide Priorities, one of which is "Practice Integrated Flood Management," again requiring multi-benefit projects (DWR 2012c, p. 12-13).

Table 10 summarizes the planning and implementation funding received as of April 2014 by the nine IRWM regions in the Central Valley, totaling over $106 million. Section 6.1 discusses the multiple benefits of funded projects in greater detail.

5.2. Regional Flood Management Plans

In contrast to the broad scope of IRWM plans, flood management is the primary focus of RFMPs. As noted earlier, RFMPs are not yet complete, and only draft plan materials are available. The Feather River and the Lower Sacramento-Delta North regions have the most complete draft plans, and thus much of the discussion in this section is based on these two plans, with supplemental information from draft chapters available from other regions.

<u>5.2.1. Goals and objectives</u>

RFMPs broadly follow the goals laid out in the CVFPP. Each RFMP includes region-specific objectives, aligned with these goals. The Feather River and Lower Sacramento-Delta North RFMPs include such objectives as achieving 200-year flood protection for specific urban areas, 100-year protection for small communities, and flood risk reduction in agricultural areas. Both also include an objective related to developing multi-benefit approaches to flood management. While the broad elements are similar, RFMPs do differ in their

emphasis on issues of specific concern to the region. For example, the Feather River RFMP states that its "regional objectives place a greater emphasis on the preservation of economically productive agricultural land than does the CVFPP," (Feather River RFMP, Administrative Draft, October 2013, p. 4).

5.2.2. Assessment of flood risks

Following a general discussion of the regional setting, each plan contains a fairly detailed assessment of flood risks. Most regions include specific estimates of flood frequencies and damages, the conditions of levees and other infrastructure, and vulnerabilities in specific sub-regions. Some of this discussion draws upon the data contained in the draft Regional Flood Atlases prepared by DWR. These atlases present flood risk information through a series of regional maps showing the location of SPFC facilities, levee conditions in the region, the 100-year floodplain as determined by FEMA, and the location of critical habitat and endangered species. Each region is updating the draft atlas with locally available data, and will include a final version in the RFMP.

5.2.3. Management strategies

A central element of RFMPs is a discussion of regional solutions to these flood management risks. RFMPs are not only intended to identify which solutions are appropriate to the region, but also which approaches will also contribute to systemwide improvements. At the time of this writing, only the Feather River and Lower Sacramento-Delta North regions had partial drafts available for these chapters. These two draft plans discuss both structural and non-structural solutions, primarily compiling projects that are either in the planning phases or already underway. Structural solutions include improvements and repairs to levees, reservoirs, flood channels and other infrastructure, while non-structural solutions include easements on land to manage flooding, habitat restoration that expands floodplains, and policies to reduce the assets at risk in floodplains. The CVFPP sets different goals for the levels of flood protection for urban, rural and small communities, so different solutions are often discussed with respect to these settings. For example, the Lower Sacramento-Delta North RFMP organizes its discussion of solutions around specific urban, rural and small communities in the three counties included within the region. The Feather River RFMP places particular emphasis on strategies to reconcile flood management with agricultural land preservation.

Each RFMP also includes a discussion of residual risk management strategies, which include emergency response programs and other flood risk reduction efforts, as well as insurance programs. Counties and cities usually have primary responsibility for emergency response, and are required to prepare multi-hazard mitigation plans under the federal Disaster Mitigation Act of 2000. These plans will likely be important sources of information as RFMPs develop this section of their plans. LMAs often play a role in disaster response, but frequently lack adequate resources and technical assistance; RFMPs will likely include strategies for supporting LMAs in this regard.

As required in DWR's guidelines, RFMPs also contain a discussion of how ecosystem protection can be achieved along with flood management goals. Further details are discussed in Section 6 on multi-benefit strategies.

5.2.4. Project prioritization and financing

A critical output of the RFMP process is a prioritized list of projects that address regional flood management needs, and a financing strategy to accomplish them. So far, none of the RFMP regions has finalized a project list, so it is difficult to say much about the types of projects that are being included and prioritized. However, a few regions have developed preliminary project lists, and criteria for project ranking. For example, the Lower Sacramento Delta North region has developed a preliminary list of approximately 150 projects in the North Delta, which are largely proposed by LMAs, cities or counties. The Upper San Joaquin RFMP region has developed a preliminary list of 87 projects, which are proposed by a variety of different entities, including LMAs, irrigation and water districts, and environmental NGOs. This region has developed a fairly elaborate system for ranking projects, organized according to DWR's three overarching goals of improving public safety, fostering environmental stewardship, and supporting economic stability, as well as addressing region-specific issues. Specific criteria include whether or not a project provides multiple benefits, generates systemwide benefits, or serves small or disadvantaged communities. Region-specific criteria are also included, such as whether or not a project contributes to the San Joaquin River Restoration Program (USJR RFMP, Regional Priorities Workshop Presentation, March 19, 2014).

5.3 Coordination between RFMP and IRWM planning

As the above discussion has shown, the IRWM plans that overlap spatially with the newly established RFMP regions each contain flood-related objectives and projects related to flood management, suggesting that coordination may be beneficial. This section discusses how IRWM and RFMP processes have coordinated with one another so far, and identifies some of the constraints and challenges involved.

At the state level, coordination within DWR regarding the management of IRWM and RFMP processes appears to have been limited. DWR included maps of overlapping IRWM regions in the draft Regional Flood Atlases that it provided to each RFMP region, and the accompanying text encourages RFMPs to collaborate with IRWM regions. However, coordination with the IRWM process was not discussed in the guidelines DWR developed for the RFMP process. Conversely, information about the IRWM process also contains little or no reference to the RFMP process, although some communication may be occurring via staff in DWR's regional offices. Part of the reason for this may be the different institutional contexts for these processes, as described in Section 2, and DWR's role in each. DWR's Division of Flood Management anticipates integrating outcomes of the RFMP process into the implementation of the CVFPP. On the other hand, Division of Integrated Regional Water Management has primarily sought to support IRWM regions in developing their own goals and governance structures, and the connection between the contents of IRWM plans and the California Water Plan update process is looser. It also appears that DWR is still in the process of fully incorporating flood management into the Water Plan update process,

suggesting that efforts are still underway to coordinate the activities of DWR's Flood Management and IRWM divisions.[3]

At the local and regional levels, the degree of coordination between the two processes varies. The six updated IRWM plans each contain at least a brief reference to the on-going RFMP processes, mentioning the need to include relevant information and projects from RFMPs in future IRWM plan updates. As already noted, plans for a few IRWM regions, such as the American River Basin and Yuba County, references to the RFMP process are a bit more extensive, suggesting that some dialogue has taken place. It appears that greater coordination has occurred when there is greater overlap between participants, and when the timing of both processes has enabled flood information from the RFMP to be incorporated into the IRWM plan. For example, the draft Feather River RFMP was already complete when the Yuba County IRWM plan was being updated, and Yuba County Water Agency is a lead participant in both processes. This may have helped make it possible for the draft update to the Yuba County IRWM plan to draw significantly upon the draft Feather River RFMP in describing flood management issues in the region. There is also overlap in leadership of the North Sacramento Valley IRWM and the Upper-Mid Sacramento RFMP, with Reclamation District 108 and county governments participating substantively in both processes. The North Sacramento Valley IRWM region delayed the finalization of its plan, with the intention of incorporating information from the Upper-Mid Sacramento RFMP. However, DWR's process for reviewing IRWM plans began in January 2014 to enable IRWM regions to have their plans reviewed in time to be eligible for 2014 drought funding. As a result, NSV finalized its plan in March 2014, and notes that RFMP projects will be incorporated at a later date (NSV Plan, p. 5-6). The Upper San Joaquin RFMP appears to have significant involvement from agencies that participate in the Merced, Madera and Westside San Joaquin IRWM regions. While the Merced plan was completed in 2013 and includes only a brief mention of the RFMP process, the Madera IRWM plan update is still underway, so there may be an opportunity to incorporate findings from the RFMP process.

Draft RFMP documents also contain references to overlapping IRWM processes. The Lower Sacramento-Delta North draft RFMP includes a short section entitled, "Integrated Regional Water Management Opportunities," which lists the three IRWM regions that overlap with this RFMP, and notes the need to coordinate. It suggests that in particular coordination may be needed in advancing flood management projects, stating that "at times, it may be more appropriate for a flood management project to be implemented through the IRWM, particularly if it is a local (or non-SPFC) issue," (Lower Sac/Delta North draft RFMP, 2014, p. 99). The Mid-San Joaquin RFMP, which overlaps with the East Stanislaus and Westside San Joaquin IRWM regions, references both of these IRWM processes and notes that the East Stanislaus IRWM plan includes several flood management projects. Finally, the

[3] The discussion of the Flood Management RMS in the Public Review Draft of the 2013 Update notes that flood management is "still relatively new to the California Water Plan" (2013 Update draft, Vol. 3, p. 4-1). The 2013 Update's Roadmap for Action includes an objective entitled, "Improve Flood Management Using an Integrated Water Management Approach," representing movement toward the integration of flood management activities (DWR 2013, Vol. 1, p. 8-14).

Feather River RFMP describes the North Sacramento Valley and Yuba County IRWM processes, and then notes that, "despite the extensive efforts invested in the IRWM process, flood risk reduction projects have not been fully integrated, and in fact have moved toward implementation on separate tracks," (draft Feather River RFMP 2013, p. 7-30).

Thus, while some coordination is taking place between IRWM and RFMP regional planning processes, it also appears that there have been challenges. The timing of these planning processes has presented some limitations, due to schedules set by DWR as well as local factors. For example, some IRWM regions began their plan update process earlier than others, and some plans were already complete by the time the RFMP process began. Another potential challenge relates to the types of flood projects that will fit within IRWM plans. While RFMPs are intended to encompass all flood management needs and strategies in a region, the emphasis so far appears to be on efforts that relate to the State Plan of Flood Control (SPFC), which is the primary focus of the CVFPP. IRWM plans can include projects related to the SPFC, there may not be a big incentive to do so under the current IRWM structure. One of the major funding avenues for flood projects in the IRWM process is the Storm Water and Flood Management (SWFM) grant program, which only funds non-SPFC projects. IRWM Implementation grants do not have this restriction, but most projects funded to date in IRWM regions in the Central Valley have been relatively small in scale (see Section 6.1). Finally, IRWM and RFMP regions face different requirements under DWR guidelines. Even though coordination of project lists could open new opportunities for leveraging funds, local agencies often have limited time and resources, and struggle to keep up with meeting requirements for multiple processes.

6. Promoting multi-benefit approaches to flood management

Among the key purposes of the RFMP and IRWM regional planning processes is to support the development and implementation of integrated, multi-benefit approaches to water management. The Central Valley Flood Protection Act of 2008 specifies that the plan developed for managing flood risks in the Central Valley should meet multiple objectives, including linking flood management with improvements in water supply, as well as promoting natural processes, reconnecting floodplains, and supporting native species recovery (CWC §9616). The IRWM Planning Act of 2008 also requires that IRWM plans follow "an integrated, collaborative, multibenefit approach to selection and design of projects and programs," (CWC §10541(e)(5)).

This section examines the types of multi-benefit approaches that are emerging within the RFMP and IRWM processes in the Central Valley. In general, the IRWM process appears to generate projects that link water supply with water quality, ecosystem, and flood benefits. While the RFMP process is also intended to encompass all types of multi-benefit flood projects, evidence so far about the RFMP process suggests a greater emphasis on projects that link flood management and environmental benefits. It is important to note the significant institutional, financial and other barriers that often exist in undertaking planning and multi-benefit projects. The findings here are indications of groundwork being

laid by IRWM and RFMP processes for multi-benefit approaches to managing flooding in the Central Valley, but more time will be needed to advance these efforts.

6.1. Meeting multiple objectives through IRWM planning

The development of integrated, multi-objective approaches to managing a region's water resources is the central goal of the IRWM process. As discussed earlier, IRWM regions are defined so as to "maximize opportunities for integration of water management activities" (CWC Section 10541(f)), and projects must yield multiple benefits in order to be eligible for IRWM Implementation or SWFM grant funds (DWR 2012c, p. 16-17).

One way to measure how IRWM regions are promoting integration is to examine the types of benefits provided by projects funded through IRWM Implementation and SWFM grants. Project proposals for these grant funds must document the anticipated benefits of each project, in either monetary or qualitative terms. DWR provides specific guidance for analyzing the benefits of water supply, flood impact reduction, water quality, ecosystem restoration, recreation, and power cost savings and production. These cost-benefit analysis procedures are fairly complex, and project proponents often hire consultants specifically to complete these proposal elements.[4]

A review was conducted of projects funded to date through Proposition 84 Implementation grants and Proposition 1E SWFM grants in the IRWM regions that overlap with the RFMP regions. Out of these nine IRWM regions, three – American River Basin, Madera, and Merced – received Round 1 or Round 2 Implementation grant funds, awarded in 2011 and 2013 respectively. This funding, totaling $27.8 million, supported 23 projects in these three regions. Under the SWFM program, three projects have been funded, all located in the American River Basin IRWM region, totaling approximately $9 million. The multiple benefits associated with these two sets of projects are described below.

6.1.1. Projects funded through Proposition 84 IRWM Implementation Grants

Table 11 shows the benefits documented for these 23 funded projects. Water supply benefits receive the greatest emphasis, with 21 out of 23 projects claiming a water supply benefit, 15 of which are documented in monetary terms. Water quality benefits were the next most frequently cited (18 out of 23 projects). Ten out of the 23 projects included a flood protection benefit, and 11 documented ecosystem restoration benefits. Finally, recreation benefits were included in five out of 23 projects. Thus, IRWM projects are mostly providing water supply and water quality benefits, but flood protection and environmental benefits are also being generated.

Furthermore, this analysis shows that among the ten projects providing flood protection benefits, eight also offer water supply benefits. The water supply benefits of these projects involve groundwater recharge through the creation of detention basins for flood waters, reduced evapotranspiration through the removal of an invasive plant species along creeks,

[4] For Round 2 Implementation grant proposals, DWR introduced a simplified, "cost-effectiveness analysis" that could be used for small projects or projects serving disadvantaged communities (Round 2 Implementation PSP, 2012, p. 44).

Table 11. Monetized ($) and qualitative (+) benefits of Proposition 84 Implementation Grants in IRWM Regions in the Central Valley

IRWM Region	Project Title	Proponent	Water supply	Water quality	Flood protection	Ecosystems	Recreation
American River Basin Round 1, $16,030,766	City of Roseville Aquifer Storage and Recovery Program	City of Roseville	$, +	+			
	Secret Ravine Fish Passage Improvement Project	City of Roseville		$, +	+	+	+
	E.A. Fairbarn Groundwater Well Project	City of Sacramento	$	+			
	Shasta Park Reservoir and Well Project	City of Sacramento	$, +	+			
	Antelope Creek Water Efficiency and Flood Control Improvement Project	Placer County Flood Control and Water Conservation District and Placer County Water Agency	$, +	+	$		
	Regional Water Meter Retrofit Acceleration Project	Regional Water Authority	$, +				
	Regional Indoor and Outdoor Water Efficiency Project	Regional Water Authority	$				
	Sacramento Regional County Sanitation District/Sacramento Power Authority Recycled Water Project	Sacramento Regional County Sanitation District	$, +	+			
	North Antelope Booster Pump Station Project	Sacramento Suburban Water District	$, +	+			
	Coyle Avenue and Roseview Park Pump Stations and Treatment System Project	Sacramento Suburban Water District	$, +	+			
	Willow Hill Pipeline Rehabilitation Project	City of Folsom	$, +				
	Lower American River Mile 0.5 Aquatic Riparian Habitat Enhancement Project	Sacramento Area Flood Control Agency	+	+	+	+	+
	Lower Cosumnes River Floodplain Restoration	Trout Unlimited	+	$, +	+	+	+
	OHWD/Rancho Murieta Groundwater Recharge Project	Omochumne-Hartnell Water District and Rancho Murieta Community Services District	$, +			+	
	Sleepy Hollow Detention Basin Retrofit Project	City of Elk Grove	$, +	+	+	+	+
Madera Round 1, $9,413,947	Ash Slough Arundo Eradication and Sand Removal	Madera County Resource Conservation District			$	+	
	Cottonwood, Dry, and Berenda Creek Arundo Eradication	Madera Irrigation District	$	+	$	+	
	Root Creek In-Lieu Groundwater Recharge Project	Root Creek Water District	$, +	+	$		
	Sierra National Forest Fuels Reduction Project	US Forest Service	+	$	$	+	
Merced Round 2, $2,386,324	Black Rascal Flood Control Project	County of Merced	+	+	$	+	
	Planada Community Services District Water Conservation Project	Planada Community Services District	$	+			
	El Nido Recharge Area	Merced Irrigation District	$	+		+	
	Merced River Education and Enhancement Program	East Merced RCD, UC Merced, Merced Irrigation District		+		+	$

Sources: Implementation grant applications - Attachment 3 (Workplan) and Attachment 10 (Benefits Summary)

Table 12. Monetized ($) and qualitative (+) benefits of Prop 1E Stormwater and Flood Management Grants in IRWM regions in the Central Valley (American River Basin)

IRWM Region	Project Title	Proponent	Water supply	Water quality	Flood protection	Ecosystems	Recreation
American River Basin	Downtown Combined Sewer Upsizing Project	City of Sacramento	+		$		
Rounds 1 and 2	Upper Unionhouse Creek Flood Protection Project	Sacramento Area Flood Control Agency	+	+	$		
$9,096,834	Florin Creek Multi-Use Basin	Sacramento Area Flood Control Agency	+	+	$	+	+

Sources: SWFM grant proposals, Attachments 3 (Workplan) and 10 (Benefits Summary)

and erosion control through either improved infrastructure or forest restoration. The following are a few examples of the multi-benefit flood projects funded in these regions:

- Eradication of the invasive Arundo species along creeks in Madera County, improving channel capacity, restoring riparian ecosystems, and reducing evapotranspiration (Madera IRWM region)
- Floodplain restoration and habitat enhancement along the Cosumnes and American Rivers and in a creek in the city of Roseville (American River Basin IRWM region)
- Forest restoration and fuel reduction, leading to reduced erosion and improved channel capacity (Madera region)
- Identification of detention basins for flood waters, yielding benefits for groundwater recharge and irrigation water supplies (American River Basin, Madera, and Merced IRWM regions)

Most of these flood-related IRWM Implementation grant projects are relatively small in scale, and most do not relate to the State Plan of Flood Control. However, the Black Rascal Flood Control Project in the Merced IRWM region does help address flood risks within the SPFC. This project involves identifying an appropriate location for a detention basin that would help reduce flood impacts for a disadvantaged community in Merced, while also providing Merced Irrigation District with additional water storage. This project is located within the Upper San Joaquin RFMP (Draft USJR Regional Setting Chapter, p. 2-24).

6.1.2. Projects funded through Proposition 1E Stormwater and Flood Management grants

SWFM projects are also required to demonstrate multiple benefits, following similar categories as those used in IRWM Implementation grants. Table 12 shows the benefits documented for each of these three projects. In this case, only flood protection benefits are monetized, and water supply, quality, ecosystem and recreation benefits are qualitatively assessed. All three projects claim water supply as well as flood benefits, which are generally related to groundwater recharge. One project, the Florin Creek Multi-Use Basin, also claims ecosystem benefits.

The multiple benefits associated with funded projects are just one measure of how IRWM regions are promoting integration. IRWM regions that have not yet received IRWM implementation or SWFM funding may well be generating stakeholder dialogue that can lead to the development of new partnerships and project ideas for future funding.

6.2. Multi-benefit approaches in the CVFPP/RFMP process

The State Systemwide Investment Approach (SSIA) described in the CVFPP emphasizes the need for projects that address flood protection, but that also provide multiple benefits, including "environmental conservation and restoration, agricultural conservation, water supply and quality, and related benefits," (DWR 2012a, p. 2-30). At the time of this writing, complete project lists were not available for any of the RFMPs, so an assessment of project benefits is not yet possible. However, the CVFPP and draft RFMP documents, the technical and programmatic support available from DWR, and the mix of participants in RFMPs all suggest that the majority of emphasis is on the development of multi-benefit projects that combine environmental benefits with flood management objectives. Projects with water supply benefits are not entirely absent, however. Water supply, water quality, and

recreation benefits may also accrue from projects that meet habitat restoration and flood management goals. Further, the Upper San Joaquin RFMP region appears to be generating some projects related to water supply, which appears to be supported by the involvement of irrigation stakeholders and other water supply stakeholders.

The implementation of the CVFPP appears to have provided a forum for much-needed dialogue regarding new, integrated approaches to addressing conservation goals in the context of flood management. Flood projects already must comply with federal and state environmental permitting requirements. Permitting often requires LMAs to undertake mitigation, which involves conserving habitat in another location to compensate for habitat loss due to project implementation. This process, which usually occurs after a project has been designed, is costly and often leads to project delays. Furthermore, traditional mitigation is a piecemeal approach that usually is not effective at improving ecosystem conditions and promoting the recovery of populations of native species (Coordinating Committee discussion, April 23, 2014). Currently, environmental organizations as well as state agencies are seeking new ways of incorporating environmental components directly into project planning, in order to improve outcomes as well as simplify the compliance process.

In order to support the integration of conservation elements into systemwide and local flood planning efforts, DWR and the Board have been developing several strategies and programs designed to facilitate the incorporation of environmental priorities. DWR's FloodSAFE Environmental Stewardship and Statewide Resources Office (FESSRO) has been leading the development of a CVFPP Conservation Strategy, identifying opportunities across the Central Valley for reducing flood risks while also advancing habitat restoration, protecting endangered species, and promoting ecosystem functions. FESSRO is also collaborating in a statewide effort, called the Regional Advance Mitigation Planning (RAMP), which is creating and piloting a means to comply with environmental mitigation requirements of infrastructure projects in advance, and at a regional scale. The Central Valley is a RAMP pilot site, where certain lands are being set aside for conservation, enabling local agencies to purchase credits that demonstrate mitigation for the impacts of their project activities. FESSRO has been encouraging RFMPs to incorporate the use of RAMP to achieve mitigation for the flood management projects they propose.

In keeping with the CVFPP's supporting goal to promote ecosystem function, DWR specified that RFMPs should include an "assessment of opportunities for developing multi-objective solutions in the region," which "may, for example, include enhancements of ecosystems within the region's flood management system," (DWR 2012d, p. 14). Given that the RFMPs are still being drafted and project ideas are still in development, only a preliminary assessment of multiple objectives is possible here. In general, however, it appears that discussions regarding multi-benefit projects in RFMPs focus primarily on the incorporation of conservation elements. Environmental organizations are involved in each RFMP process, and play a significant role in identifying multi-benefit project opportunities. Water supply, quality or recreation benefits are also associated with some of these projects. For example, floodplain restoration may help recharge groundwater while also expanding habitat. However, if measurable benefits to water supply are to be generated, the

involvement of water supply stakeholders is likely needed. Furthermore, some of the most significant water supply-oriented multi-benefit approaches involve revising reservoir operation rules to better reconcile water supply and flood needs, which are largely systemwide issues that may be addressed by reservoir operators and the Army Corps; these may not be addressed in detail in RFMPs. Recreation is another potential benefit associated with flood projects. However, this is often a challenging issue because it sparks concerns on the part of private landowners regarding public access, and sometimes raising public safety and liability issues.

Discussions of multi-benefit projects have evolved differently within each RFMP region. The following are brief overviews of how these issues are being addressed in four of the six regions for which sufficient information was available. While this is not a comprehensive analysis, these examples serve to illustrate how varied regional contexts lead to different opportunities and approaches for the development of multi-benefit projects.

Feather River. Having already received funding for several major flood projects that include setback levees, this region got an early start on its RFMP. In the process of developing these projects, dialogue between Sutter-Butte Flood Control Agency (SBFCA) and environmental advocates had already been initiated. In order to resolve differences over the environmental impact report for the Feather River West Levee Project, SBFCA signed a memorandum of understanding with a group of environmental organizations in which SBFCA agreed to actively pursue multi-benefit projects, and environmental groups withdrew their opposition to the West Levee project. In a chapter entitled, "Integration of Flood Management with Agricultural Preservation, Habitat Enhancement, and Restoration," the Feather River draft RFMP references this MOU, re-stating SBFCA's commitment to promoting environmental benefits in regional flood planning projects (Feather River draft RFMP, October 2013, p. 6-9). The Feather River RFMP specifically emphasizes strategies that will address environmental goals while still maintaining agricultural land uses, such as "safe harbor" agreements, various types of easements, and specific, wildlife-friendly strategies for different crop types (p. 6-2).

The Feather River RFMP also discusses opportunities for water supply benefits, primarily in the context of improved reservoir operation to better balance flood protection and water supply goals (p. 3-3). For example, "forecast-based operations" involve using short-term forecasts of reservoir inflow to enable the release of water into downstream channels in anticipation of peak flows. The idea is to minimize the need to spill water during flood periods, thereby maintaining flood protection while also maximizing water storage (p. 7-32). The Feather River RFMP mentions forecast-based operations as an option for improving management of New Bullards Bar and Oroville Reservoirs (p. 7-32/33).

Lower Sacramento River – Delta North. This region, which includes Sacramento, West Sacramento, and their suburbs, contains the largest urban population of any of the RFMP regions. Bringing these urban areas up to a 200-year level of flood protection is a crucial priority, and requires addressing numerous problems with existing levees. At the same time, this region encompasses a large portion of the Yolo Bypass, the expansion of which is a critical – and controversial – systemwide improvement recommended in the CVFPP. This

RFMP has provided a new opportunity for dialogue between key stakeholders on the east and west banks of the Sacramento River. Stakeholder committees have been formed for the east and west sides of the river, with a joint committee involving representatives of each providing overall guidance for the development of the RFMP. Multi-benefit approaches in this region are likely to be informed by DWR's Conservation Strategy, and include some of the environmental benefits that may accrue from the expansion of the Yolo Bypass.

Mid-San Joaquin River. Composed of several disconnected areas along the San Joaquin River, this is a primarily rural region located mostly in Stanislaus County. The region's levees currently provide relatively low levels of protection, and most of the nine reclamation districts in the region have limited capacity for levee maintenance. There are significant opportunities in the region for floodplain reconnection, and River Partners, which is playing a lead role in developing the RFMP, has been involved for years in developing floodplain restoration projects with multiple benefits. The Dos Rios/Hidden Valley and Three Amigos projects were both developed by leveraging funding from sources that required demonstrating different types of benefits. According to data presented to the Coordinating Committee in January 2014, these two projects used funding sources for ecosystem benefits (72%) and flood protection (16%). Recreation benefits represented 5% of project funding (Mid-San Joaquin Presentation, Coordinating Committee, Jan. 26, 2014). It took years of effort to assemble the funding for these projects, given the diverse requirements and timelines of various grant programs. The Mid-San Joaquin RFMP process is seeking to continue this work, as well as identifying the concerns and technical assistance needs of reclamation districts that are faced with significant levee repair problems.

Water supply issues do not appear to have figured strongly in this region's discussions so far. While several irrigation districts west of the San Joaquin River are involved in the planning process, they are primarily concerned about protecting their water intake structures from flood impacts. While there may be some opportunities for reservoir re-operation and groundwater recharge on the eastern side of the San Joaquin that would yield water supply and flood protection benefits, these water supply stakeholders have not yet significantly engaged in the RFMP around these issues (J. Rentner, personal communication, Jan. 2014).

Upper San Joaquin River. This region encompasses portions of Fresno, Madera and Merced counties, and is predominantly rural and agricultural. There are a number of significant on-going restoration programs that overlap with this region, and which play an important role in shaping the dialogue and project opportunities being discussed in this region. In addition to the CVFPP's Conservation Strategy, these include the San Joaquin Restoration Program, the San Joaquin River Parkway Master Plan, and the San Joaquin River Blueway Vision (USJR Draft Land Use and Environmental Setting Chapter, p. 3-26). Environmental organizations such as Trout Unlimited, American Rivers, and the Natural Resources Defense Council have been involved in developing these plans, and are also closely engaged in this RFMP. Recent project development meetings have sought to identify opportunities to integrate conservation elements into some of the 87 projects proposed so far for inclusion in the regional plan. Discussions at the February 2014 Coordinating

Committee meeting indicated that this process has led to the identification of several such opportunities, including habitat restoration through the development of off-stream storage, which could also provide some water supply benefits through groundwater recharge. A review of the current project list confirms this, with a number projects appearing to have both water supply and environmental benefits. Such projects may also generate flood protection benefits downstream, and these opportunities are being discussed in joint meetings with the Mid and Lower San Joaquin RFMP regions.

7. Climate change in IRWM plans and RFMPs

As awareness has grown about climate change risks, both the California Water Plan Update process and the Central Valley Flood Protection Plan have emphasized the need to build resilience to a range of possible future scenarios. In light of this, the State Systemwide Investment Approach outlined in the CVFPP seeks to build additional system capacity and flexibility in order to accommodate more extreme flood events than previously experienced. The CVFPP emphasizes the importance of multi-benefit approaches, such as floodplain restoration, in ensuring adaptability to climate change (CVFPP, p. III). Similarly, the IRWM process has been viewed as an important means for supporting climate change adaptation, as emphasized in the 2009 update to the California Water Plan (Spanos, forthcoming; DWR 2009).

Regional-scale planning can support climate change adaptation in several ways. First, the nature and severity of climate change impacts will vary widely across the state, and regional planning can provide a forum for identifying these vulnerabilities at an appropriate scale. Second, adaptation strategies often involve a more holistic understanding of resource management, and greater coordination among multiple entities. For example, restoring floodplains and setting back levees to build flexibility in managing floods in the Central Valley requires significant coordination among flood management, land use, agricultural, and environmental interests. Regional planning can help establish the dialogue needed between these different stakeholders to begin to develop specific implementation plans to accomplish this. Finally, as knowledge about climate change risks improves, regular updates of regional plans may provide an opportunity to incorporate new information and revise adaptation strategies if needed.

Yet, planning for climate change at a regional scale also poses some challenges. The analysis of climate change impacts is often a complex undertaking, particularly since projections from global climate models (GCMs) become more uncertain at smaller scales. This is particularly true when assessing the impacts of climate change on extreme weather events, including flooding. Local agencies involved in regional-scale planning often do not have sufficient technical expertise or resources to undertake such analyses, and funding for technical assistance may not always be available.

This section examines how the IRWM and RFMP processes have addressed climate change, illustrating some of these challenges. IRWM regions are each required to conduct an

assessment of their climate change vulnerabilities, providing a general indication of which types of vulnerabilities – for example, water supply, flooding, or sea level rise – are most critical. Evidence from six recently updated plans in the Central Valley indicates that IRWM regions are conducting vulnerability assessments. RFMPs are not required to consider climate change; instead, DWR is conducting a series of analyses of how climate change will impact flooding in the Central Valley. Once complete, these analyses may have considerable value for informing regional planning in the future. However, making DWR's analysis usable at the regional level may require explicit coordination between regional planners and DWR.

7.1. Climate change in IRWM plans

According to the IRWM Planning Act of 2008, each IRWM plan must include an "evaluation of the adaptability to climate change of water management systems in the region," (CWC §10541(e)(10)).[5] DWR's 2012 guidelines include a climate change "standard," requiring that IRWM plans must include the following three components with regard to climate change impacts (DWR 2012c, p. 23):

- A discussion of potential effects of climate change in the region, including an assessment of vulnerabilities and potential adaptation options
- A prioritization of the region's vulnerabilities
- A plan for further analysis and data collection regarding the prioritized vulnerabilities

In order to support IRWM regions in meeting these requirements, DWR's four regional climate change specialists, based in each DWR regional office, are available to provide technical assistance. In addition, DWR collaborated with the Environmental Protection Agency and others to develop the *Climate Change Handbook for Regional Water Planning* (EPA/DWR 2011), which provides detailed, step-by-step technical guidance for assessing climate change impacts on water resources. The Climate Change Handbook includes a review of the science of climate change, methodologies for assessing and analyzing specific types of climate change vulnerabilities at regional scales, approaches to evaluating projects with respect to climate change adaptation, and techniques for managing climate change uncertainty. While IRWM regions are not required to use the Climate Change Handbook, DWR's 2012 guidelines reference the Handbook's Vulnerability Assessment Checklist as an acceptable approach for conducting the required assessment of the region's climate change vulnerabilities (EPA/DWR 2011, Appendix B). This 40-question checklist reviews features of regional water management to identify the areas in which the region may be most highly exposed to climate change impacts. The checklist covers seven areas: water supply, water demand, water quality, sea level rise, flooding, hydropower, and ecosystems and habitat. For example, with regard to flooding, checklist questions include, "does critical infrastructure in our region fall within the 200-year floodplain?" and "does part of your region lie within the Sacramento-San Joaquin Drainage District?". The checklist requires

[5] The Act also requires IRWM regions to consider greenhouse gas emissions in identifying programs and projects (CWC §10541(e)(9)).

limited analysis, and is intended to provide regions with a simple way to prioritize their efforts to further analyze how climate change may impact their region. Further, the checklist helps regions to identify appropriate adaptation strategies.

As IRWM regions statewide have worked to update their IRWM plans to meet the 2012 guidelines, most have followed this checklist to guide their vulnerability assessment. Table 13 summarizes the vulnerabilities identified and prioritized by six of the IRWM regions with updated plans. All six have used the Vulnerability Assessment Checklist as a guide, and ranked flooding as a relatively high priority. Regions followed different approaches to prioritizing their vulnerabilities; some ranked the seven categories in order of priority, while others listed several areas of vulnerability as high priorities. For example, East Stanislaus listed water supply/quality and flooding as its top two priorities, and Merced ranked flooding as second, right after water supply/quality. Westside Sacramento, on the other hand, listed aspects of water demand and supply, water quality sea level rise, habitat and flooding as high priorities.

The prioritization of climate change vulnerabilities is intended to inform an IRWM region's project review process, leading to a greater emphasis on projects that help the region adapt to critical climate change vulnerabilities. In the case of these IRWM regions, this should mean that flooding projects are prioritized in some way. However, in most regions, a project's capacity to support climate change adaptation is just one of many elements involved in the project review process. For example, in the regions studied here, climate change adaptation accounts for only 2-6% of a project's ranking.

Furthermore, as also shown in Table 13, despite the high priority assigned to flooding, these IRWM regions' plans for further data gathering and analysis of prioritized vulnerabilities do not involve significant data or analysis related to flooding. The American River Basin describes some specific analysis and data collection related to groundwater monitoring, but not flooding. The Merced plan lays out a broad plan for incorporating climate change parameters into project and resource monitoring efforts, but does not discuss specifics related to flooding. Only the East Stanislaus region includes lists some specific, flood-related indicators in its plan to follow up on climate change vulnerabilities.

In general, most IRWM regions have not conducted quantitative analyses of climate change impacts (Conrad 2012). Intended only as a preliminary assessment, the Vulnerability Checklist does not require significant analysis, and most regions have relied upon existing literature and information about local water systems in order to complete it. A few regions, such as the American River Basin and Yuba County, have undertaken additional analysis in developing their IRWM plans, primarily focused on climate change impacts on water supply. However, most IRWM regions have limited resources available for planning beyond what is funded through IRWM planning grants, and are unlikely to conduct additional climate change analyses on their own. Given the complexities involved in analyzing the impacts of climate change on extremes such as flooding, much more significant technical assistance would be needed from DWR in order for regions to take this on.

Table 13. Prioritization and analysis of climate change vulnerabilities in six Central Valley IRWM regions

IRWM Region	Plan Status and Date	Prioritized climate change vulnerabilities	Analysis conducted/cited	Additional analysis planned
North Sacramento Valley	Final, April 2014	In order of sensitivity: flooding, water supply, water quality, ecosystems/habitat, hydropower, and water demand	Historical flood information	None described
Yuba County	Preliminary draft, Jan 2014	Vulnerabilities identified but not yet explicitly prioritized. Currently includes vulnerability to flooding, specifically increased risk of flooding and levee failure, and responses to flood risk could hinder water supply management.	Sources include Cal-Adapt and California Adaptation Planning Guide (2012), a PG&E study of the effects of climate change on runoff in Sierra Nevada rivers, and the Yuba County 2030 General Plan Update EIR. In addition, Stockholm Environment Institute is conducting some modeling for this IRWM plan, using its Water Evaluation And Planning system (WEAP).	Complete draft not yet available
Westside Sacramento	Final, June 2013	Aspects of water demand, supply, quality, sea level rise, flooding, and habitat are ranked as high priority, following checklist questions. For flooding, four out of five aspects are ranked high (only vulnerability to wildfire is ranked medium).	US Bureau of Reclamation's Sacramento Valley Study and Cal-Adapt	None described
American River Basin	Final, 2013	Aspects of water demand, supply, quality, flooding, and ecosystem/habitat are ranked as high priority. Vulnerability to flooding includes increased riverine and tidal flood risks.	Literature review on range of impacts, and quantitative analysis of impacts on ground and surface water supplies and on water demand, using Sacramento Area Integrated Water Resources Model (SacIWRM).	Specific data gathering and analysis planned related to groundwater monitoring and design of conjunctive water use. Specific analysis related to flooding not discussed.
East Stanislaus	Draft, July 2013	Water supply/quality and flood management are ranked as high priorities. Secondary priorities are ecosystems/habitat, water demand, and hydropower.	Null et al. 2010 on reductions to annual flow and changes in flow timing in Merced, Tuolumne and Stanislaus rivers, and impact on hydropower and on meadow ecosystems.	Preliminary data collection plan includes vulnerability indicators, data sources to evaluate them, and possible adaptation strategies. For flooding, indicators are increased frequency of high flow events, shift in timing of snowmelt, and increased inundated area.
Merced	Final, August 2013	In order of priority: 1) water supply/quality, 2) flood management; 3) hydropower; 4) water demand; and 5) ecosystem and habitat.	Null et al. 2010 on reductions to annual flow and changes in flow timing in Merced River, and impact on hydropower and on meadow ecosystems.	General plan described for gathering resource and project data, and incorporating climate change parameters into project-level and regional monitoring efforts. No specifics related to flooding.

Sources: draft or final updated IRWM plans.

7.2. Climate change in the Central Valley Flood Protection Plan and RFMPs

Section 9614(f) of the Central Valley Flood Protection Act of 2008 requires that the CVFPP must include "a description of the probable impacts of projected climate change, projected land use patterns, and other potential flood management challenges on the ability of the system to provide adequate levels of flood protection." Given the limited ability of global climate models (GCMs) to project how extreme weather patterns will change at local and regional scales, understanding the impacts of climate change on flood risks in the Central Valley is a challenge. For the 2012 plan, DWR conducted preliminary analyses, applying estimated changes in sea level rise and streamflow using existing models. DWR also piloted a "threshold analysis approach," designed to assess the likelihood that climate change could lead to the exceedance of certain important thresholds in reservoir or other flood management operations. For the 2017 update, DWR is conducting additional analyses to model how changes in atmospheric rivers, sea level rise, and conditions in specific watersheds will affect flow frequency curves for 2030, 2050, and 2100 (DWR 2014b). This involves studying the role of atmospheric rivers, which are an important causal factor in determining precipitation and peak flow events in the Central Valley.

As DWR undertakes these Central Valley-wide analyses, climate change is not extensively addressed in RFMPs. The draft RFMPs currently available for the Feather River and Lower Sacramento-Delta North regions include brief discussions noting the potential for climate change to increase flooding risks, affecting flood insurance rates and increasing the risk of levee failure and catastrophic flooding (Feather River draft RFMP, July 2013, p. 3-12; Lower Sacramento/Delta North draft RFMP, Jan. 2014, p. 63-4). Since DWR's guidance for RFMPs does not require consideration of climate change impacts, and regions have limited time and resources to prepare their plans, the current set of RFMPs are unlikely to include in-depth analysis on this topic.

If RFMPs are to be updated in the future, however, there is potential for considering climate change at the regional scale, informed by the analysis now being conducted by DWR. For example, the threshold analysis approach piloted for the 2012 CVFPP offers considerable opportunities to engage RFMP regions, as well as IRWM regions interested in better understanding flood risks. The threshold approach involves an assessment of the existing capacity of the flood management system, and identification of specific thresholds that, if exceeded, could pose serious flood risks. For example, in its pilot study for the threshold analysis approach, DWR focused on the operation of Oroville Dam along the Feather River. Based on simulations of how atmospheric rivers could be affected under different climate change scenarios, DWR determined that Oroville Dam's operations could be significantly affected, and that the jointly operated New Bullards Bar reservoir could be even more severely impacted (DWR 2012a, Attachment 8-K). If DWR were to use this approach to examine climate change risks in other settings in the Central Valley, local agencies could be consulted in identifying which thresholds are most critical for decision-making. This would result in an analysis of climate change risks that is directly relevant for local or regional flood management decisions.

8. Opportunities for Coordination between IRWM and RFMP processes

8.1. Key Findings

Despite their broad commonalities as regional efforts to promote multi-benefit approaches to water management, this study has demonstrated that the IRWM and RFMP processes differ in some critical ways. The IRWM program emerged from a recognized need for greater coordination among local water agencies in the context of improving water supply reliability, while remaining within the current limits of state authority over surface and groundwater management. This led to the creation of water planning regions whose boundaries are largely determined by local agencies, with water supply agencies as the most frequent participants. While a 2008 update to IRWM legislation sought to emphasize the broader purposes of IRWM to promote integration across all aspects of water management, this analysis indicates that in the nine IRWM regions in the Central Valley, water supply concerns remain a critical driver. DWR's role in the IRWM process has been primarily focused on ensuring compliance with grant program requirements and offering mostly process-oriented assistance. While the California Water Plan Update provides broad themes and resource management strategies that guide IRWM planning, regions determine their own priorities. However, the state's IRWM guidelines require regions to develop relatively formal governance structures, involving an MOU or a JPA, as well as to provide opportunities for broad range of stakeholders and the general public to participate.

On the other hand, the RFMP process emerged in the context of the state's efforts to address critical public safety needs through reducing flood risks in the Central Valley. While local entities have long played a role in flood management, the risks in the Central Valley have proved significant enough to require involvement from the state and federal government. The Central Valley Flood Protection Plan, of which the RFMP process is a part, is primarily driven by the state's interest in reducing flood risks in areas protected by the State Plan of Flood Control, for which the Central Valley Flood Protection Board and DWR have special responsibilities to assure adequate flood protection. Concerns about the state's liability for flood damages, following the 2003 Paterno decision, have been another driver. The RFMP process was created to help accomplish CVFPP goals by engaging local entities in identifying local flood protection priorities and strategies, and how these could help meet statewide interests. All six plans will ultimately inform the CVFPP Basinwide Feasibility Studies being conducted by DWR, helping to define the set of systemwide investments needed in order to improve overall flood protection in the Central Valley. As a result, DWR plays a much different role in RFMP than in IRWM planning. While still seeking to allow local agencies to determine their own region's priorities, DWR is an active participant, providing flood risk data to the regions, and developing analyses of flood risks, conservation elements, and climate change risks across the Central Valley. The Central Valley Flood Protection Board has sought to build a sustained dialogue between local and state interests through monthly Coordinating Committee meetings. Local flood implementing and maintaining agencies, which have interacted with the Board for many decades, are the primary participants in RFMPs, along with counties, cities, and environmental NGOs. Requirements regarding governance arrangements and participation

are not legislatively mandated as they are in the IRWM process, and governance arrangements in most regions are relatively informal.

These differences in policy and institutional context have important implications for how these two regional planning processes support the development of multi-benefit approaches to water management, and help prepare for climate change. As Sections 6 demonstrates, multi-benefit projects in the IRWM process largely involve connecting water supply with water quality, flood, and ecosystem benefits. Eight of the ten projects with flood protection benefits that have been funded in IRWM regions in the Central Valley provide water supply as well as ecosystem benefits. In contrast, multi-benefit projects in the RFMP process appear to primarily involve integration of conservation elements into flood management projects. Projects with water supply and water quality benefits are not entirely absent, however. The Upper San Joaquin RFMP's preliminary project list includes a number of projects with water supply benefits, many put forth by irrigation districts or other water supply stakeholders. However, since RFMPs are not yet complete, these findings should be confirmed once final project lists are available.

The approach to analyzing climate change risks also differs significantly between these processes. IRWM regions are each required to assess their own vulnerabilities to climate change, following broad guidance provided by DWR. The assessments carried out by the IRWM regions studied here have highlighted the potential for climate change to increase flooding risks, and most regions have ranked flooding as a high priority climate change vulnerability. However, IRWM regions do not appear to be undertaking additional analysis of these vulnerabilities. Indeed, given the complexities of modeling the effects of climate change on flooding, such analyses would be challenging for regions to undertake with limited resources. RFMP regions have also not analyzed climate change risks, and are not required to do so under current DWR guidelines. However, DWR is conducting in-depth analyses of how climate change will impact flooding in the Central Valley, which will be incorporated in the 2017 update to the CVFPP. This may provide a basis for more specific, regional-scale analyses of how flood risks will be affected by climate change, which could be incorporated into any updates of RFMPs or IRWM plans.

8.2. Opportunities for coordination

As indicated in Section 5.3, despite their geographical and substantive overlaps, coordination to date between IRWM and RFMP regions has been relatively limited. Part of the explanation for this lies in the different institutional settings within which they operate, as has been described above. Differences in planning requirements, the timing of the two planning processes, and limited overlap in terms of local participants have also contributed. Yet, despite these limitations, this study suggests that improved coordination between IRWM and RFMP processes may provide some straightforward, low-cost opportunities to advance integrated water management and build resilience to climate change impacts in the Central Valley. These opportunities include:

- **RFMPs can be a valuable source of information about flood risks and management strategies for IRWM plans in the Central Valley.** IRWM plans include flood management goals, but given their broad scope, most contain only a

general analysis of flood risks and management strategies. Once complete, RFMPs will contain much more detailed information that could help IRWM regions refine their flood management-related priorities. Six of the nine IRWM regions that overlap with RFMP regions have already largely completed their most recent IRWM plan update. Regions that are currently updating their plans could draw upon draft RFMPs currently available. The Yuba County IRWM region has already begun to do this. Of course, any future IRWM plan updates could incorporate information from RFMPs.

- **Project lists could be shared across IRWM and RFMP regions to identify common or complementary strategies.** Both IRWM plans and RFMPs contain lists of projects promoting improved flood management. While RFMP project lists are still being developed, these projects will likely differ from those included in IRWM plans. RFMP projects focus largely on elements of the State Plan of Flood Control, while IRWM projects tend to be relatively small-scale, non-SPFC related efforts. However, the flood management improvements contained in both project lists may complement one another. If project lists are shared and discussed among participants in both processes, common priorities may be identified, and it may be possible to build integrated efforts that leverage the funding sources available to both IRWM and RFMP regions.
- **Dialogue between RFMP and IRWM regional participants could stimulate new partnerships that can help identify multi-benefit flood projects that address water supply, water quality, and environmental needs.** This study has shown that the majority of participants in developing RFMPs are local flood implementing or maintaining agencies, while most participants in IRWM regions are agencies involved with water supply. Further, a preliminary analysis of multi-benefit projects shows that the IRWM process has led to many types of multi-benefit projects, with water supply receiving the greatest emphasis. In the RFMP process, most multi-benefit projects address flood management and environmental priorities, with more limited discussion of water supply. Partnerships with water supply agencies may help enable RFMP regions to take advantage of whatever opportunities exist to link water supply and flood benefits related to the SPFC. For example, it appears that in the Upper San Joaquin RFMP, which involves a number of irrigation districts and other water supply-oriented agencies, projects involving groundwater recharge and the use of floodwaters for irrigation are emerging. As demonstrated in Section 6.1, several IRWM regions in the Central Valley have received funding for projects that are primarily oriented toward water supply improvements, but that also have flood protection benefits, including a number of groundwater recharge efforts. More formal coordination between IRWM and RFMP regions perhaps might allow for greater circulation of such project ideas. One way to begin this might be to invite IRWM participants to a Coordinating Committee meeting to begin to share knowledge across these processes.
- **The climate change analyses being undertaken by DWR for the CVFPP could benefit IRWM and RFMP regions in the Central Valley.** IRWM regional vulnerability assessments typically point to increases in flood risk due to climate change, but given the complexities of the analysis and limited resources, it is difficult for IRWM or RFMP regions to conduct their own climate change analyses. DWR's on-

going analyses of how climate change may impact flooding will be a significant resource that can inform future updates of IRWM or RFMP plans. To help make these analyses more meaningful at the regional level, DWR could consult RFMP and IRWM stakeholders regarding critical decision variables, and assess how these might be affected by climate change using a version of the threshold analysis approach. Once study results are available, DWR could consider holding meetings with IRWM and RFMP stakeholders to discuss findings.

- **The CVFPP Conservation Strategy, the Regional Advance Mitigation Program (RAMP), and other studies emerging through the CVFPP process may be valuable resources for IRWM planning in the Central Valley.** IRWM plans seek to address many of the same flood management issues that RFMPs do. The studies, programs and resources being developed by DWR to advance the CVFPP could also be utilized in IRWM planning, as well as by RFMPs. For example, IRWM projects may be another setting through which to promote advance mitigation opportunities being developed through RAMP. However, IRWM regions may not be aware of these resources. DWR's new IRWM Program website includes links to many of these resources, but additional outreach via DWR regional offices may be helpful.
- **In some cases, IRWM regions may be able to offer organizational capacity to help sustain RFMP planning in the future.** Since RFMPs were formed quite recently and funding beyond the initial planning grant is uncertain, most have fairly informal governance arrangements, and most organizational tasks are being undertaken by consultants. If the dialogue between local stakeholders in the RFMP process is to be sustained, it will need some on-going organizational capacity to support information-sharing and meeting coordination. IRWM regions vary in their capacity, but in some cases, it might be possible for them to provide such support. This would most likely be possible in situations where IRWM and RFMP membership has some degree of overlap, such as the North Sacramento Valley IRWM and Upper-Mid Sacramento RFMP, and the Yuba County IRWM and Feather River RFMP. In other cases, the flood implementing agencies may have sufficient capacity to sustain the RFMP process. However, sharing regional coordination capacity across IRWM and RFMPs could help deepen connections between the two processes. Regardless, as described in the following section, both the IRWM and RFMP processes may need continued state support in order to sustain this capacity for regional collaboration.

8.3. DWR support needed for IRWM-RFMP coordination

Both the IRWM and RFMP processes face uncertainties about future funding, particularly for the purpose of sustaining regional-scale dialogue. The development of RFMPs has been funded through 18-month grants, which end in 2014. DWR may make additional funding available to continue the process while the basin-wide feasibility studies are developed for the 2017 CVFPP update, but this is still uncertain. Most IRWM regions received planning grants from DWR to support the update of their IRWM plans, but these funds have largely been expended. Some IRWM regions are managed by a reasonably high capacity regional entity – such as the Regional Water Authority, which manages the American River Basin IRWM region – but many have struggled to find staff and resources to continue to support routine meetings, stakeholder outreach, and other coordination needs. The availability of

project funding provides some incentive for local agencies to invest some of their own resources in regional planning, but due to the fragmented nature of California's institutional landscape, there are limited regional-scale entities with sufficient capacity. Additional state funding to support on-going dialogue within IRWM and RFMP regions, as well as encouraging greater coordination between the two, could help build dialogue and increased awareness of opportunities for multi-benefit approaches to flood and other water management concerns in the Central Valley.

In particular, DWR could provide resources to IRWM and RFMP regions to support continued stakeholder engagement efforts as regions pursue upcoming project funding opportunities. This need appears to have emerged from stakeholder input as part of the IRWM Strategic Plan process being undertaken by DWR. A recently released document outlining investment strategies for the future of IRWM mentions a need for "funding to all active regional water management groups in the state to help support key operations, including stakeholder engagement and regional planning," (DWR 2014a). Further, DWR could request that IRWM and RFMP regions explore the possibility of consolidating their staff support for regional coordination. This may be possible even if IRWM and RFMP regions maintain different yet overlapping regional boundaries. In addition, DWR could seek to improve the alignment between IRWM and RFMP planning requirements and funding sources. Through continued dialogue between the Divisions of Flood Management and Integrated Regional Water Management, DWR staff could help ensure that to the extent possible, the timing of plan updates is coordinated, and that planning and grant application requirements are consistent.

8.4. Considerations for statewide flood management

Flood risks in California are not limited to the Central Valley. The recent Flood Future Report emphasizes the need for greater attention and investment to improve flood protection across the state (DWR and USACE 2013). To accomplish this, the report recommends that flood planning regions be created across the state. Similar to the RFMP process in the Central Valley, these regions would conduct assessments of flood risks, and identify and prioritize approaches to reduce them. The report notes that this effort would need to be coordinated with IRWM regions that already exist across the state, but that initially, new flood planning regions should be developed, following a combination of hydrologic and existing planning boundaries, including those of existing IRWM regions. The Flood Futures report further notes that these statewide flood planning regions would be similar to the RFMP regions established in the Central Valley, except that they would be larger in scale (DWR and USACE 2013, p. 5-17 and 5-18).

This study raises several considerations that could help inform DWR's approach to statewide flood planning. First, this report has emphasized the unique institutional and policy environment for flood planning in the Central Valley. The creation of separate flood planning regions in the Central Valley was in part due to DWR's special responsibilities with regard to the State Plan of Flood Control, and the need to coordinate flood protection efforts to generate systemwide reductions in flood risk. In other parts of the state, DWR's role may be slightly different, with local flood management entities playing more of a lead role. Given this, it would be worth exploring the degree to which these entities are already

involved in IRWM planning across the state, or could be encouraged to participate. This study has shown that flood agency participation has been somewhat limited in the Central Valley, but this may be partly due to the fact that flood implementing and maintaining agencies have long focused their energies on working with the Central Valley Flood Protection Board and DWR's Flood Management Division. The institutional landscape may be different in other parts of the state. DWR should consider whether it may be may be more effective to focus its efforts on supporting expanded engagement by flood management entities within the IRWM process, rather than to start anew.

Second, the experience of IRWM and RFMP regional planning indicates that enabling integrated planning at a regional scale requires some degree of organizational capacity, and some funding, to sustain regional dialogue. Planning grants have so far enabled IRWM regions to develop governance structures, hold regular meetings, and conduct necessary outreach. As these planning grants come to an end, some IRWM regions are struggling to find the staff and resources to continue these arrangements. DWR's forthcoming strategic plan for the IRWM process may shed some light on how DWR intends to continue supporting the IRWM planning process. It may be worth investigating whether certain IRWM regions, with some funding support, would have the capacity to manage a regional flood planning process. In addition to consolidating DWR's investments in the development of regional planning capacity in the state, this would also help ensure that flood planning efforts benefit from potential partnerships with water supply agencies, environmental organizations, and others already involved in IRWM planning. As is the case in the Central Valley, not all IRWM regions will have sufficient capacity, or the appropriate degree of engagement with flood management issues. In these situations, separate flood planning efforts might be necessary. Regardless of the approach, efforts should be made to align the planning or funding requirements for regional flood planning as effectively as possible with IRWM planning.

References

Ambruster, A., 2008. Collaborative versus Technocratic Policymaking: California's Statewide Water Plan. Center for Collaborative Policy. California State University, Sacramento.

Aquapedia, 2014. "State Liability, Flood Protection, and the Paterno Decision." Water Education Foundation, Sacramento. Available at: http://www.aquapedia.com/state-liability-flood-protection-and-the-paterno-decision/

Central Valley Flood Protection Board (CVFPB), 2013. *California Central Valley Flood Protection Board Strategic Plan 2013 – 2017.* Sacramento.

Department of Water Resources (DWR) and United States Army Corps of Engineers (USACE), 2013. *California's Flood Future: Recommendations for Managing the State's Flood Risk.* DWR Statewide Flood Management Planning Program, FloodSAFE California.

Department of Water Resources (DWR), 2014a. Emerging Investment Strategies for the Future of IRWM. IRWM Strategic Planning, Division of Integrated Regional Water Management.

Department of Water Resources (DWR), 2014b. Central Valley Flood Protection Plan Climate Change Analysis Fact Sheet. Draft.

Department of Water Resources (DWR), 2013. *Public Draft of the California Water Plan Update 2013*. California Natural Resources Agency.

Department of Water Resources (DWR), 2012a. *The Central Valley Flood Protection Plan.* The Central Valley Flood Management Planning Program, FloodSAFE California.

Department of Water Resources (DWR), 2012b. *Strategic Plan for the Future of Integrated Regional Water Management in California: Development Approach.* California Natural Resources Agency.

Department of Water Resources (DWR), 2012c. *Proposition 84 and Proposition 1E Integrated Regional Water Management Guidelines.* California Natural Resources Agency.

Department of Water Resources (DWR), 2012d. *Draft Project Management Plan for the Development of Regional Flood Management Plans.* Regional Flood Management Planning Initiative, Division of Flood Management.

Department of Water Resources (DWR), 2010. *Draft State Plan of Flood Control Descriptive Document.* Central Valley Flood Management Planning Program, FloodSAFE California.

Department of Water Resources (DWR), 2009a. *California Water Plan Update 2009*. California Natural Resources Agency.

Department of Water Resources (DWR), 2009b. *Final Regional Acceptance Process: A Component of Integrated Regional Water Management Program Guidelines.* California Natural Resources Agency.

Dettinger, M. D., 2011. Climate change, atmospheric rivers and floods in California: a multi-modal analysis of storm frequency and magnitude changes. *Journal of the American Water Resources Association.* 47: 415-523.

California Natural Resources Agency (CNRA), California Department of Food and Agriculture, and California Environmental Protection Agency, 2014. California Water Action Plan.

Cayan, D., M. Tyree, D. Pierce, and T. Das (Scripps Institution of Oceanography), 2012. *Climate Change and Sea Level Rise Scenarios for California Vulnerability and Adaptation Assessment.* California Energy Commission. Publication number: CEC-500-2012-008.

Environmental Protection Agency (EPA) Region 9/DWR, 2011. *Climate Change Handbook for Regional Water Planning.* http://www.water.ca.gov/climatechange/CCHandbook.cfm

Hundley Jr., N., 2001. *The Great Thirst: Californians and Water – A History.* Berkeley: University of California Press.

Kelley, R., 1989. *Battling the Inland Sea: Floods, Public Policy, and the Sacramento Valley.* Berkeley: University of California Press.

Spanos, K. A., forthcoming. From an Uncertain Present to a Sustainable Future. *Golden Gate University Law Review.*

Water Education Foundation (WEF), 2013. *Layperson's Guide to Integrated Regional Water Management.* Sacramento, CA.