CVFPP

2017 UPDATE

TECHNICAL SERIES

DRAFT Technical Memorandum

Central Valley Flood Protection Plan Investment Strategy

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THE NATURAL RESOURCES AGENCY
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  - Draft CVFPP Investment Strategy supports the refinement of the 2012 CVFPP SSIA and builds upon 2012 CVFPP funding recommendations
  - The recommended funding plan is contained within the Draft CVFPP Investment Strategy
  - Investments in flood management have been sporadic and reactionary, not sustained and proactive

Over the last century, land development has continued in the Central Valley to meet the needs of a growing population. A complex water supply and flood risk management system supports and protects a vibrant agricultural economy, urban areas, and numerous small communities. The State Plan of Flood Control (SPFC) protects a population of over 1.3 million people, major freeways, railroads, airports, water supply systems, utilities, and other infrastructure of statewide importance, including $80 billion in assets (including structural and content value and estimated annual crop production values). Many of the more than 500 species of native plants and wildlife found in the Central Valley rely to some extent on habitat existing within areas protected by the SPFC.

In 2006, the Department of Water Resources (DWR) launched FloodSAFE California, a multifaceted program to improve public safety through integrated flood management. FloodSAFE California was funded by almost $5 billion provided through Proposition 1E and Proposition 84 bond measures. Preparation of the Central Valley Flood Protection Plan (CVFPP) and the Statewide Flood Management Program (SFMP) were two important components of the FloodSAFE initiative. DWR prepared the CVFPP in compliance with the Central Valley Flood Protection Act of 2008 (DWR, 2012). The Central Valley Flood Protection Board (CVFPB) adopted the CVFPP on June 29, 2012. The CVFPP provides a plan for integrated, sustainable flood management investments that will reduce flood risks for areas protected by SPFC facilities. As conceived by the legislature, the CVFPP is required to be updated every 5 years, beginning in 2017. The 2017 CVFPP Update, adopted by the CVFPB on August 25, 2017, includes recommendations on investments and policies to support comprehensive flood risk management actions locally, regionally, and systemwide, rather than promoting specific projects (DWR, 2017).

The 2017 CVFPP Update's primary focus is to refine the State Systemwide Investment Approach (SSIA) formulated in 2012 to achieve CVFPP goals. The SSIA provided a road map for Central Valley flood risk management and is now being refined based on new information, physical changes to the flood system, and policy updates over the past 5 years. The 2017 CVFPP Update describes implementation progress and recommends refinements to programmatic investments needed to implement the CVFPP over the next 30 years. The 2017 CVFPP Update also identifies the need to address eight main policy issues that impede full implementation of the CVFPP. This Draft CVFPP Investment Strategy provides the technical support and analysis for the refinements made to the SSIA since 2012. Additionally, this Draft CVFPP Investment Strategy is one of 13 supporting documents of the 2017 CVFPP Update that provide greater detail supporting the broader programmatic plan. For more information about the 2017 CVFPP Update and all of its supporting documents, appendixes, and attachments, see the 2017 CVFPP Update (DWR, 2017).

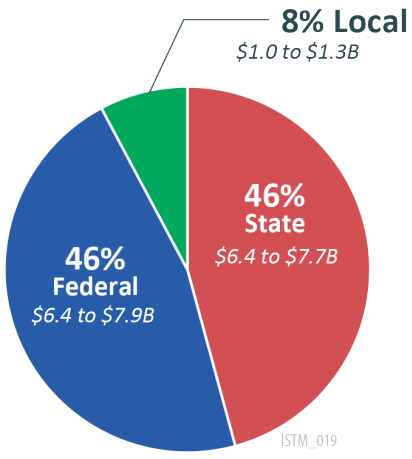
1.1 2012 CVFPP Funding Recommendations

The 2012 CVFPP (DWR, 2012) recommended a mix of federal, State of California (State), and local funds to implement the SSIA. The funding sources identified in the 2012 CVFPP vary according to the type of project or program, beneficiaries, availability of funds, urgency, and other factors. Cost-sharing among State, federal, and local agencies would change depending on specific project objectives and agency interests. A legislative requirement for Proposition 1E funds is to maximize, to the extent feasible, federal and local cost-sharing in flood management projects. Cost-sharing rules are governed by federal and State laws, regulations, and policies, which continue to evolve over time.

The intent of the CVFPP is to support equitable distribution of project costs among beneficiaries, encourage projects that provide broad public benefits, and help achieve added flexibility in the SPFC. The State proposes to place a priority on funding and providing a greater State cost share for flood management improvement projects that provide multiple benefits.

Figure 1-1 illustrates the allocation of SSIA costs to State, federal, and local interests described in the CVFPP. Federal cost-sharing for capital improvements was assumed to be based on results of feasibility studies, with cost-sharing amounts varying depending on the mix of purposes included in a project. For example, the federal cost share for ecosystem restoration projects could be as high as 50 to 65 percent for urban flood risk reduction projects. Costs not qualifying for federal cost-sharing include the property acquisition in fee or easement, relocations, operations and maintenance, and other

Figure 1-1. 2012 State Systemwide Investment Approach Cost-Shares



Note:
2012 CVFPP Totals are from Table 4.3 in the 2012 CVFPP.

costs that must be paid by nonfederal project sponsors. Water supply, recreation, or other benefits included in flood risk reduction projects could further modify federal cost-sharing. State cost-sharing of the nonfederal costs also depended on the mix of project purposes. The 2012 CVFPP indicated that adequate funding from local agencies may require creation of new assessment districts to implement capital improvements or to support effective, efficient, and improved system operations and maintenance.

The 2012 CVFPP concluded the State would have to rely more heavily on State bond funding to finance flood risk reduction projects until more federal funding became available. It was expected that local agencies would use assessments or taxes to provide their share of the cost.

1.2 Developing the Draft CVFPP Investment Strategy

The CVFPP investment strategy expands on the 2012 CVFPP efforts in several ways. Beyond incorporating the findings in the 2012 CVFPP and providing the funding recommendation in the 2017 CVFPP Update, the CVFPP investment strategy integrates findings from the 2013 California's Flood Future: Recommendations for Managing the State's Flood Risk (DWR, 2013) and the California Water Plan Update 2013 (DWR, 2014). In turn, this CVFPP investment strategy will inform the California Water Plan Update 2018 (DWR, 2017a; under development), which will be implementing an outcome-driven management approach. The 2017 CVFPP Update and its investment strategy have anticipated and used this outcome-driven approach to align with the California Water Plan Update 2018.

The 2017 CVFPP Update incorporates information from major supporting efforts, including the Draft CVFPP Conservation Strategy (DWR, 2016), six Regional Flood Management Plans (RFMPs)[1], and the Draft Sacramento River and San Joaquin River Basin-Wide Feasibility Studies (BWFSs) (DWR 2016b and 2016c). Furthermore, the RFMPs included financing or funding plans that have helped inform the CVFPP investment strategy, including the regions' ability and willingness to pay for improvements. These financing plans are critical to CVFPP implementation, given the uncertainty in State, federal, and local agency budgets and cost-sharing capabilities.

This Draft CVFPP Investment Strategy documents how the CVFPP investment strategy was developed to identify a recommended approach to fund the 2017 refined SSIA portfolio as described in the 2017 CVFPP Update. Various funding scenarios were developed and assessed to arrive at the recommended approach. The development of the CVFPP investment strategy included assembling the costs from the supporting planning studies and analyses, developing priorities of expenditures, and investigating several scenarios for funding implementation of the CVFPP. These scenarios investigated a wide range of funding priorities and amounts—from partial to full funding—and this Draft CVFPP Investment Strategy documents these details.

[1] Feather River Partners, 2014; FloodProtect, 2014; Mid and Upper Sacramento River Regional Flood Management Plan Partners, 2014; Reclamation District 2092, 2014; San Joaquin Area Flood Control Agency, 2014; San Joaquin River Flood Control Project Agency, 2015

Many tools were created to aid the decision-making process for the CVFPP investment strategy. The two primary decision-support tools were an Excel-based management action prioritization database and an Excel-based financial model.

The management action prioritization database collected all of the potential actions, and then categorized and prioritized these actions based on the State's priorities (see Chapters 2 and 3 for additional details). This database organized and prepared the inputs for the financial model that helps assess funding scenarios.

Financial modeling is the task of building an abstract representation of a real-world financial situation. The financial model supports scenario preparation for strategic planning, which is accomplished first by creating the model based on known parameters and then testing the model with different inputs. Next, the inputs are used to create a set of outputs that determine the effect of changing one variable or another. Inputs and assumptions used to develop the CVFPP investment strategy are documented here, but are primarily discussed in Chapters 6 and 7.

It is important to keep in mind that with the use of decision-support tools the results must be interpreted and checked for viability against outside influencing factors that are beyond the quantification provided by mathematical tools. In many cases, professional judgment was used to navigate some of these influencing factors to provide reasonable results and make valid recommendations. Taken together, this information provides the basis for a funding plan with the potential to support long-term implementation of the CVFPP. For more description on influencing factors, please see Chapter 4.

1.3 CVFPP Funding Plan Overview

A funding plan is one component of the CVFPP investment strategy (Figure 1-2). After the desired outcomes have been determined, the investments needed to achieve those outcomes and their priorities are developed. At that point, a funding plan can be formulated. The purpose of the funding plan is to describe the cash needs necessary for the prioritized investments, and to identify potential revenue sources to pay for the prioritized investments. The funding plan is one part of an overall strategic plan that involves forecasting combined with scenario development and analysis to produce the CVFPP investment strategy.

Figure 1-2. Nesting of Recommended Funding Plan

A long-term funding plan typically includes the following elements:

1. **Time Horizon.** This element is also known as the financial planning period. In the case of the CVFPP, the current time horizon extends for 30 years from 2017 to 2047.

2. **Scope.** The scope of the funding plan refers to the trade-off between the amount of the funds required to achieve the desired outcomes and the sources of funds that can be used or appropriated to meet the service needs.

3. **Frequency.** This element indicates how often the funding plan is updated to provide input to the State budget process. In the case of the CVFPP, updates to the funding plan would be made every 5 years in sync with the updates to the CVFPP.

4. **Content.** A long-term funding plan includes analyses of most of the following:
   - Financial environment
   - Revenue and expenditure forecasts
   - Debt position and affordability analysis
   - Strategies for achieving and maintaining financial balance

Although many reports and studies use the terms "funding" and "financing" interchangeably, each has a specific meaning, and the CVFPP investment strategy strives to distinguish between the two terms. "Funding" refers to a revenue stream, whereas "financing" refers to using that revenue stream to support debt or other financing mechanisms.

The Difference between Funding and Financing

The word "funding" refers to the generation of revenue to pay for costs or investment. For example, a basin-wide assessment or tax is a source of funding, not a source of financing.

The word "financing" refers to the use of debt or leverage to meet the cash flow demands of project delivery. For example, State-issued general obligation bonds can be used to finance identified SPFC projects. In this example, the State's general fund would be a funding source.

This distinction in terminology is critically important because, as a matter of sound financial management practices and sustainable practice, governmental entities should not use debt (such as general obligation bonds) to finance ongoing operational activities.

1.4 Historical Context

To better understand the need for a detailed CVFPP investment strategy, the historical context of past Central Valley flood investments should be reviewed. To date, investments in Central Valley flood management have been largely sporadic and reactionary based on triggering events over the past 160 years. Moving forward, the CVFPP investment strategy proposes methodical strategic investments that could course correct the historical trend to a more proactive investment approach.

1.4.1 Financial Impact of Statewide Flooding in Recent History

Statewide direct flood damages since 1955 are approximately $19.6 billion in 2017 dollars (DWR, 2017d). Annual direct flood damages for all years since 1955 average about $344 million. Table 1-1 shows the direct flood damages from the ten most expensive floods since

1955. All ten floods have impacted the SPFC planning area in the Central Valley, and seven of these included direct damages exceeding $1 billion in 2017 dollars. The annual direct flood damages for the ten most expensive floods averages approximately $1,635 million per year.

Table 1-1. California's Ten Most Expensive Flood Events

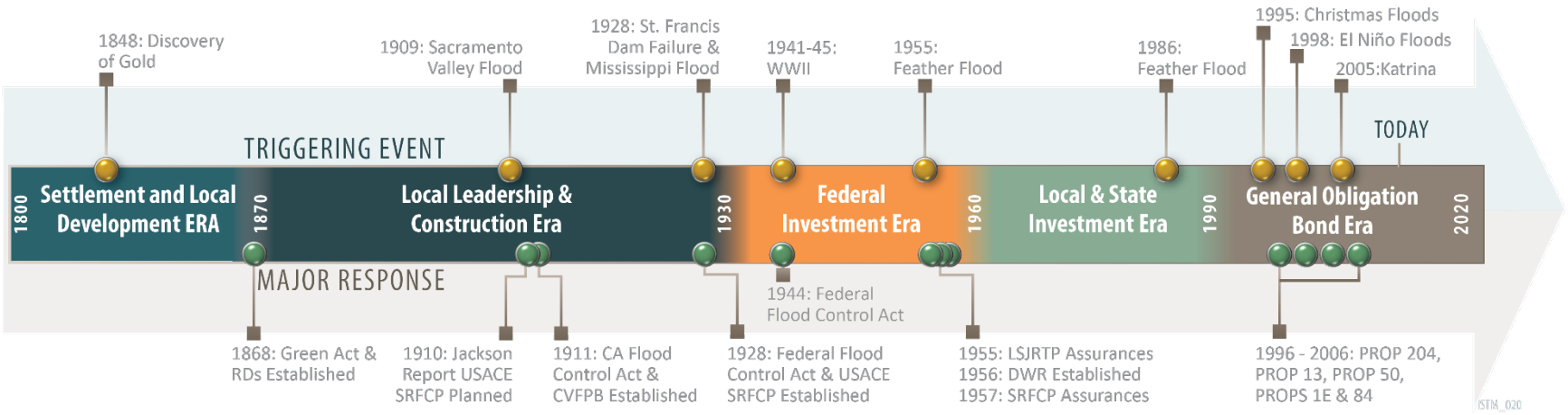
Year	Event Name	Statewide Fatalities [3]	Statewide Direct Flood Damages [1, 2]	Central Valley Flood Damages [1,4]
1955	1955 Christmas Flood	74	$1,320	--
1964	--	--	$1,540	--
1969	Winter storms	47	$2,400	--
1980	--	--	$1,370	--
1982	Winter storms	--	$750	--
1983	--	--	$1,530	$680 (San Joaquin Basin only)
1986	St. Valentine's Day storm	13	$840	330 (Sacramento Basin only)
1995	1995 Christmas floods	28	$2,410	--
1997	--	--	$3,240	$760
1998	El Niño floods	17	$960	--

Notes:
1. 2017 $M
2. DWR, 2006; DWR, 2017d; USGS, 1988; USGS, 1989; USGS, 1991
3. DWR, 2013
4. USACE, 1999

1.4.2 Historical Investments and Events over the Past 160 Years

California's historical approach to flood management can be grouped into four general eras. Figure 1-3 shows these eras and how they align with significant climatic events (i.e., floods and droughts), development of water management infrastructure, and the establishment of local, State, and federal laws and agencies.

Figure 1-3. Flood and Water Management Timeline



Settlement and Local Development Era (1800 to 1868)

California's motivations for water management activities and investments during the settlement era largely focused on public safety and providing water for development. Water managers and private landowners experimented with and employed a number of management actions, typically involving construction of infrastructure such as canals, levees, weirs, and dams. Funding for construction and operation of these flood and water management systems came from private sources (such as landowners) or, in the case of communities, from community-pooled resources. In general, investment during this era was characterized by private local investments that fostered economic development but often did not account for the action's impacts on downstream or upstream landowners and communities. Levee construction along the Sacramento River and its tributaries is an example of early private investment in flood management. In the mid-1800s, levee construction began in the Central Valley to protect individual landowners and growing cities such as Sacramento and Marysville. Many of these early levees were low levees constructed of on-site or easily available materials (sand and gravel). Landowners learned by trial and error as levees often failed during flood events. Gradually, the height and stability of levees increased to better contain the rivers, which in turn increased downstream flood risk. However, this system of private levee construction also "led to competition between landowners to continually raise and strengthen levees piecemeal so that any overflow would flood somebody else's land" (DWR, 2016), highlighting the need for a more integrated approach to flood management.

After the discovery of gold in 1848, private development of other water systems also accelerated and exacerbated the problems caused by the "levee wars" (DWR, 2016). Miners built diversion structures to aid the use of sluice boxes for faster gold mining. This eventually evolved to hydraulic mining methods. Hydraulic mining resulted in heavy sediment loads (or debris) in rivers and creeks, which reduced flow capacities and exacerbated flooding in the Central Valley. This demonstrated how one action can have systemwide impacts with negative consequences.

Local Leadership and Construction Era (1868 to 1930)

In response to slow reclamation of land, the California Legislature passed two new acts in 1868 that changed how land was developed in California. The first, the Green Act, consolidated existing land laws, made purchase and reclamation of swamplands easier, and allowed landowners to petition their county board of supervisors to permit the construction of levees to protect reclaimed lands. The second act, Assembly Bill (AB) 553 of 1868, permitted the creation of a levee district in Sutter County that protected certain lands in the county from flooding. This act led to the creation of Levee District 1, the oldest continually operating flood control district in California, which could impose taxes for construction of regional flood protection. These two acts accelerated the reclamation of land and construction of levees and resulted in competition among landowners to protect property.

The years between 1900 and 1904 were characterized by high river stages but no significant flooding. However, starting in 1904, the Sacramento River basin experienced a number of significant flood events over several years that further demonstrated the shortcomings of the trial and error approach to constructing levees (DWR, 2016). In 1910 the California Debris Commission (CDC), historically a regulatory commission of the United States Army Corps of Engineers (USACE), produced the Jackson Report (USACE, 1981). The Jackson Report was a comprehensive plan for controlling the floodwaters of the Sacramento River and its tributaries (DWR, 2016). Following this report, the Sacramento River Flood Control Project (SRFCP) was

authorized by the California Legislature in the Flood Control Act of 1911. The Flood Control Act also established the State of California Reclamation Board (renamed the CVFPB in 2008), which was empowered to approve plans for the construction of levees along the Sacramento River or its tributaries or within any of the overflow basins. By 1913, there was a lack of funding for flood control activities, which prompted the legislature to create the Sacramento and San Joaquin Drainage District, within the State Reclamation Board, to give them the authority to acquire the necessary property and easements for flood control and the ability to levy assessments to construct and maintain facilities. Later modifications to the California Water Code limited the ability to levy an assessment for construction and maintenance of projects that had been adopted before April 1, 1923.

The federal government became involved in the SRFCP project after Congress passed the Flood Control Act of 1917, which authorized $5.6 million ($110 million in 2017 dollars) to specific components of the SRFCP. The Flood Control Act of 1928 fundamentally changed the way construction of project levees were financed. As adopted, this act recognized that local interests had already contributed more that the required one-third of the total $51 million estimated for SRFCP construction and considered their financial obligation to the project fulfilled. Until this point, it had been possible for the CDC's office to be located in the Second San Francisco District of USACE. However, in 1929 the USACE established the Sacramento District to oversee work on the SRFCP, with the federal government taking over a much larger role in the administration of both river and bypass levee construction (USACE, 1981).

Federal Investment Era (1930 to 1960)

The number of large-scale water supply and flood management projects increased in the 1930s as additional federal funding became available in response to the Great Depression, when Congress authorized almost 40 projects, including the Central Valley Project (CVP), to promote infrastructure development and public works job creation. The federal government also constructed a number of large dams to provide water supply and flood protection benefits, such as Friant Dam (construction began in 1937) and Shasta Dam (construction began in 1938).

Although the start of World War II slowed the process, planning and construction continued, with Friant Dam completed in 1942 and Shasta Dam complete by 1945. These projects were primarily funded through federal appropriations, and provided water and power to growing postwar cities and agricultural communities. Contracts written with water and power users (contractors) set the terms for repayment of the costs of facilities and operations allocated to those purposes.

During and after World War II, the federal government continued to plan and build flood control projects. The Flood Control Acts of 1944 and 1946 authorized USACE to construct a number of flood control projects including dams and river projects in the San Joaquin Valley (e.g. Lower San Joaquin Tributaries Project and Pine Flat Dam, both authorized in 1944). Congress also authorized USACE to build Folsom and New Melones dams in 1944, and the operation of these facilities was integrated into the CVP. The Flood Control Act of 1958 also authorized the construction of Oroville dam on the Feather River (DWR, 2010). However, Oroville dam was ultimately not constructed as a federal facility. Instead, the Flood Control Act of 1958 authorized federal contribution to the construction proportional to the flood control benefits the project would provide. The dam was completed by DWR in 1968 (DWR, 2017e).

In the 1950s, the federal government worked to reduce flood damages by improving cooperation between local, State, and federal agencies. This was accomplished through the National Flood Insurance Act and through the Watershed Protection and Flood Prevention Act of 1954, which was designed to reduce flood damage by fostering cooperation of agencies at all levels through cost sharing of local and regional projects.

The original project assurances provided to the federal government in the mid-1950s included primarily operation and routine maintenance (O&M) of the project and make no mention of "repair, rehabilitation, and replacement" (RR&R), a phrase first introduced in the Water Resources Development Act of 1986 (WRDA 1986). Activities are guided, in part, by O&M manuals developed by USACE in the mid-1950s and hydraulic design criteria developed at approximately the same time. Currently, flood management system O&M and RR&R obligations for SPFC facilities are shared among the State and local maintaining agencies (LMAs) (DWR, 2017f).

Local and State Investment Era (1960 to 1990)

The floods of 1986 caused extensive damage to the flood management system of the Sacramento Valley. The storms caused close to $50 million in public and private property damage, excluding damage to roads and other infrastructure. In the northern Delta, 1,600 people were evacuated, and $20 million in property damage occurred.

While flood infrastructure had the unintended consequence of increasing flood risk on some floodplains (by supporting additional development within the floodplains), it and other forms of water management also generated a different set of unintended environmental consequences. Starting in the 1970s, environmental awareness increased, causing a push for increased environmental regulations and increased funding for environmental protection projects.

Following the passage of WRDA 1986, non-federal interests were required to share more of the financial and management burdens (DWR, 2016). These new requirements, coupled with the more stringent environmental regulations, resulted in further reduction in the federal share of spending for flood and water management projects. In 1973 the State Legislature began a Subvention Program to provide grants to local levee maintenance agencies in the Delta to assist with levee rehabilitation and maintenance (called the "Way Bill" after its author Senator Howard Way). Later, a second program called the Delta Special Projects Program was added to provide critical financial assistance for flood protection which has broad public benefits and enhances the economic, environmental and cultural resources in the Delta. To date, about $700 million has been provided under these two programs.

Funding local infrastructure and services, including flood and water management projects became more difficult when voters in California passed Proposition 13 in 1978, Proposition 62 in 1986, and Proposition 218 in 1996. Proposition 13 limited ad valorem taxes on California properties. The proposition limited the amount of tax that could be collected based on the assessed value of private property, including real estate, to 1 percent of the assessed value of the property. Proposition 13 also decreased the assessed value of the properties to 1975 values (negating three years of increased value), and limited increases of assessed value to 2 percent per year. Property that is sold or declines in value after an initial purchase may be reassessed. The enactment of Proposition 13 cut local property tax revenue significantly, causing cities and

counties to raise user fees and other local taxes. In response, voters approved Proposition 62, the Voter Approval of Taxes Act, in 1986. This proposition required that new general taxes be approved by two-thirds of the local agency's governing body and a majority of voters, and new special taxes be approved by a two-thirds majority of voters. This led local agencies and cash-strapped communities to use assessments and property-related fees (among other fees) to pay for government services. Proposition 218 was passed by voters in 1996, and added requirements and limits on local governments' ability to impose or increase assessments and fees (see Chapter 4 for more detail).

General Obligation Bond Era (1990 to 2020)

With the reduction in federal authorizations and the more stringent conditions on State and local financing of flood management projects, the State turned to general obligation (GO) bonds. Between 1990 and 2016, eight water management bond propositions were passed at the State level. These include Propositions 204 (1996), 13 (2000), 50 (2002), 84 (2006), 1E (2006), and 1 (2014). The size of these bond measures has steadily increased over time, with Proposition 1 in 2014 authorizing the sale of $7.1 billion for water infrastructure. Political and legal limitations on the State's borrowing capacity may restrict future bond measures. State GO bonds are paid back from the State's general fund, so the ultimate funding of projects financed by GO bonds comes largely from the State's personal income, sales, and corporate taxes. So ultimately, this method of funding of flood management competes directly with education, health care, and all of the other demands on the State's general fund.

Since 2007, and to facilitate needed flood protection improvements, Proposition 1E (2006) and the Central Valley Flood Protection Act of 2008 authorized use of bonds to make improvements to SPFC facilities prior to the adoption of the CVFPP.

Since adoption of the CVFPP in June 2012, flood management planning has progressed at the federal, State, and regional/local levels, and the implementation pace has been steady, enabled by a continued influx of State bond funding for capital projects, approval of new and increased local benefit assessments for capital improvements, and increased levels or operations and maintenance. Implementation has also been aided by recent State general fund allocations targeted at addressing deferred maintenance. The State and local entities have continued investing in projects that are consistent with the SSIA, feasible, and ready to move forward, to the extent funding has been available. Since the passage of Propositions 1E and 84 and the approval of more than a dozen assessments for flood control improvements approved by property owners (e.g., Sacramento Area Flood Control Agency, San Joaquin Area Flood Control Agency, Three Rivers Levee Improvement Authority) and services throughout the Central Valley, progress has been made implementing levee improvements and reducing flood risk, especially in urban areas.

Currently, there are over 500 local, state, and federal agencies within the Central Valley that have some involvement in flood management such as cities, counties, flood control districts, drainage districts, irrigation districts, water agencies, state resource agencies, tribes, USACE and the Federal Emergency Management Agency (FEMA), (DWR, 2017g). Collaboration and coordination of many of these agencies has enabled significant progress toward reducing flood risk since 2007 through the Early Implementation Program (EIP) projects. Although significant progress has been made since 2007, much remains to be accomplished, and continued assistance

from the federal government is key. The federal Water Infrastructure Improvements for the Nation Act of 2016 (Title 1 of which is Water Resources Development) provides authorization of feasibility studies and implementation of several flood control projects in California, but total funding is still well below those seen during the federal investment era. Unless bipartisan agreement is found to increase federal infrastructure spending, lower federal participation in flood management appears to be the current trend.

2.0 Intended Outcomes of the 2017 Refined SSIA Portfolio

Chapter 2 Highlights

- Chapter Outline:
  - The Importance of Demonstrating Value
  - The Why, What, and How of CVFPP investment
  - 2017 Refined SSIA Portfolio Organization and Expected Outcomes
- Key Chapter Takeaways:
  - The 2012 SSIA has been refined based on an outcome-driven approach.
  - Each water management program—including the CVFPP—has a specific role to play in helping the broader water management system become more sustainable with an improved balance between the highest level societal values.
  - Demonstrating the CVFPP's contribution to supporting these societal values is important for securing increased investment in, and sustainable funding for, SPFC improvements.

Historical trends indicate that the status-quo approach to flood management investment is unsustainable for the future, and there is a need to balance increasing demands with wise investments. Planning and investment must focus on expected outcomes of particular actions and investments. This outcome-driven planning approach has been used to develop the 2017 CVFPP Update and its refined SSIA portfolio. The application of the outcome-driven approach is also grounded within this CVFPP investment strategy and is guiding investment priorities.

2.1 The Importance of Demonstrating Value

Despite recent progress toward more sustainable flood risk management through implementation of the CVFPP, significant challenges remain. For the State to secure the greater levels of funding needed to implement the CVFPP, the public needs to better understand their flood risk and the value that could be realized from effective flood management.

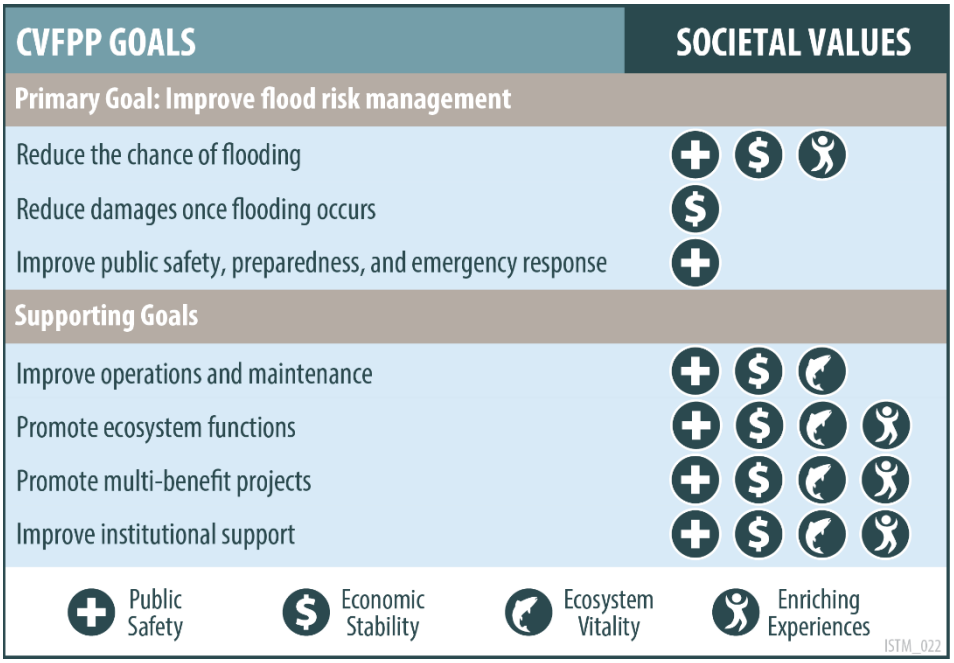
2.1.1 Societal Values

To help meet these challenges, flood management in the Central Valley must work toward sustainability, which is defined as a resilient, dynamic balance among the societal values: providing public health and safety, sustaining vital ecosystems, supporting a stable economy, and providing opportunities for enriching experiences (Figure 2-1).

Figure 2-1. Four Societal Values

All DWR water management programs—the CVFPP included—play specific roles in helping the State support these societal values and move toward sustainability. The relationship between the CVFPP's goals and societal values for water management is shown in Figure 2-2. Demonstrating the CVFPP's contribution to supporting these values is important for securing increased investment in, and sustainable funding for, SPFC improvements.

Figure 2-2. Societal Values Supported by the CVFPP Primary and Supporting Goals



2.1.2 CVFPP's Contribution to Sustainability

Each water management program—including the CVFPP—has a specific role to play in helping the broader system become more sustainable with an improved balance between the highest level societal values.

Central Valley flood management is primarily intended to contribute to these goals by helping to minimize lives lost from flooding and contribute to the economic stability of local communities, the region, and the State. At the same time, the CVFPP is expected to provide opportunities for ecosystem and other multi-benefits associated with flood system improvements (such as recreation and other enriching experiences). Characterizing management actions' ability to contribute to these outcomes of broader public interest is key to raising State funds for implementation and maximizing all potential funding sources. This makes it essential for CVFPP updates to be able to describe progress not only toward CVFPP goals, but also to show how meeting those goals can contribute to broader societal values.

Historically, planning has focused primarily on identifying individual projects in isolation to achieve short-term goals. The result has been the piecemeal flood management system we have today with inconsistent standards, funding, governance, and performance. The outcome-driven approach applied to the 2017 CVFPP Update shifts the focus from isolated actions to desired results by focusing on intended outcomes that could provide the greatest value for State investment over the long term. This shift in focus can improve flood management in the Central Valley in three important ways:

- **Funding:** Flood management has long been underfunded in California. An improved framework for setting intent, articulating dependencies between management actions and outcomes, and tracking effectiveness provides a way to more clearly demonstrate the value of flood management to California taxpayers, and will likely lead to more proactive and stable funding for flood management.

- **Effectiveness:** Setting clear intent, and then tracking whether or not intended outcomes are achieved over time, improves the ability to course-correct. This ultimately makes the system more effective as assumptions are tested and actions are improved.

- **Local-State Partnership:** When flood system funding is linked to intended outcomes, the State interest is communicated to stakeholders. This offers stakeholders the opportunity to apply local expertise and perspectives for more successful partnerships when applying for funding/cost shares.

2.2 The Why, What, and How of CVFPP Investment

Describing and justifying investments that will achieve the CVFPP goals depends upon applying an outcome-driven planning approach. Such an approach guides this CVFPP investment strategy, and has guided the types of management actions included in the 2017 refined SSIA portfolio.

The following sections discuss the hierarchy and details of flood management intended outcomes, the organization of the 2017 refined SSIA portfolio, and what kinds of outcomes are expected from this portfolio. Many of the concepts and the interconnectivity of the outcomes discussed here are associated with the overall prioritization of the refined SSIA portfolio, and influenced the recommended investments. The prioritization of the 2017 refined SSIA portfolio is directly discussed in Chapter 3.

Figure 2-3. Levels of Outcome for Flood Management

The first step in applying the outcome-driven approach is to understand the hierarchy of outcomes on which everything else is based. Secondly, it is important to understand the distinctions and key dependencies among the levels of outcomes for flood management as shown in Figure 2-3, and as described below.

- **Higher-level intended outcomes: the "why" of Central Valley flood management**
  - **Level 4: Sustainability.** Sustainability is defined here as a resilient, dynamic balance between societal values. This balance is contributed to in part by flood-specific outcomes, but also by other resource management efforts across the State.
  - **Level 3: Flood-specific resource and societal benefits.** These outcomes are specific to flood management (such as floodplain ecosystem productivity or economic damages from flooding) that contribute to societal values. Therefore, they are referred to as flood-specific outcomes in this plan. Flood-specific outcomes are the most effective and resilient way to contribute to societal values. These outcomes depend on the lower-level outcomes discussed below.

- **Lower-level outcomes: the "what" and "how" of Central Valley flood management**

  - **Level 2: Physical Assets and Behaviors.** These outcomes form the "what" of Central Valley flood management. Changes to physical assets and behaviors such as floodplain land uses, flood infrastructure, or human responses to floods come about as a result of management action implementation. However, it is common for most people to focus on the management actions themselves instead of the results or outcomes of the implemented management actions. Therefore, in many cases within the CVFPP investment strategy, the term management actions is simply used for ease of understanding.

  - **Level 1: Enabling Conditions.** This is the "how" of flood management. Enabling conditions like funding mechanisms, programs, authorities, and other foundational features are needed to support successful CVFPP implementation and associated changes to physical assets and behaviors. Establishing enabling conditions can make progress possible.

The actions that are recommended for producing the "how" and "what" of Central Valley flood management are ultimately driven by the assumptions made about those actions and their ability to affect flood-specific outcomes and societal values. As a DWR water management program, the CVFPP most directly contributes to flood-specific outcomes. These flood-specific outcomes represent **why** management actions need to be implemented to improve the flood management system. The societal values illustrate **why** some degree of public funding for such management actions is justified. This is why the CVFPP investment strategy focuses on flood-specific outcomes and uses these outcomes to prioritize its investments. Table 2-1 presents the flood-specific outcomes. Appendix F expands on the levels of outcome concepts and presents more detail regarding flood-specific outcomes.

Success is measured by the degree to which actions taken help bring about their related intended outcomes. Actual outcomes are tracked over time for the purpose of demonstrating the value and improve the effectiveness of investment with each planning cycle. During implementation, action must first be taken to establish the enabling conditions that are needed to implement further management actions that support CVFPP implementation, which then (ideally) results in the achievement of intended flood-specific outcomes and societal values. The CVFPP investment strategy is ultimately focused on providing one of those enabling conditions: an investment strategy.

Table 2-1. Flood-Specific Outcomes that Contribute to Societal Values

Societal Values	Flood-Specific Outcomes
Public Health and Safety	**Minimize number of people within the floodplain.** Reduce or minimize the current and/or additional number of people who live or work within the floodplain and could be exposed to potential flooding (floodplain defined as the area that could potentially flood in a very large, but reasonably foreseeable flood event).
	Reduce human vulnerability when flooding occurs. Reduce the extent to which people located within floodplains are harmed or are unable to evacuate in the case of a flood when faced with oncoming floodwaters.
	Increase system performance in populous areas. Reduce the extent to which river flows from storm events and runoff are capable of or likely to cause flooding in populated areas.
Ecosystem Vitality	**Reduce stressors on riverine and floodplain ecosystems.** Reduce the number of stressors to priority riverine and floodplain species and ecosystems.
	Improve the riverine and floodplain habitats and ecosystems. Increase the amount (acreage, channel miles, etc.) and variety of available floodplain-related habitats that are wetted and/or connected at the appropriate times, are subject to more natural hydrologic and/or geomorphic processes, and are of otherwise high enough quality to meaningfully function as beneficial habitat for a variety of floodplain-dependent species.
	Increase and maintain the abundance and diversity of floodplain dependent native species. Increase the number of native species that have access to, benefit from and can use floodplain and associated habitats, and which benefit from those habitats in ways that makes them more likely to survive.
Economic Stability	**Minimize property and assets within the floodplain.** Reduce or minimize the value of assets currently within or added to the floodplain and could be exposed to potential flooding (floodplain defined as the area that could potentially flood in a very large, but reasonably foreseeable flood event).
	Reduce economic vulnerability when flooding occurs. Reduce the extent to which property or other floodplain assets are damaged when faced with oncoming flood waters.
	Increase system performance for economically developed areas. Reduce the extent to which river flows from storm events and runoff are likely to cause flooding in already established areas of economic development.
	Produce or maintain economic benefits on floodplains. Maintain agricultural or industrial productivity, increase fisheries production, provide water supply or quality benefits, or reduce transactional costs (usually related to O&M and permitting) on floodplains.
Enriching Experiences	**Provide recreational benefits.** Increase the number of floodplain-related recreational opportunities or access points.
	Support societal/aesthetic values. Increase flood protection or visitation opportunities for areas or sites of cultural, social or aesthetic value.
	Provide education and public awareness. Increase access to and the number of floodplain or flood risk-related educational opportunities.
	Protect significant farmland. Maintain acreage of culturally significant farmland.

2.3 2017 Refined SSIA Portfolio Organization and Expected Outcomes

Based on the concepts described above, the 2017 refined SSIA portfolio consists of interrelated management actions working together that could achieve flood-specific outcomes and CVFPP goals. This is an update to the SSIA presented in the 2012 CVFPP, and is refined based on new information gathered since 2012.

The 2017 refined SSIA portfolio comprises management actions that will be invested in over the 30-year planning horizon. Investment is divided into two types: capital and ongoing. Many management actions require only capital investment, whereas others require ongoing, annual investment sustained over the entire planning horizon. Because prioritization, funding, and financing for these two types of investment are different, they are discussed separately throughout the remainder of this CVFPP investment strategy.

Capital and ongoing investments are grouped into management action categories, and then divided into the four areas of interest: systemwide, urban, rural, and small communities. Each area of interest includes specific management action categories (Table 2-2). All applicable tables presented in both this chapter and upcoming chapters are organized similarly.

Table 2-2. Management Action Categories by Investment Type and Area of Interest

Capital Investment	Ongoing Investment
Systemwide Actions	
■ Yolo Bypass multi-benefit improvements ■ Feather River-Sutter Bypass multi-benefit improvements ■ Paradise Cut multi-benefit improvements ■ Reservoir and floodplain storage	■ State operations, planning, and performance tracking ■ Emergency management ■ Reservoir operations ■ Routine maintenance
Urban Actions	
■ Levee improvements ■ Other infrastructure and multi-benefit improvements	■ Risk awareness, floodproofing, and land use planning ■ Studies and analysis
Rural Actions	
■ Levee repair and infrastructure improvements ■ Small-scale levee setbacks and floodplain storage ■ Land acquisitions and easements ■ Habitat restoration/reconnection	■ Risk awareness, floodproofing, and land use planning ■ Studies and analysis
Small Community Actions	
■ Levee repair and infrastructure improvements ■ Levee setbacks, land acquisitions, and habitat restoration	■ Risk awareness, floodproofing, and land use planning ■ Studies and analysis

Figures 2-4 and 2-5 present a high-level summary of the potential that each investment type has to contribute to flood-specific outcomes. These figures highlight a few important conclusions as follows:

- There are no silver bullets in flood and floodplain management. A diverse portfolio of investment is necessary to achieve a diverse set of intended outcomes and to effectively address all components of risk.

- Systemwide and rural investments have the greatest potential to contribute to system resiliency and long-term sustainability across a broader set of outcomes.

- Investments that impact densely populated areas (i.e., urban centers and small communities) are most effective at reducing risk to human lives and economic assets.

- Ongoing investments do the work of maintaining system resiliency and allowing the system to continually evolve to more effectively contribute to societal values over time.

If CVFPP is to accomplish its goals and contribute in a resilient way toward all societal values, investment must be directed toward a diversity of actions (in type, size, and area) with varying strengths that complement and balance one another. Of course, individual projects will always differ in the extent to which they are effective based on site-specific circumstances and relationships to other actions within the system. Sections 2.3.1 through 2.3.4 establish broad investment principles for balancing portfolios in each of the systemwide, urban, rural and small community contexts. These investment principles will aid the understanding of the prioritization of management actions within the 2017 refined SSIA portfolio discussed in Chapter 3.

Figure 2-4. Capital Improvement Actions: Flood-Specific Outcomes

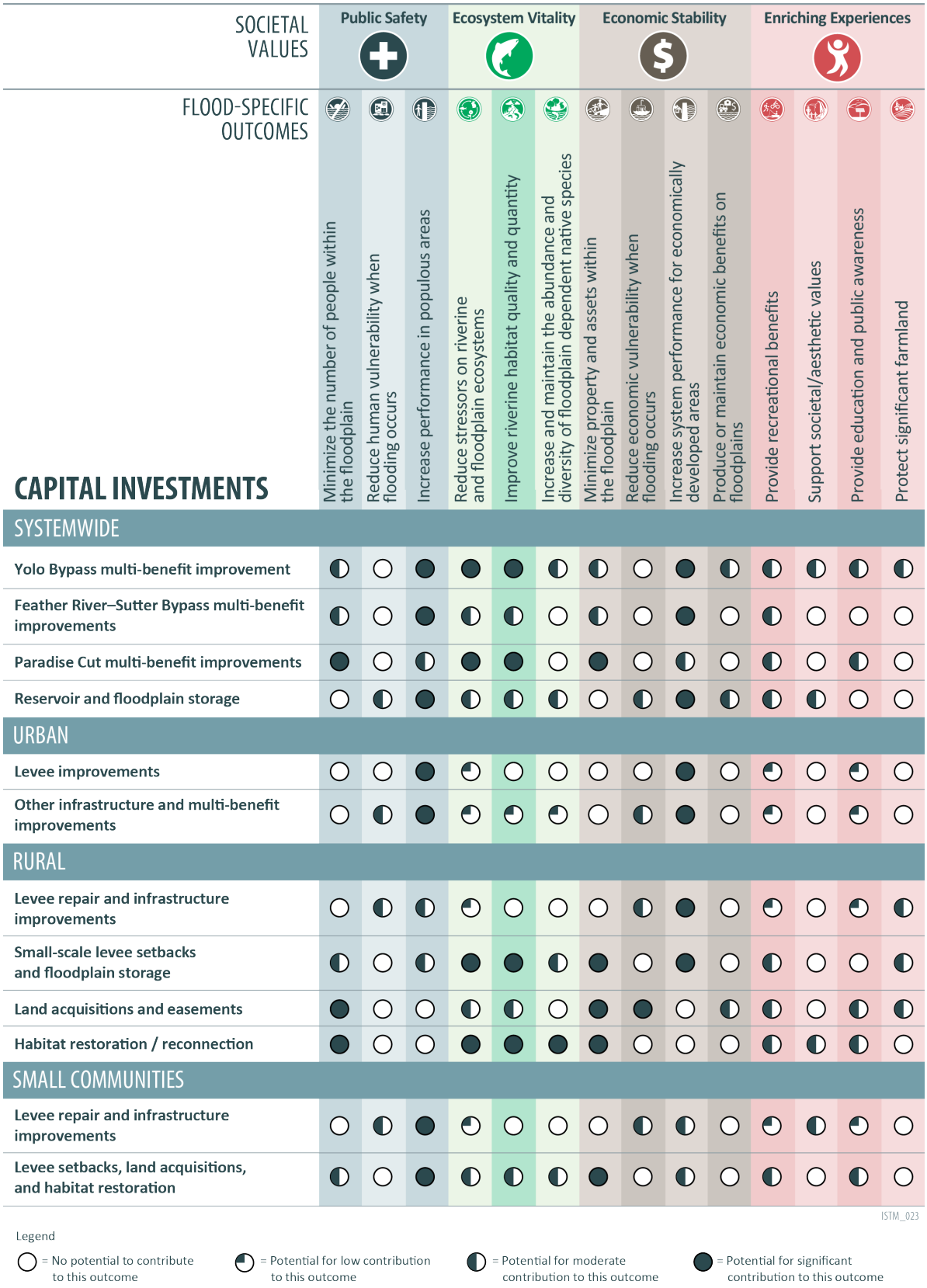
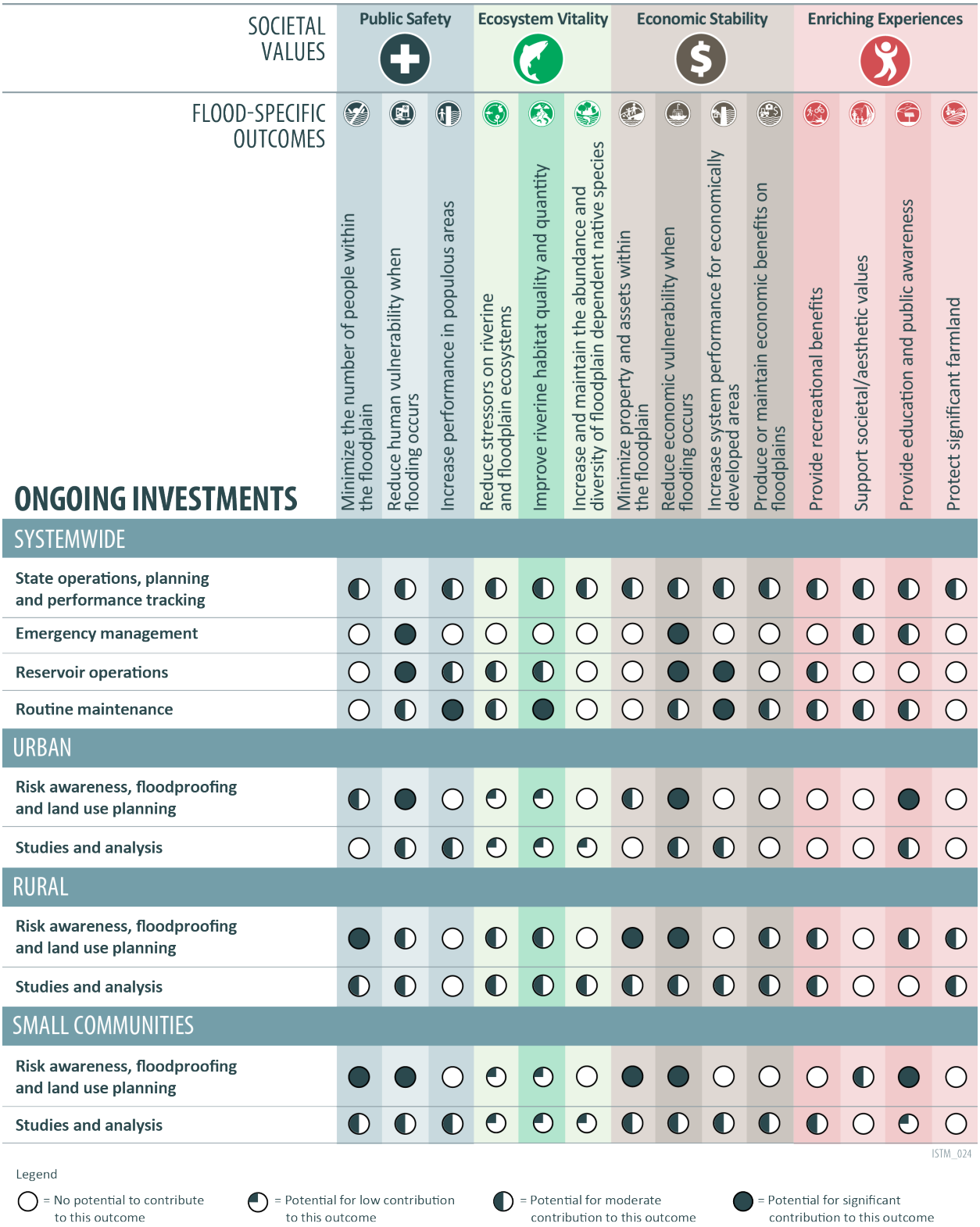


Figure 2-5. Ongoing Investment Actions: Flood-Specific Outcomes



2.3.1 A Balanced Systemwide Portfolio

Some types of actions have systemwide implications, with the potential to greatly bolster overall systemwide resiliency in a way that smaller-scale urban, rural, and small community actions cannot. This portfolio includes capital and ongoing investment in associated management action categories.

Proposed systemwide capital investment management actions were identified primarily through the Sacramento River and San Joaquin River BWFSs (DWR, 2017 and 2017a) and considered regional perspective articulated in the six RFMPs[1]. The BWFSs provide a more detailed level of analysis and project development, including a cost-benefit analysis, than provided by the six RFMPs alone. Therefore, the relevant intended outcome information for a balanced systemwide portfolio is briefly summarized in this discussion in a slightly different manner than for the urban, rural, and small community portfolios that follow. Partners and stakeholders are encouraged to refer to the Sacramento River BWFS and the San Joaquin River BFWS for additional detail influencing the 2017 refined SSIA portfolio.

Proposed systemwide capital investments in the 2017 refined SSIA portfolio include Yolo Bypass multi-benefit improvements, Feather River–Sutter Bypass multi-benefit improvements, Paradise Cut multi-benefit improvements, and reservoir and floodplain storage. Each of these management action categories provides different intended outcomes that contribute toward the societal values of public safety, economic stability, ecosystem vitality, and enriching experiences. They are described below.

- **Systemwide capital investments:**
  - **Yolo Bypass multi-benefit improvements:** These proposed improvements would provide public safety and economic stability flood-specific outcomes by significantly reducing stage and the probability of levee failure in the bypass, thereby reducing the probability of dangerous floods. In addition, life and property and asset exposure would be reduced in proposed levee setback areas. The proposed ecosystem improvements would provide a substantial increase in habitat acres throughout the bypass. Finally, flood-specific outcomes could enrich recreational experiences through the addition of public lands from non-recreational uses to enhanced wildlife-related recreational uses.
  - **Feather River–Sutter Bypass multi-benefit improvements:** Potential Feather River-Sutter Bypass multi-benefit improvements could provide public safety and economic stability flood-specific outcomes by reducing stage and the probability of levee failure in the Feather River system, thereby reducing the probability of dangerous floods. In addition, life and property and asset exposure could be reduced in proposed levee setback areas. There is also the potential for increasing habitat acres through ecosystem enhancement and for providing enriching experiences. Flood-specific outcomes could include greater habitat acreage and enhanced wildlife-related recreational uses.

[1] Feather River Partners, 2014; FloodProtect, 2014; Mid and Upper Sacramento River Regional Flood Management Plan Partners, 2014; Reclamation District 2092, 2014; San Joaquin Area Flood Control Agency, 2014; San Joaquin River Flood Control Project Agency, 2015.

- **Paradise Cut multi-benefit improvements:** The proposed Paradise Cut multi-benefit improvements would provide public safety and economic stability flood-specific outcomes by reducing potential life, property, and asset risk exposure in proposed levee setback areas. The improvements would provide stage reductions and reduce the probability of levee failure in the San Joaquin River downstream of Paradise Cut, thereby reducing the probability of dangerous floods. The proposed ecosystem improvements would substantially increase habitat acres and would provide additional habitat for endangered species. Finally, flood-specific outcomes could enrich recreational experiences through the addition of public lands from non-recreational uses to enhanced wildlife-related recreational uses.

- **Reservoir and floodplain storage:** Actions included in this category focus on increasing the availability of storage space for managing flood flows on a systemwide scale. All proposed reservoir and floodplain storage actions reduce peak flows during flood events to reduce the probability of dangerous floods that impact life safety and cause economic damages. In addition, transitory storage projects can provide significant habitat improvements.

Proposed systemwide ongoing investments in the 2017 refined SSIA portfolio include State operations, planning, and performance tracking; emergency management; reservoir operations; and routine maintenance actions. Each of these management action categories addresses one or more of the societal values of public safety, economic stability, ecosystem vitality, and enriching experiences. They are described below.

- **Systemwide ongoing investments:**

  - **State operations, planning and performance tracking** is vitally important for establishing, funding, and maintaining the enabling conditions necessary for successful implementation of the CVFPP.

  - **Emergency management** primarily reduces life vulnerability and property and asset vulnerability through improved ability to evacuate people and economic assets during flood events.

  - **Reservoir operations** actions primarily reduce the probability of dangerous floods that impact life safety and cause economic damages by reducing peak flows during flood events. They can also reduce life and property and asset vulnerability through improvements in emergency response time and potentially utilize improved operational flexibility to provide improvements to flows for ecosystem purposes.

  - **Routine maintenance** is necessary for maintaining performance of the SPFC, particularly for providing public safety, economic stability, and ecosystem vitality.

2.3.2 A Balanced Urban Portfolio

With urban areas already so densely developed, flood management opportunities within their boundaries are limited primarily to actions that improve public safety or economic stability. Although some opportunities exist in the urban footprint to improve ecosystem functioning or offer new opportunities for enriching experiences, these outcomes must largely be achieved in the rural or systemwide context associated with flood management improvements. The urban portfolio instead focuses on actions that most effectively and resiliently improve public safety and economic stability for urban areas.

Reducing Vulnerability for Urban Areas

Because it is very difficult to reduce or limit exposure in urban areas, further investment must manage residual risk by reducing human and economic vulnerability. This is accomplished in the urban setting by improving resourcefulness and evacuation capabilities in the face of impending floodwaters, and by increasing the ability of critical structures to withstand some flooding. The following action types contribute to these outcomes: risk awareness campaigns, floodproofing activities, and land use planning. These action types also bolster resiliency by introducing an element of risk reduction to the urban setting that is adaptable to changing flood risks over time.

Increasing System Performance for Urban Areas

Urban levee improvements increase system performance for urban areas, which can significantly help improve public safety and economic stability. However, they do not greatly increase the system's resiliency to stressors over the long term; they further harden, rather than add flexibility to, the flood management system, require ongoing maintenance to remain effective, and in fact can encourage risky behaviors (such as further development). Therefore, it is important that these investments are balanced with other systemwide efforts aimed at attenuating flood flows and reducing stage (like expansions to the Yolo Bypass) and at managing residual risk. Table 2-3 summarizes the potential that the different types of urban management action categories have for contributing to societal values, and to bolster resiliency toward meeting those values in a long-term and sustainable way.

Table 2-3. Urban Management Action Categories Potential to Contribute to Societal Values and the Resiliency of Those Outcomes Over Time

Management Action Category	Contribution to Public Safety	Resiliency of Public Safety Outcomes	Contribution to Economic Stability	Resiliency of Economic Outcomes	Contribution to Vital Ecosystems	Resiliency of Ecosystem Outcomes	Contribution to Enriching Experiences	Resiliency of Enriching Experience Outcomes
Levee improvements	Very High	Low	Very High	Low	Low	Low	None	N/A
Other infrastructure and multi-benefit improvements	High	Low	High	Low	None	N/A	None	N/A
Risk awareness, floodproofing, and land use planning	Moderate	High	Moderate	High	Low	Low	Low	Low

Note: Contribution rated as None, Low, Moderate, High, or Very High

Figure 2-6. Conceptual Urban Balanced Portfolio

Relative levels of effort expended within each management action category.

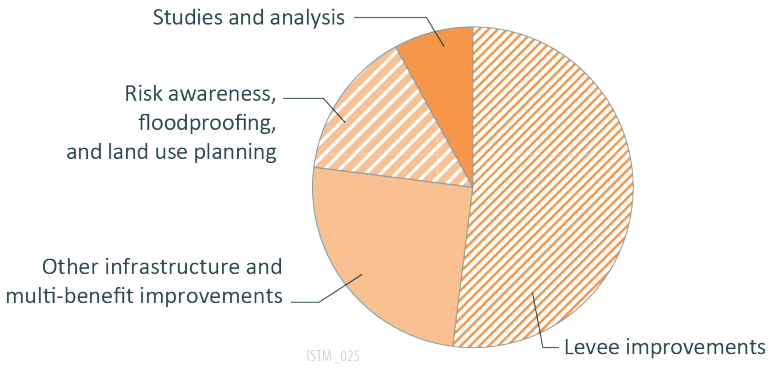


Figure 2-6 conceptually illustrates a balanced urban portfolio in terms of level of effort expended toward different management action categories. Although levee and other infrastructure multi-benefit improvements constitute the majority of actions in urban areas, a good proportion of urban activities should also be focused on risk awareness, floodproofing, and land use management. However, it is important to note that this figure is *not* intended to show the relative cost of these management action categories in urban areas. The figure represents an *idealized future* portfolio that is more balanced across all management actions. Over time, the refined SSIA portfolio will work toward a more balanced portfolio. The level of investment estimated toward urban management action categories for this cycle will be presented in Chapter 5.

2.3.3 A Balanced Rural Portfolio

The suite of potential management actions in rural areas represents the greatest potential to accomplish a broad variety of flood-specific outcomes that comprehensively address all components of flood risk. This is largely because these areas provide a greater ability to more closely integrate land use and flood management decisions in these areas so that risk can be managed across all of its components (i.e., exposure, vulnerability, and hazard). Furthermore, flood management actions can be paired with habitat restoration and other efforts to produce multiple benefits.

Reducing Exposure and Vulnerability in Rural Areas

Management actions that limit exposure and vulnerability are also needed in rural areas to address residual risk and to boost system resiliency toward long-lasting public safety and economic stability. Two management action types in the rural footprint are aimed primarily at managing human and economic exposure and vulnerability:

- Land acquisitions and easements
- Risk awareness, floodproofing, and land use planning

Easements are much more common than land acquisitions, and can come in many different forms. The most basic flood management easements are flowage easements on high-risk agricultural land, or easements that keep high-risk land in agricultural production and place restrictions on other types of development. Land acquisitions and easements are extremely effective at limiting human and economic exposure going forward by dis-incentivizing or restricting human settlement or economic development in high-risk floodplains. They may also

reduce economic vulnerability by incentivizing land use decisions and management that is more compatible with occasional flooding. Another potential outcome from such actions is the preservation of farmland in some areas. Land acquisitions and easements also open up the possibility of leveraging land for habitat restoration or other activities with ecosystem outcomes (for example, if an agricultural easement contains an agreement to conduct wildlife-friendly agricultural practices).

Risk awareness and land use planning activities also work to limit exposure by dis-incentivizing or restricting human settlement and/or economic development in high-risk floodplains. Furthermore, risk awareness and land use planning reduce human and economic vulnerability by making floodplain residents and businesses more aware of and prepared for potential flooding. Floodproofing activities specifically target economic vulnerability by making some critical facilities and farmsteads less vulnerable to damages when flooding occurs.

Finally, habitat restoration and reconnection management actions in rural areas are an important component of a balanced portfolio because rural areas often contain the best and most cost-effective opportunities for improving ecosystem functionality. These management actions also have the potential to contribute to societal values in resilient ways. For instance, habitat restoration may limit life and economic exposure within the project footprint, and increase public safety and economic resiliency by transitioning the land use to one that benefits from, rather than is harmed by, oncoming floodwaters. If project footprints are big enough and in areas that might have otherwise been developed, this may bolster overall system resiliency.

Increasing System Performance for Rural Areas

Some of the more traditional rural management actions are aimed primarily at reducing economic risk on floodplains by improving or maintaining performance of the flood conveyance system:

- Rural levee repair and infrastructure improvements
- Small-scale levee setbacks and floodplain storage

However, these management actions differ greatly in their potential to bolster resiliency toward these economic flood-specific outcomes and to contribute to other societal values.

Many rural levee and infrastructure improvements, for instance, may reduce economic resiliency if they reduce system adaptability and lead to counterproductive risk intensification. This is a particular concern for levee upgrades or the construction of new levees in rural areas. These activities typically do not have significant potential for contributing to other societal values.

Small-scale levee setbacks and floodplain storage activities provide a more resilient approach to improved system performance for rural areas because they make room for, rather than concentrate, floodwaters. These types of actions also have the potential to contribute to other flood-specific outcomes. For instance, they may contribute to public safety by limiting life exposure in the project footprint, and contribute to vital ecosystems if leveraged to improve the landscape in ways recommended by the CVFPP Conservation Strategy (DWR, 2016). These activities also sometimes open areas for recreational use or other enriching experiences that were previously unavailable.

Table 2-4 summarizes the potential of the different types of rural management actions to contribute to societal values, and their potential to bolster resiliency in terms of the system's ability to continue contributing meaningfully to those outcomes over time.

Table 2-4. Rural Management Action Categories Potential to Contribute to Societal Values and the Resiliency of Those Outcomes Over Time

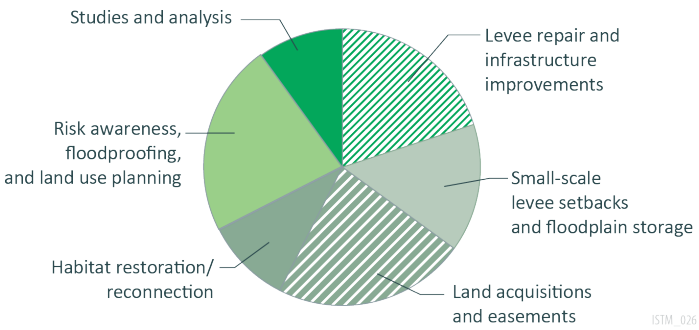
Management Action Category	Contribution to Public Safety	Resiliency of Public Safety Outcomes	Contribution to Economic Stability	Resiliency of Economic Outcomes	Contribution to Vital Ecosystems	Resiliency of Ecosystem Outcomes	Contribution to Enriching Experiences	Resiliency of Enriching Experience Outcomes
Levee repair and infrastructure improvements	Low	Low	Moderate	Low	Low	Low	Low	Low
Small-scale levee setbacks and floodplain storage	Low	Moderate	Moderate	Moderate	Moderate	High	Moderate	High
Land acquisitions and easements	Moderate	Very High	High	Very High	Low	High	Moderate	High
Habitat restoration and reconnection	Moderate	Very High	Moderate	Very High	Very High	High	Moderate	High
Risk awareness, floodproofing, and land use planning	Moderate	High	High	High	Low	High	Moderate	High

Note: Contribution rated as None, Low, Moderate, High or Very High

Based on the preceding discussion, Figure 2-7 conceptually illustrates a balanced rural portfolio in terms of level of effort expended toward different management action categories. A diverse portfolio of flood management actions in rural areas can contribute to all four societal values in a resilient way. To do so, efforts would reflect Figure 2-7 in a fairly even distribution of actions taken toward all potential rural management action categories, with a slightly greater focus on land acquisitions and easements, and risk awareness, floodproofing, and land use management.

Figure 2-7. Conceptual Rural Balanced Portfolio

Relative levels of effort expended within each management action category.



Additionally, this is an *idealized, future* portfolio that is more balanced across all management actions. Over time, the refined SSIA portfolio will work toward a more balanced portfolio. The

level of investment estimated toward rural management action categories for this cycle will be presented in Chapter 5.

2.3.4 A Balanced Small Communities Portfolio

Like urban areas, small communities in floodplains contain higher risks to human life than rural areas, and the density of development somewhat limits the types of management actions available. However, unlike urban areas, the smaller scale of development and openness of the surrounding landscape often allows for a more diverse and resilient approach to flood management. It also provides solutions that address all components of risk and contain more multi-benefit opportunities.

Reducing Exposure and Vulnerability in Small Communities

When viable levee setbacks, land acquisitions, and floodplain storage activities represent the most resilient means of improving system performance within the small community footprint, they tend to limit exposure and add to system capacity rather than concentrating flows. These types of activities also have the potential to contribute to other societal values by providing more flood-adaptive land that could be leveraged for habitat restoration or other enriching experiences.

Residual risk is managed for small communities the same way that it is in urban areas: through investments in risk awareness, floodproofing, and land use planning activities. Risk awareness targets human vulnerability by increasing residents' understanding of flood risk and incentivizing them to better plan and prepare for flood emergencies. In small communities, risk awareness activities have the added benefit of potentially limiting exposure by incentivizing new settlement to occur outside of higher risk areas. Floodproofing activities target economic vulnerability by improving the ability of critical facilities and other floodplain properties to withstand some flooding without significant damage. This also contributes to public safety by ensuring that critical facilities are still able to provide basic and emergency services during a flood. Finally, land use planning activities (like flood insurance requirements or building codes) can assist in reducing both life and economic vulnerability and exposure by incentivizing more flood-adaptive land use within the higher risk floodplain areas.

Increasing System Performance for Small Communities

Improved or new small community levees and structures, when targeting areas that are already densely populated, may further reduce the risk of lives lost from flooding. However, these investments must be undertaken with caution, as they can also lead to risk intensification, and may work against long-term system resiliency by reducing flexibility and concentrating flood flows. Table 2-5 summarizes the potential that the different types of small community management actions have for contributing to societal values, and their potential to bolster the resiliency of the system to continue providing those outcomes over time.

Table 2-5. Small Community Management Action Categories Potential to Contribute to Societal Values and the Resiliency of Those Outcomes Over Time

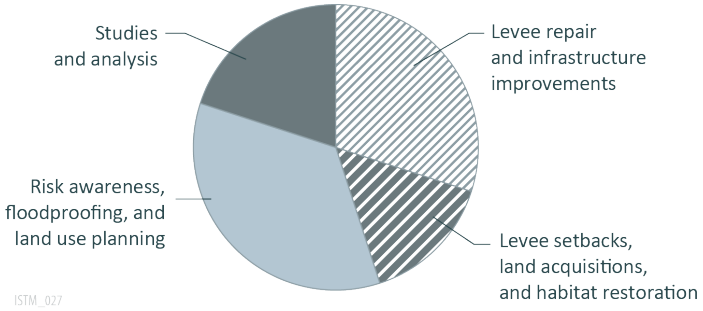
Management Action Category	Contribution to Public Safety	Resiliency of Public Safety Outcomes	Contribution to Economic Stability	Resiliency of Economic Outcomes	Contribution to Vital Ecosystems	Resiliency of Ecosystem Outcomes	Contribution to Enriching Experiences	Resiliency of Enriching Experience Outcomes
Levee repair and infrastructure improvements	High	Low	Moderate	Low	None	N/A	Moderate	Low
Levee setbacks, land acquisitions, and habitat restoration	High	High	Moderate	High	Moderate	High	Moderate	High
Risk awareness, floodproofing, and land use planning	High	High	Moderate	High	Low	High	Moderate	High

Note: Contribution rated as None, Low, Moderate, High or Very High

Based on the preceding discussion, Figure 2-8 provides a conceptual example of what an effective and balanced small community portfolio looks like in terms of level of effort expended toward different action types. While often effective, opportunities for land acquisitions and easements, small-scale levee setbacks, and floodplain storage activities can be limited. Risk awareness, floodproofing, and land use planning activities are therefore more heavily emphasized as more widely accessible and still resilient ways of managing risk for small communities.

Figure 2-8. Conceptual Small Communities Balanced Portfolio

Relative levels of effort expended within each management action category.



Additionally, this is an *idealized, future* portfolio that is more balanced across all management actions. Over time, the refined SSIA portfolio will work toward a more balanced portfolio. The level of investment estimated toward small community management action categories for this cycle will be presented in Chapter 5.

3.0 Prioritizing Investment to Support Intended Outcomes

Chapter 3 Highlights

- Chapter Outline:
  - Efforts to Develop a Database of Potential Management Actions
  - Process for Building a Portfolio
  - Portfolio Prioritization
- Key Chapter Takeaways:
  - Multiple planning efforts completed or initiated since 2012 provided the necessary information to develop the 2017 refined SSIA portfolio.
  - CVFPP planning process is intentionally strategic and cyclical, to be updated on 5-year intervals.
  - The 2017 refined SSIA portfolio was prioritization based on flood-specific outcomes grounded in a qualitative scoring approach.

Chapter 2 described the broad investment guidelines for the types of balanced action portfolios likely to be most effective for the four areas of interest across the Central Valley. This chapter applies those guidelines and takes a deeper look at what makes up each of the management action categories in the 2017 refined SSIA portfolio, and how they were prioritized relative to one another. The 2017 refined SSIA portfolio represents the updated programmatic vision for the SPFC, and does not represent a funding decision, permitting decision, or endorsement of specific projects.

3.1 Efforts to Develop a Database of Potential Management Actions

Multiple planning efforts completed or initiated since 2012 provided a wealth of data, cost, and other information that supported the identification and refinement of SSIA investment opportunities across the Central Valley. These efforts, described below, served as key data sources supporting the updated cost estimate for the 2017 refined SSIA portfolio.

3.1.1 State-Federal Feasibility Studies

State-federal feasibility studies and their approval by the USACE Civil Works Review Board (Review Board) play a major role in securing funding for federal projects. During the last 5 years, USACE has undertaken several feasibility studies primarily in urban areas protected by the SPFC, and completed the American River Common Features and the West Sacramento River

General Re-Evaluation Report (GRR) feasibility studies (USACE, 2015; USACE, 2015a). These two feasibility studies were reviewed by the Review Board in December 2015, and the Review Board recommended USACE support for the projects. Chief's Reports on these two projects are being prepared by USACE. The Chief's Report is the formal tool for USACE to communicate its recommendations to Congress for project construction authorization and eventual appropriations.

A third feasibility study, Lower San Joaquin Feasibility Study Phase 1, is being completed for the Stockton urban area and is scheduled to be submitted to the Review Board in August 2017.[1] These three projects are all moving closer to providing 200-year protection for major urban areas in the Central Valley.

Cost estimates for implementing activities identified in the feasibility studies were included in the 2017 refined SSIA portfolio. Both the RFMPs[2] and the State-federal feasibility studies provided a potential data source from which to sum a cost estimate for urban levee improvements in the Sacramento and San Joaquin basins. To avoid double-counting, only the State-federal feasibility study cost estimates were used. USACE estimates were given deference for several reasons, as follows:

- Urban levee improvements identified in the RFMPs are generally consistent with those described in the USACE feasibility studies.
- State and local investments in urban areas historically have been made in collaboration with USACE and supported by its feasibility studies.
- State-federal feasibility studies provide a greater degree of consistency in cost estimation.
- The Review Board has already recommended support for several feasibility studies in recent years.

Several other studies that DWR is anticipated to partner in were included in the cost estimation for the studies, and as an analysis management action category under the urban area of interest (Figure 3-1). An estimate of $4 million per study was applied to these studies to cover the cost of State participation. These studies include the following:

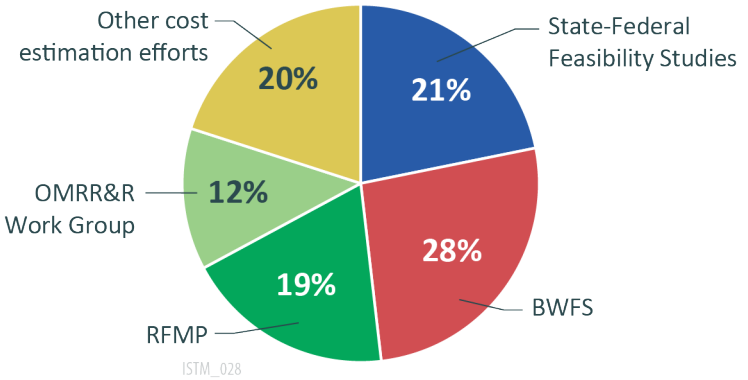
- Review Plan: Sacramento River Bank Protection Project, California GRR (Sacramento River GRR) (USACE, 2015b)
- Cache Creek Settling Basin GRR (USACE, not yet published)
- Review Plan: Lower Cache Creek, Yolo County, City of Woodland and Vicinity, CA Feasibility Study (Woodland Lower Cache Creek Feasibility Study) (USACE, 2010)
- Yuba Goldfields Study (USACE, not yet published)

[1] For more information about this study: https://www.sjafca.com/lower_sj_river_feasibility.php

[2] Feather River Partners, 2014; FloodProtect, 2014; Mid and Upper Sacramento River Regional Flood Management Plan Partners, 2014; Reclamation District 2092, 2014; San Joaquin Area Flood Control Agency, 2014; San Joaquin River Flood Control Project Agency, 2015

- Review Plan: Yuba River Basin, California Flood Risk Management General Reevaluation Study (Yuba River GRR) (USACE, 2009)
- Lower San Joaquin Feasibility Study Phase 2 (USACE, 2015c)
- Merced County Streams GRR (USACE, not yet published)
- Central Valley Integrated Flood Management Study (CVIFMS) Phase 2 (USACE, not yet published)

Figure 3-1. Contribution of Data Sources to Overall Costs



3.1.2 Basin-Wide Feasibility Studies

The BWFSs for the Sacramento River and the San Joaquin River basins recommended a range of multi-benefit actions to refine larger-scale actions in the SSIA in multiple phases; accordingly, their level of detail ranges from a full feasibility-level analyses to a reconnaissance-level look at potential concepts. Options for meeting the goals and objectives of the BWFSs were formulated using various combinations of bypass, storage, and weir expansions in the SPFC. These options were evaluated on the basis of their effectiveness at increasing system resiliency, promoting integrated and multi-benefit opportunities in a cost-efficient manner. Conceptual designs and cost estimates were prepared for features included in the various options evaluated in the BWFSs. Before any of these actions can advance to project-level studies, it will be necessary to perform further analysis, design, and cost estimating associated with those refinements. However, the BWFSs still represent some of the most detailed descriptions and cost estimates available for the 2017 CVFPP Update (DWR, 2017).

3.1.3 Regional Flood Management Planning

The six RFMPs provide information about various regionally supported management actions and project opportunities, along with associated costs and timelines. The RFMP cost estimating methods were not uniform among the six regions, and costs were not available for all listed projects. However, these plans provided the basic information needed to identify regional priorities and flood risk reduction projects, and to begin the process of compiling comparative costs.

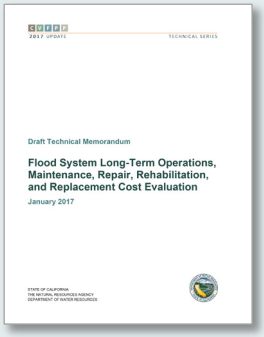
In many cases, separate regions provided the same or slightly alternative projects as those evaluated within the BWFSs, State-federal feasibility studies, or other regional plans. Adjustments were made to avoid double-counting and ensure that the most recent information was included in the 2017 refined SSIA portfolio. For example, deference was given to the State-federal feasibility studies for a large portion of the regional proposed urban improvement cost estimates because they are commonly performed with a standardized level of effort and

methodology. In general, the RFMPs provided the majority of the cost estimates for rural and small community management actions.

3.1.4 Operation, Maintenance, Repair, Replacement and Rehabilitation Workgroup and Technical Memorandum

An operation, maintenance, repair, replacement and rehabilitation (OMRR&R) workgroup was convened to identify true long-term OMRR&R costs over a 50-year time horizon in the SPFC planning area. The OMRR&R workgroup developed cost estimates based on reviewing a variety of sources and input received from DWR staff, LMA representatives, regional stakeholders, and experts. Projected OMRR&R costs identified by this workgroup focus on *future* ongoing annual maintenance and repair, rehabilitation, and replacement needs. Although discussed in the OMRR&R TM, the workgroup's cost estimates do not account for necessary deferred maintenance and repairs required to address known design deficiencies (DWR, 2017a). The workgroup focused instead on the true cost of long-term OMRR&R throughout the SPFC moving into the future *after deferred maintenance is completed*. Other key efforts supporting the CVFPP, such as the RFMPs, address needed deferred maintenance and repairs. DWR's flood project inspections and Flood System Repair Project (FSRP) also provided information on deferred maintenance and repair needs to supplement what was described in the RFMPs. These efforts collectively identified solutions to address deferred maintenance and repairs in support of a more resilient flood management system.

Understanding the True Cost of OMRR&R



Many parts of the flood system are aging and experiencing a substantial backlog of deferred maintenance resulting in part from a lack of consistent funding. In response, the 2012 CVFPP included the improvement of operations and maintenance as the first of its supporting goals. Additionally, several LMAs[1] have passed assessments pursuant to the requirements of Proposition 218 during the past 5 years to address deferred maintenance.

While progress has been made to address these issues, necessary ongoing maintenance is still critically underfunded. Within their budgets and assurances, maintainers must make difficult decisions and prioritize their work to sustain a functioning flood control system. Societal expectations, changing standards, regulatory requirements, and multiple uses of the flood management system have all influenced the current cost of OMRR&R.

DWR convened an OMRR&R Workgroup after adoption of the CVFPP in 2012 to identify true long-term OMRR&R costs of current and proposed urban and rural facilities[2] in the SPFC planning area over a 50-year time horizon.[3] This true-cost analysis is meant to include both the State and local shares of OMRR&R activities, and assumes no accumulation of future deferred maintenance. The workgroup developed cost estimates based on review of a variety of sources and input received from DWR staff, LMA representatives, and regional stakeholders and experts.

Projected OMRR&R costs identified by this workgroup focus on future needs for the following:

- Future ongoing annual maintenance needs, estimated at $88 million annually
- Future repair, rehabilitation and replacement needs, estimated at $43 million annually
- Total future OMRR&R estimate: $131 million annually
- Current local and State expenditures on OMRR&R: $30 million annually

Total future OMRR&R cost estimate:
$131M annually

The workgroup's cost estimates do not account for necessary deferred maintenance and repairs required to address known design deficiencies. The OMRR&R Workgroup focused instead on the true cost of long-term OMRR&R throughout the SPFC after deferred maintenance is complete. The OMRR&R TM documents an estimate of how much funding is needed so that deferred maintenance does not continue to increase in the future. The OMRR&R Workgroup estimate is reflected in the ongoing routine maintenance management action category.

Other key efforts supporting the CVFPP, such as the RFMPs, also address needed deferred maintenance and repairs. DWR's flood project inspections and FSRP also provided information on deferred maintenance and repair needs to supplement what was described in the RFMPs. These efforts collectively identified solutions to address deferred maintenance and repairs in support of a more resilient flood management system. The present value of deferred repair, rehabilitation and replacement needs provided by RFMPs and DWR are reflected in the capital investments of the 2017 refined SSIA portfolio.

[1] LMAs passing assessments since 2012 include: Reclamation District (RD) 784, RD 999, RD 900, RD 1001, RD 10, RD 2103, RD 536, and San Joaquin County.

[2] The estimated true long-term OMRR&R costs assume fully functioning facilities that meet applicable standards. The true-costs analysis included the following urban and rural SPFC facilities: levees, channels, major structures (as described in California Water Code Sections 8361 and 12878 and administered by DWR, and include weirs, bypass outflow control structures, outfall gate facilities, and large regional pumping plants), and minor structures (stop log or gated closure structures, pumping plants, monitoring wells and piezometers, retaining walls and floodwalls, pipe penetrations, and encroachments). Non-project levees and non-project ecosystem and multi-benefit features are not included within the OMRR&R true costs provided by the OMRR&R Workgroup.

[3] Although the CVFPP has a 30-year time horizon, a 50-year time horizon was chosen for this effort because it better corresponds to the typical design life of flood management infrastructure.

3.1.5 Other Action and Cost Estimation Efforts

To provide a comprehensive 2017 refined SSIA portfolio, DWR led additional efforts to estimate potential opportunities and their associated cost for important flood and floodplain management activities not sufficiently captured by the major studies listed above. These supplemental efforts included (1) the State operation/planning cost estimation effort, (2) the emergency management cost estimation effort, and (3) the floodplain management cost estimation effort.

The State operation/planning cost estimation effort resulted in estimated ongoing funding needs to support future State flood management operations, planning, coordination with federal agencies, systemwide tool and model development, and the development of a new performance tracking system that will track the effectiveness of future flood investments. Appendix D provides additional details on the State operation/planning cost estimation effort. Furthermore, this effort accounted for the costs associated with addressing the eight flood-management-related policy issues described in the 2017 CVFPP Update, which includes DWR's Division of Flood Management (DFM) office staff resources.

The emergency management cost estimation effort and floodplain management cost estimation effort resulted in estimated capital investments for potential future agricultural or conservation land acquisitions and easements in rural areas and small communities; ongoing emergency management on a systemwide scale, and ongoing risk awareness, flood-proofing, mapping, and land use planning for urban, rural, and small community areas of interest. DWR led this cost-estimation effort and documented its important findings and the methodology used to develop these costs. The emergency management cost estimation support and floodplain management cost estimation support is provided in Appendix D.

3.2 Process for Building a Portfolio

Individual flood management projects typically follow a fairly linear life-cycle (planning, design, implementation, operations, maintenance, and eventually abandonment or replacement). The CVFPP is intended to continually inform State investment in such projects, and to more broadly inform the State's general participation in Central Valley flood management. In this way, the planning process for Central Valley systemwide and strategic flood protection differs from an individual project's life-cycle because strategic planning is intentionally cyclical, to be updated on 5-year intervals. Several important characteristics are inherent to these cyclical updates are listed below:

- Potential management actions can be at various stages of development and refinement in any given update.

- Plans or projects that did not make a strong enough case for State investment in one cycle can be refined and reconsidered in a future update.

- Individual actions (proposed plans and projects) can be better and more optimally integrated with other actions (taking into account interdependencies) so that State investments work together to cost-effectively and resiliently achieve their intended outcomes.

Figure 3-2 provides a more detailed look at the various steps in the CVFPP planning cycle that formulated the 2017 refined SSIA portfolio. Management actions provided by the several sources described in Section 3.1 were at different stages within the cycle at any given time during the 2017 CVFPP Update, and work has continued throughout the process.

3.2.1 Collection of Potential Management Actions

Potential management actions were identified through multiple planning and implementation efforts completed or initiated since 2012. As discussed in more detail in Section 3.1, these efforts include State-federal feasibility studies, BWFSs, RFMPs, OMRR&R TM, and other efforts that provided detail on emergency and floodplain management activities and State operation, planning, and performance tracking activities. The BWFSs and RFMPs also included ecosystem restoration or enhancement actions that were guided by the Draft CVFPP Conservation Strategy. These identification efforts formed the basis of a continually updated *collection* of potential CVFPP management actions that are organized in an Excel-based database.

3.2.2 Selection of Actions with Potential State Interest

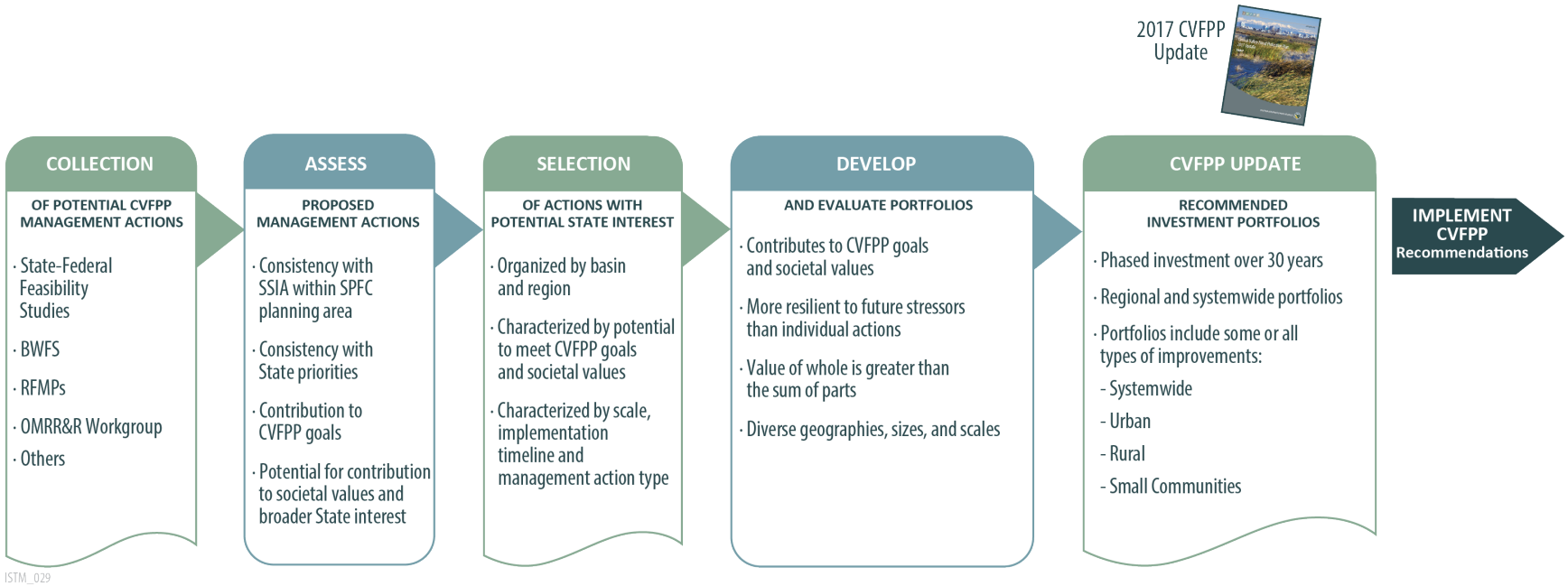
Before prioritizing investment, DWR first screened the *collection* of proposed actions against a set of basic criteria to test relevance to the 2017 CVFPP Update as follows:

- The action is located within the SPFC planning area (as defined in the 2012 CVFPP).
- The action is consistent with the SSIA and could contribute to CVFPP goals and associated societal values.
- The action is consistent with the State and federal policies regarding wise use of floodplains.
- Actions protecting a small community (as designated in the 2012 CVFPP) were automatically retained.

Only actions that are relevant to the SPFC, consistent with the SSIA, seem likely to contribute to one or more CVFPP goals and associated societal values, and are consistent with the State and federal policies for wise use of floodplains passed through the first screen. This assessment effort resulted in a *selection* of actions with potential State interest. This *selection* is organized by basin and region, with projects characterized by their potential to meet intended outcomes, their scale, and their implementation timeline.

It is important to note that all actions not meeting the criteria for the *selection* will remain in the *collection* of potential actions and can be appropriately refined or modified to better meet state interest in future CVFPP updates.

Figure 3-2. 2017 CVFPP Update Development Process



3.2.3 A Refined SSIA Portfolio

Actions taken across different areas within a region or river basin often affect or interact with other actions taken upstream or downstream, and can sometimes have secondary consequences unrelated to the intended outcomes of the investment. The effectiveness of any one action can, therefore, not be evaluated without considering dependencies and interactions with other actions in the same region or basin. This step of the CVFPP planning process considers an action's potential to be combined with others to more resiliently balance State investment across multiple action types and areas of interest. This step also considers expertise from many State and local partners.

All management actions in the 2017 refined SSIA portfolio were grouped into discrete categories of management action types in an Excel-based prioritization database. The details of these management actions and the management action types used to classify the 2017 refined SSIA portfolio are provided in Appendix B. After management actions were discretely classified, they were rolled up into either the capital or ongoing investment categories organized by the four areas of interest (systemwide, urban, rural, and small community). These portfolios of management actions were then assessed and scored for their potential to contribute to the four broader societal values and flood-specific intended outcomes. Section 3.3 provides details on how management actions were scored and prioritized.

3.2.4 Implementation of the 2017 Refined SSIA Portfolio

Although recent improvements to the SPFC began in 2007 as State bond funds became available, the 2017 CVFPP Update provides a refined SSIA portfolio of actions needed to improve flood risk management over the next 30 years. Continued implementation of the CVFPP will be achieved in coordination with federal, State, and local agencies and programs. The State will implement projects with its partners as funding is secured and as projects mature from planning to design, permitting, and construction. DWR has five major flood management programs with specialized roles in CVFPP implementation:

- Flood Management Planning
- Floodplain Risk Management
- Flood Risk Reduction Projects
- Flood System Operations and Maintenance
- Flood Emergency Response

These programs are discussed further in Chapter 8 to highlight their roles in project implementation.

3.2.5 Accountability through Performance Tracking

Progress toward achieving CVFPP goals can be measured as management actions are implemented. Performance tracking of outcomes associated with the CVFPP and its goals is aligned with the following societal values described in Chapter 2 as follows:

- Provide for public health and safety
- Sustain vital ecosystems
- Support a stable economy
- Provide opportunities for enriching experiences

Achieved outcomes must be tracked, measured, and compared to intended outcomes. Performance tracking is what allows the planning cycle to continually inform a new *collection* of potential CVFPP management actions. Without this step, it is impossible to know whether goals are being met and whether current cause-and-effect assumptions and dependencies within the flood-management system are correct. In other words, this step is crucial for ensuring that future CVFPP updates make adjustments for continued evolution toward greater flood-management effectiveness and a more resilient flood-management system that delivers broad, sustained benefits over time. Performance tracking also provides a system of accountability and a method for demonstrating return on investment for the California taxpayer.

State Bond Accountability

In 2007, Governor Schwarzenegger signed Executive Order S-02-07 that established guidelines and procedures for spending Strategic Growth Plan bond funds efficiently, effectively, in the best interests of Californians. The executive order directed government agencies that spend bond funds to institute a three-part accountability structure that included front end, in-progress, and follow-up accountability. The Department of Finance was directed to monitor these efforts. The outcome based planning process, including performance tracking, aligns directly with this executive order.

3.3 Portfolio Prioritization

To formulate the management action categories and the size of each of the categories used to make up the 2017 refined SSIA portfolio, individual projects and activities within the *collection* had to be sorted, filtered for SPFC and SSIA consistency, and prioritized. By having a better understanding of the quantity and type of projects and activities that could potentially fill the management action categories, the investments needed for each category could be more accurately represented. The CVFPP is a 30-year strategic plan; therefore, accurately identifying the types of actions and the costs associated with those actions is more flexible than identifying specific projects that are subject to future changes. The following discussion describes the scoring details of each of the individual projects and activities according to the process set forth in Section 3.2.

Section 2.6 established broad investment guidelines for management action portfolios in terms of level of activity, or resources, that should be dedicated to particular action types. These guidelines were used to inform a scoring and prioritization method developed as part of the study and planning efforts described above. This section describes the process for scoring management actions in the 2017 refined SSIA portfolio and provides detail on the Excel management action prioritization database.

3.3.1 Scoring Management Actions

Qualitative Scoring Approach

The wide diversity of sources that identified potential management actions for the *collection* and the subsequent *selection* of management actions resulted in wide variation in the level of detail provided for specific project information. For example, an especially high level of detail and understanding has been developed for actions studied in the State-federal feasibility studies and BWFSs. In contrast, the management actions identified through the RFMPs, OMRR&R TM, and other efforts are generally described at the higher, reconnaissance- or planning-level scales, which are inherently less detailed. Therefore, scoring of all management actions was first based on a mostly qualitative assessment of whether an action had the *potential* to contribute to outcomes of interest, as opposed to a more quantitative assessment of the action's actual performance with regard to those outcomes. The following discussion describes this qualitative scoring approach.

Purpose of the Scoring Process

The scoring process was intended to highlight and reward those actions that seemed to have potential to do more of the following:

- Contribute to highly weighted flood-specific outcomes and societal values, with weights differing for the four areas of interest (system, urban, rural, small communities)
- Contribute to multiple flood-specific outcomes and/or societal values
- Increase system resiliency

The following examples of two substantially different theoretical actions help illustrate how scoring might be applied across such great variability. A floodplain storage management action in a rural area might score well because it has the potential to contribute to public safety, economic stability, and ecosystem vitality through transitory storage, groundwater recharge, and habitat enhancement. However, a levee improvement action that serves only to protect a critical facility in a densely populated area could score similarly well because of the high weight, or importance, assigned to critical facility functionality within densely populated areas. These two actions could receive the same overall score. This point is important because it illustrates that a management action need not necessarily be multi-benefit to receive a high score.

Methodology: Nested Weighted Sums for Societal Values and Flood-Specific Outcomes

The management actions carried forward into the *selection* were assessed for whether or not they seemed likely to contribute to flood-specific intended outcomes and broader societal values. Each management action or action type within the *selection* was scored against criteria using a series of nested weighted sums. These nested sums were used to explicitly account for the expected ways that proposed actions might change physical assets and behaviors to contribute to tangible, flood-specific outcomes, and further how those achievements might contribute toward broader societal values.

Assessing an Action's Potential to Contribute to Societal Values

The highest level of assessment within the nested weighted sums is an assessment of the action's potential to contribute to a resilient, dynamic balance among the four societal values, weighted by the various degrees to which each of those values depends on effective flood management in order to maintain that balance. The potential for a management action to bring about these outcomes of State interest (P_{SI}) is described as follows:

$$P_{SI} = (w_{PS} \times P_{PS}) + (w_{ES} \times P_{ES}) + (w_{ECO} \times P_{ECO}) + (w_{EX} \times P_{EX})$$

where:

w_{PS} = relative importance of flood-specific outcomes that provide public health and safety

w_{ES} = relative importance of flood-specific outcomes that support a stable economy

w_{ECO} = relative importance of flood-specific outcomes that sustain vital ecosystems

w_{EX} = relative importance of flood-specific outcomes that provide opportunities for enriching experiences

and:

P_{PS} = 0 or 1, with 1 indicating that the management action has the potential to generally improve public health and safety (by reducing risk of lives lost or injured from flooding)

P_{ES} = 0 or 1, with 1 indicating that the management action has the potential to bring about outcomes that support a stable economy (by balancing economic risk and reward on floodplains)

P_{ECO} = 0 or 1, with 1 indicating that the management action has the potential to bring about outcomes that help to sustain ecosystem vitality

P_{EX} = 0 or 1, with 1 indicating that the management action has the potential to bring about outcomes that provide enriching experiences

The CVFPP's primary goal is to improve flood risk management (both in terms of public safety and economic stability), and flood management's primary role toward the broader balance between societal values is risk reduction. Additionally, flood management also plays an important role in the promotion of ecosystem functions. Therefore, the relative importance of flood management's contributions to the societal values are weighted based on the results of the sensitivity analysis below:

- $w_{PS} = 0.325$
- $w_{ES} = 0.325$
- $w_{ECO} = 0.25$
- $w_{EX} = 0.10$

The above weighting is intended to balance the societal values according to the primary and supporting goals of the CVFPP. A brief sensitivity analysis was performed on the societal value weights to test the results' sensitivity to changes in the weighting scheme. Table 3-1 presents the weights considered.

Table 3-1. Sensitivity Testing of Societal Value Weighting

Weighting Test	Societal Values Weighting				Potential Score[2]
	Public Safety	Economic Stability	Ecosystem Vitality	Enriching Experiences	
1[1]	0.325	0.325	0.25	0.1	1
2	0.225	0.225	0.5	0.05	1
3	0.3	0.3	0.3	0.1	1
4	0.4	0.2	0.3	0.1	1

Notes:
1. Weighting selected for analysis
2. Actual scores range from 0 to 1.

The sensitivity analysis found that the relative performance of each action did not change significantly unless one societal value dominated all of the others, such as in the fourth weighting test. The performance score is a linear combination of the 0 to 1 scores; small changes in weight would not have much effect. In other words, sensitivity analysis is useful in complex models where an input change is difficult to trace through to the result. In this application, it is simple. This is because scoring is set up partially to highlight the types of actions capable of contributing to multiple intended outcomes (guided by the CVFPP's supporting goal of promoting multi-benefit projects), and partially because many of the actions that scored especially highly still score highly even with slight changes in the weighting scheme. The weighting used in Test 1 was selected because it represents the closest nexus with the CVFPP goals while still balancing across the societal values.

Weighted Sums for Flood-Specific Outcomes

Not all criteria associated with the intended flood-specific outcomes were weighted the same; they varied depending on area of interest. To demonstrate this, weighting of flood-specific outcomes related to public health and safety are shown below. Weighting for all other flood-specific outcomes for the other three societal values were done in a similar fashion.

The score for an action's overall potential to reduce lives lost or injured as a result of flooding ($\mathbf{P_{PS}}$) is calculated as a weighted sum of its potential to minimize human exposure and vulnerability, while increasing system performance to minimize flood hazard:

$$P_{PS} = (w_{EX} \times P_{EX}) + (w_{VU} \times P_{VU}) + (w_{SY} \times P_{LH}) + (w_{O} \times P_{OTHER})$$

where:

w_{EX} = Relative importance of minimizing number of people within the floodplain (human exposure)

w_{VU} = Relative importance of reducing human vulnerability when flooding occurs

w_{SY} = Relative importance of increasing system performance in populous areas (to minimize flood hazard)

w_{O} = Relative importance of any other means of reducing risk to public safety not captured in the other terms

and:

P_{EX} = 0 or 1, with 1 indicating that the management action has the potential to minimize number of people within the floodplain (human exposure)

P_{VU} = 0 or 1, with 1 indicating that the management action has the potential to reduce human vulnerability when flooding occurs

P_{SY} = 0 or 1, with 1 indicating that the management action has the potential to increase system performance in populous areas (to minimize flood hazard)

P_{OTHER} = 0 or 1, with 1 indicating that the management action has the potential to reduce risk not captured in the other terms

Weights Differ Based on Population

The importance of specific outcomes, or the weight assigned to those outcomes, was varied depending on whether the action was thought to primarily impact a rural versus densely populated area. Chapter 2 provided broad guidance for the types of actions and outcomes that are likely to be most effective toward the four societal values when considering a rural, urban, or small community context. This guided the weighting procedure used to score management actions within the s*election.* For example, the outcome of limited exposure was weighted higher relative to increased performance in rural areas than in urban areas.

Project descriptions were then used to assess the potential for individual proposals within a given management action category to contribute to each outcome. Table 3-2 provides the weights assigned to flood-specific outcomes and societal values for both densely populated and rural areas.

Accounting for Scoring Shortcomings

After results were produced and interpreted from the qualitative scoring, it was clear that the nested weights were unable to capture all of the nuances needed to prioritize investment within the complex flood management system. First, the method does not provide a way to capture and rightfully account for the magnitude of benefit that some of the management actions could potentially provide (when information on magnitude of benefit is available). Second, the scoring procedure lumped small communities and urban areas together as "densely populated" areas; in reality, these two areas have some significant differences in risk reduction opportunities. Finally, the methodology did not provide a means for prioritizing critical repairs over other repair and rehabilitation activities.

Future Scoring Refinements

In the future, there may be some additional refinements to the scoring system, such as a negative baseline score to account for the administrative burden of smaller projects. This type of refinement could help alleviate issues that conflict or detract from CVFPP goals and societal values.

Table 3-2. Scoring Criteria and Sub-Criteria

Societal Value	Flood-Specific Outcome	Flood-Specific Weight		Societal Value Weight
		Densely Populated	Rural Areas	
Public Health and Safety	Minimize number of people within the floodplain	0.15	0.42	0.325
	Reduce human vulnerability when flooding occurs	0.39	0.42	
	Increase system performance in populous areas	0.45	0.15	
	Other: Action includes other components that contribute to Public Health and Safety	0.01	0.01	
Ecosystem Vitality	Reduce stressors on riverine and floodplain ecosystems	0.05	0.05	0.25
	Improve the riverine and floodplain habitats and ecosystems	0.55	0.55	
	Increase and maintain the abundance and diversity of floodplain dependent native species	0.4	0.4	
Economic Stability	Minimize property and assets within the floodplain	0.05	0.35	0.325
	Reduce economic vulnerability when flooding occurs	0.30	0.25	
	Increase system performance for economically developed areas	0.40	0.15	
	Produce or maintain economic benefits on floodplains	0.2	0.2	
	Other: Action includes other components that contribute to Economic Stability	0.05	0.05	
Enriching Experiences	Provide recreational benefits	0.2	0.2	0.10
	Support societal/aesthetic values	0.2	0.2	
	Provide education and public awareness	0.2	0.2	
	Protect significant farmland	0.4	0.4	
Total:		1.00	1.00	1.00

Therefore, a secondary layer of scoring was applied as a score boost to the management actions falling into at least one of the following three categories:

- BWFS management actions and some other management action types from DWR-led efforts, for which a higher level of understanding exists about relative performance and magnitude of benefit

- Some small community actions, for which the "densely populated" label and weighting scheme did not properly account

- Critical maintenance and repairs for rural areas

In all cases, this second layer of scoring represented a boost, or additional credit, on top of the original score. This approach was used (instead of a multiplier, for example) so that it was possible to distinguish between actions with a higher level of certainty or understanding, and actions based purely on a qualitative assessment of potential. This allowed actions with a known high magnitude of benefit to score better than other actions having only the potential to contribute to a multitude of highly valued outcomes.

Magnitude of Benefit for BWFS Management Actions

A limited number of actions' scores were boosted to account for magnitude of benefit. For instance, some systemwide investments (like the Yolo Bypass multi-benefit improvements) not only contribute to a multitude of intended outcomes, but do so in a way that is much more significant than any small-scale levee improvement or setback project. Overall, an especially high level of detail and understanding has been developed for actions studied in the State-federal feasibility studies and BWFSs. Actions from these studies could therefore be evaluated and scored based on more quantitative analyses. When enough information was available for particular actions, they were rated as having a low, medium, or high level of contribution to certain flood-specific outcomes of interest. A score boost was associated with each of the ratings for low (multiplied by 2), medium (multiplied by 5) or high (multiplied by 10) and was only applied to each flood-specific outcome that was already scored. This adjustment reconciled the management actions' overall score for each societal value. Example below is for public health and safety societal value (P_{PS}).

$$P_{PS} = (w_{EX} \times P_{EX})*B_{L,M,H} + (w_{VU} \times P_{VU})* B_{L,M,H} + (w_{SY} \times P_{LH})* B_{L,M,H} + (w_{O} \times P_{OTHER})* B_{L,M,H}$$

where:

$B_{L,M,H}$ = Boost to account for shortcoming (either low, medium, or high, if applicable)

Variance of Opportunities Between Densely Populated Areas

Although both urban areas and small communities are densely populated in a limited geographical space, each presents diverse ways to approach opportunities for risk reduction as follows:

- Urban areas tend to have more physical restrictions. This results in directing risk reduction measures more to strengthening in-place levees and other infrastructure, maintaining channel capacity, and increasing emergency management rather than creating space for flood waters

to attenuate. Furthermore, land uses are usually less flexible and space restricted, so setback levees and floodplain storage management actions are not feasible.

- Small communities tend to have more open space around them, with greater potential for management actions such as constructing levee setbacks and creating floodplain storage. Floodplain risk awareness campaigns, floodproofing, and implementation of land use management policies are particularly effective at risk reduction for small communities, and can be implemented fairly quickly.

For instance, it may be more feasible to evacuate the residents of a small community with improved notification and risk awareness activities than evacuation would be in a large urban center. Additionally, floodproofing improvements, including elevation of structures, may be more feasible in small communities than in urban areas.

Due to the grouping of urban areas and small communities, scoring had to be reconciled to account for these differences. When enough information was available, some scores for small community management actions were boosted with an adjusted score of a low, medium or high level of contribution to certain flood-specific outcomes (similar to adjustments made for the BWFS actions described previously). Total scores for these management actions reflect these changes.

Maintenance and Critical Repairs for Rural Areas

Improved routine maintenance and critical repairs may improve flood system performance in rural areas. The qualitative scoring process did not capture the urgency of some of these critical repairs due to the one-size-fits-all approach to capital investments for repair, rehabilitation, and replacement, and the large cost usually associated with these activities. Therefore, where enough information was available, the score for critical repair actions were boosted with a rating of low, medium, or high level of contribution to certain flood-specific outcomes, and total scores were adjusted accordingly.

Cost Effectiveness

This type of qualitative scoring procedure at a program level is very different from asking whether a particular project is the most cost-effective way to achieve specific objectives set at a more local scale. This latter form of assessment requires a detailed understanding of the extent to which various alternative approaches may help achieve a set of objectives (i.e., an understanding of the magnitude of benefit of any one project) relative to the cost of each alternative. This kind of more detailed and technical assessment is necessary when a grant program must make project-specific funding decisions, but is not necessary for the higher-level investment strategy that is being developed here.

In the future, there could be an opportunity to build some way to account for cost effectiveness into the prioritization database. Furthermore, there could be an opportunity to capture the effect of an administrative burden on each individual project. Administrative burdens do not contribute to societal values; conversely, they contradict each other. Therefore, this should be taken into account when concluding on a total score for each project.

Total Score

After the qualitative scoring process was considered and the shortcomings (as discussed) were accounted for, a total score was calculated for individual management actions by using this formula.

$$T_{Score} = (w_{PS} \times P_{PS}^*) + (w_{ES} \times P_{ES}^*) + (w_{ECO} \times P_{ECO}^*) + (w_{EX} \times P_{EX}^*)$$

where:

* = adjusted weighted sum for flood-specific outcomes

T_{Score} = total management action score

A total score was used to develop State priorities that could then help guide investment phasing. To do this, scoring thresholds were established to indicate which management action categories were high, medium, or low priorities. Scoring thresholds were determined by keeping each phase relatively close to the same amount of investment, approximately $6 to $7 billion. Table 3-3 presents the scoring thresholds used to inform investment phasing. Chapter 4 describes other considerations influencing investment phasing. Chapter 6 provides more detail on each phase of investment and the level of investment toward each management action type that is called for in each phase.

Table 3-3. Scoring Thresholds

Priority	Management Action Score	Phase
High	$T_{Score} \geq 0.28$	Phase 1: 2017–2027
Medium	$0.22 \leq T_{Score} < 0.28$	Phase 2: 2027–2037
Low	$0 < T_{Score} < 0.22$	Phase 3: 2037–2047

3.3.2 Capital Investment Priorities

All action categories have a role in achieving CVFPP goals and societal values. However, some have a greater benefit systemwide or do more to increase resiliency in support of intended outcomes, while others will have a greater marginal effect if taken sooner rather than later. Table 3-4 shows how various action categories scored, and articulates how these scores translate into priorities.

Systemwide capital investments generally scored well and are high priority because of their high levels of contribution to CVFPP goals and all four societal values, and because they represent more resilient means of increasing system performance by adding adaptive capacity to the floodplain. Actions that reduce flood risk or the probability of flooding for already urbanized or otherwise densely populated areas also scored well, because these actions will significantly contribute to the CVFPP's primary goal. In rural areas, land acquisitions and easements often scored well and are high priority because of their positive impact on limiting life and economic exposure that relate to the CVFPP primary goal. Furthermore, land acquisitions and easements can be bundled with improvements that contribute to other flood-specific outcomes such as

improved system performance, increased habitat, and the preservation of culturally significant farmland.

Other action categories demonstrate a greater degree of variability in their scores and priority. This is heavily dependent on what is known about the proposed management actions, their interdependencies with other actions, and where they are located in the system. For example, rural and small community levee repair and other infrastructure improvements range from low to high priority. Higher priority actions in those categories tended to be critical repair and rehabilitation actions that improve levee performance to levels that match current land uses, thereby rebalancing risk on the floodplain. Lower priority actions tended to be improvements for areas not densely populated or developed, and some larger scale improvements with the potential to result in risk intensification.

Table 3-4. Capital Investments Priority of the 2017 Refined SSIA Portfolio Over 30 Years

Management Action Category and Area of Interest	Data Source	Achieved Scores[1] (All Scores > 0)		Range of Priority
		Average Score	Standard Deviation	
Systemwide				
Yolo Bypass multi-benefit improvements	BWFS	1.23	0.78	High
Feather River–Sutter Bypass multi-benefit improvements	BWFS	N/A[2]	N/A[2]	Low
Paradise Cut multi-benefit improvements	BWFS	2.60	1.48	High
Reservoir and floodplain storage	BWFSs and RFMPs	0.99	0.92	High
Urban				
Levee improvements	USACE	0.52	0.69	Medium to high
Other infrastructure and multi-benefit improvements	BWFSs, RFMPs, and OMRR&R Workgroup	0.52	0.86	Medium to high
Rural				
Levee repair and infrastructure improvements	BWFSs, RFMPs, and OMRR&R Workgroup	0.18	0.12	Low to medium
Small-scale levee setbacks and floodplain storage	BWFSs and RFMPs	0.37	0.31	Medium to high
Land acquisitions and easements	RFMPs and floodplain management effort	0.25	0.1	Medium
Habitat restoration/reconnection	RFMPs	0.21	0.15	Low to medium
Small Community				
Levee repair and infrastructure improvements	BWFSs, RFMPs, and OMRR&R Workgroup	0.47	0.77	Low to high
Levee setbacks, land acquisitions, and habitat restoration	RFMPs and floodplain management effort	0.19	0.12	Low to medium

Notes:
1. The maximum achieved scores by any management action was 4.75. The total possible score was 13. Each individual project was given a priority based on its score. The range of priority for all projects within each category is shown.
2. Feather River–Sutter Bypass multi-benefit improvements were not scored because an array of multi-benefit actions is not anticipated to be recommended until after Yolo Bypass improvements are implemented. See page 3-5 of the Draft CVFPP.

3.3.3 Ongoing Investment Priorities

Many of the actions requiring ongoing, annual investment are high priority for their importance for long-term sustainability and resiliency. For example, emergency management and floodplain management activities represent effective and resilient means of reducing risks to lives and property as described in Chapter 2, and many floodplain management activities may provide additional benefits for ecosystems and enriching experiences. Also, the implementation, maintenance, and refinement of any management action is not possible without the enabling conditions established through baseline funding for State operations, technical assistance, planning, and performance tracking. Table 3-5 shows how various ongoing action categories scored, and show how these scores translate into priorities.

Table 3-5. Ongoing Investments Priorities of the 2017 Refined SSIA Portfolio Over 30 Years

Management Action Category and Area of Interest	Data Source	Achieved Scores (All Scores>0)		Range of Priority
		Average Score	Standard Deviation	
Systemwide				
State operations, planning, and performance tracking	RFMPs and State operations/ planning effort	0.21	0.16	Medium to High
Emergency management	RFMPs and emergency management effort	0.26	0.07	High
Reservoir operations	BWFSs	0.51	0.35	High
Routine maintenance	RFMPs and OMRR&R Workgroup	0.24	0.13	Medium to High
Urban				
Risk awareness, floodproofing, and land use planning	RFMPs and floodplain management effort	0.25	0.15	Medium to High
Studies and analysis	RFMPs and USACE	0.24	0.06	Medium
Rural				
Risk awareness, floodproofing, and land use planning	RFMPs and floodplain management effort	0.20	0.15	Medium to High
Studies and analysis	RFMPs	0.14	0.07	Medium
Small Community				
Risk awareness, floodproofing, and land use planning	RFMPs and floodplain management effort	0.13	0.12	Medium to High
Studies and analysis	RFMPs and Small Communities Program	0.21	0.08	Medium

Notes:
The maximum achieved scores by any management action was 4.75. The total possible score was 13.
Each individual project was given a priority based on its score. The range of priority for all projects within each category is shown.

4.0 Other Factors Influencing Funding

Chapter 4 Highlights

- Chapter Outline:
  - Historical Expenditures
  - Political Sentiment
  - Cost Share Agreements
  - USACE Benefit-Based Cost Shares
  - Ability to Pay
  - Willingness to Pay
  - Competing Demands and Complementary Actions
  - Challenges for Local Funding
- Key Chapter Takeaways:
  - External influences have a substantial impact on the implementation of CVFPP.
  - Political, economic, and feasibility considerations must be weighed before implementation can occur.
  - Many limitations affect the timing of investment.

Ideally, all high-priority investments would be implemented immediately. However, many factors shape the timing and sequence of investment.

The type and amount of funds available for implementation at various times during the 30-year planning horizon depend on other factors such as historical spending, political will to fund projects, the benefits anticipated from management actions, and the possibility of matching funds. Factors influencing this timeline are described in Table 4-1. A few of these factors are discussed in detail below.

4.1 Historical Expenditures

Historical expenditures provide the baseline for comparing future expenditures. This Investment Strategy TM compiles the historical expenditures of local, State, and federal agencies that contributed to flood management in the Central Valley in Appendix A. Comparing historical expenditures to levels of funds shown in the funding scenarios will give an indication of the challenge in generating that revenue.

Table 4-1. Factors External to State Planning that Influence the Investment Strategy

Factor	Influence
Historical expenditures	Historical expenditures provide the baseline for comparing future expenditures. This Investment Strategy TM compiles the historical expenditures for local, State, and federal agencies that contributed to flood management in the Central Valley in Appendix A. Looking forward, significant support will be needed for higher appropriations than past expenditures (see Political Sentiment).
Political sentiment	Some funding mechanisms require the support of voters, the California Legislature, or policy makers. Also, proposed financing mechanisms will require new legislation to be established. The political viability of both types of mechanisms must be considered, because voters and policy makers have a history of opposing numerous fee and tax-increase strategies.
Cost share agreements	Hundreds of projects have been cost-shared with USACE in California. In many cases, USACE and DWR have an existing agreement on the cost shares for certain management actions. Many flood management programs that facilitate implementation at the State and federal level have specific cost share percentages as prescribed by federal Water Resources Development Acts.
Ability to pay	According to generally accepted economic principles for allocating costs of public projects, beneficiaries pay for costs of the project based on the benefits they receive. This is known as the benefits received principle, or alternatively as the beneficiary pays principle. However, not all beneficiaries may be able to pay for their benefits, due to their financial circumstances. In these cases, the costs allocated to such beneficiaries may be adjusted to reflect their ability to pay. For this plan, ability to pay will limit the cost shares of some beneficiaries in rural and small communities. Note that when one or more beneficiaries have their allocated cost reduced based on ability to pay, another funding source must be identified to make up the difference to fund the project.
Willingness to pay	Willingness to pay (WTP) is a measure of the monetary magnitude of benefits accruing to one or more beneficiaries. It indicates the value in dollars of what beneficiaries would be willing to give up in order to receive the desirable outcomes of a project, assuming their funding capacity is not limited (see ability to pay). WTP can be observed directly from beneficiaries' actions, imputed using statistical or other models, or estimated from survey results.
Competing demands and complementary actions	Capital and ongoing investments of the CVFPP can be competitive with other public services for funding or serve as part of a multi-benefit project to leverage additional funding sources. The investment strategy considers how available funding sources are limited and competitive at the State, national, and international scale. In addition, several ongoing efforts and several being planned may occupy or influence the same footprint as the SPFC Planning Area.
Challenges for local funding	Local flood management agencies will be responsible for at least a portion of funding for any flood improvements. Many local agencies feel constrained in their ability to generate additional revenue, both by Proposition 218 requirements and the concern that the agency may be approaching debt limits.

4.2 Political Sentiment

A number of the funding mechanisms require support from voters, the California Legislature, or policy makers. Some funding mechanisms require voter or property owner approval, including local agency assessments (due to Proposition 218), local taxes and bonds, and State propositions. Also, some proposed funding mechanisms will require new legislation. The political viability of these mechanisms must be considered, because voters and policy makers have opposed some of them in the past. Political support for funding flood management typically parallels the patterns of northern California's cycle of floods and droughts in the last several decades, lowering during periods of drought and becoming more popular after wet years and/or large flood events. However, as the need for investment in water management continues to expand due to growing need and insufficient past funding, a reevaluation of these mechanisms is prudent.

4.3 Cost-Share Agreements

USACE has shared in the cost of hundreds of flood management projects in California, and DWR and USACE have partnered with local agencies on numerous flood management projects within the Central Valley. In many cases, USACE and DWR have existing agreements on the cost shares for certain management actions. Additionally, many flood management programs that facilitate implementation of capital projects at the State and federal level have specific cost share percentages that have been prescribed by federal Water Resources Development Acts. Tables 4-2 and 4-3 summarize the target cost-share ranges for State, federal, and local partners that take into account historical cost shares and respective flexibility moving forward with new funding mechanisms and programs.

Table 4-2. Target Cost Share Ranges, Capital Investments

Management Action Category and Area of Interest	Target Cost Share Range (%)		
	State	Federal	Local
Systemwide			
Yolo Bypass multi-benefit improvements	40–80	30–50	0–20
Feather River–Sutter Bypass multi-benefit improvements	40–80	0–50	0–20
Paradise Cut multi-benefit improvements	40–80	0–50	0–20
Reservoir and floodplain storage	10–50	65–75	0–20
Urban			
Levee improvements	10–50	55–65	10–40
Other infrastructure and multi-benefit improvements	10–50	55–65	10–40
Rural			
Levee repair and infrastructure improvements	50–75	0–10	25–60
Small-scale levee setbacks and floodplain storage	50–75	0-20	0–40
Land acquisitions and easements	70–100	0–10	0–20
Habitat restoration/reconnection	70–100	0–20	0–20
Small Community			
Levee repair and infrastructure improvements	50–100	0–20	0–50
Levee setbacks, land acquisitions, and habitat restoration	50–100	0–20	0–30

Table 4-3. Target Cost Share Range, Ongoing Investments

Management Action Category and Area of Interest	Target Cost Share Range (%)		
	State	Federal	Local
Systemwide			
State operations, planning, and performance tracking	100	0	0
Emergency management	100	0	0
Reservoir operations	100	0	0
Routine maintenance	70–80	0	20–30
Urban			
Risk awareness, floodproofing, and land use planning	25–50	25–50	10–30
Studies and analysis	0–25	25–65	10–50
Rural			
Risk awareness, floodproofing, and land use planning	20–50	50–75	0–50
Studies and analysis	20–50	25–65	0–25
Small Community			
Risk awareness, floodproofing, and land use planning	20–50	50–75	0–50
Studies and analysis	20–50	25–65	0–25

The target cost-share ranges are based partially on this historical precedent (often informing the low end of the range) and partially on optimistic assumptions about the State and federal agencies' changing trend toward a more comprehensive assessment of public interest beyond benefit-cost ratios. This assessment might include broader consideration of other societal values, as reflected in CVFPP goals and in the federal government's updated "Principles and Requirements for Federal Investments in Water Resources" released in 2013 (Council on Environmental Quality [CEQ], 2013). Also, the cost-share ranges are shown for broad management action categories. Therefore, the cost-share ranges represent what will be the result of a combination of varied cost-share agreements for a multitude of individual projects within that broader category. For example, if about half of the projects within a given category are expected to justify a State cost share of only 50 percent, but the other half is expected to justify a higher State cost share of 75 percent, the target cost share range would then likely fall between those numbers, from 60 to 70 percent.

Finally, the CVFPP investment strategy assumed that existing, in-progress projects would retain their established cost share agreements between local, State, and federal partners throughout their existing programs. However, new management actions included in the 2017 refined SSIA portfolio will target the cost share ranges as presented below.

4.3.1 Developing Local Cost Share Targets

The target cost-share ranges in Tables 4-2 and 4-3 reflect an underlying assumption that local ability and WTP is limited (see Sections 4.5 and 4.6), so an attempt is made to target larger investment from State and federal sources where State or national interest in the potential outcomes from that particular action category is likely to be high. So, while local ranges are often low, this does not necessarily imply that there is a low local interest in that type of activity, but rather that funding can likely be attained from other sources. Alternatively, local cost-share ranges are higher for those action categories for which a significant portion of potential projects in that category are likely limited in their potential to contribute to broader societal values.

4.3.2 Developing Federal Cost Share Targets

Federal cost shares vary over time based on changes in laws and policies. National budget conditions, political beliefs, and individual agency policies affect federal participation in funding water management projects. Recent political shifts provide mixed signals for future federal participation levels. On one hand, Congress appears to place high priority on reducing federal spending, but bipartisan interest in infrastructure investment has also been expressed.

The standards by which federal water resources agencies, specifically USACE, judge their participation in and contribution to water management projects may change over time. In the past, USACE has followed a fairly strict approach of judging projects largely based on benefit-cost analysis, with relatively smaller consideration given to other criteria. For decades, standards such as the 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies have

Principles and Requirements for Federal Investments in Water Resources

Relevant excerpts from the Principles and Requirements:

The following Principles constitute the overarching concepts the Federal government seeks to promote through Federal investments in water resources now and into the foreseeable future.

*A. **Healthy and Resilient Ecosystems.** Federal investments in water resources should protect and restore the functions of ecosystems and mitigate any unavoidable damage to these natural systems…*

*B. **Sustainable Economic Development.** Alternative solutions for resolving water resources problems should improve the economic well-being of the Nation for present and future generations.*

*C. **Floodplains.** Federal investments in water resources should avoid the unwise use of floodplains and flood-prone areas and minimize adverse impacts and vulnerabilities…*

*D. **Public Safety.** Threats to people, including both loss of life and injury, from natural events should be assessed in … the decision-making process.*

*E. **Environmental Justice.** Agencies should ensure that Federal actions identify any disproportionately high and adverse public safety, human health, or environmental burdens of projects on minority, Tribal and low-income populations (and) seek solutions that would eliminate or avoid disproportionate adverse effects on these communities.*

*F. **Watershed Approach.** A watershed approach to analysis and decision making facilitates evaluation of a more complete range of potential solutions and is more likely to identify the best means to achieve multiple goals over the entire watershed. It is imperative that assessments evaluate the interaction of a potential Federal investment with other water resources projects and programs within a region or watershed.*

Using USACE Credit

The citizens of California passed Propositions 1E and 84 in November 2006, which made approximately $4.9 billion in general obligation bonds available to rebuild and repair California's most vulnerable flood control structures that protect homes and prevent loss of life. The State leveraged a portion of the bond funds with local funds to implement federal flood risk reduction projects in advance of Congressional authorization. In many cases, the State and local agencies are seeking credit for these projects under two authorities: Section 104 of the Water Resources Development Act (WRDA) of 1986 (Public Law 99-62) and Section 2003 of the WRDA of 2007 (Title 42 of the United State Code, Sections 1962d to 5b) referred to here as Section 221. The federal government may afford credit for project or project features completed by a local sponsor that secured Section 104 or Section 221 approvals. If the federal government affords credit, that credit can be used to offset future State and/or local contributions toward congressionally authorized flood risk reduction projects. However, the USACE issued ER 1165-2-208 in February 2012 which reflects the policy decision to use the crediting provisions of Section 221 in lieu of section 104. This change in policy has the potential to delay projects and result in less credit being issued because Section 221 only applies *after* a Chief's Report has been issued. Non-federal sponsor work completed prior to completion of a Chief's Report and federal project authorization is not creditable under Section 221.

governed most federal water investments; these standards are commonly referred to as the Principles and Guidelines (United States Water Resources Council, 1983). However, in 2013, the Obama Administration released the Principles and Requirement for Federal Investments in Water Resources, an updated Principles and Guidelines that included a final set of principles and requirements that broaden the criteria and reduce the relative importance of quantitative benefit-cost analysis (CEQ, 2013). These new standards are commonly referred to as the Principles and Requirements.

The Principles and Requirements were the first step in a new process for determining federal interest and participation in water resources projects. In 2014, interagency guidelines were released (CEQ, 2014) that provide more direction to agencies on how to evaluate projects. Importantly, the role of benefit-cost analysis has been reduced and is now one of several measures that contribute to an assessment of sustainable economic development. These measures can include net economic benefits (i.e., benefit-cost analysis), the distribution of benefits among groups, effects on unemployment and other social criteria, and environmental effects.

Federal agencies are adapting their internal guidelines and procedures to respond to the Principles and Requirements. The broader set of principles for making federal investment decisions appears to be more consistent with the multi-benefit, integrated approach of the CVFPP. Overall, these changes in how federal agencies evaluate project participation, along with the shifts in political priorities at the federal level, suggest an opportunity to build support for greater federal participation in CVFPP implementation. The recommended range for federal cost sharing is optimistic, but reflects the broader federal interest in local infrastructure and benefits of flood management.

4.3.3 Developing State Cost-Share Targets

State participation in funding or financing water management projects is in most cases set by the statute authorizing participation. Often the relevant statutes set an upper limit on the State's share of project cost and sometimes on the dollar value of the contribution. Examples of other factors or criteria that can affect the State's contribution include the following:

- Whether the contribution is for capital outlay or ongoing expenses
- The geographic scope of project benefits (e.g., systemwide improvements)
- The financial capacity of local partners
- Whether the State has a specific, identified public interest or duty in a project outcome, such as environmental restoration
- Whether the project serves a defined disadvantaged community or group

The California Water Action Plan Update 2016 (DWR, 2016) supports the use of State funding to share in the cost of projects providing water storage for multiple purposes:

> *The administration will work with the Legislature to make funding available to share in the cost of storage projects if funding partners step forward. The state will facilitate among willing local partners and stakeholders the development of financeable, multi-benefit storage projects, including working with local partners to complete feasibility studies.*

Cost shares associated with recent statewide water-related bond measures provide a benchmark for recommendations. As directed by the legislature, DWR developed guidelines for cost sharing associated with bond measures passed in 2006 (Propositions 84 and 1E). The Cost Share Guidelines for State-Local Cost Shared Flood Programs and Projects (DWR, 2014) set a "base level" cost share for the State of 50 percent of total project cost, with variation from that amount for specific reasons. For example, the State's share for a project serving a disadvantaged community could be as high as 90 percent. Projects providing ecosystem restoration or multiple benefits could receive up to 70 percent State cost share.

The Water Quality, Supply, and Infrastructure Improvement Act of 2014 (Act) was passed by voters in November 2014. It authorizes bonds to finance a variety of infrastructure improvements, generally not to exceed a State share of 50 percent. For example, Chapter 5 of the Act provides a State cost share of up to 50 percent for improvements to drinking water infrastructure improvement. Chapter 8 of the Act provides up to 50 percent State funding for public benefits (including flood control, water quality, and ecosystem improvements) of water storage projects. For projects providing predominantly statewide benefits, or for projects that address a critical need, the State may provide full funding.

4.4 Ability to Pay

According to generally accepted economic principles for allocating costs of public projects, beneficiaries pay for costs of the project based on the benefits they receive. However, not all beneficiaries may be able to pay for their benefits, due to their financial circumstances. In these cases, the costs allocated to such beneficiaries may be adjusted to reflect their ability to pay. When one or more beneficiaries have their allocated cost reduced based on ability to pay, another funding source must be identified to make up the difference to fund the project.

The following principles are commonly used when discussing apportioning taxes or assessments for publicly provided goods or services:

- The **benefit-received principle** states that individuals and businesses should pay for costs of a project or public service based on the benefits they receive from it. This is alternatively known as the "beneficiary pays principle" or simply the "benefits principle." Paying based on benefits received is consistent with how consumers of private goods decide on whether to make a purchase, which is based on the benefits they expect to receive. Each consumer compares the perceived benefit to the advertised cost. In the case of a publicly provided good or service, such as flood control or public roads, taxes or assessments imposed on different groups would be based on the direct use of the service or, more likely for flood management, on an analysis of benefits received by each group. One or more groups may disagree with the size of the benefit, and therefore the tax or assessment they are assigned.

- The **ability-to-pay principle** states that the tax or assessment should be determined by the financial capacity of the beneficiaries via their income and wealth. A related concept is the notion of progressive taxation, in which individuals and businesses with larger incomes pay more taxes, both in absolute terms and relative to income, than those with lower incomes.

Basing payment on ability-to-pay alone can create two significant side effects. First, any reduction in revenue from lower-income groups must be made up from other groups, at least to the point where project costs are fully covered. Second, higher-income groups may opt out of the project by choosing not to participate in it or by voting against any tax or assessment needed to fund the project. In practice, decisions about how to pay for public goods and services are often made through a political process in which benefits received, ability-to-pay, perceived fairness, and other considerations play a role. Negotiation over the distribution of cost is common. Also, existing law may determine or restrict how these two principles are used to set taxes or assessments (see the discussion of California's Proposition 218 in Section 4.7).

As outlined in a 2011 California Debt and Investment Advisory Commission (CDIAC) report, Debt Burdens of California State and Local Governments: Past, Present and Future (Wassmer and Fisher, 2011), one approach to evaluating the feasibility and reasonableness of a proposed tax measure is to assess its affordability: whether individuals and governments can afford the tax (and its associated debt) and everything else they want to purchase. One measure of ability to pay is the effective tax rate (ETR). This analysis was focused on limits for Mello-Roos financing, a different funding mechanism than will likely be used for flood management. However, it does provide a comparable methodology for looking at the ability to incur more debt.

The total ETR on a parcel is equal to the total taxes on the home divided by the assessed value of the home. The taxes consist of ad valorem taxes and fixed charges. Ad valorem taxes are percentage taxes applied to the net assessed value of the home. Under California Proposition 13 passed in 1978, general ad valorem taxes are capped at 1.00 percent of net assessed value and nearly all of that goes to counties, cities, and school districts. Ad valorem taxes above 1.00 percent must be passed by local voters, including payment for any voter-approved general obligation (GO) debt issued by public entities, such as cities, school districts, community college districts, and water districts. In contrast, fixed charges and assessments are not impacted by the value of the home. These charges, among them Mello-Roos special taxes and special assessments, finance public facilities and services such as city and school facilities, street and storm drain maintenance, and park maintenance. Because fixed charges are not impacted by changing values, homes with high fixed charges will have their tax rates decrease as their assessed value increases.

In a 1991 report, the CDIAC established the following total ETR guideline, which has since become the industry standard: New parcel taxes should be calculated such that "the total tax burden on residential property [does not] exceed 2.00 percent of the anticipated fair market value of each improved parcel upon completion of all public and private improvements" (CDIAC, 1991). The purpose of the 2.00 percent cap is to prevent public agencies from overburdening properties with property taxes. At some point, a high tax burden may have an impact on property marketability and attractiveness, residential population, residential spending habits, and ultimately local tax revenues.

In addition, low existing total ETRs may be positively correlated with tax election successes. A Rand Foundation study, Schools, Taxes, and Voter Behavior: An Analysis of School District Property Tax Elections (Alexander and Bass-Golod, 1974), looked at 1,600 school district property tax elections held in California from the mid-1950s to 1972 and found that the existing taxes, the proposed taxes, and the change in taxes were all smaller in the successful elections than in the failed elections.

It should be noted that Proposition 13 also restricts increases of assessed value to an inflation factor not to exceed 2.00 percent per year and limited reassessment to cases of 1) a change in ownership or 2) completion of new construction. Low assessed value, therefore, may not necessarily reflect a home's condition or a property owner's income. In areas where home assessed values are, on average, lower than market value, property owners may not consider a high ETR a burden. A more useful calculation of ETR would rely on the home's market value rather than its assessed value, but market value is more difficult to determine than assessed value.

Table 4-4 shows the effective tax rates for the counties within the SPFC Planning Area, and shows that a majority of the parcels fall in the low and average ETR groups. If ability to pay were measured by staying under the 2 percent threshold, there is capacity to levy additional assessments for the SPFC.

Table 4-4. Effective Tax Rates by County

County	Low Effective Tax Rate Group (1.00% to 1.20%)			Average Effective Tax Rate Group (1.20% to 1.60%)			High Effective Tax Rate Group (greater than 1.60%)		
	Percent of Parcels in Range	Average Effective Tax Rate for the Group (%)	Average Existing FY 2015–2016 Property Taxes	Percent of Parcels in Range	Average Effective Tax Rate for the Group (%)	Average Existing FY 2015–2016 Property Taxes	Percent of Parcels in Range	Average Effective Tax Rate for the Group (%)	Average Existing FY 2015–2016 Property Taxes
Butte	87.5	1.08	$2,292	9.0	1.32	$1,600	3.6	2.21	$1,677
Colusa	69.8	1.08	$3,320	19.6	1.30	$1,388	10.6	2.03	$1,091
Fresno	23.3	1.13	$3,128	70.9	1.26	$2,992	5.8	2.11	$2,410
Glenn	68.8	1.08	$2,590	19.0	1.36	$1,307	12.2	2.18	$1,392
Madera	84.1	1.11	$2,664	10.6	1.33	$2,472	5.3	2.35	$1,938
Merced	71.6	1.11	$2,808	21.7	1.33	$2,482	6.7	2.26	$1,757
Sacramento	42.3	1.15	$3,852	46.4	1.32	$3,487	11.3	2.20	$4,552
San Joaquin	40.3	1.11	$3,601	45.3	1.36	$3,670	14.4	2.20	$4,517
Solano	40.7	1.13	$3,189	52.7	1.29	$4,807	6.6	2.18	$5,326
Stanislaus	63.2	1.11	$2,904	28.1	1.31	$3,164	8.8	2.24	$3,570
Sutter	34.5	1.13	$3,449	52.7	1.34	$2,860	12.8	1.8	$3,358
Tehama	93.2	1.02	$1,273	3.5	1.28	$1,016	2.5	2.73	$429
Yolo	42.9	1.11	$4,782	39.5	1.35	$5,100	17.6	2.0	$5,777
Yuba	31.7	1.13	$2,993	47.0	1.29	$1,621	21.3	2.08%	$2,591

Note:
FY = fiscal year

The revenue generation potential from local assessments is estimated in Table 4-5. The calculations are intended to identify the reasonable increase in tax burden that could be placed on parcels within the SPFC Planning Area for flood management activities. However, the difference between current tax burdens and the 2 percent cap does not represent total funds available for flood management, because those properties are likely to also be taxed for other property-related and public services going forward.

Table 4-5 compares the difference in the revenue generated using the effective tax rate for the county and the 2 percent "maximum" tax rate cited by California Debt and Investment Advisory Commission (CDIAC, 1991). The analysis then assumed that up to 10 percent of this increase could be available for flood management activities. This resulted in approximately $57 million per year, and an average increase of $200 additional dollars per year, per parcel.

Using the difference between the ETR of the assessed value and the CDIAC ETR limit of 2 percent of the assessed value as a proxy for ability to pay may understate the real ability to pay. The CDIAC report's 2 percent limit was based on fair market value. Because Proposition 13 has suppressed the real market value of many properties, so an ETR based on the fair market value would be higher. This analysis used assessed value because that information was readily available. It should be noted that there are many competing demands for this remaining ability to pay increment.

4.5 Willingness to Pay

WTP is a measure of the monetary magnitude of benefits accruing to one or more beneficiaries. It indicates the value in dollars of what beneficiaries would be willing to give up to receive the desirable outcomes of a project, assuming their financial capacity is not limited (see "ability to pay" above). WTP can be observed directly from beneficiaries' actions, imputed using statistical or other models, or estimated from survey results.

WTP for a good can be directly observed when potential beneficiaries make decisions to give up something of value in exchange for the good. In the case of privately owned and consumed goods, such as clothes or food, purchasing decisions and observed prices usually provide reliable WTP information. For goods that provide joint benefits to many at once, such as regional flood management facilities, no single beneficiary would likely bear the cost. Collective decisions to fund, construct, and manage such public goods are made by governments (or government-like organizations such as a Joint Power Authority (JPA)). Determining WTP for goods provided jointly is much more difficult. The observed actions of the local government and its constituents to fund flood management depend on more than simply perceived benefits; they also depend on politics, on voting behavior and requirements, and on legal restrictions on the mechanisms that can be used and the amounts raised.

Table 4-5. Estimated Revenue Generation Potential from Local Assessments

County	Actual Average Effective Tax Rate (5)	Existing Tax Revenue	Revenue at Maximum Recommended Tax Rate (2%)	Tax Revenue Increase from Max Rate	Percent of Max Revenue applied to Flood Control (10%)	Revenue Increase per Parcel
Butte	1.1108	$33,049,543	$59,505,839	$26,456,296	$2,645,630	$184
Colusa	1.1173	$9,071,957	$16,239,071	$7,167,114	$716,711	$232
Fresno	1.2492	$15,984,651	$25,591,821	$9,607,170	$960,717	$186
Glenn	1.152	$1,568,035	$2,720,866	$1,152,831	$115,283	$159
Madera	1.1563	$14,254,985	$24,656,206	$10,401,220	$1,040,122	$193
Merced	1.1727%	$44,137,063	$75,274,261	$31,137,198	$3,113,720	$203
Sacramento	1.3037	$474,322,193	$727,655,431	$253,333,238	$25,333,324	$203
San Joaquin	1.332	$102,739,973	$154,171,629	$51,431,655	$5,143,166	$128
Solano	1.2795%	$113,435,237	$177,311,820	$63,876,583	$6,387,658	$323
Stanislaus	1.2304	$15,112,886	$24,565,809	$9,452,923	$945,292	$195
Sutter	1.299	$86,188,867	$132,690,120	$46,501,252	$4,650,125	$174
Tehama	1.0405%	$158,416	$304,499	$146,084	$14,608	$112
Yolo	1.3193	$116,279,375	$176,274,350	$59,994,975	$5,999,497	$263
Yuba	1.3315	$10,511,300	$15,788,660	$5,277,359	$527,736	$111
Total		**$1,036,814,481**		**$575,935,899**	**$57,593,590**	**$200**

A number of factors may affect voters' willingness to approve a new assessment or tax, including their existing total ETR, their income, the amount, nature, or purpose of the tax itself, and public perceptions. Furthermore, these factors may affect different property owners to different extents: owners of residential property may be more influenced by the existing total ETR, while owners of non-residential property may be more influenced by the purpose of the tax or public opinion. These differences make it important to consider the type of funding mechanism and who is voting to properly assess willingness to approve and the ultimate success of the funding mechanism. For example, in a property-owner election, both residential and non-residential owners will vote, but those who rent property will not vote. However, in a registered voter election, residential property owners and renters will vote, but non-residential owners will not vote.

Property owners or registered voters need to see a return on their investment; they need to perceive tangible benefits in their day-to-day lives from increased flood protection facilities. Making the risk of an unlikely, though catastrophic, event tangible is a challenge. More immediate benefits can include lower home and auto insurance rates in areas with frequent flooding. Individuals are likely to perceive more benefit from the flood protection facilities and be more willing to pay for them when severe storms or flood events have occurred recently.

Gaining voter approval for public goods such as flood management is a challenge due to the range of opinions and information available to voters. Different individuals and groups may disagree about the risks they face and benefits they would receive, both in absolute magnitude and relative to other groups. Groups may also believe that funding already exists to pay for proposed improvements, either from other sources (such as the State or federal government) or from greater efficiencies and cost savings at the local agency. These factors can result in the defeat of local referenda to raise taxes or assessments even when analysis indicates that benefits exceed the costs of the tax or assessment. Therefore, gaining support for increasing funding for both physical (dams, levees, and reservoir maintenance) and nonphysical (emergency management plans and public awareness campaigns) management actions rely on the public's perceptions about these factors.

The willingness of the public to invest in flood management is affected by the economic condition of an area, by public priorities, and perceptions, and by competition for limited resources. Local areas with "robust economies, growing populations and tax bases, and professional planning staff often take their own initiative to reduce and manage flood risk to levels acceptable to the community" (USACE, 2014). Small and disadvantaged communities are generally not capable of implementing flood risk reduction measures and resist measures being imposed on them. Also, these communities often do not have the resources to take advantage of assistance when it is available.

4.6 Competing Demands and Complementary Actions

CVFPP investments can be competitive for funding with other public services or serve as part of a multi-benefit project to leverage additional funding sources. The CVFPP investment strategy considers how available funding sources are limited and competitive at the state, national, and international scale. In addition, several ongoing and planned efforts may occupy or influence the same footprint as the SPFC Planning Area. Activities that the CVFPP may be able to synergistically work with to enhance the State values and the effectiveness of the plan are important to consider.

The CVFPP investment strategy's priorities and schedule must be politically and financially achievable in the context of these other competing demands and programs. Some competing and related activities that could affect implementation of the investment strategy are discussed below.

4.6.1 Other State Activities

There are both competing and complementary activities in the state that require resources and need to be considered when strategizing funding. Competing activities are not related to flood control management. Complementary activities can be related and integrated into flood control management.

Competing Activities for Funding

At the State level, funding for flood management competes with other State obligations such as education, health, transportation, criminal justice, and social services. Table 4-6 shows the distribution of the State's four most recent GO bonds. Education (both K-12 and higher) and health are the biggest recipients of the State's revenues. Funding for flood management activities is included in the water category.

Table 4-6. Total Authorized GO Bond Debt in California

Category	Authorized GO Bonds ($ billion)			
	1999	2005	2011	2015
Correctional	4.1	4.1	2.8	2.8
Education	22.4	51.1	58.6	58.6
Miscellaneous	1.7	2.5	3.3	2.9
Transportation	5.6	7.2	40.0	40.6
Water	3.8	14.0	22.9	30.5
Total	**37.7**	**78.9**	**127.6**	**135.2**
Per capita	1,127.20	2,191.90	3,385.50	3,461.30

Sources: State of California, 2015, 2016; California Department of Finance, 2016b

Complementary Activities for Funding

Complementary activities are those that include flood management or related activities such as ecosystem restoration that comply with the stated goals.

Delta Levee Investment Strategy

The Sacramento–San Joaquin Delta Reform Act of 2009 directed the Delta Stewardship Council to provide a Delta Plan that reduces risks to people, property, and outlines the State's interest in the Delta. The Delta Stewardship Council supported the Delta Plan through the draft Delta Levee Investment Strategy, an updated prioritization of levee investments.

The Delta is part of the overall system for which the CVFPP has guided the State's participation in managing flood risk in areas protected by the SPFC as directed by the Central Valley Flood Protection Act of 2008. Collaboration between the investment strategies supporting the Delta Plan and CVFPP is necessary to deliver effective improvements in integrated flood management to the Central Valley and Delta.

4.6.2 Other Federal Activities

As with state funding, there are both competing and complementary activities that require resources on the federal level.

Competing Activities for Federal Funding

All federal agencies are dependent on Congressional authorizations and appropriations, which are driven by public opinion, are often highly politicized, and are subject to agendas set by Congress and each President's administration. This process creates competition among agencies for limited resources. The federal funding trend is moving away from projects that serve local or special interests.

Federal funding associated with flood management has typically come through USACE, the agency charged with flood and other infrastructure management. Federal funding for USACE declined from about 1 percent of the total federal outlays between 1962 and 1970 to about 0.2 percent of federal outlays between the early 1990s and the present (Office of Management and Budget, 2015). This decline in funding for USACE is a consequence of a political climate where there is opposition to projects paid for through federal taxes and a move to privatize or localize costs associated with projects.

Complementary Federal Actions

Additional information on complementary federal funding mechanisms, such as USACE and FEMA programs are included in Section 6.2.

4.7 Challenges for Local Funding

Local flood management agencies will be responsible for at least a portion of funding for any flood improvements. However, many local agencies feel constrained in their ability to generate additional revenue, both by Proposition 218 requirements and concern about approaching agency debt limits.

4.7.1 Proposition 218

Proposition 218 (enacted November 5, 1996) was the voters' response to the increase in user fees, charges, and special assessments that local governments resorted to as a way to make up revenues after the enactment of Proposition 13. Some special districts levied non-property-related "general" taxes (which were not addressed by Proposition 13) after approval by a majority of their local voters.

Proposition 218 amended the California Constitution to restrain many of these local government practices (Public Policy Institute of California, 2014) with the following changes:

- Clarifies that local general taxes always require majority voter approval and local special taxes require approval by a two-thirds vote of the local electorate [California Constitution Article XIIIC, Sections 2(b) and (d)].

- Prohibits special districts from levying general taxes [California Constitution Article XIIIC, Section 2(a)].

- Makes it more difficult to levy special benefit parcel assessments, which were sometimes used to fund water supply and flood protection projects and other water programs (California Constitution Article XIIID, Section 4).

- Places the burden of proof on local agencies to demonstrate that assessments are proportional to the special benefit that each parcel receives from the facility or service [California Constitution Article XIIID, Section 4(f)].

- Requires that proposed assessments be approved through an election in which votes are weighted by the amount of assessment each parcel owner would have to pay [California Constitution Article XIIID, Section 4(g)].

The most significant change that Proposition 218 brought about is that it requires that local agencies comply with the substantive standards of the law, including these requirements:

- Each parcel must receive benefits that are in proportion to the share of the assessment levied against the parcel.

- The total assessment cannot exceed the cost of the property-related service provided to each parcel.

Many local agencies have found it difficult to satisfy these criteria (Public Policy Institute of California, 2014). These changes resulted in confusion about what "as an incident of property ownership" or for a "property-related service" included. Eventually, this was clarified through the California Supreme Court, which determined that water, sewer, and refuse collection utilities were not covered under the law because these services were charged to property rather than imposed as an incident of property ownership.

Proposition 218 states that before a rate or fee can be increased, an agency must ensure the following:

- Revenues derived from the fee or charge shall not exceed the funds required to provide the property-related service.
- Revenues derived from the fee or charge shall not be used for any purpose other than that for which the fee or charge was imposed.
- The amount of a fee or charge imposed upon any parcel or person as an incident of property ownership shall not exceed the proportional cost of the service attributable to the parcel.
- No fee or charge may be imposed for a service unless that service is actually used by, or immediately available to, the owner of the property in question. Fees or charges based on potential or future use of a service are not permitted.
- No fee or charge may be imposed for general governmental services … where the service is available to the public at large in substantially the same manner as it is to property owners [California Constitution Article XIIID, Section 6(b)].
- If an affected property owner challenges a fee or charge in court, the agency has the burden of proving that it has complied with these requirements [California Constitution Article XIIID, Section 6(b)(5)].

Also, the local agency must conduct a public hearing on the proposed change in rates, fees, or rate structure and "if written protests against the proposed fee or charge are presented by a majority of owners of the identified parcels, the agency shall not impose the fee or charge." If the property-related fees and charges are not for "water, sewer, or refuse collection services," the local agencies must seek approval by either a majority of the property owners who would be subject to the fee or charge, or from two-thirds of the registered voters in the same area. Flood management agencies must comply with this requirement to increase rates or fees. However, it is important to note that there are a few exceptions to these requirements if the assessments, fees, charges, and rates were enacted before July 1, 1997.

4.7.2 Dependence on Development Fees

Many local flood management agencies are partially funded through development fees or special projects assessments that can may limit expenditures to occur within the assessment boundaries. This could exclude expenditures on improvements to correct upstream activities.

Development fees are unreliable as a funding source because these fees are heavily influenced by economic cycles. Ten economic recesessions occurred between 1948 and 2011, an average of two per decade (National Bureau of Economic Research, 2015). Although each recession has been of different duration, on average they have lasted 11 months. Much like previous recessions that hit the manufacturing and construction sectors the hardest, the Great Recession (December 2007 through June 2009) had a significant impact on these sectors, particularly the construction sector in California. Because development fees are tied to construction projects, any reductions in construction has the potential to reduce these fees. Between 2007 and 2008, the value of authorized construction permits (both commercial and residential) in California fell by 33 percent. The reduction in the value of these permits was 43 percent between 2008 and 2009 (California Department of Finance, 2010).

5.0 Investment Costs and Phasing

Chapter 5 Highlights

- Chapter Outline:
  - Overview of Total Investment Costs over 30 Years
  - Overview of Investment Phasing
  - Phased Capital Investments
  - Phased Ongoing Investments
  - Summary of Capital and Ongoing Costs over 30 years
- Key Chapter Takeaways:
  - Cost estimates indicate a total present value investment need of approximately $17 to $21 billion over the next 30 years.
  - The most effective and high-priority actions are phased first to the extent possible, given other financial or political influencing factors.
  - A ramping scheme was applied to ongoing investments to provide the State and its partner agencies with time to establish the necessary staff, resources, and mechanisms needed to accommodate the influx of annual funding while maintaining their routine activities.

This chapter presents the cost estimates for the 2017 refined SSIA portfolio, and builds upon Chapters 2 through 4 to discuss the way investments could be sequenced to most effectively and resiliently contribute to CVFPP goals and societal values within the constraints of other considerations, such as ability and willingness to pay, or viability in the current political climate.

5.1 Overview of Total Investment Costs over 30 Years

The 2012 CVFPP recommended investments in the range of $14 to $17 billion over a subsequent 20 to 25-year period. Several efforts, including regional planning, developing the BWFSs (DWR 2017a; DWR, 2017b), developing OMRR&R cost estimates, developing the CVFPP Conservation Strategy (DWR, 2016), and developing other technical studies have refined the SSIA portfolio and the associated cost and phasing estimated for full implementation. This CVFPP investment strategy is a direct result of these refinement efforts. The 2017 CVFPP Update (DWR, 2017) presents a portfolio of management actions that provide a reasonable and balanced vision of improvements for the SPFC over 30 years. These improvements are intended to be implemented at a systemwide scale, providing benefits to urban areas, rural areas, and small communities. As presented in Chapter 6, and as applied when developing funding scenarios in Chapter 7, several funding mechanisms that provide either a new or an increased funding stream will require significant time to develop. It will also take significant time to

establish which funding streams have been factored into the phasing of improvements and which have contributed to the increased time duration from 25 to 30 years. In the refined SSIA portfolio, a total refined investment of approximately $17 to $21 billion over 30 years is split between ongoing investments and capital investments. It is anticipated that each 5-year update of the CVFPP will include an evaluation of progress to date on project implementation, status regarding development and establishment of new funding streams, and utilization of existing funding streams. The CVFPP will also present a refined estimate of time for full implementation based on current information. Acknowledging and separating capital investments and ongoing investments in the 2017 CVFPP Update is a major refinement of the 2012 CVFPP. This separation of funding types is beneficial because it helps identify funding shortfalls, appropriate funding mechanisms, and areas for priority funding.

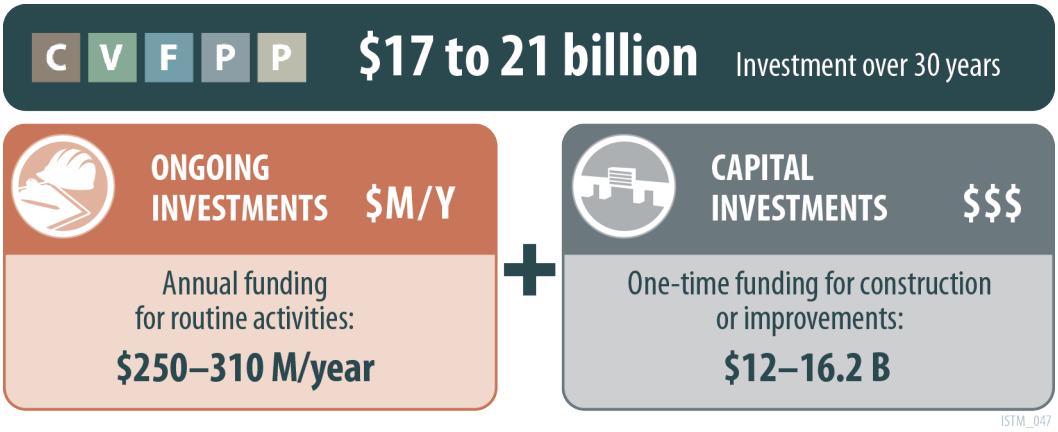
Ongoing investments provide the annual funding needed for routine activities, whereas capital investments are one-time investments that generally involve construction or expansion of infrastructure. The following section gives an overview of both capital and ongoing investment costs.

5.1.1 Treatment of Capital and Ongoing Costs

Investment is divided into two types: capital, and ongoing (Figure 5-1). Many actions require only capital investment, whereas others require ongoing, annual investment sustained over the planning horizon. Because funding methods for these two types of investment are different, they are discussed and calculated separately as follows:

- **Capital investment** in improvements, which often requires years to spend and implement, are described in *2016 dollars (i.e., present value)*
- **Ongoing investment** in improvements are described in terms of *annual levels* of investment *in 2016 dollars*

Figure 5-1. Total CVFPP Investment



Capital investments were adjusted to 2016 dollars using a present value analysis. Present value is the current worth of a future sum of money or stream of cash flow with one or more payments that has been discounted at a set market interest rate. A discount rate of 3 percent was used for the present value calculations of capital investments in the 2017 refined SSIA portfolio.

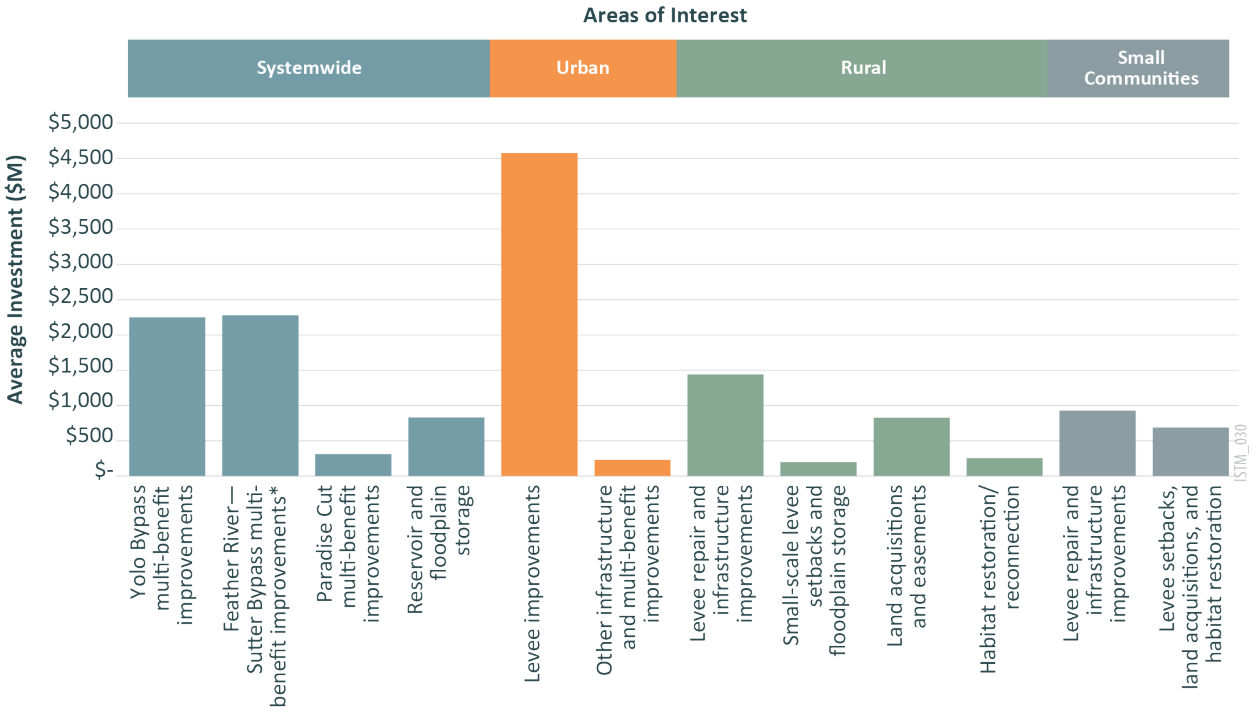
Present value provides a common basis for comparing different investment amounts throughout time, which is critically important for a 30-year planning horizon. It is important to note that the present value of a future cash flow will always be less than the true future amount of that cash flow. This is due to the immediate ability to invest the cash flow received, generating a return.

To discuss the entire investment of the 2017 refined SSIA portfolio in a 2016 dollar amount of $17 to $21 billion, present value terms were applied to both the capital and ongoing investments. In reality, the future ongoing investment will be higher due to escalating costs over time. Annual levels of investment were calculated using a 3 percent escalator rate.

5.1.2 Capital Investment Costs Over 30 Years

Implementation of capital improvements is estimated to cost approximately $12 to $16.2 billion over the next 30 years, as summarized in Figure 5-2. Table 5-1 elaborates on cost estimates and data sources for each management action category under each area of interest. This estimate is informed by the same efforts as described in Section 3.1. Many systemwide actions are expected to promote ecosystem functions and multi-benefit projects, as are some rural easements, levee setbacks, and floodplain storage actions. Therefore, costs for actions that promote ecosystem functions and multi-benefit projects are included in all areas of interest, and are embedded mostly within larger-scale activities, where feasible. An estimated cumulative capital and ongoing cost of approximately $1.3 billion in the 2017 refined SSIA portfolio contributes to the CVFPP supporting goals of promoting ecosystem functions and promoting multi-benefit projects, which are further discussed in this section.

Figure 5-2. Total Capital Investment Over 30 Years



Note: All estimated dollar values are in 2016 dollars and indicate average annual investments made over 30 years.

*The high end cost estimate was used for the Feather River—Sutter Bypass multi-benefit improvements. This is due to the larger range of uncertainty compared to other systemwide improvements, given the Sacramento River BWFS recommendations to determine an array of multi-benefit actions through future study in close coordination with local and regional partners after Yolo Bypass improvements are implemented.

Table 5-1. Capital Investments of the 2017 Refined SSIA Portfolio Over 30 Years (2016 $)

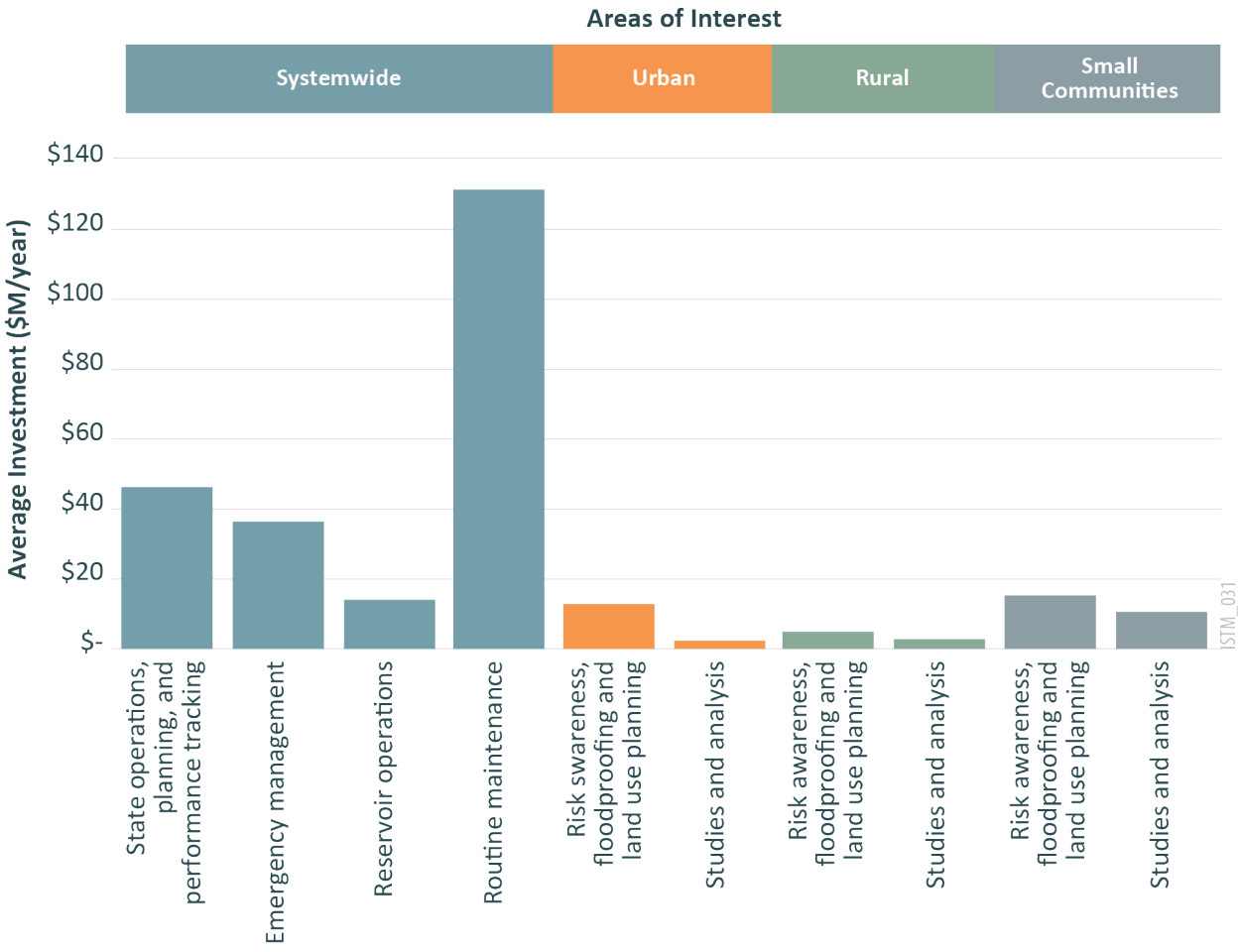
Management Action Category and Area of Interest	Data Source	Sacramento		San Joaquin		Total	
		Low ($M)	High ($M)	Low ($M)	High ($M)	Low ($M)	High ($M)
Systemwide							
Yolo Bypass multi-benefit improvements	BWFSs	$2,050	$2,500	$–	$–	$2,050	$2,500
Feather River–Sutter Bypass multi-benefit improvements	BWFSs	$600	$2,300	$–	$–	$600	$2,300
Paradise Cut multi-benefit improvements	BWFSs	$–	$–	$280	$340	$280	$340
Reservoir and floodplain storage	BWFSs and RFMPs	$130	$150	$620	$750	$750	$900
	Subtotal:	**$2,780**	**$4,950**	**$900**	**$1,090**	**$3,680**	**$6,040**
Urban							
Levee improvements	USACE	$3,240	$3,960	$900	$1,100	$4,140	$5,060
Other infrastructure and multi-benefit improvements	BWFSs and RFMPs	$100	$120	$50	$60	$150	$180
	Subtotal:	**$3,340**	**$4,080**	**$950**	**$1,160**	**$4,290**	**$5,240**
Rural							
Levee repair and infrastructure improvements	BWFSs and RFMPs	$790	$960	$540	$660	$1,330	$1,620
Small-scale levee setbacks and floodplain storage	BWFSs and RFMPs	$100	$120	$70	$90	$170	$210
Land acquisitions and easements	RFMPs and floodplain management effort	$490	$590	$280	$340	$770	$930
Habitat restoration/ reconnection	RFMPs	$250	$300	$10	$10	$260	$310
	Subtotal:	**$1,630**	**$1,970**	**$900**	**$1,100**	**$2,530**	**$3,070**
Small Community							
Levee repair and infrastructure improvements	BWFSs and RFMPs	$750	$910	$110	$140	$860	$1,050
Levee setbacks, land acquisitions, and habitat restoration	RFMPs and floodplain management effort	$530	$640	$110	$140	$640	$780
	Subtotal:	**$1,280**	**$1,550**	**$220**	**$280**	**$1,500**	**$1,830**
	Capital Total:	**$9,030**	**$12,550**	**$2,970**	**$3,630**	**$12,000**	**$16,180**

Notes:
1. All estimated dollar values are in 2016 dollars and indicate an investment over 30 years.
2. Feather River–Sutter Bypass Multi-benefit Improvement cost ranges are included for completeness, but additional study is needed to refine recommended improvements, including consideration of improvements to Tisdale and Colusa weirs.
3. An estimated cumulative capital and ongoing cost of $1.3 billion within the 2017 refined SSIA portfolio contributes to the CVFPP supporting goals of promoting ecosystem functions and promoting multi-benefit projects, embedded most within larger scale activities.

5.1.3 Ongoing Investment Costs over 30 Years

Implementation of ongoing improvements is estimated to range in cost annually from $251 to $308 million. Figure 5-3 summarizes annualized costs for the ongoing investments by each area of interest. Ongoing investments are discussed in annualized dollar values throughout this section. This estimate is informed by the same efforts as described in Section 3.1. Table 5-2 elaborates on cost estimates and data sources for each management action category under each area of interest.

Figure 5-3. Annual Total of Ongoing CVFPP Investment



Note: All estimated dollar values are in 2016 dollars and indicate average annual investments made over 30 years. They have not been discounted to present value nor escalated for inflation.

Table 5-2. Ongoing Investments of the 2017 Refined SSIA Portfolio Per Year (2016 $)

Management Action Category and Area of Interest	Data Source	Sacramento		San Joaquin		Total	
		Low ($M)	High ($M)	Low ($M)	High ($M)	Low ($M)	High ($M)
Systemwide							
State operations, planning and performance tracking	RFMPs and State operations/planning effort	$21	$26	$20	$24	$41	$50
Emergency management	RFMPs and emergency management effort	$16	$20	$16	$20	$32	$40
Reservoir operations	BWFSs	$1	$1	$12	$14	$13	$15
Routine maintenance	OMRR&R Workgroup	$81	$99	$37	$45	$118	$144
	Annual Subtotal:	**$119**	**$146**	**$85**	**$104**	**$205**	**$250**
Urban							
Risk awareness, floodproofing and land use planning	RFMPs and floodplain management effort	$4	$5	$8	$10	$12	$15
Studies and analysis	RFMPs and USACE	$2	$2	$1	$1	$3	$3
	Annual Subtotal:	**$6**	**$7**	**$9**	**$11**	**$15**	**$18**
Rural							
Risk awareness, floodproofing and land use planning	RFMPs and floodplain management effort	$1	$2	$3	$4	$4	$6
Studies and analysis	RFMPs	$1	$1	$2	$3	$3	$4
	Annual Subtotal:	**$2**	**$3**	**$5**	**$7**	**$7**	**$10**
Small Community							
Risk awareness, floodproofing and land use planning	RFMPs and floodplain management effort	$7	$9	$7	$9	$14	$18
Studies and analysis	RFMPs and Small Communities Program	$10	$12	$–	$–	$10	$12
	Annual Subtotal:	**$17**	**$21**	**$7**	**$9**	**$24**	**$30**
	Ongoing Annual Total:	**$144**	**$177**	**$106**	**$131**	**$251**	**$308**

Notes:
1. Estimated dollar values are in 2016 dollars and indicate annual investments made over 30 years. They have not been discounted to present value nor escalated for inflation.
2. Present value of total ongoing investments is approximately $5 billion over 30 years.
3. A cumulative capital and ongoing cost of $1.3 billion within the 2017 refined SSIA portfolio contributes to the CVFPP supporting goals of promoting ecosystem functions and promoting multi-benefit projects, embedded most within larger scale activities.
4. Currently, DWR's DFM spends an approximate annual $58 million per year. SPFC-related staff work on a range of activities and management actions across all areas of interest. Therefore, staff costs may be incorporated into other ongoing management action categories other than the State operations, planning, and performance tracking line item.

5.2 Overview of Investment Phasing

Ideally, the earliest investment would be focused on the most effective and high-priority actions first (i.e., those having the greatest potential to contribute to CVFPP goals and societal values, and boost system resiliency). However, Chapter 4 highlights some of the other considerations that affect program phasing, and the challenges with raising sufficient funds for full CVFPP implementation over 30 years. Some management actions may be implemented earlier if they are necessary precursors for the successful implementation of other future actions, or if they are more immediately feasible, either financially or politically. Also, ability to pay and competing activities for funding will place some constraints on the amount of investments possible in the immediate future. Because of these constraints, high-priority investment costs are spread across all three phases.

The following overarching principles guided phasing of the 2017 refined SSIA portfolio:

- **React to unacceptably high levels of risk.** Actions related to improving systemwide performance and reducing the largest risks to life and property in densely populated areas should be funded as soon as possible. Although these actions will take a significant amount of investment, they are needed to achieve the primary goal of the CVFPP.

- **Prevent risk escalation, reduce residual risk, and increase resiliency.** Actions aimed at minimizing future exposure and reducing vulnerability to life and property (such as levee setbacks, floodplain storage, and agricultural or conservation easements) are among the most resilient means of improving flood risk management; they prevent risk escalation, minimize life and economic losses when flooding does occur, and increase or maintain adaptive capacity within the flood management system. They also have the highest potential for producing other ecosystem and social outcomes of interest. These more *proactive* and multi-benefit flood management solutions will make up the majority of investment once risk has been reduced for more densely populated areas, but some investment in these activities should also start as soon as possible.

- **Maintain system performance:** Securing reliable and continuous funding for ongoing management activities that serve to maintain the system, encourage wise use of floodplains, and manage residual risk are important. Ongoing investment in O&M is also high priority to maintain flood management system performance, thereby preventing escalating life and economic risk from infrastructure deterioration. It will take time to build up the capacity and revenues necessary to better maintain the system over the long term, but some increased spending is needed right away, especially for critical repairs.

- **Ramping of ongoing resources:** For ongoing investments, the State and its partner agencies will need time to establish the staff, resources, and mechanisms to accommodate the influx of dollars and ability to execute routine activities. Therefore, a ramping of investments was applied to only the ongoing annual management action categories. This ramping scheme is intended to help the State and its partners increase institutional capacity to undertake this major effort.

These guiding principles for prioritizing investment provide the basis for establishing three basic phases of investment focus:

- Phase 1 (2017 to 2027) aims at reactively addressing the highest levels of risk to lives and assets concentrated in densely populated areas (i.e., urban and small communities).
- Phase 2 (2027 to 2037) aims at actively transitioning to more balanced flood management.
- Phase 3 (2037 to 2047) aims at proactively balancing flood management system investments for both capital and ongoing activities in a sustainable manner.

5.2.1 Phase 1

Many of the actions requiring ongoing, annual investment are high priority because of their importance for long-term sustainability and resiliency. For example, emergency management and floodplain management activities represent effective and resilient means of reducing risks to lives and property, and many floodplain management activities may have additional ecosystem or enriching experience benefits as discussed in Chapter 2. Also, the implementation, maintenance, and refinement of any management actions is not possible without baseline funding for State operations, technical assistance, planning, and performance tracking.

However, intense floodplain development in past decades outgrew the originally intended (mostly agricultural) purposes for which many of the levees and other infrastructure were built, leading to high threats to economic stability and life safety in densely populated areas. A prudent flood management approach must first react to and mitigate these high-risk levels before fully transitioning to more proactive and resilient forms of flood and floodplain management. Therefore, actions that reduce flood risk (or the probability of flooding) for already urbanized or otherwise densely populated areas must be implemented soon, since these actions will most efficiently contribute to the primary goal of the CVFPP.

Current bond funding for project implementation is expected to be depleted by fiscal year 2019-2020. No funding will be available for continued implementation of the higher-priority actions unless new State, federal, and local funding becomes available. Because it may take time to increase funding sources for flood management, a balance must be found between building up a solid baseline of investments in proactive, resilient floodplain management, and large capital investments in systemwide and regional improvements that increase system performance for areas where risk levels are already too high.

Therefore, Phase 1 is aimed at reactively addressing the highest levels of risk to lives and assets concentrated in the densely populated areas (urban and small communities). To build the needed baseline of ongoing proactive investment, the following types of ongoing activities will be prioritized for the most significant increases in annual funding in Phase 1 (relative to current spending levels):

- Emergency management (preparedness, response, and recovery)
- Reservoir operations (studies such as forecast-coordinated operations [F-CO] and forecast-informed operations [F-IO] and increased objective releases)

- Routine O&M
- Risk awareness, land use planning, and floodproofing

The following capital investment actions are considered highest priority:

- Near-term Yolo Bypass multi-benefit improvements, including Upper Elkhorn design and permitting, Bryte landfill remediation, Lower Elkhorn levee setback, Sacramento Weir design and permitting, Sacramento Bypass levee setback, Sacramento Deep Water Ship Channel design and permitting, and Cache Creek Settling Basin evaluation
- Land acquisitions and feasibility study for the Paradise Cut Bypass Expansion
- Some reservoir operations studies and floodplain storage investments, including acquisition of Dos Rios Ranch and Three Amigos, and completion of restoration activities for Three Amigos Transitory Storage Project
- Urban levee and infrastructure improvements
- Conservation and agricultural easements
- Critical rural levee repairs
- Beginning investment in small communities
- Some small-scale levee setbacks and floodplain storage in rural areas
- Management actions that can successfully secure near-term federal appropriations

5.2.2 Phase 2

Over time, many of the necessary capital improvements needed to react to and reduce currently unacceptable levels of risk in the more densely populated areas in the Central Valley will have been funded and implemented. This will make way for more active actions that strive to better align land use and flood management practices to more effectively manage residual risk and provide a broader suite of outcomes across all societal values. Also, for ongoing investments, the State and its partner agencies will need time to establish the staff, resources, and mechanisms to accommodate the influx of dollars and ability to execute routine activities. Therefore, a ramping of investment must be sought. This ramping scheme is intended to help the State and its partners increase institutional capacity to undertake this major effort.

Phase 2 aims at actively transitioning to more balanced flood management investments. However, there would still be high risks to lives and assets remaining in the Central Valley that could be addressed with some additional capital investments (like continuation of the Yolo Bypass multi-benefit improvements, and remaining urban levee improvements). New funding and financing mechanisms are required to implement medium-priority actions as described in Section 3.2. These mechanisms would especially provide stable funding for many important ongoing actions as they ramp up to levels needed for sustainable floodplain management in the

future. This would allow for a transition from reactive to proactive planning, and provide stable funding for continued success with lower priority actions.

In this second phase of investment, funding would increase for O&M and floodplain management activities. Other ongoing activities would eventually also require additional annual revenues to be implemented at levels needed to more resiliently manage flood risk. The following activities would seek increases in annual funding:

- State operations, planning, and performance tracking
- Studies and analysis for risk reduction in small communities, rural areas, and urban centers

In addition to these baseline investments, the following capital investments are recommended for Phase 2 of investment:

- Remaining urban levee improvements
- Continued implementation of the Yolo Bypass multi-benefit improvements including Lower Elkhorn ecosystem improvements, Upper Elkhorn levee setback and ecosystem improvements, Sacramento Weir extension, Sacramento Bypass ecosystem improvements, Lower Yolo Bypass levee setbacks, levee fix-in-place and ecosystem improvements, Cache Creek Settling Basin improvements, and the Fremont Weir extension
- Design, permitting, and implementation of Paradise Cut Bypass Expansion
- Remaining reservoir operations studies and floodplain storage investments
- Remaining critical small community and rural levee repairs
- A small number of property acquisitions in small communities where most feasible
- Expansion of the conservation and agricultural easements program

5.2.3 Phase 3

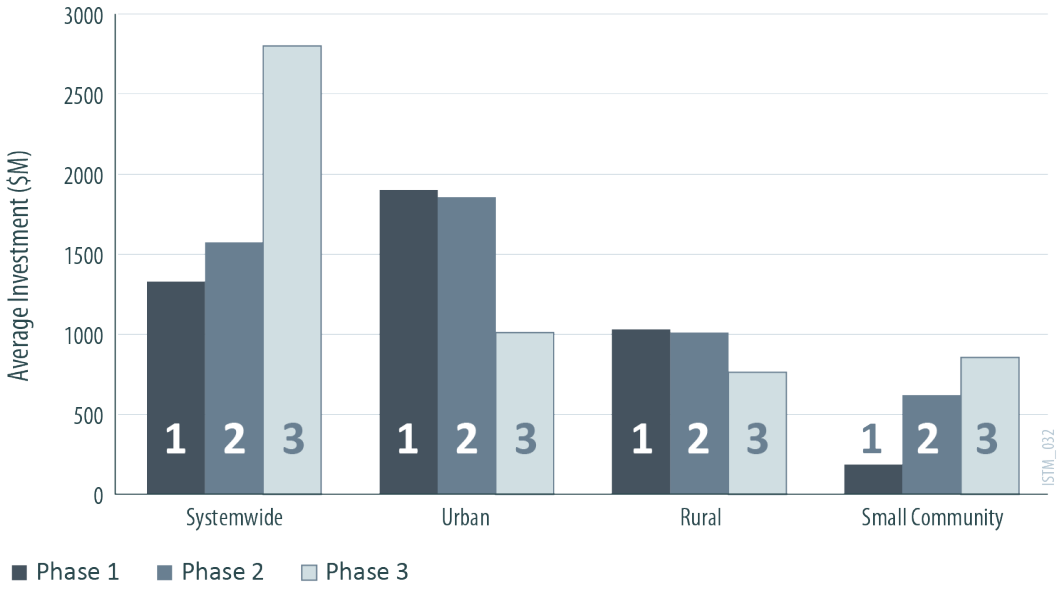
Phase 3 aims at proactively balancing flood management system investments for both capital and ongoing activities in a sustainable manner. Upon completion of the higher-priority and medium-priority actions, the amount of risk to lives and assets would be considerably alleviated. Many future uncertainties may impose their effect on flood management needs, but the intent for lower-priority actions would still be to achieve effective and resilient long-term system management that balances investments across a wide variety of activities. Lower-priority capital investment actions would require additional study and refinement to fully evaluate their investment cost and contribution to CVFPP goals. Furthermore, the required capital investment should be a much smaller percentage of the overall 2017 refined SSIA portfolio as ongoing investments increase to a steady amount that more proactively manages risk and reduces the need for reactive capital spending. This last phase of investment is when adequate annual funding levels are anticipated to have been secured to pay for all needed ongoing expenses.

5.3 Phased Capital Investments

Although the earliest capital investments would ideally focus on the most effective and high-priority actions first, a variety of constraints and the high cost of proposed capital investments make such an approach impractical. Constraints as discussed in Chapter 4, include other influencing factors such as political sentiment, cost share agreements, and ability to pay. Therefore, to approach capital investments in a more realistic sense, capital investments were spread across all three phases for some management action categories by percentage of total investment. These percentages are noted in the category description to which they were applied. This spreading of investment was common for systemwide capital improvements and urban levee improvements.

For capital investment in management action categories that did not have percentages applied, the prioritization and scoring process described in Chapter 3 determined phasing. Overall, scoring thresholds were used to create high, medium, and low priority levels; the assigned priority level then determined phase of investment. Figure 5-4 and Table 5-3 shows how investment in each of the capital management action categories is phased over time. The following sections provide further detail on each management action category, and how various subsets of activities within that line item were grouped into Phase 1, 2, or 3.

Figure 5-4. Capital SSIA Phased Over Time by Area of Interest



Note: All estimated dollar values are in 2016 dollars and indicate an investment over 30 years.

Table 5-3. Phased Capital Investments of the 2017 Refined SSIA Portfolio (2016 $)

Action Category and Area of Interest	Data Source	Phase 1		Phase 2		Phase 3		Total	
		Low ($M)	High ($M)	Low ($M)	High ($M)	Low ($M)	High ($M)	Low ($M)	High ($M)
Systemwide									
Yolo Bypass multi-benefit improvements	BWFSs	$920	$1,125	$920	$1,125	$210	$250	$2,050	$2,500
Feather River–Sutter Bypass multi-benefit improvements	BWFSs	$0	$0	$0	$0	$600	$2,300	$600	$2,300
Paradise Cut multi-benefit improvements	BWFSs	$30	$30	$250	$310	$0	$0	$280	$340
Reservoir and floodplain storage	BWFSs and RFMPs	$250	$300	$250	$300	$250	$300	$750	$900
	Subtotal:	**$1,200**	**$1,455**	**$1,420**	**$1,735**	**$1,060**	**$2,850**	**$3,680**	**$6,040**
Urban									
Levee improvements	USACE	$1,655	$2,020	$1,655	$2,020	$830	$1,020	$4,140	$5,060
Other infrastructure and multi-benefit improvements	BWFSs and RFMPs	$50	$60	$20	$20	$80	$100	$150	$180
	Subtotal:	**$1,705**	**$2,080**	**$1,675**	**$2,040**	**$910**	**$1,120**	**$4,290**	**$5,240**
Rural									
Levee repair and infrastructure improvements	BWFSs and RFMPs	$290	$350	$580	$710	$460	$560	$1,330	$1,620
Small-scale levee setbacks and floodplain storage	BWFSs and RFMPs	$150	$190	$10	$10	$10	$20	$170	$220
Land acquisitions and easements	RFMPs and floodplain management effort	$310	$370	$310	$370	$150	$190	$770	$930
Habitat restoration/ reconnection	RFMPs	$180	$220	$20	$20	$60	$70	$260	$310
	Subtotal:	**$930**	**$1,130**	**$920**	**$1,110**	**$680**	**$840**	**$2,530**	**$3,080**

Table 5-3. Phased Capital Investments of the 2017 Refined SSIA Portfolio (2016 $)

Action Category and Area of Interest	Data Source	Phase 1		Phase 2		Phase 3		Total	
		Low ($M)	High ($M)	Low ($M)	High ($M)	Low ($M)	High ($M)	Low ($M)	High ($M)
Small Community									
Levee repair and infrastructure improvements	BWFSs and RFMPs	$130	$150	$410	$510	$320	$390	$860	$1,050
Levee setbacks, land acquisitions, and habitat restoration	RFMPs and floodplain management effort	$40	$50	$150	$180	$450	$550	$640	$780
Subtotal:		**$170**	**$200**	**$560**	**$690**	**$770**	**$940**	**$1,500**	**$1,830**
Capital Total:		**$4,010**	**$4,865**	**$4,570**	**$5,575**	**$3,420**	**$5,750**	**$12,000**	**$16,190**

Notes:
1. All estimated dollar values are in 2016 dollars and indicate an investment over 30 years.
2. Feather River–Sutter Bypass multi-benefit improvement cost ranges are included for completeness, but additional study is needed to refine recommended improvements, including consideration of improvements to Tisdale and Colusa weirs.
3. An estimated cumulative capital and ongoing cost of $1.3 billion within the 2017 refined SSIA portfolio contributes to the CVFPP supporting goals of promoting ecosystem functions and promoting multi-benefit projects, embedded most within larger scale activities.

5.3.1 Systemwide Capital Investment

Proposed systemwide capital investment actions were studied and recommended largely through the Sacramento River and San Joaquin River BWFSs (DWR, 2017a; DWR, 2017b). In the Sacramento Basin, these include Yolo Bypass multi-benefit improvements and potential systemwide multi-benefit improvements for the Feather River–Sutter Bypass system. In the San Joaquin Basin, these include Paradise Cut multi-benefit improvements, and reservoir and floodplain storage actions. The following discussion describes these systemwide investments in more detail.

Yolo Bypass Multi-Benefit Improvements

Yolo Bypass multi-benefit implementation will have broad systemwide flood management and ecosystem benefits beyond any single local agency's role and responsibilities. Implementation will cost approximately $2.0 to $2.5 billion, and will include land acquisition, levee setbacks and upgrades, habitat restoration, and many other activities described in much greater detail in the Draft Sacramento River BWFS (DWR, 2017a).

Some of these improvements must happen before others (such as land acquisitions preceding levee setbacks). These chronological dependencies and the large magnitude of the overall investment need for the entire set of individual Yolo Bypass multi-benefit actions make is necessary to spread costs across all three phases of investment. The following percentages were applied to the total estimated costs for Yolo Bypass multi-benefit improvements, resulting in the amounts shown in Table 5-3:

- Phase 1: 45 percent
- Phase 2: 45 percent
- Phase 3: 10 percent

Feather River–Sutter Bypass Multi-Benefit Improvements

System-scale actions in the Feather River–Sutter Bypass are dependent on implementation and completion of Yolo Bypass improvements, which are not anticipated to reach completion until 2030 and beyond. The costs for future Feather River–Sutter Bypass multi-benefit improvements as presented in the Draft Sacramento River BWFS range from $600 to $2,300 million. The 2017 refined SSIA Portfolio includes a range of potential system-scale improvements to the Feather River–Sutter Bypass System that would be further refined through future study to formulate a recommended option in close coordination with local and regional stakeholders. In addition to the above actions, options could include upgrade and modification of Colusa and Tisdale weirs to divert additional flow from the Sacramento River to the Sutter Bypass, thereby lowering flood stage in the Sacramento River. However, these improvements are lower priority and the estimated costs have been dedicated to Phase 3.

Paradise Cut Multi-Benefit Improvements

Costs for the Paradise Cut multi-benefit improvements were developed in the Draft San Joaquin River BWFS (DWR, 2017b) and are estimated to range between $280 and $340 million, including an initial land acquisition cost of approximately $30 million. The most immediate priority needed for implementing the Paradise Cut bypass expansion and ecosystem enhancements is to acquire the appropriate lands; costs for this activity are included in Phase 1. A more detailed feasibility study and additional stakeholder engagement will need to be

completed to inform the design, permitting, and implementation of the bypass expansion in the future. Costs for performing these activities, along with the on-the-ground implementation, have been included in Phase 2, with completion by the beginning of Phase 3.

Reservoir and Floodplain Storage

Potential improvements to reservoirs and added floodplain storage are estimated to cost between $750 million and $900 million. This total estimate stems from a number of different sources. RFMPs provided an estimated cost of $140 million for New Bullards Bar outlet modification on the Yuba River, which was included in this management action category. This project is expected to increase the release capacity of the reservoir by adding a second gated spillway tunnel to the outlet works of the dam. Additionally, several costs were provided by the Draft San Joaquin River BWFS (DWR, 2017b), and include acquisition of Dos Rios Ranch, habitat and transitory storage at Three Amigos, increased objective releases for New Don Pedro Reservoir, increased flood storage in the Calaveras River Watershed, and subsidence solutions in Madera County.

Due to the large magnitude of these improvements and the viability of receiving necessary funds, costs were spread across all three phases of investment for planning purposes. The following percentages were applied to the total estimated costs for all reservoir and floodplain storage actions resulting in the amounts shown in Table 5-3:

- Phase 1: 33 percent
- Phase 2: 33 percent
- Phase 3: 33 percent

The priority actions already in progress, most immediately ready for implementation, and/or show the most promise for achieving the CVFPP's goals are listed below. It is anticipated that these priority actions will be supported by Phases 1 and 2 funding.

- Coordinate and provide project cost-share for completion of Folsom Dam Raise project
- Complete design, environmental documentation, and permitting for the project to construct a New Bullards Bar lower outlet
- Complete acquisition of Dos Rios Ranch
- Complete acquisition and restoration activities for Three Amigos Transitory Storage project
- Evaluate the feasibility of increasing upstream flood storage in New Hogan Lake or elsewhere in the Calaveras River Watershed

Investment Contributions to Ecosystem and Multi-Benefit Supporting Goals

An estimated cumulative capital and ongoing cost of $1.3 billion in the 2017 refined SSIA portfolio contributes to the CVFPP supporting goals of promoting ecosystem functions and promoting multi-benefit projects, embedded mostly within larger-scale activities. To calculate this total, assumed percentages were applied to each capital and ongoing investment for the primary and supporting goals. For this purpose, the supporting goal of promoting multi-benefit projects was assumed to not include any ecosystem enhancement investments, but only purely other multi-benefit components such as groundwater recharge, navigation, and agriculture.

For example, the rural capital management action type of small-scale levee setbacks and floodplain storage can contribute to four of the seven CVFPP primary and supporting goals. To calculate the investment of the management action category toward the applicable CVFPP goals, these assumed percentages were applied:

1. Reduce the chance of flooding: 45 percent of investment assumed
2. Reduce damages once flooding occurs: 5 percent of investment assumed
3. Promote ecosystem function: 25 percent of investment assumed
4. Promote multi-benefit projects: 25 percent of investment assumed

This methodology was applied to all of the capital and ongoing investments in the 2017 refined SSIA portfolio. Then, contribution amounts were summed for each primary and supporting goal for all the capital and ongoing investments. This is how the $1.3 billion was achieved for the supporting goals of promoting ecosystem function and promoting multi-benefit projects.

Conceptual Example of Calculation for a Rural Capital Action Category									
Management Action Category	Average Investment Amount	Contribution to Goal	CVFPP Primary Goal			CVFPP Supporting Goals			
			Reduce Chance of Flooding	Reduce Damage	Improve Public Safety	Improve O&M	Promote Ecosystem	Promote Multiple Benefits	Improve Institution Support
Small-scale levee setbacks and floodplain storage	$195 million over 30 years	Assumed Percentage	45%	5%	0%	0%	25%	25%	0%
		Contribution Amount	$87.75 million over 30 years	$9.75 million over 30 years	$0	$0	$48.75 million over 30 years	$48.75 million over 30 years	$0

Notes:
1. All estimates are in 2016 dollars and indicate investment over a 30-year timeframe.
2. The "reduce the chance of flooding" primary goal was considered as the flood-specific outcome of improving system performance, "reduce damages..." was considered exposure, and "improve public safety..." was considered vulnerability.
3. The "promote multi-benefit projects" supporting goal was assumed to not include any ecosystem enhancement investment (this category is primarily groundwater recharge actions).
4. Levee setback investments were assumed to be spread among the following goals: "reduce the chance of flooding," "reduce damages...," and "promote ecosystem functions." This assumption was made to account for the interdependencies and benefits received by implementing these types of actions. Land acquisitions investments for levee setbacks was also included.
5. CVFPP goals have been abbreviated.

5.3.2 Urban Capital Investment

Urban community in Sacramento's pocket area

As was discussed in Chapter 2, total State spending on flood risk reduction projects over the last decade totaled approximately $1.5 billion. It is difficult to break this investment down by the action categories developed for the 2017 CVFPP Update (since previous spending was not being tracked according to these categories). However, it is assumed that about two-thirds of this investment was focused on urban capital investments, with remaining funds being spent on storage or other systemwide efforts, and improvements for small communities. This implies a State capacity for implementing urban improvements of about $1 billion per decade. The total cost for urban capital improvements in the 2017 refined SSIA portfolio is between $4.3 and $5.3 billion. The State's target cost shares for these types of activities can be as high as 50 percent, so this implies up to $2.7 billion in total State investment. Therefore, planning aimed at spreading the total urban capital investment need over the 30-year implementation timeframe so that potential State contributions would not significantly exceed $1 billion per decade. This approach reflects capacity limitations in the State's ability to implement these actions within a 10-year timeframe, and financial limitations in terms of the ability to also fund other high-priority actions (outside the urban footprint) during Phase 1. The following discussion provides some additional detail on how the costs were estimated and divided among Phases 1, 2, and 3.

Urban Levee Improvements

State-federal feasibility study cost estimates were given deference to provide the costs estimates for urban levee improvements.

The major investments identified in the State-federal feasibility studies will be in urban areas protected by SPFC facilities.

Due to the large magnitude of these improvements and the viability of receiving necessary funds, costs were spread across all three phases of investment for planning purposes. The following percentages were applied to the total estimated costs for all urban levee improvements resulting in the amounts shown in Table 5-3:

- Phase 1: 40 percent ($1.6 to $2 billion)
- Phase 2: 40 percent ($1.6 to $2 billion)
- Phase 3: 20 percent ($0.8 to $1 billion)

Urban flood protection investments are generally shared among USACE, the State, and local agencies. Some communities' projects are in the feasibility and engineering phase, whereas others have been authorized or are being authorized for construction. The remaining feasibility studies and construction projects left to be completed in urban areas include the following:

- Continued implementation of ongoing USACE-authorized projects:
  - Initiate authorized West Sacramento Area Flood Control Agency (WSAFCA) construction
  - Initiate federal portion of Natomas Basin American River Common Features (ARCF) construction
  - Initiate Sacramento Bank Protection Phase II Construction (American River)
  - Initiate Stockton area levee construction, including western front levees
  - Complete ARCF 2014 WRDA sites
  - Complete Folsom Dam Joint Federal Project and Dam Raise
  - Complete Marysville Ring Levee improvements
  - Complete Sacramento Area Flood Control Agency (SAFCA) levee accreditation for the Pocket Area and North Area
  - Complete Sutter Butte Flood Control Agency (SBFCA) Feather River West Levee
  - Complete San Joaquin Area Flood Control Agency (SJAFCA) Smith Canal construction
  - Complete South Sacramento County Streams construction
  - Complete WSAFCA-approved construction, including Southport Levee Improvements
  - Complete RD 17 Improvements
  - Complete Star Bend Improvements
  - Complete Bear River Improvements
- Completion of State-federal projects recommended by the following feasibility studies:
  - Cache Creek Settling Basin General Reevaluation Report (USACE, under development)
  - CVIFMS Phase 2 (USACE, under development)
  - Merced County Streams General Reevaluation Report (USACE, under development)
  - Sacramento River General Reevaluation Report (USACE, 2015)
  - West Sacramento General Reevaluation Report (USACE, 2015a)
  - Woodland Lower Cache Creek Feasibility Study (USACE, 2010)
  - Yuba River General Reevaluation Report, including study of Yuba Goldfields (USACE, 2012)
  - Yuba River Ecosystem Restoration Feasibility Study (USACE, under development)
- Implementation of projects identified in the Lower San Joaquin River Draft Feasibility Study, Phase 2 (USACE, 2015b)

Other Urban Infrastructure and Multi-Benefit Improvements

Although the levee upgrades and improvements identified in USACE estimates constitute the bulk of potential capital investment for urban areas, additional actions were identified by the RFMPs[1] and BWFSs (DWR, 2017a; DWR, 2017b). These actions represent other opportunities for reducing urban flood risk and were used to estimate the investment required for other urban infrastructure and multi-benefit improvements. Additionally, habitat restoration activities conducted on or within urban infrastructure (such as replanting riparian vegetation in existing river bank gaps) are also included in this category. Estimated costs for these actions range between $150 and $180 million.

The priority actions already in progress, most immediately ready for implementation and/or show the most promise for achieving the CVFPP's goals are listed below. Based on the score threshold for the actions included in this category, it is anticipated that these priority actions will be supported by Phase 1 and 2 funding.

- Draft San Joaquin River BWFS cost estimates for the Mormon Channel Bypass, RD 17 levee improvements, and the associated levee setback at river mile (RM) 52.

- RFMP cost estimates for levee and minor structure (such as stop logs or gated closure structures) repair, rehabilitation, and replacement activities.

5.3.3 Rural Capital Investment

The rural capital investments focus on critical repairs for rural levees and hydraulic structures, along with an emphasis on traditionally nonstructural approaches such as land acquisitions, acquiring easements, and habitat restoration/reconnection actions. The State continues to support maintaining levee crown elevations and providing all-weather access roads to facilitate inspection and flood fighting on rural SPFC levees. Land acquisitions and acquiring easements can reduce risk intensification from future population growth and improve the system's ability to attenuate floods. Rural habitat restoration can restore floodplains, improve water quality, and provide habitat for salmonids, migratory birds, and waterfowl while maintaining agricultural production. Rural flood risk reduction actions that can achieve multiple benefits will be higher priority than other projects. The following discussion describes the rural capital investments in more detail.

Rural Levee Repair and Infrastructure Improvements

The total estimated cost for rural levee repair and infrastructure improvements ranges between $1.3 and $1.6 billion, and includes critical legacy levee repairs, repair and rehabilitation of hydraulic structures, and new or upgraded retention and detention basins. The RFMPs identified most of these opportunities, with deferred maintenance constituting the bulk of the cost.

It was common for RFMP-proposed critical levee repairs (typically including activities such as erosion repair, seepage repair, slope stability repair and levee overtopping) to be provided by DWR's Non-Urban Levee Evaluations Project (NULE) cost estimation methodology. The NULE cost estimates are order-of-magnitude estimates suitable for selecting and comparing conceptual

[1] Feather River Partners, 2014; FloodProtect, 2014; Mid and Upper Sacramento River Regional Flood Management Plan Partners, 2014; Reclamation District 2092, 2014; San Joaquin Area Flood Control Agency, 2014; San Joaquin River Flood Control Project Agency, 2015

remediation's selected for levee segments based upon preliminary and limited data and analyses. These estimates were not intended to be used as a basis for final design, or construction, or as an estimate of construction cost for construction planning. In light of these limitations, NULE cost estimates were deferred to DWR's Flood System Repair Project (FSRP) estimates for critical repair sites at an average of $4 million per site.

Investment costs are relatively balanced across all three phases for rural levee repair and infrastructure improvements. New or improved levees in rural areas have potential to intensify risk in SPFC floodplains; therefore, it is recommended that only deferred maintenance and critical levee repair sites be given higher priority in rural areas.

Rural Small-scale Levee Setbacks and Floodplain Storage

The RFMPs[2] and the BWFSs (DWR 2017a; DWR, 2017b) both contain information on potential small-scale levee setbacks and floodplain storage projects, with a total estimated cost of between $170 and $220 million.

The priority actions already in progress, most immediately ready for implementation, and/or showing the most promise for achieving the CVFPP's goals, are listed below. Based on the score threshold, it is anticipated that these priority actions will be supported by Phase 1 funding.

- Draft San Joaquin River BWFS—$63 million cost estimate for levee setbacks at San Joaquin RMs 60 and 65
- A few levee improvement and setback projects with habitat restoration components provided by the RFMPs

Rural Land Acquisitions and Easements

Land acquisitions and easements allow flood and floodplain managers more flexibility to manage flood risk and contribute toward societal values in a variety of ways.

Rural agricultural or conservation land acquisitions and easement acquisitions represent potential management action types that attenuate flood flows onto designated flowage easements or purchases that improve the system's flexibility to manage flood waters. The RFMPs identified some of these potential opportunities, but most of the cost estimates were provided by DWR's emergency and floodplain management effort. This effort used flood mapping and geographic information system (GIS) tools to estimate agricultural and conservation land acquisition and easement potential within the 100-year floodplain and in a given radius of established small communities in each basin (see Appendix D for more details). These estimates range between $770 million and $930 million. Acquiring land or easements where flooding and development are both likely to occur can reduce risk intensification resulting from future population growth, especially if implemented before other less adaptable actions, like adding or hardening flood infrastructure.

[2] Feather River Partners, 2014; FloodProtect, 2014; Mid and Upper Sacramento River Regional Flood Management Plan Partners, 2014; Reclamation District 2092, 2014; San Joaquin Area Flood Control Agency, 2014; San Joaquin River Flood Control Project Agency, 2015

Many of the acreages identified in the study may not be owned by landowners who are currently eager to participate in a flood easement program.. These issues pose timing challenges, so costs were spread across all three phases of investment for planning purposes. The following percentages were applied to the total estimated costs for all rural land acquisitions and easements, resulting in the amounts shown in Table 5-3:

- Phase 1: 40 percent
- Phase 2: 40 percent
- Phase 3: 20 percent

Ideally, Phase 1 investment would focus on areas that are very high risk and involve a willing group of landholders who show interest in the economic incentives being offered through the easement program. Acquisitions and easements also allow flood and floodplain managers more flexibility to choose different types of improvements in the future. Phase 1 investment would also focus on the areas that do the most to provide this flexibility, while also considering the potential to couple with habitat restoration or flood reconnection actions. When easements or acquisitions contribute to these broader societal values, opportunities arise for different types of funding mechanisms.

Rural Habitat Restoration and Reconnection

Guided by the CVFPP Conservation Strategy (DWR, 2016), some RFMPs also identified opportunities for habitat restoration and reconnection projects with estimated costs ranging between $260 and $310 million. This is not the only category that contributes to ecosystem-related outcomes and CVFPP supporting goals. Ecosystem improvements within this category are meant to be in addition to those implemented within other categories, such as systemwide improvements. The actions in this category are distinct because they are focused primarily on habitat improvements or connection rather than reduction of flood risk.

Wetlands in the Lower San Joaquin Region

The priority actions already in progress, most immediately ready for implementation, and/or showing the most promise for achieving the CVFPP's goals are restoration of hundreds of acres of floodplains, improvement of water quality, and provision of habitat for salmonids, migratory birds, and waterfowl while maintaining agricultural production. Based on the score threshold, it is anticipated that these priority actions will be supported primarily by Phase 1 funding.

5.3.4 Small Community Capital Investment

Many management actions applicable to small communities would require annual and ongoing expenditures and could provide effective flood risk reduction at a lower cost than capital

improvements. Therefore, only a limited amount of capital expenditure is recommended for small communities (split between more traditional levee improvements, and investment in property acquisition and retreat). The section below describes the recommended capital investments for small communities.

Small Community Levee Repair and Infrastructure Improvements

The estimated cost for currently identified repairs and improvements to levees and hydraulic structures is approximately between $860 million and $1.1 billion. Most of these costs reflect potential investments in levee repairs and improvements identified by RFMPs in the Sacramento Basin. This estimate also includes the cost for levee and hydraulic structure improvements identified in the Draft San Joaquin River BWFS (DWR, 2017b) for protecting the City of Firebaugh, along with other multi-benefit actions.

Small Community within the Mid-Upper Sacramento Region

Small community levee repair and infrastructure improvements are considered anywhere from a low- to a high-priority investment, depending on location and the potential for risk management with more cost-effective (and less risk-intensifying) alternatives. Therefore, costs are somewhat similar for each phase of investment with an emphasis in Phase 2, because results from the Small Community Program feasibility studies should more specifically describe which improvements will be needed.

Small Community Levee Setbacks, Land Acquisitions, and Habitat Restoration

Cost estimates for these actions are composed mostly of the costs for potential land and property acquisition and easements estimated by DWR's emergency and floodplain management effort, which range approximately from $640 to $780 million. Higher priority will be given to these actions that limit future intensification of flood risk and add flexibility and resiliency to the flood management system. Levee setbacks and land acquisition in small communities require close coordination with local partners and landowners and compatibility with local land use plans. Therefore, investments in these actions are assumed to ramp up over time throughout the three phases, with limited progress occurring in Phase 1.

5.4 Phased Ongoing Investment

A ramping scheme was applied to planned ongoing investments for the State and its partner agencies to provide time for establishing the necessary staff, resources, and mechanisms needed to accommodate the influx of annual funding while maintaining their routine activities. The ramping scheme is based on the prioritization and scoring process described in Chapter 3.

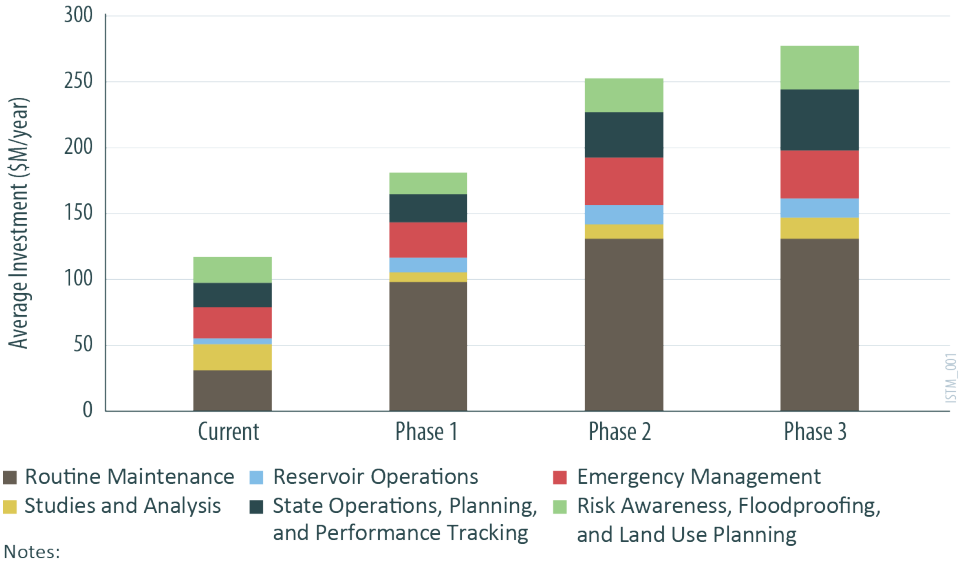
Overall, scoring thresholds were used to create high, medium, and low priority levels. Percentages for each priority level and phase were applied to all ongoing management action categories to create the buildup of investment costs over time. Table 5-4 shows the percentage of annual investments included in each phase for a given priority level, achieving full investment by the end of Phase 3.

Table 5-4. Ongoing Investment Ramping Scheme

Priority	Applied Percentage of Annual Investments (%)
Phase 1: 2017 to 2027	
Low	20
Medium	50
High	75
Phase 2: 2027 to 2037	
Low	50
Medium	75
High	100
Phase 3: 2037 to 2047	
Low	10
Medium	100
High	100

Figure 5-5 and Table 5-5 show how these ramping percentages affect all of the ongoing management action categories. All investment amounts are presented in annualized terms, where Phase 3 totals are the desired ongoing investment moving into the future. The following provides further detail on each management action category, and how various subsets of activities within that line item were grouped into Phase 1, 2, or 3.

Figure 5-5. Ongoing SSIA Phased Over Time by Management Action Categories



Notes:
1. All estimated dollar values are in 2016 dollars and indicate average annual investments made over 30 years. They have not been discounted to present value nor escalated for inflation.
2. Ramping of investments shown represent capacity building of staff and resources, it is not intended to account for escalating costs from inflation.

Table 5-5. Ongoing Investments of the 2017 Refined SSIA Portfolio Per Year (2016 $)

Action Category and Area of Interest	Data Source	Phase 1		Phase 2		Phase 3	
		Low ($M)	High ($M)	Low ($M)	High ($M)	Low ($M)	High ($M)
Systemwide							
State operations, planning, and performance tracking	RFMPs and State operations/planning effort	$19	$24	$31	$38	$41	$50
Emergency management	RFMPs and emergency management effort	$24	$30	$32	$40	$33	$40
Reservoir operations	BWFSs	$10	$12	$13	$16	$13	$16
Routine maintenance	OMRR&R Workgroup	$88	$108	$118	$144	$118	$144
	Annual Subtotal:	**$141**	**$174**	**$194**	**$238**	**$205**	**$250**
Urban							
Risk awareness, floodproofing, and land use planning	RFMPs and floodplain management effort	$7	$8	$10	$12	$12	$15
Studies and analysis	RFMPs and USACE	$1	$1	$2	$2	$3	$3
	Annual Subtotal:	**$8**	**$9**	**$12**	**$14**	**$15**	**$18**
Rural							
Risk awareness, floodproofing, and land use planning	RFMPs and floodplain management effort	$2	$2	$3	$4	$4	$6
Studies and analysis	RFMPs	$1	$1	$1	$2	$3	$4
	Annual Subtotal:	**$3**	**$3**	**$4**	**$6**	**$7**	**$10**
Small Community							
Risk awareness, floodproofing, and land use Planning	RFMPs and floodplain management effort	$6	$7	$10	$12	$14	$18
Studies and analysis	RFMPs and Small Communities Program	$5	$6	$7	$9	$10	$12
	Annual Subtotal:	**$11**	**$13**	**$17**	**$21**	**$24**	**$30**
	Ongoing Annual Total:	**$163**	**$199**	**$227**	**$279**	**$251**	**$308**

Notes:

1. Estimated dollar values are in 2016 dollars and indicate annual investments made over 30 years. They have not been discounted to present value nor escalated for inflation.
2 Present value of total ongoing investments is approximately $5 billion over 30 years.
3. A cumulative capital and ongoing cost of $1.3 billion within the 2017 refined SSIA portfolio contributes to the CVFPP supporting goals of promoting ecosystem functions and promoting multi-benefit projects, embedded most within larger scale activities.
4. Currently, DWR's DFM spends an approximate annual $58 million per year. SPFC-related staff work on a range of activities and management actions across all areas of interest. Therefore, staff costs may be incorporated into other ongoing management action categories other than the State operations, planning, and performance tracking line item.

5.4.1 Systemwide Ongoing Investment

Ongoing investments include a variety of unique and critically important activities, such as emergency management and routine maintenance, that could be incorporated into all the areas of interest. However, due to the interlinkage, dependencies and funding of these activities throughout the flood system, emergency management and routine maintenance, were assigned to the systemwide area of interest. Additionally, the systemwide ongoing investments include State operations, planning, and performance tracking and reservoir operations. The following section describes these investments in more detail.

State Operations, Planning, and Performance Tracking

Chapter 2 described the importance of enabling conditions that support effective implementation of the CVFPP over 30 years. State operations, planning, and performance tracking activities represent the State's contributions toward creating those enabling conditions.

To support the wide variety of investments which make up the 2017 refined SSIA portfolio, the State requires adequate capacity to administer program activities, continue planning and coordinating with federal agencies, and develop an initial performance tracking system for assessing the effectiveness of these flood management system investments.

A performance tracking system would compare the actual outcomes of the CVFPP investment against intended outcomes. This would enable flood managers to make better-informed decisions on what types of actions and policies are working most effectively to achieve CVFPP goals. Higher priority is assigned to maintaining State operations that support the implementation of flood management system improvements and to developing a performance tracking system for investments. Additionally, high priority is assigned to updates to the 2017 Flood System Status Report (DWR, 2016c) (mandated by legislation) and the 2017 SPFC Descriptive Document Update (DWR, 2016d) (if needed) that would accompany the future CVFPP updates, which inform the CVFPB of performance and changes to the SPFC.

Activities related to State operation, planning, and performance tracking is estimated to cost between $41 and $50 million annually. This cost estimate includes necessary DWR and other State agency staff and resources for planning and performance tracking activities associated with the SPFC. This estimate does not include any costs associated with federal or local agency operations, planning, or performance tracking. This estimate also does not include a portion of staff time that is spent on SPFC-related projects where those costs have been included in the capital total project costs and/or the state cost share is provided by bond funding and not the State General Fund.

Currently the DFM spends an annual estimated $58 million on SPFC-related staff and overhead. SPFC-related staff work on a range of activities and management actions across all areas of interest. Therefore, staff costs may be incorporated into other ongoing or capital management action categories other than the State operations, planning and performance tracking line item. For more information on the State expenditures on all flood management activities related to the SPFC see Appendix D.1.

Emergency Management

Flood exercises improve flood emergency readiness

Emergency management is estimated to cost between $33 and $40 million annually. Cost estimates for local and operational area flood emergency response planning and preparedness are based on a combination of the RFMP project cost estimates and on DWR projections based on the three flood emergency response grant programs since 2013. This includes three flood emergency response plan updates for each of the 88 LMAs in the Sacramento and San Joaquin basins. The emergency and floodplain management effort also estimated the cost of replacing/renewing flood fight supplies, updating flood information systems, adding new forecast points, exercising and equipping the State's flood emergency response teams, and other activities. This cost estimate only includes State and local costs estimated in the RFMPs.[3] Federal emergency management costs are not included. For more information on the emergency management cost estimates see Appendix D.2.

The priority actions already in progress and/or most immediately ready for implementation to reduce vulnerability of people and property in high risk areas are listed below. It is anticipated that these priority actions will be supported or continue to be supported by Phase 1 funding. However, other additionally proposed emergency management activities may not be fully funded until Phase 2.

- Design and construct improved all-weather access roads on levee crowns for quick response to flood emergencies
- Enhance flood forecasting and notifications for rural and small communities by assessing and prioritizing needs, identifying additional forecasting points in Sacramento and San Joaquin basins, and providing flood forecasts and notifications
- Continue to maintain strategically located stockpiles of flood fight materials in the Sacramento and San Joaquin Valleys, and three locations in the Delta
- Provide technical and financial assistance to local agencies to help them develop local flood preparedness and response plans for their communities and conduct regional and local flood exercises, and engage local responders to improve flood emergency readiness at the local level

[3] Feather River Partners, 2014; FloodProtect, 2014; Mid and Upper Sacramento River Regional Flood Management Plan Partners, 2014; Reclamation District 2092, 2014; San Joaquin Area Flood Control Agency, 2014; San Joaquin River Flood Control Project Agency, 2015

- Develop and train staff on the use of the Flood Emergency Management System for the State-Federal Joint Flood Operations Center to manage, track, and report the flood emergency management and flood fight activities

Reservoir Operations

Reservoir operations management actions such as F-CO and future F-IO were identified and refined by the RFMPs and San Joaquin River BWFS (DWR, 2016b). The total estimated cost of improved reservoir operations ranges from $13 million to $16 million annually. This cost estimate only reflects State costs associated with reservoir operations.

New Bullards Bar Reservoir

The priority actions most immediately ready for implementation or currently already in progress are listed below. It is anticipated that these priority actions will be supported by Phase 1 funding and ramp up throughout the other phases of investment.

- Continue to conduct F-CO and improve F-IO on Oroville Dam and the Feather River and New Bullards Bar and the Yuba River

- Evaluate reservoir operations actions for New Don Pedro Reservoir in the Tuolumne River Watershed

- Develop a decision support system and other tools for reservoir operators to enhance both F-CO and F-IO and conduct operational exercises with reservoir operators that emphasize coordinated operations of reservoirs critical to flood management in the Central Valley

Routine Maintenance

DWR's flood project inspections, the FSRP, and the RFMPs identified cost estimates for deferred systemwide routine maintenance that include a wide range of activities such as comprehensive bypass or corridor vegetation and invasive species management, sediment removal, and rodent control. The OMRR&R Workgroup identified similar costs of routine maintenance but also identified costs for the repair, rehabilitation and replacement of many facilities within the SPFC. Costs associated with the following activities are included in this ongoing investment category.

- Routine maintenance activities include:
  - Comprehensive bypass or corridor vegetation and invasive species management
  - Levee maintenance, such as rodent control, vegetation control, encroachments and pipe maintenance, minor bank erosion and repair
  - Channel maintenance, such as vegetation control and sediment removal
  - Minor structures maintenance, such as stop log or gated closure structures, pumping plants, monitoring wells and piezometers, retaining walls and floodwalls, pipe penetrations, and encroachments
  - Major structures maintenance, such as weirs, bypass outflow control structures, outfall gate facilities, and large regional pumping plants
- Repair, rehabilitation and replacement activities include:
  - Critical seepage and erosion levee repairs
  - Giant reed *(Arundo donax)* invasive species removal
  - Encroachment replacement, removal or repair
  - Legacy pipe penetration replacement, removal or repair
  - Minor and major structure full rehabilitation or replacement

The OMRR&R Workgroup estimates were produced collaboratively, and during the same time period as the regional planning effort, and contain similar identified activities. Regional maintenance needs and projects were used in the range of costs and composite averages provided in each cost category in the OMRR&R TM (DWR, 2017e), which is considered to represent an upper overall range of annual costs needed for routine and frequently deferred or un-funded maintenance. Therefore, a total of $131 million annually as provided by the OMRR&R TM (estimate ranges between $118 and $144 million annually) was used for the true cost of long-term OMRR&R throughout the SPFC for the routine maintenance category. The only exception is that these costs do not include any large-scale slope stability repair activities, these estimates remain in the capital levee improvements due to the magnitude of their effort and costs.

The higher-priority activities listed below will be carried out by the State on facilities for which it is responsible under California Water Code Sections 8361 and 12878.

- Maintain all-weather levee crown roads for quick response to potential flood threats
- Enhance inspection and maintenance of the levees and channels of the SPFC under jurisdiction of the State
- Enhance inspection and coordinate maintenance of the levees under local jurisdictions
- Ensure that sites identified as requiring maintenance actions during spring inspections are properly maintained and repaired by fall before the flood season
- Address long-standing impediments to sediment and debris removal
- Develop strategies for long-term system management and maintenance of the SPFC facilities, including strategies to address legacy system issues such as encroachment and pipe penetrations

The State will work with local agencies to explore funding mechanisms, clarify roles and responsibilities, and ensure proper operation and maintenance of all SPFC facilities including those not maintained by the State. Only a proportion of these priority activities can be funded with Phase 1 levels of funding, given that the State and local entities currently lack adequate capacity to implement the full suite of maintenance activities the flood system needs.

Routine mowing on levees

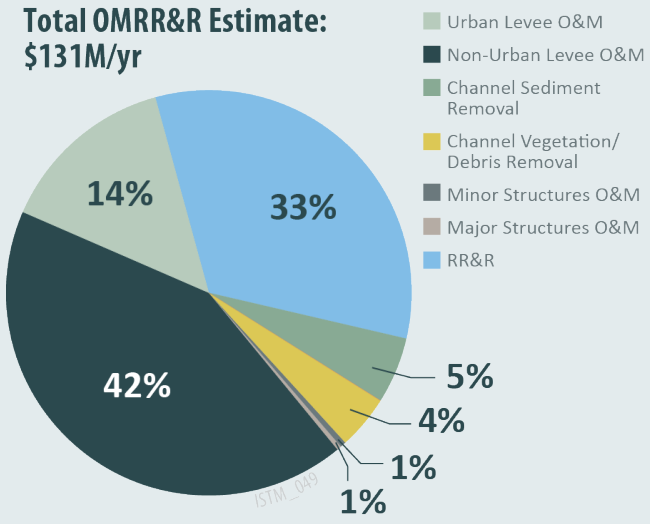
Understanding Routine Maintenance

O&M is the traditional term used to describe the routine activities necessary for a healthy flood control system. OMRR&R is a more recently developed term used to describe and include the comprehensive set of non-routine activities needed to ensure an effective flood management system.

The OMRR&R Workgroup estimated an annual need of $131 million for routine maintenance activities and for repair, rehabilitation, and replacement activities. To better understand the depth of activities covered by this estimated cost, it is helpful to define what each component of OMRR&R is and the categories used explicitly in the OMRR&R TM. (DWR, 2017e)

- **Operation:** Daily activities needed to keep the system functioning properly and for a responsible agency to perform its duties
- **Maintenance:** Routine activities (including minor repairs) that need to be performed to keep the system operational
- **Repair:** Non-routine activities needed to fix damage caused by a specific event
- **Rehabilitation:** Non-routine activities needed to fix damage caused by prolonged wear and tear degradation
- **Replacement:** Installation of new equipment and facilities needed when components have either failed or exceeded their useful life

SPFC Levees	SPFC Channels	SPFC Structures
Operation and Maintenance Cost Categories		
▪ Urban ▪ Non-urban	▪ Sediment removal ▪ Vegetation and debris removal	▪ Minor (includes pipe inspections) ▪ Major
Repair, Rehabilitation and Replacement Cost Categories		
▪ Urban ▪ Non-urban	▪ Giant reed (*Arundo donax)* removal	▪ Minor structures (includes legacy pipe penetration removal and replacement) ▪ Major structures



5.4.2 Urban Ongoing Investment

Ongoing investments are an important part of the urban portfolio to help achieve CVFPP goals and help manage risk in urban areas. Urban ongoing investments include risk awareness, floodproofing, land use planning and studies and analysis. These activities are needed on an annual basis to supplement systemwide ongoing investments and capital investments to overall reduce flood risk and increase flood risk awareness. Therefore, sustained annual funding is necessary. The following section discusses these investments in more detail.

Urban Risk Awareness, Floodproofing, and Land Use Planning

These actions are estimated to cost between $12 and $15 million annually. This estimate is based on proposed projects in various RFMPs and DWR's emergency and floodplain management effort. Estimates from this effort are based primarily on existing State expenditures for floodplain risk management programs and activities, with the majority of the costs focused on floodplain mapping. However, the numbers also include cost estimates for additional activities, including the creation and maintenance of an information management system, periodic channel capacity updates, sediment modeling, and land use planning. Opportunities identified in the RFMPs for floodplain management in urban areas include a mix of floodproofing and monitoring activities. For more information on the floodplain management cost estimates see Appendix D.3.

Higher priority will be given to actions that provide increased public risk awareness and notification for urban areas that have yet to receive structural improvements, especially if these activities involve critical facilities such as wastewater treatment plants, hospitals, or other emergency service facilities. These activities are anticipated to be included with Phase 1 funding levels, whereas some other activities may not be fully funded until Phase 2 or 3.

Urban Studies and Analysis

Cost estimates for ongoing studies and analysis were informed by proposed studies in the six RFMPs and by State-federal feasibility studies. The State-federal feasibility studies that are still in progress or will be initiated in the near future included in this estimate are as follows:

- Sacramento General Reevaluation Report (USACE, 2015
- West Sacramento General Reevaluation Report (USACE, 2015a)
- Cache Creek Settling Basin General Reevaluation Report (USACE, under development)
- Woodland/Lower Cache Creek Feasibility Study (USACE, 2010)
- Yuba River General Reevaluation Report (USACE, 2010)
- Merced County/Bear Creek Unit Feasibility Study (USACE, under development)
- Lower San Joaquin Feasibility Study, Phase 2 (USACE, 2015b)

The total annualized cost of studies and analysis for urban areas is approximately $3 million.

In some cases, efforts to complete these remaining urban studies and analyses are already underway, so continuation of these efforts for urban areas would be funded in Phase 1. Therefore, most of the remaining urban studies and analyses are medium priority and are anticipated to be funded by Phase 2, allowing much needed small community feasibility studies and analysis to begin in Phase 1.

5.4.3 Rural Ongoing Investment

Rural areas can obtain benefits from ongoing investments such as risk awareness, floodproofing, land use planning and studies and analysis. These activities are critically important in rural areas because of their effectiveness in preparation for flood events and ability to increase flood risk awareness over large geographic areas. Therefore, sustained annual funding for these activities is necessary. The following section discusses these investments in more detail.

Rural Risk Awareness, Floodproofing, and Land Use Planning

These actions are estimated to cost between $4 and $6 million annually. Similar to the estimates for urban areas, this cost range estimate is based on a limited number of proposed projects in various RFMPs and DWR's emergency and floodplain management effort. Estimates from this effort are based on the same State expenditures and types of activities as discussed in the urban areas. Other opportunities identified in the RFMPs for floodplain management in rural areas focus primarily on land use planning and data sharing and management. For more information on the floodplain management cost estimates see Appendix D.3.

The 2017 refined SSIA portfolio proposes that higher-priority annual investment in floodplain management represent a more modest increase from current spending levels, starting at $2 to $3 million annually for rural areas. This would mark the beginning of a trend toward greater investment over time in these types of proactive, resilient actions. This initial level of investment, funded by Phase 1, should focus on the following:

- Efforts to establish flood structure protection area zones
- Educational and training opportunities and additional regulations for land use planners to help ensure sound floodplain management is considered in land use planning at the local level
- Collaboration with FEMA on investing in incentives for implementing proactive floodplain management activities

Rural Studies and Analysis

Cost estimates for ongoing studies and analysis were based entirely on the cost of studies proposed by the six RFMPs. The total annualized estimated cost for rural areas ranges from approximately $3 to $4 million. Many of these studies and analyses include feasibility studies for smaller-scale levee and structure repairs, investigations for sediment management, and studies that focus on multi-benefit approaches to risk reduction.

While ongoing study and analysis is necessary even in Phase 1, most rural studies and analysis are medium to low priority, and anticipated to be funded by Phases 2 and 3. Funding for other more pressing rural investments such as flood risk notifications, emergency management, and high-priority capital investments will take priority over these types of studies and analyses.

5.4.4 Small Community Ongoing Investment

Similar to rural areas, small communities can also obtain benefits from ongoing investments such as risk awareness, floodproofing, land use planning and studies and analysis. Particularly effective activities in small communities are risk awareness and floodproofing, due to the densely populated small geographic areas. The following section discusses these investments in more detail.

Small Community Risk Awareness, Floodproofing, and Land Use Planning

The cost for these actions is ranges from approximately $14 to $18 million annually, based on a limited number of proposed projects in various RFMPs and DWR's emergency and floodplain management efforts. Floodplain risk awareness campaigns and implementation of land use management policies are particularly effective at risk reduction for small communities. For more information on the floodplain management cost estimates see Appendix D.3.

Therefore, the 2017 refined SSIA portfolio proposes that higher priority be given to these annual investments because many of these actions can be implemented fairly quickly, especially with the bolstering and support of the National Flood Insurance Program (NFIP) Community Rating System implementation program. These activities may be fully supported within Phase 1, while some of the costlier floodproofing opportunities identified in the floodplain management effort may not start until Phases 2 and 3. This is because of current capacity constraints in floodplain management implementation programs and the need for continued coordination with local and federal partners.

Small Community Studies and Analysis

Cost estimates for ongoing studies and analysis were based entirely on the cost of studies proposed by the six RFMPs. The total annualized estimated cost for small communities ranges between $10 and $12 million. The majority of these analyses are small community feasibility studies for flood risk reduction improvements that could be funded through the Small Community Flood Risk Reduction Program. These feasibility studies will consider a range of actions, such as structure buyout or flood-proofing structures, in addition to levee construction that could offer flexibility in addressing risk for small communities. These studies and analyses are assigned higher priority over similar studies in other areas of interest because much remains unknown about the best way to reduce and/or manage risk in the Central Valley's small communities. Most of these studies are anticipated to be funded by Phase 1.

Small community flood planning, studies, and analysis

5.4.5 Ongoing Annual Investment Comparison

Acknowledging and separating capital and ongoing investments is a major plan refinement since the 2012 CVFPP. This acknowledgement and separation has highlighted the amount of funding currently dedicated to ongoing investments, which is far less than the recommended levels of investment. Moving forward, annual estimated investments of $251 to $308 million represent a major increase from current and historical levels of funding.

To better understand this major increase that will be required by all cost share partners, current and historical funding levels are needed relative to the proposed investments in management action categories. Table 5-6 presents current estimated contributions of State, federal, and local partners to the 2017 refined SSIA portfolio's ongoing investments.

Table 5-6. Ongoing Investment Annual Comparison of the 2017 Refined SSIA Portfolio and Current Funding (2016 $ Million)

Current Contribution to Ongoing Investments						2017 Refined SSIA Portfolio Ongoing Investments		
Cost Share Partners and Current Activities	Data Source[1]	State ($M/year)	Federal ($M/year)	Local ($M/year)	Total ($M/year)	Area of Interest and Management Action Category	Data Source	End of Phase 3 Estimate ($M/year)
▪ **State:** Flood Management Planning Implementation Program	▪ **State:** Average expenditure for years 2006 through 2015 from DFM Fiscal Database. Estimate does not include all DFM operating costs. Assumed 50% of spending in this program was for studies and analysis. This amount was subtracted from this estimate.	$18.5	N/A	N/A	$18.5	**Systemwide:** State operations, planning, and performance tracking	▪ **RFMPs:** bypass and corridor management planning, regional programmatic permitting ▪ **DWR Operations/Planning Effort:** State activities and resources associated with implementation of a 30-year program	$41 to $50
▪ **State:** Flood Emergency Response Implementation Program ▪ **Local:** City, county, and special district disaster preparedness	▪ **State:** Average expenditure for years 2006 through 2015 from DFM Fiscal Database. ▪ **Local:** Disaster preparedness data only available for cities. Assumed the same average of overall flood management budget ($0.05 M for years 2003 through 2014) that cities spent on emergency response was also spent by counties and special districts.	$23.3	N/A	$0.15	$23.45	**Systemwide:** emergency management	▪ **RFMPs:** emergency preparedness (e.g., all-weather patrol and access roads, training and planning), emergency response and recovery (e.g., flood fight, evacuations) ▪ **DWR Emergency Management Effort:** Flood emergency response planning (e.g., forecasting/gaging, alerts and early warning systems, evacuation mapping), flood emergency response preparedness (e.g., emergency response stockpile materials, training and exercising, Flood Operations Center)	$33 to $40
▪ **State:** Flood System Operations & Maintenance Implementation Program (reservoir operations activities)	▪ **State:** Average expenditure for years 2006 through 2015 from DFM Fiscal Database. Assumed 25% of implementation program spending allocated to reservoir operations	$4.6	N/A	N/A	$4.6	**Systemwide:** reservoir operations	▪ **RFMPs:** F-CO for Yuba and Feather rivers, F-IO for Oroville, coordinated reservoir operations for Lower San Joaquin LMAs ▪ **DWR San Joaquin BWFS:** increase objective release from New Don Pedro in the Tuolumne River Watershed	$13 to $16
▪ **State:** Flood System Operations & Maintenance Implementation Program (routine maintenance activities)	▪ **State:** Average expenditure for years 2009 through 2016 from DFM Flood Maintenance Office Budget record, does not include administrative expenditures for the Flood Maintenance Office or the Joint Operations Center in support of DWR maintenance yards. ▪ **Local:** DFM LMA Annual Reporting Database, 2009 through 2016.	$10.0	N/A	$20.3	$30.3	**Systemwide:** routine maintenance	▪ **DWR OMRR&R Workgroup:** Routine maintenance activities including comprehensive bypass or corridor vegetation and invasive species management, rodent control, encroachments and pipe maintenance, minor bank erosion and repair, channel maintenance, such as vegetation control and sediment removal and minor and major structure maintenance. Repair, rehabilitation and replacement activities including critical seepage and erosion levee repairs, giant reed *(Arundo donax)* invasive species removal, encroachment removal, legacy pipe penetration replacement, removal or repair, and minor and major structure full rehabilitation or replacement.	$118 to $144
▪ **State:** Floodplain Risk Management Implementation Program (primarily risk assessment mapping) ▪ **Federal:** FEMA floodplain mapping	▪ **State:** Average expenditure for years 2006 through 2015 from DFM Fiscal Database. ▪ **Federal:** FEMA: flood hazard mapping average expenditures from 2005 through 2009.	$17.6	$2	Unknown	$19.6	**Urban, rural and small community:** risk awareness, floodproofing and land use planning	▪ **RFMPs and DWR floodplain management effort:** floodplain mapping and delineations, flood risk awareness campaigns, land use planning, elevating and flood proofing structures, technical support	$30 to $39
▪ **State:** Flood Management Planning Implementation Program ▪ **Federal:** USACE, surveys, feasibility, preconstruction engineering and design	▪ **State:** Average expenditure for years 2006 through 2015 from DFM Fiscal Database. Assumed 50% of spending in this program was for studies and analysis. ▪ **Federal:** Average expenditures from 2003 to 2016.	$18.5	$1.8	Unknown	$20.3	**Urban, rural and small community:** studies and analysis	▪ **RFMPs:** small community feasibility studies, 100-year studies and analysis, specialty studies (e.g., groundwater recharge analysis) ▪ **USACE:** urban 200-year level of protection analysis, specialty studies (e.g., geotechnical analysis, channel capacity analysis)	$16 to $19
Annual Subtotal:		**$92.5**	**$3.8**	**$20.45**	**$116.75**			**$251 to $308**

Note:
1. See Appendix A for all data tables and references on historical State, federal, and local expenditures.

DFM = DWR's Division of Flood Management
N/A = Not applicable, this cost share partner does not participate in this activity.
Unknown = Current contribution by this cost share partner is unknown.

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5.5 Summary of Capital and Ongoing Costs over 30 Years

The summary of the total 30-year investment for CVFPP is presented below. Current expenditures and what additional funding is necessary over current expenditures to implement this investment is discussed in Chapters 6 and 7. The total 30-year investment is broken down by the two river basins (Sacramento and San Joaquin) and by the four areas of interest (systemwide, urban, rural, and small community). Table 5-7 represents the summation of the cost estimates provided by the State-federal feasibility studies, BWFSs (DWR 2017a; DWR, 2017b), RFMPs[4], OMRR&R Work Group, and other efforts. This summation is the critical "need" for SPFC investments demonstrated by multiple efforts and agencies with responsibility for improving and maintaining the SPFC. Both the 30-year capital investment and 30-year ongoing investment of the 2017 refined SSIA portfolio are summarized in Table 5-7 and Figure 5-6 in 2016 dollars.

Figure 5-6. CVFPP 30-Year Investment

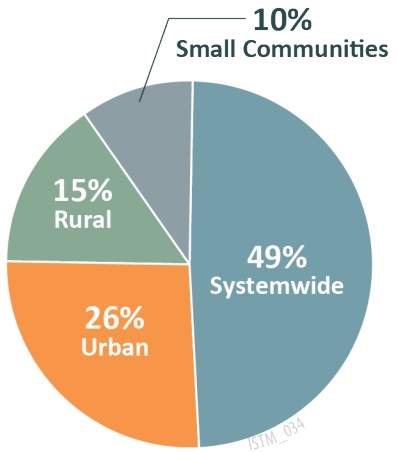

Table 5-7. Total Capital and Ongoing CVFPP Investments over 30 Years

Area of Interest	Sacramento Basin		San Joaquin Basin		Total	
	Low ($M)	High ($M)	Low ($M)	High ($M)	Low ($M)	High ($M)
Systemwide	$6,310	$7,710	$2,220	$2,720	$8,530	$10,430
Urban	$3,410	$4,160	$1,090	$1,330	$4,500	$5,490
Rural	$1,640	$2,000	$950	$1,160	$2,590	$3,160
Small Community	$1,490	$1,830	$320	$390	$1,810	$2,220
Grand Total:	**$12,850**	**$15,700**	**$4,580**	**$5,600**	**$17,430**	**$21,300**

Note:
Totals reflect annual ongoing investments converted to present value (2016 dollars) and are summed with present value capital investment costs.

Taken together, the cost estimates indicate a total present value investment need of approximately $17 to $21 billion over the next 30 years. The cost of implementing the full range of investments identified in the CVFPP represents a major increase from current and historical levels of funding.

[4] Feather River Partners, 2014; FloodProtect, 2014; Mid and Upper Sacramento River Regional Flood Management Plan Partners, 2014; Reclamation District 2092, 2014; San Joaquin Area Flood Control Agency, 2014; San Joaquin River Flood Control Project Agency, 2015

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6.0 Assessment of Potential Funding Mechanisms

Chapter 6 Highlights

- Chapter Outline:
  - Potential State Funding Mechanisms
  - Potential Federal Funding Mechanisms
  - Potential Local Funding Mechanisms
  - Other Potential Private Partnerships
  - Summary of Potential Funding Mechanisms
- Key Chapter Takeaways:
  - A large set of potential funding mechanisms, including existing and proposed mechanisms, were considered for CVFPP implementation
  - Existing mechanisms will need to be supplemented with some new mechanisms having a better nexus[1] to project benefits

Many potential funding and financing mechanisms were considered for continued CVFPP implementation.[2] Any and all of these mechanisms could be developed and applied at some point in the next 30 years to fund actions in the 2017 refined SSIA portfolio. This chapter discusses a range of funding mechanisms and their potential use for capital or ongoing investments, which is a critical distinction. For ongoing investment, the mechanisms include existing, authorized funding streams of various kinds, such as the State General Fund or local taxes and special benefit assessments, and for capital investments, limited-duration capital finance mechanisms, such as GO bonds or local bonds.

[1] "Nexus" refers to whether and how well a source of funding connects to benefits received from an activity. See next page.

[2] Throughout the remainder of this CVFPP investment strategy, the term "funding mechanism" may also include financing mechanisms. For more general information about financing versus funding, see Chapter 1, page 1-5.

The potential role for each funding mechanism within a flood investment strategy depends on three factors: applicability, reliability, and political viability as described below.

Funding Mechanism vs. Financing Mechanism

A funding mechanism is an instrument used to create a funding stream. A financing mechanism takes that revenue stream and issues debt to make a larger sum available immediately.

- **Applicability** to given action types is a function of two criteria as follows:
  - **Mechanism type.** The nature of the mechanism's revenue stream (i.e., ongoing vs. limited-duration capital). In terms of the nature of a mechanism's revenue stream, there are important distinctions between those appropriate for ongoing investment versus those more suited to capital investment. State GO bonds, for example, must be paid back from the State General Fund over the authorized period, often 25 or 30 years. Bonds cannot be used for operational and routine maintenance expenses. Therefore, mechanisms available for ongoing investments do not include GO bonds or other funding sources that are limited to capital investments.
  - **Nexus.** In terms of funding mechanisms, nexus refers to whether and how well a source of funding connects to the benefits received from an activity. Funding mechanisms have a strong nexus when the beneficiaries of the service pay for it in proportion to their share of the benefit. If a sufficient nexus cannot be established, the funding mechanism may not be appropriate for the activity being proposed unless there are other compelling reasons for using it. For example, water rates are assessed based on the benefit received (i.e., amount of water used) and the cost to produce this benefit (i.e., cost to deliver, treat, and purchase water). Many of the funding mechanisms that use property assessments have strict guidelines regarding the nexus between the benefits received and allocated costs determining the resulting assessment. The principle of nexus is used in determining the best mechanism for each category type.
- **Interannual reliability** refers to the extent to which the availability of a given amount of revenue from a funding mechanism can be predicted for years or even decades into the future. This is a different consideration from applicability. GO bonds, for example, are an applicable funding mechanism for a host of 2017 refined SSIA portfolio investments, but it is difficult to rely on the passage of new bonds at given intervals into the future. The passage and approval of new GO bonds tends to depend on voters' awareness of the need for investment and the public benefit that investment might provide. However, historical patterns show that for flood and water management, that awareness usually does not exist without a recent crisis or other triggering news story that encourages public willingness to pay for related investments.
- **Political viability** may also play a role in choosing between funding mechanisms for various action categories. Sometimes the most applicable and reliable mechanisms are the most difficult to develop or approve from a political perspective (for example, the challenges of Proposition 218 discussed in Chapter 1). This is especially important when considering new funding mechanisms; those that are currently less politically viable may not be ready for use for several years, a decade, or more.

6.1 Potential State Funding Mechanisms

In the following sections, the applicability, reliability and political viability of each mechanism is assessed. A discussion then follows on the role that each mechanism plays within the CVFPP investment strategy and on its revenue generation potential over the CVFPP's 30-year implementation timeline.

6.1.1 State General Fund

The State General Fund is the predominant source of money for many ongoing State government programs. It covers costs not specifically designated for any other fund. The primary sources of revenue are personal income tax, sales tax, and bank and corporation taxes. Major activities covered by the State General Fund include education, health and welfare programs, and corrections. A small percentage goes to DWR.

Applicability

The State General Fund is typically used to fund ongoing operations. Because all state taxpayers contribute to the State General Fund, activities providing broad public benefit or statewide resource management would have the strongest nexus. Much of the 2017 refined SSIA portfolio does have the potential to generate statewide public benefits; flood events can impair regional and statewide economic activity as a result of damage to commerce, transportation, and utilities. In addition, broad, statewide ecosystem benefits are provided by some flood management activities. This nexus indicates that the State General Fund would be a good funding source for ongoing activities that limit or reduce flood risk for people or the economy, or which provide other broad benefits like ecosystem improvements or recreational opportunities.

Interannual Reliability

While DWR's DFM can reasonably expect to get some State General Fund support for ongoing activities each year, the level of support varies greatly depending on incoming GO bond funds, and on the strength of the California economy. State General Fund revenues generally go down during recessions, and back up again during times of recovery and economic strength. Also, in the past, basic State General Fund contributions to flood management have decreased when flood management is slated to receive higher amounts of GO bond funding.

Political Viability

Any new contribution from the State General Fund would have to be approved through the State budgetary process, which is highly competitive for limited funds. Flood management programs in the Central Valley are managed by DWR's DFM. Given the competition for State General Fund revenue from other high-profile programs such as education, the political viability of significantly greater reliance on it for flood management might be low, unless Central Valley flood managers can improve public and policymaker awareness about the public benefits of ongoing flood management activities in the valley.

Role in a Flood Management Investment Strategy

The State General Fund is already used to fund ongoing activities like emergency management, State O&M responsibilities (including ecosystem restoration efforts), floodplain management, and State institutional capacity including development and use of technical tools and planning activities. Contributions to these kinds of activities are planned to continue, and may slowly

increase over time as public and policymaker awareness increases about the broader public value of active system maintenance and proactive investment in floodplain and residual risk management.

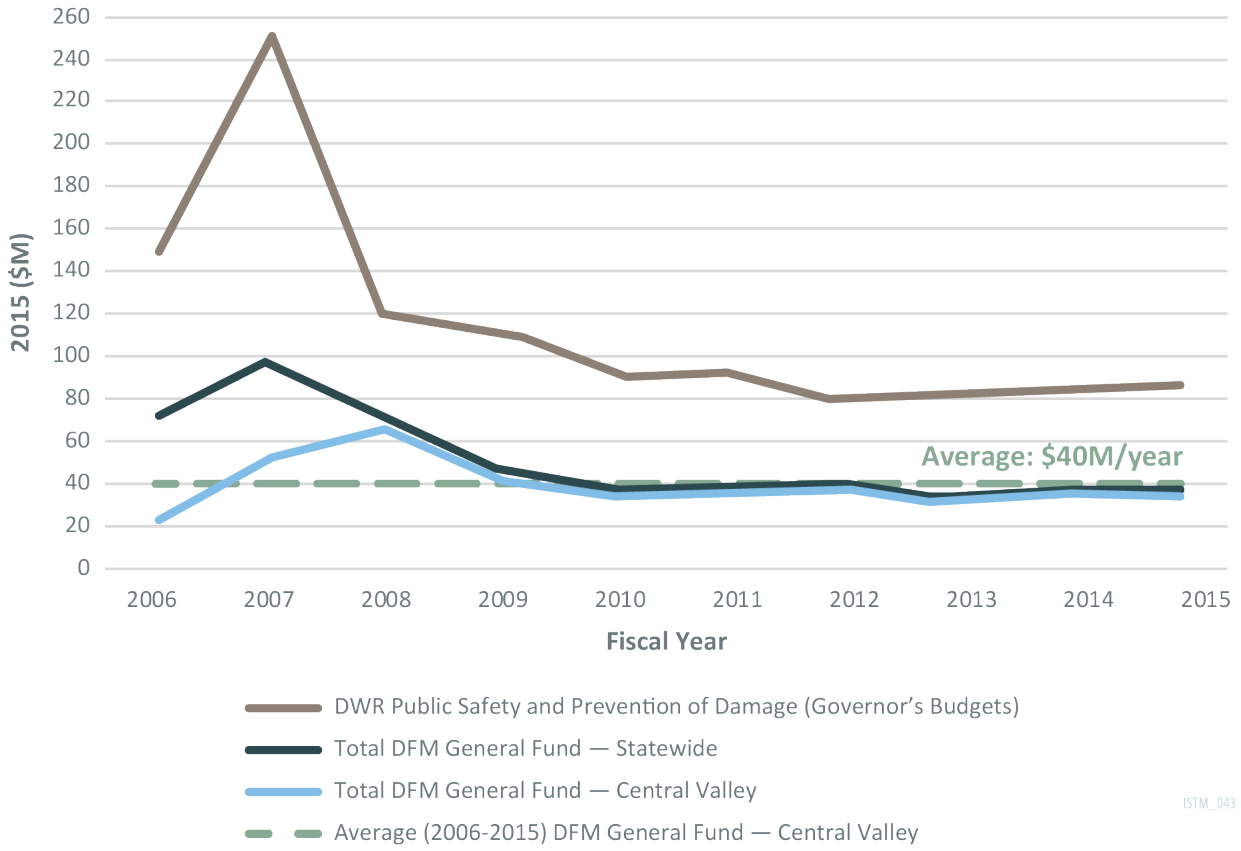
Revenue Generating Potential

DWR and DFM State General Fund expenditures (in 2015 dollars) are summarized in Appendix A.

Figure 6-1 shows DWR's State General Fund expenditures on Statewide and Central Valley flood management activities (with money allocated through the Public Safety and Prevention of Damage account in the Governor's DWR budgets) for fiscal years (FYs) 2006 through 2015. Funds for Central Valley flood management have fluctuated from a low of about $20 million in FY 2006 to a high of $64 million in FY 2008. State General Fund expenditures dedicated to flood management averaged about $40 million annually and have, on average, accounted for about 50 percent of DWR's public safety and prevention of damage expenditures.

The maximum amount that was received in the last decade from the State General Fund was doubled to approximately $135 million per year for the revenue generation potential in Phase 1. This amount is similar to DFM State General Fund expenditures prior to the passage of Proposition 1 and Proposition 84. For Phases 2 and 3, a 3 percent annual increase was assumed to be the maximum available funds to DFM. These assumptions rely on a growing California economy and a sustained awareness of the public benefits of ongoing flood management in the Central Valley.

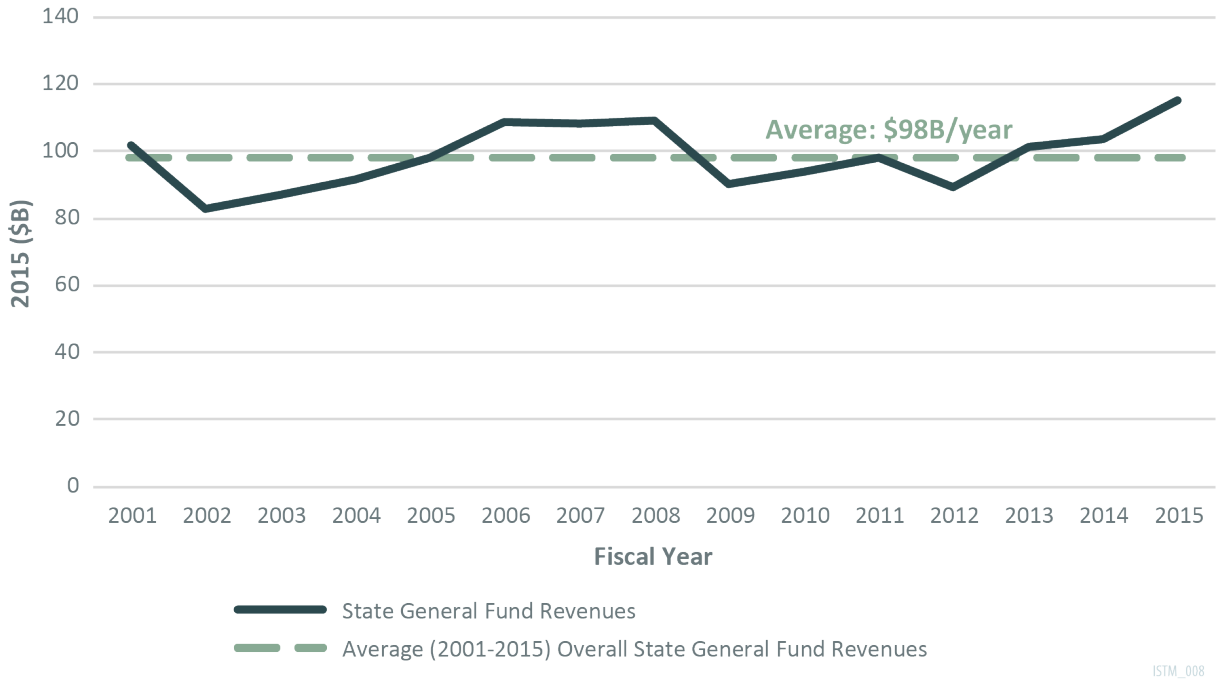
Figure 6-1. State's Annual State General Fund Expenditures on DFM, FYs 2006 to 2015



Source: Governor's Budgets, 2001-2015 and DWR, 2016

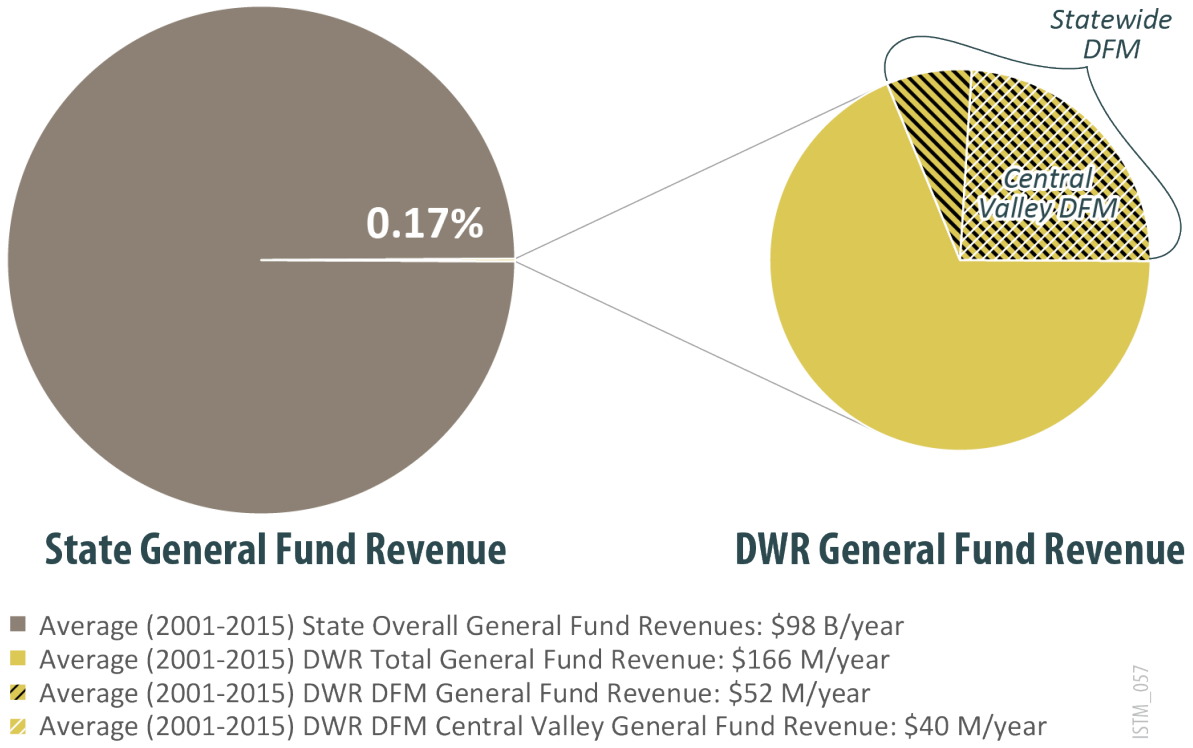
Between FYs 2001 and 2015, the proportion of State General Fund revenues allocated to DWR ranged between 0.1 and 0.2 percent. Figure 6-2 shows California State General Fund annual revenues from FYs 2001 to 2015 with an annual average of $98 billion. Figure 6-3 compares Statewide General Fund revenues, average of $98 billion per year, and State General Fund revenues allocated to DWR, average of $166 million per year. This comparison illustrates the magnitude of difference of what is collected in the State General Fund and what is allocated to all of DWR. Of the revenues that DWR receives, DFM is allocated an average of $52 million per year for all of statewide flood management, which includes an average of $40 million per year for the Central Valley.

Figure 6-2. California State General Fund Revenues, FYs 2001 to 2015



Sources: State Controller's Office (SCO), 2017; Governor's Budgets, 2001-2015

Figure 6-3. Average State General Fund Revenue



Source: Governor's Budgets, 2001-2016; DWR, 2016; and State Controller's Office (SCO), 2017

Steps Required to Implement

The California legislature determines how the State General Fund revenue is allocated, subject to how much revenue is available in that year and prior commitments. Agencies make their annual budget requests, with the combined requests typically exceeding revenue available. The legislature then has to prioritize these requests. Agencies that can demonstrate the best justification for funds have a better chance of receiving funds.

6.1.2 Sacramento and San Joaquin Drainage District

Reutilization of the Sacramento and San Joaquin Drainage District as an assessment authority is considered a State mechanism for the purposes of this discussion because it would require action by the California legislature to implement. However, in later sections of this CVFPP investment strategy that discuss cost shares, this district is considered a local source of revenue, because revenues from this district would be generated from local tax payers within the district's boundaries.

Although the Sacramento and San Joaquin Drainage District is documented in the California Water Code, code revisions would be necessary to cover new district boundaries, add authority for paying ongoing obligations, and other necessary amendments. The Sacramento and San Joaquin Drainage District ceased levying assessments in the late 1930s as a large number of properties in the district were sold for delinquent assessments. This degraded the value of bonds to the point they had to be discounted. This experience was so difficult for the State Reclamation Board (now the CVFPB) that it concluded the assessment authority would no longer be used. While the State Reclamation Board stopped using the assessment authority specified for the district, the authority itself remains authorized in the California Water Code.

Applicability

If reutilized, the Sacramento and San Joaquin Drainage District would resume assessments to fund capital and ongoing management activities. Because the funds would come from the Central Valley, this mechanism would have a strong nexus; it would become another source for local cost shares, augmenting existing assessments and other local sources.

Interannual Reliability

Once reutilized, the Sacramento and San Joaquin Drainage District would provide a stable revenue source, with relatively small unexpected variation in assessments over time.

Political Viability

The Sacramento and San Joaquin Drainage District halted assessments in the late 1930s. The current political viability of this mechanism is uncertain. There may be concerns over whether the new assessment would overlap or be in addition to existing local agency assessments. Overlaying a regional assessment district where there are already areas with existing assessments may create equity issues related to areas that either have or have not passed assessments. Additionally, there could be financial issues with current assessments that are securing outstanding bond issuances. However, further study and analysis needs to be conducted, in partnership with local agencies and stakeholders, to determine how best to address these issues before moving forward with the Sacramento and San Joaquin Drainage District.

Role in a Flood Management Investment Strategy

The CVFPP investment strategy considers reutilization of the Sacramento and San Joaquin Drainage District and its assessments for all capital and ongoing action categories. It is assumed that this funding source could be developed and available within 10 years (with some funds available before the end of Phase 1).

Revenue Generating Potential

The revenue generation potential from local assessments is estimated in Chapter 4, Table 4-5. The calculations are intended to identify the reasonable increase in tax burden that could be placed on parcels within the SPFC for flood management activities. However, the difference between current tax and assessment burdens and the 2 percent cap does not represent total funds available for flood management, because those properties are likely to also be taxed or assessed for other property-related and public services going forward.

Table 4-5 compares the difference in the revenue generated using the effective tax rate for the county and the two percent "maximum" tax rate cited by the California Debt and Investment Advisory Commission. The analysis then assumed that up to 10 percent of this increase could be available for flood management activities. This resulted in approximately $57 million per year, an average increase of $200 dollars per year per parcel.

Steps Required to Implement

The Sacramento and San Joaquin Drainage District is still authorized in the California Water Code. However, to be the most effective, the California Water Code would need to be amended to update the district's boundaries so that it includes not just those protected by the project, but those that benefit from the ability to drain flood waters. The California Water Code would also need to be changed to allow assessments to cover O&M. The code's existing assessment procedures would likely need revision.

6.1.3 State River Basin Assessment or Tax

A river basin assessment or tax would generate revenue to invest in integrated water management. It is unknown at this time whether or not a tax or assessment would be more appropriate for this mechanism depending on how the tax or assessment is implemented. The primary difference between a tax and an assessment is that funds from taxes must be used for the purpose they were voted on, but they do not need a nexus between the tax and the benefit received. To pass a tax, typically a super majority (or two-thirds vote) is required from the voting body. In contrast, an assessment needs to be proportional to the benefit received from what the assessment is paying for. Local government assessments are generally subject to Proposition 218

Tax vs. Assessment

A tax must be used for the purpose it was voted for, but doesn't need a nexus between the tax and the benefit received. To pass a tax, typically a super majority (two-thirds) vote is required.

An assessment must be proportional to the benefit received from what the assessment is paying for. Local government assessments are generally subject to Proposition 218 majority votes, which are weighted by the amount paid by the individual voters.

requirements. Under Proposition 218, property assessments require a majority vote, which are weighted by the amount paid by the individual voters.

Assessment revenue would be used in the river basin where the revenue originated and would be spread across integrated water management activities within the basin. This assessment would cover a whole watershed and would be shared by water agencies within the basin. River basin planning is based on the fundamental principles of equity, environmental protection, efficient development, balance, and cooperation. This approach seeks to reconcile these apparently competing interests and provide a comprehensive approach to planning. Planning at a river basin scale is desirable to meet social, economic, and environmental priorities that are specific to each area, to properly account for relationships and dependencies within the basin, and to avoid a piecemeal approach.

Applicability

Flood and floodplain management activities often have consequences for upstream and downstream people and resources, making them a necessary component of the river basin approach, and applicable for funding from a river basin assessment or tax. However, because flood risk management cannot address river basin priorities in isolation, only a percentage of the funds generated by a river basin assessment would be applicable for flood management activities.

Revenues from a river basin assessment or tax would apply to any flood management action categories with the potential to contribute toward outcomes that benefit residents within the basin, and that should be integrated with other land and water management activities in the basin. For the purposes of this CVFPP investment strategy, these criteria are most easily met by SSIA actions in the systemwide category, but many other action categories may also have basin-scale effects. For example, a levee setback may help protect economic assets within the basin while also providing critical habitat for species that use and provide services along the entire river corridor.

Interannual Reliability

Property taxes or assessments, once established, provide a predictable and stable revenue stream. In addition, these funds would be dedicated only to integrated water management within each basin, of which flood and floodplain management is an integral component. As such, revenues from a river basin assessment or tax would have high interannual reliability.

Political Viability

Political viability may depend on the governance structure that is created to levy, collect, and allocate funds. A new tax or assessment entity may be resisted by existing local agencies as a loss of local control, especially if the new entity were effectively a State agency. However, if the new entity were an authority made up of key local agencies, it could more easily gain acceptance. Local agencies resist additional assessments due to their unpopularity and the requirements of Proposition 218. A State assessment may be of interest to local agencies, especially if all or a majority of the assessment is returned to the river basin. In either case, significant work is necessary up front to develop a river basin governing structure and garner the necessary local and legislative support to make this funding mechanism a reality.

Role in a Flood Management Investment Strategy

Almost all action categories within the 2017 refined SSIA portfolio have the potential to benefit or otherwise have some effect on people, economies, and resources at the river basin scale. Because its interannual reliability is so high, a river basin assessment or tax might be especially helpful in boosting funding for some ongoing floodplain management activities, which are currently limited to less reliable State General Fund dollars for support. However, because of the work required to develop and establish a river basin tax or assessment, it is assumed that this mechanism is only available in Phases 2 and 3 of CVFPP implementation (i.e., no earlier than 2027).

Revenue Generating Potential

The revenue generating potential of a river basin tax or assessment within the Sacramento and San Joaquin basins has not yet been analyzed. The approach for doing so would be similar to that described above for the Sacramento and San Joaquin Drainage District, with a river basin tax or assessment generating funds from the entire basin, as opposed to just those properties within the SPFC Planning Area. This could translate to significantly more funds available from the river basin assessment or tax than from the drainage district. On the other hand, a river basin assessment or tax would need to cover all water management activities (e.g., water supply, water quality, flood management, ecosystem management) within the basin, and only a portion of revenues would be allocated to flood and floodplain management. With those two competing factors in consideration, additional revenues available from a broader river basin assessment or tax could be half of those funds available from the Sacramento and San Joaquin Drainage District approximately $25 million per year.

Steps Required to Implement

Depending on how the generated revenue would be used, the new mechanism would be structured as either a river basin assessment or tax. A river basin assessment would be based on benefit received. A river basin tax could be an ad valorem tax, parcel-based tax, or another form of fee. An example fee would be the California Department of Forestry and Fire Protection's Fire Prevention Fee. Several approaches to structuring the assessment or tax are possible. River basin authorities could be established by the legislature at the State level, where the river basin assessment or tax could vary by river basin with all funds being collected at the State level and distributed back to river basin authorities. It is anticipated that the majority of funds generated by such funding mechanism, as much as 85 to 90 percent, would go back to the river basins, with the remaining funds used to support statewide efforts for issues considered too expensive or outside the scope of a local agencies, such as climate change.

Implementing river basin planning in California would be challenging due to existing agency structures, legislative authorities, and limited funding resources. To address these challenges, and transition to a river basin-scale approach, the following actions are needed:

- Work with federal and local agencies and stakeholders to delineate State river basin areas throughout California.
- Focus the State's budgeting process for water-related investments according to the delineated State river basin areas and identified river basin priorities.

- Work with the local agencies to establish viable governance structures that enable agencies to work together and establish governance at the river basin scale. Examples of similar collaboration include the following:
  - The Sustainable Groundwater Management Act (SGMA) established a new structure for managing California's groundwater resources at a local level by local agencies, by requiring them to form locally-controlled groundwater sustainability agencies (GSAs).
  - The Santa Ana Watershed Protection Authority could serve as a potential model for collaboration.
  - Regional water management groups established for integrated regional water management could be a starting point for such governance.
- Identify ways to consolidate coordination and planning efforts within river basin planning, implementation, and regulatory efforts.
- Establish the funding mechanism through State legislation.

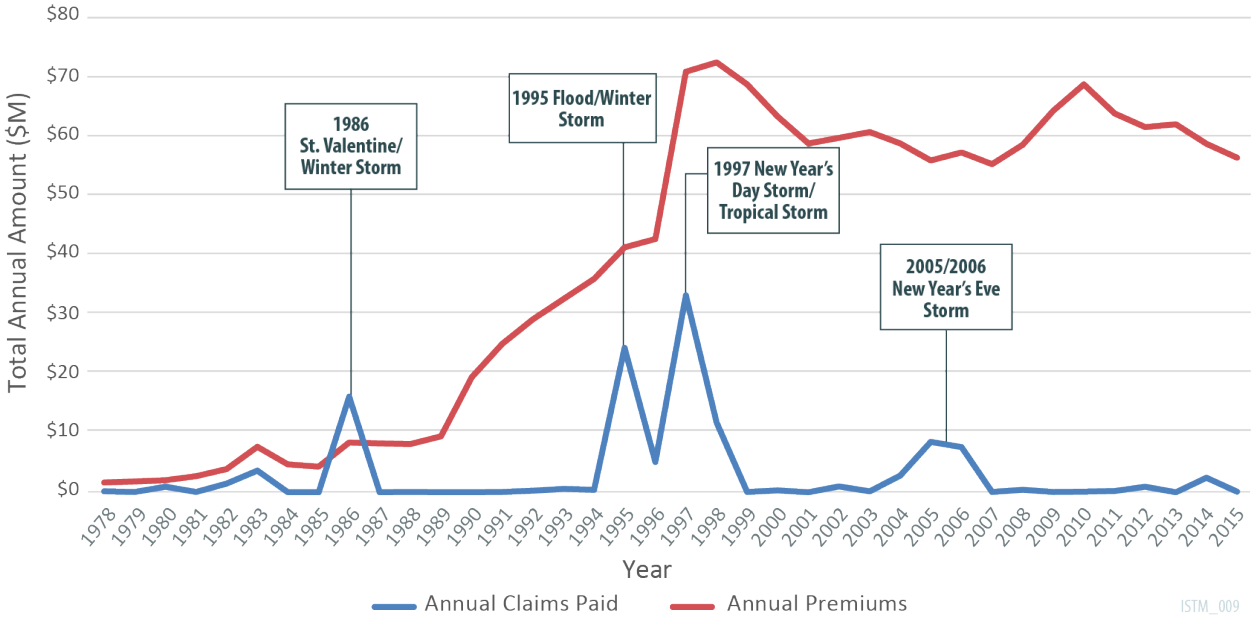
6.1.4 State Flood Insurance Program

Several states have explored implementing a statewide flood insurance program; however, no state has implemented a replacement program that would enable the state to opt out of the NFIP. Implementing a California State flood insurance program has the potential to enable California to receive a better return on its premiums currently paid into the NFIP. Californians have contributed more than five times in NFIP flood insurance premiums than claim payments received between 1978 and 2008 (Wharton Center for Risk Management and Decision Processes, 2011).

California could establish a State program that allows the State to use a portion of the funds from insurance premiums to purchase private insurance and another portion of the funds to implement risk reduction measures. These risk reduction measures have the potential to decrease damage in the event of a flood and may reduce the amount of mitigation funding needed from other sources. For further discussion on a State flood insurance program, see Appendix C.

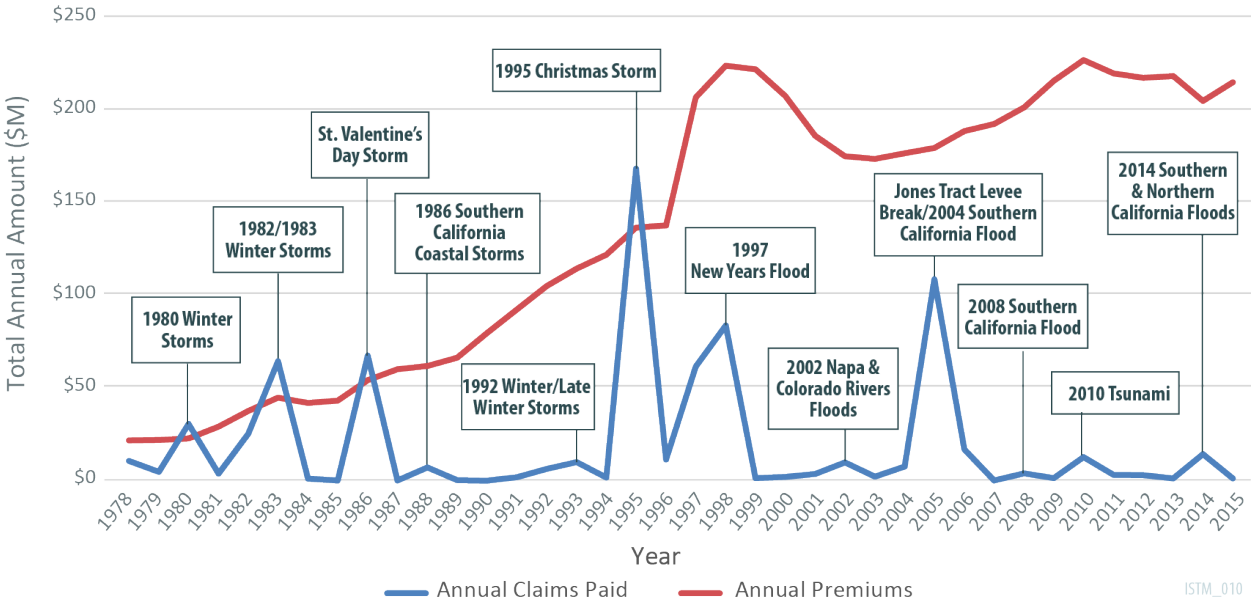
As shown in Figure 6-4, NFIP policy holders in the SPFC Planning Area have historically paid more into the system than they have received as payouts. This is also true at the state level, as described in Appendix C. On average, NFIP policy holders in the SPFC Planning Area have paid about $35 million per year (in 2015 dollars, the basis for all values in this discussion) more into the NFIP since 1978 than they have received as payouts. At the state level, NFIP policy holders have paid about $116 million per year more into the program since 1978 than they have received as payouts (Figure 6-5). Over the last 10 years (2006 to 2015), the difference between premiums and claims (i.e., payouts) in the SPFC Planning Area has increased to about $60 million, and at the State level it has increased to about $206 million. Average annual total premiums paid by policy holders in the SPFC Planning Area during the last 10-year period were about $59 million. Statewide, the average annual total premiums paid were $212 million. As a result of California's participation in the NFIP, FEMA grant programs have funded flood management activities in the State to reduce residual risk.

Figure 6-4. Annual NFIP Premiums and Claims, SPFC Planning Area, 1978 to 2015 (2015 $)



Source: Clark, 2013; Lohmann, 2014; Lohmann 2016

Figure 6-5. Annual NFIP Premiums and Claims, State of California, 1978 to 2015 (2015 $)



Note: The peaks shown do not necessarily correspond to the contribution of the identified flood events but rather represent the flood events that may have been prominent in the public view at that time.

Source: Clark, 2013; Lohmann, 2014; Lohmann 2016

Flood insurance through the NFIP is available to homeowners, renters, condominium owners, renters, and commercial owners and renters. Flood insurance is specifically required for all buildings in mapped Special Flood Hazard Areas (SFHAs) shown on FEMA's maps if they are financed by federally backed loans or mortgages (FEMA, 2015). Nationally, as of April 2016, the maximum annual premium (including basement/enclosure) is $474 under the residential Preferred Risk Policy. Based on the 1978 through 2015 NFIP premiums, the average flood insurance premium in California was about $500. These figures include both Preferred Risk Policy and non-Preferred Risk Policy rates. The average flood insurance premium in the SPFC Planning Area during this period was about $280 per year (in 2015 dollars).

Currently, NFIP flood insurance rates for properties on agricultural lands are the same as those for commercial properties. This rate assumes that floodplains and the associated flood risk in these floodplains are the same across the country. It also assumes that farming practices are the similar across the country. But, there are major differences in the type of floodplain and types of farming practices on floodplains in California and particularly within the Central Valley. The designation of land as an SFHA would typically render it inappropriate for agriculture in other parts of the country, whereas in California, deeper floodplains are particularly suited for agriculture. FEMA's proposed updates to the NFIP floodplain maps in the Central Valley have resulted in agricultural lands inside the newly designated SFHAs. Once in the SFHA, all agricultural property is subject to NFIP flood insurance requirements, especially if the property is financed with a federally backed loans or mortgages. Because this flood insurance requirement has the potential to affect the sustainability of agriculture in the Sacramento Valley, the State convened the Agricultural Floodplain Ordinance Task Force (AFOTF) in 2015 to identify and recommend changes that FEMA could administratively implement. The AFOTF developed a number of recommendations that would modify FEMA's rules on elevation and floodproofing (either reducing them or removing them) and reduce the cost of flood insurance for agricultural structures (AFOTF, 2016).

Applicability

Flood insurance typically compensates for damage rather than reduces risk. However, activities that reduce flood risk could be funded by potential savings from a State flood insurance program. This applies to almost all management action categories in the 2017 refined SSIA portfolio.

Interannual Reliability

If implemented, a State flood insurance program would provide a steady income stream from premiums. To the extent that premiums exceeded the cost of the program (further analysis is needed on this) then a portion could be available for flood risk reduction.

Political Viability

The political viability of a State flood insurance program is uncertain at this time. The NFIP has access to funds from the U.S. Treasury during years when it takes in less in premiums than it pays out in claims. A state flood insurance program must also have a source of funding to respond to claims that exceed annual premium revenue plus any accumulated fund. If premiums are not able to sustain a financially sound program, the state taxpayers would bear the burden. Opting out of the NFIP may mean that California loses access to other funds available from FEMA, especially funding typically made available upon a Presidential declaration of emergency. While Californians currently pay more in premiums than the State receives in

claims from NFIP, it is possible that one or two severe and widespread floods could change that. Implementing this type of program at the State level would shift the risk of disaster payments to the State. This increase in risk for the State might make passage and approval of legislation to set up a State flood insurance program difficult. However, the State could mitigate the risk by purchasing reinsurance on the private market. Another way to shift some of this risk is to couple a State flood insurance program with private investments in the form of resilience bonds. Resilience bonds are a type of catastrophe bond that account for reductions in risk from project implementation and pay investors a portion of the insurance value created after the implementation of the risk reducing projects. These payments are in the form of rebates paid to the bond investors. For additional information on resilience bonds, see Appendix C.

Role in a Flood Management Investment Strategy

A State flood insurance program would use a small share of premium dollars to invest in management actions that limit or reduce risk. This applies to almost all action categories within the 2017 refined SSIA portfolio. However, the legislative requirements of setting up a State flood insurance program make it unlikely that one would be implemented in time to fund Phase 1 investments. Therefore, it is assumed for the purposes of this CVFPP investment strategy that any net revenues from a State flood insurance program could likely support only Phases 2 and 3.

Revenue Generating Potential

As is discussed above, the average annual premiums to the NFIP from Central Valley residents total approximately $60 million annually. A State program could increase this number if it made insurance mandatory for all properties within any designated flood zone, including properties protected by flood management facilities (but which are still potentially subject to flood if that infrastructure fails). While some floodplain properties do currently require proof of NFIP flood insurance at the time of purchase to qualify for a mortgage, this requirement is not enforced when homeowners eventually let their policies lapse, and the requirement does not exist for all flood zones. Some NFIP insurance holders drop their policies within a few years, and almost 80 percent of policy holders drop their insurance within 10 years (See Appendix C for details). If a State program could ensure that those policies continued, it should be able to at least double (or more) the annual premiums it receives relative to the current NFIP. This would translate to about $120 million per year in premiums from Central Valley residents. However, most of this money would need to be placed into a disaster fund to pay for flood damages if or when a disaster occurs. If 10 percent of these premiums are then applied to risk-reducing or limiting activity, this translates to $12 million annually in revenue generation potential for this funding mechanism.

Steps Required to Implement

The State legislature would have to pass a law creating a State flood insurance program. It must specify how the program would be implemented and what and how funding sources would be made available.

6.1.5 General Obligation Bonds

State GO bonds are a financing mechanism, or a way to borrow from investors to fund longer-term investments. State GO bonds are backed by the full faith and credit of the State of California, and are usually repaid with California taxpayer dollars through the State General Fund. GO bonds have become an important source of flood and water management funding. As shown on Figure 6-6, State voters have approved GO bonds for water management efforts every few years.

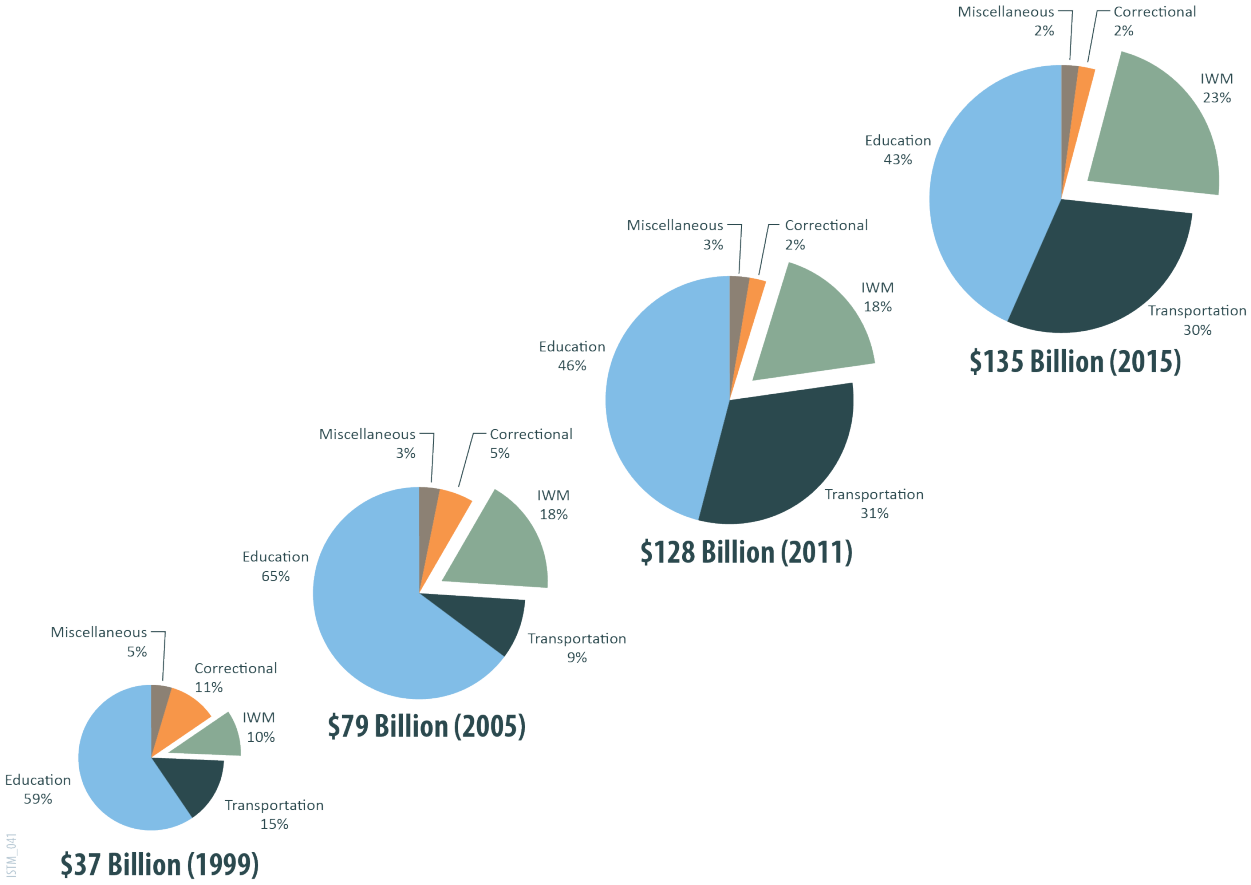
Although many GO bonds have been approved over the past few decades, few have had significant funding for flood management, with the exception of the 2006 Propositions 1E and 84 (passed in the aftermath of the Hurricane Katrina disaster). In 1999, authorized bonds for water infrastructure totaled $3.8 billion, accounting for approximately 10 percent of total authorized State bonds. This increased to approximately $23 billion by 2011, or 18 percent of total authorized bonds, due to Propositions 1E and 84 in 2006. With the passage of Proposition 1 in 2014, total GO water bonds increased to $30.5 billion in 2015. Water bonds accounted for about 23 percent of the total authorized State bonds in 2015.

GO Bonds vs. State General Fund

GO bonds are typically repaid with State General Fund revenues. GO bonds should be considered a subset of the State General Fund. The two mechanisms are separated for the following reasons:

- Funds are approved differently. GO bonds require voter approval, whereas the State legislature approves the budget that describes the use of the State General Fund.
- GO bonds are restricted to capital costs, whereas the State General Fund can pay for ongoing and capital costs.
- The State General Fund is subject to the vagaries of the annual budgeting process, whereas a GO bond approved by the voters locks repayment into the budgeting process.
- GO bonds are a way to fund a large block of capital investments.

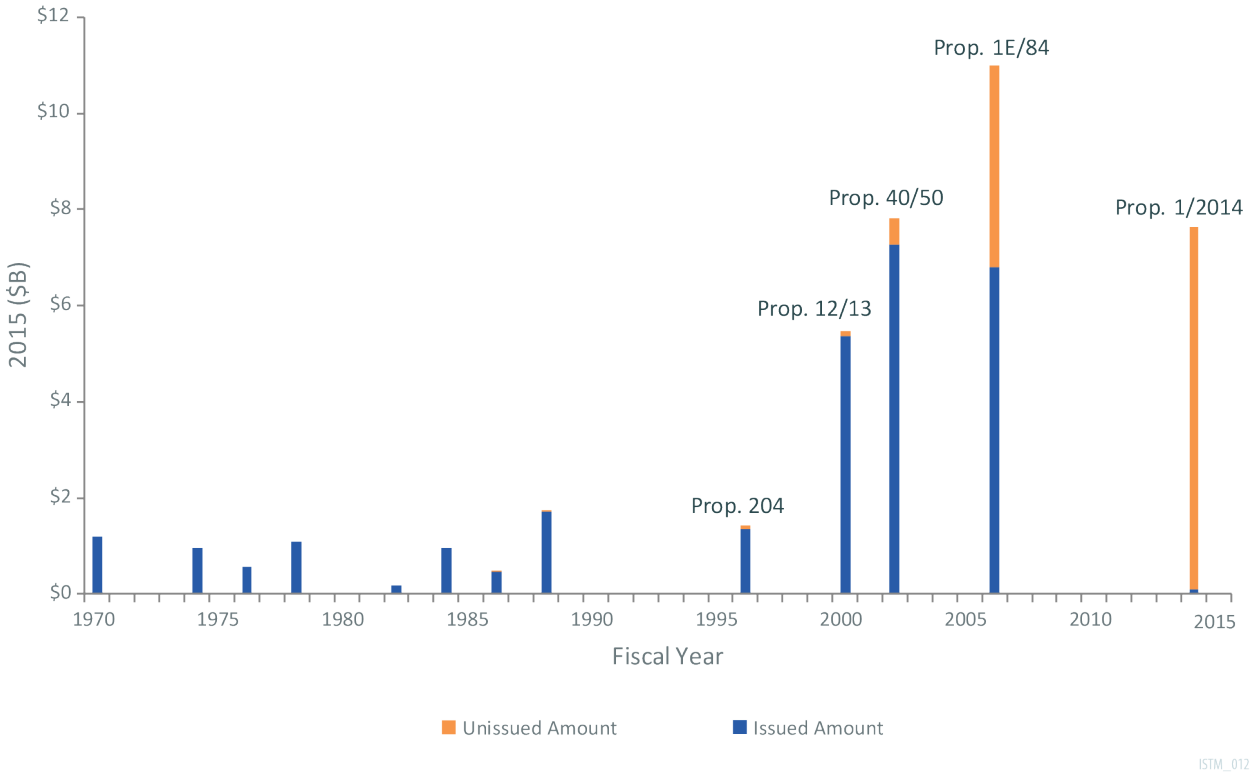
Figure 6-6. Total Authorized General Obligation Bond Debt of the State of California



Sources: PPIC, 2011; State of California, 2015, 2016

As shown in Figure 6-7, the State has issued GO bonds for water management efforts every few years. However, the portion designated for flood management has been relatively small, with the exception of Propositions 1E and 84 in 2006.

Figure 6-7. Total Authorized Integrated Water Management General Obligation Bond Debt of the State of California, 1970 to 2015



Sources: PPIC, 2011; State of California, 2015, 2016

Applicability

GO bonds can be used for whatever purpose is proposed in the ballot measure. However, current state bond law (Title 2, Government Code Chapter 4, Section 16727) restricts their use to construction, acquisition of capital assets, costs of administering the bond program, or grant and loan programs that also meet these requirements with a few unique exceptions. Because state GO bonds are repaid from the State General Fund, and all state taxpayers contribute to the State General Fund, capital activities providing broad public benefit and management would have the strongest nexus for financing by GO bonds.

Interannual Reliability

Once a GO bond is passed, the revenues from bond allocations are reliable. However, current bond funds for flood management are expected to run out within the next few years.

Typically, new propositions are not put on the ballot unless proponents believe the likelihood of passage is high. This has caused some propositions to be delayed for a few years based on the political climate (see "political viability" discussion below). For these reasons, it is difficult to rely on the passage of new bonds at given intervals into the future. The passage and approval of new GO bonds tends to depend on voter awareness of the need for investment and the public benefit that investment might provide. Historical patterns show that for flood and water

management, that awareness usually does not exist without a recent crisis or other triggering news story that encourages public willingness to pay for related investments. Because new GO bonds require voter approval and general public awareness and concern about flood risk, interannual reliability over long time frames is relatively low.

Political Viability

Water bonds have generally been successful and supported by voters, although their content is often shaped as a reaction to recent disasters or other news headlines. For example, flood management did not see substantial GO bond funding until after Hurricane Katrina, when many news headlines compared the Central Valley's aging flood infrastructure to that of failed New Orleans infrastructure. Future bonds will also be affected by the public's perception of the State's overall bonded indebtedness and competition from other infrastructure demands such as school construction and transportation. However, California voters have demonstrated a greater willingness to approve GO bonds over the last few decades (PPIC, 2014) and do not tend to directly translate a "yes" vote into implications for their personal finances or taxes. Because of this, the political viability of this mechanism might be slightly higher than for new mechanisms that are more focused at the local or river basin scale, with more visible impacts on residents' tax burdens.

Role in a Flood Management Investment Strategy

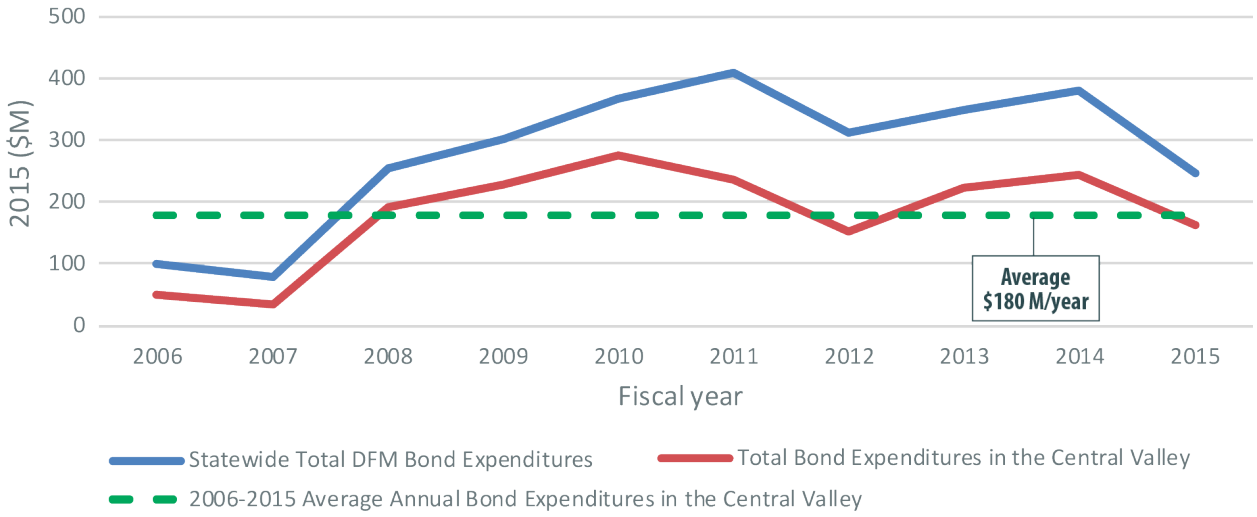
GO bonds play a key role in this CVFPP investment strategy as these can be used for many eligible capital expenditures, including easements and land acquisitions, levee or channel improvements, bypass expansions and modifications, storage (i.e., for transitory, groundwater, or surface water), and setback levees. These are also an already established mechanism that can be readily used in all phases of implementation.

Revenue Generating Potential

Figure 6-8 shows annual flood management expenditures funded through bonds between 2006 and 2015. The majority of the bond funding after FY 2007 were from Propositions 1E and 84. Proposition 84 (2006) has allocated 14.8 percent, or $800 million, for flood management, and Proposition 1E (2006) provided $4.1 billion for flood management. Beginning in FY 2008, a large share of the bond funding supported flood management activities in the Central Valley, which accounted for an average of 75 percent of DFM's general bond fund expenditures between FYs 2008 and 2015. Average flood management bond expenditures in the Central Valley over the last 10 years (i.e., from 2006 to 2015) were about $180 million per year, or $1.8 billion per decade, but the average between 2008 and 2015 was higher, at about $214 million per year. A maximum was spent of $275 million per year in 2010. With the exception of the 2014 Proposition 1 bond funding, all current/existing GO water bonds will be fully allocated by 2018, and the remaining funds from Propositions 1E and 84 are expected to be depleted by FY 2019.

If new GO bonds are approved over the next few decades with similar levels of investment for flood management to those seen in Propositions 1E and 84, then revenue generation potential would fall between $1.5 and $2.2 billion per decade. If public awareness of the need for Central Valley flood management increases over time, and the California economy is strong, revenue potential may be slightly higher. For the purposes of this CVFPP investment strategy, it was assumed that GO bond revenues could not exceed $2.5 billion over any 10-year period (i.e., a 40 percent increase over the level of investment observed since 2008).

Figure 6-8. DFM Annual Bond Fund Expenditures, FYs 2006 to 2015



Source: DWR, 2016

Steps Required to Implement

State GO bonds require 50 percent voter approval but only after approval by two-thirds of the legislature or through the initiative process.

6.1.6 Water Surcharge

In 2006, a Water Resources Investment Fund was explored by the California Natural Resources Agency. This fund would have had the following attributes:

- The State would establish a fee to be collected from each retail water supplier in the state. The supplier would decide how to apportion the fee among its customers and would collect the fee.

- The collected fees would provide a stable funding source for clean, reliable, and safe water supplies. The funds would support water management activities described in the California Water Plan, including flood management activities. As originally proposed, a significant amount of the funds would pay for water quality improvements.

- Of the funds collected in each region, 50 percent would be returned to those respective regions to plan and carry out integrated regional water management. Additional funds would be reserved to match federal water quality grants, fund priority regional projects, and respond to water-related emergencies. More than two-thirds of all funds collected would be used to fund regional water management projects.

- A designated entity, such as the California Water Commission, would oversee management and recommend changes or improvements to the fund and fee structure. The funds available to implement water management projects would increase over time as new connections are added.

- Regions would prepare integrated regional water management plans consistent with the California Water Plan to meet their local needs and fund their projects from their regional accounts.

- Remaining funds would pay for programs of statewide significance, including funding for the general public benefits of new surface water storage projects such as ecosystem restoration and flood control.

In 2010, then State Senator Joe Simitian proposed a similar approach with SB 34, which was not passed into law, but would have created the California Water Resources Investment Program and a California Water Resources Investment Fund. The fund would have used urban and agricultural water user fees to support the following:

- Planning and managing the statewide water system
- Broadening access to necessary water services
- Improving the ecosystem
- Managing water-related risks and major public emergencies
- Changing the water system to improve recreation opportunities

Funds received would have gone into a State investment account and 11 regional investment accounts. DWR would have been responsible for distributing these funds among the regions.

Applicability

A statewide water use fee has a strong nexus with integrated resource management (of which flood management is a component), with clear ties to anything that is impacted by or impacts the management and movement of water supplies. There are few flood management investments that can demonstrate such a clear tie. This mechanism would be limited to flood investments that benefit ecosystems impacted by water use, or that otherwise impact water supply activities.

Interannual Reliability

A statewide water user fee would create a stable annual income stream.

Political Viability

Attempts to pass a statewide water user fee have failed in the past, but if public and legislative support is gained, this could be a funding mechanism with a good nexus with integrated resource management (of which flood management is a component).

Role in a Flood Management Investment Strategy

Because of its limited applicability to large portions of the 2017 refined SSIA portfolio, a statewide water user fee is not being considered for a significant role in this CVFPP investment strategy.

Revenue Generating Potential

The potential revenue generated by a statewide water use fee depends on the magnitude of the fee. The portion of that revenue stream that would be allocated to flood management is variable and uncertain.

Unless further analysis suggests it should be included, the statewide water user fee is not recommended at this time.

Steps Required to Implement

A statewide water fee or surcharge could be used for a variety of purposes. Establishing this water fee would require legislation that stipulates the types of activities permitted under the fee. A water fee was proposed in the California legislature in 2006 and 2010, but failed to gain approval.

6.1.7 State Maintenance Area

Division 6 of the California Water Code, Section 12878 gives the CVFPB the authority to form a maintenance area if LMAs are unable to meet State and federal requirements. Where maintenance areas are formed, DWR performs maintenance based on the actual costs of performing the maintenance. CVFPB has authority to assess property owners who receive benefits from project maintenance. The CVFPB approves a budget for DWR to perform maintenance, and the county levies an ad valorem assessment to pay the State. Property owners would not have a vote in a maintenance area assessment.

Applicability

A maintenance area assessment would be limited to maintenance only. A maintenance area determination would need to be made for each underperforming LMA, which could limit its widespread use.

Interannual Reliability

Once established, the maintenance area would provide a stable revenue source, with relatively small unexpected variation in assessments over time.

Political Viability

State maintenance areas have been formed and are currently in place. DWR maintenance costs are generally higher than what LMAs have paid for in the past; therefore LMAs have been reluctant to support maintenance areas.

Role in a Flood Management Investment Strategy

A maintenance area assessment could be used in the near term if the LMAs reject other funding mechanisms. The advantage of a maintenance area assessment is it is already in the California Water Code, so it could be put into action sooner than some new mechanisms.

Revenue Generating Potential

Revenue generation will be dependent on the maintenance costs to be recovered. However, because it doesn't require a vote it would be certain to cover maintenance costs.

6.2 Potential Federal Funding Mechanisms

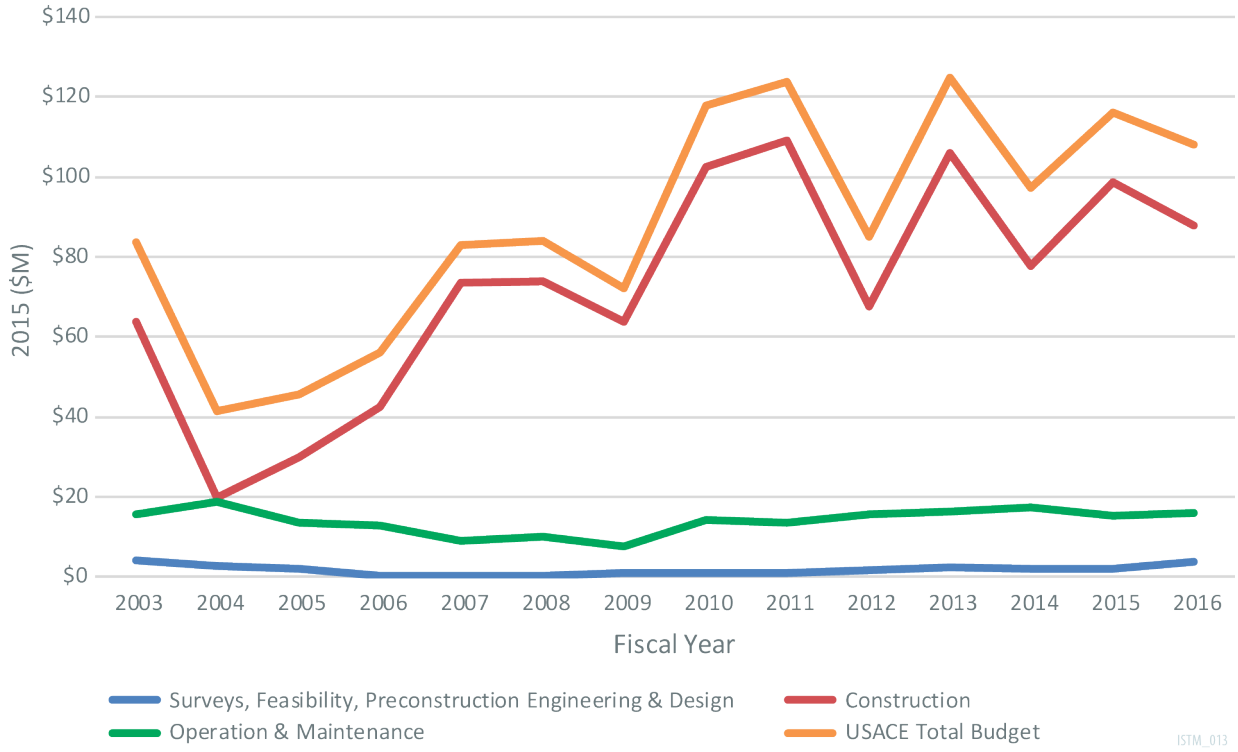
This section reviews each potential federal funding mechanism and evaluates it for applicability, interannual reliability, political viability, role in the CVFPP investment strategy, revenue-generating capacity, and other characteristics important to consider when applying it toward the CVFPP funding plan.

6.2.1 USACE Programs

USACE plays a major role in funding and implementing flood management projects across California; most major projects implemented to date have involved USACE as a partner, and hundreds of projects have included cost-sharing with USACE. Also, the State and USACE have partnered with local agencies for improving portions of the SPFC in the Central Valley.

Figure 6-9 illustrates flood management funding by USACE and includes funds that USACE received for surveys, feasibility studies, and preconstruction engineering and design, construction, and O&M for flood management in the Central Valley for FY 2003 through 2016. USACE funding has ranged from approximately $40 million to approximately $120 million per year between 2003 and 2016 (all estimates are in 2015 dollars). These numbers represent funding for studies, construction, and O&M for flood management. Expenditures data for 2007 are work plan numbers, because Congress did not pass a federal budget, which would have included official budget numbers. The spike in USACE funding in FY 2010 is attributable to the passage of American Recovery and Reinvestment Act by Congress, which funded a number of projects in California. The majority of the expenditures shown for FY 2013 are associated with projects in the American River Watershed, such as the Common Features, Folsom Dam Modifications, and Folsom Dam Raise. Other USACE projects in the Central Valley are on the Yuba River (e.g., Yuba River Fish Passage), the Sacramento River (e.g., Sacramento River Bank Protection project), and in the Delta (e.g., the Sacramento–San Joaquin Delta Islands and Levees Project). These expenditures do not include project cost shares paid by local and State agency cosponsors.

Figure 6-9. USACE Annual Budget for Flood Control by Category



Source: USACE, 2015

Applicability

As was discussed in Chapter 4, a new, broader set of principles for making federal investment decisions appears to favor the multi-benefit, integrated approach for the CVFPP. Under the revised Principles, Requirements and Guidelines of 2013 and 2014 (CEQ, 2013; CEQ, 2014), USACE funding applies to projects that help provide safe and resilient communities and infrastructure, help facilitate commercial navigation in an environmentally and economically sustainable fashion, and restore degraded aquatic ecosystems and prevent future environmental losses. USACE typically funds capital investments, but it also funds surveys, feasibility studies, and other ongoing management actions. USACE budgets by project and action are shown in Appendix A.

Interannual Reliability

A significant amount of recent funding for flood management in the Central Valley comes from USACE. Continued near-term USACE involvement in capital improvements for flood management has a high level of reliability. However, USACE participation in Central Valley flood management over long time periods is dependent on the priorities of ever-changing legislatures and presidential administrations. While it's likely that USACE will continue to play a role in Central Valley flood management, the reliability of continued levels of investment over multiple decades can only be viewed as moderate.

Political Viability

Historically, the political viability of USACE contributions to Central Valley flood management has been strong, especially for investments like urban levee improvements with clear economic benefits. Looking ahead, the viability of significant USACE participation in CVFPP implementation is less certain. As discussed above, USACE and other federal agencies are evolving their decision-making processes to consider a broader set of criteria for investment that includes other benefits beyond economic returns, and the new administration (as of 2017) appears to support continued or increased federal infrastructure spending. At the same time, congressional leaders have expressed a goal of cutting federal spending. Because there are so many components of the refined SSIA, with a variety of potential outcomes, it is likely that at least some portions of the total investment will continue to be applicable for USACE funding, regardless of the political climate in Washington, D.C. However, the viability of broader USACE commitment to large-scale investments in the 2017 refined SSIA portfolio will depend on the direction provided by Congress and the current administration.

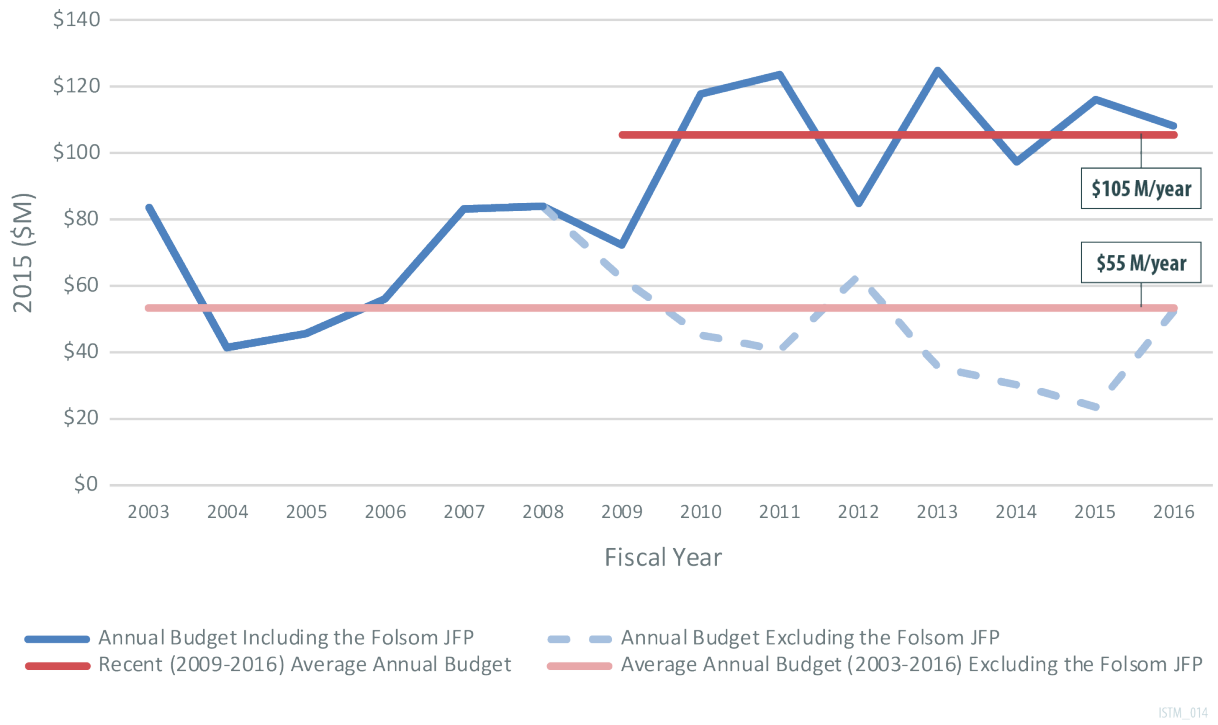
Role in a Flood Management Investment Strategy

USACE funding is identified as the most likely source of federal funding support for flood management investments. For the purposes of this CVFPP investment strategy, the historical USACE involvement in the Central Valley is assumed to continue into the future. USACE funding is also considered for some action categories to which the agency is not currently contributing funds, but which might qualify for federal funds given the move toward more holistic evaluations of public benefit that stretch beyond cost benefit ratios. Therefore, USACE is considered a potential source for all capital action categories, and for limited ongoing action categories.

Revenue Generating Potential

Figure 6-10 shows annual USACE spending in the Central Valley of California since 2003. Spending averaged $55 million per year from 2003 through 2016, not including Folsom Joint Federal Project investments that began in 2009. During the construction years of the Folsom Joint Federal Project (2009 through 2016), spending averaged $105 million, with a peak of $125 million in 2013. However, USACE spending on flood management in the Central Valley to date has focused mostly on levee and reservoir improvements, with a focus on economic outcomes. In contrast, USACE has several other large-scale programs in other states that sometimes receive higher amounts of funding toward a broader variety of intended outcomes. For example, the Great Lakes Restoration Initiative was authorized for up to up to $475 million a year under the Department of the Interior, Environment, and Related Agencies Appropriations Act, 2010 (Public Law 111–88), and the House version of WRDA of 2016 includes authorizations for up to $300 million a year for the program from 2017 through 2021. Examples like these indicate a potential for USACE to more than double its investment in the Central Valley if Congress would treat CVFPP implementation as a national priority. For the purposes of this CVFPP investment strategy, it was assumed that USACE could provide somewhere between current levels of investment and double the peak investment observed over the last 10 years, which translates to a range of $105 to $250 million annually.

Figure 6-10. USACE Budget for Flood Control Projects in the Central Valley With and Without the Folsom Joint Federal Project Budget



Source: USACE, 2015

Steps Required to Implement

Involvement of USACE in new projects requires the support of the administration and congressional approval. Water Resources Reform and Development Act (WRRDA) of 2014 created a new process calling for the Secretary of the Army to submit an annual report of potential authorizations for studies and projects to the congressional authorizing committees. Authorizations for the feasibility studies precede the authorizations for the subsequent construction projects. This annual report, along with the completed feasibility studies with favorable recommendations for construction authorizations by the Chief of Engineers, form the basis for discussion of subsequent authorization legislation. Only authorized studies and projects are considered for funding in the appropriations process.

6.2.2 FEMA Programs

The purpose of FEMA, created on April 1, 1979, is "to lead America to prepare for, prevent, respond to and recover from disasters with a vision of 'A Nation Prepared.'" FEMA coordinates with states, territories, or federally recognized tribes to serve the agency's purpose. FEMA expenditures related to flood management fall under three categories: Hazard Mitigation Assistance (HMA), flood mapping, and the NFIP.

Three HMA grant programs available to fund flood management actions are the Flood Mitigation Assistance (FMA) Program, the Pre-Disaster Mitigation (PDM) Program, and the Hazard Mitigation Grant Program (HMGP). These programs share a common goal, which is to reduce the loss of life and property due to natural hazards. FMA Program funds are intended to reduce or eliminate flood damage to buildings insured under the NFIP. PDM Program funds are for protecting the population and structures from future hazards through hazard mitigation planning and projects. The intent for HMGP funds is for long-term planning following a major disaster declared by the President. The FMA and PDM programs are also intended to reduce reliance on federal funding in future disasters. For more information on the federal assistance expenditures by each of these programs for the Central Valley, see Appendix A.

FEMA conducts floodplain mapping throughout the United States and publishes the information free to the public. These maps are used by the NFIP to help assess the risk in different parts of a floodplain. Although most of the mapping is conducted by FEMA, state and local agencies participate in updating floodplain maps. In addition, grant programs support state and local floodplain mapping efforts through the Cooperating Technical Partners (CTP) Program and other grant programs.

NFIP relies on accurate flood hazard maps to calculate premiums and reduce flood damages. Periodic updates to flood hazard maps across the US have occurred since 2000, starting with the Flood Map Modernization (Map Mod) in 2004 and Risk Mapping, Assessment, and Planning (Risk Map) in 2009. The CTP Program collaborates with state, local, and Tribal agencies on map updating efforts to better utilize federal dollars (FEMA, 2009). A complete database on historical funding to California from Map Mod, Risk Map, and the CTP Program are not publicly available at this time.

The available data on FEMA funding in California for flood hazard mapping is incomplete and from various sources. Contributions to the State of California through FEMA's CTP Program are available in annual California State Auditor's Internal Control and State and Federal Compliance Audit Reports (California State Auditor, 2006 through 2016). These reports show a combined average of $387 thousand per year from 2004-2015 to the State of California from FEMA through the CTP and Map Mod programs. These reports do not show FEMA dollars directed to the State of California for the Risk Map program. Map Mod funding directly expensed from FEMA as of FY 2009 across California was $32 million with expenditures in CVFPP counties at $6.15 million. This amount covers a time period from FYs 2004 to 2009 and some Map Mod funding was stated to continue past FY 2009. Risk Map funding in California overall was $13.5 million in FY 2009 and $16 million in FY 2010 (FEMA, 2010). Of the $13.5 million funding in California for FY 2009, $4.5 million was spent in CVFPP counties. These values will be used to estimate future revenue generation potential from FEMA for flood hazard mapping. Based on the $387 thousand per year given to the State of California through the CTP and Map Mod programs, and the historical amount that FEMA expensed in CVFPP counties through Map Mod (an average of $1.23 million per year from 2004 to 2009), the assumed revenue generation potential will be $2 million per year from FEMA for flood hazard mapping efforts in the refined SSIA portfolio.

Applicability

Activities eligible for funding include mitigation projects, hazard mitigation planning, technical assistance (eligible only through the FMA Program), and management costs. The HMA Program guidance document provides a detailed description of eligible activities.

Interannual Reliability

HMA grants and floodplain mapping have been consistently funded in recent years. Of the HMA grants, Congress appropriates funding for PDM and FMA programs annually, whereas HMGP funding is only appropriated when the President declares a major disaster.

Political Viability

Continued FEMA HMA grant awards in California are likely. However, if the State develops its own insurance program, then it would become more difficult to convince FEMA to continue to spend significant dollars in California on floodplain mapping or flood mitigation assistance programs. The case could be made that the federal government would still have an interest in funding floodplain and residual risk management through the HMA grant program because it would still play a role in disaster response and recovery in the case of a major flood. Significant federal dollars could be needed for emergency response, recovery of damaged federal assets, infrastructure repairs, and other forms of assistance. The threat of these high costs might encourage continued federal participation on floodplain and residual risk management activities through these FEMA programs.

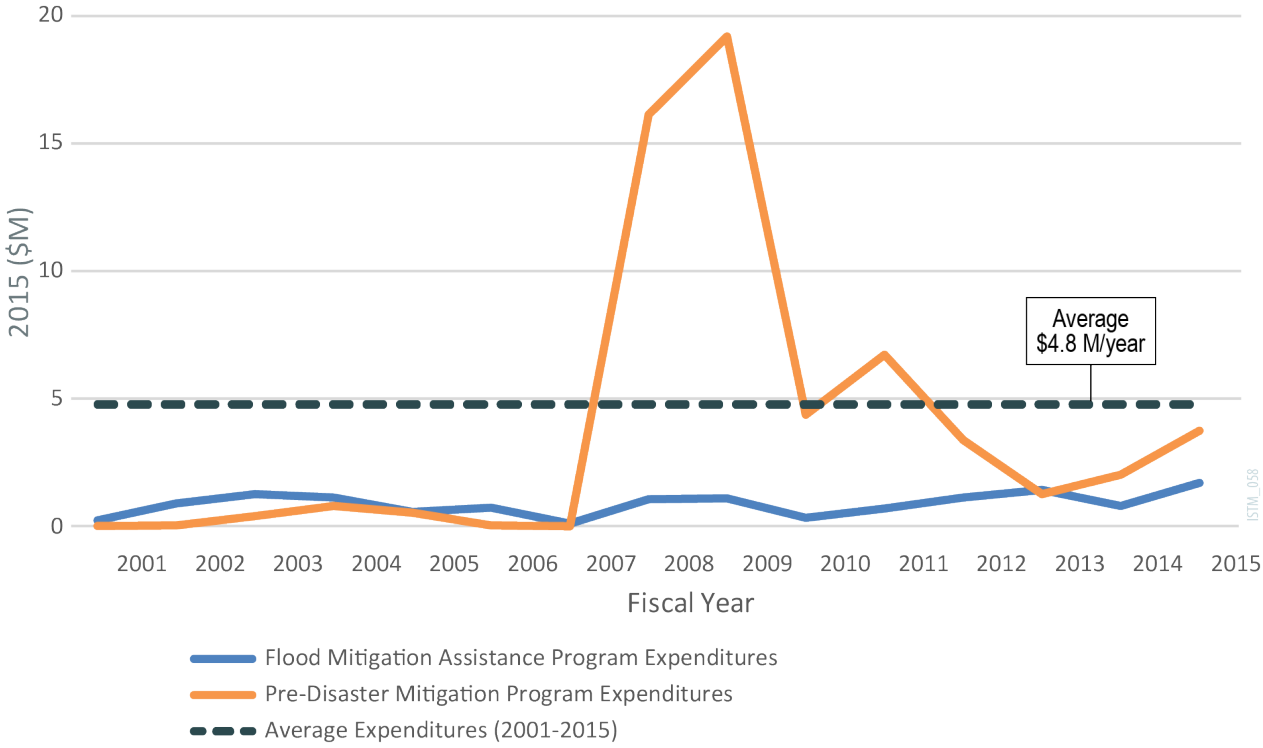
Role in a Flood Management Investment Strategy

FEMA HMA grant awards and floodplain mapping expenditures are considered applicable funding mechanisms in the CVFPP investment strategy. Although these FEMA grant programs have smaller awards than USACE programs, the contribution is important. The FEMA programs provide a federal cost share under different guidelines than USACE programs. Therefore, they invest in flood management projects that may not otherwise have a federal cost-share partner. This flexibility supports a wider portfolio of management actions in the Central Valley.
The PDM and FMA programs have cost-share agreements that consider if the applicant is a small or disadvantaged community. The HMA guidance document provides a detailed description of cost-share requirements and additional funding requirements. In the case of the State developing its own flood insurance program, it is assumed that the only FEMA dollars available are through HMA grants and not floodplain mapping.

Revenue Generating Potential

With the current data available, it is difficult to estimate FEMA revenue generation potential. FMA and PDM program grant awards in California averaged $4.8 million per year from 2001 to 2015 as shown in Figure 6-11. The combined FMA and PDM programs maximum was approximately $20 million in 2009. HMGP awards in California averaged $40 million per year from 2001 to 2015, but include expenditures on hazards other than floods. See Appendix A for details on these expenditures. Revenue generation for floodplain mapping in California is also difficult to estimate from the available data. Based on this information, it is assumed for purposes of this CVFPP investment strategy that FEMA can contribute $5 to $20 million per year toward CVFPP implementation. This assumption is similar in magnitude to the cost estimate of management actions that are applicable for FEMA funding. The estimate is adequate for use in the funding plan because it is relatively small compared to other funding mechanisms.

Figure 6-11. FEMA Program Expenditures



Steps Required to Implement

The HMA grant programs and FEMA floodplain mapping efforts are already in place, so they do not require any new steps to implement. Agencies with projects eligible for HMA assistance must apply to FEMA.

6.2.3 Federal Ecosystem Programs

The following programs are not designed to fund flood management activities. However, there are available to fund ecosystem benefits associated with multi-benefit projects included in the 2017 refined SSIA portfolio.

North American Wildlife and Conservation Act Program

The U.S. Fish and Wildlife Service (USFWS) administers the North American Wildlife and Conservation Act (NAWCA) program, which provides funding and administrative direction for the management of wetlands. The program provides matching grants to organizations and individuals who are engaged in wetland conservation projects in the United States, Canada, and Mexico for the benefit of wetlands-associated migratory birds and wildlife. The wetlands supported by the program also help in the control of flood waters and are therefore important to flood management.

Applicability
Several CVFPP multi-benefit management actions involve creation and management of wetlands, consistent with the CVFPP Conservation Strategy (DWR, 2016). This program would be helpful in providing supplemental funding to multi-benefit actions with clear benefits to wetlands ecosystems.

Interannual Reliability
Funds from these grant programs are not intended to be used programmatically, but are rather applied to specific projects that meet the program's funding criteria. Once a project is approved, reliability for funding is high, but long-term interannual reliability is low in the sense that each individual project within the broader SSIA must apply for funding.

Political Viability
The use of the grant program would be universally supported but flood-related spending may interfere with more traditional activities.

Role in Flood Management Investment Strategy
The mechanism should be used as a supplemental source of funding for any action categories with the potential to improve wetland ecosystems. These include many of the systemwide investments (like the Yolo Bypass multi-benefit improvements), as well as other capital investments that increase floodplain habitat (like some easements or land acquisitions, and small scale levee setbacks in rural areas).

Revenue Generating Potential
Over the past 25 years, the NAWCA program has funded over 2,000 projects totaling $1.4 billion in grants, and partners have contributed nearly $3 billion in matching funds to benefit more than 33 million acres of habitat (USFWS, 2017c). During FY 2015, the NAWCA program provided about $11.5 million in grant funding to 18 projects in California; six of these were in the Central Valley and received about $4.9 million in grant funding (USFWS, 2017b). It is assumed that similar levels of investment could continue, with a revenue generation potential of up to $5 million per year.

Steps Required to Implement
This is a competitive grant program, so it requires preparing a grant proposal. The program has two funding cycles per year.

Anadromous Fish Restoration Program

The goal of the Anadromous Fish Restoration Program (AFRP), administered by USFWS, is to expand the accessible range of habitat and improve the quality of fish habitat in the Central Valley in an effort to restore natural stocks of anadromous fish. The AFRP brings together federal, State, and local agencies as well as non-profit organizations and private landowners on projects that increase available juvenile and adult salmon habitat (USFWS, 2017a). The final restoration plan for the AFRP explicitly calls for coordination with flood management activities to ensure the protection of fishery resources and riparian habitats as well as spawning grounds (USFWS, 2001).

Applicability
This program would only be applicable for CVFPP management actions that provide benefits consistent with the AFRP's goals; any qualifying project would have to provide the benefit of improving fish habitat.

Interannual Reliability
Interannual reliability would be low, as the project would have to compete yearly with other potential projects for annual appropriations.

Political Viability
Because funds are provided programmatically to the AFRP (independent from CVFPP implementation), the viability of this funding mechanism rests only on the ability of individual projects to meet the program's funding criteria. Because of this, the viability of this mechanism is high, but only for the small proportion of the 2017 refined SSIA portfolio that can clearly demonstrate benefits to anadromous fish habitat.

Role in Flood Management Investment Strategy
This program would have a limited role as part in CVFPP implementation, and could be used as a supplemental source of funding for any action categories with the potential to improve anadromous fish habitat. These include many of the systemwide investments (like the Yolo Bypass multi-benefit improvements), as well as other capital investments that increase floodplain habitat (such as some easements or land acquisitions, and small-scale levee setbacks in rural areas).

Revenue Generating Potential
This program anticipates having $11 million available for grants in FY 2017. However, this is for all flood, water, and land management activities in the Central Valley that impact anadromous fish habitat. Assuming that only about a quarter of these activities relate to flood management, the revenue generation potential of this mechanism for Central Valley flood management is not likely to exceed $3 million per year.

Steps Required to Implement
This program requires an application to the USFWS.

Endangered Species Act Section 6 Grant Program

The Cooperative Endangered Species Conservation Fund Grants (Section 6 of the Endangered Species Act) is administered by USFWS and provides funding to states and territories for species and habitat conservation actions on non-federal lands (USFWS, 2017b). The program's goal is to work cooperatively with landowners, communities, and tribes to foster voluntary stewardship efforts on private lands for the recovery of endangered species. The overall program has four specific grant programs: Conservation, Habitat Conservation Plan (HCP) Planning Assistance, HCP Land Acquisition, and Recovery Land Acquisition.

Applicability
Because this program provides funding for land acquisition, it could be used to acquire lands in floodplains.

Interannual Reliability
This program provides low interannual reliability because it is set up to award one-time grants.

Political Viability
The use of this mechanism could be supported by landowners and communities.

Role in Flood Management Investment Strategy
This mechanism would have a limited role, potentially providing supplemental funds targeted for land acquisitions.

Revenue Generating Potential
The maximum grant through this program is $1 million dollars per project, and $48.7 million was awarded across the United States in FY 2015 (General Services Administration, 2017). However, revenue through this program would not be constant through time, as funding is provided on a project by project basis. In FY 2016, the Yolo County HCP received $820,660 from the HCP Planning Assistance Grant Program.

Steps Required to Implement
This program requires an application to the USFWS.

U.S. Department of Agriculture, Natural Resource Conservation Service

The Natural Resources Conservation Service (NRCS) has a history of providing funding for multi-benefit projects that impact agricultural lands. Programs that could potentially be used include the Environmental Quality Incentives Program and the Regional Conservation Partnership Program. The programs provide funding assistance to help manage natural resources in a sustainable manner.

Applicability
Some of the NRCS programs have provided funding for floodplain easements, and others will fund improving or restoring habitat.

Interannual Reliability
These grant programs are typically a one-time occurrence.

Political Viability
The use of this mechanism could be supported by local entities.

Role in Flood Management Investment Strategy
These funds could be used for easements, improving habitat, and flood protection. A recent example is the Black Rascal Creek Project. NRCS is investing $10 million in this project proposed by the partnership of Merced County, Merced Irrigation District, and City of Merced. These funds were through the Regional Conservation Partnership Program. The project will provide flood protection to the communities of Merced and Franklin/Beachwood, as well as surrounding prime agricultural lands, in an area that has seen frequent and severe flooding. In addition to flood control, this multi-benefit project will address drought, water quality, soil quality, and inadequate wildlife habitat.

Revenue Generating Potential
It is difficult to predict how much revenue could be generated through this program going forward. The maximum amount for each FY is established by the Chief for NRCS. For the purposes of this CVFPP investment strategy, it is assumed that revenue generation from this program will be similar to that available from the ESA Section 6 Grant Program, at no more than an average of $1 million annually over the 30-year implementation timeframe.

Steps Required to Implement
An application is required to be submitted for these competitive grants.

6.2.4 Other Potential Federal Mechanisms

The following programs may also provide some supplemental funds, but the nexus to flood management activities is low and they are not expected to have a significant impact on the SSIA funding plan.

WaterSMART Program

The Bureau of Reclamation (Reclamation) administers a grants program called WaterSMART that provides relatively small awards for state and local projects that improve water management. The program does not specifically target flood management, but it includes a broad range of water management activities, including Reclamation's Title 16 water recycling and reuse program. In addition, individual grant rounds have targeted water use efficiency, cooperative watershed management, water marketing, and system optimization. Typically, the grants require a 50 percent non-federal cost share.

Land and Water Conservation Fund

The National Park Service (NPS) administers the Land and Water Conservation Fund (LWCF). This fund is intended to create and maintain a nationwide legacy of high-quality recreation areas and facilities and to stimulate non-federal investments in the protection and maintenance of recreation resources across the United States. Initially authorized for a 25-year period, the LWCF was extended for another 25 years and expired September 30, 2015. The fund was temporarily extended for 3 years in the Consolidated Appropriations Act, 2016, and will expire September 30, 2018 (NPS, 2017).

This fund provides matching grants to states and local governments for the acquisition and development of public outdoor recreation areas and facilities (as well as funding for conservation strategies). In most years, all states receive individual allocations of the LWCF grants based on a national formula (with state population being the most influential factor). The identification of which projects receive the grants is done at the local and state level (NPS, 2017a). In FY 2016, California received about $8 million from the LWCF. Some of the lands developed using LWCF grants include the Millerton Lake State Recreation Area adjacent to Friant Dam (NPS, 2017b).

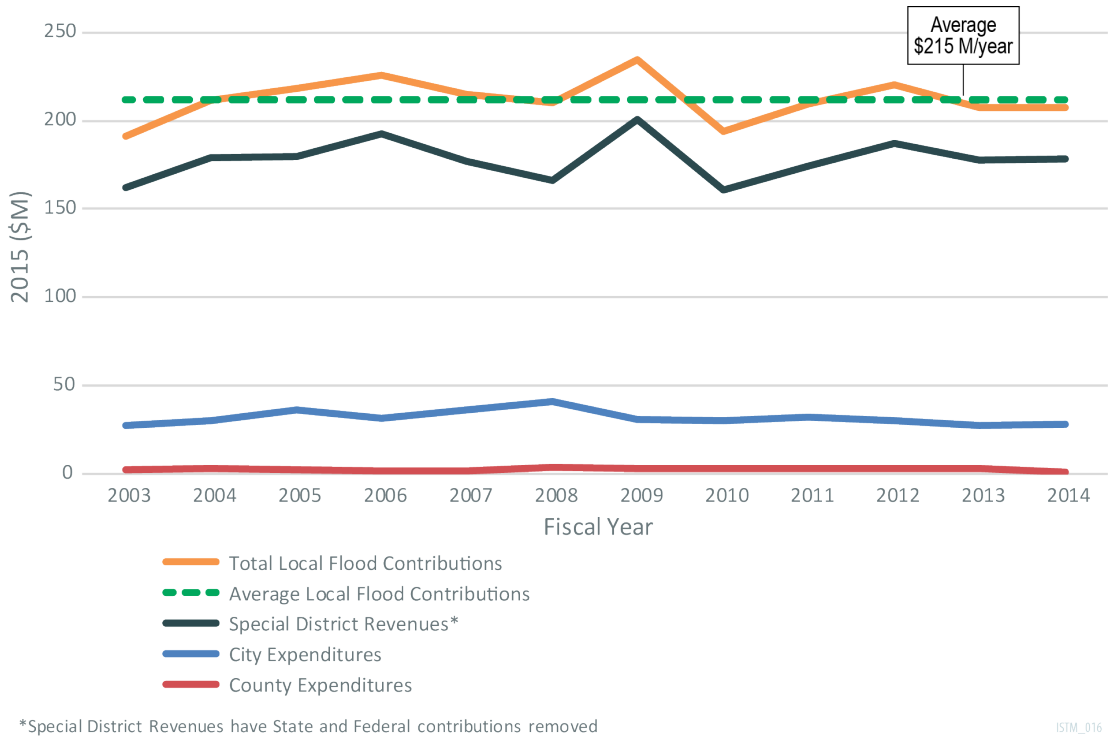
6.3 Potential Local Funding Mechanisms

These potential funding mechanisms include benefits assessment and special taxes, enhanced infrastructure financing districts, and developer fees.

6.3.1 Benefit Assessments and Special Taxes

Information for California city, county, and special district flood management expenditures were collected from the SCO (SCO 2016, 2016a, 2016b). Special districts account for the majority of the local contribution as shown in Figure 6-12, the annual local flood contributions relevant to the SPFC Planning Area for FYs 2003 through 2014 averaging $215 million per year. To evaluate special district capacity and avoid double counting, annual revenues were used instead of expenditures and State and federal assistance was not included.

Figure 6-12. Summary of Annual Local Contributions, SPFC Planning Area, FYs 2003 to 2014



Sources: SCO, 2016; 2016a; 2016b

The SCO put costs for cities into six expenditure categories; water, sewers, streets, highways, storm drains, and disaster preparedness. In addition to the storm drainage costs, the estimate of flood management expenditures by cities assumes that 5 percent of highway and streets, and 12 percent of disaster preparedness expenditures are related to flood management activities (these percentages were based on sampling selected cities). Appendix A presents the capital and O&M flood management expenditures for cities between FYs 2003 and 2014 (in 2015 dollars) averaging $31.6 million per year for all cities relevant to the SPFC Planning Area.

County expenditures on flood management, soil, and water conservation were used to calculate the county contribution. County expenditures averaged $2.6 million per year (in 2015 dollars) with a high of $3.3 million in FY 2008 and a low of $1.1 million per year in FY 2014. Appendix A presents a summary of total expenditures in flood management, soil, and water conservation across all counties relevant to the SPFC Planning Area between 2003 and 2014.

Special districts' expenditures on flood management include ongoing expenditures (labor and supplies), debt service, fixed assets, and other costs. For some special districts, debt service and assistance from State and federal agencies is a significant proportion of total annual expenditures, while some special districts rely solely on local taxes, fees, and assessment revenue generation. To avoid double counting or overestimating local funding capacity, special district revenues without State and federal assistance were evaluated. Special district revenues average approximately $199.3 million per year (in 2015 dollars), with a high of $223.8 million per year in FY 2006 and a low of $174.8 million per year in FY 2010. Appendix A presents a summary of total expenditures by special districts across all counties relevant to the SPFC Planning Area between 2003 and 2014.

Applicability

Local assessments and taxes have a nexus to any CVFPP actions with clear local benefits. Because local benefits can be in the form of improved public safety, economic stability, ecosystem health, or enriching experiences, this nexus exists for almost any action category within the SSIA (both capital and ongoing).

Interannual Reliability

Many local agencies (such as counties, cities, and utility districts) fund all or a portion of their flood management and planning programs through their State General Fund budgets. Although State General Fund revenues are collected regularly and have virtually no restrictions on their use related to flood management and planning, most local agencies are financially challenged and cannot afford to take State General Fund monies away from other programs such as schools, police, and fire departments. As a result of this competition for limited funds, flood management can vary according to local economic conditions or unforeseen needs from other government departments. Once an assessment or tax is in place, the funding is reliable.

Political Viability

Broad local support is necessary for any increase to local property assessments subject to Proposition 218 requirements. Local residents and businesses generally support spending for flood management when they can see local benefits. Support for more regional or systemwide investments can be more difficult to achieve. Local involvement in the planning process will help ensure political viability of the broad range of actions in the CVFPP.

Role in a Flood Management Investment Strategy

City, county, and special district contribution is a requirement of most capital and ongoing management actions.

Revenue Generating Potential

As was discussed in Chapter 5 and supported by the OMRR&R TM (DWR, 2017), local assessments and taxes already account for roughly $20 million dollars of spending toward OMRR&R in the Central Valley. Since AB 156 reporting began in 2008, an average approximate contribution of local assessments and taxes is $20 million dollars annually. However, many agencies do not actually report on their annual expenditures. Because of this, $20 million dollars annually is likely a low estimate of what locals currently spend on these CVFPP-related activities. It is assumed that this level of investment is likely to continue as part of the local contribution toward OMRR&R activities within the 2017 refined SSIA portfolio.

Some additional revenues may also be available to the extent that the Sacramento and San Joaquin Drainage District does not consume the remaining ability to pay in terms of local tax burdens. The total revenue generation capacity between these two mechanisms is not likely to exceed $50 million per year. Combined with the assumed continuation of $20 million of spending on OMRR&R, this translates to an additional local burden that does not exceed about $80 million per year.

6.3.2 Enhanced Infrastructure Financing District

Approved by Governor Brown in September 2014, SB 628 authorizes the creation of enhanced infrastructure financing districts (EIFD) to finance public capital facilities or other specified projects of community-wide significance. Cities or counties may establish EIFDs by adopting a resolution of intention that defines the boundaries of the district, the type of public facilities and development proposed to be financed, the need for the district, and the goals the district proposes to achieve. Additionally, cities or counties may issue bonds with a 55 percent vote of the electorate. Cities or counties may set the boundaries of the district to include multiple jurisdictions, matching a tributary or watershed. An EIFD receives the incremental growth in property tax revenues, or tax increment, of the taxing agencies (i.e., cities, counties, and special districts, but not schools) that consent.

Although the tax increment would provide a dedicated source of funding, the amount of funding may be small; the tax increment relies on new development for increased property tax revenues. Therefore, an EIFD may not be an appropriate financing mechanism for some areas not experiencing growth. In addition, only cities and counties are authorized to form an EIFD; however, because boundaries can include multiple jurisdictions, other agencies (such as flood control agencies) can contribute to the tax increment and receive funding for facilities.

Applicability

This mechanism is applicable for capital investments in areas experiencing growth. An EIFD may not be used to finance routine maintenance, repair work, or the costs of an ongoing operation or providing services of any kind.

Interannual Reliability

Once approved, an annual assessment would have good interannual reliability.

Political Viability

Political viability would depend on how an EIFD was formed. However, if local agencies collaborated on an EIFD, it would likely have a better chance of being approved.

Role in Flood Management Investment Strategy
An EIFD could potentially be used in an area experiencing growth.

Revenue Generating Potential
Revenue generation potential would be limited by amount of new development potential.

Steps Required to Implement
Cities or counties may establish EIFDs by adopting a resolution of intention that states the boundaries of the district, the type of public facilities and development proposed to be financed, the need for the district, and the goals the district proposes to achieve.

6.3.3 Developer Fees

Developer fees are monetary exactions (other than taxes or special assessments) charged by local agencies in conjunction with approval of a development project and are usually collected at the time building permits or occupancy permits are issued. Developer fees are levied to defray all or a portion of the costs incurred for any public facility, improvement, or amenity that benefits the development. However, they cannot be used to pay for public services. Most agencies currently impose developer fees for a broad range of public facilities.

AB 1600, which promulgated Section 66000 and other sections of the Government Code, was enacted in 1987 to regulate the imposition of developer fees in California. AB 1600 requires that all public agencies satisfy a number of requirements when establishing, increasing, or imposing a fee as a condition of approval for a development project. These requirements include identifying the facilities to which the collected fee would be applied and determining that there is a reasonable relationship among the facilities to be financed, the benefit received by the development paying the fees, and the amount of the fee imposed.

Applicability
This mechanism is applicable to, and could be useful in, new developments constructing flood management facilities. However, this mechanism could be used at cross purposes to the CVFPP, funding projects that would intensify risk.

Interannual Reliability
The developer fee is a one-time occurrence.

Political Viability
Developer fees are widely utilized for infrastructure because they are collected before infrastructure is constructed and development occurs.

Role in Flood Management Investment Strategy
Developer fees could be used for some of the local share of a project.

Revenue Generating Potential
This is dependent on the developer fee, but because this mechanism applies to only growth areas, the revenue potential is low. Therefore, this CVFPP investment strategy did not include this mechanism as a preferrerred mechanism in the recommened funding plan.

Steps Required to Implement

Steps required to implement developer fees include identifying the facilities to which the collected fee would be applied and determining that there is a reasonable relationship among the facilities to be financed, the benefit received by the development paying the fees, and the amount of the fee imposed. Additionally, developer fees have to be imposed and then collected by the appropriate agencies.

6.4 Other Potential Private Partnerships

"Pay for success" is an innovative approach toward project financing that links funding to project outcomes. It has been used frequently by those working on green financing or pay-to-play financing. It can take many forms, but the main idea is to reduce the financial risk to the public by attracting private capital to fund environmental and/or social projects that are in the public interest. "Pay for success" contracts create opportunities for investors to finance projects with the potential to achieve a return on investment if outcomes are cost-effectively produced. These mechanisms can also attract voluntary funds from non-governmental organizations such as Trout Unlimited, American Rivers, and The Nature Conservancy, as well as from private individuals, especially for projects that produce multiple benefits and that generate value that greatly exceeds the contributions by these groups.

- District of Columbia Water and Sewer Authority (DC Water) issued the nation's first environmental impact bond, a "pay for success" transaction, to fund the initial green infrastructure project in its DC Clean Rivers Project. The proceeds of the bond will be used to construct green infrastructure practices designed to mimic natural processes to absorb and slow surges of stormwater during periods of heavy rainfall, reducing the incidence and volume of combined sewer overflows that pollute the District of Columbia's waterways (DC Water, 2016).

- Blueprints for similar environmental impact bonds are described by Encourage Capital and Squire Patton Boggs who received funding from the Walton Family Foundation to identify potential innovative financing mechanisms for private investors to finance water resource solutions and generate related environmental benefits, including flood mitigation (Encourage Capital and Squire Patton Boggs, 2015).

6.5 Summary of Potential Funding Mechanisms

Potential funding mechanisms for CVFPP investment are summarized in Table 6-1. The table briefly describes State, federal, and local funding mechanisms by providing a summary description of each mechanism, what management actions it best applies to, and the role the mechanism can play for investments in the Central Valley.

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Table 6-1. Summary of Potential Funding and Financing Mechanisms by State, Federal, and Local Entities

Mechanism	New Mechanism	Description	Applicable Management Actions	Level of Applicability	Interannual Reliability	Current Funding Level	Revenue General Potential for 2017 Refined SSIA Portfolio	Mechanism Included in Funding Plan	Recommendations for CVFPP Funding Plan
State									
Additional State General Fund		The General Fund has traditionally funded some flood management. The CVFPP funding plan recommends increasing General Fund appropriations.	All capital and ongoing management actions	Applicability is high. There is a nexus between lowering the risk of flooding and benefits to the State economy.	Moderate	• 2006–2015 annual average: $40 million • 2006–2015 maximum $64 million (2008)	$135 million per year in Phase 1, with a 3 percent annual increase thereafter	✓	Key part of the near-term approach.
Sacramento and San Joaquin Drainage District	✓	Reutilize the function of the Sacramento and San Joaquin Drainage District to provide another source of funding. This would require new legislation to amend the Sacramento and San Joaquin Drainage District currently in the California Water Code. This mechanism would need to be coordinated with other potential assessments.	All capital and ongoing management actions	Applicability is high. There is a strong nexus between the assessments and benefits received in the drainage district.	High	N/A	$25 million per year	✓	A new funding source to pay local cost shares.
State River Basin Assessment or Tax	✓	A river basin assessment or tax could be a tool for integrated water management. Assessment or tax revenues could be returned to the watershed to be shared across the integrated water management activities. This assessment or tax could cover the whole watershed and be shared by water agencies within the watershed.	All capital and ongoing management actions	Applicability is low (if implemented, assessment revenue would be spread across other water activities in the basin with likely no more than $5 to $10M/year for flood management). Nexus is good between the assessment and the benefits received in the watershed.	High	N/A	$25 million per year	✓	A new funding source that could fund some projects in the longer term, but a minor role in the CVFPP funding plan.
State Flood Insurance Program	✓	The State could augment/replace the NFIP program with a State-led program. Beyond providing risk coverage, the program would be set up to invest in infrastructure and other floodplain management activities that reduce flood risk. Another version of this could be a local basin-wide insurance program. A local basin-wide insurance program could potentially be a companion program with the Statewide Flood Insurance Program. Any new program could also consider insurance for agricultural properties.	Levee improvements, small-scale levee setbacks and floodplain storage, land acquisitions and easements	Applicability is high (anticipated to generate $5 to $20M/yr.; however, this would require significant effort to determine feasibility). There is a strong nexus insurance and the benefits received as rates could fluctuate depending on benefit level.	High	N/A	$12 million per year	✓	A new funding source that could fund projects in the longer term.
GO Bonds		Issuance of new State general obligation bonds would require a statewide vote. This mechanism would require time to prepare language for the bond measure for the statewide vote, as well as a 2-year lag before funds would be available after passage.	Systemwide capital actions, levee improvements, small-scale levee setbacks and floodplain storage, land acquisitions and easements, habitat restoration/reconnection	Applicability is high. The benefits of reducing the flood risk and benefits to the State economy create a nexus with this mechanism.	High for bonds that have passed, low over the long term	• 2006–2015 annual average: $180 million • 2006–2015 maximum $275 million (2010)	$2.5 billion per decade	✓	Could continue to play a significant role in capital investments.
Water Surcharge	✓	An option that has been discussed for several years, a water surcharge on retail water sales could generate revenue for water projects. There would likely be a nexus to ecosystem projects.	habitat restoration/reconnection, small-scale levee setbacks	Applicability and nexus is low (except for projects w/ ecosystem benefits).	High		Not used in the funding plan		Not used for CVFPP-recommended funding plan – could be used as long-term source of funding for ecosystem efforts, but a minor role in the funding plan.

Table 6-1. Summary of Potential Funding and Financing Mechanisms by State, Federal, and Local Entities

Mechanism	New Mechanism	Description	Applicable Management Actions	Level of Applicability	Interannual Reliability	Current Funding Level	Revenue General Potential for 2017 Refined SSIA Portfolio	Mechanism Included in Funding Plan	Recommendations for CVFPP Funding Plan
State Maintenance Areas		CVFPB has the authority to form a maintenance area if the local agencies are unable to meet State and federal requirements. Where maintenance areas are formed, DWR performs maintenance based on the actual costs of performing the maintenance. CVFPB has authority to assess property owners who receive benefits from project maintenance.	Systemwide routine maintenance	Applicability is high for routine maintenance only. A maintenance area determination would need to be made for each underperforming local agency, which could limit its widespread use.	High		Not used in the funding plan		Not used for CVFPP-recommended funding plan – revenue generation would be dependent on maintenance costs to be recovered.
Federal									
USACE		The WRDA authorizes the Secretary of the Army to study and/or implement various projects and programs for improvements and other purposes to rivers and harbors of the United States. In California, the majority of federal flood protection projects are the responsibility of USACE. Federal authorized funds would require appropriation by Congress.	Systemwide capital actions; urban levee improvements; small-scale levee setbacks and floodplain storage; rural land acquisitions and easements; habitat restoration/reconnection; risk awareness, floodproofing, and land use planning; urban and small community studies and analysis	Applicability is high. Projects qualifying for USACE funding must demonstrate that they provide national benefits to receive funding.	Moderate	• 2003–2016 annual average: $55 million (excluding Folsom Joint Federal Project) • 2009–2016 annual average: $105 million (including Folsom Joint Federal Project) • 2009–2016 maximum $125 million (2013)	$250 million per year	✓	A key part of the federal contribution.
FEMA		FEMA is the disaster response agency of the federal government. FEMA provides State and local governments with funding for emergency preparedness programs in the form of non-disaster grants.	Risk awareness, floodproofing, and land use planning; rural and small community studies and analysis	Applicability is high (expected to generate no more than $10 million per year). The limited uses of the funds maintain the nexus between the funds and benefits received.	High	• 2001–2015 annual average: $4.8 million • 2001–2015 maximum $20 million (2009)	$20 million per year	✓	Part of the CVFPP funding plan, but provides smaller percentage of overall CVFPP funds.
Ecosystem Programs		Several federal programs provide grants for ecosystem purposes. For example, voluntary Farm Bill conservation programs are offered through the NRCS.	Habitat restoration/reconnection, rural land acquisitions and easements	Applicability is high. The application process for these funds would require a nexus to be shown.	Moderate		Not used in the funding plan		Not used for CVFPP recommended funding plan – programs should be explored to augment funding.
Local									
Benefit Assessments and Special Taxes		The typical mechanism for funding local activities. Increases to benefit assessments and special taxes would require a property owner or a registered voter vote (depending upon specific circumstances). Benefit assessments could be limited and not able to fund general benefits such as habitat restoration.	All capital and ongoing management actions other than habitat restoration/reconnection	Applicability is high. Benefit assessments by definition would have a good nexus.	High	2008–2016 annual average: $20 million	$80 million per year	✓	Could continue to play a major role in local funding.

Table 6-1. Summary of Potential Funding and Financing Mechanisms by State, Federal, and Local Entities

Mechanism	New Mechanism	Description	Applicable Management Actions	Level of Applicability	Interannual Reliability	Current Funding Level	Revenue General Potential for 2017 Refined SSIA Portfolio	Mechanism Included in Funding Plan	Recommendations for CVFPP Funding Plan
EIFDs	✓	EIFDs were established in 2014 and enable the establishment of one or more EIFDs within a county to assist with financing construction or rehabilitation of a wide variety of public infrastructure and private facilities.	Systemwide routine maintenance, emergency management, levee improvements, floodplain storage (transitory, groundwater, and/or surface), small-scale levee setbacks	Applicability is moderate. Nexus would be dependent on how the EIFD was established.	Moderate		Not used in the funding plan		Not used for CVFPP recommended funding plan – could be used as another approach for local funding. More applicable to new development.
Developer Fees		A system development charge for new improvements.	Levee improvements, floodplain storage (transitory, groundwater, and/or surface), small-scale levee setbacks	Applicability is high. The developer fee would have to show a nexus in the calculation of the fee.	Low, depends on development		Not used in the funding plan		Not used for CVFPP recommended funding plan. Could be used as a source for one-time management actions.

Notes:
1. A requested change for the USACE project approval methodology.
2. Numbers based on an unconstrained State funding scenario, for demonstration only.
3. State GO bond revenue generation potential is reported on a per decade basis because the CVFPP Funding Plan assumes a GO bond will be passed every decade.

EIFD = Enhanced Infrastructure Financing District
FEMA = Federal Emergency Management Agency
NFIP = National Flood Insurance Program
NRCS = Natural Resources Conservation Service
USACE = U.S. Army Corps of Engineers
WRDA = Water Resources Development Act (1986, 2016)

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Tables 6-2 and 6-3 focus on a subset of funding mechanisms that are likely to represent the majority of contribution to the CVFPP funding plan, some of which are a broader grouping of some of the more detailed mechanisms discussed above. During funding plan development, each of the management actions by area of interest were aligned with the applicable funding mechanism.

Table 6-2. Applicable Funding Mechanisms for Capital Investments

Management Action Category and Area of Interest	Applicable Funding Mechanisms (State, Federal, and/or Local)
Systemwide	
Yolo Bypass multi-benefit improvements	State General Fund, GO Bond, USACE, Local Mechanisms, Sacramento and San Joaquin Drainage District
Feather River–Sutter Bypass multi-benefit improvements	State General Fund, GO Bond, USACE, Local Mechanisms, Sacramento and San Joaquin Drainage District
Paradise Cut multi-benefit improvements	State General Fund, GO Bond, State River Basin Assessment or Tax, State Flood Insurance Program, USACE, Local Mechanisms, Sacramento and San Joaquin Drainage District
Reservoir and floodplain storage	State General Fund, GO Bond, State River Basin Assessment or Tax, State Flood Insurance Program, USACE, Local Mechanisms, Sacramento and San Joaquin Drainage District
Urban	
Levee improvements	State General Fund, GO Bond, State River Basin Assessment or Tax, State Flood Insurance Program, USACE, Local Mechanisms, Sacramento and San Joaquin Drainage District
Other infrastructure and multi-benefit improvements	State General Fund, GO Bond, State River Basin Assessment or Tax, State Flood Insurance Program, USACE, Local Mechanisms, Sacramento and San Joaquin Drainage District
Rural	
Levee repair and infrastructure improvements	State General Fund, GO Bond, State River Basin Assessment or Tax, State Flood Insurance Program, USACE, Local Mechanisms, Sacramento and San Joaquin Drainage District
Small-scale levee setbacks and floodplain storage	State General Fund, GO Bond, State River Basin Assessment or Tax, State Flood Insurance Program, USACE, Local Mechanisms, Sacramento and San Joaquin Drainage District
Land acquisitions and easements	State General Fund, GO Bond, State River Basin Assessment or Tax, State Flood Insurance Program, FEMA, Local Mechanisms, Sacramento and San Joaquin Drainage District
Habitat restoration and reconnection	State General Fund, GO Bond, State River Basin Assessment or Tax, State Flood Insurance Program, USACE, Local Mechanisms, Sacramento and San Joaquin Drainage District
Small Community	
Levee repair and infrastructure improvements	State General Fund, GO Bond, State River Basin Assessment or Tax, State Flood Insurance Program, USACE, Local Mechanisms, Sacramento and San Joaquin Drainage District
Levee setbacks, land acquisitions, and habitat restoration	State General Fund, GO Bond, State River Basin Assessment or Tax, State Flood Insurance Program, USACE, Local Mechanisms, Sacramento and San Joaquin Drainage District

Notes:
GO = general obligation
USACE = U.S. Army Corps of Engineers

Table 6-3. Applicable Funding Mechanisms for Ongoing Investments

Management Action Category and Area of Interest	Applicable Funding Mechanisms (State, Federal, and/or Local)
Systemwide	
State operations, planning and performance tracking	State General Fund, State River Basin Assessment or Tax, State Flood Insurance Program
Emergency management	State General Fund, State River Basin Assessment or Tax, Local Mechanisms
Reservoir operations	State General Fund, State River Basin Assessment or Tax, Local Mechanisms
Routine maintenance	State General Fund, State Flood Insurance Program, Local Mechanisms, Sacramento and San Joaquin Drainage District
Urban	
Risk awareness, floodproofing, and land use planning	State General Fund, State River Basin Assessment or Tax, State Flood Insurance Program, USACE, FEMA, Local Mechanisms
Studies and analysis	State General Fund, Sacramento and San Joaquin Drainage District, USACE, FEMA, Local Mechanisms, Sacramento and San Joaquin Drainage District
Rural	
Risk awareness, floodproofing, and land use planning	State General Fund, State River Basin Assessment or Tax, State Flood Insurance Program, USACE, FEMA, Local Mechanisms
Studies and analysis	State General Fund, Sacramento and San Joaquin Drainage District, USACE, FEMA, Local Mechanisms, Sacramento and San Joaquin Drainage District
Small Community	
Risk awareness, floodproofing, and land use planning	State General Fund, State River Basin Assessment or Tax, State Flood Insurance Program, FEMA, Local Mechanisms
Studies and analysis	State General Fund, Sacramento and San Joaquin Drainage District, USACE, FEMA, Local Mechanisms, Sacramento and San Joaquin Drainage District

Notes:
FEMA = Federal Emergency Management Agency
USACE = U.S. Army Corps of Engineers

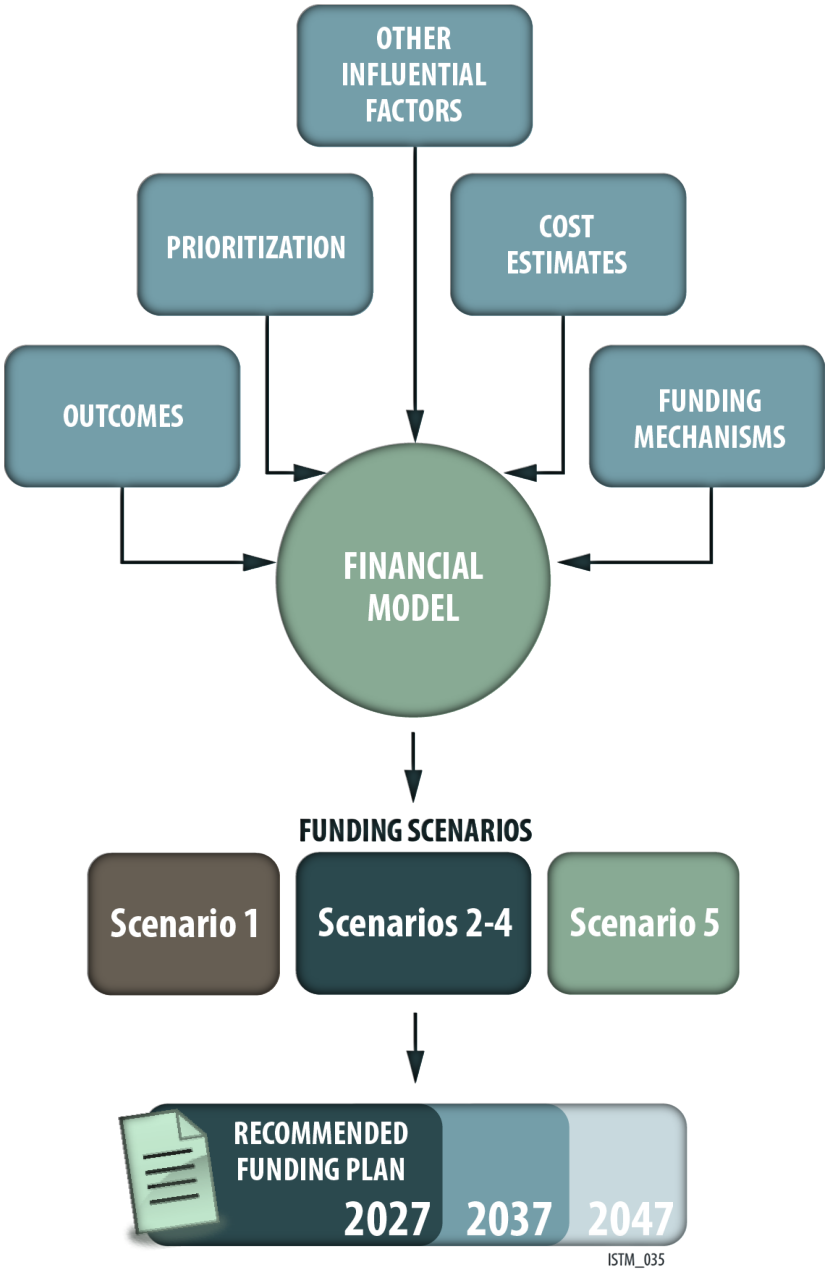
7.0 Assessment of Funding Scenarios

Chapter 7 Highlights

- Chapter Outline:
  - Financial Model and Funding Scenarios
    - Scenario 1: Decrease Current Investment Levels
    - Scenario 2: Continue Current Investment Levels
    - Scenarios 3–5: Increase Current Investment Levels
  - Scenario Conclusions and Recommended Funding Plan
- Key Chapter Takeaways:
  - The financial model analyzed five funding scenarios and quantified State, federal, and local contributions.
  - The recommended funding plan, Scenario 5: Increased Current Investment Levels, was guided by lessons learned and the results of five scenarios.

Prioritization of management actions, capacity of existing and new funding mechanisms, cost estimating, and other influential factors such as ability to pay or cost share agreements can affect future flood management investments. A CVFPP financial model was developed to quantitatively evaluate different combinations of these considerations in multiple funding scenarios and help guide the recommended funding plan. The recommended funding plan for the 2017 refined SSIA portfolio will provide the State, federal, and locals with a quantified responsibility over the next 30 years for successful implementation of the CVFPP. Figure 7-1 demonstrates how these diverse considerations were included in the CVFPP financial model, and how they led to the development of five funding scenarios. The five funding scenarios provide the context and support for three phases of the recommended funding plan.

Figure 7-1. Development of a 2017 CVFPP Recommended Funding Plan



7.1 Financial Model

The CVFPP financial model was developed in Excel to quantify how funding mechanisms contribute to each management action over the 30-year implementation timeframe. Other quantitative variables in the CVFPP financial model include annual capacity limits for each funding mechanism, applicability of funding mechanisms (good, moderate, poor, not applicable) to each management action, and the State, federal, and local cost share percentages for each management action. The CVFPP financial model quantifies the overall level of investment for the 2017 refined SSIA portfolio; the State, federal, and local contributions; and the timing of management action investment. The mechanics of the financial model and data output from the financial model are further discussed in Appendix E, Funding Scenario Support.

7.2 State, Federal and Local Contributions to CVFPP and Central Valley Flood Management

Throughout the following scenario discussions, State, federal, and local cost shares are presented for investments within the 2017 refined SSIA portfolio. The reported cost shares apply only to the SPFC and do not represent the total local and federal expenditures on flood management within the entire Central Valley. The 2017 refined SSIA portfolio is comprehensive in the State's role in flood management in the SPFC and is contained in the reported State cost shares.

Table 7-1 displays annual State, federal, and local contributions to flood management in the Central Valley from 2003 to 2015. These contributions are an estimate of potential capacity for flood management investments identified in the 2017 refined SSIA portfolio. To estimate federal and local contributions, certain expenditures were removed. These exceptions include the following:

- Federal contributions not captured within the 2017 refined SSIA portfolio are operations and improvements to reservoirs outside the SPFC (e.g., Black Butte Lake, Buchanan Dam, Farmington Dam, Hidden Dam, Pine Flat Lake, etc.). However, feasibility studies and construction costs associated with key projects within the SPFC Planning Area (e.g., American River Watershed, Merced County Streams, Yuba and Marysville improvements, etc.) are included.

- Local contributions not captured within the 2017 refined SSIA portfolio are administrative costs and assistance from State and federal programs. However, routine OMRR&R contributions are included.

Table 7-1. Historical Contributions to Central Valley Flood Management

Year	Historical State Total[1]	Historical Federal Total[2]	Historical Local Total[3]
2003	$75,239,416	$64,283,000	$234,983,102
2004	$229,283,352	$30,908,000	$211,902,795
2005	$247,712,714	$38,252,000	$218,377,953
2006	$62,645,542	$48,311,000	$225,795,315
2007	$75,239,416	$73,544,038	$215,082,694
2008	$229,283,352	$75,972,063	$210,599,527
2009	$247,712,714	$65,676,515	$234,661,799
2010	$286,576,154	$108,355,000	$194,177,729
2011	$256,802,903	$116,211,000	$209,415,598
2012	$182,626,268	$81,356,000	$220,374,279
2013	$249,347,122	$121,294,000	$207,763,978
2014	$277,585,245	$96,210,000	$207,451,970
2015	$200,312,971	$116,148,000	$215,882,228
Average	**$201,566,705**	**$108,202,000**	**$215,882,228**

Notes:
1. State contributions include State General Fund and GO bond expenditures in the Central Valley.
2. Federal contributions include only USACE budgets in the Central Valley and no other federal agency contributions. Comprehensive expenditures for other federal agencies specific to the Central Valley were not available. For calculations of historical contributions see Appendix A.
3. Local expenditures include city and county expenditures and special district revenues.
4. See Appendix A for all data tables and references on historical State, federal, and local expenditures.

7.3 Overview of Funding Scenarios

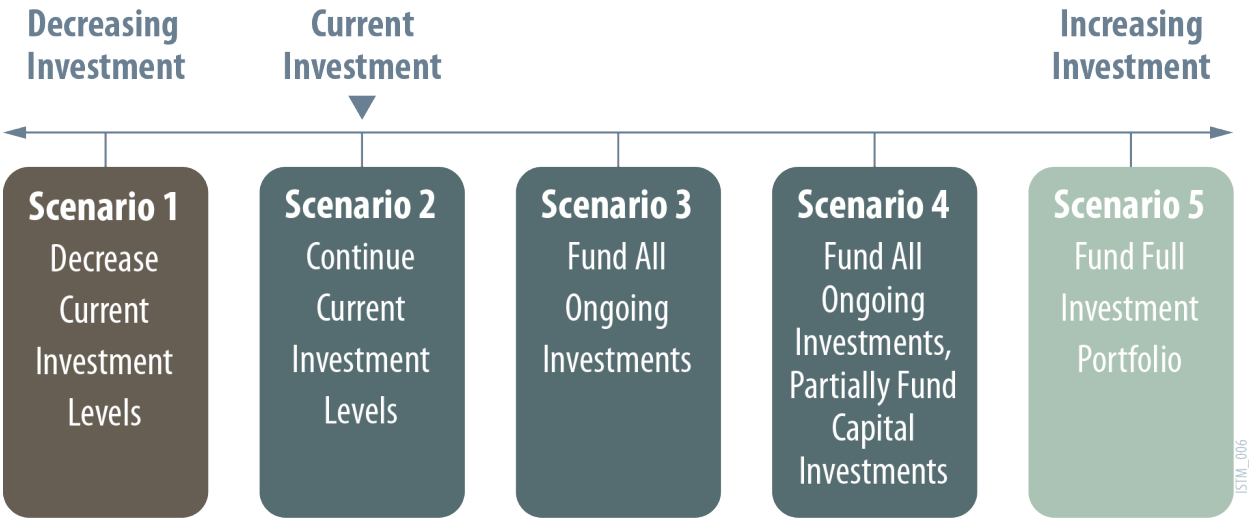
The following analysis and scenario comparison is intended to help guide State, federal, and local investment in the 2017 refined SSIA portfolio. The scenarios quantify existing and new funding mechanism contributions, and consider both cost share and ability to pay realities discussed in Chapter 4. This comparison serves to highlight some of the following key relationships:

- The shifting burdens on State, federal, and local contributions, if one or more new funding mechanisms were implemented
- The tradeoffs between ability to pay and funding mechanism applicability
- The level of funding to each management action type, given different funding mechanisms
- How existing cost shares result in overall State, federal, and local contributions

Each scenario is based on a different set of assumptions ranging from a continuation of historical trends to a more optimistic future. In addition to the paths of increased investment, Scenario 1 shows the implications of what a reduced investment could look like. The reduced investment scenario, Scenario 1, considers no additional bonds are passed and only the existing levels of the State General Fund, federal, and local funding mechanisms are available. Scenario 2 shows the implications of what continued current investment could look like. The increased investment scenarios, Scenarios 3 through 5, quantify the required need to fund all the ongoing management activities within the 2017 refined SSIA portfolio.

This comparison of decreased investment to a build-up toward funding the full 2017 refined SSIA portfolio is split into five main scenarios. Scenarios 3 and 4 consist of two sub-scenarios to evaluate nuances in funding approaches or funding constraints. Figure 7-2 provides an overview of Scenarios 1 through 5.

Figure 7-2. Funding Scenarios Compare Various Degrees of Investment Toward the 2017 Refined SSIA Portfolio



7.3.1 Scenario 1: Decrease Current Investment Levels

This scenario provides one bookend to the analysis, and demonstrates the implications of continued current levels of investment from the State General Fund, federal, and local funding mechanisms, but without any further GO bonds passed in the next decades. This represents a significant hurdle to all of the proposed capital investments within the 2017 refined SSIA portfolio, and does not allow for much of an increase in spending for ongoing investments.

7.3.2 Scenario 2: Continue Current Investment Levels

This scenario identifies the management actions in the 2017 refined SSIA portfolio that can be implemented if future investment levels match the current level of investment. This scenario does not include any new funding mechanisms, but it does assume the continued passage of GO bonds with historical levels of funds for flood management.

7.3.3 Scenarios 3–5: Increase Current Investment Levels

Scenarios 3 through 5 demonstrate the importance of increased investment in Central Valley flood management. The increase in need from existing and new funding mechanisms is quantified for the overall investment need in Central Valley flood management.

- **Scenario 3 – Fund All Ongoing Investments:** Investment in ongoing management actions is critical to maintain an effective system, to proactively managing risk intensification, and manage residual risk on floodplains. Scenario 3 consists of two sub-scenarios that fully fund ongoing investments with both existing and new mechanisms. Both sub-scenarios require significant increases in revenue from the State General Fund. Capital investments are not included in either of these sub-scenarios.

- **Scenario 4 – Fund All Ongoing Investments, Partially Fund Capital Investments:** Scenario 4 consists of two sub-scenarios to demonstrate the contributions required to fully fund the ongoing investments and partial levels of capital investment. This build-up is based on leveraging the maximum annual potential from new mechanisms. Additional contributions from existing State, federal, and local funding mechanisms are required.

- **Scenario 5 – Fund Full Investment Portfolio:** Significant increases in State, federal, and local contributions are necessary to fully fund the 2017 refined SSIA portfolio. Scenario 5 provides the contributions required for each new and existing funding mechanism. These contributions are based on cost shares and applicability of funding mechanisms representative of current programs. Annual contributions consider the revenue generating potential discussed in Chapter 6.

7.4 Scenario 1: Decrease Current Investment Levels

Scenario 1 assumes continued current levels of State General Fund, federal, and local contributions, but without any further GO bonds passed in the Phases 2 and 3. Table 7-2 shows current levels of contributions continue from each funding mechanism for Scenario 1, except for State GO bonds. In Phase 1, the remaining GO bonds are exhausted and no additional GO bonds are passed that contain flood management contributions. This decreased level of investment impacts the ability to implement capital management actions in the 2017 refined SSIA portfolio.

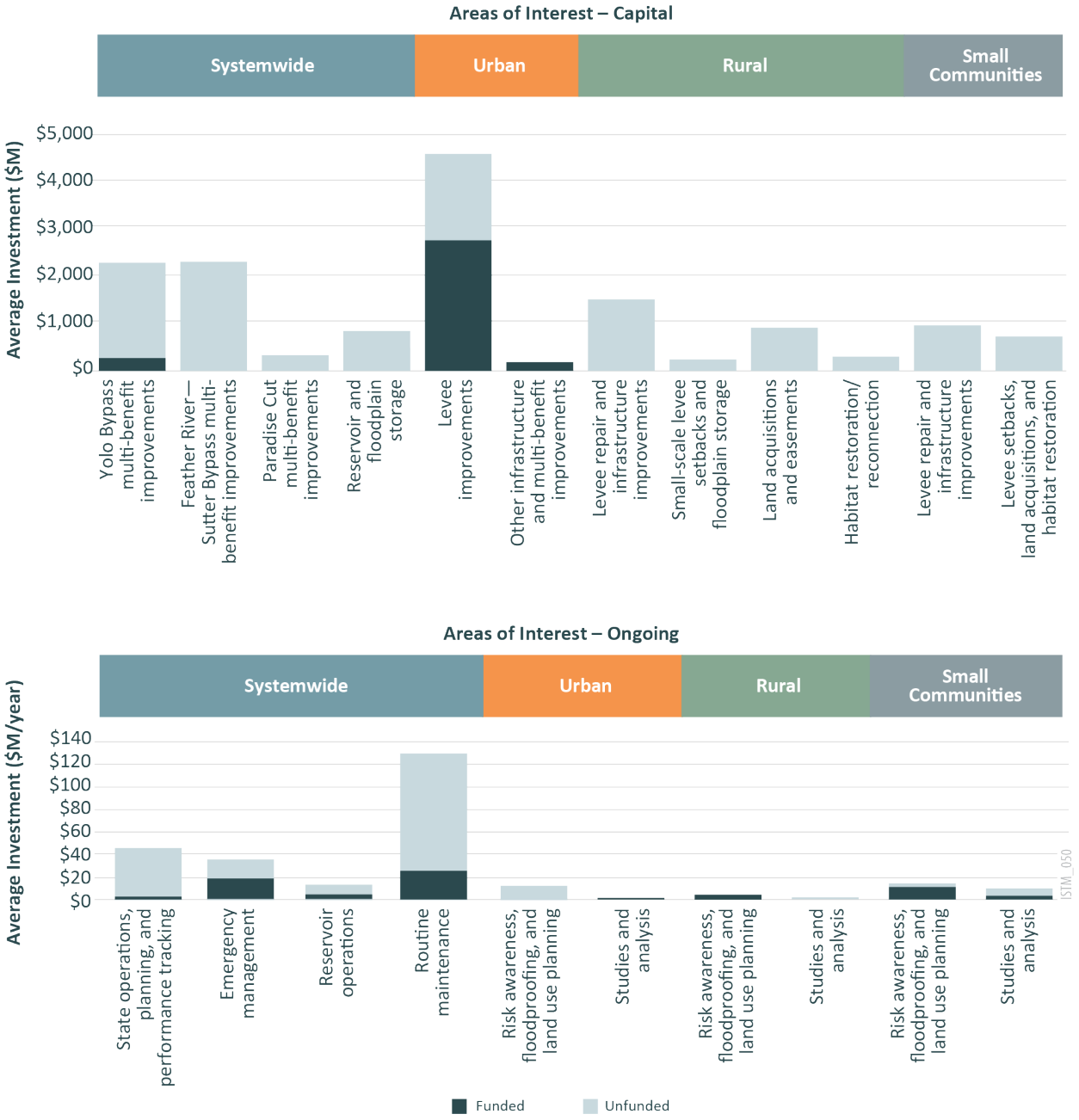
Table 7-2. Average Annual Contribution from Funding Mechanisms, Scenario 1

Funding Mechanism	Phase 1 ($M/yr.)	Phase 2 ($M/yr.)	Phase 3 ($M/yr.)
State General Fund	$60	$60	$60
State GO Bonds	$20	$0	$0
USACE	$90	$90	$90
FEMA	$5	$5	$5
Local	$35	$35	$35
Total	**$210**	**$190**	**$190**

Note:
1. The total contribution includes ongoing annual investments in 2016 dollars that have not been discounted to present value nor escalated for inflation.

Figure 7-3 shows the impact of decreased investment on ongoing management actions. Continued levels of current investment cover less than half of the costs identified. Also, some tradeoffs are apparent; investments in ongoing management actions decrease in favor of continued investment in high priority capital investments. As shown, little of the total capital investment is funded over a 30-year timeframe, with rural areas and small communities experiencing the greatest impact. This is because of the dependence those areas of interest have on significant State cost sharing; without GO bonds, the State has limited ability to assist with capital investments in those areas.

Figure 7-3. Investment in Management Activities, Scenario 1



7.5 Scenario 2: Continue Current Investment Levels

Scenario 2 keeps the current level of State General Fund, federal, and local contributions consistent. Historical levels of GO bond contributions for flood management passed in the next decades were maintained for Scenario 2. Table 7-3 shows current levels of contributions continue from each funding mechanism for Scenario 2, including State GO bonds. This current level of investment impacts the ability to implement capital and ongoing management actions in the 2017 refined SSIA portfolio.

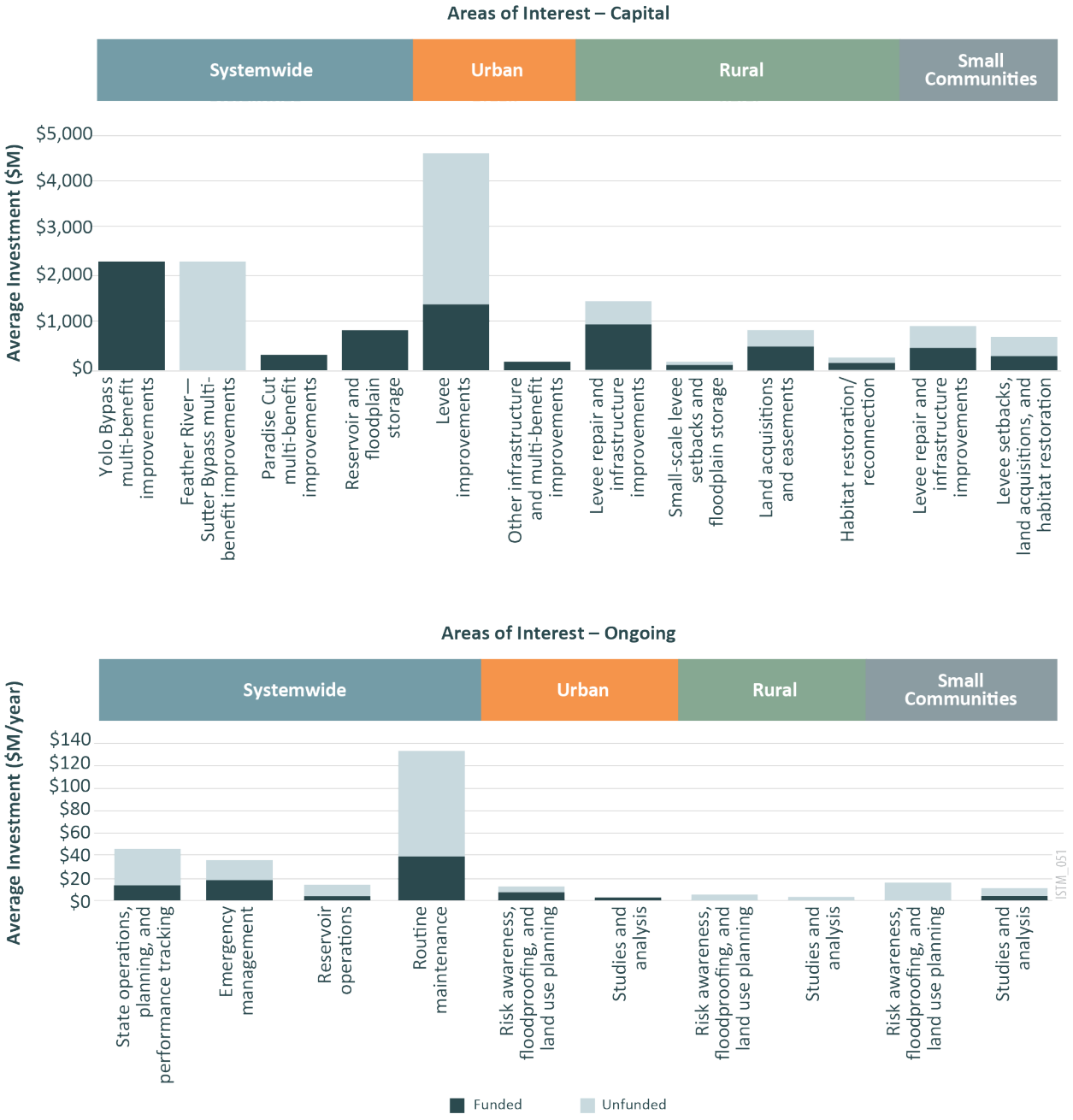
Table 7-3. Average Annual Contribution from Funding Mechanisms, Scenario 2

Funding Mechanism	Phase 1 ($M/yr.)	Phase 2 ($M/yr.)	Phase 3 ($M/yr.)
State General Fund	$60	$60	$60
State GO Bonds	$150	$150	$150
USACE	$90	$90	$90
FEMA	$5	$5	$5
Local	$35	$35	$35
Total	**$340**	**$340**	**$340**

Note:
1. The total contribution includes ongoing annual investments in 2016 dollars that have not been discounted to present value nor escalated for inflation.

Figure 7-4 shows the extent to which capital and ongoing investments can be funded with a continuation of current funding trends. Only about half of the full refined 2017 SSIA portfolio is funded, with some capital investments; urban levee improvements are still not fully funded. This continuation of current funding levels would also imply that ongoing management actions are never fully funded, instead only reaching less than half of that total need by the end of the 30-year timeline.

Figure 7-4. Investment in Management Activities, Scenario 2



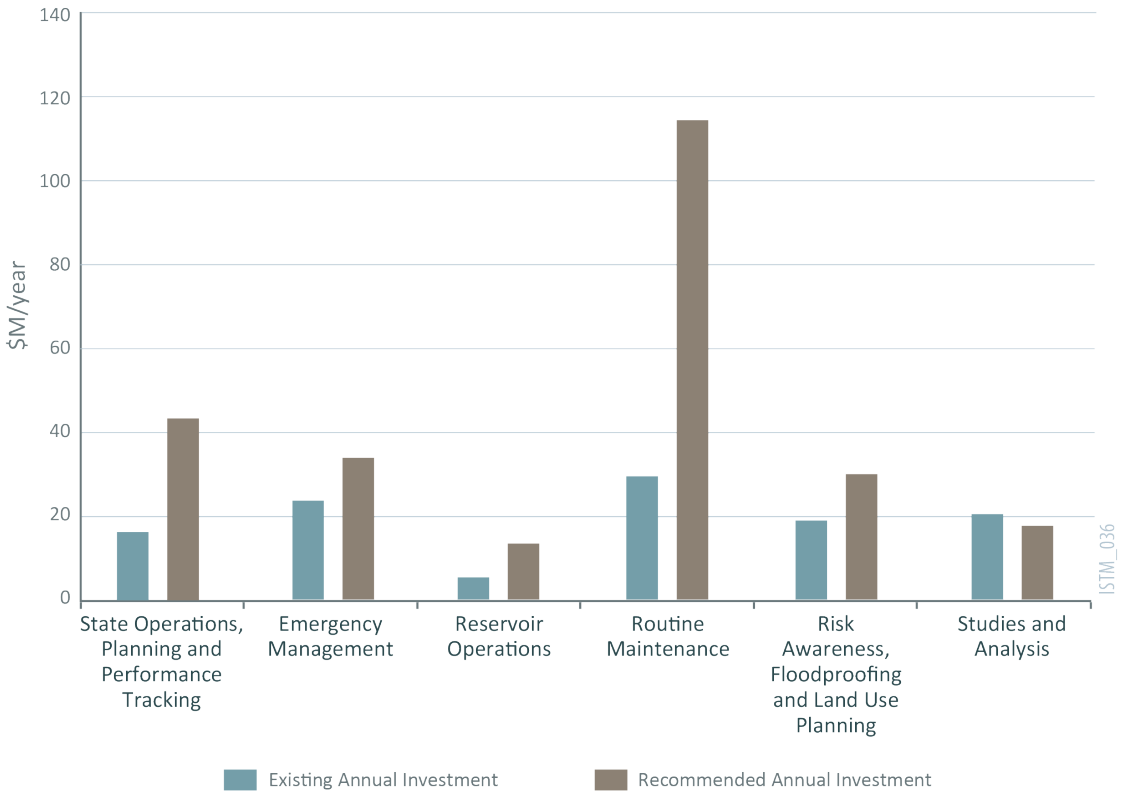
7.6 Scenarios 3–5: Increase Current Investment Levels

7.6.1 Scenario 3: Fund All Ongoing Investments

One of the CVFPP investment strategy's objectives is to demonstrate the need for securing reliable and continuous funding for ongoing management actions that serve to maintain the system, encourage wise use of floodplains, and manage residual risk. It is important to understand how much funding is needed to effectively operate and maintain the current system before additional capital improvements are made. This is especially true if potential funding for all other improvements may be depleted and investments in ongoing management actions are all that could be made.

Ongoing investments ramp up over time for the State and its partner agencies to establish the necessary staff, resources, and mechanisms needed to accommodate the influx of annual funding while maintaining their routine activities as described in Chapter 5. Figure 7-5 compares current levels of investment in ongoing management actions to the recommended Phase 3 levels of investment. Scenario 3 contains two-sub scenarios that close the funding gap that currently exists for system maintenance, ongoing operations, and floodplain and residual risk management.

Figure 7-5. Comparison of Current to Needed Annual Levels of Investment in Ongoing System Maintenance and Risk Management Activities



Notes:
1. Existing annual investments are an average of 2003-2016.
2. See Appendix A for all data tables and references on historical State, federal, and local expenditures.

Scenario 3a: Maintaining the System with Existing Mechanisms

Scenario 3a fully funds the entire ongoing investment of management actions with existing State, federal, and local funding mechanisms. Table 7-4 shows the average annual investment needed from each mechanism. No capital investments are funded in Scenario 3a.

Table 7-4. Average Annual Contribution from Funding Mechanisms, Scenario 3a

Funding Mechanism	Phase 1 ($M/yr.)	Phase 2 ($M/yr.)	Phase 3 ($M/yr.)
State General Fund	$135	$181	$193
USACE	$10	$12	$15
FEMA	$7	$12	$17
Local	$28	$45	$50
Total	**$180**	**$250**	**$275**

Note:
1. The total contribution includes ongoing annual investments in 2016 dollars that have not been discounted to present value nor escalated for inflation.

Scenario 3b: Maintaining the System with New and Existing Mechanisms

Scenario 3b funds the entire ongoing investment with new and existing State, federal, and local mechanisms. Realistic constraints are placed on the new funding mechanisms based on revenue generation capacity as discussed in Chapter 6 and timing of new mechanism implementation. Table 7-5 shows the average annual contribution needed from each existing and new funding mechanism. No capital investments are funded in Scenario 3b.

Table 7-5. Average Annual Contribution from Funding Mechanisms, Scenario 3b

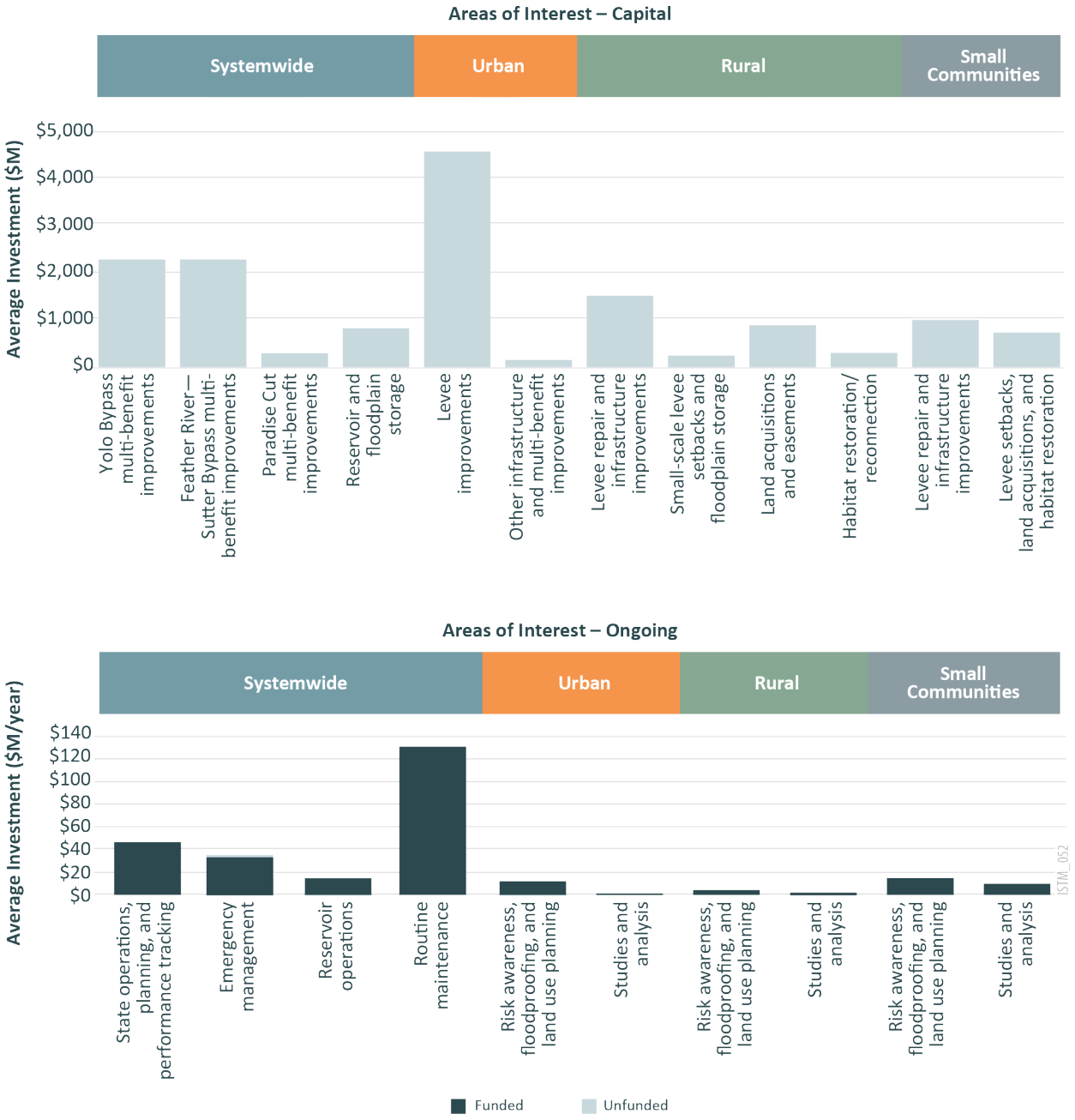
Funding Mechanism	Phase 1 ($M/yr.)	Phase 2 ($M/yr.)	Phase 3 ($M/yr.)
State General Fund	$135	$170	$190
State Flood Insurance Program	$0	$1	$1
State River Basin Assessment	$0	$10	$10
USACE	$10	$12	$12
FEMA	$7	$12	$17
Local	$26	$39	$36
Sacramento and San Joaquin Drainage District	$2	$6	$6
Total	**$180**	**$250**	**$275**

Note:
1. The total contribution includes ongoing annual investments in 2016 dollars that have not been discounted to present value nor escalated for inflation.

Results from Scenarios 3a and 3b contrast the demand for existing funding mechanisms with and without the use of new funding mechanisms. With the use of new funding mechanisms, such as the State flood insurance program and State river basin assessment or tax, the average annual burden on the State General Fund decreases. Federal funding mechanisms (for example, via USACE or FEMA) do not change with the use of new State and local funding mechanisms. Contributions generated by local agencies decrease by Phase 3 with the implementation of new State funding mechanisms. However, the impact to the local end user will increase overall when considering both the local agencies contributions plus the Sacramento and San Joaquin Drainage District.

Reducing the burden on the State General Fund and other existing mechanisms is important because some suffer from political challenges such as competing demands and Proposition 218 revenue generation. While Scenario 3a and 3b demonstrate the importance of the State General Fund, the development of new mechanisms is equally important because they establish a stable and consistent funding source for flood management activities that currently does not exist. The interannual reliability of new funding mechanisms is especially critical for the viability of ongoing management actions, which often experience unstable funding. Figure 7-6 shows full investment in all ongoing management actions and no investment in capital management actions.

Figure 7-6. Investment in Management Activities, Scenarios 3a and 3b



7.6.2 Scenario 4: Fund All Ongoing Investments, Partially Fund Capital Investments

Scenarios 4a and 4b build on Scenario 3, funding progressively larger portions of the capital investments of the 2017 refined SSIA portfolio. New funding mechanisms continue to contribute in these scenarios. Scenario 4a includes the existing level of GO bonds identified in Scenario 2, and continues the same level of contribution from new mechanisms, the State General Fund, and local as in Scenario 3b. Scenario 4b calculates the increase in GO bond and federal contributions to fully fund the 2017 refined SSIA portfolio without the Feather River–Sutter Bypass multi-benefit improvements.

7.6.3 Scenario 4a: Fund All Ongoing Investments Plus Continue Current Levels of Capital Investment

Table 7-6 shows average annual contributions of existing and new funding mechanisms to fully fund ongoing investments and fund capital investments at current levels.

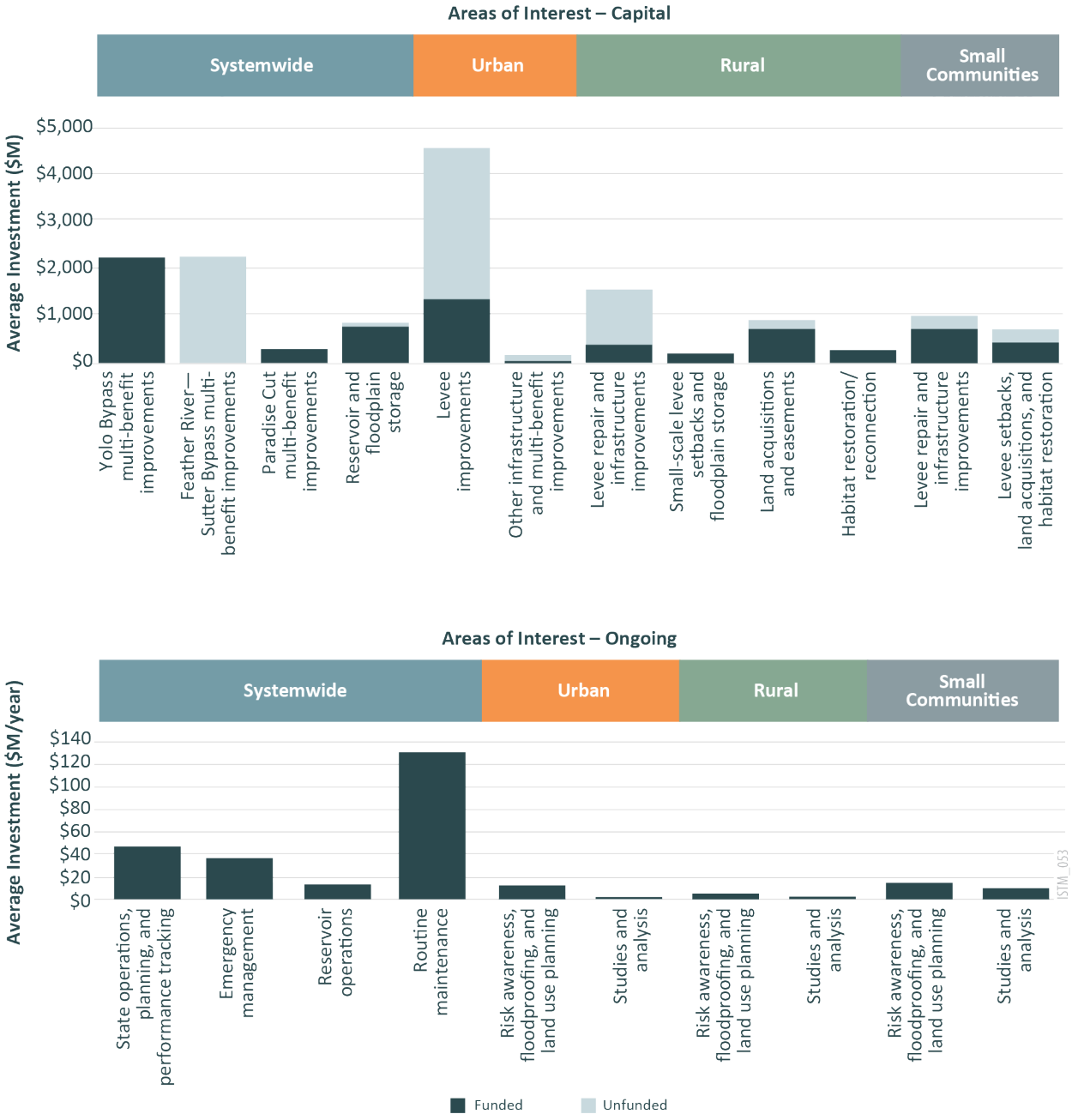
Table 7-6. Average Annual Contribution from Funding Mechanisms, Scenario 4a

Funding Mechanism	Phase 1 ($M/yr.)	Phase 2 ($M/yr.)	Phase 3 ($M/yr.)
State General Fund	$135	$170	$190
State GO Bonds	$150	$150	$150
State Flood Insurance Program	$0	$1	$1
State River Basin Assessment	$0	$10	$10
USACE	$90	$90	$90
FEMA	$10	$15	$20
Local	$35	$48	$45
Sacramento and San Joaquin Drainage District	$2	$6	$6
Total	**$422**	**$490**	**$512**

Note:
1. The total contribution includes ongoing annual investments in 2016 dollars that have not been discounted to present value nor escalated for inflation.

Figure 7-7 shows the investment in the 2017 refined SSIA portfolio in Scenario 4a. All ongoing investments are fully funded as they were in Scenario 3. Capital investments are funded by the same levels of federal and GO bond as Scenario 2. Furthermore, only the Yolo Bypass multi-benefit improvements and Paradise Cut multi-benefit improvements are fully funded, and partial levels of urban levee improvements are funded.

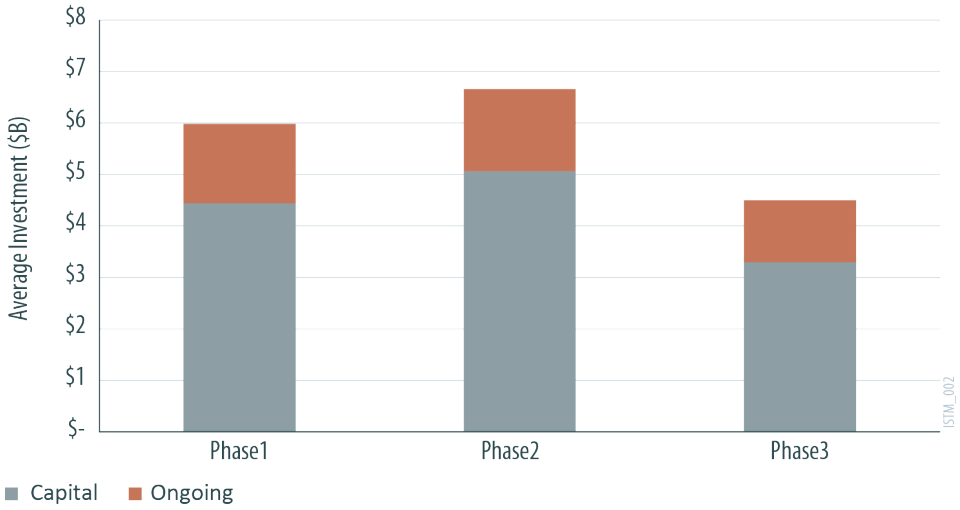
Figure 7-7. Investment in Capital and Ongoing Management Actions, Scenario 4a



7.6.4 Scenario 4b: Full 2017 Refined SSIA Portfolio without Feather River–Sutter Bypass Multi-Benefit Improvements

Funding the full 2017 refined SSIA portfolio without the Feather River-Sutter Bypass multi-benefit improvements requires a substantial increase in State and federal contributions to Central Valley flood management. However, the focus of that investment changes over time. Figure 7-8 shows how investment shifts from mostly capital investments in Phase 1 to a more balanced investment that includes a large portion of more proactive, ongoing management actions in Phase 3. The total cost of flood management also significantly decreases in Phase 3. This reflects the fact that Phase 1 implementation is primarily focused on mitigating unacceptably high levels of risk, whereas lower-cost, ongoing investments in floodplain and residual risk management throughout all three phases should eventually decrease the need for those mitigating investments in the future. This scenario therefore previews where investment in Central Valley flood management is eventually headed: toward a more proactive and cost-effective set of ongoing investments that adaptively manage risk and maintain the system's ability to produce multiple outcomes of value to society, with decreasing need for large capital investment every decade.

Figure 7-8. Trends in Capital vs. Ongoing Investment Over Time, Scenario 4b



Note: Estimated average totals are the sum of annual ongoing and capital investments in present value terms (2016 dollars).

Fully leveraging the new funding mechanisms to the estimated capacities is also required. Table 7-7 shows the increase in GO bond, federal, and funding new mechanisms contribution required for Scenario 4b.

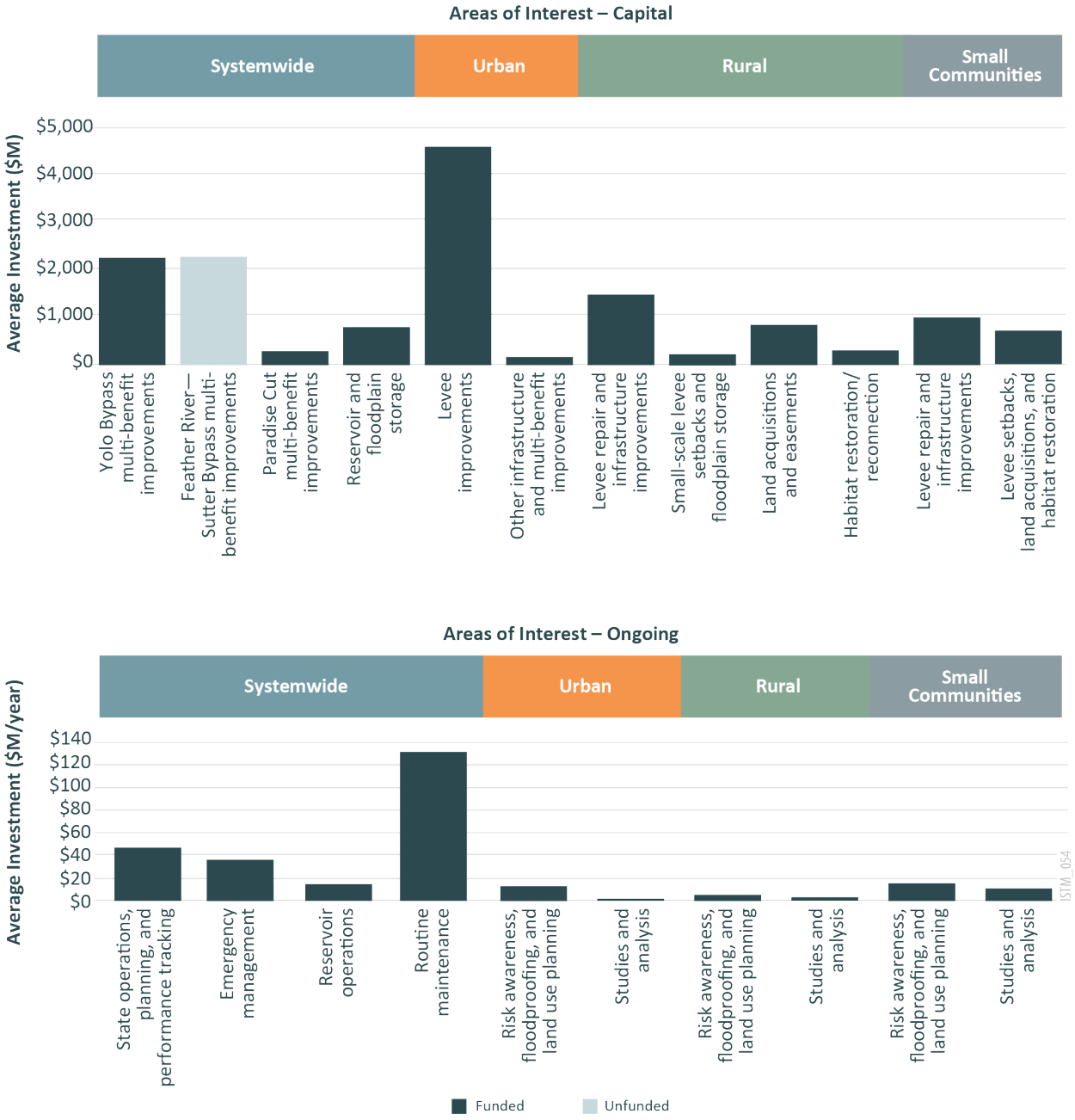
Table 7-7. Average Annual Contribution from Funding Mechanisms, Scenario 4b

Funding Mechanism	Phase 1 ($M/yr.)	Phase 2 ($M/yr.)	Phase 3 ($M/yr.)
State General Fund	$135	$170	$190
State GO Bonds	$250	$250	$135
State Flood Insurance Program	$0	$12	$12
State River Basin Assessment	$0	$15	$25
USACE	$210	$232	$140
FEMA	$10	$15	$20
Local	$35	$38	$40
Sacramento and San Joaquin Drainage District	$15	$20	$25
Total	**$655**	**$752**	**$587**

Note:
1. The total contribution includes ongoing annual investments in 2016 dollars that have not been discounted to present value nor escalated for inflation.

Figure 7-9 shows the investment in the 2017 refined SSIA portfolio in Scenario 4b. All ongoing investments are fully funded as they were in Scenario 3 and 4a, but require greater federal and GO bond contributions. In Scenario 4b, all capital investments are fully funded except for the Feather River-Sutter Bypass multi-benefit improvements.

Figure 7-9. Investment in Management Activities, Scenario 4b



7.6.5 Scenario 5: Fund Full Investment Portfolio

Scenario 5 builds upon Scenario 4, by adding in the Feather River–Sutter Bypass multi-benefit improvements capital investment. Funding the full 2017 refined SSIA portfolio will require significantly higher State and federal contributions, as shown in Scenario 5. Table 7-8 quantifies the annual need for funding the full 2017 refined SSIA portfolio.

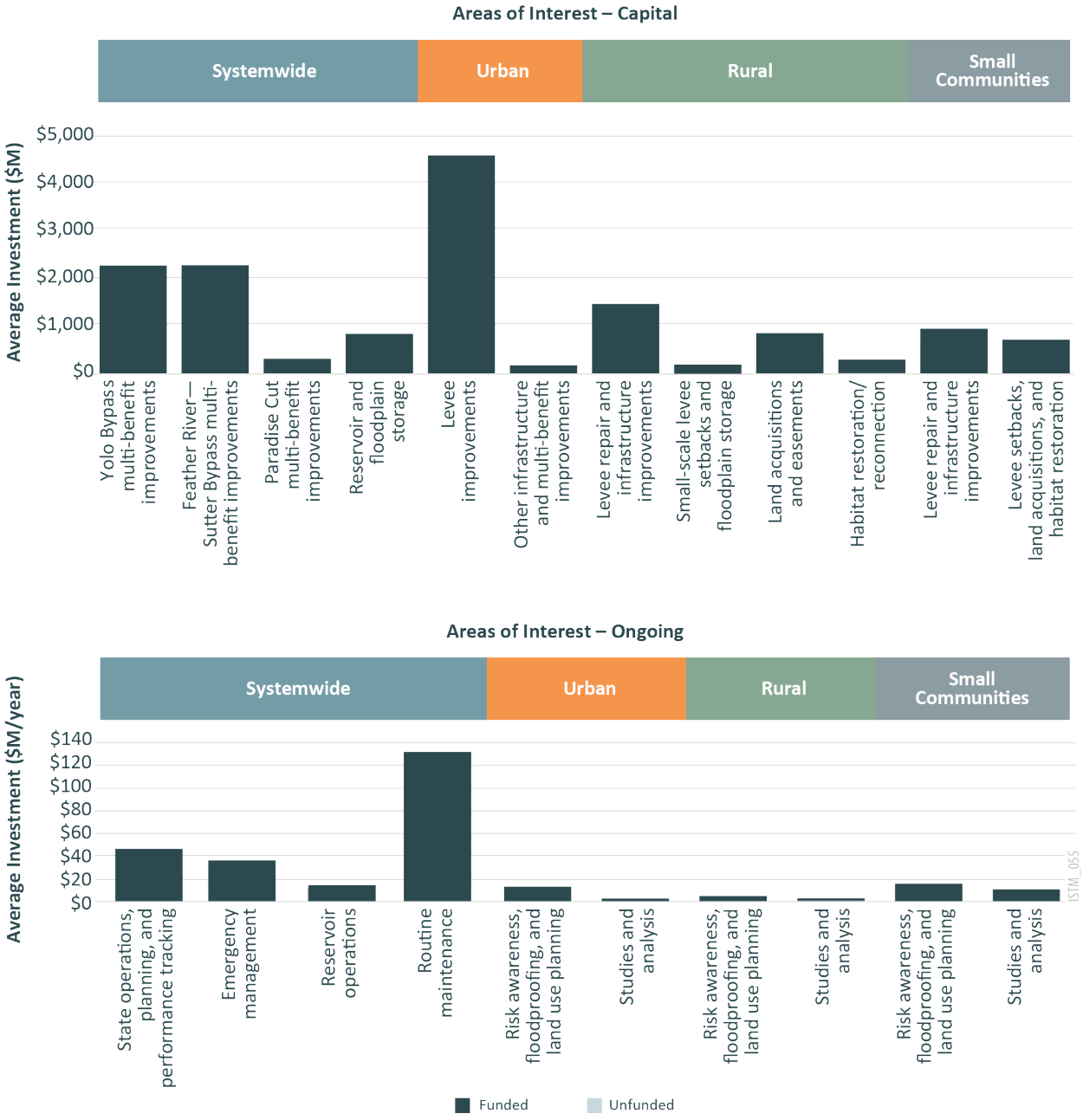
Table 7-8. Average Annual Contribution from Funding Mechanisms, Scenario 5

Funding Mechanism	Phase 1 ($M/yr.)	Phase 2 ($M/yr.)	Phase 3 ($M/yr.)
State General Fund	$135	$170	$190
State GO Bonds	$250	$250	$250
State Flood Insurance Program	$0	$12	$12
State River Basin Assessment	$0	$15	$25
USACE	$210	$232	$255
FEMA	$10	$15	$20
Local	$35	$38	$40
Sacramento and San Joaquin Drainage District	$15	$20	$25
Total	**$655**	**$752**	**$817**

Note:
1. The total contribution includes ongoing annual investments in 2016 dollars that have not been discounted to present value nor escalated for inflation.

Figure 7-10 shows the investment in the 2017 refined SSIA portfolio for Scenario 5. All ongoing investments are fully funded as they were in Scenario 3 and 4. In Scenario 5, all capital investments are fully funded, including the Feather River-Sutter Bypass multi-benefit improvements.

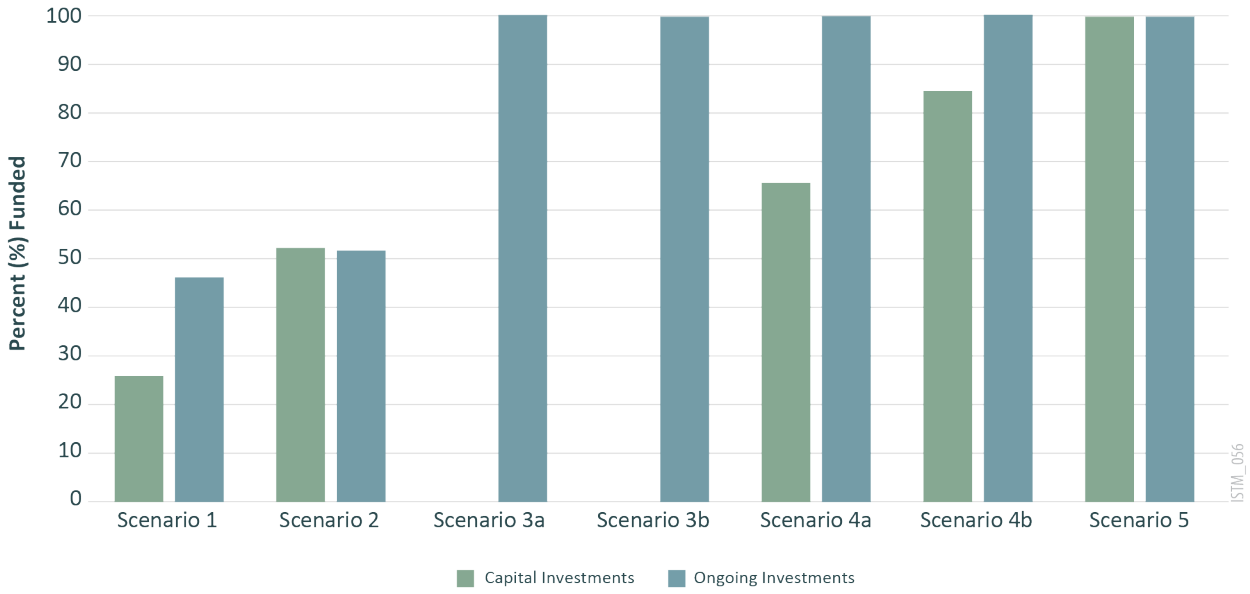
Figure 7-10. Investment in Management Activities, Scenario 5



7.7 Scenario Conclusions

This following section provides a broader comparison of Scenarios 1 through 5, and draws some conclusions about the relationships between funding mechanism applicability, constraints, cost shares and investment portfolios. Figure 7-11 provides an overview of the percent funded of ongoing and capital management actions across the scenarios.

Figure 7-11. Percentage of Ongoing and Capital Management Actions Funded by Scenario



7.7.1 Scenario 1: Decrease Current Investment Levels

Continuation of current funding levels from existing funding mechanisms, and the absence of any new GO bonds going forward has a significant impact on the system's ability to fund needed capital and ongoing investments. With this decrease, Scenario 1 demonstrated that much needed routine maintenance, emergency management and other ongoing management actions do not get adequate funding. In addition, the low investment in capital management actions impact rural and small community areas the hardest.

7.7.2 Scenario 2: Continue Current Investment Levels

Current funding levels are not enough to fully fund the ongoing and capital investments of the 2017 refined SSIA portfolio. Scenario 2 demonstrates that the continuation of GO bond contributions is critical for flood management investments. Scenario 2 also shows that the historical contribution levels need to be increased to fully fund the capital investment need.

7.7.3 Scenario 3: Fund All Ongoing Investments

With the application of new funding mechanisms, such as the Sacramento and San Joaquin Drainage District and a State river basin assessment or tax, the average annual contribution from the State General Fund and locals decreases. The new funding mechanisms are important to the long-term stability and political viability of these essential ongoing management actions. The historical and future contributions to ongoing management actions from federal funding mechanisms are mainly in risk awareness, floodproofing, land use planning, and studies and analysis.

7.7.4 Scenario 4: Fund All Ongoing Investments, Partially Fund Capital Investments

Scenario 4 requires substantial increases in State GO bond and federal contributions to even partially fund the recommended capital investment. GO bonds are critical to make high priority investments like the Yolo Bypass multi-benefit improvements, urban levees, and to invest in rural actions. Without implementation of the Feather River – Sutter Bypass multi-benefit improvements, State and federal contributions decrease in Phase 3.

7.7.5 Scenario 5: Fund Full Investment Portfolio

Implementing the full SSIA will demand significant increases in the contributions levels for State, federal, and local agencies. The State will need to issue additional GO bonds to cover the State's share of future capital improvements. Assuming the federal cost share for projects stayed the same, implementing the SSIA would require more than double the highest expenditures USACE has made in the SPFC. Local agencies will need to increase spending to raise funds to meet cost share requirements to receive additional State and federal dollars.

7.8 Recommended CVFPP Funding Plan

The funding scenarios discussed in this chapter quantify the need for existing and new funding mechanisms required to implement the 2017 refined SSIA portfolio. These scenarios considered investment priorities, the availability and applicability of funding mechanisms, and other influential factors to explore tradeoffs between available funds, cost shares, and investment phasing. Influential factors included: available State and federal appropriations, political sentiment, potential cost-share ranges, project magnitude and scope, ability to pay, and WTP.

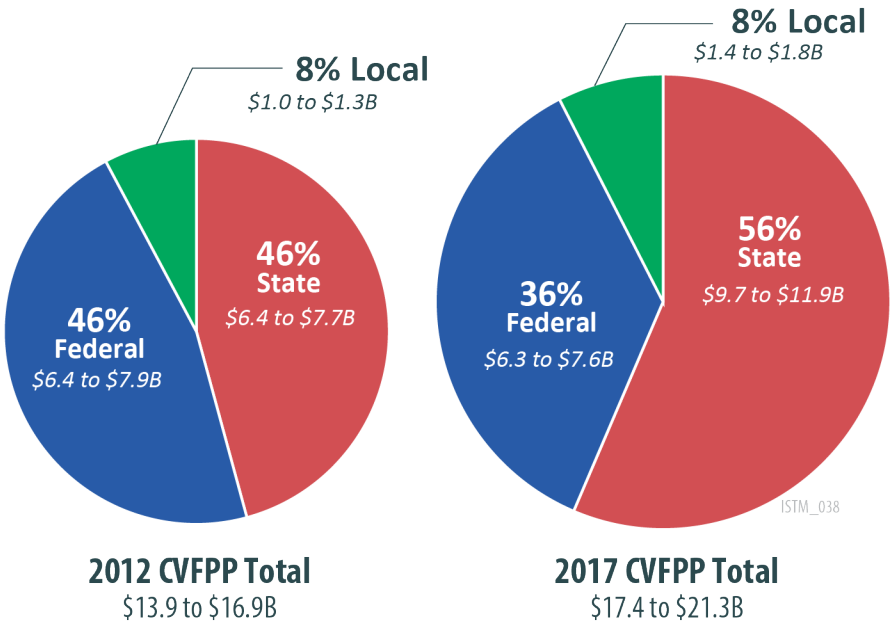
Full implementation mitigates unacceptably high levels of risk through a well-balanced portfolio of capital investments as well as investments in lower-cost, ongoing actions such as routine maintenance and floodplain and residual risk management. These ongoing management actions decrease the need for mitigating costs in the future. Scenario 5 demonstrates how investment in Central Valley flood management could lead to a more proactive and cost-effective management of risk and maintain the system's ability to produce multiple outcomes of value to society. The recommended CVFPP funding plan is full investment of the 2017 refined SSIA portfolio over 30 years as quantified by Scenario 5.

Scenario 5 funds the full 2017 refined SSIA portfolio with a State cost share of 56 percent, a federal cost share of 36 percent, and a local cost share of 8 percent. Figure 7-12 compares the recommended cost shares of the 2012 CVFPP and the 2017 CVFPP Update. The cost shares are similar, with an increase in State cost share due to the refinement of individual projects and programs within the portfolio that have potential to display broad State interest. For example, the 2017 refined SSIA portfolio has greater investment needs identified for rural and small communities compared to 2012.

Scenario 5 shows the continued reliance on federal funding. The recommended CVFPP funding plan recognizes the federal interest in contributing to multi-benefit and ecosystem investments in the Central Valley. Large federal programs in the Florida Everglades, the Louisiana Coastal Area, and the Great Lakes already spend significant sums of money on actions with ecosystem and other benefits in a way that has not yet been matched in California's Central Valley. This suggests there may be a larger degree of untapped potential for a higher level of participation from USACE and other federal entities on multi-benefit flood projects in California.

The State General Fund and local contributions in the recommended CVFPP funding plan are substantially higher than historical levels. This high level of contribution can be reduced by implementing and leveraging the maximum potential of new funding mechanisms. The recommended CVFPP funding plan considers some ways to slightly ease this State General Fund burden during the first 10 years of investment, so that the State General Fund contribution is within the revenue generation potential capacity.

Figure 7-12. 2012 and 2017 Cost Share Comparisons



Notes:

1. 2017 CVFPP Totals reflect annual ongoing investments in present value terms (2016 dollars) and summed with present value capital investment costs.
2. 2012 CVFPP Totals are from Table 4.3 in the 2012 CVFPP.

CVFPP investments are divided into three 10-year phases, as described below. Table 7-9 gives an overview of the recommended funding mechanisms for the capital and ongoing investment types within the 2017 refined SSIA portfolio in each phase. Appendix E provides additional detail on how management action categories are funded during each of the three phases. The recommended annual contribution levels in Table 7-9 are slightly different than Scenario 5 annual contribution levels due to escalation of ongoing management action costs.

Table 7-9. Recommended Timing of CVFPP Investments Shown by Average Annual Expenditures in Each Phase ($M/year, 2016 dollars)

	Phase 1	Phase 2	Phase 3
Focus	Reactively address the highest levels of risk to lives and assets concentrated in the densely populated areas	Actively transition to more balanced flood management	Proactively balance flood investments for both capital and ongoing activities in a sustainable manner
Anticipated Duration	2017 to 2027	2027 to 2037	2037 to 2047
Capital Investment			
Capital Revenue Sources	■ State ▸ $13M/year Sacramento and San Joaquin Drainage District (once established) ▸ 2020s $2.5B GO bond ■ Federal ▸ $200M/year USACE ▸ $3M/year FEMA ■ Local ▸ Incremental increase of $15M/year local revenue	■ State ▸ $14M/year Sacramento and San Joaquin Drainage District ▸ $5M/year State river basin assessment (once established) ▸ $11M/year State flood insurance program (once established) ▸ 2030s $2.5B GO bond ■ Federal ▸ $220M/year USACE ▸ $3M/year FEMA ■ Local ▸ Incremental increase of $20M/year local revenue	■ State ▸ $19M/year Sacramento and San Joaquin Drainage District ▸ $15M/year State river basin assessment ▸ $11M/year State flood insurance program ▸ 2040s $2.5B GO bond ■ Federal ▸ $240M/year USACE ▸ $3M/year FEMA ■ Local ▸ Incremental increase of $25M/year local revenue
Ongoing Investment			
Ongoing Revenue Sources	■ State ▸ $135M/year General Fund ▸ $2M/year Sacramento and San Joaquin Drainage District (once established) ■ Federal ▸ $10M/year USACE ▸ $7M/year FEMA ■ Local ▸ Incremental increase of $30M/year local revenue	■ State ▸ $170M/year General Fund ▸ $6M/year Sacramento and San Joaquin Drainage District ▸ $10M/year State river basin assessment (once established) ▸ $1M/year State flood insurance program (once established) ■ Federal ▸ $12M/year USACE ▸ $12M/year FEMA ■ Local ▸ Incremental increase of $35M/year local revenue	■ State ▸ $190M/year General Fund ▸ $6M/year Sacramento and San Joaquin Drainage District ▸ $10M/year State river basin assessment ▸ $1M/year State flood insurance program ■ Federal ▸ $15M/year USACE ▸ $17M/year FEMA ■ Local ▸ Incremental increase of $35M/year local revenue

Notes:
1. Estimated values are in 2016 dollars, and are annual averages over each 10-year period.
2. GO bonds issued by the State are full faith and credit bonds pledged by the State's General Fund, and require majority voter approval.
3. Phase 3 allocations represent the real need of annual ongoing investments within the 2017 refined SSIA portfolio. Ramping of investments shown here represent needed increases of staff and resources.

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8.0 CVFPP Delivery Through Flood Management Programs

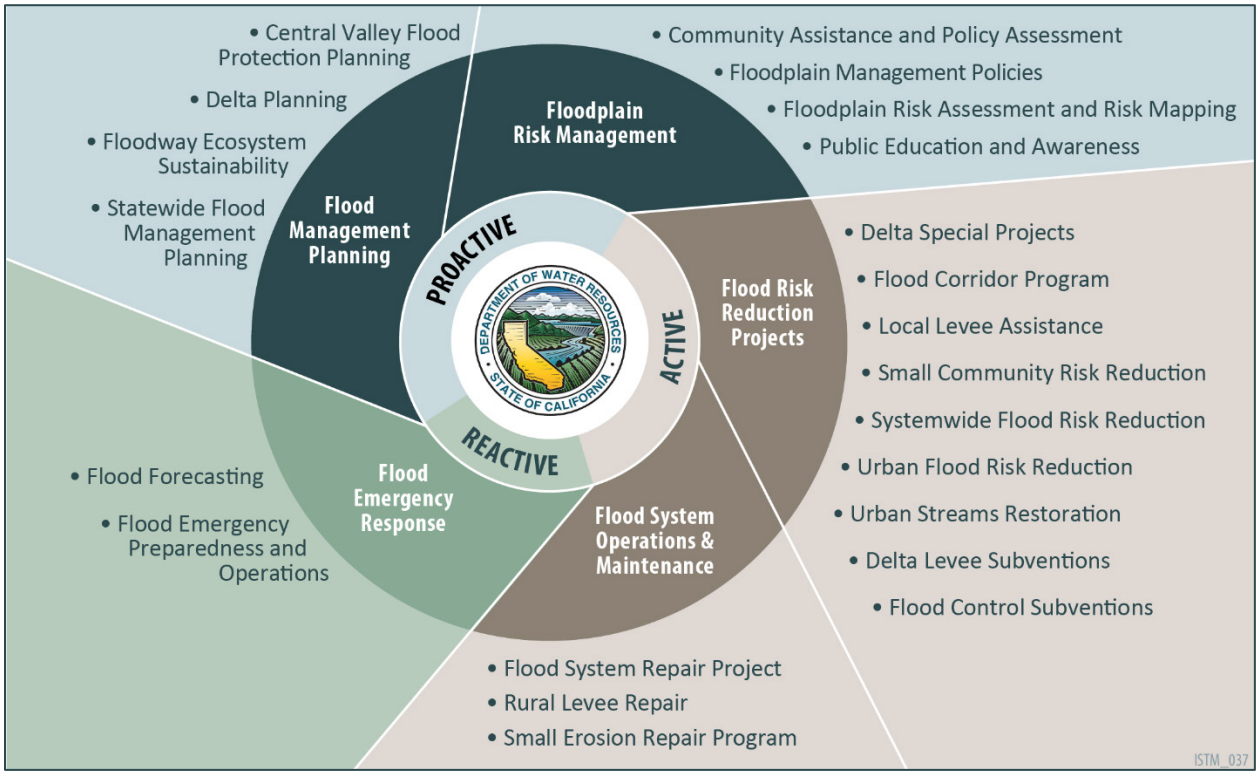
Chapter 8 Highlights

- Chapter Outline:
  - Existing Flood Management Programs
  - Future Flood Management Program Needs
  - Other Potential Water-Related Programs
  - Mapping Management Actions to Existing Flood Management Programs
  - Flood Management Program Investments Over Time
- Key Chapter Takeaways:
  - There are five existing DWR flood management programs and multiple supporting sub-programs that implement flood management activities.
  - Opportunities are available to expand the current programs' ability to support a diverse portfolio of flood management activities and provide local agencies with funding to incentivize and implement those activities.
  - To complete financial analysis, management action categories in the 2017 refined SSIA portfolio were matched to DWR flood management programs for delivery.
  - The 2017 refined SSIA portfolio is aimed in part at rebuilding and expanding the flood management programs with a surge of investment to reduce flood risk in the Central Valley and contribute toward CVFPP goals.

Progress toward CVFPP goals requires conditions that enable implementation of the 2017 refined SSIA portfolio through effective changes to behaviors, policies and objectives, organizational structures, institutional capacities, and funding priorities. Funding tied to clear and explicit intended outcomes must be provided to specific implementation programs. This will enable those programs to help regional and local flood managers develop and implement effective management actions. The CVFPP provides estimates for near- and longer-term funding levels required for these programs to accomplish their intended outcomes. These estimates were aggregated from a broad collection of potential management actions developed, and are built on explicit assumptions about the types of outcomes to which particular actions are most likely to contribute.

A wide range of expertise is needed to deliver the program activities and implement near-term and longer-term actions, including planning, design, funding, construction, and operations. At the State level, this work is organized into five major flood management programs, with DWR staff working closely with the CVFPB and other local, State, and federal partner agencies. Each program is responsible for implementing specific types of actions; together, they cover all work required for implementation of the actions identified in the CVFPP. Each program is also responsible for overall flood management in the areas protected by SPFC facilities. Each DWR flood management program is divided into sub-programs that are responsible for various aspects of flood management. Figure 8-1 shows the organization of the existing five flood management programs and their sub-programs. As part of CVFPP implementation, sub-programs within each of the major programs will be evaluated, and where necessary, programs may be removed, expanded, renamed, or newly created to improve project delivery and more effectively and efficiently deliver CVFPP intended outcomes.

Figure 8-1. Existing DWR Flood Management Programs and Sub-Programs



The State covers the cost of operation and administration of all these programs under the ongoing investment category of State operations, planning, and performance tracking to the extent funding is available. It is critical that the State maintain capacity to provide efficient project delivery to local agencies. The 2012 CVFPP organized funding of the entire SSIA and the State's share of the SSIA over time through the flood management programs described above. Table 8-1 compares the 2012 SSIA investment by program to the 2017 refined SSIA portfolio.

Table 8-1. Comparative Investment by DWR Flood Management Programs

Total Program Investment (State, Local, and Federal Investment)

Flood Management Program	2012 Total CVFPP Investment Estimate[1]		2017 Total CVFPP Investment Estimate	
	Low ($M)	High ($M)	Low ($M)	High ($M)
Flood Management Planning	$1,890	$2,300	$750	$930
Floodplain Risk Management	$600	$800	$4,720	$5,080
Flood Risk Reduction Projects	$10,520	$12,740	$9,000	$11,700
Flood System Operations and Maintenance	$440	$560	$2,310	$2,820
Flood Emergency Response	$480	$510	$650	$770
Total	**$13,920**	**$16,910**	**$17,430**	**$21,300**

Notes:
1. From Table 4.3 in the 2012 CVFPP (DWR, 2012)
2. Estimated totals reflect annual ongoing investments in present value terms (2016 dollars) and summed with present value capital investment costs.

8.1 Existing Flood Management Programs

The following section briefly describes existing DWR flood management programs, their roles, and related key policies. Furthermore, each sub-program is mapped to its respective program and described. The five existing DWR flood management programs are as follows:

- Flood Management Planning
- Floodplain Risk Management
- Flood Risk Reduction Projects
- Flood System Operations and Maintenance
- Flood Emergency Response

8.1.1 Flood Management Planning

This program performs the planning and feasibility assessments of flood management facilities and formulates potential actions to repair, rehabilitate, or improve facilities. The Flood Management Planning program looks beyond individual projects to plan how all flood management facilities, operations, habitat and ecosystem restoration actions, maintenance, and

other practices work together as a system to protect life and property while contributing to other societal values such as ecosystem vitality, economic stability, and enriching experiences.

The Flood Management Planning program provides the rationale, engineering support, and feasibility evaluations to support development of site-specific improvements as recommended by the CVFPP, the Statewide Flood Management Planning Program, Delta Planning, and other DWR planning efforts. Specific SPFC feasibility studies and updates to the CVFPP are prepared under this program. The Flood Management Planning program also performs flood system engineering and ecosystem modeling assessments of existing facility conditions. These studies are used to identify areas needing improvement, and to develop flood management policy. The Flood Management Planning program develops and maintains hydrologic, hydraulic, economic, and other models, providing the foundation of information necessary to develop site-specific and systemwide improvement projects.

USACE also prepares feasibility studies for improvement to SPFC facilities. These feasibility studies are a critical and integral part of federal project authorizations, as part of funding appropriations for new projects, and for modifications to existing projects. The Flood Management Planning program works closely and coordinates with USACE on federal cost-shared feasibility studies.

Central Valley Flood Protection Planning

This planning sub-program focuses on improving flood risk management, improving operations and maintenance, promoting ecosystem functions, and improving institutional support within the SPFC. The major component of the Central Valley Flood Protection Planning sub-program is producing the 5-year updates to the CVFPP and the necessary supporting studies and analysis. As recommended in the 2012 CVFPP, this sub-program has completed three major planning efforts in support of the 2017 CVFPP Update (DWR, 2017): the State-led BWFSs (DWR, 2017a and 2016b); the locally led RFMPs[1], which included working with more than 180 local entities; and the CVFPP Conservation Strategy (DWR, 2016) elements. Each of these planning efforts, along with the Draft CVFPP Investment Strategy and other supporting documents, have informed development of the 2017 CVFPP Update.

Delta Planning

This sub-program conducts studies, investigations, research and analyses to better understand the Delta and how to manage its resources for a more sustainable Delta. The Delta Planning sub-program conducts analyses such as Delta light detection and ranging (LiDAR), radar interferometry, tidal datum, 100-year hydrology, bathymetric surveys, Hazard Mitigation Plan/Public Law 84-99 levee assessments, levee habitat, seismic performance of organic soils, and improvements to the National Hydrographic Dataset in the Delta. This sub-program also maps Delta levees and supports research related to knowledge gaps in the Delta to improve the Delta's ecosystem and flood management.

[1] Feather River Partners, 2014; FloodProtect, 2014; Mid and Upper Sacramento River Regional Flood Management Plan Partners, 2014; Reclamation District 2092, 2014; San Joaquin Area Flood Control Agency, 2014; San Joaquin River Flood Control Project Agency, 2015.

Floodway Ecosystem Sustainability

This sub-program focuses on providing more specific ecological goals and information to help DWR and others plan, design and implement multiple-benefit flood improvement actions. The Floodway Ecosystem Sustainability sub-program consists of three major components: Central Valley Flood Protection Plan Conservation Strategy development, integration, and updates; Regulatory Alignment, including programmatic permitting and advance mitigation; and Science and Technical Support. These sub-program components are, in turn, supported by an Outreach, Communications, and Engagement component.

Statewide Flood Management Planning

This sub-program continues to work closely with USACE and local agencies to identify statewide flood risks, propose solutions, and develop an investment strategy for future flood spending based on California's integrated water management investment needs. The 2013 report titled California's Flood Future: Recommendations for Managing the State's Flood Risk (DWR, 2013) identified the immediate need for more than $50 billion to complete flood management improvements and projects statewide. Further, it estimated that significant additional funding—approximately $100 billion in additional capital investment—is needed for flood management improvements and projects. DWR has built upon the work in the 2013 California's Flood Future report by initiating a new phase of work, which includes developing the report titled Investing in California's Flood Future: An Outcome-Driven Approach to Flood Management (DWR, 2017c). This new report will expand understanding related to all recommendations from the 2013 California's Flood Future report, while focusing on the report's last recommendation: establishing sufficient and stable funding mechanisms to reduce flood risk. This new report also describes how public understanding of risk awareness, water and related resource management planning, and regulatory and environmental compliance processes affect funding for flood management.

8.1.2 Floodplain Risk Management

The Floodplain Risk Management program strives to reduce the consequences of all types of flooding in the State. A major focus of this work is the delineation and evaluation of floodplains to help local decision makers with their near- and long-term land use planning efforts. Risk awareness campaigns and flood insurance activities are also a major focus of this program. DWR also serves as the State lead for the NFIP's Community Assistance Program.

Community Assistance and Policy Assessment

This sub-program is designed to assist communities throughout the State, via the above mentioned NFIP Community Assistance Program, to understand flood hazards and to take actions to reduce flood risks in the floodplain. The Community Assistance and Policy Assessment sub-program includes community services, interagency collaboration, and influencing land use decisions, zoning, and building standards. The information gathered and organized under the Risks Assessment and Risk Mapping element of this sub-program provides an important set of tools for assisting communities.

Furthermore, this sub-program connects DWR staff with national experts and agencies in other states to investigate how flood risk situations are handled, including those for riverine, coastal, alluvial and agricultural areas. DWR staff participate in partner agency flood awareness events

and organize outreach events, such as California Flood Preparedness events, webinars, and speaker panels to disseminate flood management information.

Finally, the Community Assistance and Policy Assessment sub-program provides statewide technical support to federal, State, and local agencies, as well as the public. This technical support includes flood hazard maps, levee data, and NFIP activities, including the Community Rating System. In partnership with FEMA, sub-program staff train local officials and audit communities for NFIP compliance. The sub-program also includes the Silver Jackets and Flood Risk Notification groups; both engage in flood risk outreach and education for the public.

Floodplain Management Policies

This sub-program assesses policy development for best floodplain management practices and coordinates recommendations to address these policy issues. The Floodplain Management Policies sub-program also conducts policy research and assessment assistance on proposed federal and State information. It is important to keep abreast of national floodplain risk management items, trends, and initiatives; this sub-program obtains additional insight through the Silver Jackets network of State teams, and through participation in national and State floodplain management associations.

Floodplain Risk Assessment and Risk Mapping

This sub-program collects, assesses, organizes, maps, and disseminates the basic information needed to advance floodplain management in California. The Floodplain Risk Assessment and Risk Mapping sub-program establishes priority for new studies and the need for new flood maps. The sub-program also disseminates flood hazard information by establishing and maintaining a web-based information management system. This sub-program includes Watershed-Based Flood Risk Assessment, Flood Risk Mapping and Collection, and Information Management components.

Public Education and Awareness

The Public Education and Awareness sub-program aims to educate the general public about the risks associated with flooding, where flooding occurs, and how to best prepare for flood events. A major element of this sub-program is the Flood Risk Notification Program. The key goal of the Flood Risk Notification Program is to increase flood risk awareness by effectively communicating that risk to individual property owners, the public, and local, State, and federal agencies. This includes encouraging people to understand the levee system that protects them; to be prepared and aware of their flood risk; and to take appropriate actions before, during, and after flooding to protect themselves, minimize damage to their property or personal possessions, and facilitate recovery. DWR provides annual written notification to those who own property in an SPFC Levee Flood Protection Zone, and coordinates with federal, State, and local partners to provide information about flood risks. California Water Code (CWC) Section 9121 requires DWR to provide written notice of potential flood risk to property owners in a Levee Flood Protection Zone by September 1, 2010, and annually thereafter.

8.1.3 Flood Risk Reduction Projects

The Flood Risk Reduction Projects program conducts the work necessary to implement on-the-ground projects. For the SPFC, implemented projects are those formulated and approved through the CVFPP. State investments in system improvements may come through direct investment in

new or improved facilities or through grant programs. System improvements are generally implemented through partnership programs among DWR, the CVFPB, and USACE, and are performed in coordination with local agencies.

The Flood Risk Reduction Projects program is organized around geographical areas of the State (i.e., the SPFC in the Central Valley, Delta, and statewide). Below are sub-program summaries.

Delta Special Projects

The Delta Levees Special Flood Control Projects sub-program (Delta Special Projects) works directly with local agencies to provide critical financial assistance for flood protection, habitat, and studies of features that affect levee stability in the Delta. This funding protects and enhances the economic, environmental and cultural resources in the Delta. The sub-program is authorized under the CWC to provide funding to safeguard public benefits, including water supply, roads, utilities, urbanized areas, water quality, recreation, navigation, and fish and wildlife from flood hazards. The Delta Special Projects sub-program mitigates the habitat impacts of each project, and ensures a net long-term habitat improvement in the Delta.

Projects are periodically funded by the sub-program based on applications meeting the goals and objectives published by DWR for the Delta. These goals are guided by the CWC, the California Water Action Plan (DWR, 2014), and the Delta Plan (Delta Stewardship Council, 2013). Priorities for this sub-program's investments are approved by the California Water Commission, as prescribed by the CWC. Since its inception, the Delta Special Projects sub-program has invested approximately $300 million in the Delta for flood protection, related habitat projects, and other sub-program purposes. The Delta Special Projects sub-program was originally authorized to address flooding on the eight western Delta islands, and was expanded in 1996 to encompass the entire Delta and portions of the Suisun Marsh as outlined in CWC Section 12311.

Flood Corridor Program

The Flood Corridor sub-program is a statewide grant program in which non-structural flood risk reduction is the primary goal, with habitat and agricultural conservation incorporated as prominent program components. The goal of this sub-program is to reduce flood risk by enabling waterways to function more naturally, while enhancing native wildlife habitat and preserving agricultural uses. The Flood Corridor sub-program provides funding for acquisition, restoration, enhancement, and protection of real property while preserving sustainable agriculture and/or enhancing wildlife habitat in and near flood corridors throughout the State.

By acquiring easements for agricultural conservation, wildlife habitat preservation, and flood flow, and by restoring floodplain functions, floodwaters can be detained for later release or can safely spread over, and in some cases, move more quickly through, floodplains. Depending on the location and design of the project, these efforts can reduce peak flows upstream and downstream, in some cases allowing sediments to be trapped by the restored riparian vegetation. Other anticipated benefits include enhanced wetland development, groundwater recharge, wildlife habitat enhancement, and endangered species improvements. By incorporating non-structural solutions, the Flood Corridor sub-program achieves flood benefits at a fraction of the cost of traditional structural solutions.

Local Levee Assistance

The Local Levee Assistance sub-program was developed to help fund projects implemented by flood management agencies outside of the Sacramento-San Joaquin Delta and outside of the SPFC. The goals of this sub-program include minimizing flood risk, identifying deficiencies in flood control structures, and minimizing high flood insurance costs related to levees not accredited by FEMA. This sub-program uses two approaches to help local agencies meet these goals. The Local Levee Evaluation approach provides funding to conduct hydrology and hydraulic studies and geotechnical evaluations of levees that are needed for accreditation by FEMA. The Local Levee Critical Repair approach provides funding for DWR-approved projects that repair erosion damage, address freeboard deficiencies or substandard encroachments, and remediate unstable levee conditions.

Small Community Flood Risk Reduction

This sub-program coordinates development of local flood damage reduction projects for small communities. The Small Community Flood Risk Reduction sub-program's activities include working with local agencies achieving 100-year flood protection by constructing new ring levees around small communities, improving existing levees and floodwalls, or setting back levees, where feasible. In addition to feasible structural improvements, small communities may consider non-structural flood risk reduction measures, such as flood-proofing, raising structures, and relocation of structures to provide flood risk reduction. This sub-program is implemented in partnership with the CVFPB, local agencies, FEMA, and USACE.

Systemwide Flood Risk Reduction

This sub-program coordinates development and implementation of more complicated system projects, such as system reservoir operations, expansion and extension of flood bypasses, new bypasses, flood system structures, and related ecosystem enhancements (including fish and wildlife habitat enhancement and fish passage improvements).

USACE participation and partnership in the Systemwide Flood Risk Reduction sub-program is critical for implementing large-scale, systemwide projects. Implementation of both the Yolo Bypass and Paradise Cut multi-benefit improvements are examples of priority system improvements.

Urban Flood Risk Reduction

This sub-program coordinates with USACE and local agencies to develop regional flood damage reduction projects for urban areas, and help them achieve an urban level of flood protection (i.e., protection from a 200-year flood) by 2027. The Urban Flood Risk Reduction sub-program is implemented in partnership with the CVFPB, local and regional agencies (primarily regional joint powers authorities), and USACE.

Urban Streams Restoration

This sub-program provides communities with technical support and matching grants to create effective urban creek protection, restoration, and enhancement projects. The Urban Streams Restoration sub-program introduces communities to the concept of integrating flood risk reduction and ecosystem protection and enhancements. Focused on urban and urbanizing areas, the sub-program requires partnerships between community groups and local agencies, and requires creating broad public exposure for these projects.

Delta Levee Subventions

This is a cost-share sub-program providing financial assistance to local agencies for maintenance, rehabilitation, and improvement of approximately 700 miles of eligible federal project and non-project levees in the Delta.

All LMAs with responsibility for both SPFC facilities and local non-project levees in the primary zone and/or local non-project levees in the secondary zone of the Delta, as defined by CWC Section 12220, are eligible to participate in this sub-program. The State reimburses local agencies for part of the costs to maintain and improve non-project and eligible project levees guided by the sub-program criteria and procedures approved by the CVFPB.

Maintenance includes routine annual maintenance, habitat mitigation, repairs to restore existing levee cross sections, slope protection, repair of slips and scarps, and associated engineering and construction activities. Unavoidable impacts to habitat are mitigated through participation in programmatic mitigation banks and other environmental restoration activities of the sub-program.

Flood Control Subventions

The State legislature created the Flood Control Subventions Program in 1945 because most non-federal local partners could not shoulder the financial burden of partnering with the federal government on flood management projects, and the State recognized the public safety and statewide economic benefits associated with these projects.

The Flood Control Subventions sub-program provides State cost-share financial assistance to non-federal partners of federally authorized projects located outside of the SPFC. The sub-program provides financial assistance to local agencies cooperating in the construction of federally authorized flood control projects.

8.1.4 Flood System Operations and Maintenance

The Flood System O&M program includes work to keep SPFC flood management facilities (as defined in CWC Sections 8361 and 12878) maintained pursuant to State and federal requirements so facilities continue to function as designed. Currently, this is only in reference to about 10 percent of SPFC facilities, as LMAs provide maintenance for the other 90 percent of SPFC facilities through State and local agreements. Program activities include channel maintenance (hydraulic assessments, sediment removal, channel clearing, and vegetation management); erosion and levee repairs; levee inspection, evaluation, and maintenance; and repair and replacement of hydraulic structures. This program's work includes on-the-ground daily and annual routine maintenance activities, and frequent coordination with regulatory agencies. In addition to its routine responsibilities, this program will implement non-routine maintenance actions for SPFC facilities as described in the 2017 CVFPP Update. This program will also be responsible for administration and coordination of new routine and/or deferred maintenance programs to assist LMAs with the other 90 percent of the SPFC resulting from an increase in ongoing funding.

Flood System Repair Project

In 2013, DWR finalized its FSRP Guidelines (DWR, 2013b) that establish the process and criteria DWR use to help LMAs repair documented critical problems on SPFC facilities. The FSRP sub-program primarily focuses on repairs to rural levees to prevent problems from becoming critical, reducing repair costs, and making O&M programs sustainable. DWR developed the FSRP Guidelines with input from LMAs and local engineering consultant groups. The sub-program also developed a list of critical problems and proposed rural non-routine levee repairs for 150 problem areas on SPFC levees in concurrence with the LMAs.

Rural Levee Repair Program

The State supports cost-sharing of rural-agricultural flood management improvements, subject to availability of funds, and where feasible. Through the Rural Levee Repair sub-program, the State also assists in repair of rural-agricultural erosion sites identified by the latest inspection on a priority basis.

In many rural and small communities, structural improvements may not be economically feasible and other management actions may be implemented. This includes working with FEMA to provide assistance for flood proofing of homes and structures, or relocation of agricultural structures from deep floodplains. In addition, this sub-program works with FEMA to evaluate the feasibility of providing post-flood recovery assistance to rural-agricultural areas.

Small Erosion Repair Program

The Small Erosion Repair sub-program brings a streamlined, programmatic approach to repairing multiple erosion sites in a single construction season along the Sacramento River. This sub-program integrates the needs of public safety, environmental stewardship, and economic stability into repair projects.

8.1.5 Flood Emergency Response

The responsibility of the Flood Emergency Response Program is to prepare for floods, effectively respond to flood events, and support quick recovery when flooding occurs. Enhanced emergency response reduces flood risk and saves lives during flood events. The Flood Emergency Response Program is also needed particularly for rural-agricultural areas where physical improvements are not anticipated to be as extensive as in more populated areas. This program implements flood emergency response actions described in the CVFPP, including the provision of technical and funding assistance to local agencies to improve local flood emergency response.

Flood Forecasting

The Flood Forecasting sub-program consists of three predominant elements, which are described below:

- Real-Time Flood Conditions, Status, and Warning
- Hydro-Climate Data Collection and Precipitation/Runoff Forecasting
- Reservoir Operations and River Forecasting

Real-Time Flood Conditions, Status, and Warning
The purpose of this Flood Forecasting sub-program element is to provide information needed to manage floods as they are occurring. This element supports flood operations by doing the following:

- Inspecting, documenting, and assessing the integrity of the Sacramento and San Joaquin Flood Control Project levees
- Storing and managing information so that it is accessible to flood managers and the public
- Providing emergency flood information and warnings based on existing and forecasted conditions and field reports
- Developing information management tools to support emergency operations

The following components are also included in this Flood Forecasting sub-program element:

- Assessing project integrity/vulnerability
- Inspecting flood projects
- Disseminating flood emergency information and warnings

Hydro-Climate Data Collection and Precipitation/Runoff Forecasting
This Flood Forecasting sub-program element supports Flood Emergency Response program goals by providing information on current and forecasted water conditions, and by providing meteorological and climate information. Additionally, this element includes evaluating and improving data collection and exchange network and forecasting models, providing water supply and watershed runoff information and forecasting, and developing a new generation of forecasting and data collection tools to improve the quality, timeliness, and length of watershed and river forecasts. Real-time data, its timely availability, data quantities, and data quality are all critical to improving forecasting quality and timeliness. The following components are also included within this Flood Forecasting sub-program element:

- California Cooperative Snow Surveys
- California Data Exchange Center
- Real-Time Data Collection Network
- Hydrology Update and System Reoperation

Reservoir Operations and River Forecasting
This Flood Forecasting sub-program element is considered one of the most cost-effective measures to improve flood control. It is being implemented on the Yuba-Feather River system and it is being expanded to cover reservoirs in the San Joaquin River system. The Reservoir Operations and River Forecasting element's operations help to do the following:

- Minimize the risk of exceeding river channel capacity
- Increase warning times to communities along major California rivers

- Increase warning time to those downstream of flood control reservoirs through the following:
  - Enhanced communication between local, State, and federal agencies
  - Improved data gathering and exchange
  - Use of the most recent advancements in weather and river forecasting

The following components are also included in the Reservoir Operations and River Forecasting element:

- Reservoir Operations
- California-Nevada River Forecast

Flood Emergency Preparedness and Operations

This sub-program prepares DWR for response to flood emergencies by providing the following:

- Training for emergency response, floodfighting, and staging floodfight exercises at the State and local levels

- Performing scientific studies related to developing emergency response options

- Coordinating emergency preparedness endeavors, including the development of emergency plans with the various flood response partners

- Analyzing seasonal flood threats

- Developing and managing strategically positioned emergency response material stockpiles and transfer facilities

- Updating and operating real-time modeling tools for emergency strategy and decision support

- Ensuring staffing and function of the Flood Operations Center (FOC) to coordinate State response to flood events.

The Flood Emergency Preparedness and Operations sub-program consists of three predominant elements:

- Delta Flood Preparedness, Response, and Recovery
- Statewide Flood Emergency Operations Planning
- Flood Emergency Response Local Assistance

Delta Flood Preparedness, Response, and Recovery

This sub-program element aims to do the following:

- Protect the lives, property, and infrastructure critical to the functioning of both the Sacramento-San Joaquin Delta and California

- Protect water quality and restore water supply for both Delta and export water users

- Reduce the recovery time of California's water supply from a catastrophic flood in the Delta
- Minimize impacts on environmental resources

This sub-program element's activities include studies, planning, training, exercising to ensure agency alignment. It also maintains operational response facilities and material stockpiles to increase the State's operational capacity for responding to catastrophic flood events in the Sacramento-San Joaquin Delta.

Statewide Flood Emergency Operations Planning
The primary function of the Statewide Flood Emergency Operations Planning sub-program element is to support the Flood Operations Center (FOC) during flood emergencies. The FOC supports local response to flood emergencies with DWR staff for planning, training, and performing emergency drills. Extensive coordination and the development of working relationships with LMAs, cities, and counties and other stakeholders throughout the State aim to develop better aligned local, county, State, and federal emergency response plans and enhanced operational capacity to respond to flood emergencies, as well as support for emergency communications capabilities and stockpiling flood fight materials.

The Flood Emergency Management System (FEMS) is being developed to deploy, manage, and track resources and information during flood events. FEMS helps the FOC efficiently respond to and manage major flood events, including managing incident command teams in the field and as flood operations activities at the FOC. FEMS also provides the FOC with the ability to track and report incident costs for proper cost recovery from FEMA in real time.

Flood Emergency Response Local Assistance
This sub-program element helps to improve local flood emergency response and increase public safety. The element consists of three grant categories: 1) Statewide Emergency Response Grant, which excludes the Delta; 2) Delta Emergency Response Grant for the Delta only; and 3) Delta Emergency Communications Grant, a one-time grant to local Delta agencies for communication enhancements among all flood emergency agencies in the Delta. Public agencies with primary responsibility for flood emergency response and coordination are eligible to apply for either statewide or Delta competitive grants. These grants fund the development of flood emergency plans, training, exercises, and acquisition of emergency flood fight materials. These grants also provide funding to improve agency alignment through coordination between local flood agencies and county emergency response operational areas, reinforcing the State's standardized FEMS.

Future Flood Management Program Needs
To maintain the productivity and reliability of the five DWR flood management programs, the security of future funding is critical. Additionally, there are opportunities to expand the current major programs' ability to support a more diverse portfolio of flood management activities and provide local agencies with funding sources to incentivize and implement those activities. Table 8-2 outlines potential expansion of existing programs or new implementation programs that could be initiated for future support of CVFPP investment. Other new programs may be implemented as needed that are not currently included in Table 8-2.

Table 8-2. Expanded Existing Flood Management Programs or Create New Sub-Programs

Existing Flood Management Program	Description of Modification	Expand Existing Sub-Program	New Sub-Program
Flood Management Planning	Expand the Floodway Ecosystem Sustainability sub-program to include a more robust programmatic permitting sub-program and expand capacity to support regulatory agency review and consultation.	X	
Flood Management Planning	Under the Central Valley Flood Protection Planning sub-program, expand the Flood System Status Report to include performance tracking of the SPFC. Expand the Statewide Flood Management Planning sub-program to include performance tracking for the statewide flood system.	X	
Floodplain Risk Management	Create a new sub-program entitled Flood Easements and Land Acquisitions to support DWR easement and land acquisition actions.		X
Floodplain Risk Management	Create a new sub-program entitled Floodplain Management Policy Sub-Program to support wise use of floodplains beyond the SPFC through activities such as taskforces, NFIP reauthorization and reform, and flood insurance evaluations.		X
Floodplain Risk Management	Create a new sub-program entitled Floodplain Mitigation Planning to conduct watershed-based mitigation planning, assist in mitigation cost recovery, and engage in post-flood activities and disaster recovery.		X
Floodplain Risk Management	Create a new sub-program entitled City and County Local Assistance to support direct interaction between DWR and local agencies for land use planning activities.		X
Flood System Operation and Maintenance	Expand the Flood Control Subventions sub-program to support SPFC related minor rehabilitation reimbursement to LMAs.	X	
Flood System Operation and Maintenance	Create a new sub-program to support and provide State funding assistance for specific DWR-approved SPFC routine maintenance activities performed by LMAs.		X

As demonstrated with the new sub-programs in Table 8-2, one of the five flood management programs that the State is interested in bolstering is the Floodplain Risk Management program, which has become somewhat dormant in recent years. The State promotes an enhanced floodplain management program, especially in rural agricultural areas, through continued engagement with FEMA. The Floodplain Risk Management program could help provide grants to local agencies and citizens for applicable risk mitigation actions, including property acquisition, structure demolition, and relocation, and flood proofing and raising of residential and non-residential structures. The program would expand collaboration with local planning agencies and provide guidance regarding how to integrate local land use planning with the CVFPP to reduce flood risk for local jurisdictions. In addition to its routine activities, this program would implement floodplain management enhancement activities from the CVFPP.

Additionally, the Flood Management Planning program is another one of the five flood management programs that the State is interested in bolstering. The primary aspect of this program could be expanded to include establishment of the enabling conditions (such as funding, permits, authorities etc.) that are needed to promote progress on the eight policy issues identified in the 2017 CVFPP Update. The necessary enabling conditions can only be established through the work and cooperation of experienced staff at all scales of government and expanded capacity for ongoing collaboration and cooperation with the legislature and stakeholders. Two aspects of the Floodplain Risk Management program that are of interest include the need for a more robust programmatic permitting sub-program and a performance tracking sub-program. The performance tracking sub-program would focus on tracking system maintenance, monitoring, and adaptive management for both the SPFC and areas outside of the SPFC within the State.

8.2 Other Potential Water-Related Programs

A number of other water-related funding programs exist at the State and federal levels that could potentially fund the 2017 refined SSIA portfolio. These mechanisms may provide funding for one or more of the multiple benefits associated with management actions of the CVFPP. Even though the main focus of many of these programs is not flood management, there often can be a flood nexus found to support the applicability of funds. All of these programs are grant-based, and are typically financed by GO bonds. Other water funding programs, listed and described below, are given as a reference for other potential funding solutions outside of DWR's flood management programs. This is not an exhaustive list of other potential funding opportunities.

8.2.1 Water Storage Investment Program

The Water Storage Investment Program (WSIP) is implemented by the California Water Commission as directed by Proposition 1, which was passed by voters in 2014. The WSIP provides $2.7 billion from State GO bonds to finance water storage projects that provide public benefits. Ecosystem improvement is required of any project that receives funding, but water quality improvement, flood control, recreation, and emergency response are also eligible public benefits. The WSIP can provide no more than 50 percent of the capital cost of a project, and at least half of that amount must fund costs of ecosystem improvements. Local agencies or groups of agencies apply for bond money through a competitive process. The California Water Commission intends to receive WSIP applications by late summer of 2017 and to select projects by 2018.

8.2.2 California's Integrated Regional Water Management Program

California's IRWM program supports a regional, multi-agency approach to water management. Voters passed a series of bond measures providing implementation and planning grants for groups of local agencies to improve water supply, water quality, flood control, ecosystem improvement, and other benefits. The bond money cannot be used for O&M. Currently, 48 such regional groups of agencies are eligible to apply for grants funded by State GO bonds. The most recent bond measure, Proposition 1, provides just over $800 million for IRWM, of which $200 million is specifically for multi-benefit stormwater management projects. To date, four statewide bond measures have provided funding for projects under the IRWM program. The

number of funding rounds, required non-state cost shares, caps on grant amounts, and other preferences and requirements vary according to applicable statute and policy.

8.2.3 California State Parks

California State Parks manages the Habitat Conservation Fund program, which seeks to protect and restore sensitive habitats in California (California State Parks, 2012). Habitat improvement categories that can overlap with flood mitigation projects include wetlands, anadromous salmonids and trout habitat, riparian habitat, and wildlife area activities. For example, flood mitigation activities that include expanding and improving wetland and riparian habitats may slow flood water flows during storm events while also increasing ongoing opportunities for wildlife-related recreation. Cities, counties and districts are eligible to compete for the funds, with typical grants ranging from $50,000 to $1,000,000, and total program funding amounting to approximately $2 million each year; however, but grantees have a 50 percent cost-share requirement. During the grant performance period, HCP funds can be used for land acquisition and easements, capital outlays and direct project costs, including habitat restoration and building trails, for example.

8.2.4 California Wildlife Conservation Board Programs

The primary responsibilities of California Wildlife Conservation Board (WCB) programs are to select, authorize and allocate funds for the purchase of land and waters suitable for recreation purposes and the preservation, protection and restoration of wildlife habitat. The California WCB manages several grant programs, including land acquisition, ecosystem restoration on agricultural lands, a forest conservation program, a habitat enhancement and restoration program, a California riparian habitat conservation program, a streamflow enhancement program, and the inlands wetlands conservation program. The inlands wetlands conservation program may have the greatest nexus to the CVFPP; it was created to help the Central Valley Joint Venture implement its mission to "protect, restore and enhance wetlands and associated habitats." Nonprofit organizations, local governmental agencies, State Departments and federal agencies are all eligible for grants through WCB programs related to restoring and enhancing wildlife. Cost-sharing or in-kind contributions are required, and grants range from $10,000 to $1,000,000.

8.2.5 California River Parkways Program

The California Natural Resources Agency (CNRA) administers the California River Parkways Grant Program and the Urban Greening Project. The California River Parkways Grant Program funds state, local and community collaborative multiple benefits projects that reduce greenhouse gas emissions, increase water use efficiency, and reduce risks from climate change impacts. CNRA grants go toward the acquisition, restoration, protection and development of river parkways in accordance with the California River Parkways Act of 2004 (CNRA, 2015). Flood management projects, especially those that target the expansion of existing river parkways to accommodate periodical flooding, and those that restore land to a natural floodplain, are eligible for CNRA California River Parkways grants. Projects that acquire streamside parcels that have historically flooded to become a River Parkway are also eligible for these grant funds (CNRA, 2015). For the FY 2015 Proposition 13 bond-funded grant period, all requests were capped at $500,000.

8.2.6 Urban Greening Grant Program

The CNRA Urban Greening Grant Program is a program funded by the Greenhouse Gas Reduction Fund. Of the $1.2 billion in cap and trade revenues authorized by SB 859 to fund the Greenhouse Gas Reduction Fund, $80 million was allocated to Urban Greening Program for green infrastructure projects that reduce greenhouse gas emissions and provide multiple benefits (CNRA, 2017). Greenhouse gas emissions reduction funds must achieve reductions of greenhouse gas emissions. Based on the draft guidelines (CNRA, 2017), the Urban Greening Grant Program will establish and fund projects that enhance parks and open space (CNRA, 2017). In addition to the greenhouse emissions reductions requirement, 25 percent of Urban Greening Grant Program funds are to be allocated to projects that provide benefits to disadvantaged communities, including those that reduce flood risk to these communities (CNRA, 2017).

8.2.7 California State Water Resources Control Board

The California State Water Resources Control Board (SWRCB) administers federal grant funds for the CWA 319(h) Non-Point Source Grant Program (SWRCB, 2017). These funds support projects to improve water quality by reducing non-point source pollution, especially in impaired waters slated for total maximum daily load implementation and threatened waters. The Non-Point Source Grant Program program requires a minimum match of 25 percent of the total project cost. State agencies can use State funds and services for the funding match.

8.2.8 Clean Water State Revolving Fund

The Clean Water State Revolving Fund program is a federal-state partnership that provides communities with a permanent, independent source of low-cost financing for a wide range of water quality infrastructure projects (United States Environmental Protection Agency [EPA], 2017). As capital and interest is paid back into the fund, those funds become available to initiate new loans. The state share of capitalization is 20 percent to the EPA's 80 percent, but the states operate their own programs. Through the Green Project Reserve, the Clean Water State Revolving Fund targets critical green infrastructure and other environmentally innovative activities. As a result, stormwater management can be eligible for funds under this program, but projects must show water quality improvement. Loans can be extended for up to 30 years, but interest rates must be at or below market rates.

8.3 Mapping Management Actions to Existing Flood Management Programs

To complete financial analysis for the 2017 refined SSIA portfolio, the portfolio was organized by area of interest and by management action category as described earlier. Then, management action categories were matched with the DWR flood management programs for delivery. Each capital and ongoing investment type was assigned only one dominant DWR flood management program based on the program's primary function. This allowed capital and ongoing investments to be reported by program without overlap. Tables 8-3 and 8-4 provide mapping of capital and ongoing investment types to DWR flood management programs used during financial analysis. However, it is important to note that even though a primary flood program was assigned to the

capital and ongoing investment types, multiple programs can deliver these two types of investments. For example, levee setbacks located in small communities were categorized in the Floodplain Risk Management program, but were not for rural areas. Realistically, all setbacks would be implemented through the Flood Risk Reduction Projects program. However, the investments in levee setbacks for small communities is a much smaller percentage than land acquisition and habitat restoration/reconnection activities included in that same management action category. Land acquisition and habitat restoration/reconnection investments are more likely to be implemented under the Floodplain Risk Management program; as a result, the dominant program was assigned.

Table 8-3. Capital Investments by DWR Flood Management Program

Management Action Category and Area of Interest	Dominant DWR Flood Management Program Assigned
Systemwide	
Yolo Bypass multi-benefit improvements	Flood Risk Reduction Projects
Feather River–Sutter Bypass multi-benefit improvements	Flood Risk Reduction Projects
Paradise Cut multi-benefit improvements	Flood Risk Reduction Projects
Reservoir and floodplain storage	Flood Risk Reduction Projects
Urban	
Levee improvements	Flood Risk Reduction Projects
Other infrastructure and multi-benefit improvements	Flood Risk Reduction Projects
Rural	
Levee repair and infrastructure improvements	Flood System Operations and Maintenance
Small-scale levee setbacks and floodplain storage	Flood Risk Reduction Projects
Land acquisitions and easements	Floodplain Risk Management
Habitat restoration/reconnection	Floodplain Risk Management
Small Community	
Levee repair and infrastructure improvements	Flood Risk Reduction Projects
Levee setbacks, land acquisitions, and habitat restoration	Floodplain Risk Management

Table 8-4. Ongoing Investments by DWR Flood Management Program

Management Action Category and Area of Interest	Dominant DWR Flood Management Program Assigned
Systemwide	
State operations, planning, and performance tracking	Flood Management Planning
Emergency management	Flood Emergency Response
Reservoir operations	Flood System Operations and Maintenance
Routine maintenance	Flood System Operations and Maintenance
Urban	
Risk awareness, floodproofing, and land use planning	Floodplain Risk Management
Studies and analysis	Flood Management Planning
Rural	
Risk awareness, floodproofing, and land use planning	Floodplain Risk Management
Studies and analysis	Flood Management Planning
Small Community	
Risk awareness, floodproofing and land use planning	Floodplain Risk Management
Studies and analysis	Flood Management Planning

8.4 Flood Management Program Investments Over Time

To implement the CVFPP over the next 30 years, much larger contributions would be required from all entities than have been invested historically. For the State, this would include a much larger contribution from the State General Fund, successfully passing new State bonds, and developing new mechanisms. Contributions from the federal government, predominantly from USACE, would need to increase from current levels. Local entities would need to generate funds to provide the local match for federal and State capital investments. Local entities would also need to generate more funds for their share of ongoing costs. To fully understand the additional resources needed, the 2017 refined SSIA portfolio investment was organized by DWR flood management program and by cost-share partners.

Table 8-5 presents the 2017 refined SSIA portfolio phased investment over time (in 2016 dollars) organized by DWR flood management program and broken down by federal, State, and local share. This information was provided similarly in the 2012 CVFPP. The 2017 refined SSIA portfolio provides more clarity on the funding need for several of the flood management programs, specifically the Flood Emergency Response and Flood System Operations and Maintenance programs.

Table 8-6 presents only the capital portion of the 2017 refined SSIA portfolio investment phased over time in present value terms.

Table 8-7 presents only the ongoing portion of the 2017 refined SSIA portfolio in annualized amounts. Annual ongoing investments are shown without discounting to highlight the real need for increased resources to many of the DWR flood management programs necessary for achieving CVFPP goals. Ramping of ongoing investments is based on assumptions of time needed to build capacity for these programs. Some programs align more with ongoing activities, and a progression toward more proactive flood management in the Central Valley must be accompanied by expansion in those programs. Expansion of some of these programs can be seen in the annual investments in Table 8-7.

The 2017 refined SSIA portfolio is aimed in part at rebuilding and expanding programs with a surge of investment to reduce flood risk in the Central Valley and to contribute toward CVFPP goals. This is why recommended investments include categories of management actions rather than individual projects. This approach allows flexibility for individual programs to fund the necessary types of management actions as priorities or as conditions change throughout time. Individual projects will still have to apply to these programs and comply with program guidelines to receive implementation funding. Additionally, individual projects could pursue other potential avenues of funding, including funding from other State or federal grant programs, philanthropic contributions, private industry investment, and NGOs.

Table 8-5. Combined Present Value Capital and Ongoing State Systemwide Investment Approach Range of Investments over Time

Flood Management Programs		Flood Management Planning		Floodplain Risk Management		Flood Risk Reduction Projects		Flood System Operations and Maintenance		Flood Emergency Response		Total	
		Low ($M)	High ($M)	Low ($M)	High ($M)	Low ($M)	High ($M)	Low ($M)	High ($M)	Low ($M)	High ($M)	Low ($M)	High ($M)
Phase 1	State	$140	$170	$1,270	$1,280	$890	$1,390	$720	$730	$190	$220	$3,210	$3,790
	Federal	$130	$170	$450	$460	$1,380	$1,610	$10	$20	$0	$0	$1,970	$2,260
	Local	$0	$10	$20	$30	$230	$280	$160	$170	$0	$10	$410	$500
	Subtotal	**$270**	**$350**	**$1,740**	**$1,770**	**$2,500**	**$3,280**	**$890**	**$920**	**$190**	**$230**	**$5,590**	**$6,550**
Phase 2	State	$170	$200	$880	$1,160	$1,240	$1,510	$670	$710	$320	$360	$3,280	$3,940
	Federal	$70	$80	$1,000	$1,010	$1,540	$1,850	$10	$20	$0	$0	$2,620	$2,960
	Local	$0	$10	$20	$30	$390	$400	$180	$190	$0	$10	$590	$640
	Subtotal	**$240**	**$290**	**$1,900**	**$2,200**	**$3,170**	**$3,760**	**$860**	**$920**	**$320**	**$370**	**$6,490**	**$7,540**
Phase 3	State	$180	$200	$780	$790	$1,550	$1,940	$390	$790	$140	$160	$3,040	$3,880
	Federal	$60	$80	$280	$290	$1,420	$2,090	$0	$10	$0	$0	$1,760	$2,470
	Local	$0	$10	$20	$30	$360	$630	$170	$180	$0	$10	$550	$860
	Subtotal	**$240**	**$290**	**$1,080**	**$1,110**	**$3,330**	**$4,660**	**$560**	**$980**	**$140**	**$170**	**$5,350**	**$7,210**
Total	State	$490	$570	$2,930	$3,230	$3,680	$4,840	$1,780	$2,230	$650	$740	$9,530	$11,610
	Federal	$260	$330	$1,730	$1,760	$4,340	$5,550	$20	$50	$0	$0	$6,350	$7,690
	Local	$0	$30	$60	$90	$980	$1,310	$510	$540	$0	$30	$1,550	$2,000
	Subtotal	**$750**	**$930**	**$4,720**	**$5,080**	**$9,000**	**$11,700**	**$2,310**	**$2,820**	**$650**	**$770**	**$17,430**	**$21,300**

Notes:
1. Estimated totals are the sum of annual ongoing and capital investments in present value terms (2016 dollars).
2. The Flood Emergency Response program does not include federal contributions because the 2017 refined SSIA portfolio only includes State and local emergency response activities. The federal government does not participate in cost share on these State and local emergency response activities.

Table 8-6. Capital State Systemwide Investment Approach Range of Investments over Time

Flood Management Programs		Flood Management Planning		Floodplain Risk Management		Flood Risk Reduction Projects		Flood System Operations and Maintenance		Flood Emergency Response		Total	
		Low ($M)	High ($M)	Low ($M)	High ($M)	Low ($M)	High ($M)	Low ($M)	High ($M)	Low ($M)	High ($M)	Low ($M)	High ($M)
Phase 1	State	$0	$0	$840	$1,200	$890	$1,390	$0	$0	$0	$0	$1,730	$2,590
	Federal	$0	$0	$350	$460	$1,380	$1,610	$0	$0	$0	$0	$1,730	$2,070
	Local	$0	$0	$20	$30	$230	$280	$0	$0	$0	$0	$250	$310
	Subtotal	**$0**	**$0**	**$1,210**	**$1,690**	**$2,500**	**$3,280**	**$0**	**$0**	**$0**	**$0**	**$3,710**	**$4,970**
Phase 2	State	$0	$0	$810	$1,160	$1,240	$1,510	$0	$0	$0	$0	$2,050	$2,670
	Federal	$0	$0	$270	$570	$1,540	$1,850	$0	$0	$0	$0	$1,810	$2,420
	Local	$0	$0	$20	$30	$390	$400	$0	$0	$0	$0	$410	$430
	Subtotal	**$0**	**$0**	**$1,100**	**$1,760**	**$3,170**	**$3,760**	**$0**	**$0**	**$0**	**$0**	**$4,270**	**$5,520**
Phase 3	State	$0	$0	$500	$790	$1,550	$1,940	$0	$0	$0	$0	$2,050	$2,730
	Federal	$0	$0	$180	$220	$1,420	$2,090	$0	$0	$0	$0	$1,600	$2,310
	Local	$0	$0	$10	$20	$360	$630	$0	$0	$0	$0	$370	$650
	Subtotal	**$0**	**$0**	**$690**	**$1,030**	**$3,330**	**$4,660**	**$0**	**$0**	**$0**	**$0**	**$4,020**	**$5,690**
Total	State	$0	$0	$2,150	$3,150	$3,680	$4,840	$0	$0	$0	$0	$5,830	$7,990
	Federal	$0	$0	$800	$1,250	$4,340	$5,550	$0	$0	$0	$0	$5,140	$6,800
	Local	$0	$0	$50	$80	$980	$1,310	$0	$0	$0	$0	$1,030	$1,390
	Subtotal	**$0**	**$0**	**$3,000**	**$4,480**	**$9,000**	**$11,700**	**$0**	**$0**	**$0**	**$0**	**$12,000**	**$16,180**

Note:
1. Estimated capital investment costs are in present value (2016 dollars) terms.

Table 8-7. Annual Ongoing State Systemwide Investment Approach Range of Investments over Time

Flood Management Programs		Flood Management Planning		Floodplain Risk Management		Flood Risk Reduction Projects		Flood System Operations and Maintenance		Flood Emergency Response		Total	
		Low ($M/yr.)	High ($M/yr.)	Low ($M/yr.)	High ($M/yr.)	Low ($M/yr.)	High ($M/yr.)	Low ($M/yr.)	High ($M/yr.)	Low ($M/yr.)	High ($M/yr.)	Low ($M/yr.)	High ($M/yr.)
Phase 1	State	$27	$30	$5	$6	$0	$0	$68	$82	$22	$27	$122	$145
	Federal	$4	$5	$9	$11	$0	$0	$1	$2	$0	$0	$14	$18
	Local	$0	$1	$0	$1	$0	$0	$26	$32	$0	$1	$26	$35
	Subtotal	**$31**	**$36**	**$14**	**$18**	**$0**	**$0**	**$95**	**$116**	**$22**	**$28**	**$162**	**$198**
Phase 2	State	$39	$44	$7	$9	$0	$0	$92	$112	$30	$37	$168	$201
	Federal	$6	$8	$14	$17	$0	$0	$1	$2	$0	$0	$21	$27
	Local	$0	$1	$1	$2	$0	$0	$35	$43	$1	$2	$37	$48
	Subtotal	**$45**	**$53**	**$22**	**$28**	**$0**	**$0**	**$128**	**$157**	**$31**	**$39**	**$226**	**$276**
Phase 3	State	$54	$65	$9	$11	$0	$0	$93	$112	$30	$37	$186	$225
	Federal	$9	$11	$19	$23	$0	$0	$1	$2	$0	$0	$29	$36
	Local	$0	$1	$0	$1	$0	$0	$35	$43	$1	$2	$36	$47
	Subtotal	**$63**	**$77**	**$28**	**$35**	**$0**	**$0**	**$129**	**$157**	**$31**	**$39**	**$251**	**$308**

Notes:

1. Estimated ongoing annual investments are in 2016 dollars. They have not been discounted to present value nor escalated for inflation.
2. Phase 3 allocations represent the real need of annual ongoing investments within the 2017 refined SSIA portfolio. Ramping of investments shown here represent the time needed to build capacity of staff and resources for all programs other than Flood Risk Reduction Projects.
3. Present value of total ongoing investments is approximately $5 billion over 30 years.
4. The Flood Emergency Response program does not include federal contributions because the 2017 refined SSIA portfolio only includes State and local emergency response activities. The federal government does not participate in cost share on these State and local emergency response activities.

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9.0 The Way Forward

Chapter 9 Highlights

- Chapter Outline:
  - Five-Year Infrastructure Plan
  - Long-Term Funding Actions
  - Near-Term Funding Actions
- Key Chapter Takeaways:
  - New funding mechanisms are critical, and additional GO bonds are needed.
  - Historical State, federal, and local contribution levels need to double.
  - State, federal and local entities must collaborate and push for legislation needed to develop new funding mechanisms and reform State implementation programs.

9.1 Five-Year Infrastructure Plan

In 1999, the legislature enacted the California Infrastructure Planning Act that requires the governor to submit a proposed Five-Year Infrastructure Plan to the legislature for consideration with the annual budget bill. According to the California Infrastructure Planning Act, the Five-Year Infrastructure Plan should contain specified information concerning the infrastructure needed by State agencies, schools, and postsecondary institutions, along with a proposal for funding the needed infrastructure.

As stated in Government Code Section 13100, the Five-Year Infrastructure Plan must identify state infrastructure needs and set out priorities for funding. The code also states that the Five-Year Infrastructure Plan need not identify specific infrastructure projects to be funded, but it should be sufficiently detailed to provide a clear understanding of the type and amount of infrastructure to be funded and the programmatic objectives to be achieved by this funding. The Five-Year Infrastructure Plan is intended to complement the existing State budget process for appropriating funds for infrastructure by providing a comprehensive guideline for the types of projects to be funded through that process. The plan must also identify how the infrastructure will be funded, whether that's through the State General Fund, State special funds, federal funds, or GO bonds.

The Five-Year Infrastructure Plan must also include costs for deferred maintenance. The plan defines deferred maintenance as maintenance activities that have not been completed to keep state-owned facilities in an acceptable and operational condition, and that are intended to maintain or extend their useful life (Office of the Governor, 2016).

As part of its obligation to help prepare the Five-Year Infrastructure Plan, DWR is using the work that was completed as part of the first update to the CVFPP to better inform needs for flood management in the Central Valley. This includes capital investments and deferred maintenance (as a part of ongoing investments) of the 2017 refined SSIA portfolio recommended by the 2017 CVFPP Update (DWR, 2017). However, this recommendation of Central Valley flood management investments is much larger than in the past, and will require new funding. This new funding will allow DWR to increase flood protection in the Central Valley, which is consistent with 2017 CVFPP Update recommendations and the CWAP (DWR, 2014).

Proposition 1E was the last major GO bond to provide funding for Central Valley flood management, and is nearly spent. In 2015, the remaining $738 million Proposition 1E bond funding for Systemwide Flood Risk Reduction, Urban Flood Risk Reduction, and Non−Urban and Small Community Flood Risk Reduction capital outlay infrastructure projects was appropriated. In addition, approximately $398.5 million was appropriated to support several infrastructure investment programs ranging from local subvention grants (i.e., statewide and in the Delta), Delta Special Projects (including ecosystem restoration), O&M projects (including rehabilitation and replacement of flood control structures) and Flood Emergency Response activities (Office of the Governor, 2016).

The CVFPP funding plan recommendation for the first 5 years of the 2017 refined SSIA portfolio's Phase 1 will be used to inform the estimates for future updates of the Five-Year Infrastructure Plan. The intention of this discussion (and Table 9-1) is to provide a format for this information that feeds directly into each update of the Five-Year Infrastructure Plan. The following describes how the 2017 refined SSIA portfolio Phase 1's organization conforms to future Five-Year Infrastructure Plan formats:

- **SPFC deferred maintenance:** includes cost estimates for deferred maintenance, repair, rehabilitation and replacement of the following:
  - Levees, including deferred maintenance of levee pipe penetrations and encroachment repairs or removal
  - Channels, including deferred removal of invasive giant reed *(Arundo donax)* and sediment removal activities
  - Minor structures such as deferred maintenance of stop logs, gated closure structures, pumping plants, monitoring wells and piezometers, retaining walls and floodwalls
  - Major structures such as deferred maintenance of weirs, bypass outflow control structures, outfall gate facilities, and large regional pumping plants

- **Systemwide capital investments:** includes improvement of system performance, capacity and resiliency such as Yolo Bypass multi-benefit improvements, Paradise Cut multi-benefit improvements, and reservoir and floodplain storage actions

- **Urban capital investments:** includes continued 200-year level of protection levee improvements for urban areas and enhancements to other critical infrastructure, including incorporation of multi-benefit opportunities

- **Rural capital investments:** includes critical levee repair and infrastructure improvements, small-scale levee setbacks and floodplain storage for increased flow attenuation, land acquisitions and easements for future system flexibility, and incorporation of habitat restoration/reconnection opportunities

- **Small community capital investments:** includes continued 100-year level of protection levee improvements for small communities and enhancements to other critical infrastructure, levee setbacks and land acquisitions for future flexibility of flow attenuation, including incorporation of habitat restoration opportunities

Table 9-1. Proposed Five-Year Infrastructure Plan, Average Annual Estimate ($M/year)

Department of Water Resources	Fiscal Year 1 (2017-2018)	Fiscal Year 2 (2018--2019)	Fiscal Year 3 (2019 2020)	Fiscal Year 4 (2020-2021)	Fiscal Year 5 (2021-2022)	Potential Funding Sources
Deferred Maintenance						
Repair, rehabilitation and replacement	$10	$10	$10	$10	$10	State General Fund, Sacramento and San Joaquin Drainage District, local
Deferred Maintenance Total:	**$10**	**$10**	**$10**	**$10**	**$10**	
Capital						
Systemwide – Yolo Bypass multi-benefit improvements	$102	$102	$102	$102	$102	State GO bonds, Sacramento and San Joaquin Drainage District, USACE
Systemwide – Paradise Cut multi-benefit improvements	$0	$0	$0	$0	$0	State GO bonds, Sacramento and San Joaquin Drainage District, USACE
Systemwide – Reservoir and floodplain storage	$3	$3	$3	$3	$3	State GO bonds, State Insurance Program, Sacramento and San Joaquin Drainage District, federal (e.g., USACE, Reclamation etc.), local
Systemwide Subtotal:	**$133**	**$133**	**$133**	**$133**	**$133**	
Urban – Levee improvements	$184	$184	$184	$184	$184	State GO bonds, Sacramento and San Joaquin Drainage District, USACE, local
Urban – Other infrastructure and multi-benefit improvements	$6	$6	$6	$6	$6	State GO bonds, State Insurance Program, Sacramento and San Joaquin Drainage District, USACE, local
Urban Subtotal:	**$190**	**$190**	**$190**	**$190**	**$190**	
Rural – Levee repair and infrastructure improvements	$32	$32	$32	$32	$32	State General Fund, State GO bonds, State Insurance Program, Sacramento and San Joaquin Drainage District, State River Basin Assessment or Tax, USACE, local
Rural – Small-scale levee setbacks and floodplain storage	$17	$17	$17	$17	$17	State GO bonds, USACE, local
Rural – Land acquisitions and easements	$34	$34	$34	$34	$34	State GO bonds, State Insurance Program, State River Basin Assessment or Tax, FEMA
Rural – Habitat restoration/reconnection	$20	$20	$20	$20	$20	State GO bonds, State River Basin Assessment or Tax, USACE
Rural Subtotal:	**$103**	**$103**	**$103**	**$103**	**$103**	
Small community – Levee repair and infrastructure improvements	14	$14	$14	$14	$14	State GO bonds, State River Basin Assessment or Tax, USACE
Small community – Levee setbacks, land acquisitions, and habitat restoration	$5	$5	$5	$5	$5	State GO bonds, State Insurance Program, State River Basin Assessment or Tax, USACE
Small Community Subtotal:	**$19**	**$19**	**$19**	**$19**	**$19**	
Capital Total:	**$444**	**$444**	**$444**	**$444**	**$444**	

Notes:

1. The 10-year Phase 1 cost estimate is shown as a constant annual average, although actual amounts for years 3-5 will likely be greater than for years 1-2.
2. While the Draft CVFPP Investment Strategy was being prepared, the extraordinary events of 2017 have triggered a new awareness of deferred maintenance needs within the flood system and a renewed sense of urgency to respond to those needs. Therefore, revised deferred maintenance requests were made to the State Department of Finance that were not included in the 2017 refined SSIA portfolio. The magnitude of these requests is significantly higher for the next 5 years than what was initially proposed.

9.2 Long-Term Funding Actions

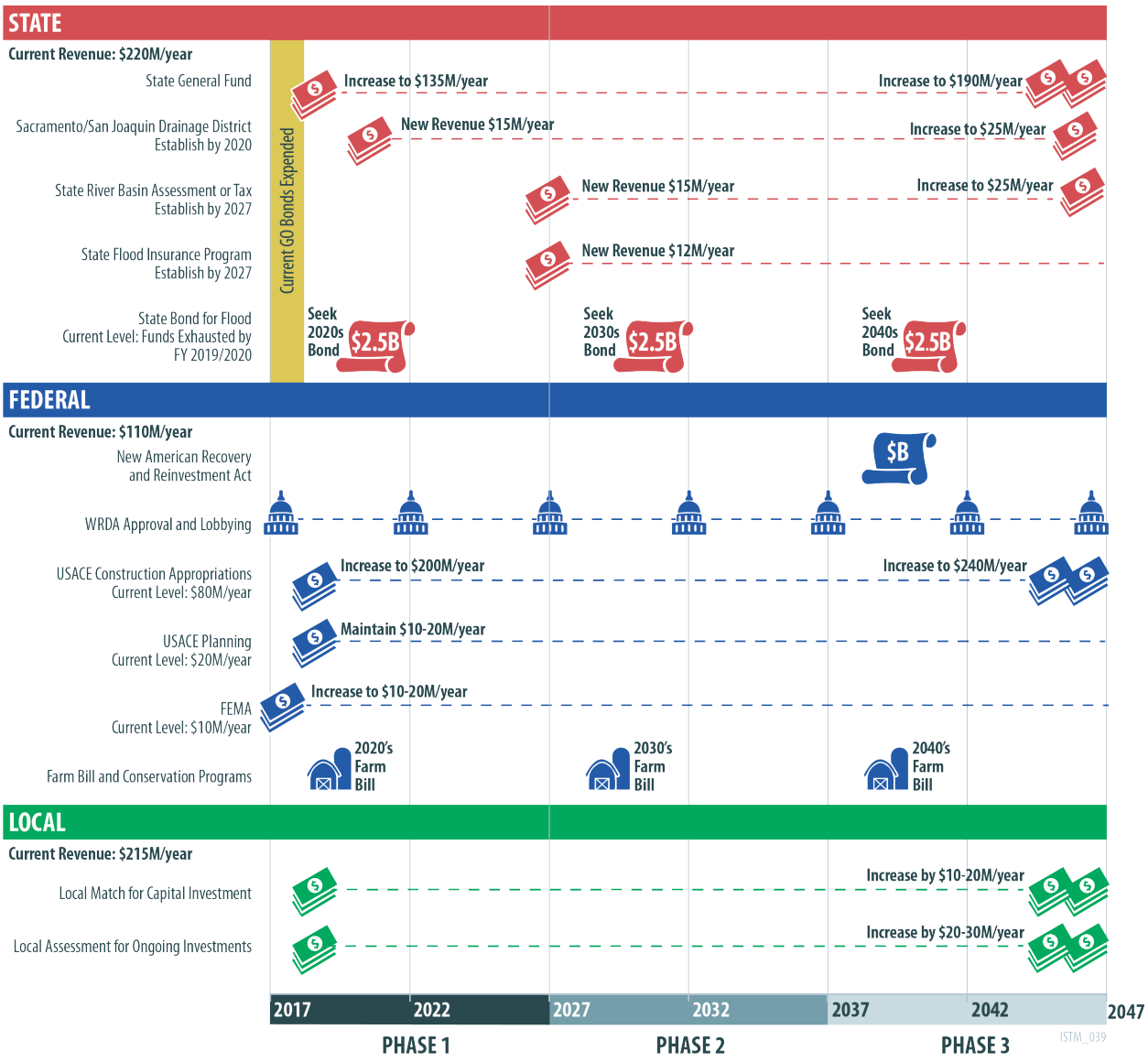
To implement the CVFPP over the next 30 years, larger contributions will be required from all entities. Figure 9-1 outlines recommended funding and phasing of funding for each cost-share partner to support the CVFPP funding plan. Information is presented this way to demonstrate when funding mechanisms could be available and how much would be needed. The recommended CVFPP funding plan takes advantage of existing revenue sources and needed increases in revenue-generation capacity.

For the State, this would include a much larger contribution from the State General Fund and the successful passage of three new State bond measures. The three bonds would be unprecedented in the amount of funding requested and frequency for flood-specific investments: an estimated 10-year frequency tied to overall State capacity to implement flood management system improvements. Time and effort would be required to develop new funding mechanisms, including evaluating the feasibility of a State flood insurance program and implementing a river basin assessment or tax program. In addition, the Sacramento and San Joaquin Drainage District could be investigated as a potential vehicle to implement an assessment at a broad scale.

For the federal government, contributions from USACE would need to increase from current levels. This requires the State to effectively promote the SSIA, likely seeking federal authorizations through the WRDA and annual appropriations from Congress to fund USACE-authorized projects. FEMA contributions could remain at current levels. The NRCS programs (such as the Farm Bill and Conservation Programs) could also provide some funds for flood management and ecosystem restoration projects.

Local entities would need to generate funds to provide the local match for federal and State capital investments. Local entities would also need to generate more funds for their share of ongoing costs. Although the Sacramento and San Joaquin Drainage District is categorized as a State funding mechanism because it would require action by the California State Legislature, it will generate revenue from local entities within district boundaries. Reutilizing the function of the Sacramento and San Joaquin Drainage District is an important mechanism to raise funds to improve the flood system for both locals and the State.

Figure 9-1. Recommended Funding Plan Timeline for CVFPP



Notes:

1. Although revenues from the Sacramento/San Joaquin Drainage District would be generated from locals within the district boundaries, it would require action by the California State Legislature to implement. This is why this funding mechanism appears as a State mechanism.
2. Current State contributions include approximately $40M/year from the General Fund and current GO Bond funding from Propositions 84 and 1E.
3. Current local contributions to all capital and ongoing investments are unknown. The $215M/year local revenue estimate (reflects the average revenue from 2003 – 2014) is assumed to cover capital and maintenance obligations and expenditures for local operating costs. It was assumed that this revenue could not be applied to the CVFPP funding plan, with one exception: local maintenance expenditures already currently being spent on SPFC facilities are applied towards the ongoing portion of the 2017 refined SSIA portfolio.
4. All estimates provided include both capital and ongoing activities unless otherwise specified.

Additional funding sources are required to manage and improve the State's flood management system into the future. However, additional funding alone is not enough; flood management policy issues present longstanding impediments to achieving full implementation of the CVFPP, and they must be addressed. To help address these longstanding impediments, eight primary flood management policy issues are identified and discussed in the 2017 CVFPP Update (DWR, 2017). Funding is one of the eight policy issues and is focused around the longer-term actions presented in Figure 9-1. Recommendations to address the funding policy issue and achieve the CVFPP funding plan are listed below. Recommended actions are a compiled list of longer-term recommendations with supporting details and recommended participating agencies. Where applicable, potential participating agencies are denoted as State (S), federal (F), and local (L). Future creation of work plans to collectively address all eight flood management policy issues will drive toward near-term implementation progress. The funding policy issue work plan is discussed in more detail in Section 9.3.

Recommendations for Funding

Issue Summary: Insufficient and unstable flood management funding has led to delayed investment and greater risk to life and property.

Recommended Actions:

- Continue to closely coordinate with State agencies and other partners, to generate State funding and support for CVFPP's flood investments.
  - **Seek increased appropriation from the State General Fund and pursue GO bonds (S/L).** It is recommended that appropriations from the State General Fund for Central Valley flood management increase from the $40 million currently expected to $190 million annually by the end of the 30-year period. General obligation bonds could be used to fund some of the more critical flood risk reduction projects, including the completion of the Yolo Bypass expansion. The CVFPP funding plan recommends pursuing flood management funding in three bond issues. The first issue of $2.5 billion would be targeted for the 2020 election, the second issue of $2.5 billion approximately a decade later, and the third issue of $2.5 billion a decade after that.
  - **Evaluate the viability and effectiveness of reutilizing the Sacramento and San Joaquin Drainage District (S/L).** The Sacramento and San Joaquin Drainage District is currently in the CWC to fund capital projects. It has been nearly 80 years since this district generated revenue. Within the next few years, the CVFPB and DWR could evaluate the viability of the district to conduct assessments. The evaluation should involve local stakeholder input and cover topics such as benefits, funding, capacity, and legal constraints. This analysis should conclude what level of assessment is viable and what legislative changes would be necessary to allow generated revenue to be used for capital and ongoing investments. The CVFPP funding plan assumes this mechanism would begin in approximately 2020 and could potentially generate $25 million/year by the end of the 30-year period.
  - **Evaluate the viability and effectiveness of establishing a State river basin assessment or tax (S).** Integrated water management is the focus of this type of assessment, and the State should develop a watershed approach to managing and funding projects. For example, a river basin assessment or tax would return money to the watershed, to be shared across integrated water management activities. DWR should develop criteria, in

coordination with local stakeholders, for the evaluation of the viability and effectiveness of this potential funding mechanism for implementation of the CVFPP. The CVFPP funding plan assumes that this mechanism could begin in Phase 2 and potentially generate $25 million/year by the end of the 30-year period.

- **Evaluate the viability and effectiveness of establishing a State flood insurance program (S).** Following the evaluation of the statewide flood insurance as described in the floodplain and land use management recommendations, a new approach to insurance could potentially generate funds to reduce flood risk while providing the same level of financial protection as offered by the NFIP. The CVFPP funding plan assumes that $12 million/year of potential revenue from this mechanism could begin in Phase 2. A State flood insurance program could use a portion of the premiums to reduce flood risk by contributing funds for flood management system repairs, improvements, and flood risk mapping and notification. Another version of this could be a local basin-wide insurance program. This could potentially be a companion program with a Statewide flood insurance program. Any new program should also consider insurance for agricultural properties. All of these potential uses of funds from a State flood insurance program would need to be further evaluated. Criteria for the evaluation should be developed in close collaboration with affected stakeholders.
- **Track outcomes from flood investments to demonstrate value (S).** Outcomes from local, State, and federal investments should be tracked to demonstrate the value of their actions through annual progress reports. These reports can help inform updates to the CWAP (Author, Year) and California's Five-Year Infrastructure Plan.
- **Commit to annually updating California's Five-Year Infrastructure Plan (S).** DWR will provide the necessary annual budget information regarding flood system ongoing and capital investments to the California Department of Finance for incorporation into the California's Five-Year Infrastructure Plan, which compiles all infrastructure needs, including water, flood, transportation, and others, across the State. Incorporate infrastructure life-cycle analysis per California Executive Order B-30-15.

- Continue to closely coordinate with federal agencies and other partners, to generate federal funding and support for CVFPP's flood investments.
  - **Establish a strategic, integrated flood management approach for California's Central Valley (S/F/L).** A strategic, integrated approach that emphasizes cooperation across all levels of government is required. This would require USACE programmatic authorities to conduct project budgeting and planning on a systemwide/watershed basis to streamline the time demand and reduce the costs incurred by all levels of government in managing California's flood risks. This should reduce transactional costs and avoid redundancy in programs. This recommendation would stretch the spending for State operations, planning, and performance tracking. This should also include federal funding for integrated water management science and services. DWR should continue to support language in upcoming federal water infrastructure legislation that would authorize USACE, in coordination with other federal, State, and local agencies, and NGOs, to develop watershed-based flood-risk planning and budgeting for projects across multiple communities and regions. Similar programs include the Greater Mississippi River Basin, the Comprehensive Everglades Restoration Program, and the Chesapeake Bay Program.

- **Seek Congressional support of State-sponsored projects in federal water infrastructure legislation (S/F/L).** The State should seek Congressional support for State-sponsored flood risk reduction and ecosystem restoration projects in federal water infrastructure legislation. Several State-sponsored flood risk and ecosystem restoration projects would benefit from continued Congressional support.
- **Seek guidance clarification for USACE project credit usage (F).** The State will seek guidance clarification from USACE for implementing Section 1020 of WRDA 2014, as modified by WRDA 2016 Section 1166. The guidance clarification could help the State submit a comprehensive plan requesting transfer of excess credit prior to completion of specific studies and projects consistent with the CVFPP. This would help maximize the leveraging of local dollars.
- **Support integration of federal and State floodplain management policies (S/F).** To prevent continued risk intensification in deep floodplains, the State supports integration of federal and State floodplain management policies to facilitate consistency. Ongoing trends for urbanization behind levees originally intended only for rural flood protection have brought the issue of risk intensification in deep floodplains in California to the forefront. As part of this, the State should seek Congressional support for USACE and FEMA to develop plans and encourage additional investments in rural flood risk management. This should include risk awareness, easements, ecosystem restoration, as well as sustaining agriculture in the floodplain.
- **Seek federal support for flood risk reduction and for ecosystem improvements in rural areas (S/F/L).** Bringing more federal dollars to the Central Valley for flood risk reduction and ecosystem improvements in rural areas will likely have to take a different approach in how projects are approved or selected. It is typically difficult to meet the benefit-cost ratio requirements for these types of projects using current guidelines. Current guidelines tend to favor projects in an urban area. The State supports USACE developing a project funding approach that takes into account more of the qualitative and other non-monetary benefits to support land productivity for agricultural and ecosystem purposes. The approach could also recognize that support of agriculture helps prevent risk intensification in rural areas.
- **Support annual contribution to the 2017 refined SSIA portfolio (S/F/L).** To implement the 2017 refined SSIA portfolio within 30 years would require a federal contribution of 36 percent (mostly through USACE), ramping up to $260 million per year. This would require the State to effectively lobby the federal government for inclusion into federal water infrastructure legislation on an ongoing basis and secure annual appropriations from USACE. The State would also seek funding available from the United States Department of Agriculture (USDA) at current levels through NRCS.

- Continue to closely coordinate with local agencies and other partners, to generate local funding for CVFPP investments. If more revenue is requested from the federal and state governments, local governments would also need to raise additional revenue to meet increased O&M and their cost-share requirements.
  - **Pursue a coordinated effort to amend Proposition 218 (S/L).** There have been many attempts to amend Proposition 218 requirements so that flood control can be treated similar to water, sewer, and sanitation utilities. A coordinated effort could make the process of raising assessments for flood control agencies similar to other utilities.

Additionally, local flood risk awareness campaigns and accomplishments reporting have been effective in increasing local support for funding flood management system improvements.

- **Increase assessments to meet cost-share requirements (L).** Local agencies may increase their assessments to meet cost-share requirements for the proposed projects and their share of O&M.

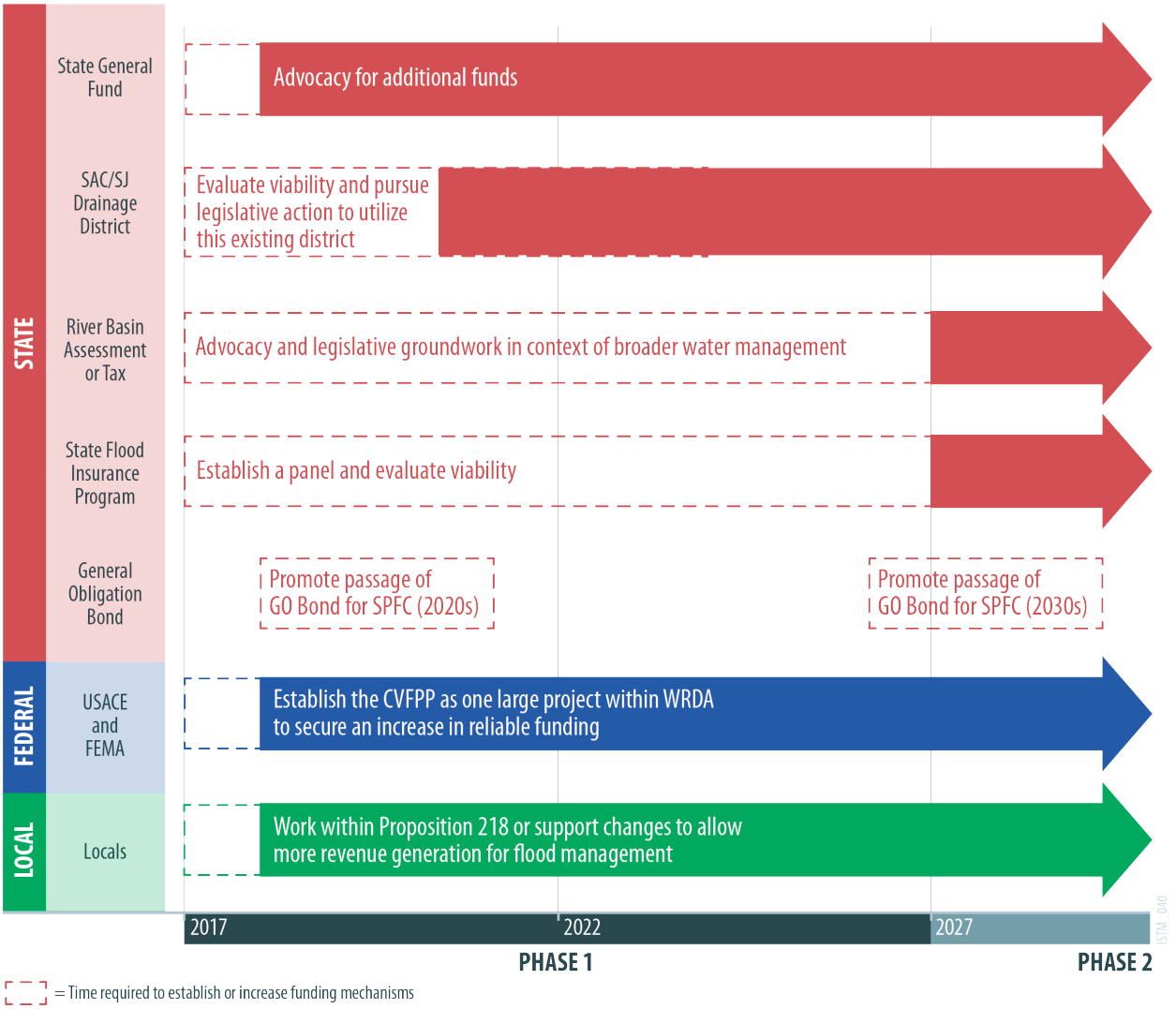
9.3 Near-Term Funding Actions

To be as efficient as possible with limited funding, a strategic, integrated approach that emphasizes cooperation across all levels of government is required. All cost-sharing partners would need to contribute significantly more than they have in the past, as historical revenue sources would only be able to fund approximately 47 percent of needed flood system investment, or closer to 20 percent if no additional GO bonds are passed. With the large investment recommended for implementation of the CVFPP, it is imperative for local and State entities to begin coordinating immediately to seek the legislative and programmatic changes necessary to bring about increased funding and develop new funding mechanisms. Local and State entities must also begin immediately working with the USACE and other federal partners to seek increased federal funds for Central Valley flood management.

Each funding mechanism in the CVFPP funding plan requires some level of groundwork to establish and/or implement. This includes research and evaluation of the viability of these mechanisms and how most effectively they could be established or implemented. Specifically, for some of the new funding mechanisms, careful attention and analysis will be needed to assure that the layering of existing and new assessments within and across all assessed or taxed areas is reasonable and equitable. Furthermore, stakeholder outreach and vetting would need to take place to ensure the most support for these actions. As described in Section 9.2, many funding actions will require a committee to be established to lead the work plan and engage stakeholders.

Figure 9-2 illustrates the actions necessary to initiate each potential funding mechanism, along with the estimated date the funding would become available. The State and its partners must work closely together over the next few years to initiate these actions so that additional funding can be realized beyond current levels. The next section outlines the near-term funding actions that are necessary for implementation to proceed.

Figure 9-2. Ten-Year Recommended Funding Actions for CVFPP



To effectively address the flood management policy issues described in the 2017 CVFPP Update, a series of work plans are being developed to provide a consistent framework and to drive CVFPP implementation progress. With funding being one of the most important policy issues, a near-term funding work plan is necessary.

Table 9-2 illustrates a funding work plan framework covering near-term actions (i.e., over the next 5 years), a timeframe for key milestones, and responsible lead agencies. This framework builds upon this CVFPP investment strategy, and will help guide a path for State, federal and local agency partners to work together in a coordinated fashion toward achieving necessary funding and funding mechanisms as we progress towards the 2022 CVFPP Update.

Table 9-2. Preliminary Funding Work Plan

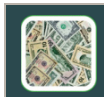
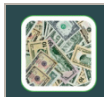
 Funding Flood Management Policy Issue										
Funding Mechanism	Near-Term Actions	Initiation Timeframe						Lead Agency Responsible		
		2017	2018	2019	2020	2021	2022	State	Federal	Local
State General Fund	▪ Expedite capabilities of the State to allocate newly received State General Fund dollars to response to the 2017 flood season.	X						X		
	▪ Advocate for increased State General Fund dollars via a budget change proposal for FY 2017-2018 with the 2017 CVFPP Update as justification.	X						X		
	▪ Advocate for additional funding from the State General Fund to increase maintenance efforts and bolster DWR's Flood System Maintenance and Operation program activities.	X						X		
Sacramento and San Joaquin Drainage District	▪ Establish a committee with local partners to evaluate the reutilization and updating of the Sacramento and San Joaquin Drainage District to secure more reliable funds for ongoing activities. As that evaluation takes place, the CVFPB will evaluate the effectiveness of implementing State maintenance areas and possible consolidation of LMAs in places where needed, in coordination with local agencies.	X						X		
	▪ Craft legislation that reutilizes the Sacramento and San Joaquin Drainage District.		X					X		
State River Basin Assessment or Tax	▪ Evaluate a State river basin assessment or tax as a supplement/replacement to the IRWM program.		X					X		
	▪ Establish a committee to evaluate the implementation of a State river basin assessment or tax.		X					X		
	▪ Craft legislation that implements a State river basin assessment or tax.					X		X		
State Flood Insurance Program	▪ Establish a panel to evaluate the feasibility of a State (or regional) flood insurance program.		X					X		
	▪ Craft legislation that implements a State flood insurance program.					X		X		

Table 9-2. Preliminary Funding Work Plan



Funding Flood Management Policy Issue

Funding Mechanism	Near-Term Actions	Initiation Timeframe						Lead Agency Responsible		
		2017	2018	2019	2020	2021	2022	State	Federal	Local
State General Obligation Bond	■ Expedite capabilities of the State to allocate remaining Proposition 1E and 84 funds to appropriated programs in FYs 2016-2017 and 2017-2018. This would include the expansion of State staffing levels and resources. ■ Expedite capabilities of the State to allocate newly received Proposition 1 funding to response to the 2017 flood season.	X						X		
	■ Demonstrate the need and appropriateness for a new flood-focused GO bond to fund capital improvements that reduce flood risk across the Central Valley.	X						X		
	■ Pass a new flood-focused GO bond to fund capital improvements that reduce flood risk across the Central Valley.			X				X		
USACE and FEMA	■ Document and solidify federal credits for State-local led projects to demonstrate to USACE the need for increased federal appropriations.		X					X		
	■ Revitalize federal advocacy for greater USACE programmatic coordination with the goal of a shorter time for project development and permitting.	X						X		
	■ Advocate for inclusion of the CVFPP USACE's budgets, and the need to establish a presence in Washington, D.C.	X						X		
	■ Establish the CVFPP as one large project within WRDA to secure an increase in reliable funding.	X							X	
	■ Partner and engage with FEMA to increase investments in non-structural risk mitigation actions.	X						X	X	
Local	■ Pursue a coordinated effort to amend Proposition 218.	X						X		X
	■ Increase assessments to provide local cost-share.		X							X

Note:
1. Near-term actions are contingent upon sufficient resources being available to complete those actions.

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