# WATERSHED PLANNING AND YOU!
# WATERSHED UNIVERSITY
# APRIL 27, 2016

**Rhiannon Kucharski**
Chief, Watershed Assessment &
Ecosystem Restoration Section
U.S. Army Corps of Engineers
Sacramento District

# USACE WATERSHED PLANNING

- Watershed - A geographic area of **hydrologic connectivity** via overland or underground flow that human communities rely on for physical, societal and economic well being; and ecological communities rely on for sustainability.
- Authority: Section 729 of WRDA 1986
- Currently updating watershed planning guidance based on WRDA 2014

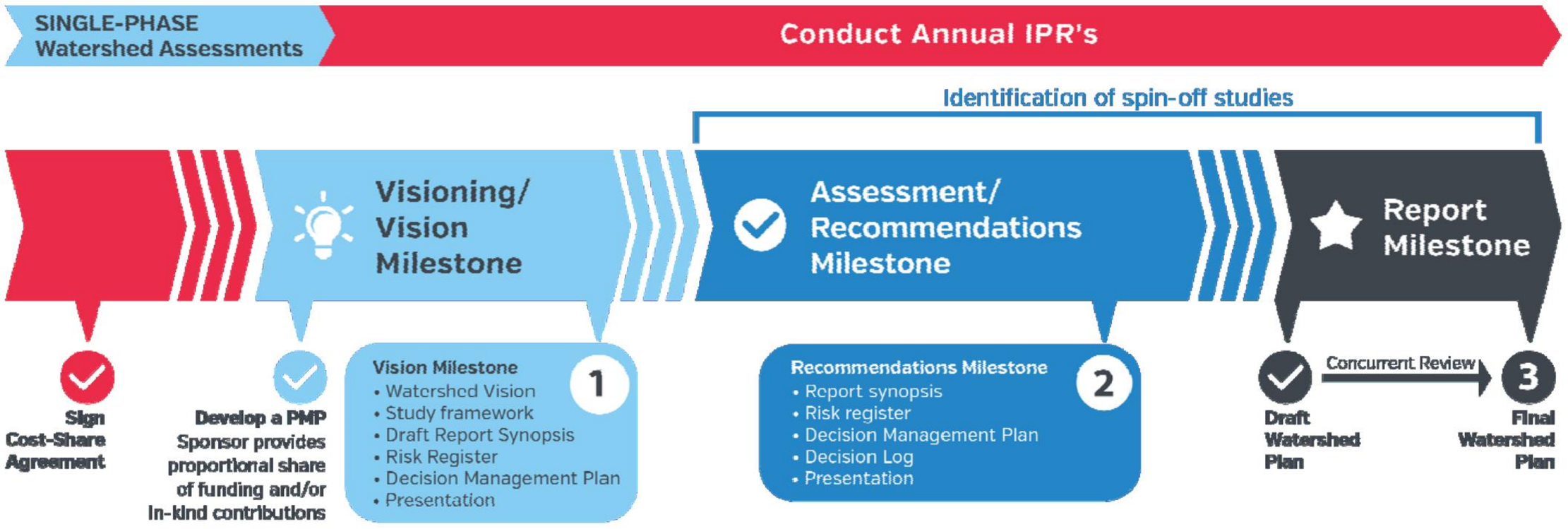
# USACE WATERSHED PLANNING: AN OVERVIEW

- Collaborative watershed vision
- Multiple partners and stakeholders
- Beyond USACE mission areas
- Multi-purpose or comprehensive single-purpose
- Broad set of solutions for multiple stakeholders
- May not result in a USACE project

# INTEGRATED WATER RESOURCES MANAGEMENT

- Integrated Water Resources Management (IWRM) provides a holistic focus on water resource challenges and opportunities that reflects coordinated development and management of water and related resources.
- Principles of IWRM are an integral part of watershed planning, focusing attention on multiple objectives and tradeoffs, better accounting for uncertainty, and accommodating the concepts of adaptive management, stakeholder collaboration, and systems analysis for watershed-scale planning and evaluation.

# USACE WATERSHED PLANNING PROCESS*




* This process is based on draft guidance and is subject to change

# A RECENT USACE WATERSHED STUDY:

Central Valley Integrated Flood Management Watershed Study (CVIFMS)

# HISTORY AND BACKGROUND: CENTRAL VALLEY COMPREHENSIVE STUDY

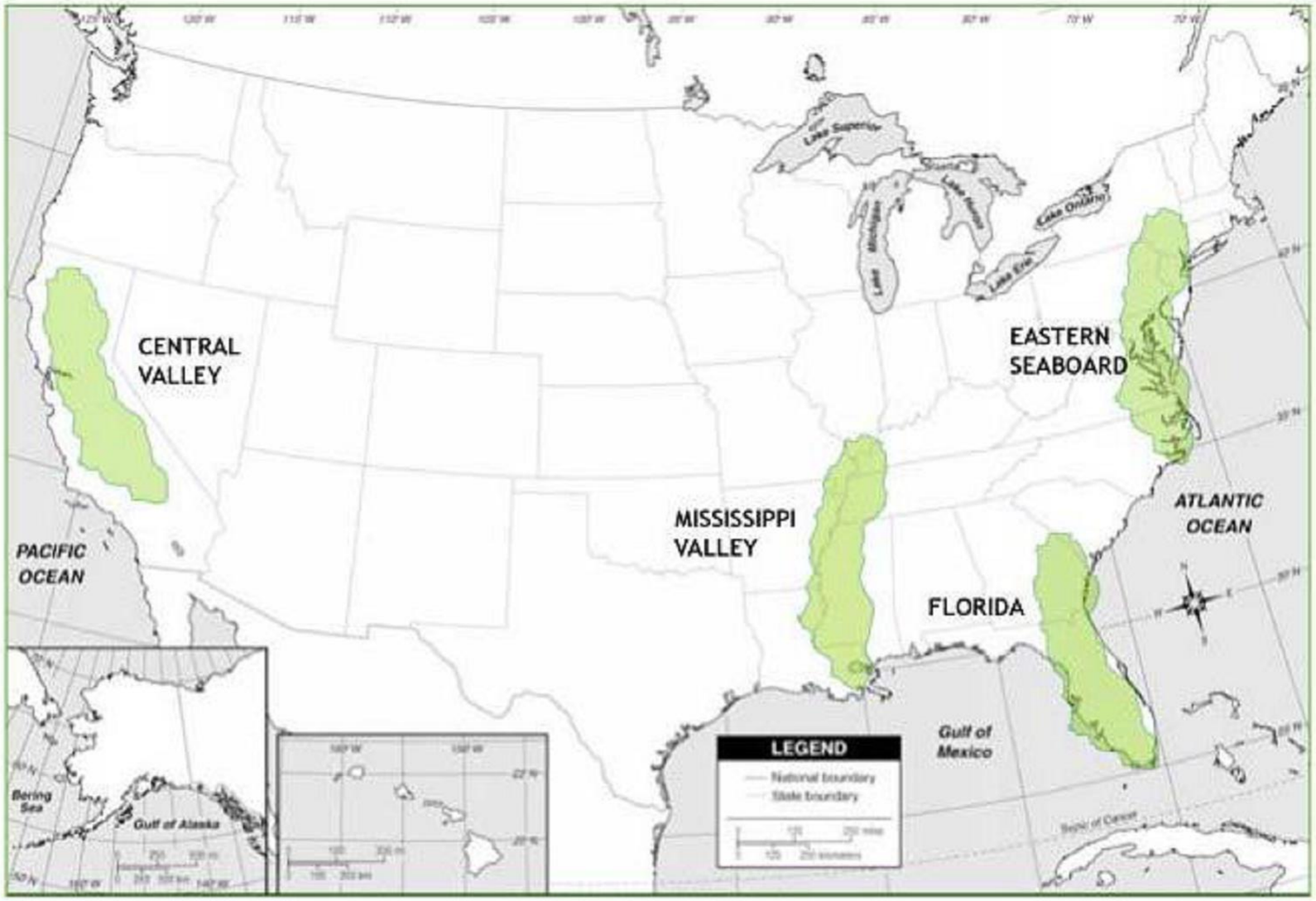
- Initiated after flood event of January 1997 – one of largest floods in History
- Damages at $524 million
- Multiple levee breaches throughout Central Valley

# STUDY AREA & AUTHORIZATION


"….conduct a comprehensive assessment of the entire flood control system….development and formulation of comprehensive plans for flood control and environmental restoration purposes…."

1998 Energy and Water Development Appropriations Bill

# CENTRAL VALLEY OF CALIFORNIA RELATIVE TO OTHER REGIONS OF UNITED STATES



# WHAT IS THE CENTRAL VALLEY?

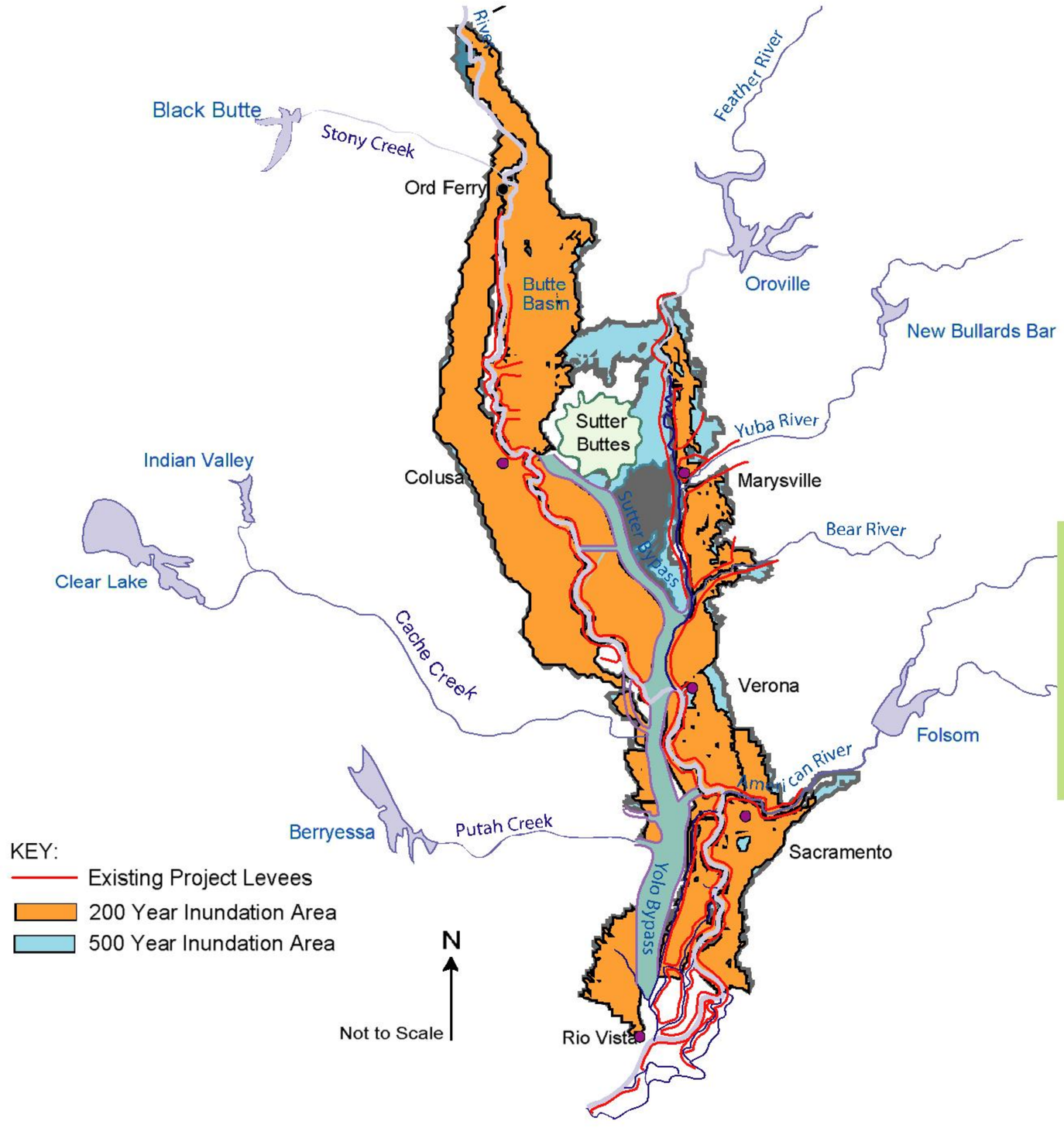

- 3 hydrologic regions
- 450 miles long, 50 miles wide
- Highly productive and diverse agricultural area
- Important ecosystem
- 4.4+ million people
- Sacramento and San Joaquin basins 43,000 sq-mi


# CENTRAL VALLEY FLOOD MANAGEMENT SYSTEM - SACRAMENTO RIVER BASIN

- 5 major dams
- Manage flood flows for 1/100 annual chance of exceedance events
- Many unregulated tributaries
- Extensive levee and bypass system
- Complex hydraulics
- Year-round water supply
- Good riparian habitat in north
- Natural process constrained in south

# SACRAMENTO RIVER BASIN – BYPASS SYSTEM

# SACRAMENTO RIVER BASIN INUNDATION AREAS




1.7 million acres

Flood depths range from shallow to over 20 feet

Expected annual damages estimated at $246 million

# Comp Study Problem Areas

- Inadequate channel capacity
- Levee deficiencies
- Erosion
- Degraded habitat (95% loss of riparian and wetland habitats)
- Institutional barriers
- Threatened & endangered species
- Development within floodplains

# COMP STUDY LEGACY
# IMPROVED SYSTEM-WIDE KNOWLEDGE

Hydrology

Reservoir Operations

Levee Reliability

Hydraulics

Composite Floodplains

Economic Damages

Flood Warning & Response

Floodplain Mgmt Measures

Biological Response

Storage Opportunities

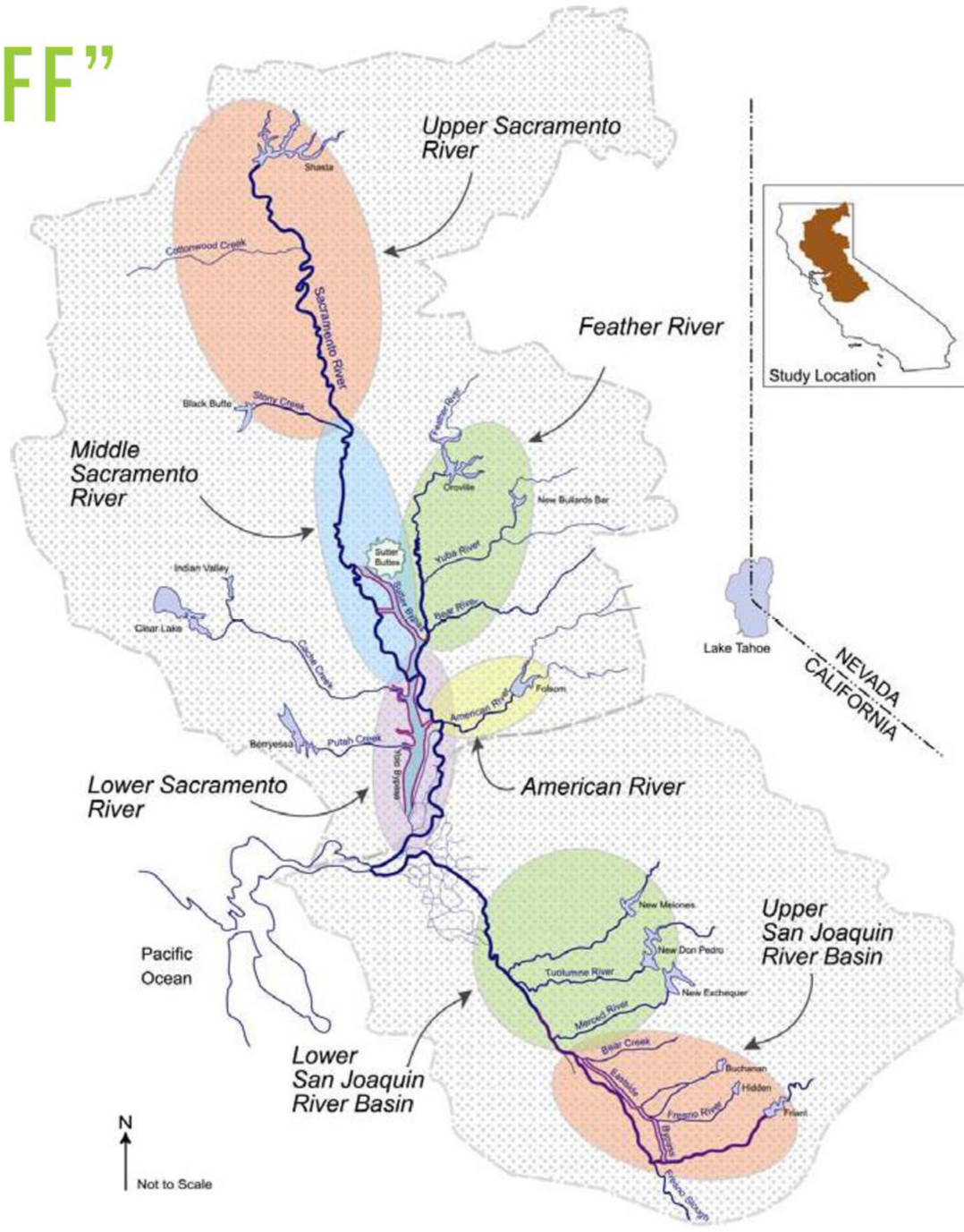
Conjunctive Use

Land Use Changes

Subsidence

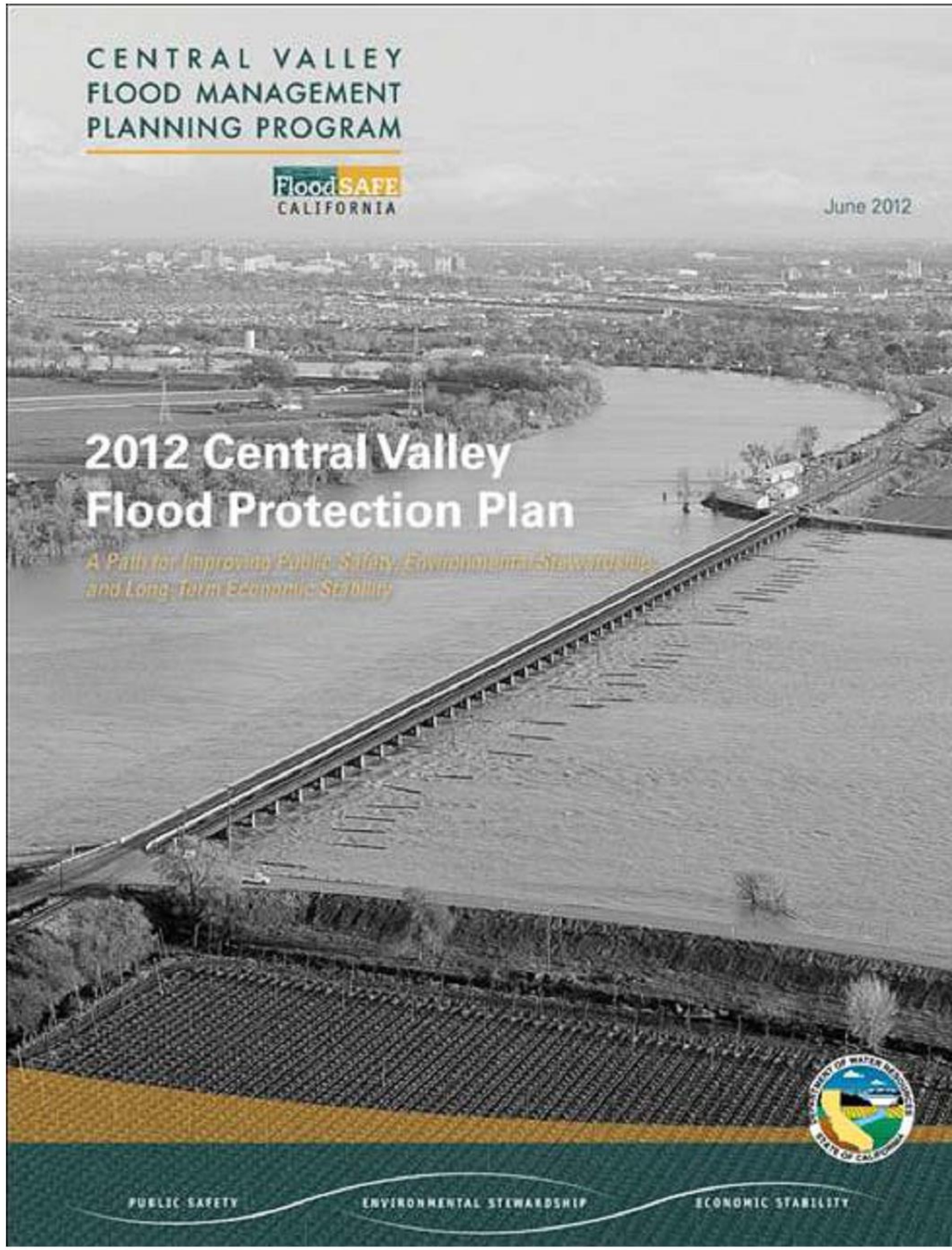
# COMP STUDY LEGACY – "SPIN-OFF" PROJECTS & REGIONAL EFFORTS

- Site specific Feasibility Study - Hamilton City Flood Damage Reduction and Ecosystem Restoration – construction initiated in 2016
- Central Valley Integrated Flood Management Watershed Study (CVIFMS)
- Studies by local & regional stakeholder coalitions



# WHAT IS CVIFMS?

Federal companion document to Central Valley Flood Protection Plan and draft Conservation Strategy, Regional Flood Management Plans and Integrated Regional Watershed Management Plans



# WHAT IS CVIFMS?

Watershed study focused on Sacramento River Watershed that developed a comprehensive, watershed-wide management plan

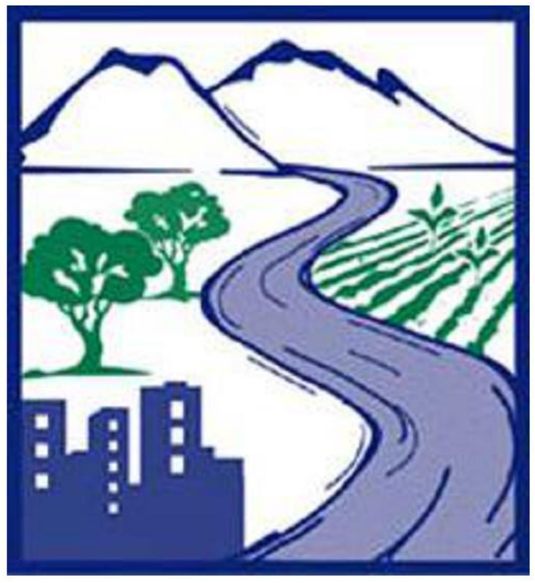
- Assessed watershed characteristics and conditions
- Identified watershed issues/problems
- Developed, evaluated and prioritized conceptual alternatives, including structural and non-structural measures for flood risk management, ecosystem restoration and water supply/conservation
- Incorporated public input and involvement
- Identified potential "spin-off" and "off-shoot" studies under Federal, State and/or local authorities

San Joaquin River Watershed– next phase

# VISION STATEMENT

The Federal and State governments share a vision for an integrated flood management system in the Central Valley to provide for safe, healthy and thriving communities while protecting and restoring the environment. The problem is so overwhelming that achievement of this shared vision can only be through pursuit of mutual priorities. The State's flood risk management priorities of public safety, environmental stewardship and economic stability match the Federal administration's priorities of protecting the American people, restoring and protecting the environment and improving the nation's economy.

# ONGOING EFFORTS



Leveraged existing information and models from State and USACE projects, including:

- Central Valley Flood Protection Plan
- Basin-wide feasibility studies
- Bay Delta Conservation Plan
- Regional Plans
- Sutter Basin Project
- Yuba River General Reevaluation Project
- Yuba River Ecosystem Restoration Study
- West Sacramento General Reevaluation Study
- American River Watershed Program: Common Features and Folsom Dam Joint Federal Project
- American River Common Features General Reevaluation Study
- Sacramento River Bank Protection Project
- Cache Creek Feasibility Study
- Delta Islands and Levees Feasibility Study
- Sacramento-San Joaquin Comprehensive Study

# RECENT ACTIVITIES

- Received funding to complete study June 2015
- Completed draft determination of federal interest
- Held two-day stakeholder planning workshop, 24-25 August 2015
- Used Multi-Criteria Decision Analysis (MCDA)
- Completed first draft watershed plan
- Completed USACE South Pacific Division, Agency Technical and Public Reviews
- Completed Final Draft Watershed Plan and transmitted to HQUSACE for review and approval April 2016

# PLANNING GOALS

Flood Risk Management

Reduce risk to public safety from flooding in Sacramento River Basin;

Reduce risk of damages to residential, agricultural and commercial/industrial areas, and roads and other critical infrastructure due to flooding;

Ecosystem Restoration

Restore aquatic habitat for Sacramento River ecosystem;

Restore natural stream processes in Sacramento River; and

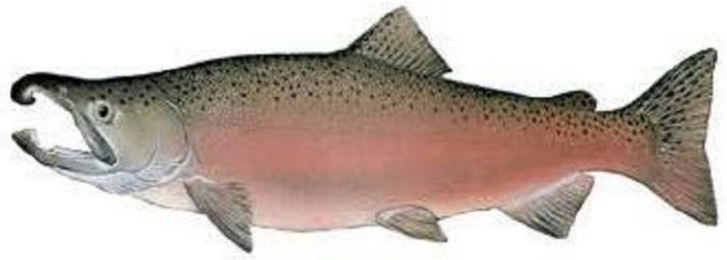
Water Supply/Conservation

Improve water supply reliability and availability

# ARRAY OF FLOOD RISK MANAGEMENT MANAGEMENT MEASURES

| | |
|---|---|
| 1. Widen bypasses | 11. Flood recovery plan |
| 2. Create new bypasses | 12. Floodplain management plan |
| 3. Modify weirs | 13. Create/enlarge floodplain storage |
| 4. Optimize operation of weirs | 14. Purchase flowage easements |
| 5. Automate weir operations | 15. Re-operate/optimize reservoirs |
| 6. Remove/modify obstructions | 16. Raise/upgrade existing dams |
| 7. Raise/strengthen existing levees | 17. Forecast-based reservoir operations |
| 8. New levees | 18. Re-allocate storage in reservoirs |
| 9. Setback levees | 19. Construct new dams |
| 10. Coordinated emergency response plans | |

# ARRAY OF ECOSYSTEM RESTORATION MANAGEMENT MEASURES

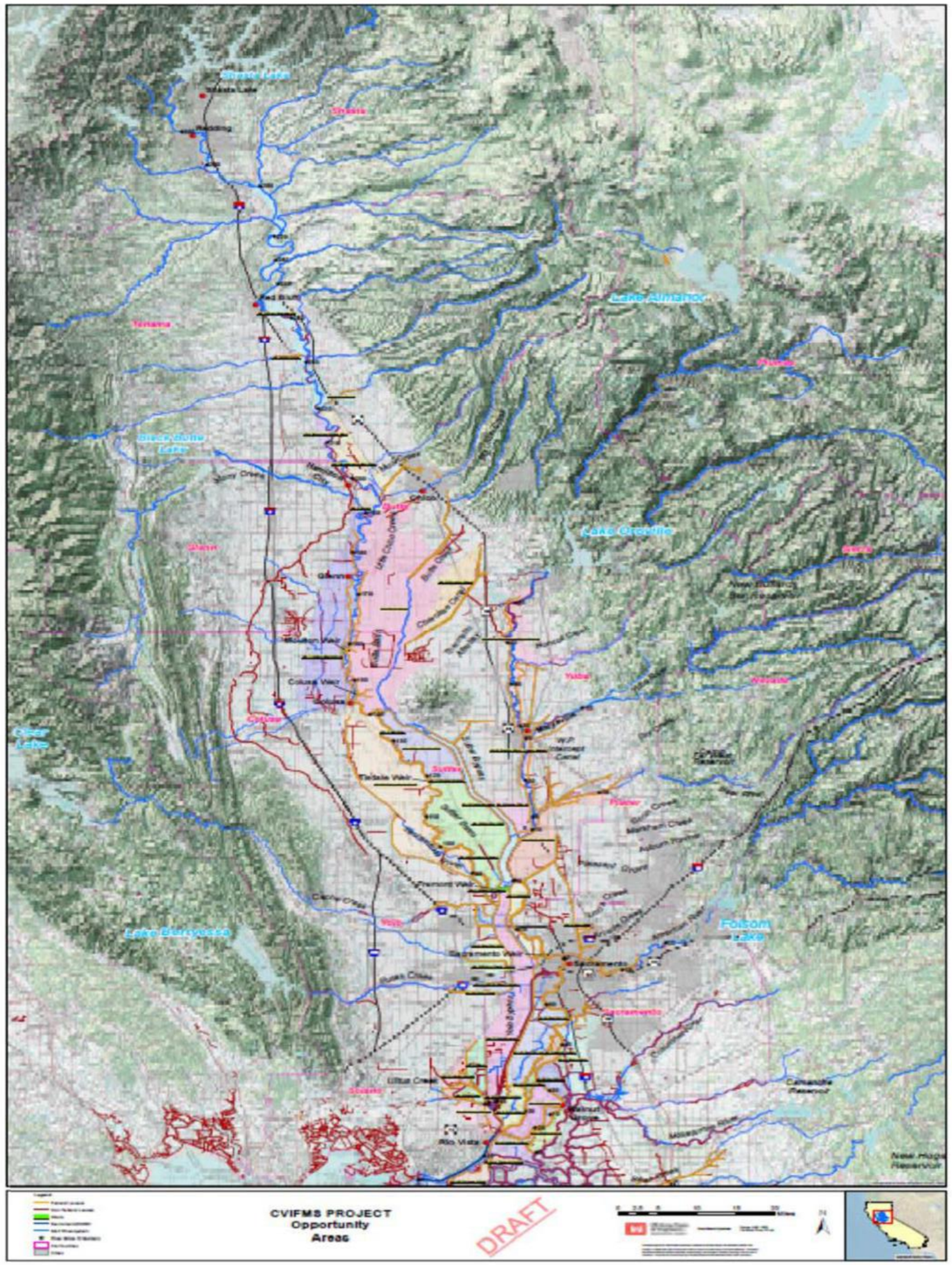


| | |
|---|---|
| 1. Increase shaded riverine aquatic habitat<br>2. Increase riverine aquatic habitat<br>3. Increase riparian habitat<br>4. Increase perennial marsh habitat<br>5. Impoundments for wetlands<br>6. Restore natural bank habitat<br>7. Re-create channel meanders<br>8. Remove barriers to channel migration<br>9. Lay-back banks to connect with floodplain | 10. Terrace floodplains<br>11. Re-contour floodway<br>12. Remove barriers to fish passage<br>13. Screen pump diversions<br>14. Extend floodplains/expand floodway<br>15. Set back levees<br>16. Notch weirs<br>17. Remove non-native species<br>18. Reservoir re-operation<br>19. Low flow channel in bypasses |

# ARRAY OF WATER SUPPLY MANAGEMENT MEASURES

1. New dams that include water supply purpose
2. Re-operate existing dams to conserve more water
3. Enhance/increase groundwater percolation
4. Re-allocate storage in reservoirs
5. Improve existing water conveyance system

# WATERSHED DIVIDED INTO 50 OPPORTUNITY AREAS



# ARRAY OF MEASURES APPLIED AS APPROPRIATE TO EACH OPPORTUNITY AREA

Sample from CVIFMS features table

| Elder Creek Opportunity Area |
|---|
| Non-native removal/management |
| Floodplain Management Plan |
| Flood Recovery Plan |
| Restore habitat within the Sacramento River floodway |
| Reduce/remove piece of levee to restore habitat in Sac River Refuge area |
| **Deer Creek Opportunity Area** |
| Non-native removal/management |
| Floodplain Management Plan |
| Flood Recovery Plan |
| Restore habitat within the Sacramento River floodway |
| Improve Fish Passage (Lower Deer Creek) |
| Levee Setback (Lower Deer Creek) |
| O&M Manual change (ER) |
| Raise/strengthen existing levees |
| **Woodson Bridge West Opportunity Area** |
| Non-native removal/management |
| Remove barriers to channel migration |
| Restore Natural Bank Habitat |
| Floodplain Management Plan |
| Flood Recovery Plan |
| Restore habitat within the Sacramento River floodway |
| **Woodson Bridge East Opportunity Area** |
| Non-native removal/management |
| Set back levees - multipurpose |
| Reduce/remove levees East |
| Reduce/remove levees on eastern side of the river adjacent to Hamilton City |
| Restore habitat within the Sacramento River floodway |
| Extend or improve spawning habitat |
| Floodplain Management Plan |
| Flood Recovery Plan |
| Restore riparian habitat |
| Sediment removal at Lindo Creek |
| **Capay Opportunity Area** |
| Non-native removal/management |
| Create connectivity between Hamilton City project, federal protected lands and TNC lands |
| Restore riparian habitat |
| Restore habitat within the Sacramento River floodway |
| **Chico Area (Lindo Channel/Sandy Gulch) Opportunity Area** |
| Non-native removal/management |
| Improve connectivity to Stone Ridge Ecological Reserve and/or Bidwell Park |
| Floodplain Management Plan |
| Flood Recovery Plan |

# QUALITATIVE SCREENING

Flood Risk Management Benefits

- How well feature could reduce risks to life safety from flooding
- How well feature could reduce consequences associated with flood risk (with emphasis on improving system resiliency and increasing integrity of flood system)
- How well feature could reduce risks to critical infrastructure from flooding
- How well feature could encourage wise use of floodplain

Water Supply Benefits

- How well feature could increase availability and reliability of water supply (groundwater and surface water)

Ecosystem Restoration Benefits

- How well feature could increase area, quality, connectivity and diversity of significant native aquatic and related habitats
- How well feature could reduce barriers to fish passage
- How well feature could increase natural dynamic hydrologic and geomorphic processes
- Which types of species feature could benefit: 1) aquatic, 2) avian, 3) terrestrial or 4) all types (zero = no benefit; low = one type could benefit; medium = two types could benefit; high = all types could benefit)

# QUALITATIVE SCREENING CONTINUED

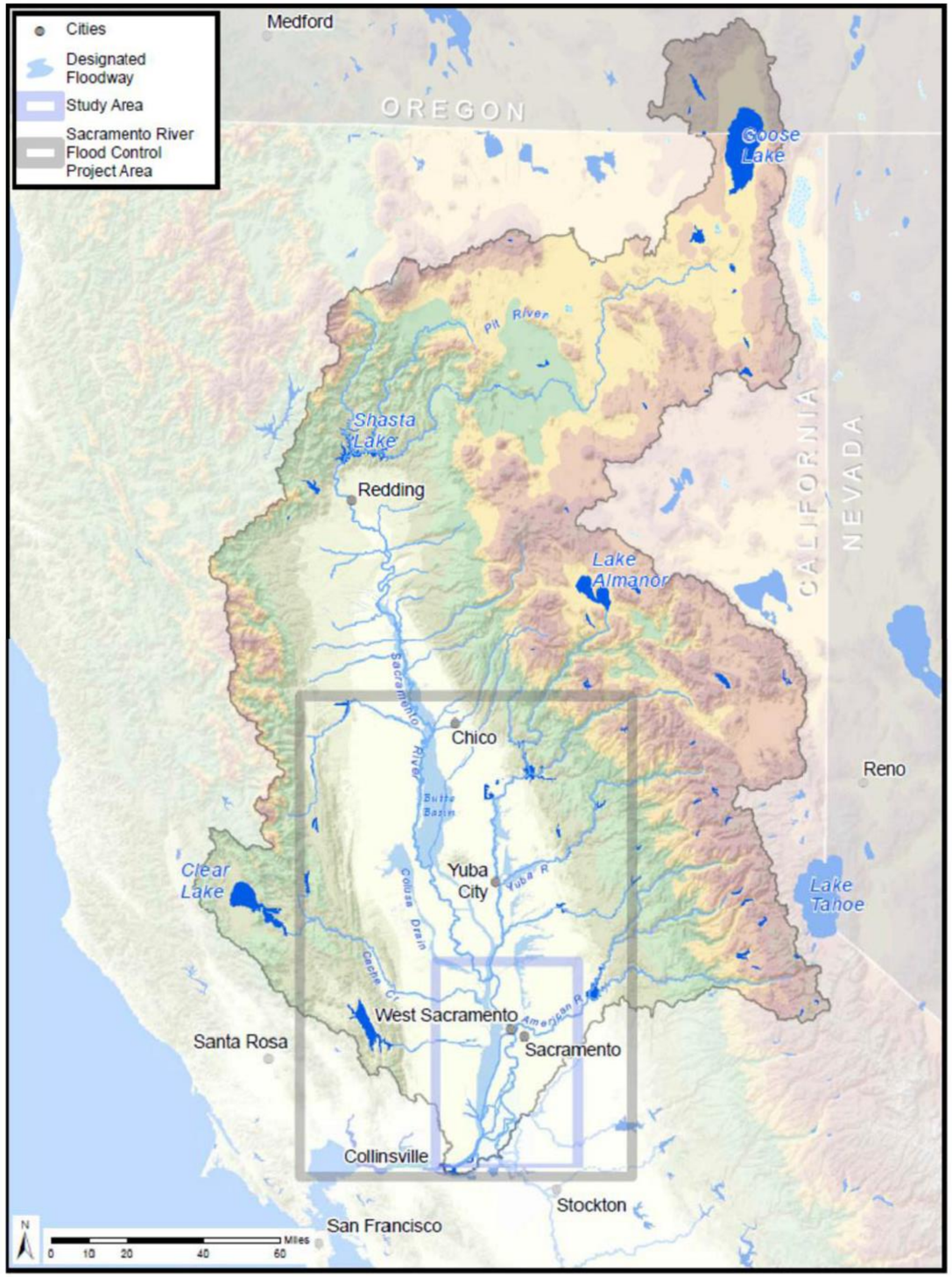
- Flood Risk Management, Ecosystem Restoration and Water Supply Costs
  - Order of magnitude of costs for feature
  - Order of magnitude of mitigation that could be required for feature
- Features that were infeasible, inefficient or ineffective were screened out

# CONCEPTUAL ALTERNATIVES

(0) No Action Alternative
(1) Non-Structural Flood Risk Management (FRM) Alternative
(2) Ecosystem Restoration (ER) Alternative
(3) Structural FRM Alternative
(4) Combined ER and FRM Alternative
(4a) Locally Developed Plan - Central Valley Flood Protection Plan and draft Conservation Strategy FRM and ER Alternative
(5) FRM and Water Supply (WS) Alternative
(6) Combined FRM, ER and WS Alternative
(7) WS Alternative
(8) WS and ER Alternative

# EARLY "OFF-SHOOT" STUDY

Sacramento River GRR – recently initiated study to revision Sacramento River flood control system for flood risk management and ecosystem restoration



# DRAFT PROPOSED "SPIN-OFF" AND "OFF-SHOOT" STUDIES

Near-term recommended "spin-off" and "off-shoot" studies include:

<u>Climate Change Assessment under USACE Floodplain Management Services</u>

- USACE, State, IWR, potentially other Districts in region and climate change experts
- Develop standard approach for assessing impact of inland climate change on decision criteria in future studies in this region

<u>San Joaquin River Watershed Study (CVIFMS Part II) under General Investigations</u>

- Originally included in this study, but during a re-scoping, San Joaquin River Watershed was recommended to be assessed in a second phase
- To address remaining portion of Central Valley, consistent with CVFPP and draft Conservation Strategy

# DRAFT PROPOSED "SPIN-OFFS" AND "OFF-SHOOTS" CONTINUED

<u>Central Valley Reservoir Reoperation Study under General/Special Investigations</u>

- Operate system in a coordinated manner to optimize benefits
- Comprehensive investigation of reservoirs within both Sacramento and San Joaquin River Basins (USACE, State, USBR) to optimize operations for FRM, ER and WS across system of reservoirs, incorporating weather forecasts and climate change analysis.
- Logical and necessary next step to DWR's Phase I and II reoperation studies (http://www.water.ca.gov/system_reop/)
- System reoperation has potential to produce benefits with little to no construction costs

# DRAFT PROPOSED "SPIN-OFFS" AND "OFF-SHOOTS" CONTINUED

<u>Middle and Upper Sacramento River Basin Study under General Investigations</u>

- Multi-purpose ER, FRM and WS study
- Study will consider sites located within middle and upper Sacramento River and Feather River sub-watersheds
- Study would complement Middle and Upper Sacramento and Feather River Regional Plans and provide an opportunity to partner with both State and regional groups
- Study area would include Sacramento and Feather Rivers and their tributaries
- Lower Sacramento River-Delta North area is *not* included in this recommendation

# DRAFT PROPOSED "SPIN-OFFS" AND "OFF-SHOOTS" CONTINUED

Mid- to Long-Term "Spin-off" and "Off-shoot" Studies Include:

Non-Structural Floodplain Management Services

- Small-scale, non-structural projects that can provide floodplain mapping, floodplain management plans, emergency plans and flood recovery plans
- Could provide significant benefits to effected areas for low cost and effort
- May be critical for small communities, agricultural areas and Tribal communities

Upper American River and Tributaries

- Multi-purpose FRM, WS and ER study along American River and its tributaries (above Folsom Dam and Reservoir)

Ecosystem Restoration Studies under Continuing Authorities Program/General Investigations/Tribal Partnership Program

- Restore ecosystem in more localized areas, including on Tribal lands
- Areas such as Clear Lake/Upper Cache Creek, Elder Creek, Deer Creek and Stoney Creek among others

# DRAFT PROPOSED "SPIN-OFFS" AND "OFF-SHOOTS" CONTINUED

Inter-Agency Support

- Support to sister Federal agencies to assist with water resource projects for which USACE has an expertise

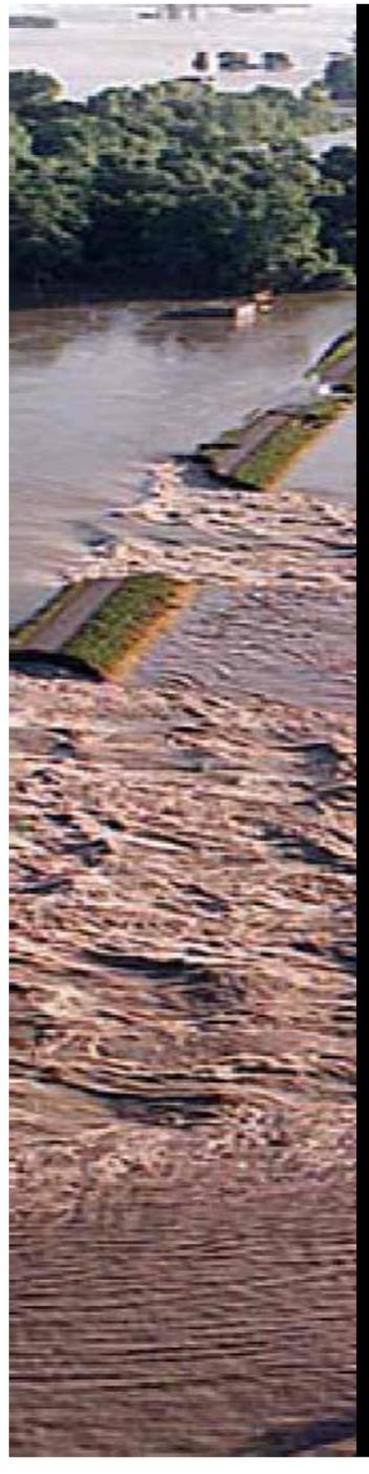
Planning Assistance to States

- USACE can provide states, local governments, other non-Federal entities and eligible Tribes assistance in preparation of comprehensive plans for development, utilization and conservation of water and related land resources
- Studies could include: water supply/demand, water conservation, water quality, ecosystem restoration and dam safety/failure

# CHALLENGES AND LESSONS LEARNED IN DEVELOPING A WATERSHED PLAN

# CHALLENGES IN WATERSHED PLANNING

- Diverse stakeholder interests
- Complex, dynamic system
- Large project scope
- Changing guidance
- Lack of understanding of watershed planning and watershed studies



# KEY LESSONS LEARNED

Clarify expectations at beginning and verify, adjust and communicate

- Have a solid communication and public involvement plan, and follow it
- Be flexible and willing to adjust based on changing policies, guidance and input from stakeholders
- Educate yourself, your team, your sponsors and stakeholders on what a watershed study is and is *not* to frame appropriate expectations

Leverage existing information to reduce need for new, costly and time consuming analyses

# QUESTIONS / DISCUSSION

# CONTACT INFORMATION

**Rhiannon Kucharski**

Chief, Watershed Assessment & Ecosystem Restoration Section

Planning Division

US Army Corps of Engineers

1325 J Street

Sacramento, CA 95814

Phone: 916-557-7258

Email: Rhiannon.L.Kucharski@usace.army.mil