Table of Contents

Table of Contents

Table of Contents

Chapter 2. Goals and Objectives

Table of Contents

Table of Contents

Table of Contents

Table of Contents

Table of Contents

List of Appendices

Table of Contents

List of Tables

Table of Contents

List of Figures

Table of Contents

List of Abbreviations and Acronyms

ac-ft	Acre-Feet
ACID	Anderson Cottonwood Irrigation District
af/yr	Acre-Feet Per Year
AWMPs	Agricultural Water Management Plans
BMO	Basin Management Objective
Brown Act	Ralph M. Brown Act of 1953
CABY	Cosumnes American Bear Yuba
CalEPA	California Environmental Protection Agency
CAP	Climate Action Plan
CAS	California Aquifer Susceptibility
CASGEM	California Statewide Groundwater Elevation Monitoring Program
CC	Computer Consultant
CDBG	Community Development Block Grant
CDEC	California Data Exchange Center
CEDEN	California Environmental Data Exchange Network
CEIC	California Environmental Information Clearinghouse
CEQA	California Environmental Quality Act
CERES	California Environmental Resources Evaluation System
cfs	Cubic Feet Per Second
Clean Water Act	Federal Water Pollution Control Act
CNRA	California Natural Resources Agency
CS	County Staff
CVFPP	Central Valley Flood Protection Plan
CVHM	Central Valley Hydrologic Model
CVP	Central Valley Project
CWC	California Water Code
CWP	California Water Plan
CWSRF	Clean Water State Revolving Fund
DAC	Disadvantaged Communities
DDTs	Dichlorodiphenyltrichloroethanes
DFW	Department of Fish & Wildlife
DMS	Data Management System
DOE	Department of Energy
DOF	California Department of Finance
DWR	California Department of Water Resources
EC	Engineering Consultant
EECBG	Energy Efficiency and Conservation Block Grant
EIR	Environmental Impact Report
EJ	Environmental Justice
ET	Evapotranspiration

ETaw	Evapotranspiration Of Applied Water
FCWCD	Flood Control and Water Conservation District
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FMMP	Farmland Mapping and Monitoring Program
GAMA	Groundwater Ambient Monitoring and Assessment program
GCID	Glenn Colusa Irrigation District
GHG	Greenhouse Gas
GWMPs	Groundwater Management Plans or GWMP's
HMGP	Hazard Mitigation Grant Program
HUD	Department of Housing and Urban Development
I-Bank	California Infrastructure and Economic Development Bank
IRWM	Integrated Regional Water Management
IRWMP	Integrated Regional Water Management Plan
IWRIS	Integrated Water Resources Information System
MHI	Median Household Income
MODIS	Moderate Resolution Imaging Spectroradiometer
MOU	Memorandum of Understanding
MS4's	Municipal Separate Storm Sewer Systems
NAHC	Native American Heritage Commission
NAWQA	U.S. Geological Survey National Water-Quality Assessment
NCWA	Northern California Water Association
NGOs	Non-Governmental Organizations
NLCD	National Land Cover Data
NRCS	Natural Resources Conservation Service
NSV	Northern Sacramento Valley
O&M	Operation And Maintenance
OEHHA	California Office of Environmental Health Hazard Assessment
OP	Organophosphate
PCBs	Polychlorinated Biphenyls
PR	Project Review
PR Subcommittee	Project Review Subcommittee
PRISM	Parameter-elevation Regressions on Independent Slopes Model
Proposition 84	Proposition 84 IRWMP Planning Grant
Proposition 50	Watershed Restoration program
PSMP	Project-Specific Monitoring Plans
QA/QC	Quality Assurance and Quality Control
RAP	Regional Acceptance Process
RCAC	Rural Community Assistance Corporation
RCD	Resource Conservation District
RD 108	Reclamation District 108

REAP/EA/REDA	Rural Energy for America Program - Energy Audit and Renewable Energy Development Assistance
RM	River Mile
RMP	Regional Monitoring Program
RMS	Resource Management Strategies
RWMG	Regional Water Management Group (NSV Board)
RWQCB	Regional Water Quality Control Board
SAFCA	Sacramento Area Flood Control Agency
SDACs	Small, Disadvantaged Communities
SEBAL	Surface Energy Balance Algorithm for Land
SEP	State Energy Program
SPFC	State Plan of Flood Control
SRBPP	Sacramento River Bank Protection Project
SRFA	Sacramento River Funding Area
SRFCP	Sacramento River Flood Control Project
SSJDD	Sacramento-San Joaquin Drainage District
State	State of California
SWAMP	Surface Water Ambient Monitoring Program
SWFM	Stormwater Flood Management
SWP	State Water Project
TAC	Technical Advisory Committee
TAF	Thousand Acre-Feet
TAP	Technical Assistance Program
TCC	Tehama Colusa Canal
TCCA	Tehama Colusa Canal Authority
TM3	Technical Memorandum No. 3
TMDLs	Total Maximum Daily Loads
USBR	U.S. Bureau of Reclamation
USCID	U.S. Society for Irrigation and Drainage Professionals
USGS	United States Geological Survey
UWMP	Urban Water Management Plan
WCWD	Western Canal Water District
WDL	Water Data Library
WSA	Water Supply Assessment
WY2010	2010 Water Year

Table of Contents

Glossary

Acre-foot	Enough water to cover an acre of land 1 foot deep (325,851 gallons)
Affordable	Economically feasible for the designated use.
Alien Species	Any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, found in a particular ecosystem, that is not native to that ecosystem.
California Native American Tribe	All indigenous communities of California, including those that are non-federally recognized and federally recognized.
Central Valley Project (CVP)	California's largest water supplier, owned and operated by the US Bureau of Reclamation, delivering on average over 7 million acre-feet per year, mostly for agricultural use. For more information visit: http://aquafornia.com/where-does-californias-water-come-from/the-central-valley-project. *(Source: Water Education Foundation's Aquafornia website).*
Conjunctive Management	Coordinating operation and monitoring of surface water and groundwater supplies to meet defined objectives.
Conjunctive Use	Using a combination of surface water and groundwater supplies to meet water demands.
Ecosystem	Relationship between organisms and their environment.
Ecosystem Improvement	Enhancement to an ecosystem that has been degraded, damaged, or destroyed.
Evapotranspiration	Loss of water from the soil both by evaporation and by transpiration from the plants growing thereon. *(Source: www.merriam-webster.com)*
Federal Emergency Management Agency (FEMA)	The federal agency administering the National Flood Insurance Program (NFIP) and disaster planning and recovery programs. FEMA works closely with states and communities and provides financial and technical assistance and flood hazard maps and data to better manage floodplains. For more information visit: http://www.fema.gov/hazard/flood/index.shtm *(Source: Water Education Foundation's Aquafornia website).*
Flood Insurance Rate Maps (FIRMs)	The official map of a community on which FEMA has delineated both the special hazard areas and the risk premium zones applicable to the community. For more information visit: http://www.fema.gov/hazard/map/firm.shtm.
Floodplain	Any land area susceptible to being inundated by water from any source. *(Source: National Flood Insurance Program Regulations 44 CFR Section 59.1)*
Groundwater	Water stored underground in pore spaces within rocks and other alluvial materials and in gaps between fractured hard rock. *(Source: Water Education Foundation's Layperson's Guide to Groundwater (2003))*
Groundwater Management Plan (GMP)	A voluntary plan developed by an existing local agency or agencies that is guided by Assembly Bill 3030 (California Water Code Section 10750 et seq.) procedures. For more information visit: http://www.water.ca.gov/groundwater/gwmanagement/ab_3030.cfm.

Healthy Forest	Forest that is not overcrowded (and therefore less prone to high-intensity fires), with minimal destructive insects, in which productivity of multiple resources, and ecological values including biodiversity, are resilient to disturbance and sustainable for the long-term.
Honor	To regard or treat with admiration and respect; or, to live up to or fulfill the terms of. *(Source: www.merriam-webster.com)*
Improve	To enhance in value or quality; to make better; to increase the value of by making it more useful for humans; to advance or make progress in what is desirable; or, to make useful additions or amendments to. *(Source: www.merriam-webster.com)*
Invasive Species	An alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health.
Land Subsidence	Land subsidence is a gradual settling or sudden sinking of the Earth's surface owing to subsurface movement of earth materials. *(Source: USGS website)*
Non-Point Source	Diffuse pollution sources that are not subject to the Clean Water Act's National Pollution Discharge Elimination System (NPDES) permitting. The pollutants are generally carried off the land by runoff. Common non-point sources are agriculture, forestry, mining, dams, channels, and saltwater intrusion. *(Source: http://www.waterboards.ca.gov/publications_forms/available_documents/water_words)*
Point Source	A discharge point subject to the Clean Water Act's NPDES program; a point source is any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, and well. This term does not include return flows from irrigated agriculture or agricultural storm water runoff. *(Source: http://www.waterboards.ca.gov/publications_forms/available_documents/water_words)*
Preserve	To keep safe from injury, harm, or destruction; to keep alive, intact, or free from decay; or, to maintain. *(Source: www.merriam-webster.com)*
Protect	To cover or shield from exposure, injury, damage, or destruction; to maintain the status or integrity of especially through financial or legal guarantees; to save from contingent financial loss; or, to foster or shield from infringement or restriction: to restrict competition for by means of tariffs or trade controls. *(Source: www.merriam-webster.com)*
Regional	Of, relating to, characteristic of, or serving a region. *(Source: www.merriam-webster.com)*
Restore	To put or bring back into existence or use; or, to renew.

Sacramento River Index

The sum of the unimpaired runoff in the water year as published in the DWR Bulletin 120 for the Sacramento River at Bend Bridge, Feather River inflow to Lake Oroville, Yuba River at Smartville, and American River inflow to Folsom Lake. This index is used to determine the Sacramento Valley water year type. The water year types based on the water year index are shown in the table below.

Sacramento Valley Water Year Hydrologic Classifications are:

Year Type	Water Year Index
Wet	Equal to or greater than 9.2
Above Normal	Greater than 7.8, and less than 9.2
Below Normal	Greater than 6.5, and equal to or less than 7.8
Dry	Greater than 5.4, and equal to or less than 6.5
Critical	Equal to or less than 5.4

(Source: http://www.waterplan.water.ca.gov/docs/cwpu2009/0310final/v4c12a01_cwp2009.pdf)

State Water Project (SWP)

The largest state-built water and power project in the United States. The State Water Project, operated by the California Department of Water Resources, provides drinking water for 23 million people and irrigation water for 750,000 acres of farmland. For more information visit: http://aquafornia.com/where-does-californias-water-come-from/the-state-water-project.

Surface Water

Water that remains on the earth's surface in rivers, lakes, reservoirs or oceans.
(Source: Water Education Foundation's Layperson's Guide to Groundwater (2003))

Sustainable

Of, relating to, or being a method of harvesting or using a resource so that the resource is not depleted or permanently damaged.
(Source: www.merriam-webster.com)

Wetlands

An area that is saturated by surface or ground water with vegetation adapted for life under those soil conditions, as swamps, bogs, fens, marshes, and estuaries.
(Source: http://www.waterboards.ca.gov/publications_forms/available_documents/water_words.shtml)

CHAPTER 1
Governance and Region Description

The purpose of this Integrated Regional Water Management Plan (IRWMP) is to document the regional water resource management conditions, needs and strategies; to describe the process and projects that will improve regional water resources management in the IRWM region; and, to comply with the Final California Department of Water Resources (DWR) Integrated Regional Water Management (IRWM) Grant Program Guidelines. This report accomplishes these goals in the following six chapters:

- Chapter 1 Introduction, Governance, and Region Description
- Chapter 2 Objectives
- Chapter 3 Plan Development Process
- Chapter 4 Resource Management Strategies
- Chapter 5 Potential Projects and Prioritization
- Chapter 6 Implementation Strategy

The purpose of this chapter is to provide a description of the governance structure and provide the Region Description of the Northern Sacramento Valley (NSV) IRWMP region, which includes all or portions of the following counties:

- Butte County
- Colusa County
- Glenn County
- Shasta County
- Sutter County
- Tehama County

This chapter is prepared in accordance with the DWR IRWM Grant Program Guidelines, dated November 2012 (IRWM Guidelines)[1].

[1] Final DWR IRWM Grant Program Guidelines for IRWM Implementation and Planning grants funded by Proposition 84 (*The Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coast Protection Bond Act of 2006*), Chapter 2, and the Stormwater Flood Management (SWFM) grants funded by Proposition 1E (*The Disaster Preparedness and Flood Prevention Bond Act of 2006*).

Chapter 1
Governance and Region Description

In accordance with the IRWM Guidelines, the IRWMP governance description must include the following elements:

- Regional Water Management Group
- Governance Structure
- Additional Provisions:
  - Public Outreach and Involvement Processes
  - Effective Decision Making
  - Balanced Access
  - Effective Communication
  - Long-Term Implementation
  - Coordination with Neighboring IRWM efforts and State and Federal Agencies
  - Collaborative Processes
  - Interim and Formal Changes
  - Updating or Amending the IRWMP

Additionally, a region description should include the following elements:

- Watersheds and Water Systems
- Internal Boundaries
- Water Supplies and Demands
- Water Quality
- Social and Cultural Makeup
- Major Water Related Objectives and Conflicts
- IRWMP Regional Boundary
- Neighboring/Overlapping IRWM efforts

These elements are described in more detail below. Information for the descriptions provided below was derived from previous documents and new information prepared during this IRWMP effort, the Sacramento Valley IRWMP prepared by the Northern California Water Association (NCWA) in 2006, and other regional planning documents.

1.1 GOVERNANCE

The governance of the IRWMP, including development of the Regional Water Management Group (RWMG), the RWMG governance structure, and other provisions for outreach, modification, and implementation are described below.

1.1.1 Regional Water Management Group

CWC 10539 defines an RWMG as follows:

> *RWMG means a group in which three or more local agencies, at least two of which have statutory authority over water supply or water management, as well as those other persons who may be necessary for the development and implementation of a plan that meets the requirements of CWC §10540 and §10541, participate by means of a joint powers agreement, Memorandum of Understanding (MOU), or other written agreement, as appropriate, that is approved by the governing bodies of those local agencies.*

The NSV RWMG consists of a group of six local agencies: the Counties of Butte, Colusa, Glenn, Shasta, Sutter, Tehama, all of which have some degree of statutory authority over water supply and water management. None of the signatories, however, have total control over water supply and water management in their respective boundaries. Therefore, a substantial effort has been made by the IRWMP signatories to solicit input and coordinate water supply planning with all of the agencies with authority over water supply and management within the IRWM planning area.

1.1.2 Governance Structure

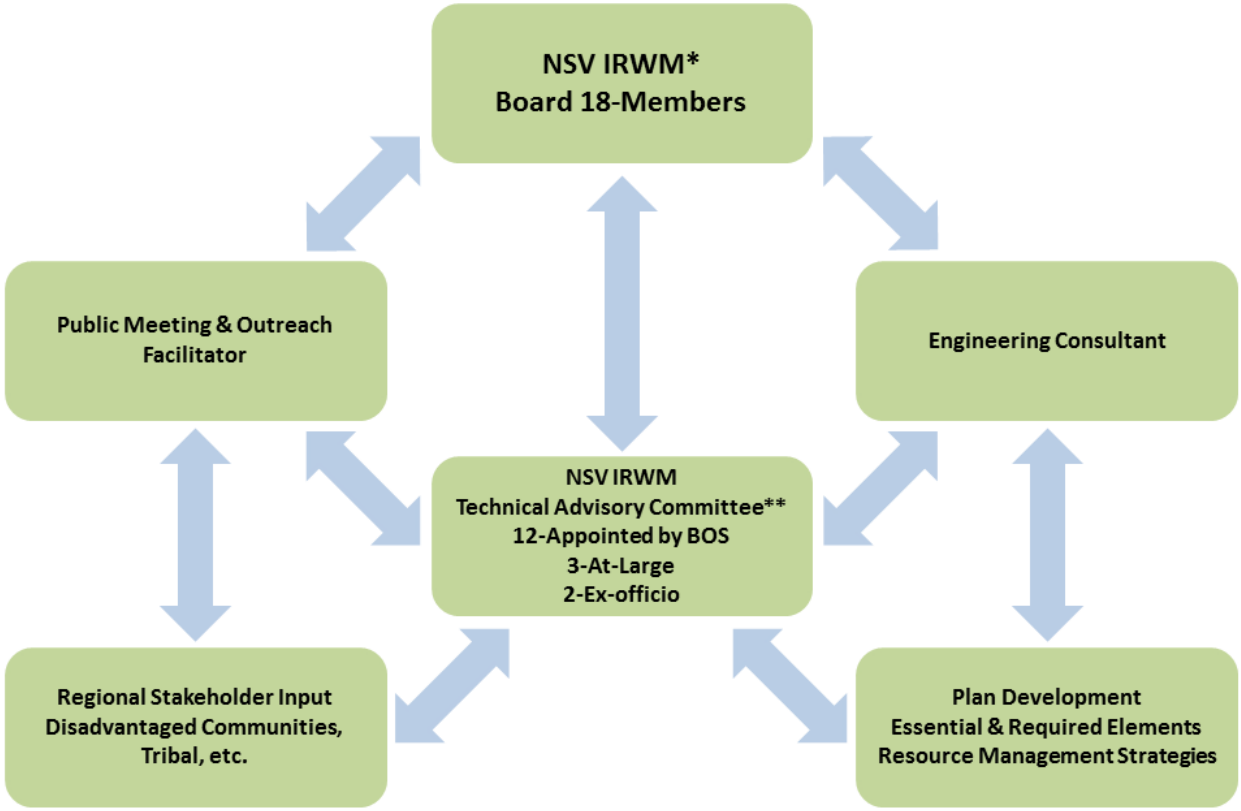
The current governance structure was developed and implemented during 2010 and 2011, prior to commencing development of this IRWMP. The process to develop that structure is documented in Technical Memorandum No. 3 (TM3), Appendix A to this IRWMP. TM3 describes the development and formation of the RWMG (the NSV Board) and its technical support group (Technical Advisory Committee, TAC). This structure was implemented pursuant to the provisions of the Four-County MOU, Appendix B to this IRWMP as a single document with the original MOU and subsequent amendments. The specific governance structure was formed through action by each of the six county Boards of Supervisors.

The 18-member NSV Board consists of three individuals selected by each of the respective county Boards of Supervisors. This composition was chosen to develop a supportable IRWMP to guide future water resources management decisions and help to secure implementation support. The NSV Board began meeting in January 2011 and focused its initial efforts on developing Bylaws that established the name of the organization, membership, purpose, names and duties of officers, meeting policies and procedures, and provisions for future amendments. NSV Board meetings are public and subject to the Brown Act, so that all people interested in the NSV IRWMP process have an opportunity to express their thoughts directly to the Board. Implementation details are set forth in the NSV Bylaws, which also describe the meeting policies and procedures for both the NSV Board and TAC. The NSV Bylaws are appended to this IRWMP as well (Appendix C). The TAC was established as a working-level group to act as staff to the Board. The relationships among the Board, the six counties and the TAC are shown on Figure 1-1 (see next page).

The NSV Board directs the activities of the TAC and receives its recommendations. Following adoption of this IRWMP, the Board's continuing role is to ensure that the IRWMP is implemented and updated, while safeguarding and supporting collaboration among stakeholders. Although the NSV Board is not an implementing entity, the membership of the NSV Board and

institutional structures within the NSV provide tremendous resources and capability for implementing most any project or program individually or in partnerships.

Figure 1-1. NSV IRWM Board Organizational Structure



* Each of the six counties Boards of Supervisors appoint members to the NSV Board, with at least one appointee being a county supervisor.
** Technical Advisory Committee – Six county staff and six landowner representative appointed by each of the six counties Boards of Supervisors (BOS), three at-large appointed by the Board, two regional organization self-appointed (ex-officio).

1.1.3 Additional Provisions

Additional provisions of the IRWMP governance are described below.

1.1.3.1 Public Outreach and Involvement Processes

Consistent with the Bylaws, all NSV Board meetings are open to the public. In compliance with the Brown Act, the NSV Board posts its meeting agendas and meeting packages in advanced of the meetings. Meeting minutes and sign-in sheets are kept for each of the meetings. Future meeting frequency will continue to be guided by both budget and agenda topic considerations, but generally continuing on a semi-annual basis, with the TAC continuing on a quarterly basis. The NSV Board expects to solicit public comments at its regular meetings at least annually on progress towards implementing the IRWMP.

To notify the public about the IRWMP's pending adoption, a Notice of Intent (NOI) to adopt this IRWMP was published in local newspapers throughout the region as shown in Appendix D.

1.1.3.2 Effective Decision Making

The current process of NSV Board decision-making has worked well since the NSV Board was established in late 2010, and began meeting in early 2011. Changes to the Bylaws have been adopted several times to improve the effectiveness of meetings and assure that decision-making is adequately supported. The Bylaws define voting requirements for both making regular decisions (for example, adopting IRWMP Goals and Objectives, providing guidance to the TAC and consultants, *etc*.) and amending the Bylaws. NSV Board decisions are informed by recommendations from the TAC, in addition to extensive public input at both TAC and NSV Board meetings.

1.1.3.3 Balanced Access

During the two-year period for development of this IRWMP, the NSV Board and TAC have made effective efforts at providing public access to their deliberations. Initial meetings were held at various locations throughout the region, eventually moving most meetings to Willows as a location central to the region. Two rounds of public workshops (January 2012 and June 2012) were held at three different locations each throughout the region to provide greater public access. The IRWMP web site has also proven to be a successful means of providing timely information to the public and allow public comments to be sent to the consultant team, NSV Board and TAC.

In addition, two separate letters at different points in the IRWMP development process were sent to each of the Tribes in the six-county NSV IRWMP region. One of the public outreach meetings was also held at the Cachil DeHe Band of Wintun Indians facilities in Colusa.

The county staff representatives on the TAC, one from each of the six counties, have also conducted substantial outreach to Disadvantaged Communities (DAC) and a wide range of interest groups. This has been conducted as a component of the local cost match pursuant to the Proposition 84 planning grant for the NSV IRWMP.

All meeting agendas, attachments and meeting minutes are distributed by email as well as through the NSV IRWMP web site (http://www.nsvwaterplan.org/).

1.1.3.4 Effective Communication

To date, the IRWMP process has focused on developing the IRWMP and providing communication within the NSV region. Much of that communication is described above in the content of "balanced access". In addition, the NSV Board plans to continue informing its membership and the public of opportunities to learn more about important regional and statewide water issues, particularly those that could have an impact on water use and supplies within the NSV region. Many of the same public entities engaged in the NSV IRWMP also sponsor the periodic NSV Water Forum, which in the past has examined and heard presentations on issues related to the Sacramento-San Joaquin Delta, groundwater management and conjunctive use, and water quality. The NSV Board is cognizant that the NSV region's concerns and opportunities benefit from being considered in the context of other water issues in California.

1.1.3.5 Long-Term Implementation

Implementation will be based on the MOU, as amended from time to time to reflect implementation obligations. The existing MOU (last amended in 2010) is aimed at the IRWMP planning process, leading to adoption of the IRWMP. Anticipated future changes to the MOU include but may not be limited to: (1) budget and funding sources to support the NSV Board and TAC implementation activities; (2) a process by which changes to the IRWMP are to be made, both interim and formal. Potential changes to the IRWMP are addressed in Sections 1.1.3.8 and 1.1.3.9.

It is clear that county staff will have an even more prominent role in IRWMP implementation than they have had in the planning process. This will include a range of activities that were done by consultants during IRWMP development with funding for those activities provided by the Proposition 84 planning grant. The counties continue to update their individual staff and institutional capabilities to assure that they will be able to make the most cost-effective use of their collective capabilities.

1.1.3.6 Coordination with Neighboring IRWM efforts and State and Federal Agencies

NSV Board meetings consistently include reports from DWR staff on a wide range of current water issues that may be of interest in the NSV region, which historically include details on special issues such as the Central Valley Flood Protection Plan and changes in the IRWM Guidelines. Coordination with other State agencies as well as federal agencies has been limited to seeking input on specific projects to be included in the IRWMP and interactions with Congressional representative staff at public outreach workshops throughout the IRWMP development process. Meetings were also held with Congressional representative staff prior to the development of the IRWMP to inform them of the upcoming IRWMP development process. The following Federal agencies were invited to the TAC, Board and Outreach meetings, but did not attend: USBR, USF&WS and USACE. Participation by State and federal agency representatives in the NSV Water Forum meetings has also provided valuable input and interaction on a number of important water issues addressed by the IRWMP. The Board believes the level of State and federal agency participation during the IRWMP development process was appropriate for the needs of the IRWMP.

The NSV region is also represented in the Roundtable of Regions and in the Strategic Focus Group for DWR's Strategic IRWM Plan as the current TAC Chair and other representatives from the NSV IRWM group regularly participate in these meetings. During Plan development, the current TAC Chair was also the appointed representative from the NSV region for the Strategic Focus Group.

Coordination with other RWMGs and water issues in their regions has been accomplished in three ways. The first is participation by several TAC county staff in conference calls of other RWMGs in the Proposition 84 designated Sacramento Valley funding region. These calls are directed at discussing common issues and concerns over how Proposition 84 implementation funds are allocated among the various RWMGs in the Sacramento Valley. The second is participation by the TAC Chair in the statewide "Roundtable of Regions", in which all RWMGs statewide discuss their issues and concerns about IRWMP planning, funding and

implementation. The third is the ongoing efforts at direct coordination with each of the RWMGs immediately adjacent to the NSV region.

1.1.3.7 Collaborative Processes

As addressed in Sections 1.1.3.3 and 1.1.3.4 above, the NSV RWMG has an excellent public process track record. An early example was the public process used to develop and adopt NSV IRWMP goals and objectives. The IRWMP consultant team developed an initial draft for discussion at TAC meetings, after which substantial changes were made based on extensive input from TAC members and the public. Initial recommendations from the TAC to the NSV Board were met with additional changes from NSV Board members, and several rounds of monthly TAC and NSV Board meetings leading to adoption of the final goals and objectives at the Board's June 2012 meeting. This extended process almost doubled the time in the IRWMP development schedule for this task, but assured that there was broad understanding of the meaning and implications of a wide range of potential goals and objectives.

The NSV Board expects that future amendments to the goals and objectives will be based on real-world experience during implementation of the IRWMP, and will be implemented in a similar way to the development of the initial goals and objectives.

1.1.3.8 Interim and Formal Changes

The NSV Board and TAC have developed and made use of solid, documented administrative procedures during development of the IRWMP. Interim changes to the IRWMP that do not alter either the goals or objectives, such as an updated list of ranked projects, are expected to be considered through adoption of an addendum to the IRWMP and an abbreviated public process through regular or special NSV Board meetings. More specifically, it is anticipated that the list of ranked projects will be updated annually as new project proposals are developed and new details on current proposed projects are known. A "formal change" to the IRWMP implies fundamental changes to the adopted NSV IRWMP, which would likely require a more formal approach. As described in Section 1.1.3.2, the NSV Board will develop appropriate changes to its Bylaws to provide the necessary authority and process to make both interim and formal changes to the IRWMP.

1.1.3.9 Updating or Amending the IRWMP

This would be a formal change to the IRWMP, which would require a thorough review of all components of the IRWMP as set forth in the then current DWR IRWM Guidelines. It is premature to know the extent to which an "update" planning process can be funded, or at least partially funded, with State funds. Regardless, the NSV Board expects to be able to expedite an update process as compared to the effort required to develop the initial IRWMP since: (1) the future focus will be on significant changes to the adopted IRWMP; and (2) the NSV Board has institutional experience and a workable governance structure which is expected to shorten both the time and effort leading to an updated, amended IRWMP. The NSV Board does not expect to consider any formal changes for at least two years following adoption. Amendments to the IRWMP will be driven by the need for any fundamental changes that may be required to protect the water resources of the region and meet the goals and objectives of the IRWMP.

The NSV Board expects to be able to modify the list of projects and programs included in the adopted IRWMP based on NSV Board discussion, public input during NSV Board meetings and NSV Board vote, as discussed in Section 1.1.3.8.

1.2 WATERSHEDS AND WATER SYSTEMS

In general terms, the watersheds included in this NSV IRWMP are tributary to the Sacramento River downstream of Shasta Dam and within all or portions of:

- Butte County
- Colusa County
- Glenn County
- Shasta County
- Sutter County
- Tehama County

The NSV IRWMP planning area does not include the Sacramento River upstream of Shasta Dam, the Trinity River system, or watershed areas outside of the participating counties listed above (for example, the Feather River upstream of the Butte County/Plumas County boundary, and the Trinity River system are not included because they are outside the boundaries of the participating counties). Although Shasta Lake and the Sacramento River upstream of Shasta Dam are within Shasta County, it is included in neighboring IRWMP efforts, described in Section 1.9 – Neighboring/Overlapping IRWMP.

1.2.1 General Description of Natural and Anthropogenic Water Features

General descriptions of the natural and anthropogenic water features in the region are provided in this section.

1.2.1.1 Natural Water Features

The main rivers within the region are the Feather and the Sacramento, which contribute significantly to the statewide water supply. According to the California Water Plan Update 2009, the Sacramento River provides approximately 80 percent of the inflow to the Delta, and it is the largest and most important riverine ecosystem in the State of California.

There are over 1,900 named streams and numerous unnamed tributaries within the IRWM planning area. Most of the streams within the IRWM planning area are eventually tributary to the Sacramento River. Natural water features are shown on Figure 1-2 (located at the end of Chapter 1).

The Sacramento River IRWMP prepared by NCWA describes the local watersheds in detail. General descriptions of some of the named watersheds tributary to the Sacramento and Feather Rivers, excerpted from that IRWMP, are provided below in alphabetical order.

The Antelope Creek watershed drainage is approximately 123 square miles, and the average stream discharge is 107,200 acre-feet per year (af/yr). In the wettest years, average flows in winter months range from 200 to 1,200 cubic feet per second (cfs). In the driest years, flows in winter average 50 cfs. In all but the wettest years, summer and early fall flows average from 20 to 50 cfs. The natural flow pattern is altered by diversions in the lower creek from spring through fall. Flows are typically diverted from April 1 through October 31.

The Battle Creek watershed is approximately 360 square miles. Monthly mean flow ranges from 265 to 766 cfs, with an average flow of 516 cfs.

The Big Chico Creek watershed is approximately 72 square miles. The average annual discharge is 102,100 acre-feet (ac-ft). Summer flows drop to an average of 30 cfs, and winter flows average more than 300 cfs.

The Butte Creek watershed is approximately 809 square miles. Water imported from the Sacramento and Feather Rivers through irrigation diversions substantially augments natural flows on the lower stretches via tailwater discharges. The mean monthly flow for the period of record at a gage station near Chico is 417 cfs. Peak flow occurs during mid-February and averages 826 cfs. The lowest flows are typically in September, averaging 119 cfs. Below Chico, instream flows downstream of Gorrill Dam during irrigation season, between mid-July and September, range from 5 to 25 cfs in most years.

The Lower Clear Creek watershed (below Whiskeytown Dam) is approximately 49 square miles. The current release schedule from Whiskeytown Dam to Clear Creek is 50 cfs (January through October) and 100 cfs (November and December).

The Deer Creek watershed is approximately 200 square miles. The creek itself is 60 miles long. The lower 10 miles of the creek passes through the valley floor where most of the flow is diverted. Peak monthly flows in wet winters reach up to 2,600 cfs. In the driest years, winter flows reach only 90 to 110 cfs. Minimum summer and fall base flows are 60 to 80 cfs.

Mill Creek flows for 60 miles draining an approximately 134-square-mile watershed, including several geothermal mineral springs on the southern flanks of Mt. Lassen. From 1929 to 1994, Mill Creek had an average annual runoff of 215,000 ac-ft, equivalent to a mean annual flow of 297 cfs, and a median flow of 175 cfs. There are no storage dams or reservoirs on Mill Creek; however, there are several diversion dams, including Ward Dam and Upper Diversion Dam.

Stony Creek flows for about 66 miles draining an approximately 773-square-mile watershed. According to the United States Geological Survey (USGS), the average discharge of the creek is about 400 cfs and ranges from 50 cfs in drought to 1,000 cfs in wet years. The maximum discharge was 39,900 cubic feet per second on February 24, 1957.

The Yuba River drains about 1,339 square miles with a total storage capacity in four dams of over 1 million ac-ft. The monthly mean flow for the gage station in Marysville on the Yuba River is 2,341 cfs. Flows range from 833 cfs during the summer to 4,740 cfs during the winter and spring. If fall flows in the lower Yuba River drop below 600 cfs, spawning habitat becomes limited.

1.2.1.2 Anthropogenic Water Features

There are many anthropogenic water features within the NSV IRWMP area, including water storage reservoirs, hydroelectric plants, and major water conveyance systems such as the Tehama-Colusa Canal and Glenn Colusa Canal system. Since 1944, the flow of the Sacramento River and its tributaries has been managed to a significant degree by the facilities of the Central Valley Project (CVP) and State Water Project (SWP), a system of reservoirs and conveyance facilities that help to deliver river water to users both within and outside the Sacramento River Basin. Flows in the Sacramento River are influenced by the operation of Shasta, Trinity, and Oroville Dams and other local projects, by climatic conditions, by land use, and by water rights and contractual allocations that govern the use of surface water and influence groundwater use.

Major CVP facilities Shasta Dam and Trinity Dam are immediately upstream of the NSV IRWMP region northern boundary. The largest SWP facility, Oroville Dam and reservoir, are located in Butte County on the east side of the NSV IRWMP planning area.

1.2.2 Major Water Related Infrastructure

Major water related infrastructure is shown on Figure 1-3 (located at the end of Chapter 1) and includes dams and reservoirs, hydroelectric power plants, and conveyance canals. Much of the infrastructure serves multiple purposes including water supply, flood control, hydroelectric power generation, and silt control. The major lakes and reservoirs, in the IRWMP planning area are listed in Table 1-1 and discussed below along with a discussion of the major conveyance canals.

Table 1-1. Major Lakes and Reservoirs

Name of Lake or Reservoir	Purpose		
	Water Supply/Storage	Hydro Power	Silt Control
Black Butte Reservoir[(a)]	Y	Y	Y
East Park Reservoir	Y	—	Y
Lake Oroville	Y	Y	Y
Lake Wyandotte	Y	—	Y
Whiskeytown Lake	Y	Y	Y
Paradise Reservoir	Y	—	Y
Stony Gorge Reservoir	Y	Y	Y
Thermalito Reservoir	Y	Y	Y
Spring Creek Reservoir[(b)]	—	—	—
Keswick Reservoir[(c)]	—	Y	Y

[(a)] Black Butte Reservoir is also used for Flood Control.
[(b)] Water treatment impoundment for Iron Mountain Mine runoff.
[(c)] Provides flow moderation.

The largest reservoirs of the CVP and SWP systems are discussed below.

1.2.2.1 Dams and Reservoirs

The major water storage reservoirs in the CVP and SWP are Shasta Lake, Trinity Lake, Lake Oroville, and Whiskeytown Lake.

Shasta Dam impounds the Sacramento River to form Shasta Lake, the largest reservoir in the CVP system at a capacity of 4.5 million ac-ft. Though not in the planning area, it provides primary control over Sacramento River Flow.

Trinity Dam impounds the Trinity River to form Trinity Lake, which is the second largest reservoir in the CVP system at 2 million ac-ft. The Trinity River is not naturally a tributary to the Sacramento River, nor is it in the NSV IRWMP planning area. However, water released from Trinity Lake is diverted at Lewiston Dam on the Trinity River into Clear Creek Tunnel that discharges into Clear Creek. Clair A. Hill Dam impounds Clear Creek to form Whiskeytown Lake. Clear Creek is a tributary of the Sacramento River. Thus a portion of the flow from the Trinity River is diverted into the Sacramento River system.

Oroville Dam impounds the Feather River at Oroville to form Lake Oroville, the largest reservoir in the SWP system at 3.5 million ac-ft.

Spring Creek Dam impounds Spring Creek and South Fork Spring Creek to form Spring Creek Reservoir. The U.S. Bureau of Reclamation constructed this impoundment to capture acid mine drainage from Iron Mountain Mine. Dam releases are treated and released to flow into the Sacramento River.

Keswick Dam impounds the Sacramento River to form the 23,800 ac-ft Keswick Reservoir. The purpose of this CVP dam is to regulate peaking power releases from Shasta Dam.

There are numerous smaller reservoirs in the NSV IRWM Region, including Black Butte, Stony Gorge, and East Park Reservoirs.

1.2.2.2 Conveyance Canals

The two major water conveyance systems are the Tehama-Colusa Canal and the Glenn Colusa Canal system. These canals, and several smaller canal systems, are shown on Figure 1-3 (located at the end of Chapter 1).

The Tehama Colusa Canal (TCC) is located on the west side of the Sacramento Valley and originates at the Red Bluff Diversion Dam. The TCC is operated by the Tehama Colusa Canal Authority (TCCA), located in Red Bluff. Paraphrasing from the TCCA website, the TCCA is a Joint Powers Authority comprised of 17 CVP water contractors. The service area spans four counties (Tehama, Glenn, Colusa, and Yolo) along the west side of the Sacramento Valley, providing irrigation water to farmers growing a variety of permanent and annual crops. TCCA operates and maintains the 140 mile Tehama-Colusa and Corning canals irrigation water supply system. The service area is approximately 150,000 acres, producing over $250 million in crops per year, and contributing $1 billion to the regional economy annually.

The Glenn Colusa Canal system is located between the TCC and the Sacramento River and originates at its main pump station on the Sacramento River northwest of Hamilton City. The Glenn Colusa Canal is operated by the Glenn Colusa Irrigation District (GCID), located in Willows. Paraphrasing from the GCID website, GCID is the largest district in the Sacramento Valley. The district boundaries cover approximately 175,000 acres; of which 153,000 acres are deeded property and 138,800 are irrigable. There are 1,076 landowners in the district and an additional 300 tenant water users. An additional 5,000 acres of private habitat land and winter water supplied by GCID to thousands of acres of rice land provide valuable habitat for migrating waterfowl during the winter months. GCID's 65-mile long Main Canal conveys water into a complex system of nearly 1,000 miles of canals, laterals and drains, much of it constructed in the early 1900s.

There are several other, smaller canal systems on both sides of the Sacramento River. These canal systems are also shown on Figure 1-3 (located at the end of Chapter 1).

1.2.3 Flood Management Infrastructure

Flood control structures mainly consist of levees along the major rivers and tributaries, weirs and bypass channels. The major flood control infrastructure is shown on Figure 1-4 (located at the end of Chapter 1).

The Sacramento River Flood Control Project (SRFCP) was developed in the early 1900's to control flooding along the Sacramento River. According to the DWR Division of Flood Management Fact Sheet, there are ten overflow structures in the SRFCP (six weirs, three flood relief structures, and an emergency overflow roadway) that serve as pressure relief valves in a water supply system. Weirs are defined as lowered sections of levees that allow flood flows in excess of the downstream channel capacity to escape into a bypass channel or basin.

Of the six SRFCP weirs, three are located within the NSV IRWM planning area; the Moulton Weir (completed in 1932), the Colusa Weir and Bypass (completed in 1933), and the Tisdale Weir (completed in 1932). The Fremont Weir (completed in 1924) is located on the south levee of the Sacramento River, south of the IRWM region. The two remaining weirs, the Sacramento Weir, and the Cache Creek Weir, are outside of the IRWM Planning area, but also appear on Figure 1-4 (located at the end of Chapter 1).

All overflow structures except the Sacramento Weir pass floodwaters by gravity once the river reaches the overflow water surface elevation. The Sacramento Weir has gates on top of the overflow section that hold back floodwaters until opened manually by the DWR Division of Flood Management.

Four other relief structures are concentrated along 18 river miles between Big Chico Creek (River Mile 194) and the upstream end of the east bank levee of the SRFCP (near River Mile 176). These structures function like weirs but are not called weirs because they do not have unique structural characteristics. All of these relief structures convey water into the Butte Basin (a natural trough east of the river) upstream of the levee system designed to guide the flood waters.

1.2.4 Major Land Use Divisions

Major land use divisions are shown on Figure 1-5 (located at the end of Chapter 1) and summarized in Table 1-2.

Table 1-2. Major Land Use Divisions

Land Use Type	Approximate Area, square miles	Approximate Area, acres
Agriculture[(a)]	1,382	884,000
Barren/Other	43	28,000
Conifer Forest	1,978	1,266,000
Hardwood Forest	2,161	1,383,000
Herbaceous (Annual Grassland)	1,817	1,163,000
Rice	764	489,000
Shrub	985	631,000
Urban	207	132,000
Water	104	66,000
Total	9,441	6,042,000

(a) Not including Land Use Types identified as rice.

As shown on Figure 1-5 (located at the end of Chapter 1), and listed in Table 1-2, the majority of the IRWM planning area (approximately 63 percent) is either forest or grassland with the second largest division being the various agricultural land use types.

A short description of each major land use division, based on descriptions in the Butte County General Plan Environmental Impact Report (EIR) and the USGS National Land Cover Data (NLCD) 92 Land Cover Class Definitions is provided below.

1.2.4.1 Agriculture and Rice

The vast, flat floodplain of the Sacramento River is one of the best agricultural areas in the world. Within the valley, agriculture is the largest land use, with the majority of farmland aggregated in the flat, rural areas of the region. The farming environment in Sacramento Valley is rich with high quality soils that, together with the temperate Mediterranean climate, support a variety of crops, including fruits and nuts, field, seed and vegetable crops. Other agricultural goods, such as livestock, apiary, nursery plants and timber, are also produced. The five most land-intensive crops in the region are rice, almonds, olives, peaches, and English walnuts.

1.2.4.2 Barren/Other

Barren/Other areas are characterized by bare rock, gravel, sand, silt, clay, or other earthen material, with little or no "green" vegetation present regardless of its inherent ability to support life. Vegetation, if present, is more widely spaced and scrubby than that in the "green" vegetated categories; lichen cover may be extensive.

1.2.4.3 Conifer Forests

Conifer forest types are dominated by conifers but vary in the dominant species and elevations at which they occur. The conifer forest types in the NSV IRWMP area include:

- Montane hardwood-conifer forests at elevations below 4,000 feet. This forest type generally has little understory except in areas of disturbance.
- Ponderosa pine forests generally occur at elevations below 7,000 feet. Stands also may include a shrub and herbaceous layer.
- Sierran mixed conifer forests occur in areas of greater precipitation than ponderosa pine forest. Many species of shrubs, grasses, and forbs occur in the understory of this forest type.
- Red fir forests occur between 6,000 and 9,000 feet in elevation and are generally dominated by red fir with few other species and little understory because of the dense shade and thick layer of dropped needles on the ground.
- Subalpine conifer forests occur at the highest elevations. The understory is usually sparse, consisting of shrubs, grasses, and annuals.

1.2.4.4 Hardwood Forests

Hardwood forests, mostly oak woodlands and riparian forests, are scattered throughout the region but are concentrated in the transition area between the lower valley and higher elevations of the region and along most of the drainages in the study area. Oak woodland community types are described as follows:

- Valley oak woodland can vary from savannas of annual grasslands with few trees to dense stands of trees. Annual grasses and forbs dominate the herbaceous layer.
- Blue oak woodland occurs in the Sierra Nevada, Cascade, and coast range foothills of the region and is dominated by blue oak, with interior live oak and valley oak as associates. The understory of blue oak woodland is often mostly annual grasses with low densities of several shrub species forming clumps in this landscape. Dominant shrub species include poison oak (*Rhus diversiloba*), ceanothus (*Ceanothus sp.*), redberry (*Rhamnus crocea*), California coffeeberry (*Rhamnus californica*), and California buckeye (*Aesculus californica*).
- Blue oak–foothill pine is co-dominated by foothill pines (*Pinus sabiniana*) and blue oaks and occurs at slightly higher elevations than blue oak woodland. The understory of blue oak–foothill pinewoodlands often contains shrub species, including manzanita (*Arctostaphylos sp.*), ceanothus, redberry, California coffeeberry, poison oak, toyon (*Heteromeles arbutifola*), and California buckeye, interspersed with smaller areas of annual grassland than is typical in the lower elevation blue oak woodland.
- Riparian woodlands are typically dominated by a mixture of trees and shrubs, including Fremont cottonwood (*Populus fremontii*), valley oak (*Quercus lobata*), Oregon ash (*Fraxinus latifolia*), Himalayan blackberry (*Rubus spp.*), and a variety of willows (*Salix spp.*).

1.2.4.5 Herbaceous (Annual Grassland)

Annual grasslands occur throughout the NSV IRWMP region and are typically used as non-irrigated, seasonal grazing pastures for livestock. Annual grasslands encompass vernal pool terrains and also form the understory for oak woodland and occur as vacant parcels in developed areas. Annual grasslands are dominated by nonnative annual grasses with intermixed annual and perennial forbs.

1.2.4.6 Shrub

Areas characterized by natural or semi-natural woody vegetation with aerial stems, generally less than 6 meters tall, with individuals or clumps not touching to interlocking. Both evergreen and deciduous species of true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions are included.

1.2.4.7 Urban

Areas characterized by a high percentage (30 percent or greater) of constructed materials (*e.g.* asphalt, concrete, buildings, *etc*.).

1.2.4.8 Water

Areas of open water or permanent ice/snow cover.

1.2.5 Water Resources

To document the water resources available to the NSV IRWM region, a conceptual, water balance model was developed as an illustrative example of how surface water, precipitation, and groundwater inflows and outflows from the region. This illustrative water balance, based on WY 2010 data, is discussed below, followed by a description of the status of groundwater monitoring in the NSV IRWM region and other available water resources such as recycled water.

1.2.5.1 Surface Waters

When considering surface water resources in the NSV region, stream flows into the region and stream flows out of the region must be considered along with precipitation within the area. It is important to note, however, that much of our surface water resources originate in the forested areas in the upper watershed. Although sparsely populated, these areas make up 63 percent of the NSV region and play a key role in maintaining a healthy water supply.

Streamflow measurements for regional inflow and outflow points for WY 2010 were obtained from the California Data Exchange Center (CDEC) maintained by the DWR. The sites measuring surface stream inflows to and outflows from the valley floor on major rivers and creeks are shown on Figure 1-6 (located at the end of Chapter 1) and listed in Tables 1-3 and 1-4. Many of these are USGS streamflow gages.

Table 1-3. Surface Inflow Sites and Total Volumes for WY2010		
ID	Station	Total Volume, ac-ft
KES	Keswick Reservoir	4,781,929
FTO	Feather River at Oroville	1,775,558
TFR	Thermalito Forebay	1,159,240
MRY	Yuba River Near Marysville	1,011,911
COT	Cottonwood Creek Near Cottonwood	779,111
COW	Cow Creek Near Millville	507,878
IGO	Clear Creek at Igo	393,800
BAT	Battle Creek Below Coleman Fish Hatchery	330,563
THO	Thomes Creek at Paskenta	269,923
MLM	Mill Creek Near Los Molinos	260,805
BCK	Butte Creek Near Chico	209,745
DCV	Deer Creek Near Vina	208,191
BLB	Black Butte	208,162
BIC	Big Chico Creek Near Chico	96,010
BRW	Bear River Near Wheatland	88,658
ECP	Elder Creek Near Paskenta	67,217
	Estimate of Ungaged Inflows[(a)]	2,000,000
	Total	14,148,701

[(a)] Ungaged inflows were estimated by the USGS for the Central Valley Hydrologic Model using the USGS Basin Characterization Model.

Table 1-4. Surface Outflow Sites and Total Volumes for WY2010		
ID	Station	Total Volume, ac-ft
VON	Sacramento River at Verona	11,559,780
SBP	Sutter Bypass at RD 1500 Pump	911,034
	Total Surface Outflow Volume	12,470,815

Based on the data presented in Tables 1-3 and 1-4, for WY2010, approximately 1.7 million ac-ft of water was consumptively used or recharged to the groundwater basin.

Based on the estimated natural runoff for the Sacramento Valley, WY 2010 was designated as a "Below Normal" water year by DWR[2]. It must be emphasized that surface water supplies must be analyzed over multiple years before conclusions can be drawn with regards to water supply sustainability. DWR has defined five year types for the Sacramento River. Over the past 30 years, 16 years were considered wet or above normal, and 14 years were considered below normal, dry, or critically dry (Table 1-5). Summary statistics of estimated inflows from the sites in Table 1-3 complied by the USGS for Central Valley Hydrologic Model (CVHM) are also provided for each year type. It is interesting to note that a "Normal" year is not defined (even though many analysts try to define a normal year for planning purposes). Total inflows ranged from a low of 7.3 million ac-ft to a high of 36.5 million ac-ft, or approximately five times the lowest annual value, over the 30 year period. Other resources also describe the range of water supply in the Sacramento River[3]. This variability in supply presents a substantial challenge for water managers. Variability in supply is accommodated through various factors including but not limited to reservoir operations and conjunctive management of surface water and groundwater supplies.

Table 1-5. Summary of Surface Inflow Volumes for Water Years 1974-2003

Year Type/ Sacramento River Index		Total Inflows USGS CVHM Model Water Years 1974 – 2003, ac-ft			
		No. Years	Minimum	Average	Maximum
Wet	W	11	18,700,586	26,196,021	36,494,678
Above Normal	AN	5	14,874,016	17,656,116	20,514,478
Below Normal	BN	1	12,174,781	12,174,781	12,174,781
Dry	D	6	11,008,973	12,048,831	13,018,998
Critically Dry	C	7	7,334,635	9,720,390	12,206,400
	Total	30			

1.2.5.1.1 Sacramento River

The Sacramento River is the largest river in California, receiving inflows from several large watersheds. The Upper Sacramento, the McCloud River and the Pitt River are impounded by Shasta Dam to form Shasta Lake. At the point where it enters the Redding Basin at the north end of the NSV Region, the flow in the Sacramento River is controlled through releases from Shasta Dam and through regulation at Keswick Dam, 9 miles downstream. USGS gage 11370555, Sacramento River at Keswick Dam, has been in operation since October 1938.

[2] DWR Sacramento River Index (http://www.water.ca.gov/) is calculated based on a 40-30-30 weighting of runoff that occurs in October-March and April-June, and the previous year's index, respectively.

[3] Meko, D. M. 2001. Reconstructed Sacramento River System Runoff From Tree Rings. Report prepared for the California Department of Water Resources, July 2001.

The Sacramento River receives substantial tributary inflow as it flows south through the Sacramento Valley. These tributaries – listed from north to south – are each briefly described below, along with associated stream gages[4].

1.2.5.1.1.1 Cow Creek

Cow Creek flows from the Sierra Nevada foothills and enters the Sacramento River on the east bank about 23 miles downstream from Shasta Dam and 4 miles east of the Town of Anderson at river mile (RM) 277. USGS flow gage 11374000, Cow Creek near Millville, has been in operation since October 1, 1949 and is located approximately 2.9 miles upstream of the mouth of the creek.

1.2.5.1.1.2 Battle Creek

Battle Creek flows from the Sierra Nevada foothills and enters the Sacramento River on the east bank at RM 269. USGS flow gage 11376550, Battle Creek below Coleman Fish Hatchery, has been in operation at this location since October 1, 1961, except for November and December 1996.

1.2.5.1.1.3 Cottonwood Creek

Cottonwood Creek flows from the Coast Range and enters the Sacramento River on the west bank at approximately RM 272. USGS flow gage 11376000, Cottonwood Creek near Cottonwood, has been in operation at this location since October 1, 1940. The USGS stream gage is located about three river miles upstream of the mouth.

1.2.5.1.1.4 Paynes and Sevenmile Creeks

Paynes Creek and its tributary Sevenmile Creek flow from the Sierra Nevada foothills and enter the Sacramento River on the east bank at RM 250, between the Red Bluff Diversion Dam and Bend Bridge. Flow data for these creeks has not been available since the USGS flow gage was shut down in 1966.

1.2.5.1.1.5 Antelope Creek Group

Antelope Creek flows from the Sierra Nevada foothills and enters the Sacramento River on the east bank at RM 232. No flow gage has been available for this location since 1982. Inflow from this creek has been estimated at the boundary and included as ungaged inflow.

1.2.5.1.1.6 Mill Creek

Mill Creek flows from the Sierra Nevada foothills and enters the Sacramento River on the east bank at RM 228. USGS flow gage 11381500, Mill Creek at Los Molinos, has been in operation since October 1928 approximately 5.5 river miles upstream of the mouth.

[4] Data and information about the stream gauges have been provided if they were available at the time of writing.

1.2.5.1.1.7 Elder Creek

Elder Creek flows from the Coast Range and enters the Sacramento River on the west bank at RM 229. USGS flow gage 11379500, Elder Creek near Paskenta, has been in operation at this location since October 1948.

1.2.5.1.1.8 Thomes Creek

Thomes Creek flows from the Coast Range and enters the Sacramento River on the west bank at approximately RM 225. Since USGS flow gage 11382000, Thomes Creek near Paskenta, discontinued operation in September 1996, measured flow data is not available. Inflow from this creek has been estimated and included as ungaged inflow.

1.2.5.1.1.9 Deer Creek

Deer Creek flows from the Sierra Nevada foothills and enters the Sacramento River on the east bank at RM 218. USGS flow gage 11383500, Deer Creek near Vina, provides flow data for Deer Creek.

1.2.5.1.1.10 Stony Creek

Stony Creek flows from the Coast Range and enters the Sacramento River on the west bank at RM 190. Regulated flows released from East Park Reservoir, completed in 1910, flow into Stony Gorge Dam, completed in 1928, and then into Black Butte Dam, completed in 1963. Inflow data for 2012 is the reported Black Butte reservoir releases (USACOE 1990-2010).

1.2.5.1.1.11 Big Chico Creek

Big Chico Creek flows from the Sierra Nevada foothills and enters the Sacramento River on the east bank at RM 196. USGS flow gage 11384000, Big Chico Creek near Chico, was in operation from October 1930 through September 1986 approximately 14 miles upstream of the mouth. The USGS site was decommissioned and later re-activated and operated by DWR.

1.2.5.1.1.12 Butte and Little Chico Creeks

Butte and Little Chico Creeks flow from the Sierra Nevada foothills on the east side of the Sacramento Valley. Little Chico Creek joins Butte Creek, which flows into Butte Slough, which then flows to the Sutter Bypass. USGS flow gage 11390000, Butte Creek near Chico, has been in operation since October 1930 providing flow data on Butte Creek.

1.2.5.1.2 Feather River

The Feather River flows from the Sierra Nevada on the east side of the Sacramento Valley, and its flows are regulated through controlled releases from Oroville Dam (constructed under the State Water Project and completed in 1968). Several tributary inflows augment the Feather River prior to joining the Sacramento River.

The Feather River flows from the Sierra Nevada and enters the Sacramento River near RM 80. Inflow data represents releases from Oroville Dam and the Thermalito complex. USGS gage 11407000, Feather River at Oroville, has been in operation since October 1901. CDEC includes manually entered monthly volumes for water flowing from Oroville Dam into the Thermalito Forebay. Total inflow is the sum of the flows at USGS gage 11407000 and flow into the Thermalito complex.

Tributaries to the Feather River – listed from north to south – are each briefly described below, along with their measurement and gaging facilities.

1.2.5.1.2.1 Yuba River

The Yuba River flows from the Sierra Nevada on the east side of the Sacramento Valley and enters the Feather River near RM 27. Inflow data represents releases from Englebright Dam after completion, plus flows from the tributaries, Deer Creek and Dry Creek, which enter the Yuba River below Englebright Dam. USGS flow gage 11421000, Yuba River near Marysville, was operated by the USGS until 2003 when the Yuba County Water Agency assumed operations and installed a datalogger.

1.2.5.1.2.2 Bear River

The Bear River flows from the Sierra Nevada Mountains and enters the Feather River near RM 12. Inflow data represents releases from Camp Far West Reservoir after dam completion. USGS flow gage 11424000, Bear River near Wheatland, has been in operation since October 1928 and is jointly operated and maintained by USGS and DWR.

1.2.5.1.3 Sacramento River Outflows

The Sacramento River flows out of the NSV region near Verona. The Sacramento River at Verona gaging station is operated by the USGS and DWR. The station is used to quantify surface outflows from the NSV region. Just upstream of the site, some flow in the Sacramento River can be shunted into the Sutter Bypass under flood conditions. To ensure all outflow from the NSV region is accounted for, the flow at the Sutter Bypass at Road 1500 pump is additionally included as an outflow. This site is operated by DWR.

1.2.5.2 Precipitation

The substantial variability in Sacramento River inflows described previously has its roots in the temporal variability in precipitation within the region. Annual precipitation volumes were estimated for the IRWMP region as a whole and for the valley floor area using the PRISM (Parameter-elevation Regressions on Independent Slopes Model) climate mapping system[5].

[5] http://www.prism.oregonstate.edu/

Based on the PRISM datasets, average annual precipitation over the whole IRWMP region ranged from 20.7 inches to 73.2 inches between 1981 and 2010 (Table 16). Table 1-6, also presents precipitation for the mountain region (IRWMP region, not including the valley floor), and for the valley floor. Substantial spatial variability in precipitation is found throughout the region. Based on average precipitation for the 30-year period, precipitation increases across the region from south to north and also as elevation increases from the valley floor up the slopes of the Sierra Nevada and Coastal mountain ranges (Figure 1-7[6] - located at the end of Chapter 1). In general, given that the portion of the Coastal Range in the IRWMP region is on the leeward side of the mountains, precipitation is less than for the Sierra Nevada mountain area.

As indicated in Table 1-6, precipitation in the valley floor area ranged from 13.0 inches to 47.8 inches between 1981 and 2010. As described above, precipitation is generally less on the valley floor than in mountain areas, and increases across the region from south to north. The valley floor area received a total of 5.4 million ac-ft of precipitation in the 2010 water year. The spatial variability of precipitation on the valley floor for WY2010 is shown on Figure 1-8[7] (located at the end of Chapter 1).

1.2.5.3 Groundwater

The water resources of the Sacramento Valley are substantially supplemented by groundwater. In addition, there are numerous, smaller groundwater basins in the IRWM region that are being used by local residents and irrigators, and available groundwater quality and quantity data from these smaller groundwater basins may be limited. The focus of this section of the region description is to provide a general description of groundwater conditions over the NSV region as a whole. This discussion focuses on the two main groundwater basins. The two main groundwater basins are the Sacramento Valley Groundwater Basin and the Redding Groundwater Basin. The Sacramento Valley Groundwater Basin contains 12 subbasins that underlie approximately 4,200 square miles within the valley floor area (Figure 1-9 - located at the end of Chapter 1). The Redding Area Groundwater Basin contains six subbasins covering 600 square miles within the valley floor area. Tables 1-7 through 1-11 summarize the available information for the 18 subbasins.

The IRWMP region includes six counties in the NSV Valley: Shasta, Tehama, Glenn, Butte, Colusa and Sutter. Many of the underlying groundwater subbasins extend across boundaries of multiple counties and, in some cases, extend into counties that are not included in the IRWMP region. For these instances, no attempt has been made to divide the descriptive data associated with the subbasins by county. Table 1-7 provides a listing of the 18 groundwater subbasins, the counties they underlie, and the associated surface area.

[6] PRISM annual precipitation shown on the figure has been resampled to 250 meter resolution from 800 m resolution using bilinear interpolation for purposes of display.

[7] PRISM annual precipitation shown on the figure has been resampled to 250 meter resolution from 4 km resolution using bilinear interpolation for purposes of display.

Table 1-6. Summary of PRISM Annual Precipitation for the IRWMP Region, Mountain Area, and Valley Floor, 1981 to 2010

Year	SRI Year Type[a]	Annual Precipitation, inches			Annual Precipitation, million ac-ft		
		IRWMP Region	Mountain Area	Valley Floor Area	IRWMP Region	Mountain Area	Valley Floor Area
1981	D	47.9	61.2	29.9	24.2	17.7	6.5
1982	W	45.0	56.7	29.3	22.7	16.4	6.3
1983	W	73.2	92.3	47.8	37.0	26.7	10.3
1984	W	27.5	35.6	16.9	13.9	10.3	3.6
1985	D	21.6	27.3	14.0	10.9	7.9	3.0
1986	W	38.9	49.4	24.6	19.6	14.3	5.3
1987	D	32.4	41.5	20.5	16.4	12.0	4.4
1988	C	27.6	35.3	17.6	14.0	10.2	3.8
1989	D	27.4	35.6	16.7	13.9	10.3	3.6
1990	C	22.3	28.3	14.3	11.3	8.2	3.1
1991	C	28.4	35.3	18.9	14.3	10.2	4.1
1992	C	36.1	45.3	24.2	18.3	13.1	5.2
1993	AN	43.3	53.9	29.2	21.9	15.6	6.3
1994	C	27.7	34.2	19.1	14.0	9.9	4.1
1995	W	60.9	77.1	39.1	30.8	22.3	8.5
1996	W	50.0	65.7	29.0	25.3	19.0	6.3
1997	W	34.5	43.6	22.5	17.5	12.6	4.9
1998	W	62.1	76.4	42.9	31.4	22.1	9.3
1999	W	27.4	36.6	15.2	13.9	10.6	3.3
2000	AN	36.7	45.6	24.6	18.5	13.2	5.3
2001	D	40.1	49.1	28.1	20.3	14.2	6.1
2002	D	33.2	42.5	20.6	16.8	12.3	4.5
2003	AN	37.9	46.7	25.9	19.1	13.5	5.6
2004	BN	33.9	41.1	23.9	17.1	11.9	5.2
2005	AN	45.5	57.0	29.9	23.0	16.5	6.5
2006	W	38.4	49.1	24.2	19.4	14.2	5.2
2007	D	20.7	26.6	13.0	10.5	7.7	2.8
2008	C	24.5	30.4	16.6	12.4	8.8	3.6
2009	D	28.2	35.3	18.5	14.2	10.2	4.0
2010	BN	45.2	56.7	29.7	22.8	16.4	6.4
	Minimum	20.7	26.6	13.0	10.5	7.7	2.8
	Maximum	73.2	92.3	47.8	37.0	26.7	10.3
	Average	37.3	47.1	24.2	18.8	13.6	5.2
	Wet Year Average	45.8	58.3	29.1	23.2	16.9	6.3
	Above Normal Year Average	40.8	50.8	27.4	20.6	14.7	5.9
	Below Normal Year Average	39.5	48.9	26.8	20.0	14.2	5.8
	Dry Year Average	31.4	39.9	20.2	15.9	11.5	4.4
	Critically Dry Year Average	27.8	34.8	18.5	14.1	10.1	4.0

[a] SRI denotes Sacramento River Index. Note that the SRI is based on a water year (Oct. - Sept.), whereas the PRISM precipitation totals are reported on a calendar year basis.

Table 1-7. Inventory of Subbasins and Corresponding Surface Areas within the Sacramento Valley and Redding Groundwater Basins (DWR Bulletin 118, 2003)

Subbasin Name	Subbasin Number	County	Surface Area	
			Acres	Square Miles
Redding Area Groundwater Basin				
Bowman	5-6.01	Tehama	85,330	133
Rosewood	5-6.02	Tehama	45,230	71
Anderson	5-6.03	Shasta	98,500	154
Enterprise	5-6.04	Shasta	60,900	95
Millville	5-6.05	Shasta	67,900	106
South Battle Creek	5-6.06	Tehama	32,300	50
Sacramento Valley Groundwater Basin				
Red Bluff	5-21.50	Tehama	266,750	416
Corning	5-21.51	Tehama, Glenn	205,640	321
Colusa	5-21.52	Colusa, Glenn, Tehama, Yolo[a]	918,380	1,434
Bend	5-21.53	Tehama	20,770	32
Antelope	5-21.54	Tehama	18,710	29
Dye Creek	5-21.55	Tehama	27,730	43
Los Molinos	5-21.56	Tehama, Butte	33,170	52
Vina	5-21.57	Tehama, Butte	125,640	195
West Butte	5-21.58	Butte, Glenn, Colusa	181,560	284
East Butte	5-21.59	Butte, Sutter	265,390	415
Sutter	5-21.62	Sutter	234,400	366
North American	5-21.64	Sutter, Placer[a], Sacramento[a]	351,000	548
		Totals	3,039,300	4,744

[a] These counties are not within the IRWMP boundary.

Groundwater levels have remained relatively steady within the basin; however, subbasins with heavy groundwater pumpage for agricultural, potable and industrial uses (North American, West Butte, Vina) have shown generally decreasing trends in water levels over time. (Table 1-8). Typically, areas with plentiful surface water rely less on groundwater than those areas with limited or unpredictable surface water.

Table 1-8. Groundwater Level Trends and Storage Capacity for Subbasins within the Sacramento Valley and Redding Groundwater Basins (DWR Bulletin 118, 2003)

Subbasin Name	Subbasin Number	County	Groundwater Level Trends	Groundwater Storage	
				Specific Yield[(a)], %	Storage Capacity, ac-ft
Redding Area Groundwater Basin					
Bowman	5-6.01	Tehama	Seasonal flux of 5 feet for normal and dry years	No published info available	No published info available
Rosewood	5-6.02	Tehama	Seasonal flux of 5-10 feet for normal and dry years	No published info available	No published info available
Anderson	5-6.03	Shasta	Seasonal flux of 1-10 feet for normal and dry years	No published info available	No published info available
Enterprise	5-6.04	Shasta	Seasonal flux of 5-15 feet for normal and dry years	No published info available	No published info available
Millville	5-6.05	Shasta	Seasonal flux of 2-8 feet for normal and dry years	No published info available	No published info available
South Battle Creek	5-6.06	Tehama	None	No published info available	No published info available
Sacramento Valley Groundwater Basin					
Red Bluff	5-21.50	Tehama	None	7.9	4,208,851
Corning	5-21.51	Tehama, Glenn	None	6.7	2,752,950
Colusa	5-21.52	Colusa, Glenn, Tehama, Yolo[(b)]	None	7.1	13,025,887
Bend	5-21.53	Tehama	No GW level monitoring is conducted	No published info available	No published info available
Antelope	5-21.54	Tehama	None	7.2	269,179
Dye Creek	5-21.55	Tehama	None	6	331,620
Los Molinos	5-21.56	Tehama, Butte	None	6	397,740
Vina	5-21.57	Tehama, Butte	10-15 ft decline since 1950s	5.9	1,468,239
West Butte	5-21.58	Butte, Glenn, Colusa	10-15 ft decline since 1950s	7.7	2,794,330
East Butte	5-21.59	Butte, Sutter	Variable	5.9	3,128,959
Sutter	5-21.62	Sutter	None		5,000,000
North American	5-21.64	Sutter, Placer[(b)], Sacramento[(b)]	Decreasing	7	4,900,000

[(a)] Specific yield is the ratio of the volume of water a rock or soil will yield by gravity drainage to the total volume of the rock or soil (DWR, 2003).

[(b)] These counties are not within the IRWMP boundary.

A groundwater budget, prepared as part of DWR Bulletin 118 (Table 1-9) and provided here as background information, provides groundwater extraction data for agricultural, municipal, industrial and environmental uses based on surveys conducted by DWR. On average, groundwater accounts for approximately 31 percent of total water use within the region (DWR, 2003). A portion of this extracted groundwater (typically between 15 percent to 25 percent) eventually ends up recharging the groundwater basin through the deep percolation of this applied water. Groundwater is also typically recharged through rainfall and stream flow. The amount of recharge varies from subbasin to subbasin depending on subbasin conditions.

Table 1-9. Groundwater Extraction Summary for Municipal, Industrial, Environmental and Agricultural Uses, by Subbasin (DWR Bulletin 118, 2003)

Subbasin Name	Subbasin Number	County	Groundwater Budget, ac-ft			
			Extraction for Agricultural Use	Extraction for Municipal & Industrial Uses	Extraction for Environmental Wetland	Deep Percolation of Applied Water
Redding Area Groundwater Basin						
Bowman	5-6.01	Tehama	350	9	N/A	1,500
Rosewood	5-6.02	Tehama	680	990	N/A	1,200
Anderson	5-6.03	Shasta	3,000	20,000	N/A	5,700
Enterprise	5-6.04	Shasta	4,449	4,127	N/A	3,788
Millville	5-6.05	Shasta	250	1,273	N/A	912
South Battle Creek	5-6.06	Tehama	1,300	310	N/A	860
Sacramento Valley Groundwater Basin						
Red Bluff	5-21.50	Tehama	81,000	8,900	N/A	20,000
Corning	5-21.51	Tehama, Glenn	152,000	6,600	N/A	54,000
Colusa	5-21.52	Colusa, Glenn, Tehama, Yolo[a]	310,000	14,000	22,000	64,000
Bend	5-21.53	Tehama	220	120	N/A	340
Antelope	5-21.54	Tehama	17,000	2,100	N/A	3,800
Dye Creek	5-21.55	Tehama	9,300	680	N/A	3,200
Los Molinos	5-21.56	Tehama, Butte	5,900	1,000	N/A	3,000
Vina	5-21.57	Tehama, Butte	130,000	20,000	N/A	30,000
West Butte	5-21.58	Butte, Glenn, Colusa	161,000	10,000	4,600	64,000
East Butte	5-21.59	Butte, Sutter	104,000	75,500	1,300	126,000
Sutter	5-21.62	Sutter	171,400	3,900	N/A	22,100
North American	5-21.64	Sutter, Placer[a], Sacramento[a]	289,100	109,900	N/A	29,800
		Totals	1,440,949	279,409	27,900	434,200

[a] These counties are not within the IRWMP boundary

Irrigation wells in the northern portion of the region (Redding Area) range in depth from 32 to 700 feet and average 270 feet, while wells in the Sacramento Valley Groundwater Basin range from 22 to 1,340 feet and average 265 feet (Table 1-10).

Table 1-10. Groundwater Well Characteristics by Subbasin (DWR Bulletin 118, 2003)

Subbasin Name	Subbasin Number	County	Well Characteristics					
			Domestic Wells			Municipal/Irrigation Wells		
			Depth Range, ft	Average Depth, ft	No. of Well Completion Reports	Depth Range, ft	Average Depth, ft	No. of Well Completion Reports
Redding Area Groundwater Basin								
Bowman	5-6.01	Tehama	60-700	257	804	112-600	312	27
Rosewood	5-6.02	Tehama	48-398	181	447	65-565	311	15
Anderson	5-6.03	Shasta	11-805	140	2,239	32-558	302	48
Enterprise	5-6.04	Shasta	18-713	139	1970	32-460	180	65
Millville	5-6.05	Shasta	40-650	156	487	50-700	265	8
South Battle Creek	5-6.06	Tehama	80-884	189	18	170-270	227	5
Sacramento Valley Groundwater Basin								
Red Bluff	5-21.50	Tehama	20-780	197	3,293	22-465	207	18
Corning	5-21.51	Tehama, Glenn	24-633	135	1,667	27-780	246	822
Colusa	5-21.52	Colusa, Glenn, Tehama, Yolo[(a)]	11-870	155	2,599	20-1340	368	1,515
Bend	5-21.53	Tehama	20-388	149	102	89-220	144	4
Antelope	5-21.54	Tehama	40-450	104	702	40-600	176	92
Dye Creek	5-21.55	Tehama	19-220	94	432	55-597	188	56
Los Molinos	5-21.56	Tehama, Butte	31-340	92	311	27-740	327	42
Vina	5-21.57	Tehama, Butte	14-754	139	2,215	36-1000	330	715
West Butte	5-21.58	Butte, Glenn, Colusa	15-680	136	1,469	40-920	321	1,038
East Butte	5-21.59	Butte, Sutter	25-639	101	1,477	35-983	285	699
Sutter	5-21.62	Sutter	35-320	121	496	60-672	205	131
North American	5-21.64	Sutter, Placer[(a)], Sacramento[(a)]	50-1750	190	665	77-1025	396	105

[(a)] These counties are not within the IRWMP boundary.

DWR well installation logs from 1977-2010 report approximately 27,994 domestic, 467 municipal, 169 industrial wells and 3,862 irrigation wells within the six-county IRWMP region. On average, from 2005-2009, these wells were estimated to extract 1,565,000 ac-ft of groundwater annually. Of this volume, approximately 1.4 million ac-ft (90 percent) was extracted for agricultural use, 136,000 ac-ft (9 percent) was extracted for municipal and domestic uses and 19,000 ac-ft (1%) was extracted for managed wetlands (Table 1-11). No water was extracted for wetland management in Shasta, Tehama or Sutter Counties during the time period. Due to the DWR Bulletin 118 estimate for the underling subbasins including areas within some basins but outside of the six counties, the estimate in Table 1-11 cannot be directly compared to the previously reported estimate from DWR Bulletin 118.

Table 1-11. Groundwater Extraction Summary for Municipal, Industrial, Wetland and Agricultural Uses, by County

County	Number of Wells		Average Total Groundwater Pumped, TAF, 2005-2009	GW Pumped for Agricultural Use, TAF	GW Pumped for M&I Use, TAF	GW Pumped for Managed Wetlands, TAF
	Irrigation	Urban Use				
Shasta	145	7,609	65	25	40	-
Tehama	614	7,987	259	238	21	-
Glenn	845	1,822	296	284	9	3
Colusa	425	876	248	233	7	7
Butte	1,170	8,834	445	387	49	9
Sutter	663	1,466	252	242	10	-
Totals	3,862	28,594	1,565	1,409	136	19

Source: McManus, D., DWR. 2013. Conjunctive Use: Let's Have a Frank Discussion. Northern Sacramento Valley Groundwater Conditions and Conjunctive Management Opportunities. Presentation, Feb 22, 2013

TAF = Thousand Ac-ft.

1.2.5.3.1 Groundwater Monitoring Programs

For several decades, groundwater levels and quality, and surface water quality have been monitored throughout the Sacramento Valley, primarily by the DWR, U.S. Geological Survey, the California Department of Health Services (now the California Department of Public Health), and local municipalities and/or water purveyors.

Several agencies including counties and cities, the U.S. Geological Survey, the DWR, water purveyors and districts, watershed groups, and others have all been involved in monitoring different parameters of water quality and quantity. Some of these monitoring efforts have been ongoing for many years, and others have been initiated only recently. The status of monitoring in the region is constantly changing as new programs evolve and monitoring wells are drilled, constructed, upgraded, or abandoned. The following provides a brief summary of the status of groundwater monitoring for each county in the NSV IRWMP region.

The website for the DWR groundwater level monitoring data, which applies throughout the NSV IRWMP planning area, can be found at: http://www.water.ca.gov/groundwater/data_and_monitoring/northern_region/GroundwaterLevel/gw_level_monitoring.cfm

The passage of SBx7-6 in 2009 added the requirement that all basins have groundwater elevation monitoring. The law was modified so that some very remote basins, or those without wells, could be periodically evaluated. This information is available at the DWR's CASGEM website at http://www.water.ca.gov/groundwater/casgem/. While this information represents a small fraction of the groundwater available in the planning area, it is a resource that the State compels locals to be interested in.

1.2.5.3.1.1 Butte County

There are presently 164 groundwater monitoring wells in Butte County (Butte County Water Commission, 2005). Groundwater level monitoring in the Sacramento Valley portion of Butte County is conducted by a number of different private and public agencies, although historically, DWR has maintained the most comprehensive, long-term groundwater level monitoring grid. Since 1997, Butte County and DWR have coordinated water level monitoring efforts. Approximately 29 wells are equipped to continuously monitor and record changes in groundwater level, and approximately 60 municipal wells are monitored monthly for level changes in the City of Chico. Butte County is currently developing a basin management objective (BMO) that has a total of approximately 50 monitoring sites. The objective of this program is to perform periodic monitoring of groundwater levels to detect any impacts to groundwater resources due to climatic conditions and/or groundwater use in the area. If impacts are detected, a technical advisory committee analyzes the available data and evaluates whether potential remedial actions are warranted. The county also encourages agricultural irrigation districts supplied by surface water to be involved in the groundwater monitoring program.

1.2.5.3.1.2 Colusa County

The DWR routinely monitors domestic and agricultural wells for groundwater levels and, at a lesser frequency, water quality. Water quality samples are analyzed primarily for naturally occurring heavy metals. The California Department of Public Health also periodically monitors wells for water quality. Additionally, the State Water Board and U.S. Geological Survey have historically done water quality surveys in the county. The DWR water level and quality data are available online at the website provided above. As of 2011, Colusa County had 60 groundwater monitoring stations monitored at least semiannually.

1.2.5.3.1.3 Glenn County

In 2011, 136 groundwater monitoring wells were used to measure groundwater levels across Glenn County. The DWR also conducts short-term specialty groundwater quality studies. Data and reports are available from DWR's regional and field offices. The county monitors a standard network of monitoring wells regularly as part of their BMO program. The objective of this program is to perform periodic groundwater level monitoring to detect any impacts to groundwater resources due to climatic conditions and/or groundwater use in the area. If impacts are detected, a technical advisory committee analyzes the available data and evaluates whether

potential remedial actions are warranted. The results of the BMO program are available on the Glenn County Web site (http://www.glenncountywater.org).

1.2.5.3.1.4 Shasta County

As of 2011, there were 37 active DWR groundwater monitoring stations in the Redding Basin. Since that time, at least 13 additional monitoring wells have been installed in the Anderson-Cottonwood Irrigation District service area, which are monitored by the DWR.

In May 2007, Shasta County adopted a Coordinated AB 3030 Groundwater Management Plan for the Redding Groundwater Basin. In June 2007 Shasta County approved the Redding Basin Water Resources Management Plan to help ensure water supply reliability in the Redding Basin during a drought. Both reports can be found on the Agency's webpage (http://www.co.shasta.ca.us/index/pw_index/engineering/water_agency.aspx).

Shasta County also collects and monitors elevation in Basin 5-50, the North Fork Battle Creek Basin (http://www.water.ca.gov/groundwater/casgem/).

1.2.5.3.1.5 Sutter County

In Sutter County, DWR and other local agencies monitor domestic and agricultural wells for groundwater levels and water quality, primarily naturally occurring heavy metals. The DWR Water Data Library (http://www.water.ca.gov/waterdatalibrary/) currently includes 183 groundwater monitoring stations within portions of the Sutter, North American, and East Butte Groundwater Subbasins located within Sutter County. In the spring of 2004, a total of 99 wells were measured for groundwater levels. Groundwater quality data are available from the DWR Water Data Library for 40 wells within the county with observations between 1998 and 2006. Sutter Extension Water District recently installed nine monitoring wells (three triple-completion wells) as part of their conjunctive use program, and the monitored data from these wells will be provided to the DWR Water Data Library. The California Department of Public Health and their cooperating agencies monitor additional selected wells for drinking water quality.

1.2.5.3.1.6 Tehama County

As of 2011, Tehama County had 115 groundwater monitoring stations, 102 of which are located in the Sacramento Valley Groundwater Basin and 13 of which are located in the Redding Groundwater Basin. To date, the County Flood Control and Water Conservation District (FCWCD) has installed three 1,000-foot-deep multi-completion groundwater monitoring wells in three known areas where depressed groundwater levels have been observed. The FCWCD has secured funding to instrument several existing DWR multiple-completion monitoring wells with pressure transducers and dataloggers to provide real-time water level data. Grant funds will also be used to install additional monitoring wells in areas slated for large-scale residential developments. Hourly groundwater level data, including hydrographs, are available at the Tehama County FCWCD Web site (http://www.tehamacountywater.ca.gov).

1.2.5.4 Recycled Water

As indicated in the water supply and demand sections of this chapter, water supplies and demands are close to being within balance, without much additional capacity available for future growth. One way to balance future water supply needs with the water supply availability would be to expand current recycled water use. The beneficial use of recycled water is very common in Southern California, but its potential has yet to be optimized in Northern California. Recycled water could provide a relatively drought-free water supply to improve the region's water supply portfolio and allow for continued economic growth in the region.

The benefits of water recycling have been evaluated extensively by DWR's Recycled Water Task Force. The task force report, *Water Recycling 2030: Recommendations of California's Recycled Water Task Force* (2003b) identified the potential for 1.5 million af/yr of recycled water statewide. Limited recycling of domestic wastewater for non-potable landscape and irrigation use is currently practiced in the Sacramento Valley, but the potential exists for the development of up to 80,000 af/yr of recycled water from domestic wastewater effluent by the year 2020.

Water recycling strategies are generally implemented at the local level but can have regional and statewide benefits by reducing surface water diversions and making that water available for other urban, agricultural, and environmental uses. Water recycling allows a local agency to reduce the costs of developing, treating, storing, and distributing additional potable supplies. Recycling can also reduce pollutant loads in receiving waters, aid in meeting TMDL requirements, and reduce treatment costs and concerns for downstream water purveyors.

Recognizing their common interests as urban water users and wastewater dischargers, the City of Yuba City, the City of Marysville, and Linda County Water District (the City of Marysville and Linda County Water District are outside of the NSV IRWMP planning area) entered into an MOU in December 2005, to jointly prepare a Regional Recycled Water Master Plan. The goals of the *Yuba-Sutter Regional Recycled Water Master Plan* are to develop a cost effective water recycling program that can accomplish the following seven goals:

1. Improve water supply reliability;
2. Provide a "diversified portfolio" of water supply options;
3. Reduce the costs of developing new water supplies;
4. Reduce the costs of wastewater treatment improvements to meet future surface water discharge limitations;
5. Reduce withdrawals from the Feather River, Yuba River, and local aquifers;
6. Improve water quality in the Feather River; and
7. Increase flows to the Bay-Delta.

The area covered by the *Yuba-Sutter Regional Recycled Water Master Plan* is anticipated to develop; the plan therefore addresses long-term water supply reliability. Cost is a high priority to the member agencies. The three agencies are conducting a market assessment of the potential demand for recycled water and are preparing a cost-benefit analysis to identify high-value water

recycling opportunities within and adjacent to the urban areas. Potential demands include agricultural irrigation, landscape irrigation, industrial and construction uses, and habitat enhancement.

In addition, the City of Shasta Lake has developed water recycling for public and private landscape irrigation as well as some industrial use.

1.2.5.5 Water Conservation

Water conservation can be considered a potential water supply source, and the cost of implementing new water conservation measures should be considered when evaluating potential new water supply sources. Water conservation can be broadly categorized as either urban water conservation or agricultural water conservation.

Senate Bill SB X7-7 2009 (The Water Conservation Act of 2009) requires urban retail water suppliers to collectively reduce water demand by an average of 20 percent by December 31, 2020. For purposes of SB X7-7, "urban retail water suppliers" are those retail water suppliers with more than 3,000 customers, or which deliver more than 3,000 ac-ft of water per year.

Also under SB X7-7, agricultural water suppliers serving more than 10,000 acres are required to prepare and adopt agricultural water management plans by December 31, 2012, update those plans by December 31, 2015, and every five years thereafter. According to SB X7-7, on or before July 31, 2012, agricultural water suppliers shall:

- Measure the volume of water delivered to customers. The DWR will adopt regulations that provide for a range of options that agricultural water suppliers may use to comply with the measurement requirement.
- Adopt a pricing structure for water customers based at least in part on quantity delivered.
- Implement additional efficient management practices.

According to SB X7-7, effective 2013, agricultural water suppliers who do not meet the water management planning requirements established by this bill are not eligible for state water grants or loans.

1.2.5.6 Imported and Desalinated Water

Because of its setting, some forms of water management that are appropriate in other areas of California are not applicable in the NSV IRWM area at this time. Current water rights and water supply availability in the NSV IRWM area do not necessitate importing water, other than through relatively local water transfers within the region. Desalination is generally not a relevant water management strategy for most of the region given the valley's location and the high cost of desalination. Some areas having poor groundwater quality lack other water supply options. Benefit/cost analyses were not completed as part of this study, but the relatively high cost of groundwater desalination and the difficulties of brine disposal may make implementation of desalination projects difficult.

1.2.6 Areas and Species of Special Biological Significance

Several of the major land use divisions discussed above provide cover and habitat for various species, some of which have special biological significance. The NSV region is home to a number of specially managed state and federal parks, forest reserves, wildlife refuges, and special ecological areas vital for the conservation of special-status species and commercially and culturally important fish and wildlife species, including many that are water-dependent.

1.2.6.1 Agriculture/Rice

Special-status wildlife species associated with agricultural lands, such as the northern harrier and giant garter snake, may use adjacent irrigation canals and freshwater marsh vegetation for foraging or breeding. Giant garter snakes have the potential to occur in irrigation canals and can use the adjacent agricultural lands as foraging and basking habitat. Swainson's hawks also will forage in agricultural lands. Irrigated pastures may provide suitable nesting habitat for the northern harrier and short-eared owl.

A managed winter flooding technique for rice straw decomposition practiced throughout the NSV IRWM planning area provides significant feeding, nesting, and loafing habitat for many of the Pacific Flyway's waterfowl and shorebird species that winter in the Central Valley. Additionally, eight national wildlife refuges and six state wildlife areas dedicated to conserving and managing habitat for migratory waterfowl and their associated ecosystems are located wholly or in part within the agricultural districts of the NSV. There are also managed wetlands on private lands. Flooded rice fields also support patches of freshwater marsh, whose potential special-status species are discussed below.

1.2.6.2 Barren/Other

Because of the lack of vegetation, barren ground has a limited use by wildlife. However, some species, such as the western burrowing owl, prefer areas with limited or very low-growing vegetation. In addition, bank swallows dig nesting holes in vertical banks along rivers.

1.2.6.3 Conifer Forests

The largest tracts of conifer forests occur on portions of the four national forests within the upper watersheds of the NSV IRWMP planning area, including the Shasta-Trinity National Forest, Lassen National Forest, Mendocino National Forest, and Plumas National Forest. Special-status wildlife species that may occur in this community type include the bald eagle, northern goshawk, Northern spotted owl, California spotted owl, Sierra Nevada red fox, Pacific fisher, and California wolverine.

1.2.6.4 Hardwood Forests

The importance of oak woodland ecosystems and conservation was recognized in 2001 with the legislative establishment of the Oak Woodland Conservation Program administered under the auspices of the Wildlife Conservation Board. Under this program, three of the six NSV IRWMP member counties, Butte, Colusa, and Tehama, have adopted voluntary Oak Woodland Management Plans that guide voluntary efforts for use of conservation easements, land

improvements, research and education, and restoration to benefit oak woodlands and promote the economic sustainability of farm and ranch operations. These plans qualify the counties to participate in the state-sponsored funding to support actions contributing to sustainable oak woodland management.

Special-status wildlife species that may occur in the oak woodlands of the region include the western spadefoot toad, golden eagle and Townsend's big-eared bat. Rock cliffs in oak woodland provide suitable nesting habitat for the American peregrine falcon and golden eagle.

1.2.6.5 Riparian Habitats

Riparian habitats are considered sensitive natural communities, which are given special consideration because they provide several important ecological functions, including streambank stabilization, water quality maintenance, and essential habitat for wildlife and fisheries resources. Six state parks and seven wildlife areas/ecological reserves and one national wildlife refuge dedicated to conserving and managing riparian habitat and its associated ecosystem values are located along the Sacramento River and its tributaries within the NSV.

Elderberry shrubs, which provide habitat for the federally-listed valley elderberry longhorn beetle, may be present within riparian woodlands. Riparian woodlands also provide nesting habitat for several special-status birds, including the western yellow-billed cuckoo, southwestern willow flycatcher, bald eagle, Swainson's hawk, and white-tailed kite. Cavities within riparian trees along waterways may be used as roosting sites by some species of special-status bats, such as the pallid bat.

1.2.6.6 Herbaceous (Annual Grasslands)

Special-status wildlife species that could breed or nest within annual grasslands include the California horned lizard, northern harrier, western burrowing owl, and American badger. Trees in annual grasslands provide nesting habitat for white-tailed kite, Swainson's hawk, and loggerhead shrike.

Annual grasslands also provide important foraging habitat for special-status resident and wintering birds, including Swainson's hawk, white-tailed kite, northern harrier, golden eagle, and loggerhead shrikes.

1.2.6.7 Shrub

Special-status wildlife species that may occur in shrub and chaparral habitat include the California horned lizard at lower elevations and the Sierra Nevada snowshoe hare at upper elevations.

1.2.6.8 Urban

Urban areas generally have a lower value for wildlife because of human disturbance and alteration of the natural vegetation and landscape features. Special-status species are less likely to occupy urban areas.

1.2.6.9 Water

Special-status wildlife species commonly associated with ponds are the California tiger salamander, California red-legged frog, and western pond turtle.

Special-status fish species that occur in the local rivers and streams include all runs (fall, late-fall, winter, and spring) of Chinook salmon, Central Valley steelhead, green sturgeon, river lamprey and hardhead. Many of the foothill tributary streams of the NSV IRWM planning region also provide habitat for the foothill yellow-legged frog.

Wetlands include freshwater marshes, wet meadows, and vernal pools. Special-status wildlife species, such as the California red-legged frog and giant garter snake, may take cover and forage within freshwater marsh vegetation, in drainages and irrigation canals. Extensive areas of freshwater marsh may also provide suitable nesting habitat for northern harrier, short-eared owl, and tricolored blackbird. Wet meadows may provide suitable habitat for special-status wildlife species including the Cascades frog, Sierra Nevada yellow-legged frog, northwestern pond turtle, and tricolored blackbird. Vernal pools provide habitat for several special-status species, including conservancy fairy shrimp, vernal pool fairy shrimp, vernal pool tadpole shrimp, California tiger salamander, and western spadefoot toad. Vernal pools are most frequently associated with annual grasslands and oak woodlands throughout the NSV IRWM planning area.

1.3 INTERNAL BOUNDARIES

Internal boundaries and the entities having jurisdiction in the NSV IRWM planning area are shown on Figure 1-10 (located at the end of Chapter 1) and discussed below.

1.3.1 Municipalities

The IRWM planning area includes the following 17 incorporated municipalities (all cities except the Town of Paradise):

1. Anderson
2. Biggs
3. Chico
4. Colusa
5. Corning
6. Gridley
7. Live Oak
8. Orland
9. Oroville
10. Paradise
11. Red Bluff
12. Redding
13. Shasta Lake
14. Tehama
15. Williams
16. Willows
17. Yuba City

The planning area also includes over 400 unincorporated communities and census designated places.

1.3.2 Water, Wastewater, and Flood Control Districts

In addition to the counties within the planning areas there are other entities and agencies with statutory authority over water supply or water management. These entities are listed in Table 1-12, by county, within the planning area. This list includes entities with statutory authority over water supply, water quality management, wastewater treatment, flood management/control, or storm water management by county. As indicated in the table, some of the entities are multi-jurisdictional.

1.3.3 Land Use Agencies

In addition to the 17 municipalities listed above, the following entities have permitting authority in the planning area consistent with their missions:

1. Counties of Butte, Colusa, Glenn, Shasta, Sutter, and Tehama
2. California Department of Fish and Wildlife
3. California Department of Forestry and Fire Protection
4. California Department of Parks and Recreation
5. California DWR
6. California State Lands Commission
7. Central Valley Flood Protection Board
8. Special Districts within the region that have permitting authority
9. Sacramento and San Joaquin Drainage District
10. U.S. Army Corps of Engineers
11. U.S. Bureau of Land Management
12. U.S. Bureau of Reclamation
13. U.S. Fish and Wildlife Service
14. U.S. Forest Service
15. U.S. National Park Service

1.3.4 Tribes

The following Tribes have land within the IRWM region:

1. Berry Creek Rancheria
2. Colusa Indian Community Council
3. Cortina Rancheria
4. Enterprise Rancheria Of Maidu
5. Greenville Rancheria
6. Grindstone Indian Rancheria
7. Mechoopda Tribal Council
8. Mooretown Rancheria
9. Nor-Rel-Muk Nation
10. Paskenta Tribal Council
11. Redding Rancheria

Table 1-12. Entities with Statutory Authority Over Water By County

County	Entity	Provider	Emphasis
Butte	Biggs-West Gridley Water District		Irrigation Supply
Butte/Sutter	Butte Water District		Irrigation Supply
Butte	Richvale Irrigation District		Irrigation Supply
Butte/Glenn	Western Canal Water District		Irrigation Supply
Butte	Thermalito Water and Sewer District		Domestic and Irrigation Supply
Butte	Paradise Irrigation District		Domestic Supply/Water Quality
Butte	City of Biggs		Domestic Supply/Wastewater/Water Quality
Butte	City of Chico	California Water Service, Chico	Domestic Supply/Wastewater/Water Quality
Butte	City of Gridley		Domestic Supply/Wastewater/Water Quality
Butte	City of Oroville	California Water Service, Oroville	Domestic Supply/Wastewater/Water Quality
Butte	South Feather Water and Power		Supply/Water Quality
Butte	Durham Mutual Water Company		Supply
Butte	Durham Irrigation District	California Water Service, Chico	Domestic Supply
Butte	Joint Boards		Supply
	Reclamation Districts		Flood control and Drainage
Colusa/Glenn	Glenn-Colusa Irrigation District		Supply
Colusa	Colusa County Water District		Supply
Colusa	Maxwell Irrigation District		Supply
Colusa	Carter Mutual Water Company		Supply
Colusa	Colusa Drain Mutual Water Company		Supply
Colusa	Mehrhof & Montgomery		Supply
Colusa/Glenn	Princeton-Codora-Glenn Irrigation District		Supply
Colusa/Glenn	Provident Irrigation District		Supply
Colusa/Glenn	Reclamation District 1004		Supply
Colusa/Yolo	Reclamation District 108		Supply
Colusa	Roberts Ditch Irrigation Co.		Supply
Colusa	Sycamore Family Trust		Supply
Colusa	Willow Creek Mutual Water Co.		Supply
Colusa	Maxwell PUD		Municipal
Colusa	City of Colusa Water Company		Municipal
Colusa	Arbuckle PUD		Municipal
Colusa	4-M Water Co.		Supply
Colusa	Cortina Water District		Supply
Colusa	Davis Water District		Supply
Colusa	Glenn Valley Water District		Supply
Colusa	Holthouse Water District		Supply
Colusa	La Grande Water District		Supply
Colusa	Myers-Marsh Mutual Water Company		Supply
Colusa	Westside Water District		Supply
Colusa	City of Williams PUD		Municipal/Wastewater
Colusa	Grimes PUD		Municipal
Colusa	Zumwalt Water District		Supply
Colusa/Glenn	RD 2047		Flood Control/Drainage
Glenn/Colusa	Reclamation District #1004		Supply
Glenn/Colusa	Glenn-Colusa Irrigation District		Supply
Glenn	Princeton-Codora-Glenn Irrigation District		Supply
Glenn	City of Willows	California Water Service, Willows	Domestic Supply/Wastewater/Water Quality
Glenn	Willow Creek Mutual Water District		Supply
Glenn	Kanawha Water District		Supply
Glenn	Glide Water District		Supply
Glenn	City of Orland	City of Orland	Domestic Supply/Wastewater/Water Quality
Glenn	Orland Unit Water Users Association		Supply
Glenn/Butte	Western Canal Water District		Supply
Glenn	Orland-Artois Water District		Supply
Glenn	Provident Irrigation District		Supply
Shasta	Anderson-Cottonwood Irrigation District		Supply
Shasta	Bella-Vista Water District		Domestic and Irrigation Supply
Shasta	Centerville Community Services District		Domestic Supply
Shasta	City of Anderson	City of Anderson	Domestic Supply/Wastewater/Water Quality
Shasta	City of Redding	City of Redding	Domestic Supply/Wastewater/Water Quality
Shasta	City of Shasta Lake	City of Shasta Lake	Domestic Supply/Wastewater/Water Quality
Shasta	Clear Creek Community Services District		Domestic and Irrigation Supply
Shasta	Cottonwood Water District		Domestic Supply
Shasta	Igo-Ono Community Services District		Supply

Table 1-12. Entities with Statutory Authority Over Water By County

County	Entity	Provider	Emphasis
Shasta	Mountain Gate Community Services District		Domestic Supply
Shasta	Shasta Community Services District		Domestic Supply
Shasta	Shasta County Water Agency		Supply
Shasta	Shasta County	Various County Service Areas	Domestic Supply/Wastewater/Water Quality
Sutter	City of Yuba City	City of Yuba City	Supply & Wastewater
Sutter	City of Live Oak	City of Live Oak	Supply & Wastewater
Sutter	Community of Robbins	Water Works District Number One	Supply & Wastewater
Sutter	Community of Sutter	Sutter Community Services District	Supply
Sutter	Community of Rio Ramaza	Rio Ramaza Community Services District	Wastewater
Sutter/Butte	Butte Water District		Supply
Sutter	Meridian Farms Water Company		Supply
Sutter	Sutter Extension Water District		Supply
Sutter/Butte	Biggs-West Gridley Water District		Supply
Sutter	Sutter Mutual Water Company		Supply
Sutter	Pelger Mutual Water Company		Supply
Sutter	Oswald Water District		Supply
Sutter	Tisdale Irrigation District		Supply
Sutter	Natomas Central Mutual Water Company		Supply
Sutter	Pleasant Grove/Verona Mutual Water Company		Supply
Sutter	South Sutter Water District		Supply
Sutter	Gilsizer County Drainage District		Drainage
Sutter	State of California		Drainage & Flood Control
Sutter	Reclamation District 823		Drainage & Flood Control
Sutter	Reclamation District 70		Drainage & Flood Control
Sutter	Reclamation District 1660		Drainage & Flood Control
Sutter	Reclamation District 1500		Drainage & Flood Control
Sutter	Reclamation District 1001		Drainage & Flood Control
Tehama	City of Red Bluff		Domestic Supply/Wastewater/Water Quality
Tehama	Proberta Water District		Supply
Tehama	El Camino Irrigation District		Supply
Tehama	Thomes Creek Water District		Supply
Tehama	City of Tehama		Domestic Supply/Wastewater/Water Quality
Tehama	Gerber-Las Flores CSD		Supply
Tehama	City of Corning		Domestic Supply/Wastewater/Water Quality
Tehama	Corning Water District		Supply
Tehama	Stanford Vina Ranch Irrigation Company		Supply
Tehama	Deer Creek Irrigation District		Supply
Tehama	Los Molinos MWC		Supply
Tehama	Rio Alto Water District		Supply
Tehama	Anderson Cottonwood Irrigation District		Supply
Tehama	Mineral County Water District		Supply
Tehama	Golden Meadows Estates CSD		Supply
Tehama	Los Molinos CSD		Supply
Tehama	Tehama County Flood Control and Water Conservation District		Flood Management and Supply
Tehama	Thomes Creek Water Users Association		Supply

1.4 WATER SUPPLIES AND DEMANDS

Water supplies available to the IRWM region and the existing and projected demands are discussed in this section. Specific topics include:

- 20-year Demand and Supply Projection
- Water Demands to Support Environmental Needs
- Impacts of Climate Change

1.4.1 20-Year Demand and Supply Projection

Agriculture and the environment are the dominant water demands in the predominately rural six county NSV IRWMP Region. This 20-year demand and supply projection focuses on agricultural demands because agricultural demands are substantially greater than urban demands. Environmental demands are discussed in the next section. Multiple agencies supply water to agriculture in the region. The predominate source of supply for these agencies is surface water flowing into the region in streams that originate in the surrounding Coast and Sierra Nevada mountain ranges and the storage reservoirs within the region. Many of these agencies and their water users also have groundwater wells that they use to supplement the surface water supplies depending on the availability of surface water supplies. Many growers outside of water purveyor service areas served by the agencies have installed groundwater wells that are used to meet irrigation demands.

This section describes in general the source of supply, climate variations, population density, type of water use, trends in water use and supply, and projected supply and demand.

1.4.1.1 Source of Supply

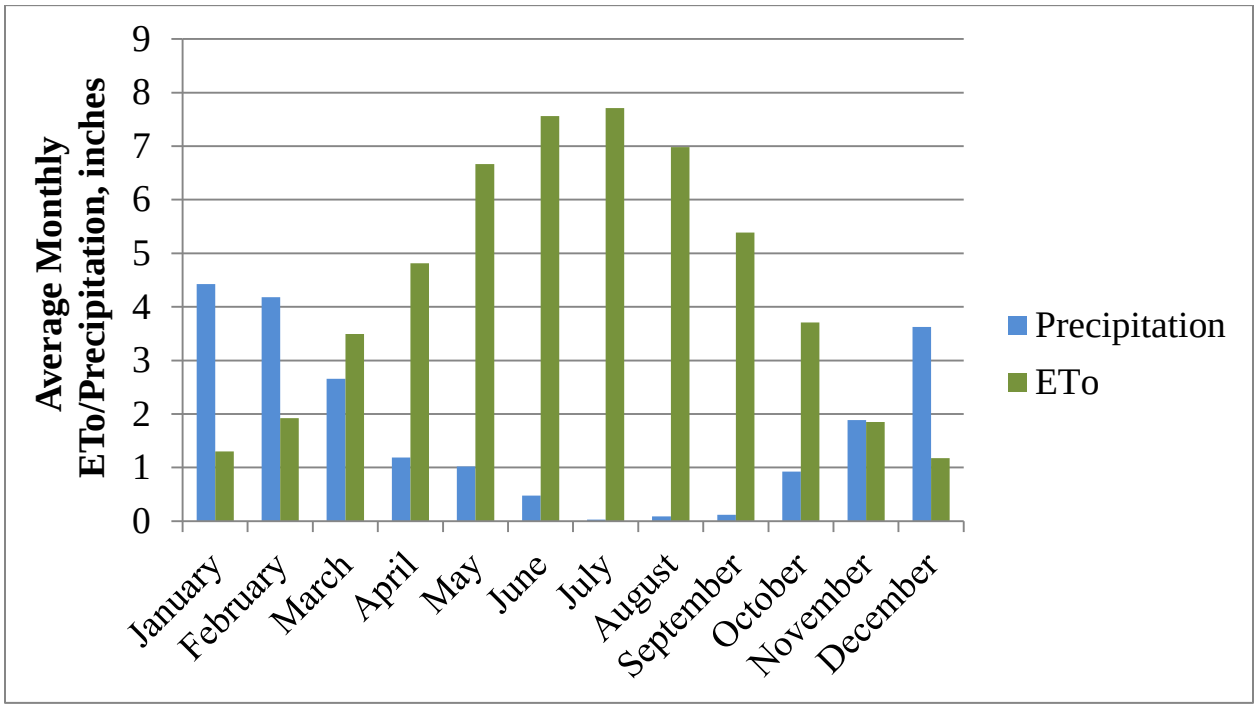
NSV region water agencies rely upon two main sources of water supplies to meet the demands of their customers: surface water supplies and groundwater supplies. Agriculture water suppliers are largely dependent on surface water from the Sacramento River or its tributaries. Most agricultural water suppliers and their customers have developed supplemental groundwater production capacity that they can call on in below normal or dry years. Agricultural water demands outside of surface water supplier areas are met primarily by private groundwater supplies. Most municipalities and rural residential users rely upon groundwater supplies exclusively. Since the reliability of surface water supplies varies depending on water rights and surface water sources, water supply availability differs from agency to agency.

1.4.1.2 Climate

Based on weather observations at the CIMIS stations, DWR has prepared a statewide map of reference evapotranspiration (ET) zones. Two reference ET zones with little difference in annual reference ET are found in the valley floor area of the NSV region. This indicates that the evaporative demand in the agricultural portion of the region is relatively homogenous. As a result, variations in water use within the region are more strongly influenced by cropping, soils and irrigation management. Precipitation varies spatially across the region and over time, decreasing from north to south (see previous precipitation discussion in Section 1.2.5.2). Most of

the precipitation occurs in the winter months while most of the evaporative demand and corresponding irrigation water demand occurs in the summer months. Thus summer irrigation is required to support agricultural production. An example of how most of the precipitation occurs in winter months while most of the evaporative demand and corresponding irrigation water demand occurs in the summer months is shown in Figure 1-11.

Figure 1-11. Example of Monthly Reference ET and Precipitation



1.4.1.3 Projected Supply

A literature search found little information on regional water supply projections. Water planning reports discussed the existing water use and projections of future water requirements without projecting water supplies. Projecting water supplies will be an important component to the NSV IRWMP and an integral part of regional planning. The proposed enlargement of Shasta Reservoir and construction of Sites Reservoir are two proposed increases in storage that may increase water supplies to the NSV and other California regions. However, planning continues for both of these projects and it remains uncertain whether or not the projects will ultimately be approved and built. Small storage projects, in response to local water shortages, may also be developed, but future water demands may exceed supply.

1.4.1.4 20-Year Projected Demands

Changes in regional agricultural water demands are driven primarily by changes in cropped area and cropping patterns, and to a lesser degree by changes in on-farm irrigation efficiency. A recent study of Glenn and Colusa Counties for update of the SacFEM groundwater model[8] found that total cropped area increased by just over 15,000 acres, or 2.2 percent, from 2003 to 2010 (Table 1-13). However, nearly 43,400 acres, or 6.3 percent, of existing cropped areas growing annual crops or pasture and hay converted to orchard or vineyard, indicating more persistent and intensive irrigation demand. These trends lead to increased agricultural water demands.

Table 1-13. Land Use Changes from 2003 to 2010 in Glenn and Colusa Counties[(a)]

Description of Land Use Change	No. Fields	Acres	Percent
No Change in Land Use			
Non-cropped, no change	1,235	131,455	19.00%
Annual/pasture/hay, no change	9,039	391,541	56.50%
Orchard/vineyard, no change	2,049	98,930	14.30%
Subtotal	12,323	621,926	90%
Cropped Converted to Non-cropped			
Annual/pasture/hay converted to non-cropped	113	7,520	1.10%
Orchard/vineyard converted to non-cropped	11	129	0.00%
Subtotal	124	7,649	1.10%
Non-cropped Converted to Cropped			
Non-cropped converted to annual crop or pasture/hay	411	9,431	1.40%
Non-cropped converted to orchard or vineyard	76	5,852	0.80%
Subtotal	487	15,283	2.20%
Annual/pasture/hay converted to orchard/vineyard	772	43,394	6.30%
Orchard/vineyard converted to annual/pasture/hay	164	4,780	0.70%
Land use from DWR survey not assigned	157	598	0.10%
Total	13,870	693,032	100%

(a) DWR 2003 Land Use Survey and 2010 GCID cropping data, Glenn County pesticide reporting and NASS 2010 Crop Data Layer.

All six counties in the IRWMP region report estimated agricultural water usage. The agricultural water usage of the counties for which data was available was 4.4 million ac-ft (Table 1-14). All six counties reported 20-year projected agricultural demands totaling approximately 4.5 million af/yr. The total net 20-year projected agricultural water usage was about 148,000 ac-ft more than current usage. Shasta and Butte counties estimated 20-year projected agricultural water demands

[8] Davids Engineering, Inc. 2011. Technical Memorandum for Glenn Colusa Irrigation District. Preparation of 2010 Glenn and Colusa County Agricultural Land Use Coverage and Associated Attributes.

to be less than current usage, by 20 and 66,700 ac-ft, respectively. Sutter County projected future agricultural water demands to be 98,000 ac-ft greater than current usage. The most recent data available was for Butte County and was from 2005. Tehama County reports an expected 10 percent increase in agricultural water demands due to changes in the permanent cropping patterns in the area. All of these data should be updated in future IRWMP projects.

Table 1-14. Current and 20-Year Projected Agricultural Water Demands by County

County	Current Agricultural Water Usage, ac-ft	Projected Agricultural Water Demands, ac-ft	Projected Additional Agricultural Water Required, ac-ft
Shasta[a]	101,120	101,100	-20
Tehama[b]	308,600	339,460	30,860
Glenn[c]	723,000	806,000	83,000
Colusa[d]	1,066,000	1,066,000	0
Butte[e]	1,006,200	939,500	-66,700
Sutter[f]	1,182,000	1,280,000	98,000
Total	4,383,714	4,532,060	148,346

Data Source:
[a] Shasta County Water Resources master Plan Phase 1, Current and Future Needs
[b] Tehama County FCWCD Water Inventory and Analysis, and correspondence with Tehama County Public Works Director.
[c] Stony Creek Fan Conjunctive Water Management Program Feasibility Investigation (January 2006)
[d] Colusa County General Plan Update 2030.
[e] Butte County IRWMP, 2005
[f] DWR 1998 land use survey data and DWR, 2001 Water Duty

Agricultural water use as described above refers to the amount of water diverted or pumped and applied to a crop to support growth, and generally includes conveyance and application losses. The water actually consumed by the crop is referred to as ET. Water that is not evapotranspired by the crop either runs off the field or percolates through the soil beyond the crop root zone. Water that runs off a field typically flows into a drain, stream or river and thereby returns to the supply system where it may be reused within or flow out of the region. Percolation of water beyond the crop root zone percolates to groundwater and may eventually discharge to a stream or river or may be pumped and used again. Thus, water diverted or pumped for agricultural use is greater than the amount consumed by the crops through ET, but the unconsumed portion is naturally conserved or captured in either the surface water or groundwater systems. This is one of the signature hydrologic characteristics of the Sacramento Valley, leading many to refer to the Sacramento Valley as being a “flow through” system. The only water depleted from the region is that actually consumed by ET.

1.4.1.5 20-year Municipal and Industrial Water Demand Projections

The 20-year municipal and industrial (M&I) water demand projections, based on the most recent water use and population projections available, are summarized in Table 1-15.

Table 1-15. 20-Year Water Demand Projections, Municipal and Industrial

County	Recent Documented Water Use, af/yr	Population Served by Documented Water Use	Per Capita Water Demand, gallons per capita per day	2035 Projected Population for entire County[(a)]	Total County Projected M&I Water Demand, af/yr[(b)]
Butte[(c)]	30,245	107,003	252	305,039	86,105
Colusa[(d)]	3,736	10,316	323	31,219	11,295
Glenn[(e)]	8,709	28,122	276	34,747	10,760
Shasta[(f)]	51,415	177,223	259	232,908	67,571
Sutter[(g)]	47,679	75,263	537	151,452	83,928
Tehama[(h)]	23,100	57,933	356	83,688	33,370
Total	164,884	455,860		839,054	293,029

(a) Projected population from California Department of Finance projections (January 2013).
(b) Projected population multiplied by current per capita water demand.
(c) Documented water use and population served from Butte County 2010 General Plan 2030.
(d) Documented water use, population served, and per capita water demand from 2011 Colusa General Plan 2030 environmental Impact Report.
(e) Population Served and per capita water demand from Willows 2010 UWMP, Chico-Hamilton City 2010 UWMP, and Orland 2003 Water Master Plan.
(f) Documented water use and population served from 2006 Sacramento Valley IRWMP.
(g) Documented water use and population served from 2010 Sutter County 2030 General Plan.
(h) Documented water use and population served from 2003 Water Inventory and Analysis.

Based on California Department of Finance estimates, the current population of the six counties in 2010 is approximately 604,964. As shown in Table 1-15, even though the population is projected to increase by about 40%, to almost 840,000 persons, the projected water demand of 293,029 af/yr is substantially less than the projected total regional water balance discussed above and shown in Table 1-14. Much of the M&I water supply is included in the water balance discussed above. A portion of the M&I water use becomes wastewater that is treated and discharged into surface waters, and is thus also included in the water balance discussed above.

1.4.1.6 Evapotranspiration Demands in the NSV Region

Spatially distributed ET estimates have been developed through application of the SEBAL[9] energy balance algorithm (Bastiaanssen et al. 2005)[10] to MODIS[11] satellite images for the 2010

[9] SEBAL (Surface Energy Balance Algorithm for Land), computes actual ET without the need to know the crop or land use. The energy balance approach inherently accounts for the effects of any stress, such as lack of sufficient water, salinity, disease, pest infestations, or other stressors. SEBAL ET estimates have been compared with various ground based ET measurement/estimation techniques (Eddy covariance, Bowen ratio, Lysimeters, *etc.*,) for different types of landuse and has been found within 5 percent of these ground based techniques. www.sebal.us.

[10] Bastiaanssen, W. G.M., E. J. M. Noordman, H. Pelgrum, G. Davids, B.P. Thoreson, and R. G. Allen, 2005.

water year (WY2010). SEBAL ET estimates were generated using satellite imagery and ground-based CIMIS weather data at a spatial resolution of 250 meters on a weekly basis for the entire Central Valley of California[12]. These estimates represent the total consumption of water by ET in the region, including all agricultural areas, managed wildlife habitat areas and other land areas. The ET estimates are summarized by county and are contrasted between areas inside and outside of water suppliers.

The area averaged weekly ET values were obtained for the regional area and summed to obtain mean monthly ET depths for each month (Table 1-16). The monthly ET depths were multiplied with the water balance area to obtain monthly total ET volumes.

Table 1-16. Average Monthly ET from SEBAL for the Water Balance Area

Month	SEBAL ET, inches	SEBAL ET, ac-ft
October 2009	1.8	398,491
November 2009	1.1	241,731
December 2009	0.4	90,633
January 2010	0.8	169,695
February 2010	2.2	472,891
March 2010	3	656,775
April 2010	3.6	783,569
May 2010	5.3	1,152,919
June 2010	6.3	1,371,866
July 2010	6.5	1,397,989
August 2010	4.9	1,062,152
September 2010	3.5	754,422
Total	39.5	8,553,134

Spatially distributed ET estimates offer unique and informative insights into the consumption of water within the region. Figure 1-12 (located at the end of Chapter 1) shows the spatial distribution of ET within the major agricultural area of the NSV IRWMP water balance area, highlighting the ET differences between areas inside and outside of water suppliers. It is interesting to note that many areas outside of water suppliers have ET as high or nearly as high as the areas inside, suggesting that groundwater provides a widespread and substantial water supply source for irrigation. Another informative regional water management parameter is

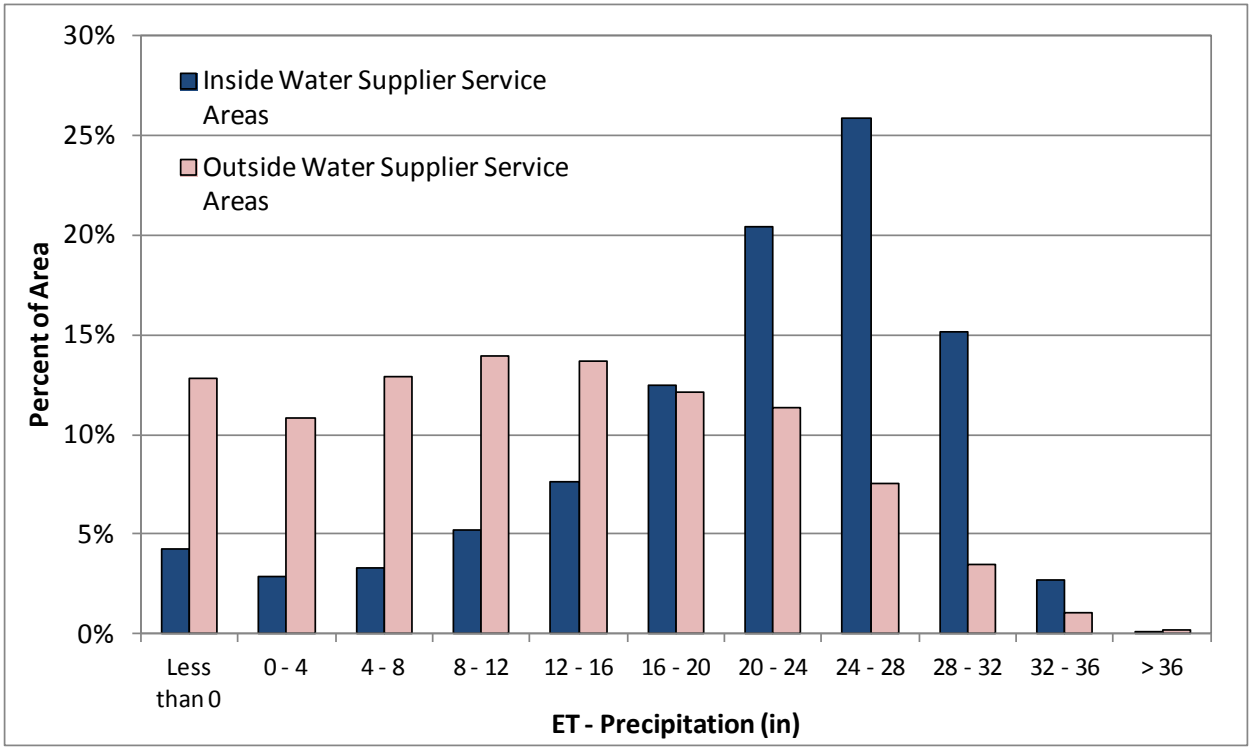
SEBAL model with remotely sensed data to improve water-resources management under actual field conditions. ASCE J. Irrig. Drain Eng. 131(1): 85-93.

[11] MODIS (Moderate Resolution Imaging Spectroradiometer) is an imaging sensor on-board the Terra (EOS AM) and Aqua (EOS PM) satellites. http://modis.gsfc.nasa.gov/about/

[12] Lal D., Clark, B., Thoreson B., Davids G., Bastiaanssen, W. G. M. (2010). Monitoring Near-Real Time Evapotranspiration Using SEBAL®: An Operational Tool for Water Agencies/Growers. The U.S. Society for Irrigation and Drainage Professionals (USCID) 2010 Spring Meeting. Sacramento, CA.

represented by the difference between ET and precipitation (Figure 1-13 - located at the end of Chapter 1). Because precipitation is very low during the summer, areas with ET much greater than precipitation on a water year basis indicate where ET is sustained by sources other than precipitation, primarily by applied irrigation water in most cases but also including sub-irrigated vegetation in areas with shallow groundwater, natural wetlands, and riparian vegetation. Many of the areas outside water supplier service areas exhibit substantially more ET than precipitation, suggesting that groundwater is an appreciable water supply source for irrigation. The histograms in Figure 1-14 below show the differences in the range of ET minus precipitation within water suppliers service areas, compared to outside of water supplier service areas. The relatively concentrated distribution of ET relative to precipitation within water supplier service areas suggests that water is more uniformly available for irrigation and may suggest that cropping patterns are less variable. Many of the water supplier service areas in the region are dominated by rice. In contrast, the distribution of ET relative to precipitation outside of surface water suppliers is wider, reflecting the difference between cropped areas utilizing groundwater and areas of natural vegetation that are sustained solely by rainfall.

Figure 1-14. Relative Frequency Distributions of ET Relative to Precipitation within and outside of Water Supplier Services Areas, WY2010



Total ET within water supplier service areas can be contrasted with total ET outside of water supplier services areas. Observations are generally consistent with the expectation that mean annual ET will be higher in the areas within water supplier service areas and will be less variable; however, the differences in the means by county are not very large. Interestingly, the

maximum single pixel[13] ET in each county is slightly more in areas outside of water supplier service areas. This may be because groundwater is generally available continuously whereas surface water supplied by most districts is available seasonally (typically March through October).

Fifty-seven percent of the total ET in the water balance area comes from areas not served by water suppliers (Table 1-17). Areas served by water suppliers account for more than 50 percent of the ET in Colusa, Sutter and Glenn Counties. Tehama County has the smallest area inside water suppliers, and only seven percent of the ET in Tehama County comes from areas within water suppliers.

Table 1-17. ET Volumes by County Within and Outside Areas Served by Water Suppliers

County	ET Volume, af	ET within Water Balance and Water Suppliers, acres		ET within Water Balance and Outside Water Suppliers	
		ac-ft	Percent	ac-ft	Percent
Tehama County	2,110,834	155,845	7%	1,950,521	92%
Colusa County	1,601,811	1,041,704	65%	553,206	35%
Butte County	1,415,672	603,216	43%	810,978	57%
Glenn County	1,398,053	742,382	53%	652,322	47%
Sutter County	1,345,874	809,518	60%	531,739	40%
Shasta County	724,890	348,320	48%	374,464	52%
Total	8,597,134	3,700,984	43%	4,873,229	57%

1.4.1.7 ET Trends in the NSV Region

As noted previously, agricultural demand is expected to increase slightly over the next 20 years continuing the recent trend of slow conversion of native vegetation and annual crops to permanent crop plantings and increased development of permanent crops on existing agricultural lands. This ongoing expansion of the irrigated area and conversion to permanent, higher value crops also "hardens" demand because permanent crops require water every year and cannot be fallowed in dry years.

Based on the observed change in cropping patterns, some assumptions can be made to estimate the change in agricultural water use based on changes in ET. These assumptions are by their nature speculative and are included only to serve as an example of how cropping trends can be used to estimate future changes in ET. Assuming five percent of the land inside water districts increases evapotranspiration of applied water (ETaw) from 30 to 40 inches, the ET within areas served by water suppliers will increase four percent, or by about 154,000 ac-ft by 2030. Similarly, assuming five percent of the land outside water suppliers increases ETaw from 0 to 40 inches, ET for areas not served by water suppliers would increase 17 percent, or about

[13] A pixel is a square area on the surface of the earth defined by the resolution of a satellite sensor. For SEBAL ET calculated from MODIS satellite images, the pixel is 250 m by 250 m, or roughly 16 acres.

812,000 ac-ft by 2030 to 9.54 million ac-ft (Table 1-18). This will add a total of nearly one million ac-ft to the agricultural ET and corresponding crop water demand by 2030.

Table 1-18. Projected 2030 Agricultural ET

County	ET Volume, af	ET within Water Balance and Water Suppliers, acres		ET within Water Balance and Outside Water Suppliers	
		ac-ft	Percent	ac-ft	Percent
Tehama County	2,437,946	162,339	7%	2,275,608	93%
Colusa County	1,730,515	1,085,108	63%	645,407	37%
Butte County	1,574,491	628,350	40%	946,141	60%
Glenn County	1,534,357	773,315	50%	761,042	50%
Sutter County	1,463,609	843,248	58%	620,362	42%
Shasta County	799,708	362,833	45%	436,875	55%
Total	9,540,626	3,855,192	40%	5,685,434	60%

In closing, as the ET data analysis clearly shows, the NSV is a well balanced region using both surface and groundwater to meet the needs of our people and agriculturally based economy. The region is dependent on conjunctive use/management of both sources of water. It is clear, our water supply is codependent on groundwater and surface water. Should either source be threatened via drought, climate change, or regulatory mandates, the NSV water supply system would be at risk.

1.4.1.8 20-Year Demand and Supply Projection Conclusions

Significant loss of surface water would likely stress the groundwater aquifers and could potentially lead to overdraft, permanent damage, and/or subsidence.

1.4.2 Water Demands to Support Environmental Needs

Environmental water demands in the NSV have not been fully specified for all identified environment uses but primarily consist of demands for fish and wildlife habitat and water quality objectives. Some of the most important environmental water demands within the region are shown in Table 1-19. Any future proposed environmental demands proposed to be met from water supply originating from the NSV region could potentially cause an imbalance to the NSV region's use of available water resources.

Table 1-19. Principal Environmental Water Needs

Program or Watershed	Description	Source
CVPIA §3406(b)(2) Environmental Water Program	800,000 ac-ft of CVP storage dedicated to fish and wildlife conservation and enhancement purposes is coordinated among the CVP reservoirs, including Shasta and Whiskeytown reservoirs, for use throughout the Central Valley and the Delta; the future of this program is uncertain pending completion of Bay-Delta Plan and the accompanying Bay-Delta Conservation Plan	CVPIA§3406(b)(2) CVP-SWP OCAP Biological Opinion (NMFS 2009; 2011)
Bay-Delta Plan and BDCP objectives for Sacramento River inflows through the NSV region	At Wilkins Slough (Colusa Co.), provide pulse flows of 20,000 cfs for 7 days starting in November through January coinciding with storm events producing unimpaired flows at Wilkins Slough above 20,000 cfs until monitoring indicates that majority of smolts have moved downstream; At Rio Vista, up to 75% of 14-day average unimpaired river flow; Accommodate reservoir management of sufficient coldwater storage to protect salmon spawning habitat in upper Sacramento River	SWRCB (2010) DFG (2010)
CVPIA §3406(d)(1-5) refuge and private wetland water deliveries[(b)]	There is about a 314,673 ac-ft need for existing wetland habitat in the in Butte, Sutter, and Colusa basins; CVPIA currently delivers about 117,810 ac-ft (Level 2) and 155,000 ac-ft (Level 4) could be potentially delivered under existing water market conditions	Central Valley Joint Venture (2006)
North American Joint Venture waterfowl habitat conservation provisions[(b)]	Under a full implementation of the integrated bird habitat objectives and winter agricultural flooding requirements a need exists for 747,986 ac-ft in Butte, Sutter, and Colusa basins	Central Valley Joint Venture (2006)
Fish and Game Code §5937 streamflow below diversion requirement	It is required that the owner of any dam or diversion from a stream shall allow sufficient water at all times to pass through a fishway, or in the absence of a fishway, allow sufficient water to pass over, around, or through the dam to keep in good condition any fish that may exist below the dam	Fish and Game Code §5937
NPDES permit dilution requirements	As the Central Valley Regional Water Board continues its development of TMDLs and adopts control actions for the Sacramento River and its tributaries, discharges and stream flow needs may be revisited to accommodate water quality objectives	SWRCB (2010)
Sacramento River at Keswick Dam (Shasta)	Minimum 3,250 cfs year round; complex and variable seasonal release schedule based on adaptive management of end of September reservoir storage, water year hydrology, water temperature objectives, water demands, and Delta water quality requirements	CVP-SWP OCAP Biological Opinion (NMFS 2009; 2011)
Clear Creek (Shasta)	Minimum of up to 200 cfs year round; two 600 cfs pulse flows (May-June); one 3,250 cfs mean one day channel maintenance flow seven times in 10 years; may change as result of ongoing instream flow study	CVP-SWP OCAP Biological Opinion (NMFS 2009; 2011)
Cow Creek (Shasta)	A minimum fall season flow of 50 cfs at Millville to support adult salmon migration was recommended by the Department of Fish and Wildlife as an interim measure until an instream flow needs study can be conducted. Watershed improvement, including fish passage and instream flow management, is currently be conducted by the local watershed management group.	USFWS (1995)
Battle Creek Salmon and Steelhead Restoration Project (Shasta/Tehama)	The minimum instream flows vary by season and stream reach throughout the watershed and are specified under a phased restoration implementation plan between Pacific Gas and Electric Company, U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service, and California Department of Fish and Game.	Kier Associates (1999) Battle Creek Salmon and Steelhead Restoration Program Final EIS/EIR (2005)
Mill Creek (Tehama)	The Mill Creek Water Exchange Program was started in the mid-1990s. The Los Molinos Mutual Water Company has worked with the resource agencies to develop and implement the water exchange program. The program trades groundwater for stream diversion water, increasing streamflows and improving fish passage in the lower reaches of the creek. The Water Exchange Program is a three-party agreement between DFW, DWR, and the LMMWC. The WEP is funded by State Water Contractors, DWR, and DFWG. Phase I included the construction of a new well and restoration of an existing well. During critical migration periods, groundwater is used to augment LMMWC's water requirement in exchange for leaving an equivalent amount of water in Mill Creek. This was an improvement but more water was needed during low flow times. Under Phase II a second, on-going renewable agreement was initiated whereby the LMMWC and landowner with priority water rights forgo diversion of 16 cfs from Mill Creek when additional flows are needed for spring-run. This allows the project to provide instantaneous releases of up to 25 cfs. In exchange, the project pays the landowner's cost to operate an irrigation well.	DWR (2005)
Deer Creek (Tehama)	The proposed Deer Creek Flow Enhancement Program will operate from April 1-June 30 and Oct 15-Nov 15 when the Deer Creek flow, as measured below the Stanford Vina Diversion Dam, is equal to or less than 50 cfs, or up on mutual consent of DCID, DFW, and DWR. Upon completion of both phases, DCID may have the additional capacity to provide approximately 15-18 cfs of instream transportation flow while meeting agricultural water demand requirements in the District.	Deer Creek MOU (2007)
Butte Creek (Butte)	In normal and wetter years a minimum stream flow of 100cfs from September - March 14, 80 cfs from March 14 - May, 40 cfs from June - August. In dry years, a minimum stream flow of 75 cfs from September - April, 65 cfs in May, and 40 cfs from June – August.	DFG (2008)
Feather River at Oroville Dam (Butte)	Under the new FERC license for Oroville Dam, an increased minimum flow from the current 600 cfs to a new minimum flow of 700 cfs in the Low Flow Channel during most of the year, but increasing flow to 800 cfs during the Chinook salmon spawning season from September 9 through March 31. The volume of increased flows was determined from the results of instream flow investigations and spawning habitat utilization studies	SWRCB (2010) FERC (2006)
Feather River at Thermalito outlet (Butte)	Provide minimum instream flows in the high flow channel, based on preceding April to July unimpaired runoff > or = 55%: October 1 to March 31—1,700 cfs; April 1 to September 30—1,000 cfs preceding April to July unimpaired runoff < 55%: October 1 to February 28/29—1,200 cfs; March 1 to September 30—1,000 cfs Reduce monthly average minimum instream flows in the high flow channel by not more than 25% if forecast indicates that Lake Oroville will be drawn down to 733 feet	FERC (2006)
Stony Creek (Glenn)	According to DWR 2003 (groundwater study) the minimum instream flow from Black Butte Dam is 30 cfs. According to the NMFS BO, 1) the diversion structure for the TCC will not be installed prior to April 1 of each year and a minimum 40 cfs bypass flow will be maintained at all times while the diversion structure is in place; 2) analysis of the effects of the proposed project anticipates that a minimum of 30 cfs flow will be maintained below the lowest point of diversion not withstanding the above 40 cfs requirement below the active TCC diversion; and 3) analysis of the effects of the proposed project anticipates that the Corps will follow the flood control/ramping rate guidelines described in the BO.	NMFS (2008) DWR (2003)

[(a)] As identified by regulatory requirements, conservation plans, and water facilities permits and licenses within the Northern Sacramento Valley region.
[(b)] Includes water demand for wildlife refuges on Federal, State, and private lands.

1.4.3 Potential Effects of Climate Change

Throughout the region there is some skepticism about the existence and/or mechanisms of climate change. The bottom line concern, regardless of how it is characterized, is how the region can respond to changes in hydrology and temperature that go beyond what we have historically experienced. This concern is nothing new to the Sacramento Valley, which has experienced decade-after-decade of extreme variability over the past 150 years. California's largest water projects, including the federal CVP and SWP, were built assuming that water needs would be met during a recurrence of the assumed worst-case drought (similar to the extended 1928-1934 drought), as well as the historic peak floods that existed as of the 1940s, 1950s and 1960s. But we have continued to see new records broken for both drought and flood events. For example, the 1976-1977 drought was short but very severe (1977 is still the driest year in recorded history in the State). The more recent 1987–1994 drought was extreme in its unprecedented duration in modern California history, and saw the development of new water management tools to cope with extended and severe drought. These more recent droughts resulted in more stress on every region of California, including the surface and ground water resources of the NSV region.

Record floods in 1907 and 1909 were the basis for design of the Sacramento River Flood Control Project. With construction of reservoirs in the Sacramento River watershed that provided flood control storage in the second half of the 20th century, the system was able to accommodate flood flows larger than originally envisioned. Record floods in 1983 and 1986 were so extreme that they pushed the entire flood system – levees, bypasses and reservoirs – to maximum capacity and required reevaluation of the operations of flood control facilities throughout California. Evaluation of the extraordinary February 1986 series of storms resulted in changes to flood control plans at major reservoirs in northern California. And yet a decade later in January 1997, the largest Sacramento River flows in the State's history pushed the system beyond capacity and resulted in two major levee breaks in the Sacramento River system. Looking back even further, the last half of the 19th century was a remarkable period of droughts and floods in the Sacramento Valley. The flood issues were captured well in the book *Battling the Inland Sea* which focuses on historic flood control issues in the Sacramento Valley (Robert Kelley, *Battling the Inland Sea*, University of California Press, 1998). The book has a predominant observation that "floods of record" were periodically surpassed to establish new "worst case" conditions. In the 1880s (130 years ago), State Engineer William Hammond Hall essentially said that we will always face larger storms and bigger floods (Kelley, op cit, pages xiii, 205 and 206). An important lesson that this region has learned over the past 150 years is to plan for worst-case conditions, whatever the causes.

As an "area-of-origin" with protections under State law, the NSV region water users have very high priority water rights to its surface water supplies. Even so, there will continue to be water supply, flood and other vulnerabilities associated with varying hydrology and a changing climate. It is important to note that this region's vulnerabilities are far less than would be expected in all other regions of California and most of the areas throughout the western United States. The RWMG has adopted Foundational Objective 1-7, Honor and preserve area-of-origin statutory protections, to emphasize the importance to the NSV region that area-of-origin, watershed-of-origin, and County-of-origin statutory protections be preserved, including, but not limited to, the protections set forth in California Water Code sections 10505, 10505:5, 11128, 11460, 11463, and 12200.

The principal areas of potential vulnerability for our region are water demand, water supplies and flood risk. It is possible that increasing temperatures could slightly increase water demands for irrigated agriculture, but it is difficult to project impacts due in part to agricultural land use changes in some areas of the Sacramento Valley. Nonetheless, it is expected that rice will continue to be a predominant crop supported by surface water diversions. The high priority of rights to surface water in the region act to limit potential adverse impacts of climate change to the adequacy of water supplies to meet future water demands. There could be some problems if demand increases in areas irrigated predominantly with groundwater that do not benefit from conjunctive management with surface water supplies. While most areas in the NSV have adequate-to-abundant groundwater supplies (in part due to investments in surface water acquisition and distribution), a combination of increased pressures on management of groundwater in the region (including historic transfers of water out of the region) and expansion of irrigated agriculture in areas of stressed groundwater aquifers may pose future risks to very long term agricultural production in such areas. It is for these reasons and others that long-term comprehensive groundwater management linked to surface water supplies has been a very high regional priority for the last decade and reflected in this NSV IRWMP.

As the Sacramento Valley has seen over the past 150+ years, flood risk is difficult to assess due to a changing hydrology. One hundred percent protection from flood damages can never be assured, but additional actions can be taken to reduce flood risk and the magnitude of flood damages. While predicting the impacts climate change may have on future flood risk remains inadequate, indications are that peak flood flows could increase to the extent that temperature increases cause more precipitation to fall as rain rather than snow. Large scale flood protection measures for the Sacramento River and its primary tributaries (Feather, Yuba and American Rivers) are the purview of the federal government (with support from the State of California), but local jurisdictions will continue to address flood threats on local streams.

Finally, while there appears to be strong scientific support for global warming and the induced changes to our climate, technical models still have limitations in their ability to forecast climate changes at the local and regional scale. A summary of pros and cons for California regional modeling scenarios was published by DWR in May 2012 (http://wwwdwr.water.ca.gov/climatechange/docs/Strengths-Weaknesses-Criteria- FINAL-5-22-12.pdf). We expect, like many areas of scientific research, that better predictive tools will be available in the future. Updated information as it is developed is expected to be posted by DWR http://wwwdwr.water.ca.gov/climatechange/cctag.cfm) and the Governor's Office of Planning and Research (http://www.opr.ca.gov/s_climatechangefacts.php), among other sources.

A more thorough analysis of climate change vulnerability is included in Chapter 4. Again, due to the regional balance of groundwater and surface water use, additional water supply needs or stressors may cause negative impacts to our current water supply system, and/or the local economy that is dependent on that water supply system.

1.5 WATER QUALITY

A general description of the water quality of the NSV IRWMP region is provided in this section. Existing and potential future water quality conditions, which include descriptions of the water quality protection needs, are discussed. This description of current water quality conditions is based on readily available tools and reports, not on an original review of current, available data. Information sources include the following:

- U.S. Geological Survey National Water-Quality Assessment (NAWQA) Program (http://pubs.er.usgs.gov/publication/cir1215)
- Sacramento River Watershed Program monitoring, 1998-2004 (http://www.sacramentoriver.org/srcaf/library/library_browse.php?subject=Water%20Quality)
- Sacramento River Watershed Program "A Roadmap to Watershed Management" (http://sacriver.org/aboutwatershed/roadmap)
- Sacramento River Watershed Sanitary Survey 2010 update http://www.cityofwestsacramento.org/civica/filebank/blobdload.asp?BlobID=6569
- My Water Quality Portal (http://www.waterboards.ca.gov/mywaterquality/)
- California Integrated Water Quality System Project (http://www.swrcb.ca.gov/ciwqs/)
- U.S. Environmental Protection Agency Watershed Improvement Report (http://www.epa.gov/region9/water/watershed/measurew/feather-sac/2010SacFeatherRiverSP12final-Rpt.pdf)
- Surface Water Ambient Monitoring Program (SWAMP) Lakes Study - Bioaccumulation In Sport Fish (http://www.waterboards.ca.gov/water_issues/programs/swamp/lakes_study.shtml)
- DWR Water Data Library

1.5.1 Water Quality Regulatory Framework

Water quality concerns are identified when monitoring data exceed standards set to protect beneficial uses. Some stream segments are listed as "impaired" by various contaminants (U.S. Environmental Protection Agency, accessed January 2, 2000). Impairment means that a standard of water quality for beneficial uses (for example, as a source of drinking water or for recreation or industrial use) is not being met. The federal Clean Water Act requires states to maintain a listing of impaired water bodies for the purpose of establishing Total Maximum Daily Loads (TMDLs). A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that load among the various sources of that pollutant.

In the NSV Region, there are 126 water bodies listed as impaired, primarily associated with metals, pathogens and pesticides. The most prevalent listings in the Sacramento River watershed are for organophosphate pesticides and mercury. Eleven listings (six of which are sloughs) are associated with eutrophication (which results in low dissolved oxygen, odors, and loss of water

clarity). The impaired water bodies are mainly affected by nonpoint sources of contaminants from agriculture discharges or abandoned mines. Water-quality objectives are commonly not met only during conditions of stormwater-driven runoff.

1.5.2 Current Water Quality Conditions

Water of the Sacramento River and its major tributaries is generally of good quality; largely melted snow that collects in upstream reservoirs and is released according to various operating rules. Well managed dam operations and diversions of all sizes has improved streamflow, aquatic habitat, fish migration, and stream temperature. The NSV region has worked diligently to maintain high water quality while successfully preventing water shortages and meeting environmental mandates.

1.5.2.1 Reservoirs

The State Water Resources Control Board's SWAMP conducted a lakes survey in 2007-2008. The survey was a preliminary screening of contamination in sport fish (primarily rainbow trout, largemouth bass, and common carp) that are known to accumulate high concentrations of contaminants and are therefore good indicators of contamination problems. This screening study did not provide enough information for consumption guidelines – this would require monitoring a broader array of species, larger numbers of fish, and a much higher level of funding.

Fish tissue concentrations were evaluated using thresholds developed by the California Office of Environmental Health Hazard Assessment (OEHHA) for methylmercury, polychlorinated biphenyls (PCBs), dieldrin, dichlorodiphenyltrichloroethanes (DDTs), chlordanes, and selenium, and a State Water Resources Control Board threshold for mercury in tissue that is being used for identification of impaired water bodies. Based on these thresholds, methylmercury was determined to pose the most widespread potential health risk to persons who consume fish caught in California lakes, exceeding thresholds of concern in approximately one quarter of lakes surveyed statewide. However, in northern California, low concentrations were commonly observed in fish from high elevation lakes in the Sierra Nevada and Trinity Alps. Photodemethylation in the very clear water column of high-elevation lakes may be a mechanistic process that contributes to the low methylmercury concentrations in these areas, which underscores the importance of maintaining low turbidity in these reservoirs.

1.5.2.2 Wetlands and Irrigated Agriculture

The Sacramento Valley supports about 2 million acres of irrigated agriculture. Rice is the number one crop in the valley, accounting for approximately a quarter of the harvested acres. Chemicals used on irrigated farmland vary by crop, pest, weather and other factors. As reported in the 2002 California Department of Pesticide Regulation Pesticide Use Report Database, a total of 1,329 different insecticides, herbicides and fungicides were used in crop production in the region. The potential threat to surface water quality posed by each of these pesticides can vary widely and is based on physical characteristics of the pesticide, application method, time of year applied, and weather conditions during application, among other factors.

Wetland resources in the Sacramento Valley are separated into three broad categories: unmanaged, seasonally managed and permanently managed. Because unmanaged wetlands are not irrigated, they are not monitored under the Irrigated Lands Regulatory Program. The waiver refers directly to irrigated lands and includes both seasonal and permanent duck marshes for a total of approximately 65,104 acres. The majority of the managed wetlands in the watershed are seasonal with flood-up occurring in late September or October with draw-down in February or March. However, some managed wetlands are flooded permanently or semi-permanently and may hold water all year or may be drained in late summer for vegetation and water quality management. Water quality on and discharged from seasonal wetlands can vary substantially depending on how the wetland's hydrology, habitat, and vegetation are managed. Even a particular wetland will exhibit substantial variability depending on climate (sunlight, wind, and temperature), hydrology (depth, duration, and frequency of flooding), waterfowl use, and vegetation type and state (growing, senescing or decomposing).

The Northern California Water Association partners with over 200 agricultural representatives, natural resource professionals, wetlands managers and local governments throughout the Sacramento Valley to improve water quality for Northern California farms, cities and the environment. The Sacramento Valley Water Quality Coalition (Coalition; http://www.svwqc.org/) is composed of more than 8,600 farmers and wetlands managers encompassing more than 1.1 million irrigated acres and supported by local farm bureaus, resource conservation districts, County Agricultural Commissioners, and crop specialists with the University of California Cooperative Extension. The Coalition's Annual Monitoring Reports identify water quality exceedances associated with agricultural and managed wetlands discharges to the Sacramento River Basin. From October 2010 through September 2011 (see http://www.svwqc.org/pdf/2011_Annual_Water_Quality_Summary.pdf), the Coalition and its partners collected and analyzed a total of 206 water column samples at 24 sites (yielding a total of 6,710 chemistry analyses). As in past years, more than 97% of all pesticide analyses performed by the Coalition were below detection. There were 137 water samples tested for toxicity (351 toxicity results from 19 sites), with only six of these samples (4.4%) showing statistically significant toxicity. Again in 2011, concentrations of nutrients in Coalition's samples were low, with only one exceedance of water quality objectives for nitrate in 160 samples tested, and no exceedances of water quality objectives for ammonia in 130 samples tested. Total dissolved solids concentrations exceeded drinking water thresholds in 10% of samples, but no agricultural drains are sources of drinking water. Similarly, 20% of samples exceeded thresholds for E. coli bacteria indicators of fecal contamination, but most agricultural drains are not intended for contact recreation.

1.5.2.3 Abandoned Mines

A number of abandoned mines, especially those near Lake Shasta, were identified in the 1990s by the U.S. Geological Survey as having elevated concentrations of trace metals. Acid mine drainage has been a serious environmental problem in the northern portion of the Sacramento River watershed. Several streams are listed as impaired because of high concentrations of metals such as cadmium, copper, lead, and zinc. Fortunately, the SRWP found in the early 2000s that metals were generally not a problem in the watershed, which led to discontinuing monitoring of most metals (except mercury). Documented mercury mines in the Coast Range are almost

exclusively in the Cache Creek and Putah Creek watersheds to the south, which are within the Westside IRWM Region.

1.5.2.4 Municipal Wastewater Discharges

Several NPDES-permitted municipal wastewater facilities and many more industrial facilities operate in the region. A cursory review of self-reported permit violations (http://www.swrcb.ca.gov/ciwqs/) in years 2008-2012 found several hundred instances, but essentially all were minor concerns (*e.g.*, a temporary turbidity exceedance).

1.5.2.4.1 Urban Runoff

Urban runoff is a potential source of contaminants in waterways downstream of urban areas. Several municipalities in the region are regulated for stormwater discharges under a statewide general permit. The statewide general permit does not require water quality monitoring. Consequently, no relevant data of urban runoff water quality have been found. Permit revisions underway may include discharge and receiving water monitoring requirements.

1.5.2.5 Key Water Quality Issues

Key water quality issues for the NSV region are described briefly below, in general order of higher to lower concern.

1.5.2.5.1 Mercury

Mercury is generally considered the most serious water-quality problem in the Sacramento River, some tributaries of the Sacramento River, and downstream waterbodies including the Sacramento-San Joaquin Delta and San Francisco Bay. Methylmercury is the most toxic and bioaccumulative form of mercury. At much higher dosages than commonly experienced in the region, methylmercury in humans has been found to affect the immune system, alter genetic and enzyme systems, and damage the nervous system, including coordination and the senses of touch, taste, and sight. Lower doses, both to humans and wildlife, still have subtle negative effects.

Mercury can enter streams or aquatic systems through either atmospheric deposition or transport from geological or human sources. Several processes contribute to the subsequent bioaccumulation of mercury in fish tissue. Because of the presence of mercury in the tissue of certain fish species, fish consumption advisories have been posted for several water bodies within the NSV region[14].

[14] Available online at http://oehha.ca.gov/fish.html.

1.5.2.5.2 Aquatic Toxicity

Beyond these descriptions of water quality based on individual or classes of pollutants, another metric is toxicity to aquatic organisms. Aquatic toxicity is measured by subjecting sensitive test organisms to ambient water samples. The results of aquatic toxicity monitoring in the Sacramento River Watershed over the period 1998-2004 found significant toxicity to test organisms occurred in surface waters throughout the watershed.

DWR monitored sites on the Sacramento River and Feather River more recently and found similarly high incidences of toxicity, but follow-up tests to determine the cause of the toxicity were unsuccessful. These data are not available online.

1.5.2.5.3 Pesticides

Pesticide (a term used here generally to include algaecides, herbicides, fungicides, and plant/ insect growth regulators) use within the Sacramento Valley is high and application occurs during as much as 75 percent of the year. Pesticides can be transported from the fields to surface water by irrigation and winter storm runoff or to ground water by percolation of rain or irrigation water. Three classes of pesticides have been applied in the region over the last several decades (in chronological order):

- PCBs and legacy organochlorine pesticides, such as DDT, were banned in the 1970s yet continue to be detected in streambed sediments and the tissues of aquatic organisms because of their persistent and bioaccumulating characteristics. However, no controllable sources have been identified.
- Organophosphate (OP) insecticides such as diazinon, chlorpyrifos, and malathion are toxic at low concentrations to some aquatic organisms. OP concentrations were a significant problem downstream of irrigated farmland and urban areas, but have significantly decreased in recent years as their use has been phased out.
- In 2006, there were 161 pesticides applied in amounts of five hundred kilograms or more (active ingredient) within the larger San Francisco Estuary watershed[15], most of which have never been monitored in water. Most (although not all) of the current-use pesticides can be grouped into classes of similar structures and properties. The classes include carbamates, thio- and dithiocarbamates, chlorinated hydrocarbons (some are still being used), organophosphates, phenoxy and benzoic acid herbicides, pyrethroids, triazines, and ureas.

[15] Kuivila KM, Hladik ML. 2008. "Understanding the occurrence and transport of current-use pesticides in the San Francisco Estuary Watershed." San Francisco Estuary and Watershed Science 6(3): article 2. Available from: http://repositories.cdlib.org/jmie/sfews/vol6/iss3/art2.

1.5.2.5.4 Nutrients

Infants below six months in age who drink water containing excessive concentrations of nitrate could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue baby syndrome. Nitrate, added as a fertilizer, can drain off fields or seep below the root zone to contaminate surface and groundwater supplies. Nutrient concentrations such as nitrate are generally low throughout the Sacramento River watershed, and drinking-water standards for nitrate are not exceeded in surface waters.

Excess algal growth, which is usually related to higher-than-normal nutrient inputs to streams, is a water-quality concern when the algae affect the aquatic community (because of dissolved oxygen depletion), reduce recreational values, or contribute to taste and odor problems in drinking water. Such effects are not widely reported in the Sacramento River or its major tributaries.

1.5.2.5.5 Drinking Water Constituents of Concern

Drinking water sources that contain elevated concentrations of dissolved organic carbon or bromide can produce unsafe (carcinogenic) levels of trihalomethanes and haloacetic acids if chlorinated for drinking water. Because levels of organic carbon are generally low in the watershed, trihalomethanes are not a significant concern in the region. The main stem of the Sacramento River and its major tributaries (the Yuba, Feather and American rivers) consistently meet water quality goals and objectives for drinking water-related pathogens. Turbidity, a measure of filter-clogging suspended solids in the water, is also generally low.

1.5.2.5.6 Salts

Accumulation of salts in groundwater can impact drinking water quality, while accumulation of salts on crop lands can reduce agricultural productivity. The amount of dissolved solids in the Sacramento River and its major tributaries is generally low. Higher concentrations of dissolved solids tend to occur in agricultural irrigation drains such as Sacramento Slough and Colusa Basin Drain.

1.5.3 Potential Future Water Quality Conditions

This section speculates how water quality conditions in the IRWM region could change in the future based on climate change, larger-scale management efforts, and IRWMP project implementation. Potential effects of IRWMP projects are addressed qualitatively for categories of projects rather than quantitatively for any particular project. For a description of the IRWMP projects, refer to Chapter 5 Potential Projects and Prioritization.

1.5.3.1 Potential Water Quality Changes Caused by Climate Change

Much of the landscape surrounding the major reservoirs of the NSV region, including Shasta Lake, Whiskeytown Lake, Lake Oroville, Englebright Reservoir, New Bullards Bar Reservoir, and Black Butte Reservoir, is dominated by oak and conifer woodlands and grasslands. These reservoirs are located in the steep foothill and mountainous terrain of the Sierra Nevada, Klamath Mountains, and Coast Ranges where large wildfires are common and

where wildfire suppression is a major challenge. Wildfires could be exacerbated by future climate change. In the short term, wildfires can lead to increased sediment loads and turbidity, which require increased filtration at water treatment plants. In the long term, increased debris and sediment entering reservoirs after wildfires will reduce a reservoir's lifespan. Increased erosion associated with increased wildfires will increase ambient turbidity (decreasing predation for site feeders) and sediment loads (covering fish beds with sediments).

The North Fork Feather River is currently listed as impaired by high temperatures. Higher regional temperatures will reduce reservoir operational flexibility needed to meet fisheries habitat criteria, decrease equilibrium dissolved oxygen concentrations, and decrease available nutrients.

Over the past 100 years, the fraction of the annual runoff that occurs during April-July has decreased by 23 percent in the Sacramento River watershed (California Climate Change Center, 2009. "The Future is Now: An Update on Climate Change Science Impacts and Response Options for California." May. http://www.energy.ca.gov/2008publications/CEC-500-2008-071/CEC-500-2008-071.PDF). Lower summer-season flows decrease a waterbody's assimilative capacity by both reducing the diluting flow volume and reducing the ambient water quality.

1.5.3.2 Regional Water Quality Management Efforts

Three ongoing Central Valley-wide efforts may impact water quality management in the region in the future:

- CV-SALTS (www.cvsalinity.org/) aims to develop a workable, comprehensive plan to address salinity, including nitrates, throughout the region in a comprehensive, consistent, and sustainable manner.
- Drinking Water Policy Workgroup (www.waterboards.ca.gov/rwqcb5/water_issues/drinking_water_policy/) is developing a drinking water policy for surface waters in the Central Valley.
- Statewide Mercury Policy (www.waterboards.ca.gov/water_issues/programs/mercury/) regulators from around the state are working to develop a regulatory program to address mercury contamination in California reservoirs, as part of a larger policy to control mercury in all of the state's waters.

The impacts that these multi-regional programs may have on key water quality issues is listed in Table 1-20.

Table 1-20. Potential Water Quality Impacts of Multi-Region Programs, by Key Water Quality Issue

Key WQ Issue	CV-SALTS	Drinking Water Policy Workgroup	Statewide Mercury Policy
Mercury			+
Aquatic toxicity			
Pesticides			
Nutrients	+	+	
Drinking Water Constituents of Concern	+	+	
Salts	+	+	

Note: "+" indicates likely benefits and blank indicates minimal impacts.

1.5.3.3 Water Quality Effects of IRWMP Projects by Resource Management Strategy

A survey of the most often cited Resource Management Strategies (RMSs) is discussed in Chapter 4. The top five RMSs are:

- Watershed Management (55 projects)
- Ecosystem Restoration (52 projects)
- Pollution Prevention (36 projects)
- Conveyance – Regional/Local (34 projects)
- Agricultural Water Use Efficiency (33 projects)

The purpose of this section is to discuss the potential impacts that projects implementing these general categories of RMSs may have on water quality in the IRWM region.

The top five RMSs and their potential relationship to the key water quality issues summarized above are shown in Table 1-21. Where, what type, and how much benefit would be generated—or impact cause—by any particular project depends on its nature, location, and scale.

Table 1-21. Potential Water Quality Impacts of Major RMS, by Key Water Quality Issue

Key WQ Issue	Watershed Management	Ecosystem Restoration	Pollution Prevention	Conveyance – Regional/ local	Agricultural Water Use Efficiency
Mercury	+	+/–	+		
Aquatic toxicity	+	+	+		+
Pesticides	+		+		+
Nutrients	+		+	+/–	+
Drinking Water Constituents of Concern	+	+/–	+	+/–	+
Salts			+/–	+/–	+/–

Note: "+" indicates likely benefits, "+/-" indicates impacts would be project-dependent, and blank indicates minimal impacts.

Additional descriptions of the potential impacts of the top five RMSs are provided below, in order of frequency cited.

1.5.3.3.1 Watershed Management

The objective of watershed management as a resource strategy is to improve conditions in the watershed for various benefits. In general terms, watershed projects that encourage native land cover and stabilize erodible soil will reduce sediment loads to streams. Reduced sediment loads may positively impact several key water quality issues: nutrients, pesticides, and mercury.

1.5.3.3.2 Ecosystem Restoration

The objective of ecosystem restoration as a resource strategy is to improve habitat value regardless—or in spite—of water quality conditions. Nonetheless, restoration projects could benefit water quality by improving floodplain connectivity (trapping sediments and sequestering or degrading toxic compounds). A potentially significant negative impact of increased wetland-type habitat is increased methylmercury production[16].

1.5.3.3.3 Pollution Prevention

The concept of pollution prevention is to start at the source: prevent pollution from entering the environment rather than trying to remove it downstream. Success of this strategy depends on current, controllable human actions being the dominant sources. In urban areas, pollution prevention practices typically address household, industrial, municipal and construction/development activities. Pollutants commonly controlled by pollution prevention measures in urban areas include sediment, pesticides, hydrocarbons, and heavy metals.

In rural areas, pollution prevention measures typically address fertilizer and pesticide applications, which enter waterways by excessive spraying or runoff. Major sources of mercury pollution include natural geothermal mineral springs by Mt. Lassen, abandoned gold mines in the Sierra Nevada, and in the Trinity Mountains, and native soils in the Coast Range. Adequately controlling such sources is a monumental challenge.

1.5.3.3.4 Conveyance – Regional / Local

Conveyance as a resource strategy involves re-routing water from its natural course to another area where it can be used more beneficially. Conveyance structures may improve water quality in the area receiving its water. Insofar as the dilution of downstream pollution sources would be reduced by a diversion of high-quality water, downstream water quality could be impacted.

[16] Brumbaugh, W.G., D.P. Krabbenhoft, D.R. Helsel, J.G. Wiener, and K.R. Echols. 2001. A national pilot study of mercury contamination of aquatic ecosystems along multiple gradients: Bioaccumulation in fish: U.S. Geological Survey USGS/BRD/BSR-2001-0009, 26 pp.

1.5.3.3.5 Agricultural Water Use Efficiency

Projects that improve agricultural water use efficiency will reduce agricultural runoff volumes and seepage (recharge) into groundwater basins. Reduced runoff volumes generally lead to reduced loads of salts (including nitrate), sediment (with associated pesticides, nutrients, and mercury), and organic carbon discharged to receiving waters. A potential negative impact of efficiency is increased salt content on farmland, which could reduce agricultural productivity.

An additional concern is management of agricultural irrigation tailwater. Project ID 21 – Irrigated Cropland Water Efficiency Projects includes investigations to improve water efficiency including tailwater management.

1.5.3.3.6 Other RMS Projects

In addition to the top five RMSs, some of the three conditions mentioned above (urban runoff, abandoned mines, and municipal wastewater discharges) are also addressed by the selected projects. Thirteen projects have identified the Urban Runoff Management RMS as being achieved. As mentioned above, the Spring Creek Dam impounds Spring Creek and South Fork Spring Creek to form Spring Creek Reservoir. The Bureau of Reclamation constructed this impoundment to capture acid mine drainage from the Iron Mountain Mine. The water is treated and released to flow into the Sacramento River. No projects selected at this time specifically identify management of abandoned mines. Seven projects identify the Recycled Municipal Effluent RMS as being achieved.

In addition, Projects 43 (North Sac Valley Regional Water Quality Assessment Project) and 97 (Water Quality Assessment of NSV Watersheds), sponsored by the California Urban Streams Alliance and the CSU Chico Research Foundation – Aquatic Bioassessment Laboratory, both look to improve water quality. Project 43 would accomplish this through studying watershed health and management and ecosystem restoration. Project 97 would accomplish this through augmentation of the State Water Board's Perennial Streams Assessment.

1.5.4 Monitoring and Reporting

Various current monitoring and reporting efforts are noted in this section. All of these activities operate at a larger geographic scale than the NSV IRWM region, thus providing some inter-regional context.

1.5.4.1 Irrigated Agricultural Runoff Monitoring

There are two main regulatory programs related to irrigated agriculture in the watershed, the Rice Pesticides Program and the Irrigated Lands Regulatory Program, which includes a *Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands*. The Rice Pesticides Program, which focuses on the herbicide thiobencarb, prohibits discharge of rice field drainage unless specific management practices are implemented. The California Rice Commission monitors rice drains at key locations in the lower rice-producing areas. The Sacramento Valley Water Quality Coalition monitors for other irrigated agriculture.

1.5.4.2 Data Interpretation

The California "My Water Quality Portal" (http://www.waterboards.ca.gov/mywaterquality/) provides a convenient set of web-based tools for answering basic questions about local water quality. This website is a work in progress being led by the California Water Quality Monitoring Council. The questions posed on the website and the status of the data include:

- Is our water safe to drink? Status - Not yet available.
- Is it safe to swim in our waters? Status - Only Shasta County within the six-county region has data presented.
- Is it safe to eat fish and shellfish from our waters? Status - Shows fish consumption advisories, fish contaminant data, and fish consumption-related impaired waters and TMDLs for each county.
- Are our aquatic ecosystems healthy? Status - addresses wetlands and streams/rivers/lakes separately. Estuaries and Ocean to be added in the future.
- What stressors and processes affect our water quality? Status - Not yet available.

1.5.4.3 Sacramento River Watershed-wide Regional Monitoring Program

The Sacramento River Watershed Program is launching an effort to develop a sustainable, coordinated regional monitoring program (RMP) for the entire Sacramento River watershed. The RMP could have multiple objectives, including to:

- Communicate and coordinate participants' monitoring activities to prioritize and focus efforts;
- Monitor ambient water quality and conduct special studies within the watershed in a science-based, watershed approach and contribute those data to a comprehensive water quality and sediment monitoring database;
- Provide regular, integrative assessment reports and program evaluations; and
- Respond to new information and changing priorities to inform decision-makers and program managers.

An RMP could serve many purposes for the NSV region, including to:

- Determine background pollutant concentrations for permitting and assessing compliance with water quality standards;
- Understand pollutant sources, transport, and transformations, linking water quality to beneficial uses and sources to impairment;
- Establish baseline conditions for water quality, sediment quality, biodiversity and ecological health;
- Evaluate emerging (currently unregulated) contaminants; and,
- Evaluate status and trends in conditions over time.

1.6 SOCIAL AND CULTURAL MAKEUP

General descriptions of the counties, the prevalence of disadvantaged communities, economic conditions and trends, and involvement of Tribal communities are described in this section.

1.6.1 General Descriptions

General descriptions of the counties' demographics are provided below.

1.6.1.1 Butte County

Butte County has a strong economy based in its agricultural, commercial, industrial, educational and professional industries. The County encourages economic development within these industries, and the development and enrichment of new industries that are job-creating and environmentally sustainable.

As of January 2009, the population of unincorporated Butte County was approximately 83,900 people. Although the population of the unincorporated portion of Butte County has generally been declining since 1990, the total county population has been increasing. The root cause for the unincorporated population decrease is annexation to Butte County's municipalities.

The median age of unincorporated Butte County residents is approximately 40 years, which is higher than the overall county and statewide median age of approximately 35 years. This higher median age in the unincorporated area is attributable to a relatively high percentage of the population that is over 55 years of age, as retirees find Butte County an appealing retirement home location. Over 83 percent of the total county's population is white. People who identify themselves as two or more races or a race that is not listed by the Census make up about 10 percent of the population, and the remaining 7 percent consists of African American, American Indian, Asian, Native Hawaiian and other Pacific Islander people.

1.6.1.2 Colusa County

The Colusa County General Plan EIR indicates that Colusa County encompasses approximately 1,156 square miles in north central California, of which 1,151 square miles are land and six square miles are water. The eastern part of the county is located in the Sacramento Valley, with the Sacramento River flowing along the eastern edge of the county; the western portion is in the Klamath/North Coast Range.

Existing land uses in Colusa County are primarily agricultural. Colusa County houses some of the richest rice-producing land in the country, as well as important waterfowl habitat along the Pacific Flyway. Major commodities include rice, almonds, processing tomatoes and seed crops. The land use pattern is typical of rural counties of the Sacramento Valley. A checkerboard of large acreage farms dominates the eastern half of the County, with land ownership and road alignments mostly following square mile section lines. The land is generally flat and is covered by fields of rice, orchards, and row crops. Views are expansive, framed only by the rolling foothills of the Coast Range on the west and jagged peaks of the Sutter Buttes on the east. As one moves west through the county, cultivated fields give way to vast rangeland, and the flat terrain transitions into rolling hills and upland valleys. Further west, the land becomes yet more rugged

and wild, as it climbs into the Coastal Mountain Range, until finally reaching the summit of Snow Mountain in the wilderness area at 7,000 feet above the valley floor.

There are two incorporated cities in Colusa County: Colusa and Williams, and the unincorporated communities of Arbuckle, College City, Grimes, Maxwell, Princeton, and Stonyford.

The 2010 United States Census reported that Colusa County had a population of 21,419. The racial makeup of Colusa County was 13,854 (64.7 percent) White, 195 (0.9 percent) African American, 419 (2.0 percent) Native American, 281 (1.3 percent) Asian, 68 (0.3 percent) Pacific Islander, 5,838 (27.3 percent) from other races, and 764 (3.6 percent) from two or more races. Hispanic or Latino of any race were 11,804 persons (55.1 percent).

1.6.1.3 Glenn County

With over 1,188 farms, agriculture remains the primary source of Glenn County's economy. Major commodities include rice, almonds, walnuts, milk products, prunes and livestock. Glenn County was incorporated on March 5, 1891. The County seat, Willows, was created March 11, 1891. Glenn County was developed out of the northern portion of Colusa County and was named for Dr. Hugh J. Glenn, who was the largest wheat farmer in the state during his lifetime, and a man of great prominence in political and commercial life in California.

As of 2010, it had a population of 28,122. The racial makeup of Glenn County was 19,990 (71.1 percent) White, 231 (0.8 percent) African American, 619 (2.2 percent) Native American, 722 (2.6 percent) Asian, 24 (0.1 percent) Pacific Islander, 5,522 (19.6 percent) from other races, and 1,014 (3.6 percent) from two or more races. Hispanic or Latino of any race were 10,539 persons (37.5 percent).

1.6.1.4 Shasta County

The cities of Anderson, Redding and Shasta Lake along the I-5 corridor are the primary trade and commerce center for the far north central and northeastern portion of California. Indicators of sustained growth in the cities and County as a whole include increases in education employment accompanied by expansion of the construction, services, retail trade, and manufacturing industries.

Outdoor recreation is also an important part of the Shasta County economy. Visitors enjoy a variety of outdoor activities and a configuration of dams provides year-round hydroelectric power and water supply for agricultural and industrial production.

Strawberries, a major crop in Shasta County, are exported internationally. Apiary products, exported to Canada, and orchard crops are just a few of the important sources of the County's agricultural income. Vast private and public timberlands provide jobs in the timber and wood products industry. Continued job growth is expected in all economic sectors, except lumber and wood products. Expansion of the services and retail sales sectors are expected to continue domination of the Shasta County economy in the near future, while lumber and wood products are expected to continue to decline.

The 2010 United States Census reported that Shasta County had a population of 177,223. The racial makeup of Shasta County was 153,726 (86.7 percent) White, 1,548 (0.9 percent) African American, 4,950 (2.8 percent) Native American, 4,391 (2.5 percent) Asian, 271 (0.2 percent) Pacific Islander, 4,501 (2.5 percent) from other races, and 7,836 (4.4 percent) from two or more races. Hispanic or Latino of any race were 14,878 persons (8.4 percent).

1.6.1.5 Sutter County

From the Sutter County General Plan, Sutter County is located in north central California within the Sacramento Valley and is part of the six-county greater Sacramento region. The entire County, including incorporated cities, covers approximately 607 square miles with the unincorporated area totaling approximately 592 square miles. Sutter County's jurisdictional boundaries are generally defined by Yolo and Colusa counties to the west, Butte County to the north, Yuba and Placer counties to the east, and Sacramento County to the south. Sutter County was one of the original twenty-seven counties of California, created in 1850 at the time of statehood. Sutter County is a general law county.

Sutter County's landscape is dominated by extensive agricultural areas, significant natural and recreational resources, and relatively low population density. The County can generally be divided into two distinct geographic areas: the valley floor and the Sutter Buttes. The valley floor covers a majority of the County and is primarily flat, dominated by farming related operations and including the County's cities and rural communities. The Sutter Buttes, often referred to as the world's smallest mountain range, rise out of the valley floor in the northern portion of the County and are the symbolic focal point of the County.

Sutter County has experienced moderate growth over the last two decades, with its incorporated cities, Yuba City and Live Oak, receiving the majority of that growth. Similar to other areas in the region, Sutter County is encountering new growth pressures. These pressures are reflective of the County's quality of life, relative affordability, and attractiveness to people and businesses relocating from the Bay Area and Sacramento.

The 2010 United States Census reported that Sutter County had a population of 94,737. The racial makeup of Sutter County was 57,749 (61.0 percent) White, 1,919 (2.0 percent) African American, 1,365 (1.4 percent) Native American, 13,663 (14.4 percent) Asian, 281 (0.3 percent) Pacific Islander, 14,463 (15.3 percent) from other races, and 5,297 (5.6 percent) from two or more races. Hispanic or Latino of any race were 27,251 persons (28.8 percent).

1.6.1.6 Tehama County

From the Tehama County General Plan, Tehama County's location in the upper Sacramento Valley has cultivated its development as an agrarian and rural community. As of January 2008, the County boasted a population of approximately 62,419 people, as estimated by the California Department of Finance (DOF), ranking it 41st among the 58 counties in California. In 2000, the County boasted a population of approximately 55,918, as estimated by the DOF. Since 2000, the population of Tehama County has grown by approximately 6,501 people, resulting in an average annual increase of 928.7 people (1.48 percent).

A large part of the County's population, approximately 34 percent (21,054 persons according to the DOF), reside in the Cities of Red Bluff and Corning, with the remainder distributed throughout the City of Tehama and several unincorporated communities and rural areas throughout the County.

Tehama County's strong agricultural background grew from the fertile valley lands along the Sacramento River and the expansive foothills where grazing activities are prevalent. Development and growth over the years were possible due to the ability to move goods up and down the Sacramento River and, in more recent times, Interstate 5. Recently, growth pressures from outlying counties have spurred new housing and commercial developments.

The 2010 United States Census reported that Tehama County had a population of 63,463. The racial makeup of Tehama County was 51,721 (81.5 percent) White, 406 (0.6 percent) African American, 1,644 (2.6 percent) Native American, 656 (1.0 percent) Asian, 76 (0.1 percent) Pacific Islander, 6,258 (9.9 percent) from other races, and 2,702 (4.3 percent) from two or more races. Hispanic or Latino of any race were 13,906 persons (21.9 percent).

1.6.2 Disadvantaged Communities

Large portions of the NSV region are "disadvantaged" according to DWR's Proposition 84 median household income threshold level of 80 percent of the Statewide average. According to IRWM Guidelines, the DAC threshold is $48,706, based on American Community Survey data for the years 2006-2010. Therefore, many of the projects in the NSV IRWMP will serve DACs. To quantify the number and location of DAC's in the IRWM region, the NSV RWMG used GIS tools to plot published census data from 2000 indicating mean household income relative to the defined poverty level. The mapped data were then used by the planning staff in each County to define DACs for which focused outreach was conducted. The identified DACs are shown on Figure 1-15 (located at the end of Chapter 1). Additional census data from 2007 shows that five of the six counties in the NSV region have a higher percentage of individuals living below the defined level of poverty than the statewide average of 12.4 percent. The average for each county is shown in Table 1-22.

Table 1-22. Comparison of Countywide Poverty Level to Statewide Average

County	% of Individuals Living Below the Poverty Level (2007 Census Data)	Above or Below the Statewide Average (12.4%)
Butte	17.1	Above
Colusa	12.7	Slightly Above
Glenn	15.8	Above
Shasta	12.7	Slightly Above
Sutter	12.2	Slightly Below
Tehama	19.3	Above

The NSV IRWMP members are committed to identifying, inviting, and encouraging DACs to participate in the planning process. As shown on Figure 1-15 (located at the end of Chapter 1), DACs are located in the foothill and intermountain areas, in addition to the valley floor. Foothill and intermountain areas exhibit different resource management issues or priorities than the valley floor due to differences in climate, geology, hydrology, and socio-economic factors. The NSV IRWMP members are cognizant of these potential differences and are committed to ensuring a balance across the planning leadership, in the advisory and public input processes, and engagement of DACs.

On a more specific level, three counties have made significant prior efforts to engage DACs within their county. Examples from Butte, Shasta, and Tehama Counties are described below.

1.6.2.1 Butte County

Butte County implemented a "go-to-them" strategy for the Climate Action Plan (CAP) project. To reach out to disadvantaged citizens who have never been involved in the process, the County utilized approaches that had proven successful during the General Plan 2030 process:

- Work with County staff to identify groups and organizations active in the community
- Create a presentation template that County staff can use when speaking to these groups.
- Expand the web presence for the project using social networking web sites such as Facebook and Twitter
- Develop notices and flyers for distribution through various channels including schools, churches, community centers, libraries, local businesses, non-profits, faith organizations, and newspapers.
- Hold two community workshops, four public meetings and public hearings throughout the process of developing the CAP.

1.6.2.2 Shasta County

Shasta County has conducted significant outreach to DACs. All DACs in Shasta County were approached during preparation of Shasta County's 1997 Water Resources Master Plan Phase 1 Report: Current and Future Water Needs. During development of this NSV IRWM Plan, the Shasta County TAC members gave presentations to the governing boards of most water districts. Many of the water districts are coincident with a particular disadvantaged community. These water district meetings were moderately attended. Additional outreach was conducted in the City of Shasta Lake, Redding and Anderson City Council meetings.

Shasta County has also conducted a successful outreach program for long-term land use planning using resources in the County's Department of Public Health. For example, the County has translation services that can be used to gather survey data from Mien and Spanish speaking individuals. The County's translation resources are used where there is a nexus between a particular planning effort and public health.

1.6.2.3 Tehama County

Tehama County is rural, with approximately 70,000 residents in 13 communities with their own zip codes plus additional smaller communities. Nearly all of the identified communities in Tehama County are economically disadvantaged.

These communities have a variety of water resource management issues and priorities due to substantial differences in their geographic, hydrologic, climate, and economic settings. There are approximately 50 Community Service Districts within Tehama County that provide drinking water to its residents.

The County has already engaged many DACs in water resource planning processes, and has identified a number of critical water resource management issues. Some issues are listed here to illustrate how working effectively with DACs and addressing the needs of DACs will be critical to the success of the NSV IRWMP:

- The Ponderosa Sky View Water District Development is in need of additional drinking water resources.
- The community of Mineral derives its drinking water from a spring system, and needs to address associated supply limitations and vulnerabilities.
- The community of Manton must address water supply reliability. A 2008 proposal titled "The Big Idea" was introduced by members of the Manton community to achieve multiple benefits such as more reliable water supplies for potable use, irrigation, and fire protection; and to stimulate the local economy; through integrated surface water and groundwater management, including elements of water use efficiency, conjunctive water management, possible water transfers, and others.
- The Rio Alto Water District provides water and wastewater services in Lake California, and is currently under a Cease and Desist Order related to their effluent discharge to the Sacramento River. It is high priority for the community to develop an alternative means of managing the community's wastewater.
- The community of Los Molinos is a small but densely populated community that relies on groundwater for domestic use. The entire community housing depends upon septic systems and there is potential need for a wastewater treatment facility to better meet the community's needs and to protect groundwater and surface water quality.

1.6.3 Economic Conditions and Trends

Agriculture has had a major influence on the landscape and its economy, and was the area's primary industry in the nineteenth and twentieth centuries. Manufacturing and service industries also flourished during the twentieth century, as exemplified by canning, lumber and wood-processing enterprises.

Agriculture generates considerable economic activity and trends indicate that agriculture will continue to maintain a strong position within the IRWMP area's economy. Agriculture also supports other industrial sectors, such as manufacturing, transportation and warehousing, which

all generate a significant portion of the total sales volume in unincorporated areas. Other strong sales sectors in unincorporated areas are construction, wholesale and retail trades, and educational services.

Beginning in 2008, and continuing at the time that this IRWMP is published, the IRWMP area, like the rest of the state and country, has been experiencing a significant economic downturn. This recession affects virtually all of the business sectors in the area, and has caused significant fiscal strains.

1.6.4 Outreach to Tribal Communities

Consistent with the 2009 Update to the California Water Plan, the NSV IRWMP uses the term "California Native American Tribe" to signify all indigenous communities of California, including those that are non-federally recognized and federally recognized. In addition to the separate efforts related to tribal notification and overall stakeholder outreach, the IRWMP process worked with DWR's Government and Community Liaison to develop questions and focused support including emerging changes to Tribal coordination. Coordination, interaction and other responsibilities related to federal, state and local governmental programs are undergoing great changes as they relate to water issues. The locations of the California Native American Tribes with lands within the NSV Region are shown in Figure 1-16 (located at the end of Chapter 1).

The DWR Tribal Communication Committee's Tribal Communication Plan addresses the importance of Tribal knowledge of and engagement in water planning processes, including those at the local level such as IRWMPs. The 2009 Update to the California Water Plan includes a specific recommended action related to participation of Tribes in local water planning, including IRWMPs.

The NSV RWMG recognizes the importance and uniqueness of engaging Tribes that exist within the boundaries of the NSV RWMG. The NSV RWMG has notified Tribes of the NSV IRWM planning process as suggested by the IRWM Guidelines. The TAC employed the Office of Planning and Research's procedures for tribal consultation for General Plans and Specific Plans as guidance. The TAC first confirmed which tribes have traditional lands located within the NSV region by working with the Native American Heritage Commission (NAHC).

The TAC notified Tribes of the IRWMP process and invited them to participate in the stakeholder input meetings. The NSV RWMG also attempted to involve Tribes in more direct participation in the NSV IRWMP process, including an initial meeting with Tribal representatives in three different places throughout the region. Initial meeting locations were in Colusa, Butte, and Shasta counties. A higher level of outreach than past planning efforts was completed, both with Tribes and all water interests in the NSV region. Tribal participation is low, however, a representative from the Colusa Indian Community Council is a member of the NSV IRWMP TAC and has been attending the NSV Board Meetings. A representative from the Cortina Rancheria also frequently attends meetings.

California Native American Tribe Notification is part of DWR's CEQA review for projects requesting funding under Proposition 84. All applicable projects adopted under the NSV IRWMP will follow the formal notification required by PRC 75102.

1.7 MAJOR WATER RELATED OBJECTIVES AND CONFLICTS

The major water related objectives and conflicts that have been identified by the NSV RWMG are described in detail in Chapter 2 – Objectives, and summarized below.

1.7.1 Goals and Objectives

As a basis for the broad category goals and specific objectives identified in this IRWMP, the following statement of intent was established for the NSV IRWMP:

> *To establish a regional collaborative structure with the objective of ensuring an affordable, sustainable water supply that supports agricultural, business, environmental, recreational, and domestic needs of the NSV.*

The IRWMG developed six primary goals to be accomplished through execution of the IRWMP. The six goals are:

- Water Supply Reliability
- Flood Protection and Planning
- Water Quality Protection and Enhancement
- Watershed Protection and Management
- Integrated Regional Water Management Sustainability
- Public Education and Information Dissemination

The IRWMG then developed specific objectives for each of these goals. Each goal and objective is drafted to support and further the region's statement of intent for the IRWMP. As context for the detailed goals and objectives that follow, it is important to understand that this IRWMP was created by local entities within the region for the benefit of those living, operating, and recreating within the region, as defined in the IRWMP. Increasing water demands and limited supplies outside the NSV region have resulted in pressure to export water from the NSV Region. To protect the NSV water supplies, the RWMG adopted twelve Objectives associated with the first Goal, Water Supply Reliability. The Objectives associated with this first Goal are discussed in detail in Chapter 2. Several of the Objectives directly relate to the protection of surface and groundwater resources for local use, development of out-of-region water transfer protocols that recognize the NSV region as having first priority for use. Other Objectives emphasize maintaining statutory protections for water rights, including, but not limited to, the protections set forth in California Water Code sections 10505, 10505:5, 11128, 11460, 11463, and 12200.

1.7.2 Implementation Strategies

To accomplish the goals, the IRWM team developed procedures for project solicitation and selection. One of the processes was the creation of an NSV Board Project Review (PR) Subcommittee. The PR Subcommittee developed an online submission process to solicit project and program proposals for possible incorporation into the NSV IRWM Plan. The Proposal Instructions provided detailed step-by-step directions regarding the submittal and review process, and informed potential project proponents that the submittal application requires the submittal of information regarding the proposed project, to provide reviewers sufficient information to determine if the project met criteria for potential inclusion into the IRWMP projects and programs database.

Factors that were considered in the project review included:

- Number of NSV IRWMP Objectives addressed
- Multi-Benefit (multiple goals, partners, and/or counties)
- Readiness to proceed/project status
- Local contribution to cost share
- Benefits to Disadvantaged Communities
- Benefits to Tribes
- Economic feasibility
- Number of statewide priorities addressed
- Number of resource management strategies utilized
- Ability of the project to assess vulnerabilities to climate change, adapt to the effects of climate change, or mitigate climate change

The development of the project submittal, review, and acceptance process is described in detail in Chapter 5 – Potential Projects and Prioritization. Procedures for soliciting, submitting, reviewing, and adding projects in the future, after adoption of this IRWMP, are also discussed in Chapter 5.

As described in Chapter 5, the project selection process was developed to ensure that the NSV IRWMP is in line with local water planning documents in the NSV region since the regional plan should not supersede local planning, but instead compile and incorporate the pertinent points of local plans, including groundwater management plans, Urban Water Management Plans, water supply assessments, agricultural water management plans, City and County general planning, and other resource management planning.

1.7.3 Implementation Projects

The projects that were selected for inclusion in this NSV IRWMP were grouped into the following five categories:

1. Shovel-Ready, Discrete Projects (includes hard project permitting, construction/implementation - may include mitigation monitoring associated with implementation)
2. Planning Projects (includes plans, studies, design, environmental permitting/documentation)
3. New Programs/Projects, Education and Research (includes Concepts, Feasibility Studies, Research and Education Programs)
4. Continuing/Ongoing Existing Projects/Programs (includes maintenance, monitoring)
5. Staffing/Support

The projects are described in detail in Chapter 5. A total of 75 projects were ranked for inclusion in the IRWMP. In addition, 34 projects were listed as "Projects-to-Track". "Projects-to-Track" were solicited to be included in the NSV IRWMP to simply acknowledge projects in the region that may be on the horizon for future consideration, but at this time are only concept projects, and are not yet developed or defined sufficiently to be ranked according to the criteria of the prioritization process. Some of these projects will not be seeking funding and are listed because they may affect the NSV IRWM region.

1.7.4 Technical Analysis

The objectives of this IRWMP and the other information contained within it are based on a variety of existing technical information, technical informational gaps, and technical analyses.

1.7.4.1 Technical Information

The technical information relied upon for the development of this IRWMP includes population data, groundwater level data obtained through DWR, surface and groundwater use estimates, water quality information, water demands, land use information obtained through DWR, demographic information, infrastructure details and general descriptions from water purveyors.

1.7.4.2 Technical Information Gaps

Despite the collection of available technical information, there are still gaps in technical information that prevent optimal water resources management. The lack of technical information led to the development of several of the foundational NSV IRWMP objectives. For example, Objectives 1-1 (Document baseline conditions and trends for surface water and groundwater resources) and 1-2 (quantify current and future water demands), which are discussed in Chapter 2, were established due to the need for more technical information related to the baseline water resource and demand conditions. Without this information, many of the other important objectives cannot be achieved – or at least can't be quantitatively measured.

The specific technical gaps that need to be filled before other IRWMP objectives can be achieved include documentation of surface and groundwater supplies, trends, and use as well as more information on groundwater levels, groundwater recharge, groundwater quality, inelastic land subsidence, flood risks, region-wide water quality, and scientific information on aquatic, riparian, and watershed resources. In addition there is a need for regional water transfer guidelines based on technical information. Currently water transfers are considered by county-level jurisdictions and don't necessarily take into consideration the region-wide water resource implications of water transfers.

1.7.4.3 Technical Analyses

The primary technical method that was used to assess the quantitative water resource picture of the region was the development of a region-wide water balance, discussed above. Based on the outcomes of this water balance, it has become clear that the water management needs of the region, over the next 20 years, center on decreasing the amount of water flowing out of the region.

The technical methodologies used to analyze other technical information and data sets are shown in Table 1-23, below. As evident from this table, much of the information was analyzed visually through GIS mapping. Due to the large area covered by the region's boundaries, GIS mapping proved to be an efficient and effective way to view data and data trends in the region.

Table 1-23. Technical Analyses Used in IRWMP

Data or Study	Analysis Method	Results/Derived Information	Use in IRWMP	Resource or Source
Population Growth Study	Statistical analysis	Future population	Used to estimate future water demand	
Data Collection Study	Interview of County and Irrigation District staff	Summary of data currently collected in the region	Data Management section	County and Irrigation District staff
Land Use Data	GIS mapping	Summary of current land use patterns in the region	Region Description section	California DWR
Demographics Data	GIS mapping	Median household income and identification of disadvantaged communities	Region Description and Finance section	U.S. Census Bureau via California Department of Finance
Geology Data	GIS mapping	Location of different geologic formations and deposits throughout the region	Region Description section	Helley and Harwood's 1985 "Geologic Map of Late Cenozoic Deposits of the Sacramento Valley and Northern Sierran Foothills, California" and California DWR Bulletin 118 - "California's Groundwater"
Irrigation Water Source Data	GIS mapping	Surface versus groundwater source of irrigation water throughout region	Region Description section	California DWR Land use Survey Program
Groundwater Level and Capacity Study			Region Description section	

1.8 HISTORY OF IRWMP REGIONAL BOUNDARY

Since the inception of DWR's IRWMP grant program, DWR has encouraged and supported the formation of self-determined IRWM planning regions. However, DWR recognizes that IRWM regions are dynamic and therefore may evolve over time as more information becomes available and different partnerships are formed as a result of additional research.

In response to the challenges associated with a cookie-cutter approach to IRWM, DWR developed the Regional Acceptance Process (RAP) as a mechanism to evaluate and accept both existing and developing IRWM regions for the purposes of the Proposition 84 IRWM Program (California Water Code (CWC) §10541 (f) effective March 1, 2009. The RAP guidelines include the definition of a region as, "At a minimum, a region is defined as a contiguous geographic area encompassing the service areas of multiple local agencies; is defined to maximize the opportunities to integrate water management activities; and effectively integrates water management programs and projects within a hydrologic region as defined in the California Water Plan, the Regional Water Quality Control Board (RWQCB) region, or subdivision or other region specifically identified by DWR (Public Resources Code §75026.(b) (1))." These guidelines are in response to SB1 (Perata, Stats. 2008, ch.1; eff. March 1, 2009), also known as the "Integrated Regional Water Management Planning Act," which provided guidelines to DWR about what an IRWM must contain and what it should contain. SB1 was signed by the Governor, in September 2008 and codified as CWC §10530 *et seq).*

The IRWMP regional boundary described herein grew out of historical regional resource management discussions. The original planning area included the counties of Butte, Colusa, Glenn, and Tehama. As the planning area became more defined, Sutter County and a portion of Shasta County were added to the planning area. The development of the planning area boundary is described below, followed by an explanation of why the current boundary is the most appropriate for this IRWMP.

1.8.1 How it was determined

The Counties of Butte, Colusa, Glenn and Tehama worked together on resource management issues for many years. This relationship was formalized through the Four County MOU in early 2006 and the participants became known as the Four County Group.

In 2009, a RAP application was developed in response to the DWR requirements to define the way that neighboring and/or overlapping IRWMPs will work together in the management of water and other natural resources throughout the State. During this RAP application process, Sutter County was added to the regional planning group.

In early 2010, as the emerging NSV RWMG began meeting to discuss governance options, Shasta County expressed interest in joining the effort. In the summer of 2010, all five existing Boards and the Shasta County Board approved Addendum Four to the MOU adding Shasta County to the NSV RWMG. Subsequent to that action, the Four County planning group became the NSV Integrated RWMG.

The portion of southern Shasta County that was added to this IRWMP region was added in response to DWR comments to make sure that neighboring IRWM planning areas did not overlap while providing coverage for contiguous areas. Northern Shasta County (north/upstream of Shasta Dam) is included in a neighboring IRWM area (Sacramento-McCloud), but, prior to joining the NSV IRWMP, southern Shasta County was not included in any State-defined IRWM areas.

1.8.2 Why Appropriate for IRWM Planning

Many opportunities exist within the IRWM planning area to develop creative multi-beneficial projects through the integration of resource management tools. An example of why Integrated Regional Water Management Planning is necessary to avert conflicts on a project would be the Deer Creek Watershed Conservancy project entitled "Lower Deer Creek Restoration and Flood Management" in Tehama County. The project involves native spring and fall run salmon, a federal levee on both sides of the creek, high upper watershed snowmelt issues, channel migration, private property owners, the Tehama County Flood Control and Water Conservation District (District), among others. The project brought together agencies such as the District, DWR, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, Department of Fish and Wildlife, the Deer Creek Watershed Conservancy, private property owners, and others to discuss and resolve many conflicting issues which resulted in a win-win situation. The project will increase flood capacity, improve channel migration for fisheries, improve ecosystem restoration, and provide for a more reliable levee system. The IRWMP strives to create and enhance projects such as this one, with multiple benefits and ample support from the community.

As the IRWMP planning group (first the Four County Group that now includes all or portions of six counties) continued to meet and share ideas and strategies. They have developed a solid framework for cooperation and collaboration that has the support of the Boards of Supervisors and other stakeholders within the region.

The following list summarizes the rationale for supporting this regional effort:

- Each of these six counties is primarily rural in nature with centralized pockets of urban development. In addition, each of these counties is currently experiencing growth demands and therefore an increased demand on shared water resources with limited funding to address critical resource management issues that may impact the environmental and water supply issues. This scenario serves to increase the advantages of working together collaboratively on water resource management issues.
- The IRWMP group has demonstrated that they can successfully work together on the shared management of their water resources and have a history of implementing projects and programs in a collaborative manner for the benefit of the region as a whole.
- Portions of the NSV region overlie the Sacramento River Basin and Redding Area groundwater basins. Specifically, portions of Shasta County overlie the Anderson, Enterprise and Millville sub-basins. Portions of Tehama County overlie the Bowman, Rosewood and South Battle Creek sub-basins. Entities in the NSV region often draw water supplies from the same aquifer systems to meet their cumulative water needs.

In addition, each county also has surface water supplies made available through the State Water Project, the Central Valley Project and individual diversions from the Sacramento River and/or its tributaries. There are also many small groundwater sub-basins unique to each county.

- The IRWMP is defined not only by the geographic characteristics of the shared watersheds, tributaries and groundwater basin, but also by emerging water resource concerns such as urban growth; eco-system preservation and enhancement; flood management; public access and recreation and groundwater and surface water supplies and quality.
- The IRWMP region is defined as the area within the boundaries of the Counties of Butte, Colusa, Glenn, Sutter and Tehama, and portions of Shasta County in the NSV. The shared water resources enjoyed by this region, both surface and groundwater, do not recognize political boundaries making it both logical and more efficient to manage these resources in a collective and collaborative manner to better meet the needs of the region.
- The IRWMP members are prepared to work with and support the needs of neighboring regions in meeting the resource management needs of the larger Sacramento River watershed. As discussed below, the IRWMP members will continue to work collaboratively with the Upper Feather River IRWM, the Cosumnes American Bear Yuba (CABY) IRWM, the Westside IRWM, as well as the other IRWMPs within the Sacramento River Funding Area (SRFA).
- There are forested areas throughout the IRWM region that are part of the upper watersheds and are important factors in preserving water quality and water supply.

1.9 NEIGHBORING/OVERLAPPING IRWM EFFORTS

There are several neighboring and overlapping IRWM efforts. Both the neighboring and overlapping IRWM efforts are shown on Figure 1-16 (located at the end of Chapter 1) and discussed below.

1.9.1 Other IRWM Efforts

Representatives from the NSV RWMG have been participating in meetings with other IRWM planning regions throughout the Sacramento River Hydrologic Area in an attempt to coordinate all efforts throughout the larger region. This group of RWMGs met several times to discuss an approach to integrated planning that would provide for the needs of all potential participants within the SRFA.

As the process has moved forward and additional partnerships have been formed, some of these RWMGs have experienced changes and consolidations, much like the expansion of the NSV RWMG. For instance, Lake, Napa, Solano and Yolo Counties, along with a portion of Colusa County have consolidated into the Westside-Sacramento IRWMP. The NSV RWMG has continued to cooperate and collaborate with these entities throughout the various transitions that have taken place and anticipates continuing to do so into the future.

Known overlapping and adjacent IRWM efforts are shown on Figure 1-16 (located at the end of Chapter 1) and listed in Table 1-24. In this regard, NSV RWMG coordinated with the following IRWMPs between 2008 and 2010 with the intent to facilitate a regional approach to water management and funding distribution that would be equitable for all parties. As a result of these meetings, the various RWMGs decided to compete with each other for implementation funding.

As indicated in Table 1-24, several of the neighboring IRWM efforts are in watersheds other than the Sacramento River, or represent Sacramento River tributaries that enter the Sacramento River downstream of the NSV IRWM region.

Table 1-24. Neighboring and Overlapping IRWM Efforts

IRWM Effort Name	Notes
American River Basin IRWMP	Neighboring Downstream[(a)]
Cosumnes American Bear Yuba (CABY) IRWMP	Neighboring Downstream[(a)]
Lake County IRWMP	Superseded[(b)]
Napa-Berryessa IRWMP	Superseded[(b)]
North Coast IRWMP	Neighboring Adjacent[(c)]
Sacramento Valley IRWMP	Superseded[(b)]
Upper Feather IRWMP	Overlapping Upstream[(d)]
Upper Pit River IRWMP	Neighboring Upstream[(e)]
Upper Sacramento-McCloud IRWMP	Neighboring Upstream[(e)]
Westside-Sacramento (Yolo, Solano, Napa, Lake, Colusa) IRWMP	Overlapping Downstream[(f)]
Yolo County IRWMP	Superseded[(b)]
Yuba County IRWMP	Neighboring Upstream[(e)]

(a) "Neighboring Downstream" means the neighboring IRWM watershed enters the Sacramento River downstream of the NSV IRWM region.
(b) "Superseded" means the existing IRWM effort has been incorporated into this or other current IRWM efforts.
(c) "Neighboring Adjacent" means the NSV IRWM region and the neighboring IRWM watersheds are adjacent and do not naturally come together.
(d) "Overlapping Upstream" means the NSV IRWM watershed overlaps with another IRWM effort, which also continues upstream of the NSV IRWM effort watershed.
(e) "Neighboring Upstream" means the neighboring IRWMP effort incorporates the Sacramento River or a tributary upstream of the NSV IRWM region.
(f) "Overlapping Downstream" means the NSV IRWM region watershed overlaps with another IRWM effort, which also enters the Sacramento River downstream of the NSV IRWM boundary.

1.9.2 Strategies to Promote Cooperation

The IRWMPs in the SRFA cover a large geographic area and need to address a wide range of issues including: water supply, surface and groundwater management, land use and environmental stewardship. Although there are many similarities throughout the larger region, due to the vast geographic area included in the SRFA, there are many different approaches to the management of resources that make each planning area unique.

The NSV IRWM planning area has a shared interest in many common resources. One of most significant resources shared by the participants in this planning area is the Sacramento River. Each of these counties access and/or have streams that are tributary to the Sacramento River. One of the other commonalities of the planning area is a mutual groundwater basin. Current research indicates that this planning area shares portions of the Tehama and Tuscan aquifer systems that have varying linkages to one another throughout the landscape.

The discussion below describes how the NSV IRWM effort interacts with adjacent and overlapping areas within the greater Sacramento River Hydrologic Region.

The neighboring and overlapping IRWM efforts that are most critical to the NSV IRWM effort are the:

- Upper Feather River
- Westside Sacramento River

The relationships between the NSV IRWM effort and the two IRWM efforts listed above, as well as the relationship with the SRFA are discussed below.

1.9.2.1 Relationship with Upper Feather River IRWMP

The NSV IRWM has an overlapping area with the Upper Feather River Region IRWM in the portion of Butte County that includes the Upper Feather River watershed. Both planning areas consider the overlap area to be an important and appropriate part of their respective IRWM regions for a number of reasons:

1. The Upper Feather River region is based on a watershed boundary which encompasses the entire Feather River watershed upstream of Lake Oroville.
2. It is important to include Lake Oroville and the bottom portion of the watershed in the regional boundary because Lake Oroville provides a discrete point where management actions in the Upper Feather region can be monitored and measured on a macro scale. Since the Feather River watershed supplies the State Water Project's primary storage facility at Lake Oroville, monitoring and measuring effects on the watershed scale is an important means of quantifying benefits and directing watershed investment in collaboration with DWR and the State Water Project Contractors.
3. The Plumas National Forest, which is one of the key partners in the Upper Feather IRWM program, and manages nearly half of the land in the Upper Feather River watershed, includes areas that extend into Butte County in the vicinity of Lake Oroville.

Butte County and the Upper Feather River IRWM agree that coordination of projects within this overlap area is appropriate and plan to address the means of coordination through an MOU. The MOU will address planning and management in the overlap area, determine areas of responsibility, and provide for appropriate consultation on certain matters. For example, the communities of Paradise, Magalia, and Concow are located on the western edge of the watershed

in Butte County. For purposes of municipal water and wastewater services, any integrated management issues would best be addressed by those communities coordinating with Butte County, the NSV IRWM and the other population centers in the valley. For forest management and Fire Safe activities, there is already coordination between the Plumas National Forest and the Butte County Fire Safe Council, which will be enhanced through the MOU.

1.9.2.2 Relationship with Westside Sacramento (Yolo, Solano, Napa, Lake, Colusa) IRWMP

The NSV IRWMP has an overlapping area with the Westside Sacramento IRWMP in the portion of Colusa County that includes the Bear Creek watershed, which is tributary to the Cache Creek watershed. Both planning areas consider the overlap area to be an important and appropriate part of both the NSV IRWMP and the Westside IRWMP for a number of reasons. For example, the Westside IRWMP is based on a watershed boundary which encompasses the entire Putah and Cache Creek watersheds. It is important to include the Bear Creek watershed in the Westside IRWM boundary because Bear Creek is tributary to Cache Creek. At the same time, Colusa County is a part of the NSV IRWMP because of the NSV IRWMP basis on political and jurisdictional boundaries. The NSV entities, which have clearly defined governance structures and regulatory authorities, recognize the value derived from coordination of activities, objectives and strategies of common regional participants. In addition, the NSV entities also recognize the value of their independent utility on specific activities and participants, which may or may not be included in the Westside IRWM plans for the Bear Creek watershed. For example, the local governments that make up the NSV IRWMP have fiduciary and regulatory responsibilities in the following areas which cannot legally be abdicated to non-governmental agencies:

1. Water supply;
2. Water quality;
3. Environmental stewardship;
4. Flood management;
5. Internal drainage;
6. Drought preparedness;
7. Wastewater collection, treatment and discharge;
8. Domestic water treatment and distribution;
9. Watershed management;
10. Recycled water;
11. Groundwater management;
12. Land use;
13. Natural habitat and conservation;
14. Conjunctive use; and
15. Emphasis on reduced dependence on imported water.

Although the NSV IRWM region includes the entirety of Colusa County, it collaborates and coordinates with the Westside IRWMP. Colusa County, the Westside IRWMP, and the NSV IRWMP agreed early on that coordination of projects within this overlap area is appropriate. To that end, an MOU between the Westside IRWMP and Colusa County Resource Conservation District has been developed. The MOU addresses planning and management in the overlap area, determines areas of responsibility, and provides for appropriate consultation on certain matters. For example, for purposes of municipal water and wastewater services in the Bear Creek watershed, any integrated management issues are addressed by Colusa County through the NSV IRWMP. However, for ecosystem management in the Bear Creek watershed, integrated management issues are addressed by the Colusa County Resources Conservation District in collaboration with the Westside IRWMP.

1.9.2.3 Relationship to the Sacramento River Funding Area

The NSV IRWM region is engaged in coordination and planning with all of the IRWM regions in the SRFA. DWR's map of IRWM funding regions identifies eight planning efforts in the SRFA: American River Basin, CABY, NSV, Upper Feather River, Upper Pit River, Upper Sacramento-McCloud, Westside-Sacramento, and Yuba County Water Agency.

Beginning in June of 2008, representatives from each of the then 10 Regions (American River Basin, CABY, Four Counties (now NSV), Sacramento Valley (now superseded by NSV, American River Basin, and Westside), Lake County (now superseded by Westside), Napa-Berryessa (now superseded by Westside), Solano (now superseded by Westside), Upper Feather River, Yolo County (now superseded by Westside), and Yuba County Water Agency) met to discuss common interests and have met on five subsequent occasions through 2010. The six meetings were focused on communication and collaboration, identifying joint projects and several specific objectives, which include:

- Ensuring that adjacent or overlapping regions define an appropriate level of coordination,
- Recognizing the need for additional planning, and the need for state funding to support it, in all of the independent regions,
- Exploring the concept of an equitable funding distribution among regions within the SRFA, for possible proposal to DWR, and
- Sending a common message that the SRFA, as the major source of water for much of the rest of the state, should receive a significant portion of the "interregional" funds.

The various IRWMPs in the region have developed specific agreements or understandings with adjacent plans with which they have a boundary overlap. Over the course of the SRFA meetings the group identified the specific planning needs of each IRWM area based both on the evolution of events within the area and also the then anticipated Proposition 84 guidelines for IRWM update and revision. After the 2010 Prop 84 Planning Grant application process, the group decided that individual IRWM efforts would compete for implementation funds as-needed without specific approval by the SRFA group. As of fall 2012, the now eight IRWM efforts have not convened a joint meeting since 2010. The most recent coordination occurred in January 2013 via email to communicate and coordinate amongst the SRFA IRWM regions who would be applying for Prop 84 Round 2 IRWM implementation funding.

The ongoing coordination throughout the SRFA is expected to continue indefinitely and to be memorialized by an area-wide MOU or other agreement in the future.

1.9.2.4 Neighboring IRWMPs Requiring Minimal Coordination

The Trinity River watershed is the boundary between the NSV IRWM effort and the North Coast IRWM effort is a watershed boundary and water does not naturally flow from one to the other, nor do they share a common groundwater basin. Therefore, coordination between the two IRWM efforts is minimal. However, the Trinity River Project and Central Valley Project are operated by the United States Bureau of Reclamation and Trinity operations send critical cold water to the

Sacramento Valley annually. Should a project in the North Coast IRWM contemplate changing this, more extensive coordination would be required.

The Upper Pit River flows into Shasta Lake upstream of the NSV IRWM watershed and therefore coordinates with the Upper Pit IRWMP. The Shasta County Water Agency also participated in development of that plan.

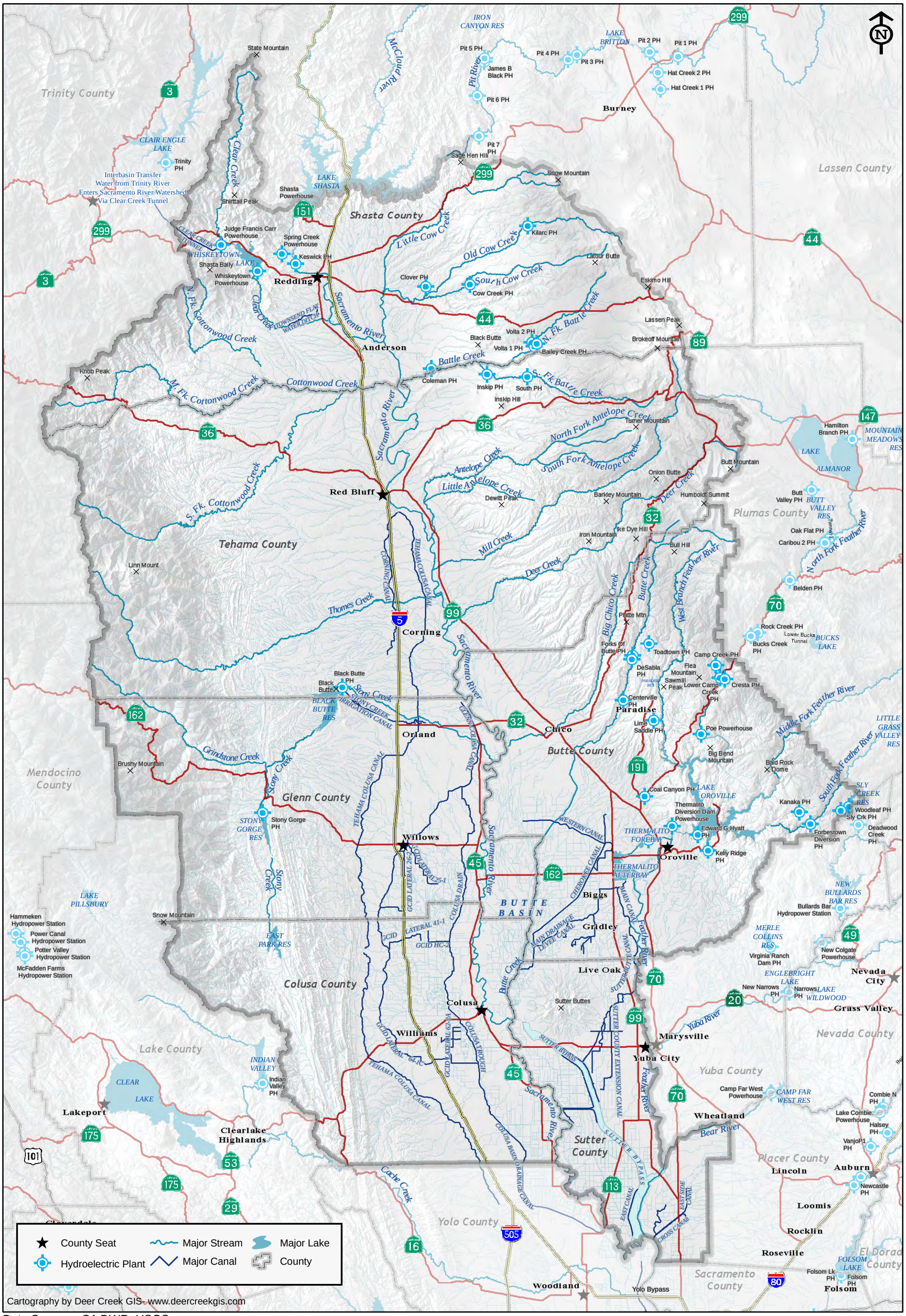
The Upper Sacramento-McCloud IRWMP, immediately upstream of Shasta Dam, has recently begun. Although Shasta County is not directly involved in the Upper Sacramento-McCloud, it is aware of the IRWMP effort and will have an opportunity to comment on the draft IRWMP. Shasta County will ensure that projects in the NSV IRWMP are coordinated with the Upper Sacramento-McCloud IRWMP.

Yuba County, immediately east of Sutter County, developed an IRWMP in 2008. The Yuba County IRWMP was primarily focused on protecting the fisheries and riparian habitat of the Yuba River, which is a tributary of the Feather River, but is not included in the NSV IRWMP planning area.

For a short length, the NSV IRWMP also shares a boundary with the CABY IRWMP, which lies east of the Yuba County IRWMP.

Northern Sacramento Valley Integrated Water Management Plan - Major Water Related Infrastructure

Figure 1-3



Data Sources: CA DWR, USGS

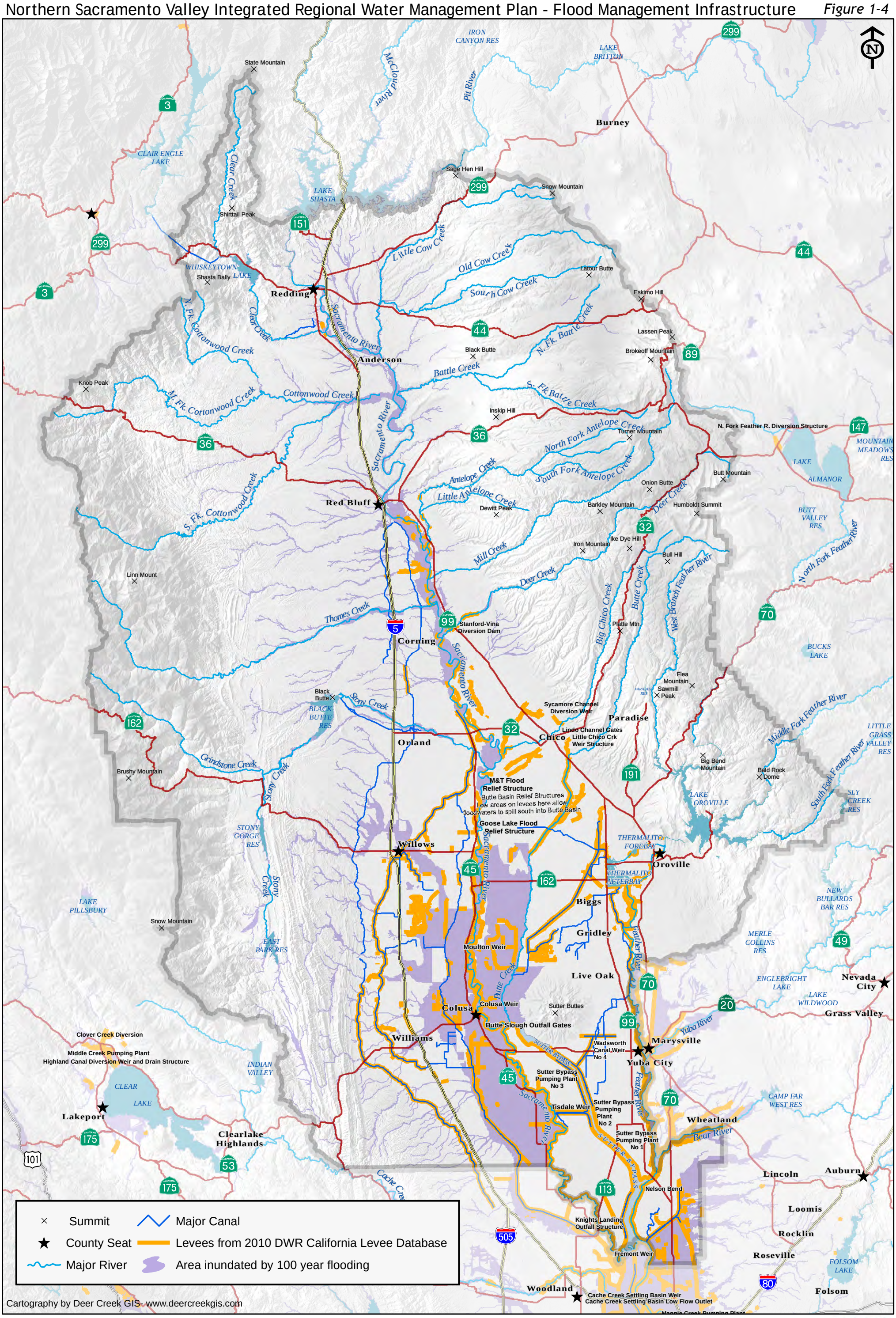
0 5 10 20 30 40 50

Miles

DEER CREEK GIS

WEST YOST ASSOCIATES Consulting Engineers

Northern Sacramento Valley Integrated Regional Water Management Plan - Flood Management Infrastructure *Figure 1-4*



Data Sources:
USGS NHD, FEMA flood data
Levees from DWR 2010 California Levee Database
Sacramento Flood Control Structures from DWR Northern Region

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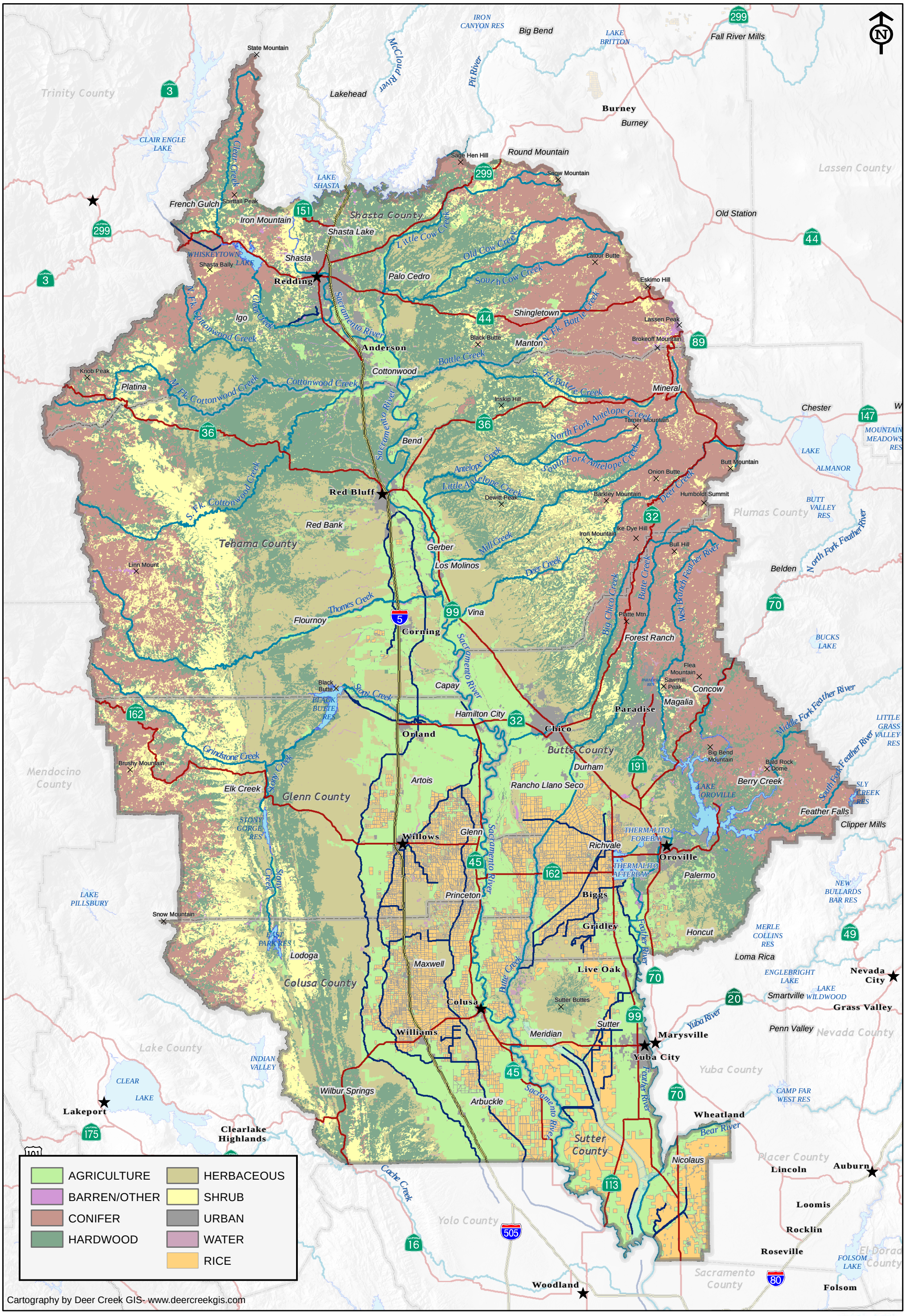
DEER CREEK GIS

WEST YOST ASSOCIATES
Consulting Engineers

Northern Sacramento Valley Integrated Regional Water Management Plan - Major Land Use Division *Figure 1-5*



Data Source:CalFire FRAP
Ca. Department of Water Resources, Landuse Survey Program.
http://www.water.ca.gov/landwateruse
Shasta County - 2005, Glenn County - 2003,
Tehama County - 1999, Colusa County - 2003,
Butte County - 2004, Sutter County - 2004

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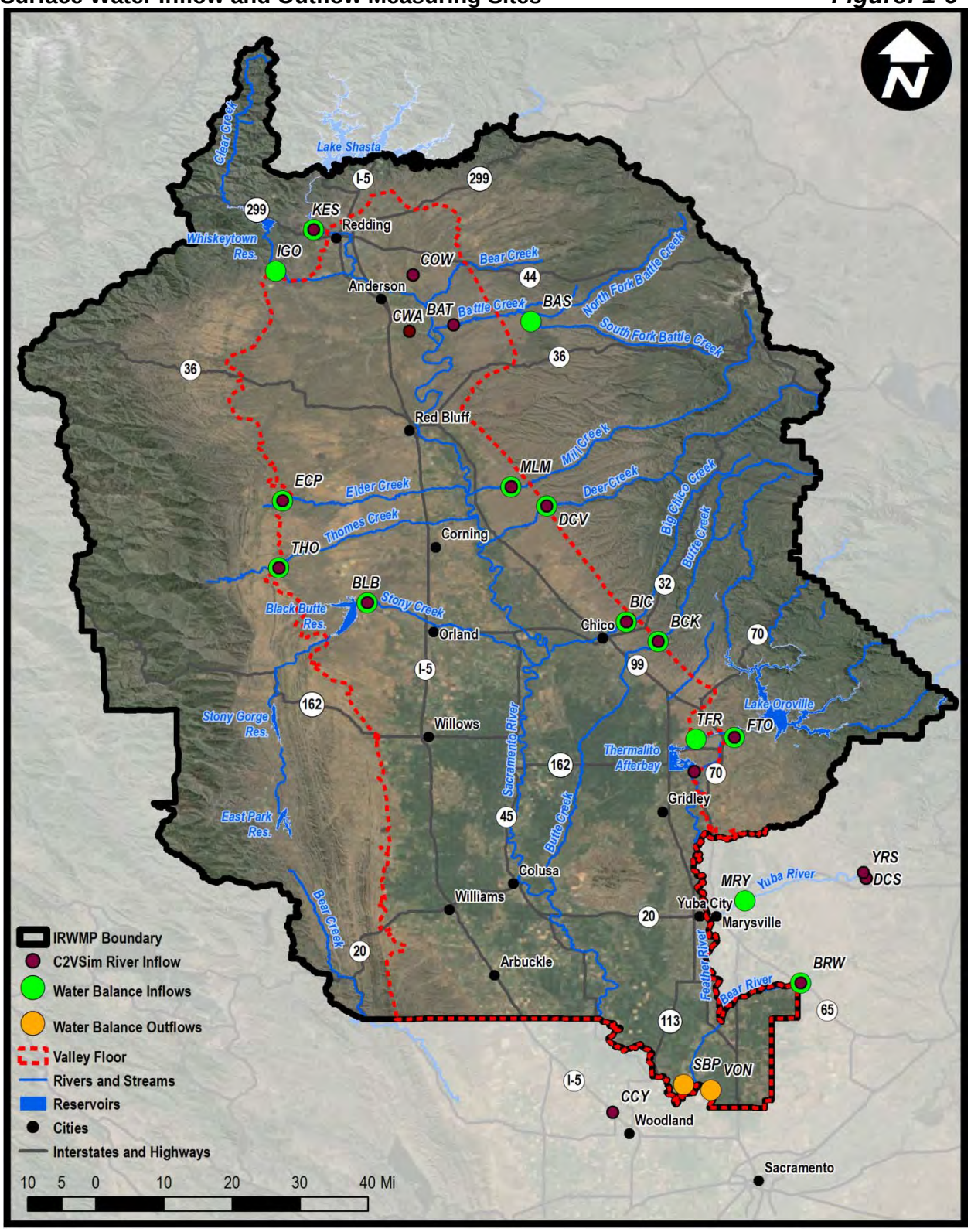
Miles

Northern Sacramento Valley IRWM Planning Area

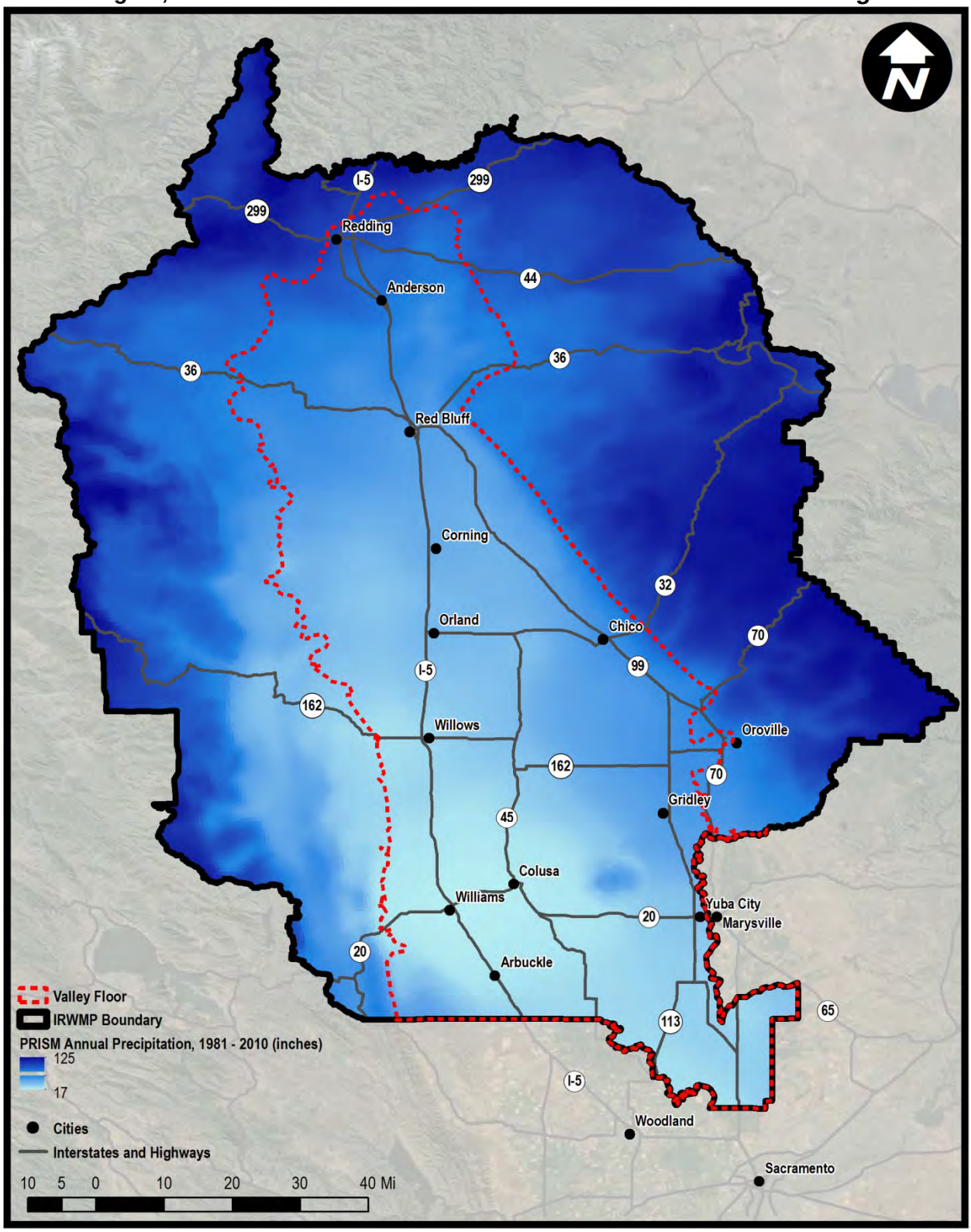
Surface Water Inflow and Outflow Measuring Sites ***Figure: 1-6***



Northern Sacramento Valley IRWM Planning Area

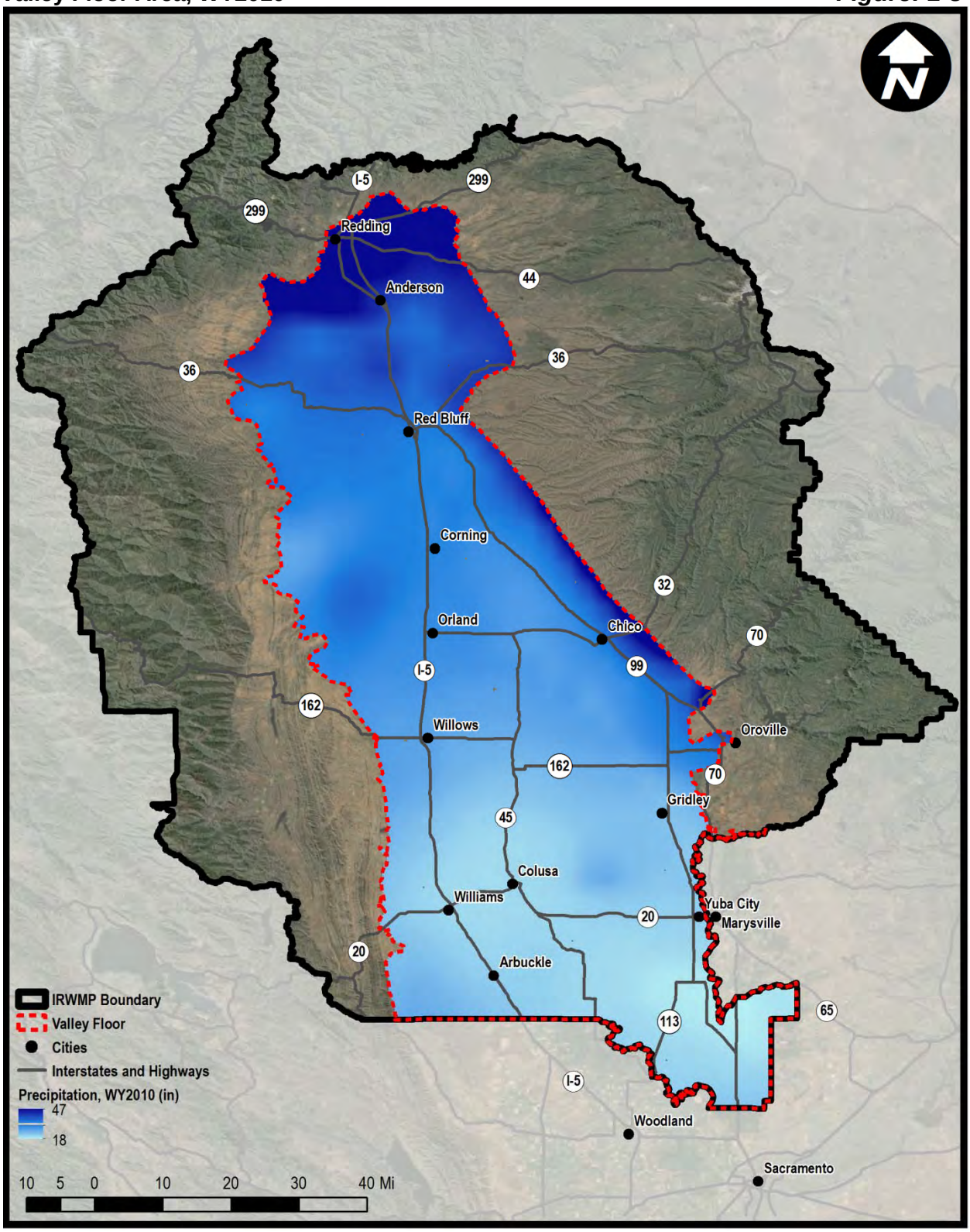
Spatial Distribution of PRISM Average Annual Precipitation for the IRWMP Region, 1981 to 2010

Figure: 1-7



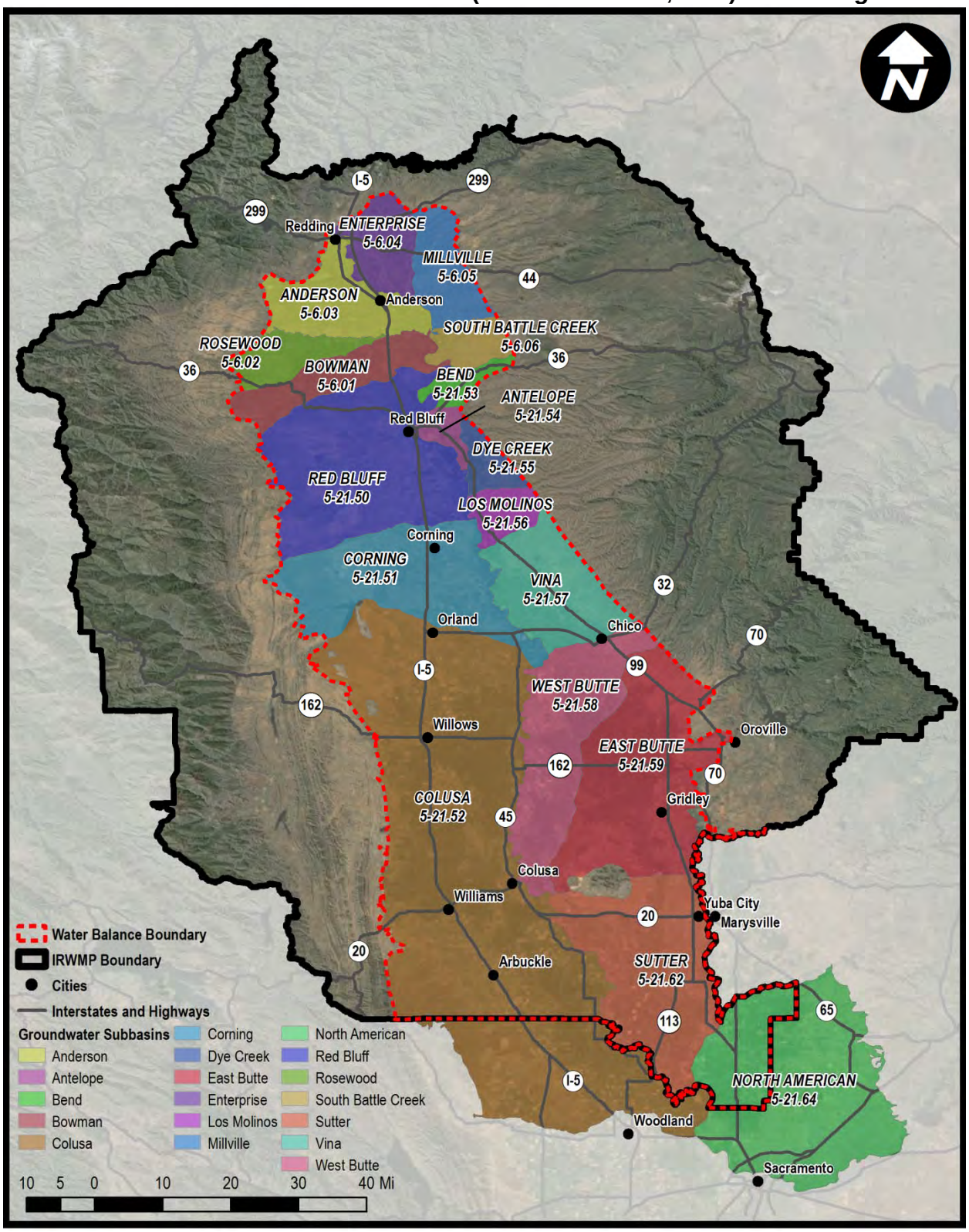
Northern Sacramento Valley IRWM Planning Area
Spatial Distribution of PRISM Annual Precipitation for the Valley Floor Area, WY2010

Figure: 1-8

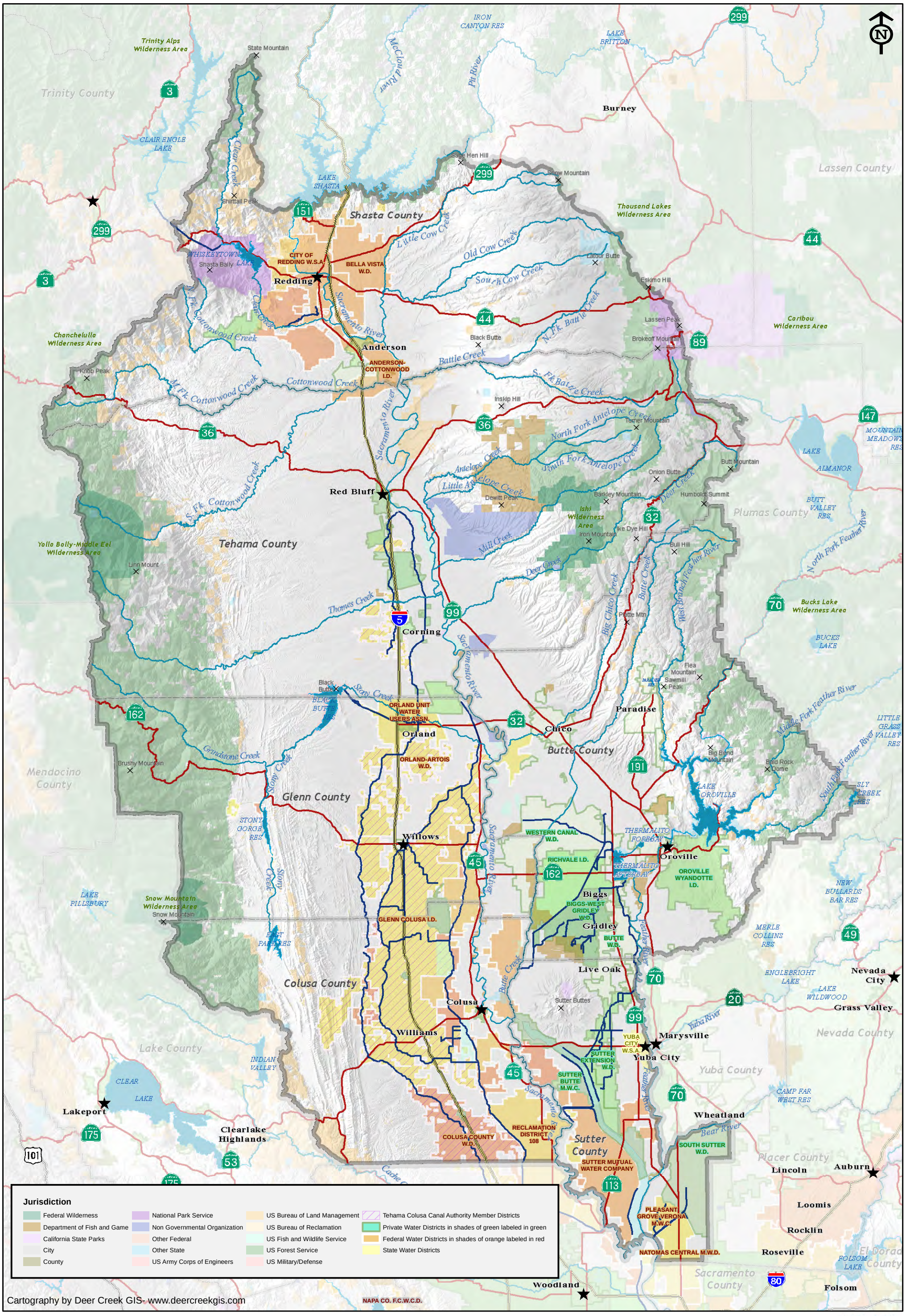


Northern Sacramento Valley IRWM Planning Area

Groundwater Subbasins in the IRWMP area (DWR Bulletin 118, 2003) ***Figure: 1-9***



Northern Sacramento Valley Integrated Regional Water Management Plan - Internal Boundaries *Figure 1-10*



Data Source: CA Department of Water Resources, USGS NHD

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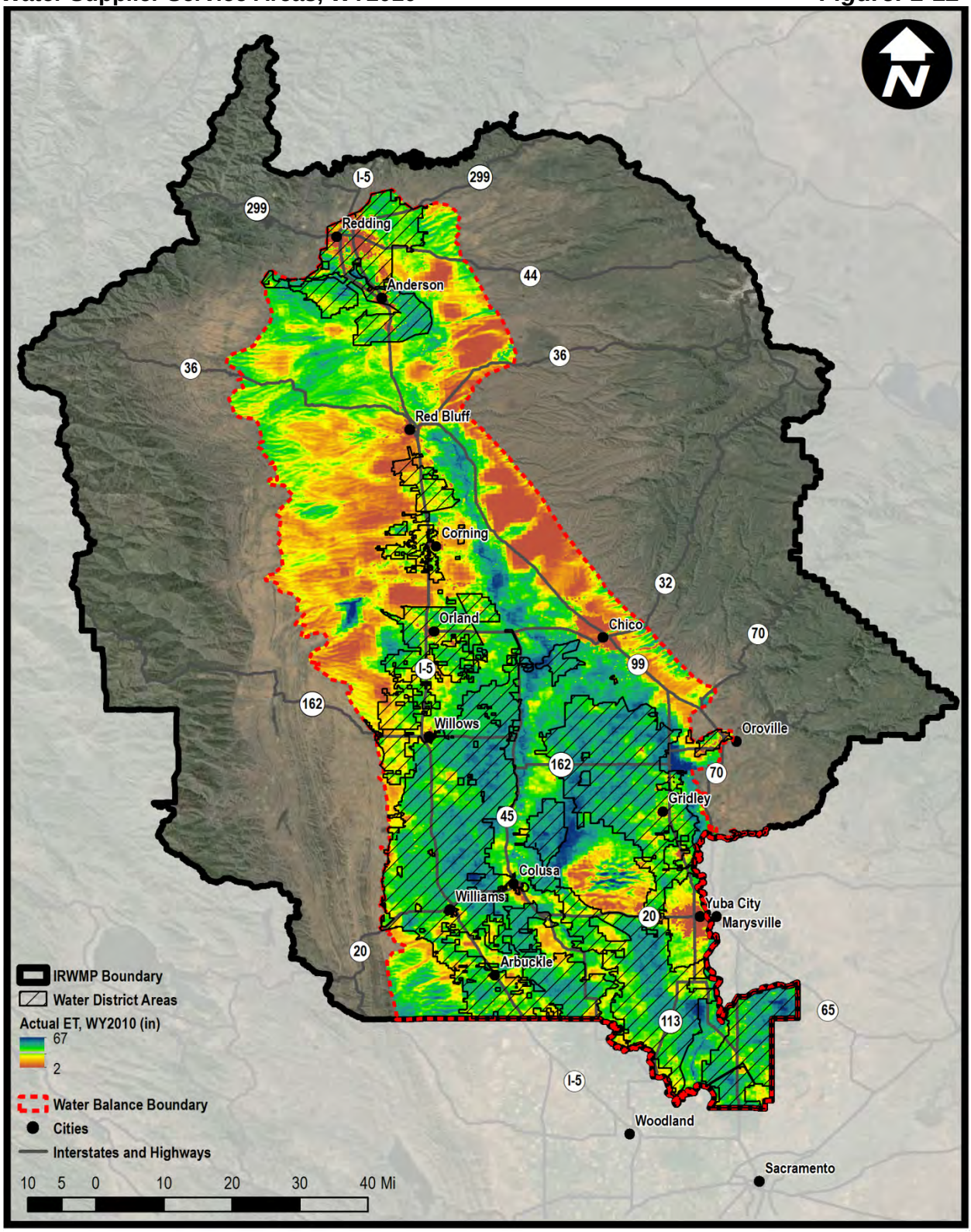
Northern Sacramento Valley IRWM Planning Area

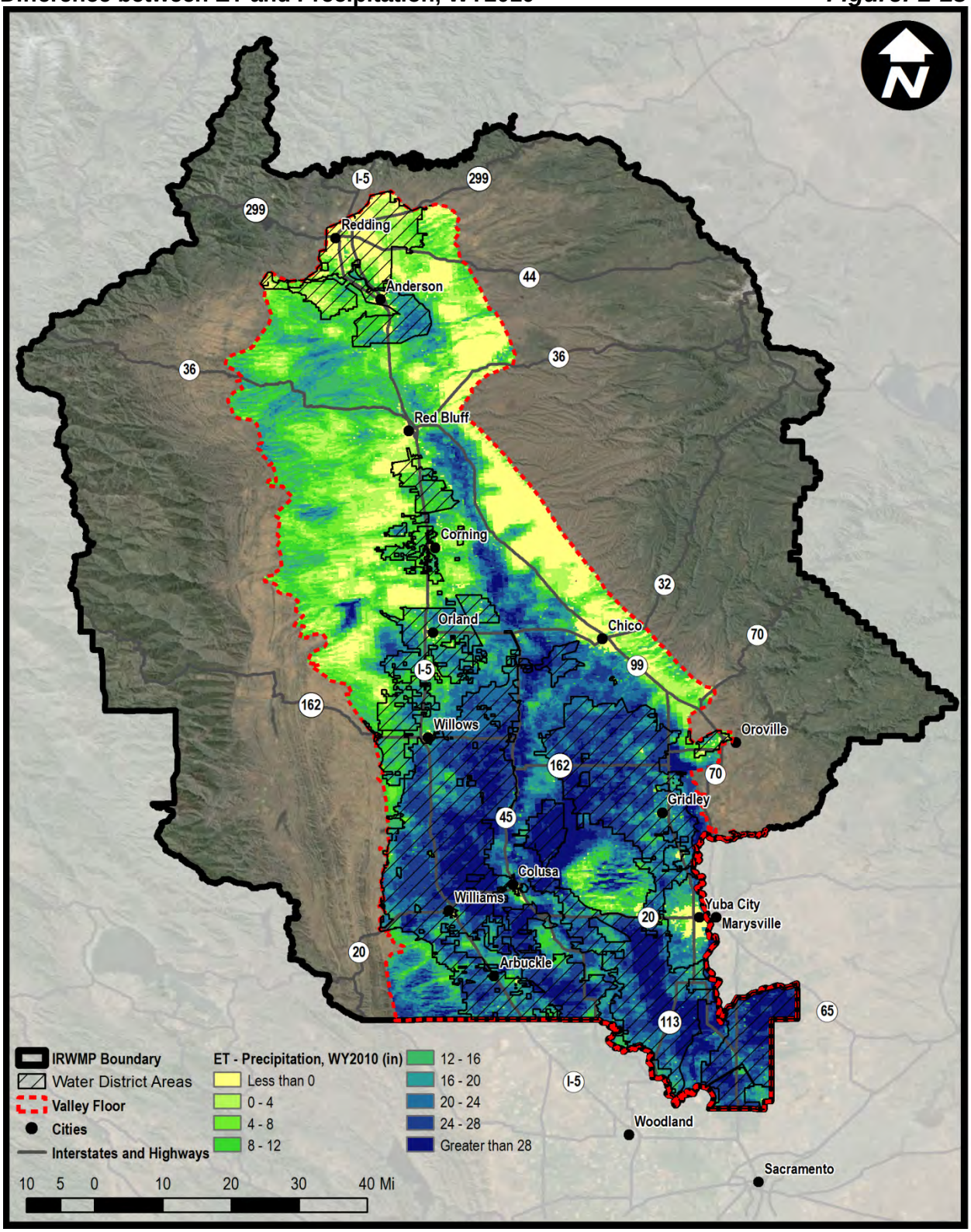
Spatial Distribution of ET within and Outside of Water Supplier Service Areas, WY2010

Figure: 1-12

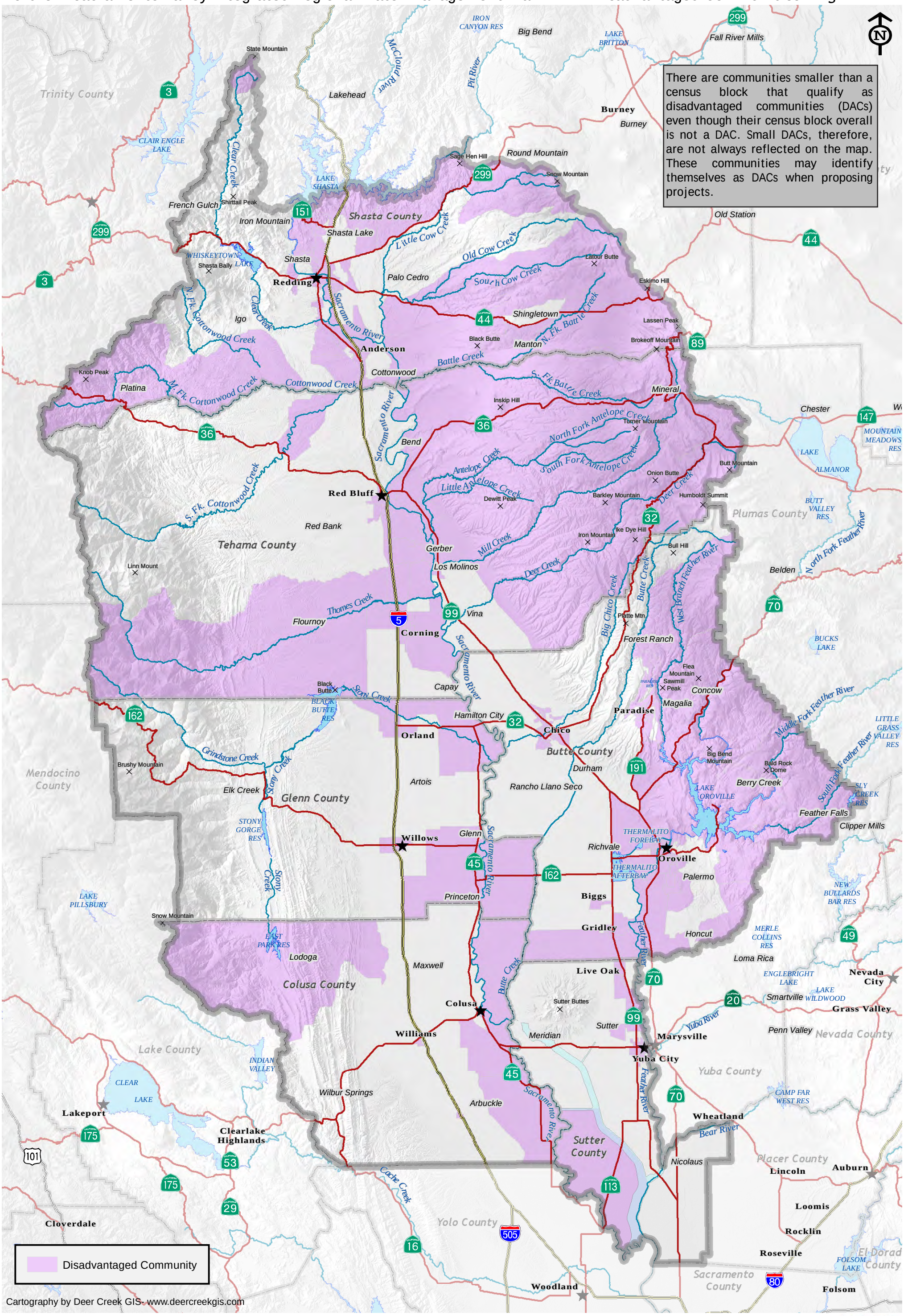


Northern Sacramento Valley IRWM Planning Area

Difference between ET and Precipitation, WY2010 ***Figure: 1-13***



Northern Sacramento Valley Integrated Regional Water Management Plan - DWR Disadvantaged Communities *Figure 1-15*



Northern Sacramento Valley IRWM Planning Area

California Native American Tribal Areas

Figure: 1-16

Source: The Tribes shown are based on a database search of available contacts for California Native American Tribes with lands within the NSV Region. The locations shown for Tribes are based on the mailing addresses of the available contacts. The Tribes shown may not include all Tribes with lands, land-claims, and/or ancestral lands in the NSV Region.

Nor-Rel-Muk
Redding Rancheria
Greenville Maidu
Paskenta Rancheria
Grindstone Indian Rancheria
Mechoopda TDSA
Berry Creek Rancheria
Enterprise Rancheria
Mooretown Rancheria
Colusa Rancheria
Cortina Indian Rancheria

Tribes

Cartography by Deer Creek GIS- www.deercreekgis.com

Data Source: U.S. Census Department

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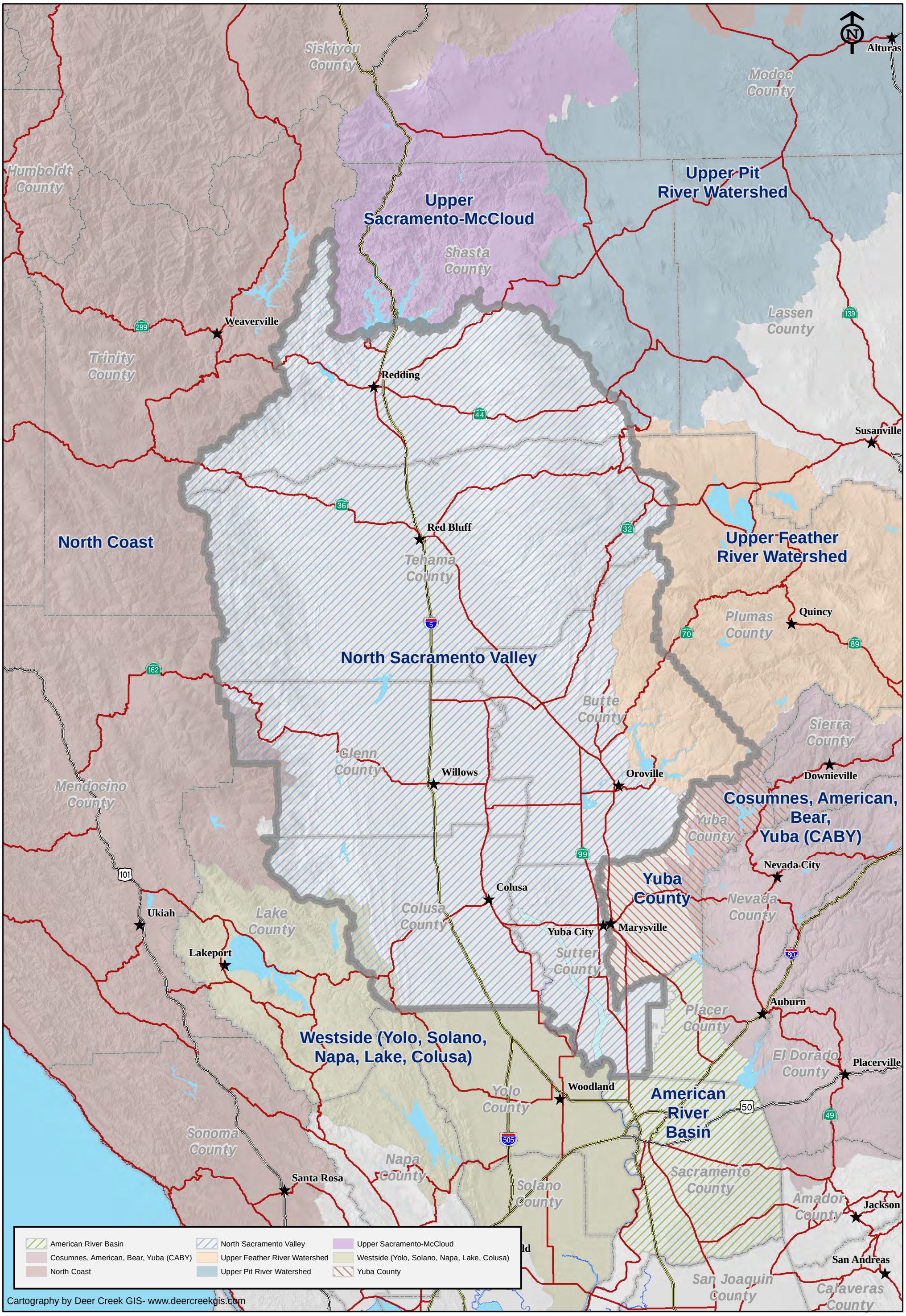
Northern Sacramento Valley Integrated Regional Water Management Plan - Neighboring IRWM Regions *Figure 1-17*



Data Source: Ca. Department of Water Resources.
IRWM Grant Program:
http://www.water.ca.gov/irwm/grants/resourceslinks.cfm

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CHAPTER 2
Goals and Objectives

The purpose of this chapter is to discuss the Goals and Objectives of the IRWMP. The following related topics are presented:

- Development Process
- Ranking
- Goals and Objectives
- Narrative for Water Supply Reliability (Goal #1)
- Narrative for Flood Protection and Planning (Goal #2)
- Narrative for Water Quality Protection and Enhancement (Goal #3)
- Narrative for Watershed Protection and Management (Goal #4)
- Narrative for Integrated Regional Water Management (Goal #5)
- Narrative for Public Education and Information (Goal #6)

These topics are discussed in detail below.

2.1 DEVELOPMENT PROCESS

The IRWMP was developed in three phases: Phase 1 centered on developing the goals and objectives for the region; Phase 2 focused on developing and prioritizing projects; and Phase 3 focused on drafting, and public review of, the IRWMP.

Phase 1 of the NSV IRWMP process focused on identifying the region's needs, issues, and aspirations, and then developing goals and objectives for the region consistent with the region's identified needs, issues, and aspirations. The Phase 1 stakeholder workshops, held in Oroville, Red Bluff and Colusa, on January 18, and 19, 2012, focused on soliciting input from a wide-range of stakeholders in the region. In early February 2012, the consultant team reviewed public comments collected from November 29, 2011, through January 31, 2012, and developed preliminary draft goals and objectives to initiate and stimulate the NSV IRWM TAC and NSV Board discussion. The consultant team developed five broad goal categories, based on the issues and concerns raised in the public comments. From these issues and concerns, the consultant team developed specific objectives for each goal based on DWR IRWM Guidelines, the general water resource-related needs of the region, geography, specific public concerns, and measurability.

Following the discussion of the preliminary draft goals and objectives at the February 16, 2012, TAC meeting, a TAC Subcommittee was formed to further refine the draft goals and objectives. The Subcommittee consisted of one TAC member from each of the six participating counties, either the staff or landowner appointee. The TAC Subcommittee meetings also included participation from the NSV Board Chair and Vice Chair in an effort to bring about a smooth transition of concepts to the NSV Board. This Subcommittee met several times between February and June 2012 to develop the objectives recommended to, and ultimately adopted by, the NSV Board in June 2012. Having objectives firmly established prior to commencing Phase 2 was critical to effectively identify and review potential projects and programs submitted for

evaluation and prioritization by project proponents during Phase 2 of the IRWMP development process.

Updated draft goals and objectives were brought forward by the Subcommittee to the TAC at their March 15, 2012, meeting. The TAC and members of the public provided comments on the draft goals and objectives – specifically related to Goals #1 and #2 - at that meeting. Subsequently, the TAC Subcommittee met with the consultant team on March 23, 2012, and independently met on April 11, 2012, to discuss further changes to the draft goals and objectives based on TAC input and public comments received through April 10, 2012. The TAC Subcommittee then brought forward revised draft goals and objectives for discussion at the April 19, 2012, TAC meeting. The TAC, and members of the public, provided comments on the draft goals and objectives – primarily related to Goals #3, #4, and #5 - at the April 19, 2012, TAC meeting.

The first phase of written public comments on Goals #1 and #2 closed on March 2, 2012. These comments were brought forward as part of the TAC's discussion for the first revision of the draft goals and objectives at its March 15, 2012, meeting. The second phase of written public comments on the draft goals and objectives closed on April 10, 2012. This next round of comments was brought forward as part of the TAC's discussion for the second revision of the draft goals and objectives at its April 19, 2012 meeting. Copies of all written comments received were made available on the website and in TAC and NSV Board meeting agenda packets.

At the April 19, 2012, TAC meeting, the TAC forwarded their recommendation to the NSV Board on goals and objectives by consensus vote after significant discussion, public comment, and modification. On May 7, 2012, the NSV Board reviewed and discussed the TAC recommendations, made several revisions and heard extensive public comment. The NSV Board decided in concept, to adopt the goals and objectives. However, the NSV Board asked that the TAC refine the preamble to the goals and objectives, which was written to provide context for the goals and objectives to provide more clarity, and also requested the TAC to add and/or revise definitions for a number of terms in the goals and objectives, and provide the NSV Board with a draft narrative to explain the thought process behind the development of the recommended goals and objectives.

The TAC then further refined the preamble and definitions and revised the goals and objectives based on the NSV Board's comments at the May 17, 2012 TAC meeting. The major change made to the recommended goals and objectives was the addition of a sixth goal (Public Education and Information Dissemination), populated with various related objectives that had been listed under the previous five goals. The TAC decided to recommend its revised preamble and goals and objectives to the NSV Board for adoption on May 17, 2012. Due to a tight turnaround time, the TAC Subcommittee meanwhile drafted the draft narrative for the NSV Board's reference at its June 2012 meeting.

The NSV Board re-considered, and ultimately adopted, the goals and objectives, at its June 4, 2012, meeting along with the introductory text, as refined by the TAC at the May 17, 2012, TAC meeting. The NSV Board reviewed draft IRWMP definitions and a draft narrative at this same meeting. The NSV Board wanted to define any terms that were subject to interpretation or could

be perceived as controversial to alleviate potential confusion. These terms now reside in the NSV IRWMP Glossary.

The introductory text to the goals and objectives was developed to set the context and framework for the goals and objectives. The introductory text includes the statement of intent which was specifically developed to clarify that local agencies would be implementing the IRWMP for the benefit of the people and resources in the region. This introductory text is provided at the beginning of Section 2.3 below.

2.2 RANKING

Consistent with DWR IRWM Guidelines, a ranking was assigned to each objective. Ranking categories were: "*foundational*", "*critical*", "*high*", and "*medium*". The list of objectives was evaluated as a whole when assigning the foundational, critical, high, and medium rankings (*i.e*. these rankings were not done within the context of each goal).

The "foundational" objectives are regarded as essential, or a prerequisite, for: determining baseline conditions from which to measure the performance of programs and projects to accomplish other objectives; obtaining core data and information upon which to make informed water management decisions; and/or to inform the interested public of resource and resource-related information in the region.

A "critical" objective is critical compared to other objectives, not just the objectives in its goal category, and "critical" rankings were reserved for objectives that directly addressed public health or safety.

Objectives that addressed economic health for the region generally received a "high" ranking, while environmental objectives generally received a "medium" ranking in response to a number of public comments that stated people should come before the environment. All objectives listed are considered important (otherwise it was not listed), but a "medium" ranking just meant it's less of a priority than other ranking categories.

The NSV Board ultimately approved this tier-based approach for rating objectives for the region. However, the NSV Board and TAC did consider other options for prioritization which included numerical ranking of each objective, grouped objectives for specific geographic areas in the region, and grouping objectives into short-term and long-term categories of priorities. The NSV Board decided to prioritize the objectives to help with project prioritization during Phase 2 of the IRWMP process. Furthermore, the NSV Board decided to prioritize objectives to demonstrate the importance, and order of priority, the NSV Board placed for each objective. The prioritization tiers then served as an indicator of the NSV Board's priorities for Phase 2 of the IRWMP development.

In short, through an iterative process with stakeholder input, consultant team input, TAC and NSV Board input, the Subcommittee identified and refined objectives so that the most important watershed objectives were made clear. These rankings are for general objectives; individual projects may rise in importance based on specific funding criteria and/or additional considerations in the future, particular to the project.

2.3 GOALS AND OBJECTIVES

The goals and objectives developed for the NSV IRWMP are intended to serve as the cornerstone foundational elements from which the IRWMP will be shaped. The IRWMP is not regulatory in nature and its development reflects the voluntary cooperation and coordinated planning efforts of local entities within the region, and input from the public. The NSV Board envisions that through implementation of the IRWMP's goals and objectives, DWR and other regional, state, and federal agencies will better understand the full intent of the NSV's IRWMP and, more broadly, the region's guiding principles in regard to water resources management. The established objectives will be used as benchmarks during the development of resource management strategies and the basic criteria for evaluation and prioritization of projects meeting the intent of the IRWMP. Local entities, including but not limited to, cities, Counties, Tribes, and special districts seeking funding and/or endorsement through the IRWMP will implement projects on a voluntary basis that are consistent with the IRWMP, in compliance with existing Federal, State, and local law, as funding becomes available and as authorized within their legal authorities.

As a basis for the broad category goals and specific objectives identified in this IRWMP, the following statement of intent was established for the NSV IRWMP:

> *To establish a regional collaborative structure with the objective of ensuring an affordable, sustainable water supply that supports agricultural, business, environmental, recreational, and domestic needs of the Northern Sacramento Valley.*

Each goal and objective is drafted to support and further the region's statement of intent for the IRWMP. As context for the detailed goals and objectives that follow, it is important to understand that this IRWMP was created by local entities within the region for the benefit of those living, operating, and recreating within the region, as defined in the IRWMP.

The adopted goals and objectives are provided in Table 2-1, below.

Measurements for the objectives are both quantitative and qualitative and are described below along with the narrative for each objective.

Table 2-1. NSV IRWMP Goals and Objectives

Goals	ID	Objectives	Rank/Category
Water Supply Reliability	1-1	Document baseline conditions and trends for surface water and groundwater resources.	Foundational
	1-2	Quantify current and future water demands.	Foundational
	1-3	Maximize efficient utilization and reliability of surface and groundwater supplies in coordination with local groundwater management plans (GMP's).	Foundational
	1-4	Coordinate and protect regional groundwater resources, consistent with locally developed GMP's that monitor groundwater levels, groundwater quality, and inelastic land subsidence.	Foundational
	1-5	Develop regional water transfer guidelines to facilitate efficient management of water supplies that recognize the NSV Region as having the first priority for use.	Foundational
	1-6	Protect existing and established surface water rights.	Foundational
	1-7	Honor and preserve area-of-origin statutory protections.	Foundational
	1-8	Protect existing and established regional Central Valley Project (CVP) and State Water Project (SWP) water contract supplies.	Foundational
	1-9	Increase surface water storage and hydropower generation within the region.	High
	1-10	Develop and implement a regional drought preparedness strategy to minimize socio-economic impacts.	High
	1-11	Develop and improve water resources infrastructure to increase water supply reliability within our region.	High
	1-12	Develop, update, and implement GMPs through local jurisdictions.	High
Flood Protection and Planning	2-1	Develop and coordinate flood risk reduction plans and projects consistent with current law and regulation to provide protection for agricultural, urban and rural communities.	Foundational
	2-2	Evaluate new flood control projects that have potential economic impacts on agricultural land.	High
	2-3	Develop and coordinate flood preparedness programs and alert systems for flood-prone areas consistent with existing flood and hazard mitigation plans.	High
	2-4	Implement mutually beneficial flood risk reduction and floodplain ecosystem enhancement programs and projects on a voluntary basis.	Medium
Water Quality Protection and Enhancement	3-1	Develop and improve infrastructure to meet State and Federal standards for drinking water quality.	Critical
	3-2	Develop and improve infrastructure for wastewater collection, treatment, discharge, and reuse.	High
	3-3	Meet State and Federal standards for water quality in surface water bodies and groundwater basins.	High
	3-4	Minimize adverse water quality impacts from point sources to surface and groundwater.	Medium
	3-5	Minimize adverse water quality impacts from non-point sources to surface and groundwater.	Medium
Watershed Protection and Management	4-1	Aggressively manage invasive species within the watershed.	High
	4-2	Integrate mutually beneficial agricultural production and habitat conservation programs and projects that don't redirect impact to neighbors.	Medium
	4-3	Improve and protect riparian and fish habitat, and fish passage.	Medium
	4-4	Implement healthy forest/foothill management activities that improve watersheds.	Medium
	4-5	Protect wetlands that are critical to hydrologic function.	Medium
	4-6	Integrate recreational opportunities within water resource programs and projects.	Medium
	4-7	Evaluate habitat conservation and ecosystem improvement programs and projects that have potential economic impacts on agricultural lands.	Medium
Integrated Regional Water Management (IRWM) Sustainability	5-1	Preserve the autonomy of local governments, special districts, and Tribes.	Foundational
	5-2	Enhance communication and coordination among federal, state, Tribal, and local governments, and other stakeholders.	Foundational
	5-3	Maintain a governance structure to update the Integrated Regional Water Management Plan (IRWMP) and support IRWMP project implementation.	Foundational
	5-4	Coordinate with neighboring IRWM regions to identify opportunities to enhance water management.	Foundational
	5-5	Pursue funding opportunities to implement programs and projects consistent with the IRWMP.	Foundational
	5-6	Coordinate IRWM activities with land-use planning.	Foundational
Public Education and Information Dissemination	6-1	Conduct public education and outreach to promote IRWMP goals.	Foundational
	6-2	Develop and disseminate information to protect regional water supplies.	Foundational
	6-3	Disseminate information on flood risks, Federal Emergency Management Agency's (FEMA's) flood insurance rate maps (FIRM), and new FEMA policies.	Foundational
	6-4	Develop and disseminate water quality information throughout the region.	Foundational
	6-5	Develop and disseminate scientific information on aquatic, riparian, and watershed resources.	Foundational

2.4 NARRATIVE FOR WATER SUPPLY RELIABILITY (GOAL #1)

2.4.1 (1-1) Document baseline conditions and trends for surface water and groundwater resources. (Foundational)

Effective water management of both surface water and groundwater relies on accurate and objective quantitative information. Documentation of baseline conditions and analysis of trends are critically important to identify current and projected future water supply quality and quantity, in order to evaluate proposed water management improvements. In addition to documenting historic and current conditions, this objective supports continuous monitoring and recording of conditions to provide high quality technical information for informed decision-making. Projects or programs that would contribute toward meeting this objective include, but are not limited to, those that gather, compile, analyze, model, and/or facilitate sharing baseline water resources data.

Measurement of this objective will be conducted through: 1) counting the number of reports available documenting baseline conditions; 2) establishing a region-wide water balance under low, normal, and wet conditions/years; and/or 3) considering whether gaps in information have been identified.

2.4.2 (1-2) Quantify current and future water demands. (Foundational)

This objective aims to provide the best available information on current and projected future water demands associated with urban, agricultural, commercial, Tribal, and industrial water use. Water demands change as population grows and ebbs, as crops and industries change, as technology changes and as a result of water conservation and water use efficiency programs. Decision-makers need up-to-date information on water demands to efficiently and effectively plan future projects and programs. Projects or programs that would contribute toward meeting this objective include, but are not limited to, those that gather, develop, calculate, model, or estimate urban, agricultural, commercial or industrial demands or use patterns.

Measurement of this objective will be conducted through 1) counting the number of reports that document baseline conditions; 2) identifying gaps of insufficient water supply; and 3) tracking progress towards quantifying current and future water demands for areas not yet quantified.

2.4.3 (1-3) Maximize efficient utilization and reliability of surface and groundwater supplies in coordination with local groundwater management plans (GWMPs). (Foundational)

This objective encourages efficient use and management of surface water and groundwater supplies to improve water supply reliability within the NSV IRWMP area, while respecting independent local authority and the unique aspects of existing GWMPs. Projects or programs that would contribute toward meeting this objective include, but are not limited to, those that improve efficient utilization and reliability of surface and groundwater supplies, or improve communication and coordination among neighboring jurisdictions within the NSV IRWMP area.

Measurement of this objective will be conducted by 1) mapping the total acreage incorporated into GWMP's; 2) identifying geographic coverage gaps for areas overlying groundwater basins not covered by baseline conjunctive use or groundwater protection programs; and 3) tracking progress towards developing programs for areas not covered.

2.4.4 (1-4) Coordinate and protect regional groundwater resources, consistent with locally developed GWMP's that monitor groundwater levels, groundwater quality, and inelastic subsidence. (Foundational)

This objective encourages protection of groundwater resources against activities that may cause a decrease in water supply, water quality, or result in inelastic land subsidence. This objective also improves regional coordination of groundwater protection, since groundwater resources are often shared across two or more political jurisdictions. Currently, locally developed GWMP's provide for monitoring groundwater levels, quality and inelastic land subsidence in some areas; these GWMP's provide a foundation for groundwater protection activities. Projects or programs that would contribute toward meeting this objective, include but are not limited to, those that help increase understanding of threats to groundwater quantity or quality, prevent or mitigate harm to groundwater resources, or coordinate such activities across political or agency boundaries.

Measurement of this objective will be conducted through: 1) counting the number of "coordination" actions; 2) measuring actual yield against the established sustainable yield or assessing the number of basins operating within established sustainable yields; and 3) developing a groundwater quality index, groundwater level index, and land subsidence index.

2.4.5 (1-5) Develop regional water transfer guidelines to facilitate efficient management of water supplies that recognize the NSV Region as having the first priority for use. (Foundational)

Long-term self-sufficiency in water supplies is an important goal for the region. Water transfers in the region have been implemented by individual water right holders, with some degree of oversight for water transfers by counties that have adopted specific ordinances. Fulfilling this objective would help to streamline the water transfer process and focus transfers on those that preserve local water rights and improve water supply reliability within the NSV region. The creation of shared, regional, non-regulatory guidelines will help to identify opportunities for the management of available supplies to meet water needs within the region now and into the future. Where beneficial, large water wholesalers, such as the United States Bureau of Reclamation and DWR, must participate in these discussions.

Measurement of this objective will be through: 1) documenting whether or not each county has adopted water transfer guidelines that have been developed within a framework identified for the NSV, and subsequent adoption for the NSV Region; and 2) evaluating whether or not water transfers that keep water rights whole, through maintaining beneficial use, have been facilitated. The measure would be first by county and then at the regional level.

2.4.6 (1-6) Protect existing and established surface water rights. (Foundational)

Protecting existing and established surface water rights is critical to meeting the goal of maintaining long-term regional self-sufficiency regarding water supply. Fulfilling this objective would strengthen and perpetuate the longstanding advocacy positions of water right holders and local government within the Sacramento Valley. Protecting surface water rights may be achieved through efficient water use, conservation, public education, usage documentation, water transfers, and legislative and legal actions to assure sufficient documentation of reasonable and beneficial use as set forth in Article 10, Section 2 of the State Constitution.

Measurement of this objective will be through assessment of the level of: 1) records of existing and established water usage related to water rights; and 2) evaluation of water rights utilization or plans for utilization. The completeness of the documentation of water rights, along with utilization records to substantiate the need for water, would be considered in the evaluation. Water rights holders in the region include public agencies, municipalities, corporations, individuals, and others.

2.4.7 (1-7) Honor and preserve area-of-origin statutory protections. (Foundational)

The preservation of area-of-origin statutes has been, and will continue to be, central to water policy in the Sacramento Valley. Fulfilling this objective would strengthen and preserve a longstanding position held by water right holders and local government within the region since the adoption of the watershed protection (area-of-origin) statutes in state law. This position will continue to be strongly reinforced in statewide water planning forums. Also, the prospects for preservation through a constitutional amendment will be pursued as the opportunity avails itself to ensure that water right holders, existing and future, in areas where water originates (particularly in the Sacramento River watershed) have rights to use this water which are senior to water users outside of the region.

Measurement of this objective will be through documentation of existing and established or planned water uses.

2.4.8 (1-8) Protect existing and established regional Central Valley Project (CVP) and State Water Project (SWP) water contract supplies. (Foundational)

Existing contracts for supplies from the CVP and SWP represent a significant part of the total water supply for agricultural and urban use in the region. Fulfilling this objective would strengthen the prospects for the continued delivery of reliable surface water under these contracts. The existing contracts and their renewal in the future are essential to maintaining water supply reliability to individual CVP and SWP contractors in the region. A reduction in these contract supplies would severely jeopardize the ability to maintain reliable water supplies in the region and would increase demands on local groundwater supplies.

Measurement of this objective will include: 1) documentation of existing and established water contracts; and 2) documentation of contract supplies and utilization, or plans for utilization. The measure would be the completeness of the documentation of contracts by all contractors and the completeness of the ongoing record of utilization.

2.4.9 (1-9) Increase surface water storage and hydropower generation within the region. (High)

Additional surface water storage in the region would address multiple needs, including but not limited to local and regional water supply reliability. These water supplies would offer the potential to meet increased water needs within the region and allow the region to contribute to meeting water needs within the greater Sacramento Valley or state, if regional needs are met. Additional hydropower generation facilities would provide economic opportunities and address the growing demand for renewable energy.

Measurement of this objective will be determined by the number of acre-feet and number of megawatt increase since adoption of this IRWMP. Under objective 1-1, the baseline level of surface water storage and hydropower generation capacity should be documented.

2.4.10 (1-10) Develop and implement a regional drought preparedness strategy to minimize socio-economic impacts. (High)

No region is immune to droughts, which may be more severe and longer in duration than documented in the recorded hydrologic period for the Sacramento Valley. Many water users in the region had reduced surface water supplies in the recent droughts in 1991-1994 and 2007-2009. Water supply reductions during droughts of a greater magnitude would have the potential to be devastating to agricultural production, urban users, the economy, and the groundwater basin. Having a voluntary, region-wide strategy developed in advance of the occurrence would provide the region with a thoughtful and equitable "roadmap" for managing the available water resources during drought conditions to minimize adverse impacts to the socioeconomic health, welfare, and resources of the region. Implementing common region-wide messaging and strategies can increase government efficiency and water use efficiency. Coordinated activities would be executed within the existing authority and jurisdiction of local agencies.

Measurement of this objective will be based on: 1) whether or not a drought preparedness strategy is developed; and 2) the extent to which the strategy has been implemented.

2.4.11 (1-11) Develop and improve water resources infrastructure to increase water supply reliability within our region. (High)

Achieving water supply reliability requires the ability to deliver water where and when it is needed. Fulfillment of this objective would identify infrastructure necessary to deliver available water supplies to water deficient areas in a timely manner. This delivery may require upgrading or replacing aging facilities, interconnecting existing facilities, and constructing new facilities. Many individual cities, water agencies, and irrigation districts have plans to improve water resources infrastructure within the region to increase individual and region-wide water supply reliability.

Measurement of this objective will be quantified through: 1) counting the number of IRWM listed infrastructure projects completed per year, per County, which improve water supply reliability; and qualitative through 2) counting/documenting the number of times water agencies or customers were not able to receive water.

2.4.12 (1-12) Develop, update, and implement GWMP's through local jurisdictions. (High)

This objective encourages local agencies to develop, update and implement GWMP's. GWMP's are important to inform the public about groundwater resources and ensure sustainable use of groundwater. Through the GWMP update process, amendments to the various GWMP's could improve regional consistency and compatibility of key provisions in local GWMP's. Projects or programs that would contribute toward meeting this objective include, but are not limited to, the development of new local or regional GWMP's, updates of existing GWMP's, and implementation of GWMP provisions.

Measurement of this objective will be through: 1) evaluating whether or not all the basins in the region have current GWMP's; and 2) the extent to which each are being implemented and updated.

2.5 NARRATIVE FOR FLOOD PROTECTION AND PLANNING (GOAL #2)

2.5.1 (2-1) Develop and coordinate flood risk reduction plans and projects consistent with current law and regulation to provide protection for agricultural, urban, and rural communities. (Foundational)

The NSV, by virtue of its location and geography, has urban, rural, and agricultural areas that will be threatened by floods. Fulfilling this objective would provide an assessment of the flood risk confronting the respective communities, the extent to which flood risk reduction opportunities have been identified and implemented, and identify the communities for which flood risk reduction opportunities need to be evaluated and/or implemented. Projects or programs that would contribute toward meeting this objective include, but are not limited to:

- Investigation of use of flood waters for groundwater recharge and storage opportunities;
- Evaluation of use of flood waters for increased surface water storage and potential hydroelectric generation opportunities;
- Flood risk assessment;
- Flood risk reduction planning and coordination;
- Construction or improvement of flood risk reduction infrastructure;
- Flood response and recovery plans; and,
- Efforts to improve operations and maintenance of flood risk reduction infrastructure..

Coordination of flood risk reduction planning and projects will increase regional efficiency and effectiveness at reducing flood risks.

The intent of this objective would be to identify the flood risks from the information in objective 6-3 and any other means.

Measurement of this objective will be qualitative through: 1) surveying staff about their perception of improved flood risk reduction plans and project and coordination of these efforts; and 2) evaluating the extent to which infrastructure or management plans have been identified to reduce the flood risks. To assist with this measurement, an inventory would be created to characterize the flood risks and identify and/or develop infrastructure or management plans to reduce flood risks for staff to review.

2.5.2 (2-2) Evaluate new flood control projects that have potential economic impacts on agricultural land. (High)

Flood control projects that significantly modify or create new infrastructure – *e.g.* those that would create new bypasses, set levees back from the river channel, raise levee height, or lower weirs – have the potential to negatively impact agricultural lands and the economies of agricultural communities. Such projects could necessitate taking agricultural land out of production or increase periodic flooding on some lands. It is important for the region to assess and discuss these potential impacts early in the project development and proposal stages. One significant planning effort is the newly adopted Central Valley Flood Protection Plan (CVFPP), which has identified potential modifications to features of the State Plan of Flood Control (SPFC) that could significantly impact areas within the region. Evaluation of the CVFPP's potential impacts on agricultural lands would assist affected local agencies and landowners in determining their response and provide an opportunity for participation in the regional planning forums that will be initiated as the CVFPP is implemented. By July 1, 2013 DWR will be providing floodplain maps (100-, 200-, and 500-year) associated with the SPFC for use by local land use agencies. Those areas within the region, for which projects may be developed, could potentially benefit by coordinating their approaches for addressing legislative requirements as appropriate.

To measure this objective, the number of flood control projects, with potential economic impacts on agricultural land, that were evaluated will be counted and compared to the number of flood control projects, with potential economic impacts on agricultural land, that were not evaluated.

2.5.3 (2-3) Develop and coordinate flood preparedness programs and alert systems for flood-prone areas consistent with existing flood and hazard mitigation plans. (High)

Flood preparedness programs can be effective in protecting public health and safety in flood-prone areas. Fulfilling this objective would increase the extent and effectiveness of flood preparedness programs and community flood alert systems. Some communities in the region have flood or multi-hazard mitigation plans and flood preparedness programs while others do not. Coordinating efforts aimed at increasing the level of awareness and preparedness can be helpful to communities in the region and result in improved regional consistency, efficiency, and effectiveness. Projects or programs that would contribute toward meeting this objective include, but are not limited to, planning, coordinating, and testing local and regional flood preparedness programs and alert systems; coordination in seeking assistance from the State Office of Emergency Services and Federal Emergency Management Agency; and implementing, updating, or maintaining infrastructure and systems for flood preparedness and emergency alerts.

Measurement of this objective will include the extent to which flood preparedness programs are established for flood prone areas not previously having a program. A simple form of measurement would be counting the number of additional flood preparedness programs and alert systems.

2.5.4 (2-4) Implement mutually beneficial flood risk reduction and floodplain ecosystem enhancement programs and projects on a voluntary basis. (Medium)

This objective encourages flood risk reduction projects and programs that incorporate ecosystem restoration and multi-benefit components such as protecting water quality, improving groundwater recharge, improving water supply reliability, recreation, power generation, and adapting to climate change. Integrating floodplain ecosystem enhancement with flood risk reduction projects when feasible can greatly enhance the prospects for implementation as well as maximize the overall benefits of the project. In addition to flood risk reduction, this tool also provides the following benefits: groundwater recharge, slowed flood flows, reduced sediment, water quality improvements through filtration of nutrients and pesticides, and enhanced habitat value. The potential for integrating floodplain ecosystem enhancements into a viable flood risk reduction project would depend on the voluntary combining of both by the project sponsor.

Measuring this objective will include counting the number of opportunities identified for incorporating floodplain ecosystem enhancements into flood risk reduction infrastructure or management plans.

2.6 NARRATIVE FOR WATER QUALITY PROTECTION AND ENHANCEMENT (GOAL #3)

2.6.1 (3-1) Develop and improve infrastructure to meet state and federal standards for drinking water quality. (Critical)

Water quality can be maintained and improved using either watershed-based controls or water treatment infrastructure. State and Federal drinking water standards may be unattainable for some local water supply systems without improved treatment systems and/or infrastructure. This objective addresses the need for new or improved infrastructure or facilities where source protection activities are insufficient, less cost-effective or infeasible.

Measurement of this objective will be through assessing the level to which municipal water purveyors' Capital Improvement Project budgets have increased to reflect increases in drinking water quality infrastructure investments.

2.6.2 (3-2) Develop and improve infrastructure for wastewater collection, treatment, discharge and reuse. (High)

Some communities and individual residences in the region need to develop or improve their wastewater infrastructure to meet increasingly stringent effluent quality regulations. Additionally, aging wastewater infrastructure will need to be replaced or upgraded. Opportunities for local water reuse, which are supported by state policy, will increase as effluent quality improves. Projects or programs that would contribute toward meeting this objective include but are not limited to planning, constructing, and improving centralized wastewater

collection, treatment and disposal systems, de-centralized septic systems, and infrastructure for water reuse.

Measurement of this objective would be through assessing the level to which: 1) wastewater authorities' Capital Improvement Project budgets have increased to reflect increases in wastewater infrastructure investments; and 2) municipalities and community service districts comply with the State's "20x2020 Water Conservation Plan".

2.6.3 (3-3) Meet State and Federal standards for water quality in surface water bodies and groundwater basins. (High)

Surface water bodies that do not consistently meet all State and Federal water quality standards are listed as impaired. Impairment listings trigger State regulators to develop control programs that set appropriate targets, allocate load reductions of the impairing pollutant(s), and develop implementation plans for meeting those allocations. State regulators are significantly challenged in identifying pollutant sources and producing feasible plans for improving surface water bodies or groundwater basins. This objective encourages local entities to identify pollutant sources and to develop feasible implementation plans to attain standards for surface water or groundwater basins. Projects or programs that would contribute toward meeting this objective include, but are not limited to, local planning efforts, coordination, and project implementation (such as pollution prevention or remediation) that help to meet State and Federal standards for surface water and/or groundwater.

Measurement of this objective would be through: 1) assessing the percentage of impaired water bodies on the 303(d) list with approved programs and plans (*e.g.*, TMDL's), watershed restoration plans, *etc.*) designed to achieve compliance with standards; (2) assessing the level of compliance with Waste Discharge Requirements for treated wastewater discharges to surface water and land; (3) evaluating the compliance record under permits for municipal, construction and industrial stormwater dischargers; and 4) evaluating the compliance with the Irrigated Lands Regulatory Program.

For surface water, programs to address TMDL's should be contained in the Basin Plan. The Regional Water Quality Control Board (RWQCB) is responsible for developing TMDL's, although stakeholders can potentially lead the development. Regional authorities primarily need to implement such programs through permit programs.

2.6.4 (3-4) Minimize adverse water quality impacts from point sources to surface and groundwater. (Medium)

Surface water and groundwater pollution results from a combination of point and non-point discharges. Point sources include municipal and industrial wastewater as well as urban, industrial, and construction-site stormwater discharge. Point source discharges to surface water and groundwater are regulated by Waste Discharge Requirements issued by the RWQCB. Point sources to surface water are also regulated by the federal National Pollutant Discharge Elimination System permits administered by the RWQCB. Projects or programs that would contribute toward meeting this objective include, but are not limited to, those that minimize adverse water quality impacts associated with point source discharges through both source control and treatment control, in compliance with applicable regulatory requirements. This

objective is intended to be implemented on a voluntary basis and is not a regulatory action or mandate.

Measurement of this objective would be through assessing the compliance record under regulatory program and permits for regulated municipal separate storm sewer systems (MS4's), construction sites, and industrial facilities. This objective is a subset of objective 3-2.

2.6.5 (3-5) Minimize adverse water quality impacts from non-point sources to surface and groundwater. (Medium)

Surface water and groundwater pollution result from a combination of point and non-point discharges. Non-point sources are diffuse and more difficult to monitor than are point sources. It is also more difficult to assign responsibility for pollution from non-point sources. Non-point sources include runoff from agricultural lands, forests, mining, and urban and residential activities. Agricultural non-point source pollution is regulated by the RWQCB's Irrigated Lands Regulatory Program. Forestry non-point source pollution is regulated by several federal statutes through forest management plans. Mining activities and mine site remediation are regulated by a multitude of federal and state agencies, programs, and policies. Projects or programs that would contribute toward meeting this objective include, but are not limited to, those that minimize the adverse water quality impacts of non-point source pollution through improved source controls and land management practices. This objective is intended to be implemented on a voluntary basis and is not a regulatory action or mandate.

Measurement of this objective will be through assessing the level of compliance with the Irrigated Lands Regulatory Program.

2.7 NARRATIVE FOR WATERSHED PROTECTION AND MANAGEMENT (GOAL #4)

2.7.1 (4-1) Aggressively manage invasive species within the watershed. (High)

Invasive species pose a myriad of threats to local economies, ecosystems, and human health. Invasive species that have a high potential for deleterious effects on management of water resources in the NSV region include, but are not limited to, the non-native giant reed (Arundo), tamarisk, Brazilian egeria, hydrilla, Eurasian watermilfoil, purple loosestrife, New Zealand mudsnail, and Eurasian mussels. Projects or programs that would contribute toward meeting this objective include, but are not limited to, those that aggressively monitor for the presence and spread of invasive species, eradicate established infestations, and implement critical control point measures for invasive species in water resource projects and operations.

Measurement of this objective will be conducted through counting: 1) the number of invasive species management projects or project components; 2) acres treated; 3) sites with surveillance/inspection/maintenance; and 4) the annual and cumulative reduction in invasive species distribution from baseline surveys since IRWMP adoption.

2.7.2 (4-2) Integrate mutually beneficial agricultural production and habitat conservation programs and projects that don't redirect impact to neighbors. (Medium)

Integration of agricultural production with habitat conservation and improvement projects is an effective multi-benefit strategy to improve and increase wildlife habitat in the region and enhance natural resource conditions on the land, while not impacting the highly significant regional economic base and rural tradition of Northern Sacramento Valley agriculture. Projects or programs that would contribute toward meeting this objective include, but are not limited to, those that encourage, coordinate, develop, improve, and implement land management practices that provide mutual benefits to agricultural interests and wildlife habitat, while preventing adverse impacts to neighboring landowners. The potential for integrating habitat conservation elements into agricultural production would be facilitated on a voluntary basis by individual landowners.

Measurement of this objective will entail counting the number of: 1) voluntary agricultural habitat projects; 2) project components; and 3) the acres in joint venture or conservation reserves.

2.7.3 (4-3) Improve and protect riparian and fish habitat, and fish passage. (Medium)

This objective acknowledges the importance of riparian and aquatic habitat enhancement, fish passage improvements, and protection of the region's streams, rivers, lakes, reservoirs, and wetlands. Projects and programs that help fulfill this objective would support regional economic, ecosystem, and quality of life values. Additionally, they would contribute to nationally important commercial and recreational fisheries for Pacific salmon and internationally important migratory waterfowl.

Measurement of this objective will be through counting the number of: 1) fish habitat and fish passage projects and project components; 2) stream miles improved; and 3) spawning habitats restored or rehabilitated. The numbers counted will be measured against the severity of problems per year and cumulatively since IRWMP adoption.

2.7.4 (4-4) Implement healthy forest/foothill management activities that improve watersheds. (Medium)

A key component of watershed improvement and protection in the largely rural Northern Sacramento Valley region is the implementation of management actions that sustain healthy forests and foothill woodlands and grasslands. Healthy forests and foothill woodlands and grasslands provide natural filters and channels for water runoff and promote groundwater recharge, thereby improving water quality, groundwater infiltration and watershed functions that benefit both humans and the environment. Healthy forest/foothill management activities that will contribute to fulfillment of this objective include, but are not limited to, state-of-the-science timber harvesting and silviculture, controlled burns, understory biomass management, eradication of invasive species, establishment of native species, streambank erosion control, road maintenance, erosion control, and sustainable management practices for hardwood harvest and livestock grazing.

Measurement of this objective would be completed through counting the number of: 1) management activities funded; 2) acres treated; and 3) forest road rehabilitated. The numbers counted would be compared annually and cumulatively since IRWMP adoption.

2.7.5 (4-5) Protect wetlands that are critical to hydrologic function. (Medium)

Hydrologic function of regionally important wetlands, including floodplains and riparian forests, valley bottom tule marsh, vernal pool wetlands, and montane wet meadows, is important to municipal, agricultural, and ecological interests in the region. Important hydrologic functions of wetlands include floodwater attenuation; storm water detention; physical, biological, and chemical processes that improve water quality; groundwater recharge and water storage for regional and downstream benefit.

Measurement of this objective would be assessed by: 1) counting the number of acres of critical wetlands protected; and 2) evaluating the effectiveness of county or regional programs for management of key wetlands per year and cumulatively since IRWMP adoption.

2.7.6 (4-6) Integrate recreational opportunities within water resource programs and projects. (Medium)

Many water resource programs and projects present opportunities to incorporate compatible recreational improvements/components to benefit the public and local economies, such as boating, picnicking, swimming, bird watching, fishing, hunting, and hiking. Projects or programs that would contribute toward meeting this objective include, but are not limited to, those that encourage and/or incorporate recreational facilities when compatible, to increase the number of benefits and beneficiaries of IRWMP projects and programs.

Measurement of this objective would include counting the number of recreation elements included in projects or project components. If possible, it would also be desirable to assess the level of economic growth associated with water-based recreation sectors per year and cumulatively since IRWMP adoption.

2.7.7 (4-7) Evaluate habitat conservation and ecosystem improvement programs and projects that have potential economic impacts on agricultural lands. (Medium)

Some habitat conservation and ecosystem improvement programs designed to benefit the environment and provide broad regional economic benefits have had adverse impacts on adjacent agricultural land uses. This objective is included to promote evaluation of approaches and practices associated with existing and proposed future habitat conservation and ecosystem improvement projects in order to anticipate and avoid or minimize any adverse economic impacts on nearby agricultural land uses.

Measurement of this objective would be conducted through assessing whether habitat conservation and ecosystem improvement programs and projects have positively or negatively impacted the economics of agricultural lands. Positive or neutral economic impacts would demonstrate the successful implementation of this objective.

2.8 NARRATIVE FOR INTEGRATED REGIONAL WATER MANAGEMENT (IRWM) SUSTAINABILITY (GOAL #5)

2.8.1 (5-1) Preserve the autonomy of local governments, special districts, and Tribes. (Foundational)

The development of the NSV IRWMP was initiated by local entities within the region for the benefit of those living, operating, and recreating within the region. This objective clarifies that maintaining the autonomy of local governments and special districts is an important guiding principle of the local entities that teamed together to create the IRWMP. Local governments and special districts in the region will be primary implementers of projects and programs to fulfill the IRWMP objectives. The IRWMP and its NSV Board in no way infringe upon or alter the rights, duties, and authorities of local governments, including Tribes, and special districts.

To measure this objective, an assessment would be conducted on whether or not local governments, special districts, and Tribes are maintaining autonomy. This assessment would be qualitative by surveying staff on their perception of autonomy preservation.

2.8.2 (5-2) Enhance communication and coordination among federal, state, Tribal, and local governments, and other stakeholders. (Foundational)

The success of integrated regional planning efforts will rely upon extensive communication and coordination among all key participants and stakeholders. This objective aims to provide one of the most essential ingredients to develop and implement the NSV IRWMP. The conduct of regular NSV Board and TAC meetings has already contributed to the development and enhancement of networks of communication and coordination on water management-related issues in the region.

This objective would be measured through evaluating: 1) whether positive outreach at public meetings has occurred; and 2) whether correspondence among parties has increased each year and cumulatively since IRWMP adoption. A qualitative assessment would also be conducted by asking staff for their perception of the level of positive two-way participation, opportunities to participate, outreach effort documentation, and ability to contact each other in the regional network.

2.8.3 (5-3) Maintain a governance structure to update the Integrated Regional Water Management Plan (IRWMP) and support IRWMP project implementation. (Foundational)

The successful implementation of the NSV IRWMP requires a governance structure that facilitates regional coordination, communication, and cohesiveness, including continued regional dialog on shared priorities and current events. Fulfilling this objective will ensure that an effective governance structure is maintained to support IRWMP implementation, assess its progress, and update the IRWMP as deemed appropriate. Its success will be dependent on the relationships, integrity, and commitment of the individuals involved to enhancing water management in the region for the benefit of the people and resources of the region.

This objective will be measured by the currency of the MOU and data management plan, and the number of scheduled NSV Board and TAC meetings that are successfully conducted with a quorum.

2.8.4 (5-4) Coordinate with neighboring IRWM regions to identify opportunities to enhance water management. (Foundational)

Many water projects, programs, and issues transcend the boundaries of IRWM regions. This objective aims to facilitate voluntary coordination with neighboring IRWM regions to enhance water management. The Northern Sacramento Valley neighboring regions include the Westside Sacramento River, Upper Feather River, North Coast, Cosumnes-American-Bear-Yuba, American River Basin, Yuba County, Upper Sacramento-McCloud River, and Upper Pit River. Coordination may provide opportunities for shared participation in projects and programs to enhance water management for the greater area.

This objective will be measured through evaluating whether or not the region and its neighbors have established institutional structures or mechanisms for inter-regional cooperation (such as MOUs or regular meetings).

2.8.5 (5-5) Pursue funding opportunities to implement programs and projects consistent with the IRWMP. (Foundational)

Without funding from outside sources many of the most foundational and critical IRWMP projects may never be realized. This objective encourages regional entities to seek and pursue opportunities to obtain local, state, and federal funding for projects and programs consistent with, and listed in, the IRWMP. Participation in the IRWM process, which ensures regional coordination and support for projects, is viewed favorably by many funding agencies and thereby increases the collective opportunity to obtain funding for implementation.

This objective would be measured by counting the number of: 1) external funding opportunities that have been pursued each year and cumulatively since IRWMP adoption; and 2) grant or loan applications submitted per year and cumulatively since IRWMP adoption; and grant funds received per year and cumulatively since IRWMP adoption.

2.8.6 (5-6) Coordinate IRWM activities with land-use planning. (Foundational)

Land and water use planning are inseparable and the two should be coordinated to sustain the socioeconomic vitality of the region. Legal authority for land use and water planning remains unchanged by the IRWMP. This objective aims at maintaining and improving coordination between land use management and IRWM activities in order to maximize regional benefits from the investment of limited financial resources, and anticipate and prevent unintended adverse consequences to land and water. An inherent benefit of the existing governance structure is that the NSV Board includes publicly elected officials with experience and fiscal responsibility for making decisions on both water and land use matters. Enhanced coordination among land use planners and water managers may result in improved water management in areas such as municipal landscaping programs, public access and recreational area management, changes in land use that affect water resources, General Plan updates and long-term planning, planning review, development review, and habitat management.

Measurement of this objective would assess the level of increase in communication between water planners and land-use planners. A qualitative survey of staff would be used to perform this assessment.

2.9 NARRATIVE FOR PUBLIC EDUCATION AND INFORMATION DISSEMINATION (GOAL #6)

2.9.1 (6-1) Conduct public education and outreach to promote IRWMP goals (Foundational)

A key to making decisions affecting land and water resources and public health and safety in the region is interaction with members of the public who are knowledgeable about the merits and consequences of resource-related decisions. This objective aims to provide opportunities for the public to learn about and provide input to the IRWMP and its associated programs and projects. A successful outreach program will require an ongoing coordinated effort to provide information to, and receive information from, the public and water managers subsequent to adoption of the IRWMP.

This objective can be measured qualitatively through assessing staff's perception of positive public outreach achievement. To assist with this measurement, a record of public outreach will be maintained.

2.9.2 (6-2) Develop and disseminate information to protect regional water supplies (Foundational)

The management of water supplies affects land and water resources and public health and safety in the region. Fulfilling this objective would ensure that important resource information such as groundwater levels, aquifer characteristics, and stream flows collected under objective 1-1 is compiled, explained, disseminated, and readily available to the interested public, water managers, and other regional entities acting to protect regional water supplies. The NSV IRWM website is one readily available tool for disseminating resource information.

This objective will be measured both qualitatively and quantitatively. The first form of measurement will be counting the number of: 1) websites with regional water supply information; 2) reports made available to the public; and 3) presentations to various stakeholder groups. Qualitative measurement will include conducting annual surveys to evaluate the public's knowledge of regional water supplies and to identify gaps.

2.9.3 (6-3) Disseminate information on flood risks, Federal Emergency Management Agency's (FEMA's) flood insurance rate maps (FIRM), and new FEMA policies. (Foundational)

Understanding flood risks and policies is essential to land and water resources management and public health and safety in the region. Fulfilling this objective would ensure that basic information regarding related topics such as flood risks, FEMA's Flood Insurance Rate Maps, new FEMA policies, and DWR's legislatively mandated flood maps is compiled, disseminated, and readily available to the public, water managers, land-use planners, and other stakeholders in the region. The NSV IRWM website is one readily available tool for disseminating flood related information.

This objective would be measured through quantitative assessment of staff in the region. Staff would be asked to assess whether flood risk, FEMA's FIRMs, and new FEMA policy information has been adequately distributed and if the overall understanding of flood risks, flood preparedness, and flood risk reduction planning and management has improved.

2.9.4 (6-4) Develop and disseminate water quality information throughout the region. (Foundational)

Water quality information is essential to land and water resources management and public health and safety in the region. This objective encourages the development and dissemination of water information collected under objective 1-1 about the quality of the region's groundwater basins and surface water bodies. The NSV IRWM website is one readily available tool for dissemination.

Measurement of this objective will be through assessing the: 1) adequacy of information available for the state's biannual 305(b) report; 2) adequacy of data for assessments in CA Water Quality Monitoring Council's My Water Quality portals; 3) ambient data uploaded to CEDEN; 4) regulated facilities' compliance records tracked in USEPA's ECHO program; and 5) whether wastewater dischargers are uploading effluent monitoring data to CIWQS. Simulation models could be used to increase the understanding of water quality cause/effect relationships.

2.9.5 (6-5) Develop and disseminate scientific information on aquatic, riparian, and watershed resources. (Foundational)

The aquatic, riparian, and watershed resources of the Northern Sacramento Valley region are of local, state-wide, national, and international importance to water supplies, water quality, fisheries, and wildlife. Having readily available information on these resources is vital for developing timely, efficient, and mutually beneficial management solutions and for avoiding conflicts among resource uses. Projects or programs that would contribute toward meeting this objective include, but are not limited to, those that collect, compile, develop, and disseminate scientific information on aquatic, riparian, and watershed resources for educating and informing the public, water managers, land-use planners, and other stakeholders in the region. The NSV IRWM website is one readily available tool for dissemination.

Measurement of this objective would be conducted by counting the number of projects and programs that include aquatic, riparian, or watershed public information elements per year and cumulatively since IRWMP adoption.

CHAPTER 3
Plan Development Process, Schedule, and Phasing

The purpose of this chapter is to discuss the plan development process, including stakeholder involvement and integration, and coordination. The formation of the NSV Board and the TAC are discussed in detail in Chapter 1 Governance and Region Description.

3.1 STAKEHOLDER INVOLVEMENT AND INTEGRATION

The NSV Board gives the opportunity to all stakeholders to actively participate and influence the IRWM decision making process on an ongoing basis. For the purpose of this IRWMP, the term "stakeholder" is defined as any individual or organization with an interest in, or who would be impacted by, the work of the NSV Board.

The NSV Board and TAC are considered stakeholders and have actively participated in all aspects of the IRWMP development. Chapter 1 – Governance and Region Description describes how the NSV Board and TAC members were selected. As described in Chapter 1, the 18-member NSV Board consists of three individuals selected by each of the respective county Boards of Supervisors and includes landowners, water purveyors, members of the Board of Supervisors and other elected officials. NSV Board meetings are public and subject to the Ralph M. Brown Act of 1953 (Brown Act), so that all people interested in the NSV IRWMP process have an opportunity to express their thoughts directly to the NSV Board. The TAC was established as a working-level group to act as staff to the NSV Board.

An emphasis on stakeholder involvement is essential due to the nature of working with six different counties and the variety of water users within. An ongoing collaborative water planning process should engage a wide range of stakeholders and provide a balance of the region's interest groups, to address the region's objectives and RMSs. The following describes the NSV Board's open door to stakeholders, the region's stakeholder composition, the region's disadvantaged communities, technology and information access for stakeholders, and the NSV Board's decision making process.

3.1.1 Open door to Stakeholders/Stakeholder Involvement

The NSV Board keeps an open door to the region's stakeholders through a variety of means. First, all members of the public are welcome to attend NSV Board and TAC meetings to learn about the IRWMP development process, hear deliberations of the NSV Board and TAC, and share information and viewpoints. NSV Board and TAC meetings abide by the Brown Act, which promotes a high degree of transparency and timely communication. NSV Board and TAC agendas, potential action items, and meeting materials are made publicly available at least 72 hours in advance of every noticed meeting. Meeting agendas are posted at the physical location of meeting and the agenda and meeting materials are emailed to the list of stakeholders on the NSV IRWM stakeholder e-mail list as well as posted on the NSV IRWM website. The NSV Board's pledge to Brown Act compliance means that during the NSV Board and TAC meetings, the NSV Board and TAC receive public comment prior to making any decisions. There is also a standing item on every NSV Board and TAC agenda to receive public comment at each meeting for items not listed on the agenda.

Another way that the NSV Board keeps an open door is through continuously receiving comments through the NSV IRWM website, through the info@nsvwaterplan.org email address, and through TAC County staff representatives. Received comments are typically referred to the appropriate TAC County staff representative or consultant for response, and/or included in meeting materials as correspondence. Comments received through the website or email and their corresponding responses are also logged in a spreadsheet. If the comments are addressed specifically to the NSV Board or TAC, they are included in the next NSV Board and/or TAC meeting's agenda package. The website in particular is a good way for stakeholders who are new to the IRWM process to learn about IRWM basics, the activities completed by the NSV IRWM region to date, NSV Board and TAC members, and future opportunities for public involvement.

The third primary way that the NSV Board has maintained an open door with stakeholders is through holding public workshops throughout the IRWMP development process. As described in Chapter 2, Phase 1 identified the region's needs, issues, and aspirations, and then developed goals and objectives for the region consistent with the region's identified needs, issues, and aspirations. A series of public workshops was held in January 2012 in Red Bluff, Oroville, and Colusa to solicit and discuss the needs and aspirations of the region's stakeholders in order to develop appropriate goals and objectives for the IRWM Plan. Phase 2 identified and reviewed potential projects and programs submitted for inclusion in the plan by project proponents. During Phase 2, a series of public workshops was held in September 2012 in Redding, Chico, and Yuba City to discuss the project submission process, discuss the proposed project prioritization process, and facilitate interaction between proponents of submitted projects and with the public. Flyers announcing each public workshop and inviting new stakeholders to attend are shown in Appendix E. A third series of public workshops will be conducted when the draft IRWMP is available for public review in mid-2013.

The NSV Board and TAC have never restricted involvement, or composition of the NSV Board and TAC, due to inability of an individual or group to contribute financially to the IRWM process. Stakeholder comments and involvement have been encouraged through all of the methods mentioned above without regard for any of the stakeholders' ability to contribute financially.

3.1.2 Stakeholder Composition and Identification

The stakeholders in the NSV region are diverse. The composition of stakeholders and their identification is described in the following text.

3.1.2.1 Stakeholder Composition

A wide range of stakeholders have attended meetings and indicated interest in the NSV Board and the IRWMP. Participating stakeholders include, but are not limited to: water users such as wholesale and retail water purveyors, water districts, municipalities, agricultural water users, Tribes, various landowners, environmental stewardship groups, members of local political activist groups, resource conservation districts, wastewater agencies, flood control and drainage agencies, and university staff. The NSV IRWM stakeholder e-mail list currently contains contact information for 260 stakeholders.

3.1.2.2 Stakeholder Identification

As indicated above and in Chapter 1 Governance and Region Description, the NSV Board and TAC represent a significant number of stakeholders, including the six counties, water purveyors, and landowners. Stakeholders other than the NSV Board and TAC have been and continue to be identified through several means. One way is through signing in or commenting at NSV Board, TAC, and public workshop meetings. As described in section 3.1.1, all NSV Board and TAC meetings are openly announced to invite new stakeholders. At all public NSV IRWM meetings, a voluntary sign-in sheet is provided so that the NSV Board has a record of who attends, and new attendees can be added to the NSV IRWM stakeholder e-mail list. Note, however, some stakeholders regularly attend meetings but choose not to sign in. For example, a typical TAC meeting has ±20 members of the public (in addition to the TAC members and consultants) in attendance, yet most sign-in sheets from these meetings record fewer than 10 people. Many of the people that attend the meeting and do not sign in make public comments during the meeting and may identify themselves at that time. So, some stakeholders are identified through a combination of meeting sign-in sheets and public comments.

Another way that stakeholders are identified is through comments received through the website and through the info@nsvwaterplan.org email. Many comments were received during the goals and objectives development process from interested parties that did not necessarily attend meetings. For example, comments were received from CSU Chico professors that had never attended the meetings.

Members of the NSV Board and TAC also announce IRWM meetings through their individual organizations – either at their NSV Board meetings, through their newsletters, or other forms of communication. Many new stakeholders have been identified by NSV Board and TAC members as a result of their local outreach.

3.1.3 Outreach to DAC Stakeholders

In addition to the methods of identifying and involving stakeholders described above, the NSV IRWM group has targeted outreach to DACs in an attempt to involve additional underrepresented stakeholders in the IRWMP development process.

DAC outreach is primarily conducted by County staff, building upon existing relationships. In November 2011, in the early part of Phase 1, the TAC County staff representatives and other County staff with existing relationships with DAC representatives attended an all-day DAC training session conducted by the consultant. In this training, County staff received overview information on the IRWMP development process and how to convey this message to DACs in their counties. County staff also brainstormed ideas for how to explain the IRWMP development to various DACs and reviewed outreach toolkit materials that were developed for this purpose. The outreach tool-kit materials, aside from the January 2012 outreach workshop flyer, are included in Appendix E. Also included in Appendix E is a fact sheet, PowerPoint presentation, and a questionnaire (in both English and Spanish) about water-related needs and aspirations. County staff received these toolkits for their use at meetings and other community events in which they might have the opportunity to share information about the IRWMP process with DACs. Part of their immediate charge was to distribute and collect questionnaires. As a result of

DAC targeted outreach, County staff collected 189 questionnaires from DACs (out of a total of 349 received questionnaires).

Although many of the County staff was already familiar with the DACs existing in their counties, a map (Figure 3-1 – located at the end of Chapter 3) was also created and referenced to ensure that Census Block Group areas with high concentrations of DACs were not overlooked in the DAC targeted outreach. As shown on Figure 3-1, a significant portion of the NSV IRWMP region consists of DACs.

After Phase 1, TAC County staff representatives on the TAC have continued to communicate with other County staff from their respective counties to ensure that IRWM announcements are conveyed to DACs.

3.1.4 Outreach to Tribal Stakeholders

In addition to the methods of identifying and involving stakeholders described above, the NSV IRWM group has targeted outreach to Tribes in an attempt to involve additional underrepresented stakeholders in the IRWMP development process.

In-person Tribal outreach has been conducted by County staff. In December 2011, the TAC County staff representatives and other County staff with existing relationships with Tribes attended an all-day Tribal training session. In this training, County staff received information on California Indian history and culture, federal Indian law and Tribal sovereignty, and the difference between collaboration and formal government-to-government consultation. County staff that had existing relationships with Tribes in their county have communicated with these Tribes about the NSV IRWMP process using materials from the outreach toolkit described in section 3.1.3.1. Tribal focus groups were offered at the first round of public workshops in Phase I; however, there were not enough meeting participants interested in separate Tribal focus groups at the workshops to conduct those focus groups.

In addition to in-person outreach to Tribes, hard copy letters signed by the NSV Board Chair were sent to Tribal chairpersons and other representatives (such as Tribe environmental directors, project managers, and executive directors) periodically throughout the IRWM process. In December 2011, a letter was sent to invite Tribes to participate in the IRWM planning process and to attend the first round of public outreach workshops, including the Tribal focus groups, in January 2012. In March 2012, a letter was sent regarding the opportunity to comment on the proposed goals and objectives. In June 2012, a letter was sent to provide an update on the IRWM process, transmit a copy of the adopted goals and objectives, and to invite Tribes to submit their water projects to the NSV IRWM group during July and August. In September 2012, a letter was sent to notify Tribes that the project solicitation process would be re-opened in October, solicit the Tribes' comment on the project prioritization process, and invite the Tribes to attend the second round of public workshops in September. A copy of each of the letters sent to the Maidu Nation, as an example, is provided in Appendix F. The full list of Tribes that received these written communications is:

- Berry Creek Rancheria
- Colusa Indian Community Council
- Cortina Rancheria
- Enterprise Rancheria of Maidu
- Greenville Rancheria
- Grindstone Indian Rancheria
- Mechoopda Tribal Council
- Mooretown Rancheria
- Nor-Rel-Muk Nation
- Paskenta Tribal Council
- Redding Rancheria
- Tsi-Akim Maidu
- Maidu Nation
- Honey Lake Maidu
- Wadatkuta Band of the Northern Paiute of the Honey Lake Valley
- Wintu Tribe of Northern California
- Shasta Indian Nation
- Shasta Nation
- Susanville Indian Rancheria
- Winnemem Wintu Tribe

This list of Tribes includes both Tribes with lands in the NSV region as well as Tribes with ancestral lands in or bordering the NSV region. The list includes both federally and non-federally recognized Tribes (*i.e*. California Native American Tribes).

3.1.5 Technology and Information Access

Technological tools such as the project website, online project submittal process, and NSV IRWMP stakeholder email list have been important ways to provide easy and timely access to information for stakeholders who use the internet. However, the NSV Board has been sensitive to the fact that not everyone in the region has easy access to the internet and therefore makes announcements and resources available in ways other than via email and websites.

First, although NSV Board and TAC meeting notices and materials are emailed to the NSV IRWM stakeholder email list and posted on the website, a hard copy is also posted at the meeting location and TAC County representatives typically announce meeting dates, times, and cancellations at standing meetings of interested local groups such as their county water committee or water commission, Resource Conservation District (RCD) Board, or Farm Bureau Board. At the meetings themselves, hard copies of meeting materials are also made available. These meeting materials have included key documents in both draft and final forms, such as the NSV IRWMP goals and objectives.

Second, hard copies of fact sheets and other informational materials have been provided at each public outreach workshop. The County staff assigned to perform outreach to DACs and Tribes provided both hard copy and electronic copies of the Phase 1 questionnaire on needs and aspirations, including hardcopy questionnaires in Spanish as appropriate. Also, the materials included in the DAC/Tribal outreach tool-kits were provided in an alternate black and white version to make printing materials more affordable for County staff and thereby encourage the circulation of a higher volume of printed materials where appropriate. In Phase 2, materials describing the project submittal process and the project ranking system were provided in hardcopy at the second round of public workshops. Project submission forms in Phase 2 were made available not only on the website, but also in Word document format for submissions via

email and in hard copy format for submission via "snail mail" as needed. In Phase 3, hardcopies of the draft IRWMP will be made available for public comment.

In addition to materials produced and disseminated by the NSV IRWM group, general comments have been solicited and received from the public in a variety of formats. For example, in addition to electronically-submitted comments, hardcopy comment forms were disseminated at public workshops for handwritten comments on needs and aspirations and goals and objectives (Phase 1) and project prioritization and integration (Phase 2). As needed, consultants assisted members of the public with writing and submitting their comments at workshops.

3.1.6 Decision Making Process

The general decision-making process for the NSV Board, as described in the Governance section of Chapter 1, involves the NSV Board making all final decisions at publicly noticed Brown Act compliant meetings. The NSV Board's decisions are informed by recommendations from the TAC, various subcommittees – such as the Project Review Subcommittee and the Governance Subcommittee – and public comment. For major changes in the Bylaws, such as the number of members on the NSV Board, change in the NSV Board's purpose, or annual budgets, the County Boards of Supervisors may need to give their approval to their counties' appointed NSV Board members before the NSV Board can make a decision. As part of the Brown Act compliance any decision that the NSV Board will consider is clearly listed on the publicly noticed agendas at least 72 hours in advance of NSV Board meetings.

The TAC does not make IRWMP decisions; rather it creates recommendations to the NSV Board for consideration. However, TAC actions to recommend items to the NSV Board for its consideration are also clearly listed on the publicly noticed TAC agendas at least 72 hours in advance of TAC meetings as part of Brown Act compliance. Like the NSV Board, the TAC considers recommendations from various subcommittees – such as the Project Review Subcommittee and the six TAC County staff representatives – and public comment prior to creating recommendations to the NSV Board.

3.2 COORDINATION

The NSV IRWM region aims to successfully coordinate with projects and activities with project proponents and stakeholders within the region, neighboring IRWM regions, and government agencies. Coordination is a key activity in the NSV IRWM region due to its geographically large nature and the involvement of six counties. Coordination with stakeholders within the region as well as stakeholders neighboring the region is important to avoid redundancies and create efficiencies – such as cooperating on projects where appropriate. These coordination efforts are described in the following sections.

3.2.1 Coordination of Activities within an IRWM Region

The NSV IRWM region coordinates its efforts with project proponents and stakeholders in the region to avoid conflict within the region and to maximize the utilization of the region's resources. There are several ways in which the region's project proponents and stakeholders can coordinate their IRWM-related activities. To begin with, summaries of all of the projects submitted to the NSV Board for ranking were made available to the public on the NSV IRWM

website's projects database. Printed copies of this summary were also provided at the NSV Board and TAC meetings following each submittal deadline as well as at the Round 2 public workshops. At the Round 2 public workshops, the majority of the workshop time was set aside for a poster session with project proponents in which meeting attendees had an opportunity to interact with attending project proponents. This poster session also provided an opportunity for project proponents to talk with each other and, in some cases, consider integrating or coordinating their projects. The poster session increased awareness amongst project proponents and stakeholders about potential upcoming projects in the region.

Another way that the NSV region facilitates coordination is by inviting project proponents of key projects of interest to the region to provide informational presentations at NSV Board and TAC meetings. For example, the proposed Sites Reservoir project was presented and discussed at the August 16, 2012 TAC meeting and the September 10, 2012 NSV Board meeting.

The six TAC County staff representatives have also facilitated greater coordination between stakeholders and project proponents as the County staff are often the people with the most knowledge about projects in their county. As the NSV IRWM process has increased their knowledge of proposed local projects, the six TAC County staff representatives can use this information in their interactions internally with their own county's staff members, across county staffs, and with the region's various stakeholders.

3.2.2 Identification and Coordination with Neighboring IRWM Regions

As described in Chapter 1, there are several neighboring and overlapping IRWM efforts. The neighboring and overlapping IRWM efforts are shown in Figure 3-2 below and described in further detail in Chapter 1 (Section 1.10).

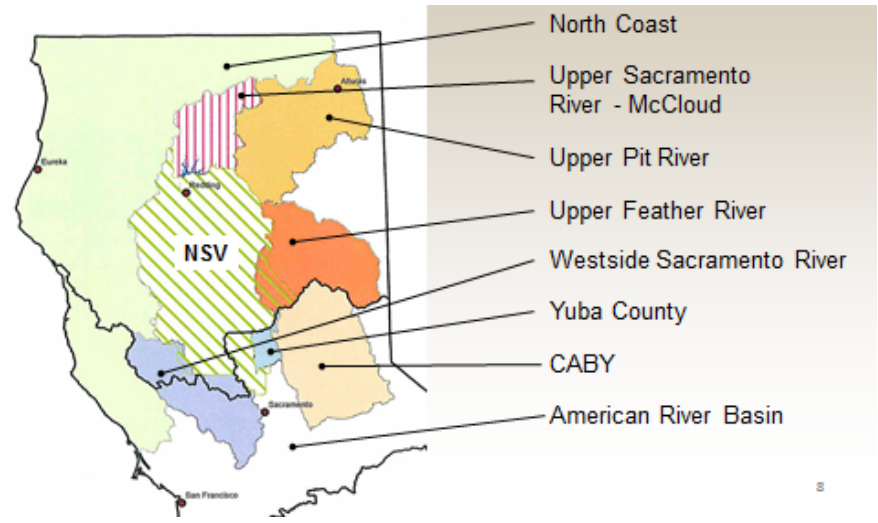


Figure 3-2. Neighboring IRWM Regions

Representatives from the NSV IRWM region have been participating in meetings with other IRWM planning areas throughout the Prop 84 SRFA in an attempt to coordinate all efforts throughout the larger region. Since 2008, this group of IRWMP representatives has met several times to discuss an approach to integrated planning that would provide for the needs of all potential participants within the SRFA.

The IRWMPs in the SRFA cover a large geographic area and need to address a wide range of issues including: water supply, surface and groundwater management, land use and environmental stewardship. Although there are many similarities throughout the larger region, due to the vast geographic area, there are many different approaches to the management of resources that make each planning area unique.

The NSV region coordinated with several IRWMPs between 2008 and 2010, and they continue to coordinate on grant funding pursuits and on specific projects and issues where there is an overlap of interests.

The neighboring and overlapping IRWM efforts that are most critical to the NSV IRWM effort are the:

- Upper Feather River
- Westside Sacramento River

The relationships between the NSV IRWM effort and the two IRWM efforts listed above, as well as the relationship with the SRFA are discussed below.

3.2.2.1 Relationship with Upper Feather River IRWMP

The NSV IRWM region has an overlapping area with the Upper Feather River IRWM region in the portion of Butte County that includes the Upper Feather River watershed. Butte County and the Upper Feather River IRWM agree that coordination of projects within this overlap area is appropriate and plan to address the means of coordination through an MOU. The MOU will address planning and management in the overlap area, determine areas of responsibility, and provide for appropriate consultation on certain matters. For example, the communities of Paradise, Magalia, and Concow are located on the western edge of the watershed in Butte County. For purposes of municipal water and wastewater services, any integrated management issues would best be addressed by those communities coordinating with Butte County, the NSV IRWM and the other population centers in the valley. For forest management and Fire Safe activities, there is already coordination between the Plumas National Forest and the Butte County Fire Safe Council, which will be enhanced through the MOU.

3.2.2.2 Relationship with Westside Sacramento (Yolo, Solano, Napa, Lake, Colusa) IRWMP

The NSV IRWM region has an overlapping area with the Westside Sacramento IRWM region in the portion of Colusa County that includes the Bear Creek watershed, which is tributary to the Cache Creek watershed. Although the NSV IRWM region includes the entirety of Colusa County, it collaborates and coordinates with the Westside IRWMP. Colusa County, the Westside IRWMP, and the NSV IRWMP agreed early on that coordination of projects within this overlap

area is appropriate and plan to address the means of future cooperation and coordination through an MOU. The MOU will address planning and management in the overlap area, determine areas of responsibility, and provide for appropriate consultation on certain matters. For example, for purposes of municipal water and wastewater services in the Bear Creek watershed, integrated management issues may be addressed by Colusa County through the NSV IRWMP; however, for ecosystem management in the Bear Creek watershed, integrated management issues may be addressed by the Colusa County Resource Conservation District in collaboration with the Westside IRWMP.

3.2.2.3 Relationship to the Sacramento River Funding Area

The NSV IRWM region is engaged in coordination and planning with all of the IRWM regions in the SRFA. DWR's map of IRWM funding regions identifies eight planning efforts in the SRFA: American River Basin, Cosumnes American Bear Yuba (CABY), Northern Sacramento Valley, Upper Feather River, Upper Pit River, Upper Sacramento-McCloud, Westside-Sacramento, and Yuba County Water Agency.

Beginning in June of 2008, representatives from each of the 10 Regions [American River Basin, Cosumnes American Bear Yuba (CABY), Four Counties (now Northern Sacramento Valley, NSV), Sacramento Valley (now superseded by NSV, American River Basin, and Westside), Lake County (now superseded by Westside), Napa-Berryessa (now superseded by Westside), Solano (now superseded by Westside), Upper Feather River, Yolo County (now superseded by Westside-Sacramento), and Yuba County Water Agency] met to discuss common interests and have met on five subsequent occasions through 2010. The six meetings were focused on communication and collaboration, identifying joint projects and several specific objectives, which include:

- Ensuring that adjacent or overlapping regions define an appropriate level of coordination,
- Recognizing the need for additional planning, and the need for state funding to support it, in all of the independent regions,
- Exploring the concept of an equitable funding distribution among regions within the SRFA, for possible proposal to DWR, and
- Sending a common message that the SRFA, as the major source of water for much of the rest of the state, should receive a significant portion of the "inter-regional" funds.

The various IRWMPs in the region have developed specific agreements or understandings with adjacent plans with which they have a boundary overlap. Over the course of the SRFA meetings, the group identified the specific planning needs of each IRWM area based both on the evolution of events within the area and also the then-anticipated Proposition 84 guidelines for IRWM update and revision. The group discussed possible formulas for the distribution of funds, development of a single region-wide approach to planning allocations, development of subareas within the region to facilitate development of funding allocation formulas and other similar topics. However, discussions at that time were unsuccessful in coming to mutual agreement. The most recent coordination occurred in January 2013 via email to communicate and coordinate

amongst the SRFA IRWM regions who would be applying for Prop 84 Round 2 IRWM implementation funding.

Ongoing coordination throughout the SRFA is expected to continue indefinitely and to be memorialized by an area-wide MOU or other agreement in the future.

3.2.2.4 Neighboring IRWMPs Requiring Minimal Coordination

The Trinity River watershed and the Sacramento River watershed form the boundary between the NSV IRWM region and the North Coast IRWM region and water does not naturally flow from one to the other, nor do they share a common groundwater basin. Therefore, coordination between the two IRWM efforts is minimal. However, the Trinity River Project and Central Valley Project are operated by the United States Bureau of Reclamation and Trinity operations send critical cold water to the Sacramento Valley annually. Should a project in the North Coast IRWM contemplate changing this, more extensive coordination would be required.

The Upper Pit River flows into Shasta Lake upstream of the NSV IRWM watershed and therefore coordination with the Upper Pit IRWM effort exists. The Shasta County Water Agency also participated in development of the Upper Pit IRWMP.

The Upper Sacramento-McCloud IRWMP, immediately upstream of Shasta Dam, has recently begun. Although Shasta County is not directly involved in the Upper Sacramento-McCloud, it is aware of the IRWMP effort and will have an opportunity to comment on the draft IRWMP. Shasta County will make sure that none of the projects in the NSV IRWMP require coordination with the Upper Sacramento-McCloud IRWMP.

Yuba County, immediately east of Sutter County, developed an IRWMP in 2008. The Yuba County IRWMP was primarily focused on protecting the fisheries and riparian habitat of the Yuba River, which is a tributary of the Feather River, but is not included in the NSV IRWMP planning area.

For a short length, the NSV IRWMP also shares a boundary with the CABY IRWMP, which lies east of the Yuba County IRWMP.

3.2.2.5 Joint Project Opportunities and/or Conflicts

At this time, no projects that would require coordination with neighboring IRWM regions have been identified. The Westside IRWMP (Yolo, Solano, Napa, Lake and Colusa) overlaps the NSV IRWMP region on the west side of Colusa County (Bear Valley/Cache Creek). To avoid conflicts, no projects for this area were submitted to the NSV IRWMP. Any projects in this area were submitted to the Westside IRWMP. Representatives from Colusa County are involved in both IRWMP projects. However, projects that require coordination may arise in the future. For this reason, the NSV and Westside IRWM regions plan to develop an MOU as described in section 3.2.2.2.

Similarly, on the east side of Butte County, the Upper Feather River Watershed IRWMP, which includes portions of Butte County and Plumas County, overlaps the NSV IRWMP region upstream of the Oroville Dam. As with the Westside, to avoid conflicts, no projects upstream of

Oroville Dam were submitted to the NSV IRWMP and all projects in that area were submitted to the Upper Feather River IRWMP. Refer to Chapter 1 for more information on the relationship between the NSV and Upper Feather River IRWMPs.

3.2.3 Coordinating with Agencies

There are several State, federal, and local agencies with an important role in developing the IRWMP. The role of these is described in the sections that follow.

3.2.3.1 Coordination with State Agencies

The State agencies that have been involved in the NSV IRWMP process include the DWR and the Department of Fish & Wildlife (DFW, formerly the Department of Fish & Game). A DWR representative from the Northern Region office participates on the TAC as a non-voting member and provides a report on DWR recent and upcoming activities that may be of interest to the IRWM region at each NSV Board meeting. Representatives from the DFW have attended TAC meetings and provided periodic public comment. DFW also submitted a number of projects on behalf of local entities during the 2012 project solicitation process.

The NSV Board has also coordinated with DWR extensively due to the fact that the IRWMP development has been funded with a grant administered by DWR. Because DWR has contracted with each of the IRWM regions, DWR has also served as a valuable resource to the NSV IRWM region for coordinating with neighboring regions.

Other state agencies are involved in a minor role. The California Environmental Protection Agency (CalEPA) is involved to the extent that they will process the CEQA documents needed to permit many of the IRWM implementation projects. The State Water Resources Control Board is involved to the extent that water rights issues are part of IRWM implementation projects. The Central Valley Regional Water Quality Control Board and Department of Public Health are involved indirectly in that compliance with their waste discharge requirements is a driver for many of the IRWM implementation projects. The Central Valley Flood Protection Board is involved indirectly in that it oversees implementation of the Central Valley Flood Protection Plan; the NSV IRWM will be coordinated with the Regional Flood Management Planning activities of the Central Valley Flood Protection Plan.

State agencies can assist in communication through announcing Board and TAC meetings and public workshops through their agencies' regular communication channels (e.g. websites, newsletters, *etc.*). The state agencies can also aid in gaining stakeholder cooperation through its roles on particular projects as well as agencies' roles in the IRWM planning process. For example, the NSV region has taken advantage of the local DWR representative's willingness to participate in the NSV IRWM process and therefore has a local DWR representative on the TAC as well as a standing Board meeting agenda item for DWR to provide updates to the Board. Face-to-face interaction, through participation on the TAC and presentations to the Board, has enhanced communication and cooperation between DWR and the region's stakeholders.

3.2.3.2 Coordination with Federal Agencies

To date, there has not been a need for the NSV Board to coordinate directly with federal agencies, and representatives from federal agencies have not attended IRWM meetings. However, projects in the NSV IRWMP are often influenced by federal actions and requirements, and project proponents interact with federal agencies as appropriate in the design, permitting, and implementation of projects. For example, the U.S. Army Corps of Engineers sets the design and engineering standards for flood control projects, and the Federal Emergency Management Agency prepares the flood insurance mapping, which have created the need for some of the IRWM flood control implementation projects. The Bureau of Reclamation also operates the Central Valley Project, which many of the local agencies and water districts rely on for irrigation water supply.

3.2.3.3 Coordination with Local Agencies

Many local agencies are heavily involved in the development of the IRWM Plan. The following agencies have a staff representative on the NSV Board or TAC:

- Western Canal Water District (NSV Board rep)
- Reclamation District 108 (NSV Board rep)
- Anderson Cottonwood Irrigation District (NSV Board rep)
- Rio Alto Water District (NSV Board rep)
- Tehama County RCD (NSV Board rep)
- Sutter Extension Water District (NSV Board alternate rep)
- Tehama County Public Works (TAC rep)
- Sutter County RCD (TAC rep)
- Colusa County RCD (TAC rep)
- Glenn County Agriculture Department (TAC rep)
- Butte County Department of Water and Resource Conservation (TAC rep)
- Sutter County Public Works Department (TAC rep)
- Tehama Colusa Canal Authority (TAC rep)
- Shasta County Water Agency (TAC rep)

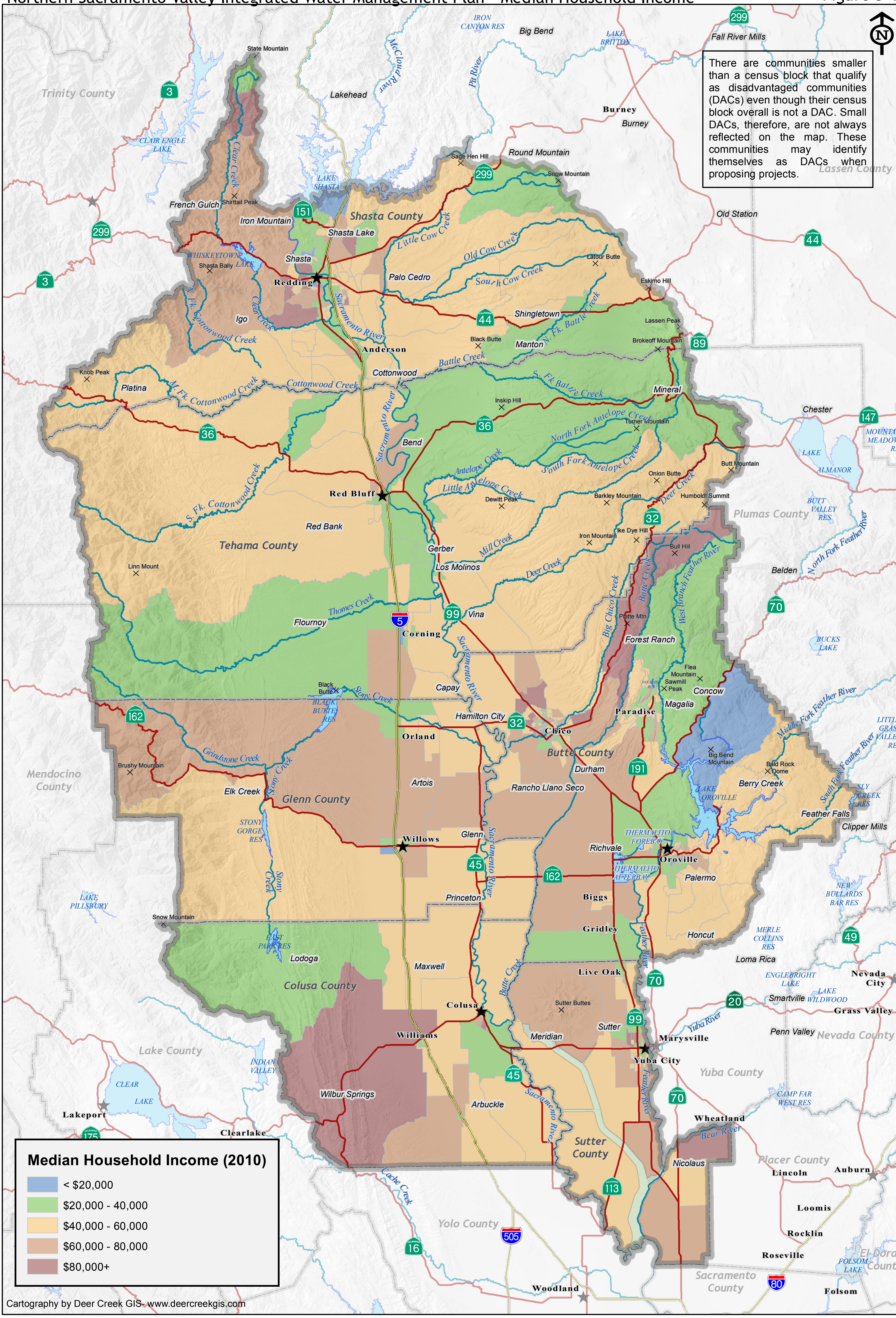
In addition to the agencies with direct connection to the NSV Board and TAC, the following non-governmental organizations (NGOs) and private water companies have either reached out to the NSV RWMG, or the NSV RWMG has solicited input from the following NGOs and private water companies:

- Butte Creek Watershed Conservancy
- Big Chico Creek Watershed Alliance
- Little Chico Creek Watershed Group
- Cherokee Watershed Alliance
- Butte Sutter Area Groundwater Users Corporation
- Butte County RCD
- Glenn County RCD
- Battle Creek Watershed Group
- Cottonwood Creek Watershed Group
- Deer Creek Watershed Conservancy
- Mill Creek Watershed Conservancy
- Sutter County RCD
- California Water Service, Chico, serving the City of Chico and Hamilton City
- California Water Service, Oroville, serving Oroville
- Del Oro Water Company, serving areas on the Paradise Ridge
- California Water Service, Willows, serving the City of Willows

The NSV Board has also reached out to the Family Water Alliance. The Northern California Water Association is represented in the TAC.

Northern Sacramento Valley Integrated Water Management Plan - Median Household Income

Figure 3-1



Data Source: Ca. Department of Water Resources.
IRWM Grant Program: http://www.water.ca.gov/irwm/grants/resourceslinks.cfm
Based on the DWR's Proposition 84 and 1E IRWM Guidelines, dated August, 2010, communities with a Median Household Income of less than $48,706 (80% of the Statewide MHI) are considered 'Disadvantaged'.

0 5 10 20 30 40 50
Miles

DEER CREEK GIS
WEST YOST ASSOCIATES Consulting Engineers

Table of Contents

Chapter 4. Resource Management Strategies

Chapter 4
Resource Management Strategies

The purpose of this chapter is to discuss the Resource Management Strategies (RMS) that were considered during the project selection process, discuss resource integration, and examine climate change vulnerability, including presenting the climate change vulnerability assessment.

4.1 RESOURCE MANAGEMENT STRATEGIES

The intent of the RMS Standard is to encourage diversification of water management approaches as a way to mitigate for uncertain future circumstances and comply with PRC §75026.(a) and CWC §10541(e)(1). An RMS, as defined in the California Water Plan (CWP) Update 2009, is a project, program, or policy that helps local agencies and governments manage their water and related resources. An IRWMP must consider each of the 29 RMSs included in the CWP Update 2009 which are listed below in Table 4-1.

Table 4-1 California Water Plan Update 2009 Resource Management Strategies [a]

Agricultural Water Use Efficiency	Conjunctive Management & Groundwater Storage
Urban Water Use Efficiency	Desalination
Crop Idling for Water Transfers	Precipitation Enhancement
Irrigated Land Retirement	Recycled Municipal Water
Conveyance – Delta	Surface Storage – CALFED
Conveyance – Regional/local	Surface Storage – Regional/local
System Reoperation	Drinking Water Treatment and Distribution
Water Transfers	Groundwater Remediation/Aquifer Remediation
Flood Risk Management	Land Use Planning and Management
Agricultural Lands Stewardship	Matching Quality to Use
Economic Incentives (Loans, Grants and Water Pricing)	Pollution Prevention
Ecosystem Restoration	Salt and Salinity Management
Forest Management	Urban Runoff Management
Recharge Area Protection	Water-Dependent Recreation
	Watershed Management

[a] Table 3 of the IRWM Guidelines, November 2012.

In addition to the 29 RMSs listed above, four RMSs were included in earlier DWR IRWM Guideline RMS lists and in the NSV project solicitation checklist (for a total of 33 RMSs). The four additional RMSs are discussed later in this chapter. As will be discussed in Chapter 5 Potential Projects and Prioritization, individual projects were ranked depending on how many of the RMSs were listed in the project application, submitted by the project proponents, as being achieved by each project. The RWMG did not evaluate the RMS claims of the project applicants. Each RMS was awarded one point, up to a total of seven points. The entire list of the 113 Ranked projects adopted through June 2013 and the 33 RMSs that would be achieved as reported by project proponents is shown in Table 4-2. A summary of the percentage of projects that would achieve each of the 29 required RMSs is shown in Table 4-3, in order of greatest to least.

Table 4-2. Resource Management Strategies by Ranked Project[a]

Project ID	Project Title	Agricultural Water Use Efficiency	Urban Water Use Efficiency	Crop Idling for Water Transfers	Irrigated Land Retirement	Conveyance – Delta	Conveyance – Regional/local	System Reoperation	Water Transfers	Flood Risk Management	Agricultural Lands Stewardship	Economic Incentives (Loans, Grants and Water Pricin	Ecosystem Restoration	Forest Management	Recharge Area Protection	Conjunctive Management & Groundwater Storage	Desalination	Precipitation Enhancement	Recycled Municipal Water	Surface Storage – CALFED	Surface Storage – Regional/local	Drinking Water Treatment and Distribution	Groundwater Remediation/Aquifer Remediation	Land Use Planning and Management	Matching Quality to Use	Pollution Prevention	Salt and Salinity Management	Urban Runoff Management	Water-Dependent Recreation	Watershed Management	Rainfed Agriculture	Dewaporation or Atmospheric Pressure Desalination	Fog Collection	Waterbag Transport/Storage Technology	Total Number of RMSs
1	Hydronium Acid & Rice Water Holding Times	1	1		1						1															1	1							8
2	Lower Stony Creek Watershed Restoration Plan									1			1		1											1			1					5
3	Improve Surface and Ground Water Quality and Quantity	1									1														1				1					4
4	Modeling the "Lower Tuscan Aquifer"															1																		1
5	Irrigation Delivery Automation Program	1					1	1	1																									4
6	Community Wildfire Protection Plan									1			1	1	1						1					1			1					7
7	RAWD Wastewater Treatment Plant & Constructed Wetlands Proje												1													1		1	1					4
8	Program of Modeling & Monitoring in Support of Groundwater M	1													1														1					3
9	In-lieu Recharge in North-Eastern Glenn County						1									1																		2
10	WSRCD NSV IRWMP Grants Specialist	1	1							1	1	1	1	1	1											1		1	1	1				12
11	Climate Stewardship Coordinator	1	1								1	1	1	1	1														1	1				9
12	Inventory/Analysis Report Update														1															1				2
13	Table A Options						1			1																								2
14	Groundwater Model Evaluation and Update									1					1												1			1				4
15	Groundwater Management Plan Update	1	1	1			1			1	1					1						1	1				1		1					11
16	Well Monitoring Network									1		1				1											1			1				5
17	Environmental Monitoring Program												1		1																			2
18	Identification and Evaluation of Groundwater Recharge														1	1																		2
19	Tormey Drain Rehabilitation						1			1																			1					3
20	Anderson River Park Restoration												1																	1				2
21	Irrigated Cropland Water Efficiency Projects	1					1				1																							3
22	ACID Main Canal Modernization Project	1					1	1												1														4
23	Kids and Watershed Stewardship	1	1							1		1	1	1					1				1			1		1		1	1			12
24	Packer Ranch Pump Station and Fish Screen Project	1					1		1		1		1			1																		6
25	Foothill Stream Restoration and Recharge Enhancement												1		1	1														1				4
26	IRWM Outreach and Education	1	1				1			1	1	1	1	1	1	1					1		1			1	1	1		1				16
27	Cortina Rancheria Water Assistance Plan		1				1	1					1	1	1				1				1	1		1				1				12
28	Groundwater Management Plan for the North Fork Battle Creek																									1								1
29	Town of Paradise Community Wastewater Collection System Proj						1						1								1	1							1	1				6
30	Feasibility Study-Town of Paradise Wastewater System						1						1								1	1							1	1				6
31	Pump House No. 1 Fish Protection Project		1				1	1				1	1										1							1				7
32	Well Contaminant Treatment System							1															1											2
33	Magalia Dam Replacement		1																		1													2
34	Magalia Fault Study																				1													1
35	Paradise Bladder Dam																				1													1
36	Drought Supply Project						1		1												1	1												4
37	Watershed Foresthealth Project											1										1				1				1				4
38	Waterline Replacements																					1												1
39	Detention Basin & Lateral		1				1			1			1													1	1	1						7
40	Flood Hazard Preparation Plan									1																								1
41	Water Supply Reliability Well																					1												1
42	Wastewater Plant Improvements																					1			1									2
43	North Sac Valley Regional Water Quality Assessment Project		1							1			1	1	1			1								1		1	1	1				10
44	K-12 Watershed Education and Science Ambassador Project		1										1	1	1			1								1	1		1	1				9
45	Regional K-12 Watershed Education		1										1	1	1			1								1		1	1	1				9
46	Water Tank Improvement						1	1															1											3
47	Recycle Residuals Dewatering		1																1							1								3
50	Northern Sacramento Valley Mobile Irrigation Lab	1	1								1															1		1						5
51	Influent Pump Station																		1							1								2
52	Biggs WWTP Improvement Project																		1							1								2
53	Cottonwood Creek Invasives Control Follow Up									1	1		1													1				1				5
54	Battle Creek Stream Monitoring Plan												1																	1				2
55	Clover Creek Millville Diversion Restoration Project	1					1			1	1		1													1				1				7
56	Deer Creek Fish Passage Project, DCID Dam	1					1	1			1	1	1																	1				7
57	Impacts of Illegal Marijuana Activity on Fish										1		1	1									1			1		1		1				7
58	Antelope Creek Juvenile Fish Passage Improvement Project	1					1	1			1		1																	1				6
59	Mill Creek Fish Passage	1					1			1	1		1																	1				6
60	Cow Creek Riparian Assessment and Restoration												1	1												1		1		1				5
61	Mill Creek Riparian Assessment and Restoration Projects	1			1						1		1													1				1				6
62	SF Cottonwood Hammer Diversion Fish Passage Project		1					1					1	1												1				1				6
63	Antelope Creek Distributary/Fish Passage Improvement Project	1											1			1														1				4
64	Small Sac River Tributary Habitat & Passage Project		1							1			1													1			1	1				6
65	Deer Creek Instream Habitat Improvement												1																	1				2
66	Bear Creek Fish Passage and Screening Project												1																	1				2
67	Payne's Creek Fish Passage						1						1																	1				3
68	Elder Creek NIS Plant Control									1			1													1				1				4
69	Tehama West NIS Plant Control									1	1		1													1			1	1				6
70	Clear Creek NIS Plant Control												1																	1				2
71	Sacramento River Redd Dewatering Study												1							1	1									1				4
72	Sacramento River Juvenile Salmonid Limiting Factor Analysis												1							1										1				3
73	Sacramento River Fish Screens	1								1			1																	1				4
74	Sacramento River Spawning Gravel Augmentation												1							1										1				3
75	Cottonwood Creek Gravel Man. Project									1			1	1		1										1				1				6
76	Cow Creek Fish Habitat Improvement	1											1																	1				3
77	Cottonwood Creek Riparian Habitat Restoration												1	1															1	1				4
78	NF Cottonwood Creek Fish Habitat Improvement	1						1		1			1	1																1				6
79	Tehama-Colusa Canal Authority Canals Automation Project	1					1	1	1																					1				5
80	Robbins Water Main & Meters		1				1					1											1			1								5
81	Robbins Water Tower Demo						1								1											1	1			1				5
82	Robbins Water Treatment Plant						1								1								1		1									4
83	Live Oak Canal Master Plan						1			1	1															1				1				4
84	SWIM Project IRWM Support	1	1	1	1		1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	30
85	Creeks of Chico Salmon Education Mural										1															1		1	1	1				5
87	OAWD Canal Pre-Screen Project							1					1	1											1									4
88	WCWD Agricultural Efficient Water Management Implementation	1																																1
89	USBR Lateral 30 Underground Project	1					1																											2
90	USBR Lateral 51 Underground Project Phase 1	1					1																											2
91	USBR Lateral 51 Underground Project Phase 2	1					1																											2
92	USBR Lateral 40 Underground Project	1					1																											2
93	USBR Lateral 43 Underground Project	1					1																											2
94	USBR Lateral 50 Underground Project	1					1																											2
95	Eva Drive Well							1				1	1										1		1									5
96	Tehama Flood Reduction and GW Recharge									1			1																					2
97	Water Quality Assessment of NSV Watersheds											1																		1				2
98	Butte County Well Abandonment Program																						1		1	1								3
99	Water Stories	1	1								1	1	1		1											1				1				8
100	Stirling Reservoir Feasibility Study						1	1													1	1												4
101	Bear Creek Watershed Group Shingletown Groundwater Study																													1				1
102	PID Treatment Process Reuse							1												1		1				1	1			1				6
103	Misselbeck Dam Spillway - Repair and Improve									1												1												2
104	Rock and Sand Creek Flood Mitigation									1	1		1																	1				4
105	Feather River Pump Station Fish Screen Feasibility Study						1				1		1																	1				4
106	Northern Sacramento Valley Regional Atlas	1	1	1	1		1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	30
107	Preliminary Intermittent Tributary Analysis									1	1	1	1	1	1								1							1				8
108	IRWMP Cooperative Environmental Services Program						1	1			1		1	1	1	1		1		1	1					1		1	1	1				14
109	Robbins Backup Power Supply														1											1								2
110	Robbins Wastewater Collection System Improvements														1											1								2
111	Robbins Trailer Park Project														1											1								2
112	Lwr Deer Creek Levee Improvements & Habitat Restoration Ph1									1			1																					2
113	Lwr Deer Creek Levee Improvements & Habitat Restoration Ph2									1			1																					2
114	Lwr Deer Creek Levee Improvements & Habitat Restoration Ph3									1			1																					2
115	Lwr Deer Creek Levee Improvements & Habitat Restoration Ph4									1			1																					2
116	Lwr Deer Creek Levee Improvements & Habitat Restoration Ph5									1			1																					2
	Total Number of Approved Projects	**33**	**21**	**3**	**4**	**0**	**37**	**18**	**10**	**30**	**26**	**10**	**59**	**20**	**28**	**16**	**0**	**6**	**8**	**10**	**15**	**17**	**9**	**0**	**9**	**41**	**11**	**14**	**16**	**61**	**3**	**2**	**2**	**2**	

Deleted Project #48: Lower Deer Creek Flood Protection and Restoration - Phase II
Deleted Project #49: Lower Deer Creek Flood Protection and Restoration - Phase III
Deleted Project #86: Sacramento River Watershed Regional GIS

[a] Resource Management Strategies to be achieved are based on the project applications submitted by the project proponents. Project data are accurate as of March 3, 2014.

Table 4-3. Resource Management Strategies to be Achieved through the NSV IRWMP Ranked Projects[a]

Resource Management Strategy	Percent of Ranked Projects Achieving
Watershed Management	54%
Ecosystem Restoration	52%
Pollution Prevention	36%
Conveyance – Regional/local	33%
Agricultural Water Use Efficiency	29%
Flood Risk Management	27%
Recharge Area Protection	25%
Agricultural Lands Stewardship	23%
Urban Water Use Efficiency	19%
Forest Management	18%
System Reoperation	16%
Drinking Water Treatment and Distribution	15%
Conjunctive Management & Groundwater Storage	14%
Water-Dependent Recreation	14%
Surface Storage – Regional/local	13%
Urban Runoff Management	12%
Salt and Salinity Management	10%
Water Transfers	9%
Economic Incentives (Loans, Grants and Water Pricing)	9%
Surface Storage – CALFED	9%
Groundwater Remediation/Aquifer Remediation	8%
Matching Quality to Use	8%
Recycled Municipal Water	7%
Precipitation Enhancement	5%
Irrigated Land Retirement	4%
Crop Idling for Water Transfers	3%
Conveyance – Delta	0%
Desalination	0%
Land Use Planning and Management	0%

[a] Resource Management Strategies to be achieved are based on the project applications submitted by the project proponents. Project data are accurate as of March 3, 2014.

As shown in Table 4-3, all of the RMSs were considered in the development of the projects except for Conveyance through the Delta, Desalination, and Land Use Planning and Management. While Delta Conveyance is an issue with potential to greatly impact the NSV Region, this region is upstream of the Delta and this IRWMP does not currently include projects that specifically address Conveyance through the Delta.

For most of the NSV region, desalination is not feasible since there are few high salinity waters in the region, or within easy import distance. Although the Redding Basin and the Sacramento Valley Basin are both underlain by a saline aquifer that could be tapped and desalinated, the aquifer is generally far below the ground surface and desalination costs would likely exceed the local value of water. Some areas do have poor groundwater quality and may not have other water supply options other than desalination.

Many of the projects will also achieve the Land Use Planning and Management RMS, but none of the projects indicated on the application submittals because this particular RMS was added in the CWP Update 2009 and in the final IRWM Guidelines in November 2012, after all project applications were submitted.

Several RMSs identified in the 2010 draft IRWM Guidelines have been included in previous CWP Updates as "Other RMS". These RMSs include Rainfed Agriculture, Dewvaporation, Fog Collection, and Waterbag Transport. These "Other RMS" were listed individually in the draft 2010 IRWM Guidelines, but removed during the updates for the final 2012 IRWM Guidelines. Because the project applications were based on the draft 2010 IRWM Guidelines, some of the projects included achieving the "Other RMS". These RMSs are listed in Table 4-4.

Table 4-4. 2010 Guideline Resource Management Strategies to be Achieved through the NSV IRWMP Ranked Projects

Resource Management Strategy	Percent of Ranked Projects Achieving
Rainfed Agriculture[a,b,c]	3%
Dewvaporation or Atmospheric Pressure Desalination[b,c]	2%
Fog Collection[b,c]	2%
Waterbag Transport/Storage Technology[b,c]	2%

[a] Project: Kids and Watershed Stewardship
[b] Project: SWIM Project IRWM Support
[c] Project: Sacramento River Watershed Regional GIS

As indicated in Chapter 2 Objectives, the RWMG goals for the IRWMP are:

1. Water Supply Reliability
2. Flood Protection and Planning
3. Water Quality Protection and Enhancement
4. Watershed Protection and Management
5. Integrated Regional Water Management Sustainability
6. Public Education and Information Dissemination

The RMSs developed for the California Water Plan Update 2009 closely match the NSV's IRWMP goals.

As indicated by the NSV's IRWMP goals, and the number of projects submitted to the NSV Board that focus on watershed management and ecosystem restoration RMSs, the IRWMP will be doing as much as it can to address the potential impacts of climate change. As the surface water resources in the NSV IRWM region are significant water supply elements of the Central Valley Project and the State Water Project, water users in the IRWM region adjacent to or receiving surface water supplies are compelled to rely on federal and State operators to offset many of the potential impacts of climate change. In addition to potential impacts on water supply, some climate change models also predict a potential for more severe flooding. To address this, 24 of the NSV proposed projects address Flood Risk Management. Given the uncertainty of the climate change models, the effectiveness of the RMSs in mitigating the impacts of climate change may not be known for decades.

4.2 RESOURCE INTEGRATION

As indicated in the IRWM Guidelines, the term "Resource Integration" can take many forms, including data and education integration, and the integration of natural water resources (*e.g.* snowpack, rivers, lakes, groundwater, *etc*.) and manmade water resource infrastructure (*e.g.* various storage and conveyance systems, *etc*.). There is already a substantial amount of resource integration in the IRWM region, and it is the intent of the RWMG to expand that integration. Current resource integration takes the form of data and education, water resources, and flood control. The Northern Sacramento Valley Water Forum[1] is a regional educational forum, including representatives from each county, which meets periodically and provides educational presentations and information to meeting attendees. As indicated in Chapter 1, it is the intent of the RWMG to take advantage of the existing data and educational resource opportunities through integration with the Northern Sacramento Valley Water Forum. Announcements are posted on many of the NSV IRWMP members' websites, such as http://buttecounty.net and http://rd108.org.

Because the IRWM region is part of the Central Valley Project and the State Water Project, there is substantial integration of water resources. The irrigation districts also provide water resources integration within the IRWM region and adjacent areas.

State and federal flood protection programs also provide integration of flood protection resources in the IRWM region, mostly along the Sacramento River and its major tributaries, but also on smaller, flood prone tributaries. The on-going efforts of the Regional Flood Management Plan will also be integrated (to the degree this information is available) for use in this NSV IRWMP, as this Regional Flood Management Plan is looking at flood management within major areas that are also within the NSV IRWMP region.

[1] The Northern Sacramento Valley Water Forum is a diverse group from Shasta, Tehama, Glenn, Butte, Colusa, Sutter, Yolo and Yuba counties representing local government, agriculture, business and the environment that came together to provide an arena to discuss, promote and support the common interests of local elected officials and water users through educational public forums.

4.3 CLIMATE CHANGE VULNERABILITY

Throughout the region there is some skepticism about the existence and/or mechanisms of climate change. The bottom line concern, regardless of how it is characterized, is how the region can respond to changes in hydrology and temperature that go beyond what we have experienced during recorded history. This concern is nothing new to the Sacramento Valley, which has experienced extreme variability over the past 150 years of climate record. California's largest water projects, including the federal Central Valley Project and State Water Project, were built assuming that water needs would be met during a recurrence of the assumed worst-case drought (similar to the extended 1928-1934 drought), as well as the historic peak floods that existed as of the 1940s, 1950s and 1960s. But we have continued to see new records broken for both drought and flood events. For example, the 1976-1977 drought was short but very severe (1977 is still the driest year in recorded history in the State). The more recent 1987–1994 drought was extreme in its unprecedented duration in modern California history, and saw the development of new water management tools to cope with extended and severe drought. These more recent droughts resulted in more stress on every region of California, including the surface and groundwater resources of the NSV.

The last half of the 19th century was a remarkable period of droughts and floods in the Sacramento Valley. The flood issues were captured well in Robert Kelley's book, *Battling the Inland Sea*, which focuses on historic flood control issues in the Sacramento Valley. The book has a predominant observation that "floods of record" were periodically surpassed to establish new "worst case" conditions. In the 1880s (130 years ago), State Engineer William Hammond Hall said that we would always face larger storms and bigger floods. Record floods in 1907 and 1909 were the basis for design of the Sacramento River Flood Control Project. With construction of reservoirs in the Sacramento River watershed with flood control storage in the second half of the 20th century, the system was able to accommodate flood flows larger than originally envisioned. Even so, record floods in 1983 and 1986 were so extreme that they pushed the total flood system – levees, bypasses and reservoirs – to maximum capacity and required reevaluation of the operations of flood control facilities throughout California. Evaluation of the extraordinary February 1986 series of storms resulted in changes to flood control plans at major reservoirs in northern California. And yet a decade later in January 1997, the largest Sacramento River flows in the State's history again pushed the system beyond capacity and resulted in two major levee breaks in the Sacramento River system. An important lesson that this region has learned over the past 150 years is to plan for worst-case conditions, whatever the causes.

Whether we are addressing the IRWMP requirements related to climate change or focusing on variable hydrology and rising temperatures, there are important issues to confront that will continue to affect the water future of the NSV. State regulations require that integrated regional water management plans address climate change and provide the tools to do so in four steps (Climate Change Handbook for Regional Water Planning, USEPA and California DWR, November 2011):

1. Assess vulnerability of the region's water resources to climate change, essentially an analysis of risk;
2. Quantify any climate change impacts to the region's most vulnerable water resources;

3. Evaluate water resource management strategies in the context of effectiveness in adapting to and/or mitigating the impacts of climate change; and
4. Incorporate the uncertainties associated with climate change into IRWMP implementation.

This section addresses vulnerability, and the other three steps are incorporated into the discussion of resource management strategies in this chapter.

The way in which climate change vulnerability and greenhouse gas (GHG) emissions are considered in the project review process is also discussed in the Project Review Process section of Chapter 5.

4.3.1 Climate Change Vulnerability Assessment

Figure 4-1, below, is an overview of the suggested process for assessing climate change vulnerability of a region as part of an IRWMP. This figure is taken from page 4-1 of DWR's November 2011 handbook.

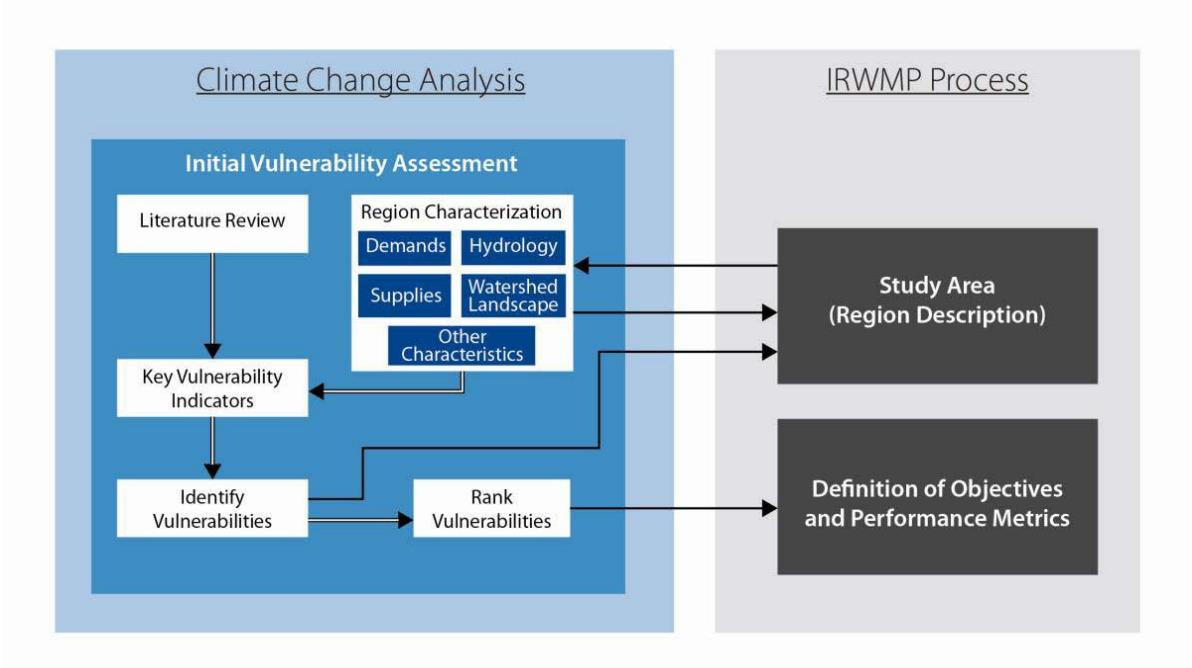


Figure 4-1. Process for Assessing Vulnerability to Climate Change as part of an IRWMP

Rather than taking a rigorous approach to the elements of climate change analysis shown in Figure 4-1, we have taken a modified approach of incorporating these elements into responses to the Climate Change Vulnerability Checklist in DWR's November 2011 Climate Change Handbook (http://www.water.ca.gov/climatechange/CCHandbook.cfm). Our responses to the Checklist incorporate appropriate elements from Figure 4-1 specific to each of the Checklist items. The DWR Climate Change Vulnerability Checklist is consistent with DWR's IRWM 2012 Proposition 84 and 1E IRWM Guidelines: http://www.water.ca.gov/irwm/grants/guidelines.cfm, which add to the draft 2010 IRWM Guidelines to require greater attention to vulnerability assessment of an IRWM region to climate change.

As discussed in the Region Description chapter of this IRWMP, the NSV encompasses a large rural area with a few prominent population centers. Those population centers include (from north to south) the cities of Shasta Lake, Redding, Anderson, Red Bluff, Chico, Oroville and Yuba City. Almost all urban areas in the region are supplied solely with groundwater, with the exception of the City of Shasta Lake (100 percent surface water), Redding (which receives the majority of its water from the Sacramento River and Whiskeytown Lake), Oroville (which receives the majority of its water from Lake Oroville), and Yuba City (which receives all of its water from the Feather River). Water use in the region is a mix of large-scale irrigated agriculture and municipal water supplies, in addition to domestic use in rural areas. Rural residential needs are met by groundwater, as are supplies to agricultural areas that are not within an irrigation or water district that have rights to surface water.

As an "area-of-origin" with protections under State law, the NSV has very high priority water rights to its surface water supplies. This means that the first priority for much of the water supplies in the Northern Sacramento Valley will be for meeting direct rights-holders in our region. However, there will continue to be water supply, flood and other vulnerabilities associated with varying hydrology and a changing climate. It is important to note that this region's water supply vulnerabilities for meeting our regional water needs are far less than would be expected in most other regions of California and most of the western United States. Historically, the Northern Sacramento Valley has had significant water supplies even in dry years, which is the principal reason why the Sacramento River system is a major source of water supplies for SWP and CVP water service areas. However, there are areas within the NSV region now experiencing water supply cut-backs in dry years, so caution must be taken when deciding on potentially exporting water supplies. As explained in Chapter 1, Section 1.4, through management of the available surface and groundwater resources, the region's water supplies have historically been in balance. Additional export without additional supply could upset that water supply balance and potentially damage the region's economy. Because of these issues, “yes” answers in “Water Supply” in the following survey will be given additional weight in the scoring provided in Table 4-5.

Climate change is receiving increasing attention in planning documents and processes throughout the region, as exemplified by the following list.

- The City of Chico’s 2030 General Plan (City of Chico, 2030 General Plan, April 2011) has a specific “Sustainability Element” that emphasizes reducing contributions to climate change (page 2-2) and provides “…goals, policies and actions that address the City’s role in statewide climate change mitigation efforts.” (Page 2-6). While this text falls into the category of climate change mitigation rather than vulnerability, it is an important climate change policy emphasis by Chico.
- The Colusa County Resource Conservation District has developed a Colusa Basin Watershed Management Plan, which was adopted in December 2012 (http://www.colusarcd.org/nodes/projects/WatershedManagementPlan.htm). The plan has as one of its eight goals (Goal #8) the need to address unknown future impacts from climate change.

- The Shasta County Department of Resource Management's Planning Division is developing a Regional Climate Action Plan (http://www.co.shasta.ca.us/index/drm_index/aq_index/programs/RCAP.aspx).
- The City of Yuba City's Environmental Impact Report on the Lincoln East Specific Plan includes an extensive discussion of climate change concerns, laws and requirements. The EIR also includes an analysis of the potential impacts of the Specific Plan on greenhouse gas emissions.
- Sutter County has both a Climate Action Plan and a Climate Change element of the Sutter County General Plan Update, both adopted by the Sutter County Board of Supervisors in March 2011. Both include specific actions to address potential impacts of climate change.

While not explicitly characterized as climate change response, the new 2030 General Plan Update for Colusa County (adopted July 31, 2012) does have policies in its Conservation Element that support efforts to maximize agricultural resources efficiency including efforts to conserve energy and focus on renewable energy technologies.

In the following pages, we list the seven potential areas of vulnerability (water demand, water supply, water quality, sea level rise, flooding, ecosystem and habitat, and hydropower), along with the specific questions for each area. The responses for the NSV region follow each question. The only exception is for sea level rise, where we provide a general answer on that topic due to the inland location of the NSV region. The seven areas of potential climate change vulnerability are scored and prioritized in the section following the survey.

1. Water Demand

a. Are there major industries that require cooling/process water in your planning region?

☒Yes ☐No ☐Perhaps/Uncertain

- Energy production (City of Redding natural gas, and Wheelabrator peaking plant)
- Colusa Generating Station in Maxwell
- Tomato processing plants (Olam, Morning Star)
- Other Ag processors

b. Does water use vary by more than 50% seasonally in parts of your region?

☒Yes ☐No ☐Perhaps/Uncertain

The NSV region's water use is dominated by agricultural water use, which by its nature has a higher late spring through summer peak irrigation demand period than other times during the year.

c. Are crops grown in your region climate-sensitive? Would shifts in daily heat patterns, such as how long heat lingers before night-time cooling, be prohibitive for some crops?

☒Yes ☐No ☐Perhaps/Uncertain

The region's water use is dominated by irrigated agriculture, which is rather temperature sensitive. As described in the Climate Change Handbook, climate change model

projections for California generally agree that warming will be greater in summer months (primary irrigation season) than in the winter (page 2-9). The Climate Change Handbook goes on to conclude that "…without accounting for changes in evapotranspiration rates, agricultural crop and urban outdoor demands are expected to increase in the Sacramento Valley by as much as 6%..." (page 2-11). Warmer temperatures for longer periods of time would be associated with higher ET rates, and may lead to shifts in timing of crops. Also, warmer winter temps could reduce the freeze hours, greatly affecting many fruit and nut crops. Although some studies have indicated that warmer nighttime temperatures may lead to reduced rice yields, it is not anticipated that shifts in daily heat patterns would be prohibitive for crops currently grown in the IRWM Region.

d. Do groundwater supplies in your region lack resiliency after drought events?

☐Yes ☒No ☐Perhaps/Uncertain

Not in most areas of the region. Below is a general description of groundwater supplies and basins in the larger Sacramento Valley (most of which is within the NSV region), from DWR's Bulletin 118, 2003 Update:

> *Groundwater provides about 31 percent of the water supply for urban and agricultural uses in the region, and has been developed in both the alluvial basins and the hard rock uplands and mountains. There are 88 basins/ subbasins delineated in the region. These basins underlie 5.053 million acres (7,900 square miles), about 29 percent of the entire region. The reliability of the groundwater supply varies greatly. The Sacramento Valley is recognized as one of the foremost groundwater basins in the State, and wells developed in the sediments of the valley provide excellent supply to irrigation, municipal, and domestic uses. Many of the mountain valleys of the region also provide significant groundwater supplies to multiple uses.*
>
> *Geologically, the Sacramento Valley is a large trough filled with sediments having variable permeabilities; as a result, wells developed in areas with coarser aquifer materials will produce larger amounts of water than wells developed in fine aquifer materials. In general, well yields are good and range from one-hundred to several thousand gallons per minute. Because surface water supplies have been so abundant in the valley, groundwater development for agriculture primarily supplement the surface supply. With the changing environmental laws and requirements, this balance is shifting to a greater reliance on groundwater, and conjunctive use of both supplies is occurring to a greater extent throughout the valley, particularly in drought years. Groundwater provides all or a portion of municipal supply in many valley towns and cities. Redding, Anderson, Chico, Marysville, Sacramento, Olivehurst, Wheatland, Willows, and Williams rely to differing degrees on groundwater. Red Bluff, Corning, Woodland, Davis, and Dixon are completely dependent on groundwater. Domestic use of groundwater varies, but in general, rural unincorporated areas rely completely on groundwater. (page 159, DWR Bulletin 118-03).*

While groundwater supplies are resilient in the NSV region as a whole, there have been and continue to be localized areas where groundwater demand puts a great deal of stress on local groundwater resources and results in declining water levels. Some small area

(for example, on the Cortina Rancheria in southwestern Colusa County) do not overlie an identified groundwater aquifer but rely on water wells for their very limited water supplies. The extreme north end of the Redding Basin also does not overly aquifers sufficient to provide municipal supplies to the City of Shasta Lake or Mountain Gate Community Services District.

e. Are water use curtailment measures effective in your region?

☐Yes ☐No ☒Perhaps/Uncertain

As indicated earlier, water use in the region is dominated by irrigated agriculture. The region also has significant groundwater supplies. Groundwater use typically increases during times when there are curtailments or limitations in surface water deliveries. Since the NSV is in what is often described as the "area-of-origin", most surface water supplies have very high reliability. Curtailment of surface water supplies is largely provided for in water right settlement contracts with both the U.S. Bureau of Reclamation and DWR. Since water demand is dominated by irrigated agriculture and there are significant groundwater resources, crop production is expected to continue to be reliable due to the wide range of water supply options available and ability to change crops depending on water reliability each irrigation season. A notable exception is the service area of the TCC, which continues to experience significant cutbacks in contract water supplies from the U.S. Bureau of Reclamation. In Shasta County, water purveyors that are wholly or mostly reliant on CVP water have been able to meet demand during cutbacks through transfers with other in-basin purveyors with more secure Settlement or Exchange supplies. Finally, in Colusa County, in many instances permanent crops are replacing row crops. Permanent crops require sufficient irrigation every year, which poses a water management challenge due to TCC water supply deficiencies in dry years. The conversion to permanent crops in many areas will make it more difficult to meet future curtailments without associated impacts through greater groundwater pumping. Loss of perennial and annual crops would result in economic loss in the local regional economy.

f. Are some instream flow requirements in your region either currently insufficient to support aquatic life, or occasionally unmet?

☐Yes ☐No ☒Perhaps/Uncertain

Instream flow requirements in the region are mandated by regulation to protect migrating, spawning, and juvenile rearing of salmon and steelhead. Provision of suitable water temperatures is an associated element of instream flow requirements in several NSV streams. Stream temperatures are largely controlled by the temperature of releases from upstream reservoirs such as USBR's Shasta Dam and DWR's Oroville Dam, both of which have temperature control devices to regulate temperatures of releases. To date, there have been few problems in meeting temperature requirements, particularly since the installation of the Shasta temperature control facilities more than fifteen years ago. However, some uncertainty and concerns remain among the resource agencies about minimum flow targets and ramping rates for protecting spawning areas and preventing stranding of salmon fry along the Sacramento River. For instance, the USBR has denied water transfers to the City of Shasta Lake because its intakes on the face of Shasta Dam might impact the cold water pool. And, there have been problems in the past in meeting stream flow needs during extreme and/or prolonged drought conditions, such as experienced in the 1976-1977 and 1987-1994 droughts. During 1977, for example, total

rainfall was roughly 1/3 of average and followed the critical water year of 1976. In 1991 (the fifth consecutive drought year), storage amounts in Shasta and Oroville reservoirs had decreased to critical low levels and were not capable of effectively controlling downstream water temperatures to meet the needs of migratory fish.

2. **Water Supply**

a. Does a portion of the water supply in your region come from snowmelt?

☒Yes ☐No ☐Perhaps/Uncertain

A substantial portion of the region's surface water supplies come from snowmelt, particularly from the Sacramento and Feather Rivers. Snowmelt runoff on both river systems is regulated by Shasta Dam and Oroville Dam (and to some extent by Yuba County Water Agency's Bullards Bar Dam on the Yuba River, tributary to the Feather River), which are all located below the snow line at around 1,000 feet above sea level. In addition, water imported into the region from the Trinity River watershed comes, in part, from snowmelt. However, such imported water supplies are used primarily to support contract water deliveries (mostly to the south of the region) rather than water rights settlement deliveries.

b. Does part of your region rely on water diverted from the Delta, imported from the Colorado River, or imported from other climate-sensitive systems outside your region?

☐Yes ☒No ☐Perhaps/Uncertain

Mostly no. The NSV is upstream of the Delta and consequently does not rely on imported water supplies. There are some limited CVP supplies imported from the Trinity River into the Sacramento Valley. However, the region exports large quantities of water to and through the Delta to augment statewide needs.

c. Does part of your region rely on coastal aquifers? Has salt intrusion been a problem in the past?

☐Yes ☐No ☒Perhaps/Uncertain

The NSV is not adjacent to the coast or any coastal aquifers. However, most of the region overlies ancient seabeds and deeper aquifers and some fractured rock aquifers have high saline and/or mineral contents and are generally not suitable for human consumption or agriculture.

d. Would your region have difficulty in storing carryover supply surpluses from year to year? Has your region faced a drought in the past during which it failed to meet local water demands?

☒Yes ☐No ☐Perhaps/Uncertain

Regional carryover storage is dominated by Shasta Dam and Oroville Dam, which have a combined storage capacity of about 8 million acre-feet. System-wide carryover storage is a primary purpose of these reservoirs, with water carried over from one year to the next to meet local and export water demands. The Bureau of Reclamation, which operates Shasta Dam, and the Department of Water Resources, which operates Oroville Dam, have generally declined to allow contracting water districts to carry over unused

allocations from the previous water year as they do for South-of-Delta contractors. Other than the exception of the Tehama-Colusa Canal service area, surface water use in the region has a prevailing water right priority to downstream and export water demands and therefore has not faced the inability to meet local water demands. The availability of groundwater in much of the region has historically allowed most surface water users to meet a portion of their demands from groundwater when surface water supplies are reduced during droughts. The other exception is some localized problems with groundwater pumping during drought conditions, where a switch from surface water to ground water has aggravated groundwater pumping by some smaller water users who historically rely solely on groundwater.

e. Does your region have invasive species management issues at your facilities, along conveyance structures, or in habitat areas?

☒Yes ☐No ☐Perhaps/Uncertain

Creeping yellow primrose, European watermilfoil, Brazilian waterweed, and purple loosestrife are problematic aquatic species in irrigation canals. Arundo, and Tamarisk, Alanthus, and purple loosestrife are major invasive species along ephemeral, intermittent, and perennial streams of the region – utilizing excessive amounts of water and degrading habitats. Yellow starthistle, barbed goatgrass, perennial pepperweed, Scotch broom, and rattlebush are problematic in habitat areas. Himalayan blackberry is an invasive species problem within Anderson-Cottonwood Irrigation District in Shasta County, and in many riparian and other wetland habitats throughout the region. The New Zealand mudsnail, an invasive mollusk, is known to have recently been introduced to the region, probably by unaware fishermen, in the upper Sacramento River near Red Bluff and some of its tributaries. Additionally, several aquaculturally-important aquatic plants, mollusks, and fish species with the potential for release from ornamental ponds and aquaria have been discovered in waterways at several locales within the region. Currently, the highly invasive quagga and zebra mussels have not been reported to occur in the region; however, awareness is high as to their potential for adverse effects to the environment, water supplies, and economy of the region.

3. **Water Quality**

a. Are increased wildfires a threat in your region? If so, does your region include reservoirs with fire-susceptible vegetation nearby which could pose a water quality concern from increased erosion?

☒Yes ☐No ☐Perhaps/Uncertain

Much of the landscape surrounding the major reservoirs of the NSV region, including Shasta Lake, Whiskeytown Lake, Lake Oroville, Englebright Reservoir, New Bullards Bar Reservoir, and Black Butte Reservoir, is dominated by fire-susceptible oak and conifer woodlands and grasslands. These reservoirs are located in the steep foothill and mountainous terrain of the Sierra Nevada, Klamath Mountains, and Coast Ranges where large wildfires are common and where wildfire suppression is a major challenge. In the short term, wildfires can lead to increased sediment loads and turbidity, which require increased filtration at water treatment plants. In the long term, increased debris and sediment entering reservoirs after wildfires will reduce a reservoir's lifespan.

b. Does part of your region rely on surface water bodies with current or recurrent water quality issues related to eutrophication, such as low dissolved oxygen or algal blooms? Are there other water quality constituents potentially exacerbated by climate change?

☒Yes ☐No ☐Perhaps/Uncertain
In the six-county region, there are 126 impairment listings, primarily associated with metals, pathogens and pesticides. Only 11 listings are associated with eutrophication (excessive nutrients which leads to low dissolved oxygen), 6 of those in sloughs. Increased erosion associated with increased wildfires (see previous item) will increase ambient turbidity (decreasing predation for site feeders) and sediment loads (sedimentation of fish beds). Another "constituent" exacerbated by climate change is temperature. Only the North Fork Feather River is currently listed as impaired by high temperatures. Higher regional temperatures will reduce reservoir operational flexibility needed to meet fisheries habitat criteria, decrease equilibrium dissolved oxygen concentrations, and decrease available nutrients.

c. Are seasonal low flows decreasing for some water bodies in your region? If so, are the reduced low flows limiting the water bodies' assimilative capacity?

☒Yes ☐No ☐Perhaps/Uncertain
Over the past 100 years, the fraction of the annual runoff that occurs during April-July has decreased by 23% in the Sacramento River watershed (California Climate Change Center, 2009. "The Future is Now: An Update on Climate Change Science Impacts and Response Options for California." May. http://www.energy.ca.gov/2008publications/CEC-500-2008-071/CEC-500-2008-071.PDF). Lower summer-season flows decrease our water bodies' assimilative capacity by both reducing the diluting flow volume and reducing the ambient water quality.

d. Are there beneficial uses designated for some water bodies in your region that cannot always be met due to water quality issues?

☒Yes ☐No ☐Perhaps/Uncertain
The same response to question b above applies here. Water quality issues are identified when monitoring data exceed standards set to protect beneficial uses.

e. Does part of your region currently observe water quality shifts during rain events that impact treatment facility operation?

☐Yes ☐No ☒Perhaps/Uncertain
The Sacramento River and Whiskeytown Lake provide 71% of Redding's water supply. Whiskeytown Reservoir has a small, protected watershed covered largely with pine forest. Sacramento River water is discharged through Lake Shasta, the state's 6th largest reservoir. City of Yuba City's surface water source is the Feather River, downstream of Lake Oroville (the state's largest reservoir). These reservoirs are largely immune from long-term water quality shifts though rain events may lead to short term operational changes. Municipal treatment costs are increased proportional to turbidity. Some agricultural users, even on the GCID and TCCA canals, experience short term increases

in turbidity that foul drip irrigation systems. Other water supply systems rely on groundwater, which is substantially buffered by natural filtration from short-term water quality effects associated with rain events.

4. **Sea Level Rise**

The NSV is far from the coast, and is not expected to be subject to changes in sea level. The lowest elevations in the region are in the proximity of the City of Colusa, approximately 50 feet above sea level and the City of Yuba City, approximately 60 feet above sea level. Most of the region is at a much higher elevation, with elevations in the region increasing to the north up to an elevation of about 500 feet in Redding. Areas above the floor of the Sacramento Valley to both the west and east are at even higher elevations.

5. **Flooding**

a. Does critical infrastructure in your region lie within the 200-year floodplain? Other follow-up questions that might help answer this question: (1) what public safety issues could be affected by increased flooding events or intensity; and (2) could key regional or economic functions be impacted from more frequent and/or intense flooding?

☒Yes ☐No ☐Perhaps/Uncertain

The Cities of Chico and Yuba City are urban areas in the NSV that are protected by features of the State Plan of Flood Control (SPFC). Urban and rural communities protected by features of the SPFC include the Cities of Colusa, Gridley, and Biggs and the communities of Princeton, Meridian, Grimes, and Robins. The respective areas are within the 200-year floodplain. Infrastructure critical to the public health and safety of the residents including hospitals, nursing homes, and state highways, plus water supply and wastewater facilities would be at risk from flooding and be subject to lengthy recovery times.

Urban areas within the NSV that are not protected by features of the SPFC but would be adversely impacted by a 200-year flood event include the cities of Redding, Red Bluff, Corning, and Williams.

The NSV is a highly productive agricultural area with substantial amounts of land protected by features of the SPFC. Critical infrastructure including agricultural water supply and drainage facilities and processing facilities would be subject to flooding for extended periods of time in the event of a 200-year or even a 100-year flood event. As a consequence, the ability and time to recover and become productive is uncertain thereby adversely impacting the economic functions in the NSV.

b. Does part of your region lie within the Sacramento-San Joaquin Drainage District?

☒Yes ☐No ☐Perhaps/Uncertain

A map of the Sacramento-San Joaquin Drainage District (SSJDD) is reproduced below in Figure 4-2, taken from their web site (http://www.cvfpb.ca.gov/ssjdd_maps/):

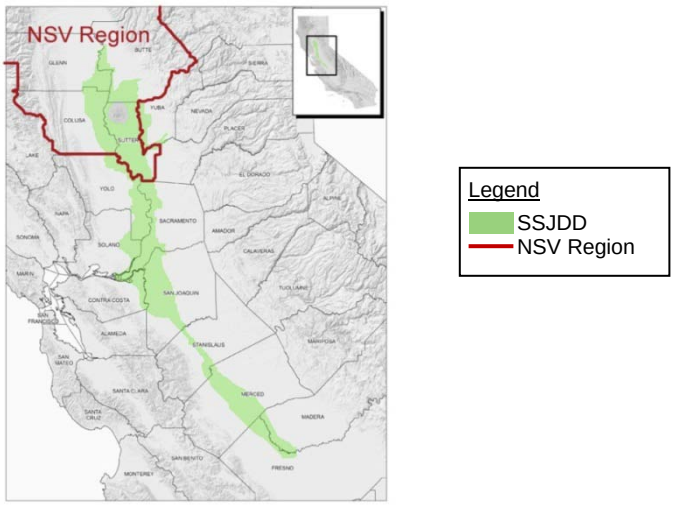


Figure 4-2. Boundaries of Sacramento-San Joaquin Drainage District

As shown in this figure, most of Sutter County, the far eastern portion of Colusa County and portions of Glenn and Butte counties adjacent to the Sacramento River are within the boundaries of SSJDD.

c. Does aging critical flood protection infrastructure exist in your region?

☒Yes ☐No ☐Perhaps/Uncertain
The majority of the land within the SSJDD is protected by features of the SPFC. These features including levees, weirs, and bypasses are insufficient in integrity and capacity to handle large floods in the Sacramento River Basin.

d. Have flood control facilities (such as impoundment structures) been insufficient in the past?

☒Yes ☐No ☐Perhaps/Uncertain
The flood control system along the Sacramento and Feather Rivers combines upstream flood regulation by Shasta Dam and Oroville Dam, with protection of lands by levees and the diversion of higher flood flows into the Sutter Bypass and the downstream Yolo Bypass (located just south of the NSV region). The 1986 and 1997 storms pushed the total flood system to maximum capacity. Some levees failed and areas were flooded. In 1997 some reaches of the Sacramento River system were pushed beyond their capacity resulting in levee breaks and substantial flooding. There continues to be localized flooding along tributaries to the Sacramento River, since they cannot (by virtue of their locations) benefit from reservoir and Bypass flood operations. Flooding along such stream systems continues to be a problem in areas throughout the region, particularly in Tehama County in areas outside of the floor of the NSV.

e. Are wildfires a concern in parts of your region?

☒Yes ☐No ☐Perhaps/Uncertain
Wildfires occur periodically in forest areas on both sides of the Sacramento Valley. Most of the surface water in the region originates in national forests to the east and north of the NSV. Approximately 63% of the NSV Region is forests, oak woodlands, or rangelands

which are all susceptible to wildfires. Large catastrophic wildfires leave vast landscapes barren of vegetation which can lead to localized flooding, increased siltation of waterways and flood control structures, reduction of surface water quality, and exacerbated erosion. These impacts have the potential to threaten and damage the region's water distribution systems.

6. **Ecosystem and Habitat Vulnerability**

   a. Does your region include inland or coastal aquatic habitats vulnerable to erosion and sedimentation issues?

      ☒Yes ☐No ☐Perhaps/Uncertain
      Erosion and sediment deposition are natural and important processes that shape landscapes and aquatic habitats and have contributed to the incredible fertility of the Sacramento Valley floor. Flood control operation of the large reservoirs and bank protection along the Sacramento River and its tributaries greatly limit large-scale erosion in the NSV region. However, some agricultural land drainage, forestry, and urban stormwater management practices have resulted in imbalances that contribute locally to excessive erosion and sedimentation, especially in some tributaries to the Sacramento River. Salmon spawning habitat in the upper Sacramento River and its smaller tributaries is particularly vulnerable to the effects of excessive fine sediment deposition on the streambed, which can smother salmon nests and reduce salmon production.

   b. Does your region include estuarine habitats which rely on seasonal freshwater flow patterns?

      ☐Yes ☒No ☐Perhaps/Uncertain
      The region does not have substantial estuarine environments. However, there are a number of state and federal wildlife refuges that serve as managed wetlands for both migratory waterfowl and terrestrial wildlife species. There are also important privately-managed wetlands – NRCS has restored and protects just over 10,000 acres of wetlands in the Colusa Basin Watershed (Colusa, Glenn & Yolo Counties) through their Wetlands Reserve Program. All refuges rely on seasonal freshwater supplies.

   c. Do climate-sensitive fauna or flora populations live in your region?

      ☒Yes ☐No ☐Perhaps/Uncertain
      A number of climate-sensitive species occur in the NSV region including anadromous salmonids, which require cold water streams, and migrating waterfowl, which depend on seasonal wetlands. A number of endemic invertebrate and plant species that are adapted to the region's seasonal rainfall cycles, such as vernal pool-dependent species, would be vulnerable to protracted droughts.

   d. Do endangered or threatened species exist in your region? Are changes in species distribution already being observed in parts of your region?

      ☒Yes ☐No ☐Perhaps/Uncertain
      Species in the region occurring for all or a portion of their lives and listed under either the Federal Endangered Species Act or the California Endangered Species Act, include but are not limited to winter-run and spring-run Chinook salmon, steelhead, green sturgeon,

giant garter snake, valley elderberry longhorn beetle, vernal pool fairy shrimp and tadpole shrimp, California red-legged frog, tricolored blackbird, Swainson's hawk, bank swallow, greater sandhill crane, California tiger salamander, western yellow-billed cuckoo, and the conservancy fairy shrimp. Changes in species distribution for salmon and steelhead are well-documented by the National Marine Fisheries Service and the California Department of Fish and Game, who continue through a variety of state and federal programs to take actions to improve conditions for all stages of the life cycles of these species.

e. Does the region rely on aquatic or water-dependent habitats for recreation or other economic activities?

☒Yes ☐No ☐Perhaps/Uncertain
Aquatic recreation is a substantial activity in the region, both in reservoirs as well as along river systems. Examples include substantial new recreational facilities developed near the City of Oroville along the Feather River, wildlife viewing and photography, and waterfowl hunting on refuges, rice fields and private wetlands.

f. Are there rivers in your region with quantified environmental flow requirements or known water quality/quantity stressors to aquatic life?

☒Yes ☐No ☐Perhaps/Uncertain
As discussed elsewhere, the NSV region includes major migratory pathways for anadromous fish, such as sturgeon, salmon and steelhead. They begin and end life in the region, while spending most of their lives in the Pacific Ocean as well as migrating out of and back into the region by way of the Sacramento and Feather Rivers. While spawning habitat has been a significant limiting factor in the past, the recent replacement of the Red Bluff Diversion Dam with a new pumping plant, combined with many other recent and planned fish migrating barrier removal projects, are expected to continue the trend of improving anadromous and resident fish populations. The substantial limiting factor continues to be water temperature, which affects mortality for early life stages of both salmon and steelhead.

g. Do estuaries, coastal dunes, wetlands, marshes, or exposed beaches exist in your region? If so, are coastal storms possible/frequent in your region?

☐Yes ☒No ☐Perhaps/Uncertain
Coastal storms may impact the region, but there are no estuaries, coastal dunes or exposed beaches. Wetlands and marshes exist in several state and federal wildlife refuges, as well as along tributary creeks to major rivers in the region.

h. Does your region include one or more of the habitats described in the Endangered Species Coalition's Top 10 habitats vulnerable to climate change (http://www.itsgettinghotoutthere.org/)?

☒Yes ☐No ☐Perhaps/Uncertain
Yes (qualified). The only two potential habitats on this list are the Sierra Nevada and the Bay-Delta. The focus on the Sierra Nevada in this reference is on higher elevation areas, which in general are above the floor of the Northern Sacramento Valley and outside (and tributary to) the region. The Bay-Delta brings forward more complex issues. While the

NSV is far above the Delta, it contributes a major portion of the surface water inflow to the Delta with major characteristics being flow (very high), water quality (generally very good) and the specific water quality characteristic of temperature. Based on review of the referenced information, the primary "habitat" applicable to the NSV is related to spawning and survival of sturgeon, salmon and steelhead as they pass through the region at various life cycles. These fish are migratory and go through the Delta.

i. Are there areas of fragmented estuarine, aquatic, or wetland wildlife habitat within your region? Are there movement corridors for species to naturally migrate? Are there infrastructure projects planned that might preclude species movement?

☒Yes ☐No ☐Perhaps/Uncertain

Less than 5-10 percent of the historic riparian wetlands continue to exist in the NSV region; however, acquisition of large tracts of the riparian corridor along the Sacramento River and its tributaries over the past 20 years for the express purpose of conservation management has prevented further reduction and fragmentation of this important habitat. Central Valley riparian and marsh wetlands are particularly important to neotropical birds and waterfowl, respectively, migrating along the Pacific Flyway. So, continuing conservation and, ultimately, restoration of these habitats are very important for migratory birds in view of the potential effects of global climate change in the NSV region in the future. Farming and agricultural operations in the region also provide thousands of acres of migratory bird habitat when water is available for rice straw decomposition. This migratory bird habitat also provides habitat for giant garter snakes and other local fauna. Furthermore, the recent removal of Red Bluff Diversion Dam on the Sacramento River, several diversion dams on Battle Creek, and McCormick-Seltzer Dam on Clear Creek have eliminated numerous impediments to anadromous fish migration and increased accessibility to presently important cold water spawning habitats. However, under some of the most severe climate change scenarios, blockage of anadromous salmonids from access to high-elevation, cold water habitat above Shasta Dam (Sacramento River), Whiskeytown Dam (Clear Creek), Centerville Dam (Butte Creek), and Englebright Dam (NF Yuba River) is thought to limit the long-term survival probabilities of salmon and steelhead in these streams.

7. Hydropower

a. Is hydropower a source of electricity in your region?

☒Yes ☐No ☐Perhaps/Uncertain

The region is served by the Pacific Gas and Electric Company (PG&E) and two municipal utilities, the Cities of Redding and Shasta Lake, which have varied sources of electricity that make up their energy generation portfolio. In wetter years a higher percentage of electricity is from hydropower generated within California from Shasta Lake Power Plant and Lake Oroville's Hyatt Power Plant, and also imported hydropower supplies from the Pacific Northwest. Other sources include fossil fuels (principally natural gas), nuclear, solar and wind. While other sources provide fairly constant supplies from year to year, hydropower generation decreases during dry years as well as prolonged drought years. When this relatively inexpensive source of power (at least as compared to other energy sources) is diminished, energy rates at the consumer level have

historically increased. Hydropower is unlike fossil fuel sources, which are always available although energy costs vary with fuel prices.

b. Are energy needs in your region expected to increase in the future? If so, are there future plans for hydropower generation facilities or conditions for hydropower generation in your region?

☐Yes ☐No ☒Perhaps/Uncertain

Whether energy needs will increase in the future is uncertain, but opportunities for greater hydropower generation in the region do exist. At the same time Californians are increasing their efficiency of electrical use, we expect after the economy improves to see continued population increases. At present the net impacts on increased energy use are difficult to forecast.

The source of water supplies for reservoirs is largely snowmelt runoff, and indications are that timing of snowmelt runoff is shifting to earlier in the year. In addition, any decrease in the volume of snowpack (whether from changes in precipitation or temperature) will decrease summer inflow to reservoirs. Consequently it is possible that there will be a shift in the timing for hydropower generation. This is particularly the case under circumstances where, in any year, a greater percentage of total precipitation comes as rain. Reservoir hydropower generation is further restricted by environmental flow restrictions and flood control requirements.

There may be future opportunities to expand hydropower generation to take advantage of future changes in reservoir releases, particularly those releases for flood control. Investing in expansion of hydropower generation will depend on a number of factors, such as:

- Can the impoundment and generation facilities be built at a cost that will result in competitively priced energy?
- Is there the political will to move forward with such a project?
- Will the extensive environmental challenges that would be expected to occur be worth the effort?

4.3.2 Prioritization of Potential Climate Change Vulnerabilities

The potential climate change sensitivities listed in the survey were scored and ranked according to the following criteria:

1. For most questions, a “Yes” answer indicated vulnerability and a “No” answer indicated a lack of vulnerability. One exception to this was question 1.e. For Question 1.e, the scoring was reversed because a “No” answer indicated vulnerability.
2. In general, “Yes” answers were given a score of 10. “No” answers were given a score of 0. “Uncertain/Perhaps” answers were given a score of 5.

3. The scores for each question were totaled by category and a percent vulnerability was calculated by dividing the score by the maximum possible score (number of questions times 10).
4. The potential climate change vulnerabilities were then prioritized by percent vulnerability.

The scoring process is shown in Table 4-5.

As shown in Table 4-5, the NSV region is most potentially sensitive to water supply and flooding impacts that may be exacerbated by climate change. Potential impacts to water quality and ecosystem and habitat vulnerability also scored high. Based on the responses to the DWR Climate Change Vulnerability Checklist and as shown in Table 4-5, the "Flooding" climate change sensitivity category scored 100%, the "Water Supply" category scored 100%, the "Water Quality" category scored 90%, the "Ecosystem and Habitat Vulnerability" category scored 78%, the "Hydropower" category scored 75%, the "Water Demand" category scored 67%, and the "Sea Level Rise" category scored 0%. Therefore, based on this vulnerability assessment, the NSV region's vulnerabilities to climate change, in order of sensitivity, are flooding, water supply, water quality, ecosystems and habitat, hydropower, and water demand. These climate change vulnerability ratings should not be confused with the NSV region priorities, or the IRWM Goals and Objectives described in Chapter 2.

Table 4-5. Climate Change Sensitivity Survey Scoring Sheet

Climate Change Survey Category	Climate Change Survey Question	Score[a]
1. Water Demand		
a	Are there major industries that require cooling/process water in your planning region?	10
b	Does water use vary by more than 50% seasonally in parts of your region?	10
c	Are crops grown in your region climate-sensitive? Would shifts in daily heat patterns, such as how long heat lingers before night-time cooling, be prohibitive for some crops?	10
d	Do groundwater supplies in your region lack resiliency after drought events?	0
e	Are water use curtailment measures effective in your region?	5
f	Are some instream flow requirements in your region either currently insufficient to support aquatic life, or occasionally unmet?	5
	Total	40
	Percent	67%
2. Water Supply		
a	Does a portion of the water supply in your region come from snowmelt?	15
b	Does part of your region rely on water diverted from the Delta, imported from the Colorado River, or imported from other climate-sensitive systems outside your region?	0
c	Does part of your region rely on coastal aquifers? Has salt intrusion been a problem in the past?	5
d	Would your region have difficulty in storing carryover supply surpluses from year to year? Has your region faced a drought in the past during which it failed to meet local water demands?	15
e	Does your region have invasive species management issues at your facilities, along conveyance structures, or in habitat areas?	15
	Total	50
	Percent	100%
3. Water Quality		
a	Are increased wildfires a threat in your region? If so, does your region include reservoirs with fire-susceptible vegetation nearby which could pose a water quality concern from increased erosion?	10
b	Does part of your region rely on surface water bodies with current or recurrent water quality issues related to eutrophication, such as low dissolved oxygen or algal blooms? Are there other water quality constituents potentially exacerbated by climate change?	10
c	Are seasonal low flows decreasing for some water bodies in your region? If so, are the reduced low flows limiting the water bodies' assimilative capacity?	10
d	Are there beneficial uses designated for some water bodies in your region that cannot always be met due to water quality issues?	10
e	Does part of your region currently observe water quality shifts during rain events that impact treatment facility operation?	5
	Total	45
	Percent	90%
4. Sea Level Rise (Not Applicable)		
	Total	0
	Percent	0%
5. Flooding		
a	Does critical infrastructure in your region lie within the 200-year floodplain? Other follow-up questions that might help answer this question: (1) what public safety issues could be affected by increased flooding events or intensity; and (2) could key regional or economic functions be impacted from more frequent and/or intense flooding?	10
b	Does part of your region lie within the Sacramento-San Joaquin Drainage District?	10
c	Does aging critical flood protection infrastructure exist in your region?	10
d	Have flood control facilities (such as impoundment structures) been insufficient in the past?	10
e	Are wildfires a concern in parts of your region?	10
	Total	50
	Percent	100%
6. Ecosystem and Habitat Vulnerability		
a	Does your region include inland or coastal aquatic habitats vulnerable to erosion and sedimentation issues?	10
b	Does your region include estuarine habitats which rely on seasonal freshwater flow patterns?	0
c	Do climate-sensitive fauna or flora populations live in your region?	10
d	Do endangered or threatened species exist in your region? Are changes in species distribution already being observed in parts of your region?	10
e	Does the region rely on aquatic or water-dependent habitats for recreation or other economic activities?	10
f	Are there rivers in your region with quantified environmental flow requirements or known water quality/quantity stressors to aquatic life?	10
g	Do estuaries, coastal dunes, wetlands, marshes, or exposed beaches exist in your region? If so, are coastal storms possible/frequent in your region?	0
h	Does your region include one or more of the habitats described in the Endangered Species Coalition's Top 10 habitats vulnerable to climate change (http://www.itsgettinghotoutthere.org/)?	10
i	Are there areas of fragmented estuarine, aquatic, or wetland wildlife habitat within your region? Are there movement corridors for species to naturally migrate? Are there infrastructure projects planned that might preclude species movement?	10
	Total	70
	Percent	78%
7. Hydropower		
a	Is hydropower a source of electricity in your region?	10
b	Are energy needs in your region expected to increase in the future? If so, are there future plans for hydropower generation facilities or conditions for hydropower generation in your region?	5
	Total	15
	Percent	75%

[a] Yes = 10, No = 0, and Uncertain/Perhaps = 5, except for question 1e where Yes =0, No = 10, and Uncertain/Perhaps = 5.

For More Information

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CHAPTER 5
Project Selection Process and Procedure

The purpose of this chapter is to describe the process by which potential projects were developed and prioritized through the following five sections:

- Project Review Process
- Impact and Benefits
- Project Integration
- Relation to Local Water Planning
- Relation to Local Land Use Planning

5.1 PROJECT REVIEW PROCESS

The project review process included procedures for submitting projects, reviewing projects, and communicating the list of selected projects, as described below. The project lists included in Appendices G, H, and I are a preliminary inventory of projects and proposed projects in the NSV area, some of which are more highly developed than others. The project lists will be modified periodically by the NSV Board at open public meetings as projects may be added, dropped, integrated, or improved by their sponsors as they progress through permitting and local approval processes. NSV Board modification of the project lists does not require ranking of projects or re-adoption of the IRWMP.

5.1.1 Procedures for Submitting a Project to the IRWMP

The procedures that the RWMG used to solicit projects under this IRWMP and the procedures that will be used to add projects in the future are discussed below.

5.1.1.1 2012/2013 Project Solicitation Procedure

On May 7, 2012, the NSV Board formed a Project Review Subcommittee (PR Subcommittee) to create an online submissions process to solicit project and program proposals for possible incorporation into the NSV IRWMP. This PR Subcommittee was also tasked with developing review criteria and reviewing project and program submissions, prior to TAC and NSV Board consideration. The original PR Subcommittee consisted of then-NSV Board Chair Leigh McDaniel, NSV Board Vice Chair Stan Wangberg, NSV Board member Ryan Sale, and the six county representatives to the TAC (TAC Chair Vickie Newlin - Butte, TAC Vice Chair Lester Messina - Glenn, Gary Antone - Tehama, Eric Wedemeyer - Shasta, Mary Fahey - Colusa, and Dan Peterson - Sutter). Some staff changes have occurred since the founding of the PR Subcommittee (Lester Messina was replaced by Lisa Hunter in late 2013).

The PR Subcommittee met on May 10, 2012 and May 16, 2012 to develop the proposal submittal form and process, including instructions for the online proposal submittal form. It was decided at this time that although online submissions would be encouraged, paper submittal forms could also be made available.

The PR Subcommittee also developed a New Proposal Submittal Agreement and Terms of Use (Agreements, see Appendix J) for the proposal submittal process. Proposal proponents were required to sign the Agreement prior to completing the proposal submittal form. Agreement with the Terms of Use was required by anyone wishing to submit a proposal or access the published information related to submitted proposals. The Terms of Use is a basic disclaimer and limitation of liability form, while the New Proposal Submittal Agreement more specifically addresses expectations and understandings that organizations should have before submitting a project or program for possible inclusion in the IRWMP. For example, the New Proposal Submittal Agreement states that the proposal proponent has reviewed the NSV IRWMP's Goals and Objectives and has determined that the submitted proposal will meet one or more of the NSV IRWMP's Goals and Objectives and, furthermore, that the organization will provide a letter of support for the NSV IRWMP. At the same time, the New Proposal Submittal Agreement states that the proposal proponent may continue their independent planning, undertake efforts to secure funding from any source, and withdraw from participation in the IRWMP at any time.

The PR Subcommittee developed an online proposal submission section on the NSV IRWMP website (see Appendix J) and launched this website feature on July 16, 2012. The PR Subcommittee sent a press release (see Appendix J) several weeks prior to the website launch date to notify potential project proponents in the region that project solicitation and submission would begin in July 2012.

5.1.1.1.1 Project Proposal Application

The Proposal Instructions provided detailed step-by-step directions regarding the submittal and review process, and informed potential project proponents that the application requires information regarding the proposed project to provide reviewers sufficient information to determine if the project meets criteria for potential inclusion into the IRWMP projects and programs database. The instructions stated that proposals adopted as part of the NSV IRWMP would be eligible for future IRWM-specific funding opportunities, as grant solicitations became available. It also noted that it was becoming more common that other funding opportunities for project/program implementation also require or give preference to projects/programs that are included in an IRWMP. In addition to potential funding opportunities, the projects/programs database will be used to better integrate and coordinate projects/programs for improved water management.

The Proposal Instructions also informed potential project proponents of the process that would be used to include projects and programs in the IRWMP.

Before an applicant could upload a new project proposal on the website, they had to first register as a user by creating an online account, signing in as a member, and reading and agreeing to the New Proposal Submittal Agreement and Terms of Use Agreement. After that initial step, applicants had seven sections to fill out. Some fields, denoted with an asterisk, were required to be filled-out in order for an application to be considered complete and publishable. Proposals had to be published to be considered for inclusion in the IRWMP. Any visitor to the website was able to view a summary of published proposal information on the 'Published Proposals' tab of the website and on an interactive map on the website.

The seven sections included:

1. Organization Information
2. General Proposal Information
3. Funding
4. Permitting
5. Collaborative Partnerships
6. Location
7. Strategies and Benefits

Information requested on the application included the project name, description, an explanation of why the project or program was needed, project phase, anticipated start date, location, sources of funding - including cost-share, status of permits, description of collaborators and political support, and the IRWMP objectives that applied to the project. Screen shots of the full application are shown in Appendix J.

Applicants were able to save their entered information by clicking the 'Save' button and could work on their application over several days. Upon completion of the proposal forms, applicants were able to print and review the proposal information, upload supporting documents, and confirm that all required information was provided on the project form, prior to submitting.

Once the proposal was submitted, the applicant no longer had access to their proposal information. Once the PR Subcommittee's review was complete, the applicant was either notified that their submittal was incomplete or that their project had been published. Ultimately, proposal summary information – including organization name, project name, project description summary, major streams or watersheds, current project phase, project cost, matching funds, and project location - became viewable by the public under the 'Published Proposals' section of the website for all submitted projects.

5.1.1.1.2 Responses to the Call for Project Submittals

Proposals were received on the online submittal portion of the website through 5 p.m. on August 9, 2012. A total of 58 proposals were received and made available on the website for public viewing. Although a wide variety of projects were received during the submittal period, the NSV Board, per the PR Subcommittee's recommendation, re-opened the project submittal opportunity for a second round of submittals between October 10 and October 31, 2012 for the following reasons (in no particular order):

1. Several potential project proponents requested more time to complete their submittals. Some project proponents felt they were not given enough notice prior to the initial due date to acquire their required board or agency approval to submit projects, especially if the projects were in the conceptual stage.
2. Several project proponents (existing and potential) could have new ideas for projects, or integration of projects, based on their review of the initially submitted projects.

3. Potential project proponents, and those that have submitted projects, could have additional ideas for projects or project integration following the outreach meetings in late September 2012.
4. Some projects were accepted after the deadline due to technical difficulties they experienced. To ensure fairness, the NSV Board chose to re-open the submittal process to provide everyone with an equal opportunity for project submittals.
5. Technical difficulties may have excluded some project submittals for which the NSV Board and PR Subcommittee were unaware.
6. It was made clear at the August 2012 TAC meeting that the NSV Board was also interested in receiving project concepts, and not just fully defined projects. Prior to the August 2012 TAC meeting, potential project proponents may not have clearly understood that projects in the concept phase were eligible to be submitted.
7. It was the desire of the PR Subcommittee and NSV Board to include as many projects in the region as possible that align with the region's objectives.
8. After reviewing the proposed projects, the PR Subcommittee could identify opportunities to improve or align projects through editorial review and facilitated communication and collaboration among project proponents.

The PR Subcommittee sent a press release (see Appendix J) a few days prior to re-opening the submittal process on October 10, 2012 to notify potential project proponents in the region. An additional 41 projects were received during the second submittal process, for a grand total of 99 projects submitted for potential ranking. In addition to the list of 99 projects submitted to be ranked, ten projects were submitted as "Projects-to-Track". Projects-to-Track were solicited to be included in the IRWMP to simply acknowledge projects in the region that either may have an effect on water management activities in the region but might not necessarily be seeking funding through the NSV IRWMP or may be on the horizon for future consideration but which essentially (concept projects) were not yet developed enough to be ranked according to the criteria of the prioritization process. One example of a Project-to-Track is the North-of-the-Delta Off-stream Storage project which has the potential to create substantial impacts or benefits to regional water management. Projects submitted for tracking will not be considered for IRWM-related funding opportunities unless or until they are more fully developed and submitted to the region for ranking. Project proponents were informed that project and program submittals would be ranked (prioritized) for inclusion in the NSV IRWMP unless project proponents specifically requested to have their project included as a Project-to-Track in the NSV IRWMP.

Although 99 projects were initially submitted for ranking, the NSV Board decided at its meeting on December 3, 2012 to move the 24 projects submitted by the California Department of Fish & Wildlife to the Projects-to-Track list rather than to rank these projects. This decision was made because the Department of Fish & Wildlife was not the project proponent or project sponsor. The NSV Board decided that the projects submitted by the Department of Fish & Wildlife should be on the Projects-to-Track list until such time that local project proponents stepped forward. Therefore, in December 2012, 75 projects were ranked for inclusion in the IRWMP and 34 projects were included on the list of Projects-to-Track.

To allow additional projects and programs to be submitted and to provide an opportunity for projects to be transferred from the tracked to the ranked list, a third round of proposals were solicited and received between April 5 and May 2, 2013. The PR Subcommittee sent a press release (see Appendix J) a few days prior to re-opening the submittal process on April 5, 2013 to notify potential project proponents in the region. This most recent project submittal round included the submission of 17 new projects, the removal and/or modification of three previously submitted projects, the transition of 24 projects from the Projects-to-Track list to the ranked list, and the submission of one new project to the Projects-to-Track list. In summary, 113 projects were submitted for ranking through the third submittal round (75 projects from the previous two submittal rounds, plus 24 projects moved from Projects-to-Track to ranked, plus 17 new projects, minus three replaced projects). A summary of the currently ranked projects is provided in Appendix G.

Resolutions from the respective governing bodies of each of the project proponents included in Appendix G will be provided to show approval and support of the NSV IRWMP. These resolutions will be provided sometime after the IRWMP is initially adopted by the NSV IRWM Board in early 2014, but prior to when an application for IRWM implementation funding is submitted. In the meantime, letters of support from each of the project proponents are included in the back of Appendix G. Resolutions from the project proponent organizations that have already adopted the NSV IRWMP are included in Appendix G, after the letters of support.

Project proponents were also encouraged to integrate projects where possible for broader cross-jurisdictional and regional efficiency and/or benefits. Project proponents that submitted projects in the initial or second solicitation round were encouraged to use the second and third submittal periods as opportunities to integrate their project(s) with other previously submitted project(s) or program(s), and/or to "fine tune" their project submittals based on the prioritization criteria.

5.1.1.2 Future Project Solicitation Procedure

The NSV Board has discussed that future IRWM solicitation rounds will have a similar process to that used in 2012 and 2013 to solicit the initial list of projects for the IRWMP database. Although the NSV Board reserves the right to modify the solicitation process in the future, it currently plans to re-open the solicitation process on an annual basis. The NSV Board will continue to offer both online and hard copy submittals. Appendix K includes a list of steps that the Board anticipates following for future project solicitation processes. As funding opportunities arise and as the Board sees appropriate, the Board will rank projects. The Board will not rank new projects, or re-rank existing projects, as new projects are added to the IRWMP. The Board will rank projects in response to specific funding opportunities as indicated in Appendix L.

The NSV Board intends to adopt the updated list of projects (Appendices G, H, and I) each year, but not re-adopt the entire IRWMP each year. The NSV Board only plans to adopt updates to the IRWMP at times when significant sections of the IRWMP are changed or modified, excluding when project lists or other appendices are updated. However, when the IRWMP updates are adopted, the most recently adopted list of projects will be included in the adopted IRWMP update.

In addition to the NSV IRWMP, several member counties are also engaged in preparing the Mid & Upper Sacramento River Regional Flood Management Plan (MUSR RFMP) and the Feather River Regional Flood Management Plan (FRRFMP), which will ultimately produce prioritized lists of potential flood management projects located within the NSV Region. It is the intent of the NSV IRWM Board to integrate the unranked list of MUSR RFMP and FRRFMP projects into the NSV IRWMP "Projects to Track" list (Appendix I). Following scoring of the projects by the MUSR RFMP and the FRRFMP it is the intent of the NSV Board to move the scored projects from the NSV IRWMP list of Projects-to-Track to the Ranked Projects list at a future NSV Board Meeting, following review and approval by the NSV TAC.

5.1.2 Procedures for Review of Projects to Implement the IRWMP

The procedures that the RWMG used to review projects under this IRWMP and will use to review projects in the future are discussed below.

5.1.2.1 2012/2013 Project Review Procedure

As explained in the proposal instructions, the PR Subcommittee took the lead in reviewing submitted projects, but relied on the NSV Board to ultimately approve the inclusion of projects in the IRWMP. The specific steps used in the 2012 and 2013 project submittal and review process, and approximate timing, are listed below.

1. Proponents completed preliminary on-line or hard copy project/program information. (July-August 2012, October 2012, April-May 2013)
2. The PR Subcommittee reviewed the proposals for clarity and eligibility, and followed up with proponents as needed. (July-August 2012, October-November 2012, April-May 2013)
3. The PR Subcommittee reviewed and determined whether proposals met minimum eligibility requirements. (July-August 2012, October-November 2012, April-May 2013)
4. The PR Subcommittee 'published' and summarized a listing of eligible IRWMP projects/programs for TAC and NSV Board consideration. (August 2012, November 2012, May 2013)
5. The PR Subcommittee, TAC, and NSV Board received public comment on submitted project proposals. (August-December 2012, May-June 2013)
6. The PR Subcommittee reviewed proposals, considered the potential for integration among submitted projects/programs, and ranked IRWMP projects and programs. (November 2012 and May 2013)
    a. Review projects for potential integration opportunities. Project proponents were encouraged early in the process to integrate projects where possible for broader cross-jurisdictional and regional efficiency and/or benefits.

b. Determine if a submitted project is to be ranked or tracked, based on the project proponents' request. Ranking was encouraged in order to demonstrate project qualifications for future funding. All submitted projects were initially ranked unless the project proponent had requested otherwise by October 31, 2012 during the first and second round of submittals and May 2, 2013 during the third round of submittals.
c. For projects to be ranked, points were assigned to factors A through J presented in Section 5.1.2.1.1. Next, proposed projects were evaluated based on factors K through N (presented in Section 5.1.2.1.2).
d. Use the ranked list to group projects into the following categories to include in the draft IRWMP:
    i. top projects by project type/status category
    ii. top projects by county;
    iii. top projects by goal;
    iv. top DAC projects; and
    v. top Tribal projects.

7. The TAC received public comment and created a recommendation to the NSV Board on projects and programs. (November 15, 2012; May 16, 2013)
8. The NSV Board accepted public comments and selected projects and programs for inclusion in the IRWMP. (December 3, 2012; June 3, 2013)

Note that DWR IRWM Guidelines require all projects to be ranked, even though there is not a current funding stream or criteria. Development of the ranking criteria was valuable in that it illustrated the difficulty of sorting a broad variety of projects.

The flowchart shown in Figure 5-1 (located at the end of Chapter 5) was developed to visually show the process for project review and prioritization (step 6, above), including how to track large, conceptual projects (that are not yet specifically defined) into the IRWMP.

In addition to these steps for inclusion in the IRWMP, potential applicants were informed that additional proposal information would be required when specific grant opportunities became available. When the NSV Board issues funding solicitations and calls for proposals, NSV IRWMP project proponents will be allowed to edit their preliminary proposal, and upload any new information in light of the specific grant requirements.

The PR Subcommittee prepared draft project review criteria for prioritizing project and program submissions in August 2012 and presented them to the NSV Board and TAC for discussion/possible action in September 2012. A written description of the recommended method of prioritization was provided along with a sample scorecard and flow chart. During the month of September 2012, the public was asked to comment on the proposed approach to prioritization as presented to the NSV Board and TAC and in the three Round 2 Public Outreach workshops held in September 2012 (refer to Chapter 3 Plan Development Process) as well as provide their ideas and comments on integration opportunities.

In response to the NSV Board, TAC, and public comment, in early October, the PR Subcommittee revised the prioritization criteria to expand the local matching funds factor to include in-kind/labor/other non-monetary contributions as well as monetary cost-share contributions. The PR Subcommittee did not make any other changes to the proposed prioritization criteria until June 2013 when the criteria for receiving Tribal benefit points was made more stringent so that only projects in which a Tribe is a primary beneficiary would receive tribal benefit points.

Project ranking was conducted using a point-based system based on factors A through J listed in Section 5.1.2.1.1. Ranked projects were also qualitatively evaluated based on factors K through N listed in Section 5.1.2.1.2. All factors evaluated are described in the sections that follow.

5.1.2.1.1 Point-Based Factors

Scores were based only on information submitted by the project proponents during the project submittal process. Staff did not separately evaluate the information submitted by project proponents. During a ranking process for a specific funding opportunity, the information provided by project proponents will need to be verified. Factors A through J are described below. Factors with an asterisk are required by the DWR IRWM Guidelines to be considered when ranking projects.

A. *Number of NSV IRWMP Objectives addressed. This factor is the primary determinant of score; it is weighted most heavily compared to all other factors.
    i. Number of objectives met
    ii. Type of need met (higher weight for higher priority primary and secondary objectives – *i.e.* critical health & safety objectives get the most weight. This is based on the priority that was established for each NSV IRWMP objective - either “critical”, “foundational”, “high”, or “medium” priority - when the NSV Board adopted the Goals and Objectives in June 2012. Note: A score is only given for one objective: the highest of the primary and secondary objectives.)
B. *Multi-Benefit
    i. Meets objectives under more than one NSV IRWMP goal
    ii. Number of committed collaborative partners (Note: A score is given in only one category for each partner. If a partner meets multiple categories, then the category with the highest point value is used for scoring.)
    iii. Benefits more than one county
C. *Readiness to proceed/project status (Based on project phase. Higher weight for projects that are closer to the construction/implementation phase. Note: Points are only awarded for one project phase. If multiple phases are provided in a submittal, points will be based on the highest scoring phase.)

D. Local contribution to cost share (including both monetary and non-monetary/in-kind contributions). This is the local share of total cost or local "matching funds" – *e.g.* for a local agency's project with 50% matching funds, the local agency can fund half of the total project cost.

E. *Benefits to DACs, a DAC is defined as an area where the median household income is less than 80 percent of the Statewide average. The DAC cutoff is currently (2013) $48,706 per year.

F. *Benefits to Tribes (California Native American Tribes – *i.e.* federally recognized or non-federally recognized). Projects claiming a benefit to Tribe must (1) list a Tribe as a primary project beneficiary and (2) address water supply, flood control, water quality, watershed protection, and/or public education needs of a Tribe to receive Tribal benefit points.

G. *Economic feasibility (assessed with a cost-effectiveness analysis or cost-benefit analysis). Projects are not disqualified if they have not done a cost analysis, but they earn extra points if they have done one, and if they can show project benefits outweigh costs.

H. *Number of statewide priorities addressed.

I. *Number of resource management strategies utilized.

J. *Ability of the project to assess vulnerabilities to climate change, adapt to the effects of climate change, or mitigate climate change. This factor has a very low weight compared to all other factors, because impacts of climate change on water management are expected to be relatively low for the NSV region. Assessing vulnerabilities to climate change and minimizing GHGs is incentivized to projects through points in the project review process, but the NEPA and/or CEQA permitting process prior to project implementation will further act to reduce specific project's impact on climate change.

Figure 5-2 (located at the end of Chapter 5) lays out the scorecard used for assigning points based on the factors described above. The scorecard shows the number of points for each factor and the corresponding weight for each factor. Points were objectively given to each project based on information provided on the project submittal form. The PR Subcommittee developed this approach with the intent of making the prioritization process as simple and objective as possible, while still considering the factors required in the DWR IRWM Guidelines.

Table 5-1 shows the weight that each factor had on the overall scoring.

Table 5-1. Weight of Each Quantitative Factor on Overall Project Score[(a)]

Criteria	Overall Weight of Factor
Number of NSV IRWMP Objectives Met	24%
Local Matching Funds	14%
Primary Beneficiary is DAC	8%
Primary Beneficiary is Tribal	8%
Type of Need Met (highest scoring of primary or secondary objective)	8%
Number of Committed Collaborative Partners	8%
Meets Objectives Under More Than One Goal	6%
Number of Statewide Priorities Met	6%
Number of Resource Management Strategies	6%
Program Phase	5%
Benefits More than one NSV County	4%
Economic Feasibility Analysis	2%
Vulnerability, Adaptation, Mitigation of Project to Climate Change	2%

[(a)] see scorecard in Figure 5-2 (located at the end of Chapter 5) for further scoring details

5.1.2.1.2 Qualitative Factors Considered for Ranked Projects

After the initial numeric scoring, subjective factors were considered. Qualitative factors K through N are described below. Factors with an asterisk are required by the DWR IRWM Guidelines to be considered when ranking projects. One minimum criterion that is not listed below is the factor of whether the project proponent has adopted or will adopt the NSV IRWMP. During the IRWMP development, it was assumed that all project proponents would eventually adopt the NSV IRWMP since the project proponent had to agree to provide a letter of support in the New Proposal Submittal Agreement. Prior to the NSV IRWM Board approving the IRWMP, it was unreasonable to expect project proponents to provide adoption resolutions and, therefore their provision of a letter of support was deemed sufficient to have them included in Appendix G and H. Projects without a letter of support from their project proponent were not included in the Appendix G and H project lists. As adoption resolutions from project proponents are received, they are added to Appendix G. Projects still without an adoption resolution from their project proponent at the time of an IRWM grant application submittal will be removed from the Appendix G and H project lists.

K. *Technical feasibility of the project. The PR Subcommittee made a conceptual technical feasibility determination based on information provided in the proposals.

L. *Environmental Justice (EJ). Environmental Justice is defined as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies (California Government Code §65040.12(e)). If EJ concerns are raised, the NSV Board may choose not to include the project in the ranked lists until EJ concerns are addressed in a good faith effort.

M. *Project costs and financing. A basis for cost estimate must be provided for inclusion in the ranked lists in the IRWMP.

N. Potential conflict with one or more NSV IRWMP objectives. In the event that a project conflicted with any NSV IRWMP objective(s), the NSV Board had the option of not including the project in the ranked lists.

The PR Subcommittee reviewed each submitted project for conceptual, technical feasibility. None of the submitted projects appeared to have fatal flaws that would potentially result in the projects being technically infeasible. Therefore, all submitted projects are considered to have passed the technical feasibility criteria. Furthermore, all submitted projects provided a basic basis for their projects' costs and financing, and none of the projects were determined to potentially conflict with one or more of the IRWMP objectives. Lastly, none of the projects were deemed to have significant enough environmental justice issues associated with them to disqualify them from inclusion in the IRWMP.

5.1.2.1.3 Ranked Projects

The ranked projects were initially sorted into the following five categories as an example and are shown in Appendix G:

1. Shovel-Ready, Discrete Projects (includes hard project permitting, construction/implementation - may include mitigation monitoring associated with implementation)
2. Planning Projects (includes plans, studies, design, environmental permitting/documentation)
3. New Programs/Projects, Education and Research (includes Concepts, Feasibility Studies, Research and Education Programs)
4. Continuing/Ongoing Existing Projects/Programs (includes maintenance, monitoring)
5. Staffing/Support

The ranked projects were organized into these five categories because the PR Subcommittee thought it was most appropriate to only compare projects that would likely compete for the same sources of funding. For instance, a well construction project would not likely compete against a groundwater data collection research project (which uses existing wells). Therefore, these types of projects were assigned to separate categories. These categories also aid decision-makers in knowing what projects are ready to proceed with particular phases. Note that some projects may be ready to implement several phases at once or otherwise appropriately fit into more than one category. Therefore, some of the projects are shown in more than one category.

Although the projects are numerically ranked in an overall fashion, the projects are also shown in several ways in the tables in Appendix H to illustrate what the highest ranked projects are on the following lists: top projects by county, goal category (*i.e.* Water Supply, Flood, *etc.*), shovel-ready projects, DAC projects, and Tribal projects. Through these categories, a project that might not be top-ranking compared to all other projects in the region, may appear on another "top 10" or "top 5" list within the IRWMP. Tiers are shown on the sorted tables in Appendix H. Tier I is

for projects with a total score between 100 and 127, Tier II indicates a score between 60 and 99, Tier III indicates a score between 5 and 59 points.

Despite the rankings, it was emphasized to project proponents that being ranked highly on any of these lists does not influence the likelihood of receiving future funding since IRWMP projects will be re-evaluated for eligibility and priority when specific funding opportunities are considered. What is most important for all of the submitted, ranked projects is that they are included and recognized in the IRWMP - since inclusion in the IRWMP makes these projects eligible for IRWM-implementation funding opportunities and may also increase their opportunities for receiving funding from other grant sources.

5.1.2.1.4 Projects-to-Track

In addition to the list of 113 ranked projects, 11 projects were submitted as Projects-to-Track by the third round of project submittals. A summary of the projects-to-track are included in Appendix I. These projects were not ranked, but are included in the IRWMP to acknowledge projects that may be on the horizon for future consideration but which are not yet developed enough to be ranked according to the criteria of the prioritization process. One example of a tracked project is the North-of-the-Delta Off-stream Storage project which has the potential to create substantial impacts or benefits to regional water management. Projects submitted for tracking will not be considered for IRWM-related funding opportunities unless they are more fully developed and submitted to the region for ranking.

Ranked and tracked projects are both included and described in the IRWMP, however the tracked projects have significantly shorter descriptions, as there is less definition and information about these projects.

Inclusion in the ranked lists or projects-to-track list contained in the IRWMP does not constitute project "endorsement" by the NSV Board. Project "endorsement" will occur when individual projects are packaged and/or recommended for specific grant funding opportunities.

5.1.2.2 Future Project Review Procedure

The NSV Board will conduct future project submittal solicitations after the initial IRWMP is adopted, however the May 2, 2013 5:00 p.m. deadline was the last opportunity to submit projects for consideration to be included in the initial IRWMP.

After adoption of the initial IRWMP, project proponents' projects that are not included by the NSV Board on the ranked lists in the IRWMP may be re-submitted for ranking during future project submittal periods to be determined by the NSV Board for updating the IRWMP. Ranked projects may also be updated to improve their rankings, moved between the tracked list and ranked lists, or integrated with other projects, during re-submittal periods (after adoption of the initial IRWMP).

The NSV Board may alter or update the submittal process and criteria for future submittals at its discretion, but it plans to continue to have the PR Subcommittee review projects as outlined in Appendix K. NSV Board modification of the project list does not require re-ranking of projects or re-adoption of the IRWMP. Future grant opportunities may require adding additional criteria

and re-ranking the IRWMP lists for that specific opportunity at a later date. The Board intends to respond to funding opportunities as described in Appendix L. If the Board decides to modify its intended approach for future project solicitations or responding to funding opportunities it may modify Appendices K or L without re-adopting the IRWMP.

5.1.3 Procedure for Communicating the list(s) of Selected Projects

All project submittals, whether submitted online or via hard copy, were published on the public NSV IRWM website (http://www.nsvwaterplan.org/app_pages/view/35) so that anyone could download summary information about all of the submitted projects. A function was also made available on the website to download the published project data into a table that could be copied to an Excel or Word program for easy viewing and sorting.

The list of submitted projects was published in the August 2012, September 2012, November 2012, and May 2013 TAC agenda packets and the September 2012, December 2012, and June 2013 NSV Board agenda packets. In addition the summary information of the 58 initially submitted projects was also made available in hard copy format at the Round 2 public outreach workshops. This summary was also posted on the 'Projects' page of the website. Three press releases (see Appendix J) inviting public comments on prioritization and integration, and inviting participants to submit projects during the second and third round of submittals, included information on where to access the list of already submitted projects.

The prioritization, and inclusion in the IRWMP, of submitted projects was discussed at the August, September, and November 2012 and May 2013 TAC meetings and the September and December 2012 and June 2013 NSV Board meetings. Once the NSV Board adopted the final list of projects to include in the IRWMP (both ranked and tracked), the final lists were posted to the NSV IRWM website (http://www.nsvwaterplan.org/app_pages/view/35) and project proponents were notified via email. In addition, the final list of projects was documented in the public meeting minutes from the December 2012 and June 2013 NSV Board meeting.

5.2 IMPACTS AND BENEFITS

The implementation of the IRWMP will occur as the projects included in this IRWMP are undertaken. Therefore, the impacts and benefits of implementing the IRWMP are the same as the impacts and benefits of the ranked projects included in this IRWMP. The stage of each project is slightly different so it is impossible to provide an accurate impact and benefit analysis of every project in this IRWMP. As projects near implementation, more detailed analyses and project-specific impact and benefit analyses will occur. On an annual basis, the NSV Board plans to evaluate the status of the projects listed in the IRWMP and request project-specific potential impacts and benefits from the project proponents. Prior to the NSV Board's endorsement of any project, a project-specific impact and benefit analysis must be provided to the NSV Board for their review.

The simplified, anticipated impacts and benefits of the IRWMP, to entities within the region, including DACs and California Native American tribal communities, as well as to entities within neighboring or overlapping regions, are described in the following sections.

Without discussing specific projects, many of these impacts and benefits were presented, discussed, and developed during the stakeholder workshops in Round 1 and 2. The multiple benefits were emphasized to encourage members of the public to support the development of the IRWMP and their participation in the IRWMP. It was also made clear, however, that without this IRMWP, any of these projects could still be implemented as long as they had funding and could obtain all appropriate permitting. The IRWMP effort is not regulatory in nature. However, by demonstrating regional support for high-priority projects in the region, these particular projects in the IRWMP may have a better chance at obtaining local, statewide, and even national support (whether financial or other form of support) than projects not included in the IRWMP.

5.2.1 Screening Level Impacts of IRWMP Implementation

The potential impacts of the ranked IRWM projects to the region and those outside of the region are shown in Table 5-2.

The majority of the negative impacts are generally due to temporary, but unavoidable construction. Other potential project impacts are purely speculative, and some parties may perceive as negative – while others would view as an overall positive impact. For example, many of the projects aim to present and/or collect information about water supply and quality. While this is useful for water planners, individual land owners or specific irrigation districts may not want information to become so readily available. Very few impacts are anticipated for stakeholders external to the region.

None of the 113 projects, submitted through the third round of submittals, were determined to cause specific, known environmental justice concerns – although several projects with construction-related components may present localized environmental justice concerns that will need to be resolved prior to implementation. None of the 113 projects, submitted through the third round of submittals, were determined to have potential impacts that were disproportionately associated with DACs.

Table 5-2. Known Impacts of Implementation of NSV IRWMP Programs and Projects

Goal Category	# of Projects Included in this Goal Category[a]	Nature of Projects in this Goal Category[b]	Within NSV RWMG	Inter-regional
			Potential Impacts	Potential Impacts
Water Supply Reliability	39	Tank improvement, data inventory updates, GWMPs, Groundwater Monitoring and Modeling, replacement of water mains and installation of water meters, watershed restoration, crop irrigation efficiency projects, irrigation canal modernization, dam replacement, well installation, in-lieu recharge, evaluation of groundwater recharge, and water quality assessment	Temporary construction-related impacts Unwanted information sharing about groundwater levels Unwanted tracking of water use	Less water flowing out of NSV region to neighboring regions due to increased irrigation efficiency
Flood Protection and Planning	11	Stream restoration, stream recharge, flood hazard preparation planning, canal master plan, storm drain rehabilitation, detention basin	Temporary construction-related impacts Loss of riparian acreage	
Water Quality Protection and Enhancement	20	Well abandonment program, well containment and treatment system, wastewater treatment plant upgrade, water treatment plant upgrade, aging infrastructure demolition, recycle residuals dewatering	Temporary construction-related impacts	
Watershed Protection and Management	29	Fish screen project, stream monitoring, wildfire protection plan, environmental monitoring program, river and park restoration, invasive species control	Temporary construction-related impacts Unwanted monitoring and access to remote areas, removal of habitat for species that have adapted to the presence of invasive species	
IRWM Sustainability	5	Climate stewardship coordinator, region-wide watershed model support, IRWMP grant support, environmental services for IRWMP projects	Unwanted widespread information shown on region maps such as land use, crop types, *etc.*	
Public Education and Information Dissemination	9	K-12 watershed education, K-12 science ambassador project, educational mural, well monitoring network, kids watershed stewardship program, region-wide IRWM outreach and education		

[a] Number is based on the 113 projects submitted through the third round of project submittals (May 2013). The numbers in this column will change as projects are added and removed from the ranked projects lists (Appendices G and H).
[b] For more detailed information on projects by goal category, refer to Appendix H.

5.2.2 Screening Level Benefits of IRWMP Implementation

The potential benefits of the 113 IRWM projects, submitted through the third round of submittals, to the region and those outside of the region are shown in Table 5-3.

In addition to the benefits listed in Table 5-3, several RMS, as described in Chapter 4, will be utilized through the implementation of the 113 projects submitted through the third round of submittals. The use of these RMS will be beneficial to the region as multiple, diverse strategies will be used to manage the region's resources and therefore mitigate against future uncertain circumstances.

Although none of the 113 projects, submitted through the third round of project submittals, were determined to cause specific, known environmental justice concerns or have potential impacts that were disproportionately associated with DACs, the majority of these projects also do not tend to have specific benefits to DACs. However, many projects will peripherally benefit DACs and some projects specifically address critical water-related concerns in DACs. A total of 87 projects, submitted through the third round of project submittals, benefit DACs in some way. Examples of projects that address specific, critical water supply needs of DACs include the Live Oak Flood Hazard Preparation Plan (Project ID #40), the Robbins Water Main and Meters project (Project ID #80), the Cortina Rancheria Water Assistance Plan (Project ID #27), the Town of Paradise Wastewater Collection System Project (Project ID #29), and the City of Orland Eva Drive Well project (Project ID #95). Examples of projects that peripherally benefit DACs tend to include projects with a wide area of benefit – often the entire region – such as the Regional K-12 Watershed Education project (Project ID #45), Butte County Well Abandonment Program (Project ID #98), and the Battle Creek Stream Monitoring Plan (Project ID #54). Other projects provide more localized benefits, but benefit the DACs in the area about the same amount as other residents in the area or provide specific benefits to DACs – but not necessarily meeting critical water supply needs. Examples of these projects include the Well Contaminant Treatment System (Project ID #32), the Rio Alto Wastewater Treatment Plant & Constructed Wetlands Project (Project ID #7), the Colusa Indian Community Council's Packer Ranch Pump Station and Fish Screen project (Project ID #24), the Paradise Irrigation District Magalia Dam Replacement (Project ID #33), and the City of Shasta Lake Recycle Residuals Dewatering Project (Project ID #47).

Comparing the potential benefits of the projects listed in Table 5-3 to the potential impacts listed in Table 5-2, it can qualitatively be concluded that the benefits of implementing the IRWMP and projects far outweigh the minor, and mostly temporary, impacts.

Table 5-3. Known Benefits of Implementation of NSV IRWMP Programs and Projects

Goal Category	# of Projects Included in this Goal Category[a]	Nature of Projects in this Goal Category[b]	Within NSV RWMG	Inter-regional
			Potential Benefits	Potential Benefits
Water Supply Reliability	39	Tank improvement, data inventory updates, GWMPs, Groundwater Monitoring and Modeling, replacement of water mains and installation of water meters, watershed restoration, crop irrigation efficiency projects, irrigation canal modernization, dam replacement, well installation, in-lieu recharge, evaluation of groundwater recharge, and water quality assessment	Improved knowledge of water supplies and use, improved ability to store and manage water supplies, improved in-stream flow, reduced pumping costs, decreased and/or prevention of groundwater overdraft	Improved knowledge of water supplies and use, decreased and/or prevention of groundwater overdraft
Flood Protection and Planning	11	Stream restoration, stream recharge, flood hazard preparation planning, canal master plan, storm drain rehabilitation, detention basin	Reduced flooding, increased aquifer recharge, runoff reduction, improved surface water quality, natural resources preservation and restoration, reduced risk to life and property, reduced flood insurance costs	Reduced flooding, increased aquifer recharge, runoff reduction, improved surface water quality, natural resources preservation and restoration, reduced risk to life and property, reduced flood insurance costs
Water Quality Protection and Enhancement	20	Well abandonment program, well containment and treatment system, wastewater treatment plant upgrade, water treatment plant upgrade, aging infrastructure demolition, recycle residuals dewatering, water treatment wetlands construction	Improved drinking water quality, improved aquatic and wetland species habitat and populations, increased cropland production, creation of wetlands and riparian habitat, improved recreation opportunities, decreased treatment costs	Improved aquatic and wetland species habitat and populations, increased cropland production, creation of wetlands and riparian habitat, improved recreation opportunities
Watershed Protection and Management	29	Fish screen project, stream monitoring, wildfire protection plan, environmental monitoring program, river and park restoration, invasive species control	Improved water supply quality, enhanced fish habitat, increased opportunities for recreational hunting/fishing and wildlife viewing, reduced flood risks, education opportunities, increased public safety, increase in natives species populations (with the removal of invasive species), improved fish and wildlife passage	Enhanced fish habitat, increased opportunities for recreational hunting/fishing and wildlife viewing, reduced flood risks, education opportunities, increased safety from wildfire protection
IRWM Sustainability	5	Climate stewardship coordinator, region-wide watershed model support, IRWMP grant support, environmental services for IRWMP projects	Improved region-wide coordination, increased funding opportunities, improved knowledge of the region's water supplies and water uses	improved knowledge of the region's water supplies and water uses
Public Education and Information Dissemination	9	K-12 watershed education, K-12 science ambassador project, educational mural, well monitoring network, kids watershed stewardship program, region-wide IRWM outreach and education	Increased educational opportunities, increased knowledge about water supplies in the region	Increased educational opportunities, increased knowledge about water supplies in the region

[a] Number is based on the 113 projects submitted through the third round of project submittals (May 2013). The numbers in this column will change as projects are added and removed from the ranked projects lists (Appendices G and H).
[b] For more detailed information on projects by goal category, refer to Appendix H.

5.3 PROJECT INTEGRATION

Integrating projects was largely encouraged amongst the individual project proponents, but also considered by the NSV Board, TAC, and PR Subcommittee.

Project proponents were encouraged to integrate projects where possible for broader cross-jurisdictional and regional efficiency and/or benefits. Project proponents that submitted projects in the initial solicitation round were encouraged to use the second submittal period as an opportunity to integrate their project(s) with other previously submitted project(s) or program(s). The project proponents' incentive to consider integrating their project with another entity or project may stem from not only practical economies of scale project cost-savings and efficiencies, but also from improving their project score and ranking in the IRWMP to increase their regional support and potential for funding.

The goal of integration is to meet the needs of the region rather than just the specific needs of specific entities in the region. As an example, in the first round of project submittals, multiple entities in the region proposed programs to improve water resource public education within their jurisdiction. In the second round of submittals, various region-wide public education programs were submitted. These region-wide programs improve efficiencies and still achieve the goal of public education in each entities' jurisdiction. By integrating each jurisdiction's ideas into a single region-wide program, the program may be more comprehensive and effective than a program conducted by any one individual entity. Although integrating construction-type projects would also be useful – such as if multiple communities propose to build individual pipelines to connect their wastewater collection systems to a wastewater treatment facility, then the communities that are relatively near each other may consider integrating and combining their projects to reduce the length of total pipe required - few integrated construction/implementation projects were submitted.

The PR Subcommittee also reviewed the submitted projects for potential integration opportunities – especially between the initial and second round of project submittals when there was an opportunity for project proponents to revise their applications. The PR Subcommittee encouraged integration through creating incentives in the project scoring system. Projects that were integrated received more points since integrated projects typically met objectives under more than one NSV IRWMP goal (factor B.i.), had a greater number of committed collaborative partners (factor B.ii.), and benefited more than one county (factor B.iii.).

The three Round 2 public outreach workshops also provided an opportunity for project proponents to communicate with each other and consider integration opportunities. The project proponents that had submitted during the initial round of project solicitations were specifically invited to attend, share a project poster and interact with other project proponents and members of the public.

5.4 RELATION TO LOCAL WATER PLANNING

The intent of this IRWMP standard is to ensure that the NSV IRWMP is in line with local water planning documents in the NSV region since the regional planning should not supersede local planning, but instead compile and incorporate the pertinent points of local plans.

The most recent local water planning documents published in the NSV region are listed by County in Table 5-4. These documents include standardized plans such as groundwater management plans and urban water management plans as well as plans tailored specifically for a local region such as the Colusa Basin Watershed Management Plan.

The jurisdiction of each local plan is noted in Table 5-4. All of these jurisdictions fall within or overlap the NSV IRWM boundary. If known, the adoption date and frequency of updates for each local plan is listed in Table 5-4. As the multitude of local plans continues to constantly change, it is impractical to update the IRWMP simultaneous with local plans. However, local water resource managers and land use planners tasked with updating local plans will be asked to inform the NSV Board of any changes that have been made at the local level that could impact existing or future regional planning efforts. Each time the NSV Board updates the IRWMP, the NSV Board will consider the changes that have been made to local plans since the previous adopted IRWMP. To successfully incorporate local plan changes in future IRWMPs, participation and engagement in the IRWM process by a wide variety of geographically diverse water resource managers within the region will need to continue. With this continued engagement, results of regional planning efforts can also successfully feedback to the local planning efforts. In general, if inconsistencies emerge between local and the IRWMP, the IRWMP will need to be modified for consistency with the local plans as one of the NSV IRWM foundational objectives is to preserve the autonomy of local governments, special districts, and Tribes.

In developing this IRWMP, the County staff from the TAC has coordinated water management planning activities with cities, various county staff, special districts, and others in their respective counties to ensure that the important, relevant elements of the local planning documents are incorporated into the NSV IRWMP. The ways in which particular management activities have been coordinated are described below.

5.4.1 Groundwater Management

GWMPs are the primary way that counties and other entities in the NSV region plan for groundwater management. Each county has its own GWMP which specifies groundwater coordination within that county. Some counties have multiple groundwater management plans because there are irrigation and special districts in which groundwater is utilized and is tracked separately from the county. Most of the county GWMPs cover areas of their county which other GWMPs do not cover, in order that all areas in the NSV region are covered. One exception to date is the Shasta County GWMP which only includes the Redding groundwater basin.

Table 5-4. Local Water Planning Documents

County	Local planning documents	Plan Type	Lead Agency	Adoption Date	Frequency of Updates	Plan Jurisdiction
Butte	Butte County GWMP (AB3030)	GWMP	Butte County Department of Water and Resource Conservation	2004	as-needed	Butte County
	South Feather Water and Power Agency 2010 UWMP	UWMP	South Feather Water and Power Agency	2012	every 5 years	County of Butte; City of Oroville; Oroville Union High School District; Oroville City Elementary School District; Palermo Elementary School District; Bangor Elementary School District; Oroville Mosquito Abatement District; Butte County Mosquito and Vector Control District; Lake Oroville Area Public Utility District; and, Feather River Recreation and Park District
	Paradise Irrigation District UWMP	UWMP	Paradise Irrigation District	2011	every 5 years	Paradise Irrigation Disctirct
	CalWater Chico-Hamilton City District UWMP	UWMP	California Water Service Company	2011	every 5 years	City of Chico and Hamilton City
	CalWater Oroville UWMP	UWMP	California Water Service Company	2011	every 5 years	City of Oroville
	Butte County Water Resources Inventory and Analysis and Update	other	Butte County	2009	as-needed	Butte County
	Thermalito Irrigation District GWMP	GWMP	Thermalito Irrigation Distrcit	1995		Thermalito Irrigation District
	Western Canal Water District GWMP	GWMP	WCWD	1995		Western Canal Water District
	Richvale Irrigation District GWMP	GWMP	Richvale Irrigation District	1995		Richvale Irrigation District
	Biggs-West Gridley Water District GWMP	GWMP	Biggs-West Gridley Water District	1995		
	Butte Water District GWMP	GWMP	Butte Water District	1996		
	Big Chico Creeek Watershed Aliance Strategic Plan 2007-2009	Wtrshd MP	Big Chico Creek Watershed Alliance	2007	as-needed	Big Chico Creek Watershed
	Little Chico Creek Watershed Management Plan	Wtrshd MP	Little Chico Creek Watershed Alliance		as-needed	Little Chico Creek Watershed
	Cherokee Creek Watershed Mgt Plan	Wtrshd MP	Cherokee Watershed Alliance		as-needed	Cherokee Creek Watershed
	Butte County GP	GP	Butte County	2010	as needed	Butte County
	Chico GP	GP	City of Chico	2011	as-needed	City of Chico
	Gridely GP	GP	City of Gridley	2010	as needed	City of Gridley
	Marysville GP	GP	City of Marysville			City of Marysville
	Oroville GP	GP	City of Oroville	2009	as-needed	City of Oroville
	Disaster Plans by Emergency Dept.	other	Butte County		as-needed	
	Flood Planning Process	other	County PW Department		as-needed/ongoing	
	Butte County Flood Mitigation Plan	other	Butte County	2006	5 year progress report	Butte County
	Butte County Multi-Jurisdictional All hazard Pre-Disaster Mitigation Plan	other	Butte County	2007	every 5 years	Butte County
	Drought Response Plan	other	County Drought Task Force			
	Butte Creek Watershed Mgt Plan	Wtrshd MP	Butte Creek Watershed Conservatory	2000	Receive Recommendations Annually	Butte Creek Watershed
Colusa	AB3030 Glenn-Colusa	GWMP	Glenn-Colusa Irrigation District (GCID)	1993	Annual Status Report	Glenn-Colusa Irrigation District
	RD 108 GWMP	GWMP	RD 108	Amended 2006		
	AB3030 Westside WD	GWMP	Westside Irrigation District			
	AB3030 RD1004	GWMP	RD 1004			
	Provident ID AB3030	GWMP	Provident Irrigation District			
	AB3030 Princeton-Codora-Glenn Irrigation	GWMP	P-C-G Irrigation District			
	Colusa County GWMP	GWMP	County Water Resources Dep't*; Colusa County Groundwater Commission	2008	As funding is available	Colusa County
	Colusa Basin Watershed Assessment	other	Colusa County RCD	2008		Colusa Basin Watershed
	Colusa Basin Watershed Management Plan	Wtrshd MP	Colusa County RCD	TBA Jan. 2013	As funding is available and watershed resources change	Colusa Basin Watershed
	City of Williams GP	GP	City of Williams	2012	as required	City of Williams
	Colusa County GP	GP	County Planning and Building	TBA 2012	as required	Colusa County
	City of Colusa Drainage Master Plan	other	City of Colusa	2009	as required (part of GP)	City of Colusa
	City of Colusa GP	GP	City of Colusa	2007	as required	City of Colusa
Glenn	Glenn County GWMP	GWMP	Glenn County	2000	as funding is available	Glenn County
	AB3030 Orland Artois	GWMP		2001	as funding is available	
	Glenn-Colusa Irrigation District GWMP (AB3030)	GWMP	Glenn-Colusa Irrigation District (GCID)	1993	as funding is available	Glenn-Colusa Irrigation District
	AB3030 Princeton-Codora-Glenn Irrigation	GWMP	P-C-G Irrigation District		as funding is available	
	Western Canal AB3030	GWMP			as funding is available	
	Water Supply Assessment for TCCA	WSA			as funding is available	
	Willows GP	GP			as funding is available	
	CalWater Willows UWMP	UWMP	California Water Service Company	2011	every 5 years	City of Willows
	Orland GP	GP	City of Orland	2012	as funding is available	City of Orland
	Glenn County GP	GP	Glenn County	1993	as funding is available	Glenn County
	AB3030 Provident ID	GWMP	Provident Irrigation District		as funding is available	Provident Irrigation District
Shasta	Coordinated GWMP for the Redding Groundwater Basin	GWMP	Shasta County Water Agency	2006	as funding is available	Redding Groundwater Basin
	ACID GWMP	GWMP	Anderson-Cottonwood Irrigation District (ACID)	2006	as funding is available	
	City of Redding UWMP	UWMP	Redding	2012	every 5 years	City of Redding
	Shasta County GP	GP	Shasta County	2004	Annual Status Report	Shasta County
	Redding GP	GP	City of Redding	2000	Annual minor technical updates	City of Redding
	Redding Areas Basin Water Supply Assessments	WSA	Shasta County Water Agency	2003		
	Redding Area Watershed Sanitary Survey	other	Shasta County Water Agency	2011	every 5 years	Redding Basin; Clear Creek Watershed
	City of Shasta Lake UWMP	UWMP		2012	every 5 years	City of Shasta Lake
	Joint Hazard Mitigation Plan	other	City of Anderson and County of Shasta	2011		Shasta County; and, City of Anderson
Sutter	County GWMP	GWMP	Sutter County	2012	as needed	Sutter County
	Sutter Extension Water District GWMP	GWMP	Sutter Extension WD	1995	as needed	Sutter Extension WD
	Feather Water District GWMP	GWMP	Feather Water District	2005	as needed	Feather Water District
	RD 1500 GWMP	GWMP	RD 1500	1997	as needed	RD 1500
	RD 787 GWMP	GWMP	RD 787	2005	as needed	RD 787
	Yuba City UWMP	UWMP	Yuba City	2011	every 5 years	Yuba City
	Sutter County GP	GP	Sutter County	2011	every 5 years	Sutter County
	Yuba City GP	GP	Yuba City	2004	every 5 years	Yuba City
	City of Live Oak	GP	Live Oak	2011	as needed	City of Live Oak
	County Master Drainage Plan	other	Sutter County	TBA Jan. 2013	as needed	Sutter County
	Multi-Hazard Mitigation Plan	other	Sutter County	2007	every 5 years	Sutter County
Tehama	Tehama County GWMP	GWMP	Tehama County Flood Control and Water Conservation District	2013	every 5 years	Tehama County
	El Camino Irrigation District GWMP	GWMP	El Camino Irrigation District	1995		El Camino Irrigation District
	Red Bluff UWMP	UWMP	City of Red Bluff, Dept of Public Works	2005		City of Red Bluff
	Corning UWMP	UWMP				City of Corning
	County Water Supply Inventory	WSA		2003	no	Tehama County
	Tehama County GP	GP	Tehama County	2009	Annual Status Report	Tehama County
	Red Bluff GP	GP		Housing Updated 2008		City of Red Bluff
	Corning GP	GP				City of Corning
	Tehama GP	GP				City of Tehama
	County flood mitigation plan	other		2006		Tehama County
	County local hazard mitigation plan	other		June 1997		Tehama County
	County Emergency Response Plan	other		2001		Tehama County
	Tehama County Hazard Mitigation Plan Vol2: Planning Partner Annexes	other	Tehama County	2012	every 5 years	Tehama County
	Tehama County Hazard Mitigation Plan Vol1: Planning Area-Wide Elements	other	Tehama County	2012	every 5 years	Tehama County

GWMPs are voluntary and are not on a routine update schedule throughout the region. Typically, GWMPs are produced or updated only as funding is available – which can be sporadic. Therefore, even if the IRWMP could be updated every time a local water plan was updated, a regular schedule is not possible for updating the IRWMP in order to maintain consistency with local GWMPs as they are updated and created within the region. The existing county GWMPs vary widely in adoption dates. The Tehama County GWMP was just adopted in 2013 and Sutter County's GWMP in 2012, and Shasta County's was updated in 2006.

The County staff from the TAC is aware of the various groundwater management activities in their region and has communicated with the other local groundwater management entities, as applicable, and has reviewed the IRWMP to ensure that the regional plan is aligned with local plans. Furthermore, representatives from several groundwater management plan lead agencies have also been actively engaged in the NSV IRWMP process. For example, Lewis Bair of Reclamation District 108 (RD 108) (Colusa County), Stan Wangberg of Anderson Cottonwood Irrigation District (ACID) (Shasta County), and Greg Johnson of Western Canal Water District (WCWD) (Butte County) are NSV Board members. Therefore, if regional planning efforts dictate that changes are necessary to future GWMPs, these representatives from lead GWMP agencies that participate in the NSV process can carry that message to their local agencies. For lead agencies of GWMPs that don't actively participate in the regional efforts, the County staff from the TAC will relay this information back to the GWMP lead agencies in their counties. As a second level of assurance, most local agencies in the region receive regular IRWMP updates through the NSV IRWM website and email listserv, and have been encouraged to review the IRWMP for consistency with their local plans.

A foundational objective, Objective 5-1 of the IRWMP is to "preserve the autonomy of local governments, special districts, and Tribes." If inconsistencies between the local GWMPs and the IRWMP emerge, the IRWMP will need to be revised to reflect the local GWMP – unless the GWMP is out-of-date and the next GWMP update will include the same information contained in the IRWMP. Unfortunately, the IRWMP effort doesn't have the budget or time to update outdated local plans, so the regional planning effort relies upon coordination with representatives of local GWMPs to be both consistent with local plans and include up-to-date information.

As an example of some known specifications for groundwater management in the region, Butte County has an ordinance that wells must be a specific distance from each other based on their diameter (Ch. 23B of the Butte County Code) and if a water transfer contains a groundwater component, then a permit and EIR are required (Ch. 33 of the Butte County Code). The IRWMP is consistent with these local restrictions as the IRWMP does not go to the level of detail of specifying well distances or authorizing water transfers, but also does not contain any projects that violate either of these specifications. In general, a project will not be accepted into the IRWMP if it violates any local ordinance or other local agency restriction. To the TAC and NSV Board's knowledge, all of the projects contained in this IRWMP are consistent with local groundwater management planning efforts.

5.4.2 Urban Water Management

State law requires water utilities serving 3,000 or more water connections, or distributing at least 3,000 acre-feet of water per year, to prepare an urban water management plan (UWMP) every five years. According to the IRWM Guidelines: Water suppliers who were required by the Urban Water Management Planning Act (CWC §10610 *et seq*.) to submit an Urban Water Management Plan (UWMP) to DWR must have submitted a complete UWMP to be eligible for IRWM Grant Program funding. Applicants and project proponents that are urban water suppliers and have projects that would receive funding through the IRWM Grant program must have a 2010 UWMP that has been verified as complete by DWR before a grant agreement will be executed. The NSV Board encourages all water utilities in the region that are required to prepare UWMPs to be in compliance with this requirement. The latest round of UWMPs was due to the state in June 2011. The next set of UWMPs will be due in December 2015.

As appropriate, information from the region's various UWMPs has been incorporated into the IRWMP. However, the IRWMP generally does not contain the same level of detail on urban water supply issues that UWMPs do. The regional plan largely leaves detailed urban water management activities to local jurisdictions. However, basics of UWMPs such as providing long-term resource planning and ensuring adequate water supplies are available to meet existing and future water demands, are incorporated into the IRWMP. The IRWMP and UWMPs have similar goals which are to provide long-term resource planning and ensure adequate water supplies are available to meet existing and future water demands. Both plans also have a 20-year planning horizon.

UWMPs provide essential foundational information to help meet the water supply reliability goal of the IRWMP. For example, UWMPs provide information to help achieve Objective 1-1, which documents baseline conditions and trends for surface water and groundwater resources, and Objective 1-2, which quantifies current and future water demands for the specific service areas being addressed.

To ensure that all communities in the region are covered, the IRWMP focuses attention on DACs, Tribes, and other small communities that typically are not covered by an UWMP. Throughout the region, many rural homes and some developments are outside the boundaries of water districts. This developed land not covered by water utilities does not have readily available estimates of water use. The IRWMP may include an initial, preliminary water balance of existing conditions for the region which could help fill-in the knowledge gap for these rural development areas.

Since the next set of UWMPs will not be completed until late 2015, the IRWMP may contain more up-to-date information than what is in the 2011 UWMPs. The region's water supply portfolio and water demand information contained in the IRWMP may be informative to water utilities in the region as they prepare their next UWMPs. More broadly, the IRWMP advocates for preserving existing water rights, area-of-origin statutory protections, and CVP and SWP contract supplies (per Objectives 1-6, 1-7, and 1-8). The IRWMP will advocate for continued water supply reliability and water rights protections throughout the region which will help support the effort of local water utilities in the region as they plan for their water supply future.

To the extent that these plans overlap, the County staff from the TAC will coordinate with the water utilities in their counties on urban water management activities. Staff has also reviewed the IRWMP to ensure that the IRWMP aligns with, and is not in conflict with, local UWMPs. In keeping with foundational Objective 5-1, preserving the autonomy of local governments, special districts, and Tribes, if inconsistencies between the local UWMPs and the IRWMP emerge, the IRWMP will need to be revised to reflect the local UWMP – unless the UWMP is out-of-date and the next UWMP update will include the same information contained in the IRWMP.

5.4.3 Water Supply Assessments

Since 2007, as part of the California Environmental Quality Act (CEQA), a water supply assessment (WSA) has been required when a residential development with greater than 500 dwelling units is proposed or if proposed development represents more than 10 percent of a public water system's service connections for existing public water systems with less than 5,000 service connections. In the NSV region, WSAs are typically prompted by the 10 percent exceedance of existing service connections since many communities in the region are small enough to where it does not take a very large development to exceed 10 percent of the existing connections. WSAs are associated with proposed developments and therefore are only completed once and never updated except in the rare case that the same development is rejected and later re-proposed. The one-time nature of the WSAs means that the IRWMP will provide little feedback to existing WSAs. However, information provided in the IRWMP may be useful for those preparing new WSAs in the region since the IRWMP outlines the water resources generally available and used in various areas of the region. Likewise, information provided in existing WSAs will be useful as the region description of the IRWMP is developed because WSAs indicate where urban growth is likely to occur in the region.

Because they are associated with developments, WSAs are typically very focused on just the particular area in question and do not provide information for the greater urban area or region. WSAs, however, can be useful in filling-in information gaps for areas not covered by an UWMP.

County staff from the TAC has reviewed the most recent WSAs, such as the Adams Tentative Subdivision and Reddington Ranch Subdivision in Colusa County and Sutter Pointe in Sutter County, and confirm that this IRWMP is consistent with them. It will be the responsibility of those that prepare future WSAs to review and incorporate appropriate aspects of the IRWMP into the new WSAs – similar to the way WSAs already incorporate information provided in UWMPs.

5.4.4 Agricultural Water Management

Senate Bill X7-7, passed in November 2009, mandates agricultural water suppliers, serving more than 25,000 irrigated acres, to develop Agricultural Water Management Plans (AWMPs) by the end of 2012 that outline the water supplies and use within the supplier's jurisdiction. Water suppliers serving between 10,000 and 25,000 irrigated acres are required to develop an AWMP only if funding is provided. AWMPs must include information relating to the water efficiency measures the supplier has undertaken, and is planning to implement, as well as information about water measurement. In addition, AWMPs must include an evaluation of the effect of climate change on future water supply reliability.

According to the IRWM Guidelines: Beginning July 1, 2013, an agricultural water supplier is not eligible for a water grant or loan awarded or administered by the State unless the supplier complies with SBx7-7 water conservation requirements outlined in Part 2.55 (commencing with §10608) of Division 6 of the CWC.

The NSV Board encourages all agricultural water suppliers in the region that are required to prepare AWMPs to be in compliance with this requirement. AWMPs are not on a regular schedule for required updates although the next set of AWMPs will be due in 2015 and the following set in 2020 – which will perhaps set the pattern for a future 5-year interval cycle. Although specific AWMPs have not been developed yet, many of the large irrigation districts in the region, such as ACID, GCID, TCCA, and RD 108 are part of a Sacramento Valley Basinwide Water Management Plan which was prepared in 2004 for Sacramento River Settlement Contractors as a requirement by the Bureau of Reclamation. This regional water management plan was updated in 2007 and 2010. This regional plan is expected to meet the requirements of the state's newly required AWMPs so that Sacramento River Settlement Contractors do not have to produce duplicative plans to meet state and federal requirements. This plan will be updated every five years from 2007 to meet both state and federal requirements.

The NSV region is dominated by agriculture. Sutter County, in fact, by acreage is 94% irrigated agriculture. Therefore County staff from the TAC is acutely aware of agricultural water management activities in the region. The County staff's participation in the IRWMP process, coupled with the participation from representatives from several prominent irrigation districts in the region, such as NSV Board members Lewis Bair of RD108 (Colusa County), Stan Wangberg of ACID (Shasta County), and Greg Johnson of WCWD (Butte County), and TAC member Jeff Sutton of the TCCA (Colusa County) have ensured that the IRWMP is consistent with local agricultural water management activities.

As the AWMP is a new statewide requirement, the IRWMP process has helped local agricultural water suppliers through offering a forum for communication and coordination on how to comply with the new regulation. The IRWMP itself may also serve as a source of information for agricultural water suppliers as they update their AWMPs.

Similar to the planning efforts discussed above, if inconsistencies between the local AWMPs and the IRWMP emerge, the IRWMP will need to be revised to reflect the local AWMP unless the IRWMP is more up-to-date than the AWMP.

5.4.5 City and County General Planning

According to California Government Code Section 65300, every city and county in California must adopt a comprehensive long-term General Plan. General Plans are prepared by local city and county governments in the region to layout long-term plans for development. The housing element of each jurisdiction's General Plan must be updated at least every five years, but otherwise the state does not have a requirement for local governments to update their General Plans at certain frequencies. It is up to local governments to determine when to update the General Plan.

City and County General Plans are typically led by city or county land use planners and include a discussion about existing and future water demands and supplies under the conservation element. Potable demands for urban and commercial uses in developed (and proposed developed) areas, as discussed, in addition to the need for non-potable water to meet landscaping, parks, sports fields, and other non-potable demands. However, in most of the NSV counties, water managers at the city and county levels have been involved in General Plans to, at least, a limited extent. For example, through successful coordination between water managers and land use planners in Shasta County, Shasta County's general plan considers the amount of water available for additional development by water purveyor.

Through the review by County staff appointed to the TAC and their colleagues at the county and city levels, this IRWMP is consistent with the city and county General Plans in the region.

5.4.6 Other Resource Management Planning (flood protection, watershed management, multipurpose planning, stormwater management, *etc.*)

In addition to the standard planning activities listed above, Butte, Colusa, Glenn, and Shasta Counties each have one or more watershed management plans. For example, NSV members Colusa County and Glenn County, along with non-NSV member Yolo County, are part of the Colusa Basin Watershed Management Plan. Butte, Shasta, and Tehama Counties each have flood mitigation plans while Sutter County has floodplain management rules laid out in its ordinance code. Butte, Shasta, Sutter, and Tehama Counties also have disaster/hazard mitigation plans. Through participation of the County staff appointed to the TAC, recommendations on the plan made to the NSV Board regarding the IRWMP have been reviewed and checked for consistency with these other local planning documents.

Resource management planning documents and regulations are required at the local level to protect local community interests. However, the local planning documents and regulations noted in the paragraph above are not in conflict with, and often further the emphasis of, the goals and objectives of the NSV IRWM region. For example, several specific flood control management regulations are described in the Sutter County Ordinance Code in Chapter 1780 with the purpose of protecting human health, minimizing the expenditure of public money for costly flood control projects. These regulations clearly outline procedures minimizing the need for rescue and relief efforts associated with flooding and other disasters which might be undertaken at the expense of the general public, minimizing prolonged business interruptions, damage to public facilities such as water, sewer, and gas mains, and many other local purposes. Local planning documents and regulations are typically needed to provide specific guidance in areas such as construction standards and insurance requirements. The NSV IRWMP is consistent with these local restrictions, but is also broader in scope and does not include these specific details that are provided by local entities. At the same time, the IRWMP also does not contain any projects that violate these local plans and specifications. As stated previously, a project will not be accepted into the IRWMP if it violates any local ordinance or other local agency restriction. To the TAC and NSV Board's knowledge, all of the projects contained in this IRWMP are consistent with local planning efforts and if inconsistencies between the local planning efforts and the IRWMP emerge, the IRWMP will need to be revised to reflect the local plans unless the IRWMP is more up-to-date than the local plans.

5.5 RELATION TO LOCAL LAND USE PLANNING

As described in the IRWM Guidelines, the intent of the Relation to Land Use Planning Standard is to require an exchange of knowledge and expertise between land use and water resource managers; examine how RWMGs and land use planning agencies currently communicate; and identify how to improve planning efforts between the RWMGs and land use planning agencies.

One of the goals of the California Water Plan Update 2009 is to ensure water managers and land use planners make informed, collaborative water management decisions using effective coordination among all parties at the federal, State, and local levels, particularly with respect to the Resource Management Strategies described in Chapter 4 Resource Management Strategies.

Coordination between land use planners and water resource managers is required by State law for larger developments, as codified in SB 610 (requires Water Supply Assessment), SB 221 (requires certification of water supply), and SB 910 (added requirement to describe groundwater resources in UWMPs). For smaller developments, coordination is encouraged, but not codified. The purpose of this section is to describe the existing coordination between local land use planners and water resource managers and to describe future efforts to improve coordination and communications.

To determine the current relationship between local land use planners and water resource managers and future efforts to establish a proactive relationship between local land use planners and water resource managers, the local land use planners and water resource managers were interviewed. Top staff from the six counties and the four largest water suppliers (ACID, GCID, RD108, and TCCA) were interviewed. The results of the interviews are summarized below.

5.5.1 Current Relationship between Local Land Use Planners and Water Resource Managers

The current relationships between land use planners and water resource managers in general vary significantly depending on location and need. The general opinion seemed to be that relationships are strong, but coordination and communication could be improved.

The overall level of communication and interaction between local land use planners and water resource managers varies greatly from excellent to needing improvement. The land use planners and water resource managers in Sutter County work in the same building and reported strong working relationships. ACID, which spans areas in Shasta and Tehama Counties, and RD 108 in Colusa County both reported proactive communications with county staff. Other water suppliers indicated better coordination is needed.

As with the coordination among the counties, the current status of the coordination between the cities and the counties also ranges from excellent to needing improvement. Some cities do not have land use planners.

Regular forums where land use planners and water managers can meet and converse are also rare in the IRWM region. Some counties have regular Water Commission meetings and coordinating meetings regarding water conservation measures. In other areas, there are no regular forums between land use planners and water managers.

In general within in the IRWM region, land use decisions include consideration of water resources, especially for developments that require a water supply assessment. In some areas, non-agricultural development does not happen, and therefore there are no land use decisions to be made. GCID reported that an evaluation of available resources must be completed prior to authorizing any annexations into the GCID service area.

Although water resources decisions take land use planning into consideration more than land use planning takes water resources into consideration, the level of consideration varies according to location and need.

5.5.2 Future Efforts to Establish a Proactive Relationship between Local Land Use Planners and Water Resource Managers

In general, the interviewees indicated that better communications could be achieved and existing communication and coordination protocols could be improved. Budget constraints all across the IRWM region have severely cut into the amount of staffing and staff availability to attend forums. Any future effort to improve communication and coordination must keep these limitations in mind. The most effective effort is the increased awareness of the need to coordinate land use decisions and water resources management decisions between the various land use planners and water resource managers throughout the IRWM region. This increased awareness results from participation in this IRWMP.

The IRWMP process has been identified by one interviewee as a way to smooth the boundary issues and open communications throughout the IRWM region. Continued participation in the IRWM through implementation of the projects will foster this openness and lead to more proactive planning.

Figure 5-1
Process for Project Review and Prioritization

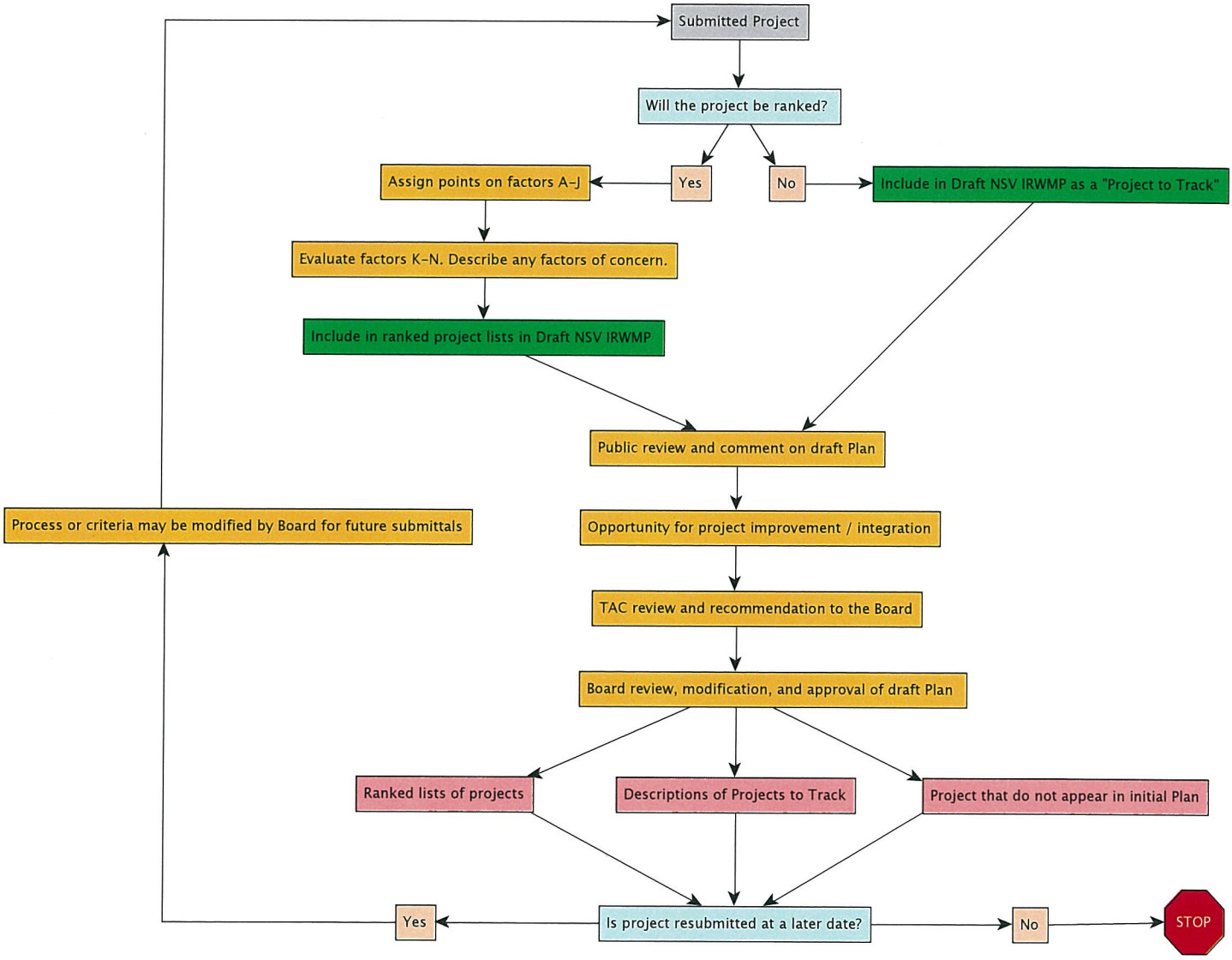

Figure 5-2. Scorecard

Northern Sacramento Valley Integrated Regional Water Management Plan Projects/Programs Scorecard

Factor	Criterion	Point value	Max points	Overall Weight of Factor	Point Assignment to Projects or Programs	Notes
A.i.	Number of NSV IRWMP objectives addressed	5 each per objective	30	24%		
A.ii.	Type of need addressed (highest scoring of primary or secondary objective)	Critical = 10 Foundational = 5 High = 3 Medium = 1	10	8%		A score is only given for one objective: the highest of the primary and secondary objectives.
B.i.	Addresses objectives under more than one goal	2 per additional goal area	8	6%		
B.ii.	Number of committed collaborative partners	Financial contributer = 3 each MOU/JPA = 2 each Letter of Support = 1 ea In-kind support = 2 ea	10	8%		A score is given in only one category for each partner. If a partner meets multiple categories, then the category with the highest point value is used for scoring. More than one partner can contribute points in each sub-category. "Partner" is defined as an Agency or organization (i.e. individuals do not count).
B.iii.	Benefits more than one NSV county	1 for each additional county above 1	5	4%		
C	Program phase	Concept =1 Feasibility =2 Planning =3 Env Doc =4 Permitting =5 Implementation =6 Maintenance =3 Monitoring =3	6	5%		Points are only be awarded for one project phase. If multiple phases are provided in a submittal, points will be based on the highest scoring phase.
D	Local matching funds	1-9% = 2 10-19% =4 20 - 29% =6 30 - 39% = 8 40 - 49% =10 50 - 59% =12 60 - 69% = 14 70 - 79% = 16 80% or more = 18	18	14%		The % of the the total project cost that comprises total local matching funds (in dollars). Local matching funds includes monetary cost-share contributions as well as in-kind/labor/other non-monetary contributions. Projects with 0% local matching funds will not receive points in this category.
E	Benefits a DAC	yes = 10	10	8%		
F	Benefits a Tribe	yes = 10	10	8%		
G	Economic feasibility analysis	Exists = 1 Satisfactory Project Benefit (B) to Project Cost (C) Ratio (if B:C is greater than 1) = 2	3	2%		
H	Number of statewide priorities addressed	1 each	7	6%		
I	Number of resource management strategies	1 each	7	6%		
J	Vulnerability, adaptation, mitigation of project to climate change	Project assesses vulnerability to CC = 1 Project adapts to CC = 1 Project mitigates against CC = 1	3	2%		
Total Points			**127**			

Tier List	Tier 1 (100-127 points)		
	Tier 2 (60-99 points)		
	Tier 3 (5-59 points)		If projects do not meet any of the NSV IRWMP objectives, then they will not be included in the Plan. Therefore, projects with 0-4 points will not be included in Tier 3).
Other Lists to Include in Plan:	Top projects by county Top projects by goal Top shovel-ready projects Top DAC projects Top Tribal projects		

CHAPTER 6
Implementation Strategy

The purpose of this chapter is to discuss the implementation strategy for the IRWMP. Specific topics include data management, plan performance and monitoring, and future governance and finance.

6.1 DATA MANAGEMENT

As indicated in the IRWM Guidelines, the intent of the Data Management Standard is to ensure efficient use of available data and stakeholder access to data, and to ensure the data generated by IRWM implementation activities can be integrated into existing State databases. Throughout this document, the term "data" is assumed to mean "non-security sensitive data". It is not the intent of this NSV Board to require project proponents to submit data that may be in violation of applicable laws, or that, in the project proponent's or lead agency's opinion, creates a security risk.

Data management will be used to track data generated by the various projects as they are completed and operated. The types of data to be managed will vary considerably from project to project. Some projects, such as the TCCA Canals Automation Project (Project ID 79), will have very little data of interest to other stakeholders and the State Board. Other projects, such as Glenn County's proposed Program of Modeling and Monitoring in Support of Groundwater Management (Project ID 9), will generate a substantial amount of data as it seeks to fill gaps that have been identified in the State's CASGEM database.

Due to budget constraints and limited staff availability, the NSV Board intends to require the project proponents to collect and collate the data generated by the projects. One example of an effective way to do this would be for each project proponent or lead agency to create a webpage specifically for the project. The webpage would include non-security sensitive project data, including electronic (usually PDF) copies of all project data and completed work products such as reports, feasibility studies, design documents, and supporting documentation (well boring logs, geotechnical reports, surveys, *etc*.). In some cases, draft documents would also be posted on the project webpage. A link to the project webpage would be provided on the NSV IRWMP website and data management system. Some ranked projects have project proponents that may have very limited resources available to create a webpage. In these cases, the project proponent can contact their County representatives for more information about how they can comply with the data management requirements of the funding program. At a minimum, the project proponent or lead agency will provide data in the proper format to the NSV Board for coordination with the State databases.

The primary way that stakeholders can contribute data to the NSV region is through data contributions from a specific IRWM project. The quality assurance and quality control (QA/QC) of data is primarily the responsibility of the project proponents. However, the NSV Board appointed County representative from the TAC will review the data and the formatting of the data transferred to State databases.

6.1.1 Data Needs and Typical Data Collection Techniques

The adopted projects range from school programs to groundwater monitoring programs, to construction projects. The data developed for each project and produced during the operations phase of each project will be very different. For construction projects, typical data required include geotechnical studies and topographic surveys. Groundwater monitoring programs usually generate well boring logs during construction and generate groundwater level and water quality data during the monitoring or operations phase. Each project will be required, as part of its Project-Specific Management Program, discussed below, to identify the data that will be required and generated by the project, as appropriate, and provided to the NSV Board for uploading to State databases.

6.1.2 Stakeholder Access to Data

It is the intent of the NSV Board to ensure that all non-security sensitive data generated by the projects are available to the other stakeholders and project proponents. However, it is not the intent of the NSV Board to duplicate efforts and repeat data that are available elsewhere. To accomplish these two goals, the NSV Board will ensure that all stakeholders will have access to the data generated by the other projects through the links page on the IRWM website. The links page will contain links to the project-specific webpages, if applicable, and to the State database webpages.

6.1.3 Integrating Data into State Databases

The NSV Board, or its representative, will coordinate the data received from the project proponents with the following State databases, as appropriate to the type of data collected. The State databases include, but are not limited to:

- California Environmental Data Exchange Network (CEDEN)
- Water Data Library (WDL)
- California Statewide Groundwater Elevation Monitoring Program (CASGEM)
- Surface Water Ambient Monitoring Program (SWAMP)
- Groundwater Ambient Monitoring and Assessment program (GAMA)
- Integrated Water Resources Information System (IWRIS)
- California Environmental Resources Evaluation System (CERES)

As described in the IRWM Guidelines, for geospatial data collected by project proponents with projects within the NSV Region, data maintained by the region will be accompanied by applicable metadata that describes each data set (including projection and datum information, dataset description, data lineage, *etc*.). The State databases are described below. Information about each website is included in Appendix M.

California Environmental Data Exchange Network – CEDEN is a system designed to facilitate integration and sharing of data collected by many different participants. The CEDEN data templates are available on the CEDEN website: http://www.ceden.org. The CEDEN Fact Sheet and Introduction, which includes instructions on required format of submitted data, are included as Appendix M.

Water Data Library – DWR maintains the State's WDL which stores data from various monitoring stations, including groundwater level wells, water quality stations, surface water stage and flow sites, rainfall/climate observers, and well logs. Information regarding the WDL can be found at: http://wdl.water.ca.gov/. A screen shot of the WDL homepage is included in Appendix M.

California Statewide Groundwater Elevation Monitoring Program – CWC §10920 et seq. establishes a groundwater monitoring program designed to monitor and report groundwater elevations in all or part of a basin or subbasin. These requirements also limit counties and various entities (CWC §10927.(a)-(d), inclusive) ability to receive State grants or loans in the event that DWR is required to perform ground monitoring functions pursuant to CWC §10933.5. Requirements of the CASGEM Program can be found here: http://www.water.ca.gov/groundwater/casgem/. CASGEM has generated a 104 page Online System Users Guide that details how to upload and download data. A copy of the introductory webpage is included in Appendix M.

Surface Water Ambient Monitoring Program – The SWRCB has developed required standards for SWAMP. Any group collecting or monitoring surface water quality data, using funds from Propositions 13, 40, 50, and 84 must provide such data to SWAMP. More information on SWAMP is available at: http://www.swrcb.ca.gov/water_issues/programs/swamp. A copy of the introductory page and brochure is included as Appendix M. SWAMP is currently in the process of developing a Data Management Plan to describe business rules as well as field sampling guides, data formats, and data management processes that are helpful in collecting and sharing SWAMP-comparable data. The Data Management Plan will be posted to this webpage once completed: http://swamp.mpsl.mlml.calstate.edu/resources-and-downloads/database-management-systems/swamp-25-database/documentation-25/swamp-data-management-plan

Groundwater Ambient Monitoring and Assessment program – GAMA provides a comprehensive assessment of water quality in water wells throughout the State. GAMA has two main components, the California Aquifer Susceptibility (CAS) assessment and the Voluntary Domestic Well Assessment Project. The CAS assesses the relative susceptibility of public supply wells throughout the State by combining age dating of water and sampling for low-level volatile organic compounds. The Voluntary Domestic Well Assessment Project provides sampling of water quality in domestic wells, which will assist in assessing the relative susceptibility of California's groundwater to contaminants. Because water quality in individual domestic wells is unregulated, the program is voluntary and will focus, as resources permit, on specific areas of the State. Constituents to be analyzed include nitrate, total and fecal coliform bacteria, methyl tert-butyl ether, and minerals. Additional information on the GAMA program is available at: http://www.swrcb.ca.gov/gama. A copy of the GAMA website and fact sheet is included as Appendix M.

California Environmental Information Clearinghouse (CEIC) – The California Natural Resources Agency (CNRA) maintains the CEIC, which is a statewide metadata clearinghouse for geospatial data. The CEIC is accessible at: http://ceic.resources.ca.gov/. The online directory is used for reporting and discovery of information resources for California. Participants include cities, counties, utilities, State and federal agencies, private businesses, and academic institutions that have spatial and other types of data resources. The introductory webpage and a slideshow explaining CEIC is provided in Appendix M.

Integrated Water Resources Information System – DWR maintains IWRIS, which is a data management tool for water resources data, but not a database. IWRIS is a web based GIS application that allows entities to access, integrate, query, and visualize multiple sets of data simultaneously. Information on IWRIS is available at: http://www.water.ca.gov/iwris/. A copy of the introductory webpage is provided as Appendix M.

California Environmental Resources Evaluation System – CERES is an information system developed by CNRA to facilitate access to a variety of electronic data describing California's rich and diverse environments. The goal of CERES is to improve environmental analysis and planning by integrating natural and cultural resource information from multiple contributors and by making it available and useful to a wide variety of users. The CERES is available at: http://ceres.ca.gov/. A copy of the CERES introductory webpage is provided as Appendix M.

6.1.4 QA/QC of Projects

The IRWM Board expects project proponents to provide QA/QC for projects, since the project proponents should have full control over their projects, and hold their scientific, engineering and other consultants fully responsible for competent project design and reporting.

6.2 PLAN PERFORMANCE AND MONITORING

As indicated in the IRWM Guidelines, the intent of the Plan Performance and Monitoring Standard is to ensure:

- The NSV Board is efficiently making progress towards meeting the goals and objectives in the IRWMP.
- The NSV Board is implementing projects listed in the IRWMP.
- Each project in the IRWMP is monitored to comply with all applicable rules, laws, and permit requirements.

This standard is consistent with PRC §75026.(a), which states that an IRWMP "shall include performance measures and monitoring to document progress toward meeting plan objectives."

For the NSV Board, monitoring performance will be closely related to the implementation of projects. As indicated below, the NSV Board or its appointee will be the primary contact for project proponents. Project proponents will take primary responsibility for tracking project progress and coordinating with the NSV Board. Project-Specific Monitoring Plans (PSMP) will be prepared and carried out. At this point, most of the adopted projects are in the concept stage

and therefore would not necessarily trigger a PSMP. The proposed Plan Performance and Monitoring is discussed below.

6.2.1 Responsibility for IRWM Implementation Evaluation

The NSV Board will appoint a NSV TAC representative from County staff to track the project progress for the NSV Board. The activities of this representative will likely be limited to summarizing project progress information provided by the project proponents as reported to DWR, as part of the overall RWMG responsibilities described under the Data Management System section, above. Other responsibilities may be added to the NSV Board's representative as budget and staff time is available.

6.2.2 Evaluation Frequency

The NSV Board representative will poll the project proponents on a minimum annual basis and update the IRWM website, add any new data to the Data Management System (DMS), and notify the DWR, as appropriate. The project proponents will provide the data and updates to the NSV Board representative.

6.2.3 Relationship to DMS

The NSV Board representative will update the DMS with any new data and project progress information provided by the project proponents.

6.2.4 Feedback Protocol

As the projects move through planning, design, and plans and specifications stages of development, any changes to the projects that may affect the validity of the project under the IRWMP (for example, if RMSs or Statewide Priorities for the project change), the project proponents will notify the NSV Board representative who will direct the NSV Board's attention to the changed project. If the NSV Board feels further review is required, it will put the matter on the next NSV Board agenda for discussion and potential action.

In addition, the NSV Board may choose to amend the project RMSs or IRWM goals and objectives if data or changed conditions during project development warrant. As indicated in the IRWM Guidelines, any amendments to the RMS or objectives will need to adequately identify water demand, water supply, water quality protections, and environmental stewardship actions that provide long-term, reliable, and high-quality water supply; including water supply to DACs.

6.2.5 Project-Specific Monitoring Plans

All projects that enter the development phase and are receiving funding under the IRWM grant program must submit a PSMP. The party with primary responsibility for developing the PSMP, actions that would trigger a PSMP, and typically required PSMP contents are described below.

6.2.5.1 Party with Primary Responsibility for PSMP

The project proponent will have primary responsibility for developing and submitting the PSMP to the NSV Board for review. The NSV Board will review the draft of the PSMP and provide comments to the project proponent.

6.2.5.2 Actions that Trigger PSMP

As of June 2013, the IRWMP discusses 124 projects, 113 ranked projects and 11 Projects to Track. PSMPs have not been developed for any of the 113 ranked projects. Concept-level, draft and final, and updated PSMPs will be required at various stages of project development. The general categories are described below:

> **Planning Stage** – Concept-level PSMP will be provided by the project proponent to the NSV Board so the NSV Board can verify conformance with the IRWMP goals and objectives, and RMSs, include in the DMS, and provide to the DWR. If data are to be collected during the planning stage, the data collection program will be provided in greater detail than the data collection program intended for the execution phase of the project. This submittal need not be completed until funding is secured for the project.
>
> **Design Stage** – Draft and final PSMPs will be provided by the project proponent to the NSV Board so the NSV Board can verify conformance with the IRWMP goals and objectives, and RMSs, include in the DMS, and provide to the DWR.
>
> **Execution Stage** – Updates to the PSMP will be provided by the project proponent to the NSV Board during the project execution stage (construction and operation, as appropriate) as information becomes available that would require changes to any of the PSMP components. Draft and Final PSMPs, as described above, will be provided by the project proponents for projects that are in the execution stage at the time the project is listed in the IRWMP.

The concept level PSMP will generally include the same contents as the draft and final PSMPs, described below, but with less detail.

6.2.5.3 Typically Required Contents of PSMP

The PSMP will be prepared to clearly document the data that will be collected during all stages of the project. Although no specific template has been developed, it is the intent of the PSMP to provide the necessary information in as concise a format as possible, using summary tables and lists to condense the information. The minimum required contents listed below were taken from the IRWM Guidelines.

- Clearly and concisely (in a table format) describe what is being monitored for each project. Examples include monitoring for water quality, water depth, flood frequency, and effects the project may have on habitat or particular species (before and after construction).

- Include measures to remedy or react to problems encountered during monitoring. An example would be to coordinate with the Department of Fish and Wildlife if a species or its habitat is adversely impacted during construction or after implementation of a project.
- Include location of monitoring.
- Provide the intended monitoring frequency.
- Include the monitoring protocols/methodologies that will be used, including who will perform the monitoring.
- Include DMS or procedures to keep track of what is monitored. Each project's monitoring plan will also need to address how the data collected will be or can be incorporated into statewide databases.
- Provide procedures to ensure the monitoring schedule is maintained and that adequate resources (including funding) are available to maintain monitoring of the project throughout the scheduled monitoring timeframe.

6.3 FUTURE REGIONAL WATER MANAGEMENT GROUP GOVERNANCE AND FINANCE

The IRWM Guidelines for Integrated Regional Water Management, prepared by DWR, require inclusion of a chapter on finance in the IRWMP. Here is what the IRWM Guidelines say:

> *The IRWM Plan must include a plan for implementation and financing of identified projects and programs (CWC § 10541.(e)(8)). The IRWM Plan must also identify and explain potential financing for implementation of the IRWM Plan. The financing discussion must, at a minimum, include the following items:*
>
> - *List known as well as possible funding sources, programs, and grant opportunities for the development and ongoing funding of the IRWM Plan.*
> - *List the funding mechanisms, including water enterprise funds, rate structures, and private financing options, for projects that implement the IRWM Plan.*
> - *An explanation of the certainty and longevity of known or potential funding for the IRWM Plan and projects that implement the Plan.*
> - *An explanation of how operation and maintenance (O&M) costs for projects that implement the IRWM Plan would be covered and the certainty of operation and maintenance funding.*

This section is organized into three parts:

1. IRWMP process funding during development of the Plan, October 1, 2011 through anticipated adoption around March 2014.
2. Minimum requirements of the IRWM Guidelines as outlined above, which primarily require a plan for implementation and financing of projects and programs identified in the IRWMP.
3. Anticipated funding to support the NSV Board following adoption of the Plan.

6.3.1 IRWMP Process Funding

This section describes all cost components for development of the IRWMP: USBR grant-funded consultant work, DWR Proposition 84 and Proposition 50 grant-funded consultant work, in-kind local staff contributions, and direct cost shares.

The development of the IRWMP is being substantially completed by the consultant team with support and active participation by County staff, members of the TAC and NSV Board, and extensive input from stakeholders and the public. The consultant team is funded through two key grants: U.S. Bureau of Reclamation (USBR) funded Sacramento Valley IRWMP Revision Grant ($100,000) and the Proposition 84 IRWMP Planning Grant (Proposition 84) ($900,000). $45,000 of the Proposition 84 grant is allocated to Butte County for grant administration since Butte County is the fiscal agent of the grant on behalf of the NSV Board. For both grants, local agencies contribute a local cost-share. Nearly all of the cost-share in the NSV region is coming through in-kind contributions of County staff time, which is a combination of local coordination as well as direct work on specific IRWMP tasks. The USBR grant covered costs related to development of early technical memoranda for both governance and finance, and also supported NSV Board and TAC activities during 2011 prior to availability of Proposition 84 funds. The Proposition 84 grant authorized the consultant to proceed on October 12, 2011, and funds the remaining IRWMP development process. In addition, during the fall of 2012 DWR funded a new program for development of regional flood protection plans, as a follow-up action to the adoption earlier that year of the Central Valley Flood Protection Plan. Since flood management is a resource management strategy of an IRWMP, DWR agreed to extend completion of this NSV IRWMP until April 2014, to allow for the better coordination and integration of information developed from the regional flood protection plan to be integrated into the NSV IRWMP. Additionally, $50,000 of Proposition 50 funds previously-allocated to Butte County will be used to support inclusion of the new regional flood protection plans into the IRWMP.

Table 6-1 shows the total grants awarded and the portions that will be allocated to consultants and the accompanying local-cost share components. The total cost of the IRWMP process is expected to be about $1.4 million in direct consultant and tracked in-kind costs. However, the total local contribution is understated in Table 6-1 because it does not take into consideration the countless hours that NSV Board appointees and other members of the public have contributed toward the development of the IRWMP. Such local in-kind support includes an active and direct role in outreach to disadvantaged communities.

Table 6-1. Summary of Grants Awarded and Local Cost-Share Contributed to Support the Development of the NSV IRWMP

Grant	Total Grant Award	Allocation to Consultant (West Yost)	Local Cost-Share Commitment	Planned Cash Contribution from Local Agencies	Planned In-Kind Contribution from Local Agencies	Project Total
Prop 84	$900,000	$855,000	$299,000	0	$299,000	$1,199,000
USBR	$100,000	$100,000	$100,000	$22,000	$78,000	$200,000
Prop 50	$50,000	$50,000				
					Total Cost of IRWMP Process	**$1,399,000**

6.3.2 Implementation of Projects and Programs

This section addresses potential funding sources for IRWMP implementation by categories of projects and programs.

A review of a number of existing IRWMPs reveals that some provide detailed funding information, while others provide more general information. Recognizing the changing nature of potential funding sources, the IRWMP web site (http://www.nsvwaterplan.org/) will be updated periodically to provide information on potential project funding sources. This section describes potential funding sources in 13 categories, which encompass most or all of the resource management strategies as well as individual proposed projects incorporated into this IRWMP:

1. Municipal water and wastewater, including small systems
2. Local flood management/internal drainage
3. Regional flood management
4. Ecosystem restoration and enhancement / watershed management
5. Groundwater/subsidence monitoring, including water levels and quality
6. Groundwater banking, conjunctive use
7. Agricultural and urban water use efficiency
8. Tribal water-related projects
9. Water management and planning
10. Water quality
11. Surface water supplies and hydro power generation
12. Water supply reliability and drought preparedness
13. Recreation

Each of the 13 categories is addressed below by four potential funding sources: (1) local funding support, (2) general funding opportunities, (3) specific funding sources for each of the 13 categories, and (4) specific funding that may be available for multiple categories.

6.3.3 Local Funding Support

The information for the 13 project categories primarily addresses outside funding sources including certainty and longevity of such sources. These are the first and third of the four required elements in the DWR IRWM Guidelines. The other required elements are addressed in general below:

1. Local Funding Mechanisms. Most projects and programs that will be included in the IRWMP fall into four sub-categories: (a) projects that provide utility functions, either for municipalities, water districts or Tribal governments; (b) surface and groundwater monitoring programs; (c) capital investments in ecosystem restoration or flood control; and (d) projects that may benefit DACs. We expect that local cost shares will

be provided for the first two subcategories by way of a combination of utility rate increases, revenue bond sales and appropriations by the governing bodies. This will be a decision to be made by the sponsors of each project, working with the beneficiaries (in many cases, utility ratepayers). Capital investments for monitoring programs are expected to attract utility funds for any required local cost share. Capital investments in ecosystem restoration will depend on specific projects that may be proposed and identified funding sources. Full funding may be available for some projects, and a local cost match may be required in other cases. It is possible, based on past experience, that non-profit foundations could provide all or a portion of any local cost share that may be required. Local flood control investments are expected to be treated in a similar manner as municipal utility investments, to the extent a local cost share is required. Projects for DACs pose a greater challenge, since "ability to pay" will be a serious issue. Full funding may be available for some projects in DACs, so that a local cost share would not be needed.

2. Funding for Operations and Maintenance (O&M). O&M costs will be straightforward for most utility-related projects, with such costs recovered through the utility rate structure. Monitoring programs are heavily weighted toward O&M, and we would expect that the utility beneficiaries (municipalities, water districts, *etc*.) would develop a mechanism for funding continuing O&M costs. Such costs for ecosystem and local flood control projects will depend on the nature of projects, and whether such projects are one-time investments without an O&M component or projects that require O&M to maintain project benefits. Such projects will need to identify a local or regional sponsor to cover O&M costs before they can proceed. Funding O&M for DAC-related projects, such as improvements to small water and wastewater systems, will pose a serious problem. O&M for DAC projects will require a project-by-project determination, and any grant requirements related to O&M from the funding source. It is clear that many DACs will be challenged in recovering full O&M costs in utility rates.

6.3.4 General Funding Opportunities

Californians are at a time of increased uncertainty regarding funding of water resource projects and programs, just as it is a time of uncertainty for public financing in general. This section describes existing or anticipated future funding sources, recognizing that a statewide water bond is currently anticipated to be on the ballot in late 2014 although there are substantial legislative discussions about changes in both the content, total dollar figure, and timing of that bond measure. There is also continued interest and discussion in the Congress about formation of a federal infrastructure bank. It is important to recognize that implementation of most projects and programs will require multiple funding sources.

Financial support can be provided in two forms. The first is an outright grant, which does not require repayment but often requires a local cost share or match. The second is help in financing all or a portion of capital investments, typically in the form of below-market loans through various state and federal government programs. Many such programs are limited in scope, tailored to specific problems or types of projects.

The State of California (State) administers a number of grant and loan programs for a wide variety of purposes related to water. The key agencies are the State Water Resources Control Board, DWR, and the Department of Public Health/Drinking Water Program. The Department of Fish and Game also administers funds for wildlife habitat conservation programs. Finally, the California Natural Resources Agency has specific authority to administer some funding programs, although details are not readily available. Each has statutory authority to administer specific loan and grant programs. Here are links to descriptions of their respective financial support programs:

- State Water Resources Control Board:
  http://www.swrcb.ca.gov/water_issues/programs/grants_loans/srf/index.shtml
- Department of Water Resources:
  http://www.grantsloans.water.ca.gov/
- Department of Public Health:
  http://www.cdph.ca.gov/certlic/drinkingwater/Pages/DWPfunding.aspx
- Department of Fish and Wildlife:
  http://www.dfg.ca.gov/habcon/
- California Natural Resources Agency:
  http://resources.ca.gov/
- In addition, the California Infrastructure and Economic Development Bank (I-Bank) was established, "…to finance public infrastructure and private development that promote economic development, revitalize communities and enhance quality of life for Californians". While the I-Bank has broad financing authorities, it is not focused primarily on water and there is a great deal of competition for such financing. The I-Bank web site is:
  http://www.ibank.ca.gov/.

The federal government also administers a number of grant programs, particularly through the Federal Emergency Management Agency (FEMA), the Department of Housing and Urban Development (HUD), and the U.S. Fish & Wildlife Service. FEMA's programs provide some form of financial assistance related to disaster preparedness and disaster recovery. FEMA's Hazard Mitigation Grant Program (HMGP) provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce loss of life and property due to natural disasters, and to support implementation of mitigation measures during immediate recovery from a disaster. In addition, FEMA administers the National Flood Insurance Program, which may be of particular importance in our region due to remapping of flood-prone areas.

HUD administers the Community Development Block Grant (CDBG), which provides communities with resources to address a wide range of community development needs. Beginning in 1974, the CDBG program is one of the longest continuously run programs at HUD, and provides annual grants.

The U.S. Fish & Wildlife Service administers funds for wildlife habitat conservation programs.

The U.S. farm bill is the primary agricultural and food policy tool of the federal government, with a new farm bill coming before the Congress every four to five years. The farm bill is administered by the U.S. Department of Agriculture. The current farm bill was passed in 2008, and indications are that the Congress will consider a new farm bill in 2013. The 2013 farm bill is expected to be under pressure to reduce federal funding along with many programs in the federal budget, aimed at reducing the federal deficit.

The 2008 farm bill provided funding for a variety of purposes, described below from the USDA web site (http://www.usda.gov/wps/portal/usda/farmbill2008?navid=FARMBILL2008):

> *The **Food, Conservation, and Energy Act of 2008** <was> enacted into law in June 2008…. Its 15 titles include administrative and funding authorities for programs that cover income and commodity price support, farm credit, and risk management; conservation though land retirement, stewardship of land and water resources, and farmland protection; food assistance and agricultural development efforts abroad and promotion of international access to American farm products; food stamps, domestic food distribution, and nutrition initiatives; rural community and economic development initiatives, including regional development, rural energy efficiency, water and waste facilities, and access to broadband technology; research on critical areas of the agricultural and food sector; accessibility and sustainability of forests; encouraging production and use of agricultural and rural renewable energy sources; and initiatives for attracting and retaining beginning and socially disadvantaged farmers and ranchers.*

The 2008 farm bill addresses a number of problems and issues that are directly related to many of the projects and programs in the IRWMP. It is reasonable to expect that similar problems and issues will be considered as part of the 2013 farm bill.

6.3.4.1 Specific Funding Sources, By Category

All projects contained in the IRWMP are eligible for available IRWMP implementation funding on a competitive basis. Such funding currently exists through Proposition 84, with limited remaining funding from the earlier Proposition 50 and some funding through Proposition 1E. We assume that future State water bonds may also provide some funding for IRWMP implementation, although on a competitive basis within a designated funding region as set forth in the bond language.

Listed below are specific funding opportunities for the 13 general project categories.

1. Municipal Water and Wastewater, including Small Systems. The Federal Water Pollution Control Act (Clean Water Act) established the Clean Water State Revolving Fund (CWSRF) program. The CWSRF program offers low interest financing agreements for water quality projects. This program disburses between $200 and $300 million to eligible projects. Program details are provided and updated on the State web site: http://www.swrcb.ca.gov/water_issues/programs/grants_loans/srf/index.shtml.

   Projects potentially funded under this program include construction of publicly-owned wastewater treatment facilities, sewers and interceptors, water reclamation and storm water facilities. Applicants for this program must fall into one of three

categories as described on the web site: (1) a city, town, district, or other public body created under state law; (2) a Native American tribal government or an authorized Native American tribal organization having jurisdiction over disposal of sewage, industrial wastes or other waste; or (3) any designated and approved management agency under Section 208 of the Clean Water Act. Applications for the CWSRF program are accepted on a continuing basis, with a great deal of competition for available funding.

The SWRCB in partnership with the Rural Community Assistance Corporation (RCAC) provides wastewater-related training to small, disadvantaged communities (SDACs) statewide. The SWRCB's Division of Financial Assistance defines a SDAC as a public body with a population of 20,000 persons or less, and an annual median household income (MHI) of less than 80 percent of the current statewide MHI. The assistance will help improve SDAC compliance and ensure that funds available through the SWRCB are used as effectively as possible in implementing practical, cost-effective wastewater projects that will be adequately maintained over the long-term. The types of training courses to be offered include: Wastewater Board Basics: Board; Sewer System Management Plan; Rate Setting and Proposition 218; and Small Wastewater System Operation and Maintenance.
http://www.waterboards.ca.gov/water_issues/programs/grants_loans/small_community_wastewater_grant/strategy.shtml#wwtraining

The USDA provides loans and grants to develop water and waste disposal systems in rural areas and towns with populations less than 10,000. The funds are available to public bodies, non-profit corporations and Indian tribes. Applications are accepted at any time through the Rural Development State and Area Offices.
http://www.rurdev.usda.gov/UWP-dispdirectloansgrants.htm

USDA Emergency Community Water Assistance Grants provide assistance to rural communities that have experienced a significant decline in quantity or quality of drinking water due to an emergency, or in cases where such decline is considered imminent, to obtain or maintain adequate quantities of water that meets the standards set by the Safe Drinking Water Act. This emergency is considered an occurrence of an incident such as, but not limited to, a drought, earthquake, flood, tornado, hurricane, disease outbreak or chemical spill, leakage or seepage.
http://www.rurdev.usda.gov/UWP-ecwag.htm

USDA offers Section 306E Grants for the Construction, Refurbishment, and Servicing of Low or Moderate Income Individual Household Water Well Systems. The purpose is to provide funds to non-profit organizations to assist them in establishing loan programs from which individuals may borrow money for household water well systems. Applications are accepted at any time through the Rural Development State and Area Offices.
http://www.rurdev.usda.gov/UWP-individualwellsystems.htm

The USDA has made available Technical Assistance and Training Grants for Rural Waste Systems. The purpose is to provide grants to non-profit organizations for technical assistance and/or training to associations on a wide range of issues relating to delivery of water and waste disposal service. These associations are located in rural

areas or cities and towns with a population of 10,000 or less. http://www.rurdev.usda.gov/UWP-wwtat.htm

2. Local Flood Management. As with other potential project categories, there are a number of possible grant and loan sources. Grant programs potentially available for local flood management include elements of the following State bond programs: drainage funding (Proposition 204), flood protection corridor (Proposition 13), FloodSAFE California (Propositions 84 and 1E), and stormwater flood management (Propositions 84 and 1E). Another potential grant funding source is the State's Urban Streams Restoration Program.

   Loan sources are more limited, either through self-funding by public agency owners/sponsors of revenue or general fund bonds, and any funding that might be available through the State I-Bank.

   Regional Flood Management. Funding from various sources has historically been available for elements of the Sacramento River Flood Control Project – a complex program consisting of reservoirs, levees, weirs and bypasses. Key elements of the Project in the Northern Sacramento Valley include Shasta Dam, Oroville Dam, Sacramento River levees and the Sutter Bypass. The Project is operated in an integrated manner. Key facilities outside of the IRWMP boundaries include Bullards Bar Reservoir, Folsom Dam and the Yolo Bypass. Much funding has been available through Congressional appropriations through the U.S. Army Corps of Engineers. Information on weirs and bypasses is summarized in this December 2010 DWR report:
   http://www.water.ca.gov/newsroom/docs/WeirsReliefStructures.pdf.

   Augmenting the Project is the Sacramento River Bank Protection Project (SRBPP) a continuing construction project authorized by the Flood Control Act of 1960, to provide protection for the existing levees and flood control facilities. SRBPP details can be found on the Sacramento Area Flood Control Agency's (SAFCA) web site: (http://www.safca.org/protection/sacriverbank.html).

   Funding for any regional flood management projects associated with the Sacramento River will likely be considered in the context of the entire area of the Sacramento River Flood Control Project. DWR's Flood Control Subventions program along with the Central Valley Flood Protection Board provide financial assistance to local agencies cooperating in the construction of federally authorized flood control projects. The Central Valley Flood Protection Board administers the State financial assistance for major U.S. Army Corps of Engineers' projects in the Central Valley, including the Sacramento River Flood Control Project. Details of this funding program are on DWR's web site:
   http://www.water.ca.gov/floodmgmt/fpo/sgb/fcs/.

   DWR also administers the Flood Protection Corridor Program, funded over the years by Propositions 13, 84 and 1E (see: http://www.water.ca.gov/floodmgmt/fpo/sgb/fpcp/). DWR also administers the Proposition 84 Local Levee Assistance Program (see: http://www.water.ca.gov/floodmgmt/fpo/sgb/llap/).

One unknown area of potential funding is anything new that may arise following the adoption of the Central Valley Flood Protection Plan in June 2012 (http://www.cvfpb.ca.gov/CVFPP/) and the subsequent development of nine regional flood management plans (http://www.water.ca.gov/cvfmp/regionalplan/), of which portions of four regional flood management plans are located in the IRWMP area. Development of the regional flood management plans began in early 2013, and the outcome of the four local plans in the Northern Sacramento Valley (including any new potential funding sources) will be reflected in the adopted final IRWMP.

3. Ecosystem Restoration and Enhancement/Watershed Management. Grants historically have been made available through the Watershed Restoration program (Proposition 50). In addition, a variety of funding sources have been available in the past due to implementation of the CALFED ecosystem restoration program. Such funds have been a combination of annual State and Federal appropriations and various bond funds. In addition, technical and financial support has been available through local resource conservation districts and the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) (it should be noted that NRCS funding and technical support services is specifically for individual landowners, not organizations).

   A subset of this category is improvements in fish passage including modification of flows downstream of major reservoirs. Large multi-purpose reservoirs that have gone through relicensing of their hydropower projects through the Federal Energy Regulatory Commission (FERC) in the past 20 years has often resulted in requiring reservoir operators to modify their downstream fish flow releases and make other investments to improve fish passage. In addition, a great deal of attention in the past 20 years has been brought to salmon migration in the Sacramento River, requiring all major reservoir operators to change their operations. The most significant capital improvement to date has been the installation of a temperature control structure at Shasta Dam. Many other investments have been made to improve fish passage in the NSV area, including a number of projects on Butte Creek and other tributaries to the Sacramento River. Funding sources have been complex, but typically include a variety of State and Federal funds combined with local contributions.

   Sacramento River fish passage has been benefitted from the replacement of a number of major agricultural surface water intakes with state-of-the-art screened intakes. Such projects to date have run into the tens of millions of dollars, and have been funded through a complex series of sources that also included specific Federal appropriations. The single largest such project, the new intake for the Tehama-Colusa Canal, has been completed with a cost in excess of $200 million.

   Separate from usual funding sources is the California Fisheries Fund, which offers three types of loans: fishing association loans, infrastructure loans, and business loans. The Fund's web site is: http://www.californiafisheriesfund.org/loan.html.

4. Groundwater/Subsidence Monitoring, including Water Levels and Quality. DWR's Local Groundwater Assistance Program, funded through Proposition 84, is currently on hold as indicated on the program web site (http://www.water.ca.gov/lgagrant/). The program was established to provide grants for projects such as groundwater data collection, modeling, monitoring and management studies; monitoring programs and installation of equipment; basin management; development of information systems; and other groundwater related work. Technical support related to groundwater monitoring historically has been provided by DWR's regional offices.

5. Groundwater Banking, Conjunctive Use. Funds historically have been available through State bond programs that have/had specific groundwater programs in the bond language. Most or all of such funds have been allocated under Propositions 204, 13, and 50. Additional unallocated funds are available under Proposition 84.

   More specifically, grant funds are available through the Local Groundwater Assistance Program (Proposition 84), Groundwater Storage Program (Proposition 13), and any funding that might be available in annual legislative appropriations through the groundwater assistance program set up through AB 303. Loans historically have been available through the Groundwater Recharge Construction Program (Proposition 13).

   Groundwater banking is still a relatively new water management tool in California, but is expanding in use. "Water banks" that have been set up in the San Joaquin Valley are mostly self-funded through a combination of investments by the owner/operator and any revenues generated through water storage agreements on behalf of participants. One example is the Semitropic Water Storage District Water Bank, a partnership through the sponsoring agricultural water district and a number of urban water utilities located outside that region.

6. Agricultural and Urban Water Use Efficiency. Grants historically have been available through the State's Agricultural and Urban Water Use Efficiency program (Proposition 50). In addition, loans historically were made available under the Agricultural Water Conservation program (Proposition 13).

7. Water Management and Planning. Major funding has been provided through Propositions 204, 13, 50 and 84 for water resources planning and management. As indicated earlier, IRWMP development and implementation support has been provided through funding from Propositions 50, 84 and 1E. Funding has continued to increase in succeeding State bonds for integrated regional water management, and would continue based on language in the proposed water bond that had been scheduled for the November 2012 ballot. The California Legislature is revisiting the bond based on a number of public financing and water resource planning concerns arising since the language of the proposed bond was adopted in late 2009.

8. Water Quality. Grant funds have been made available for investments in Sacramento River water quality (Proposition 84). Loans for agricultural drainage management are still available under Proposition 204, although grants under Proposition 204 have been fully allocated. The SWRCB administers California's Non-Point Source Program, which receives about $4.5 million per year from the U.S. Environmental Protection Agency to support implementation and planning

projects that address water quality problems in surface and ground water resulting from non-point source pollution.

9. Surface Water Supplies and Hydro Power Generation. Funding for surface water facilities is typically from mixed sources, since most surface water facilities are multi-purpose projects. Funding sources historically have included: (1) assessments from water sales, typically through long-term water supply contracts; (2) income from hydropower generation; (3) Federal funding for flood control components; and (4) State and Federal funding for project components associated with fish, wildlife, and recreation. Potential funding sources for new surface water projects will be very specific to the proposed purposes and beneficiaries of the project. Funding and financing of relatively small new reservoirs (50,000 acre-feet storage or less) are far more likely to be funded through programs of the sponsoring operating utility than larger projects. It is difficult to address funding opportunities in the abstract, since they are fairly specific to individual proposed projects.

   There is continuing attention to development of additional surface storage in California, as well as expansion of current storage facilities. For the Northern Sacramento Valley, new surface water facilities have been proposed in the past to provide local and regional flood control, stabilize water supply reliability for the region, provide additional water supplies for users outside the region, and/or augment flows for downstream environmental purposes. The most significant currently proposed new storage facility is the proposed Sites Reservoir, which has been under study for more than a decade. Sites Reservoir is included in the IRWMP as a project to be tracked, since there is currently no specific project proposal. Should this or any proposed project go forward, potential funding sources will depend on the mix of benefits and beneficiaries. This mix is currently not known, but indications are that it could be a mix of downstream environmental and water supply benefits combined with local water supply reliability improvements.

   Hydro power generation is included in this category since it is typically a component of multi-purpose surface water facilities. To that extent, hydro power generation facilities would be funded as a component of a new surface water facility on the basis of the expected beneficiaries of the power to be generated. However, the IRWMP may include other power generation proposals, including but not limited to small hydropower facilities on water canals and pipelines, power generation related to wastewater treatment facilities, solar power facilities ancillary to another IRWMP project, *etc*. Funding for such facilities would need to be considered on a case-by-case basis, mindful of the increasing financial incentives at the federal and state levels for developing sources of renewable electrical energy.

10. Water Supply Reliability and Drought Preparedness. Funding for this general category of projects overlaps with other categories, including groundwater, water management, surface storage and investments in water use efficiency. As greater focus is placed in the next few years on urban and agricultural water use efficiency, it is possible that additional funding sources may be developed (such as may be included in future State water bonds). In addition, past drought conditions in California have brought further legislative and funding attention to water supply reliability.

11. Recreation. Historically, recreation funding at reservoirs in the Sacramento Valley has been provided through funding programs available at the time each reservoir was constructed. This has changed over time for those multi-purpose reservoirs that have gone through relicensing of their hydropower projects through the FERC. Over the past 20 years or more, FERC relicensing has often resulted in requiring reservoir operators to make additional investments at their expense on reservoir recreation.

6.3.5 Funding for Multiple Categories

Other funding sources are available that may help support multiple categories of projects. These are summarized below. Funding programs are typically time-sensitive, with application deadlines and specific application requirements. A web link follows the description of each program.

- The California Energy Commission has announced the availability of funds for low-interest loans for energy efficiency and energy generation projects. Low interest rates of 3 percent can help local jurisdictions invest in energy efficiency, save money, reduce greenhouse gas emissions, and create new jobs and industries. http://www.energy.ca.gov/efficiency/financing/index.html
- CAL FIRE has Urban & Community Forestry Grants to advance the development of sustainable urban and community forests in California, with current funding available from Proposition 84. Here is a link to the program: http://www.fire.ca.gov/resource_mgt/resource_mgt_urbanforestry.php
- The Clean Water State Revolving Fund Financial Assistance Application has been updated. Applications are accepted on an ongoing basis. http://www.waterboards.ca.gov/water_issues/programs/grants_loans/srf/srf_forms.shtml
- The Department of Energy's (DOE) $25 million Technical Assistance Program (TAP), in support of the State Energy Program (SEP) & the Energy Efficiency and Conservation Block Grant (EECBG), is providing state, local, and tribal officials with tools and resources needed to implement successful and sustainable clean energy programs. TAP offers a wide range of assistance. http://www.energy.gov/recovery/index.htm
- The REAP/EA/REDA (Rural Energy for America Program - Energy Audit and Renewable Energy Development Assistance) Grant Program will provide grants for energy audits and renewable energy development assistance. http://www.rurdev.usda.gov/BCP_ReapEaReda.html
- The SWRCB Agricultural Drainage Loan Program and Agricultural Drainage Management Loan Program accepts applications on a continuous basis. http://www.swrcb.ca.gov/water_issues/programs/grants_loans/agdrain/agdrain_loan.shtml
- The U.S. Bureau of Reclamation’s WaterSMART program provides grants to support efficient water use (both agricultural and municipal). These grants require a 50 percent cost-share and are offered to irrigation and water districts, Tribes, States, and other entities with water or power delivery authority in the following categories:

Water and Efficiency Grants, System Optimization review Grants, and Advanced Water Treatment and Pilot and Demonstration Project Grants. The WaterSMART program also offer Grants to Develop Climate Analysis Tools to universities, non-profits and other organizations with water or power delivery authority. http://www.usbr.gov/WaterSMART/

- The USDA Rural Development Energy Program provides direct loans and loan guarantees to upgrade, expand, maintain, and replace America's rural electric infrastructure including construction of electric distribution, transmission and generation facilities, and on- and off-grid renewable energy systems. http://www.rurdev.usda.gov/Energy.html
- The USDA has grant programs to help rural businesses create jobs through cooperative development centers. Under the RCDG program, grants may be awarded to colleges, universities, and non-profit groups to create and operate centers that help individuals or groups establish, expand or operate rural businesses, especially cooperatives. Grants may be used to conduct feasibility studies, create and implement business plans, and help businesses develop new markets for products and services. http://www.farmprogress.com/story.aspx/nl5_5nl/grants/will/help/rural/development/conservation/8/50260
- USDA provides funding to stabilize and reduce energy costs for residents in remote rural areas where the current costs of producing electricity is high. The funds are being provided through USDA's High Energy Cost Grant program and much of the money will go to construct renewable energy projects. Grants are available to individuals, businesses, non-profit entities, states, local governments and federally recognized Indian tribes. http://www.rurdev.usda.gov/RD_Grants.html

The USDA NRCS offers a wide variety of programs to assist landowners with conservation and good stewardship. While technical assistance is always available, some financial assistance is made available during certain times of the year. Landowners, including Tribes, may apply for funding by visiting their local NRCS office. A conservation planner will assist the landowner in identifying their resource concerns, methods of addressing these concerns, and to develop a conservation plan. This conservation plan will serve as a road map to determine their short term and long term goals and objectives and to set priorities. Once a plan is developed, the landowner can apply for funding to address all or a portion of their conservation plan. Because funding is limited, each project is screened and ranked for environmental benefit. Projects that screen as High priority, meaning they best address the area's priority resource concerns, are funded first. The ranking score is used to determine the order in which each High priority project is funded. NRCS will fund as many high priority projects as the available funding will allow.

Finally, there have been discussions by both the U.S. President and the Congress in recent years about some form of national infrastructure investment bank. This has not yet translated into action, but if implemented could be a very important source of funds for implementation of public infrastructure projects that may be identified in the IRWMP.

6.3.6 Future Funding for the Regional Water Management Group (NSV Board)

This section describes anticipated ongoing NSV Board and TAC activities (aside from project and program categories addressed in Section 6.3.2) following adoption of the IRWMP, including potential costs and funding sources. These ongoing activities may include coordination, administration, NSV Board/TAC meeting facilitation and documentation, development of loan/grant applications, website maintenance and data management. Keeping any organization going requires support, through funding of consultants and/or support from member organization staff and volunteers.

In developing the proposed future structure and funding plan, the NSV Board discussed at length the business case for ongoing purposes and tasks of the organization, costs and value. The NSV Board also considered its own institutional history beginning in early 2011, as well as examples of different organizational and funding approaches used by regional water management groups in California as they updated and implemented their respective IRWMPs. The NSV Board took action at its March and April 2013 NSV Board meetings to include the budget and structure outlined below.

Once the IRWMP is adopted, program monitoring, data management, and public outreach must continue for the projects to be eligible to receive grant funding. Variables that have been considered included who would do the work (county staff vs. consultant), the number of assumed NSV Board and TAC meetings each year, and how and where the NSV website would be hosted, along with many other issues. Estimated costs were developed for each task. Assumed costs for this analysis are County staff at $90/hour, Local Computer Consultants (distinctly different from in-house county computer or IT staff) at $100/hour, and Engineering Consultants at $190/hour. A Local Computer Consultant is defined as a private consultant located within the NSV region that could assist the County staff with computer-related issues that could not be performed by county computer or IT staff. The billing rate for County Staff was developed by Butte County based on the average billing rate of the County Representatives. The cost analysis does not account for in-kind county staff time provided to support the NSV IRWMP effort, but is in addition to such efforts.

6.3.7 Task Descriptions

Ten Tasks have been identified as being necessary to move forward with the collaborative work effort forged by the NSV IRWMP. They are:

1. NSV Board Meetings
2. TAC Meetings
3. Website
4. Data Management System
5. Accepting/Logging Public Comments
6. Press Releases/Letters to Tribes/Correspondence
7. Grant Applications

8. Grant Administration Coordination
9. Public Workshops/Meetings
10. Addressing Regional Water Policy Issues

In addition, there are some first-year costs (both soft costs (County staff) and out-of-pocket hard costs) in setting up the data management and public outreach website. Each task is described in more detail below, and whether these tasks could be performed by either County staff, local computer consultants, or an Engineering consultant.

6.3.7.1 NSV Board and TAC Meetings

Tasks include:

- Driving the preparation of the Agenda packet and other meeting material preparation, including staff reports and leading the agenda and conference call discussions of the Joint Executive NSV Board/TAC Committee
- Posting meeting materials and meeting announcements to website and posting agenda at physical meeting location
- Facilitation/Attendance to respond to questions/provide clarifications
- Preparation of meeting notes

These tasks could be performed by either County Staff (CS), the Engineering Consultant (EC), or split between both. To-date, these tasks have been performed by the Engineering Consultant – with the exception of posting the agenda at the meeting location. Based on West Yost's actual average effort to date to perform these services, this effort requires approximately 41 hours of staff effort, as broken down by individual subtask on Table 6-2.

Table 6-2. Estimated Labor Hours to Support NSV Board and TAC Meetings

Tasks	Labor Hours per meeting	Notes
Agenda packet and other meeting material preparation	16.5	Includes development of staff reports, determining agenda contents, photocopying agenda packets and other meeting materials, preparing posters, and preparing PowerPoint presentations. Based on West Yost's actual average effort.
Posting meeting materials and meeting announcements to website	1	Based on West Yost's actual average effort.
Facilitation/Attendance	6.5	Based on West Yost's actual average effort.
Meeting minutes	17	Based on West Yost's actual average effort.
Total per meeting	41	

6.3.7.2 Website

Tasks include:

- Website/URL hosting, Programming/formatting website maintenance
- Day-to-day maintenance/posting updates/responding to public comments

The current NSV website is hosted on a private system by a subconsultant to West Yost, MIG. There will be on-going annual fees for MIG to continue to host this website and provide maintenance. Currently the EC is also providing website updates, posting new information as available, and responding to public comments. However, these functions can all be performed by CS in the future. The website could also be moved and hosted on a county website, or local independent site. There will be some one-time charges related to the transfer of the website to a new host location.

For budgeting purposes, four hours per month (48 hours per year) was assumed needed to program the website and two hours per month (24 hours per year) to complete day-to-day maintenance. This level of effort does not include costs or time to perform the actual transfer of the website to another host location.

6.3.7.3 Data Management System

The IRWM grant program requires the IRWM Group to maintain data regarding project status for the projects included in the NSV IRWMP, and to make all non-security sensitive data related to these projects and the IRWM region available to the public and allow uploading to the State database. Three tasks have been identified:

- NSV IRWM – Database Coordinator
- NSV IRWM – Specific Data Management
- Online Database Data Updates

These first two tasks could be completed by CS, the EC, or local Computer Consultant (CC). Four hours per month was used as an estimate (48 hours per year) for each of the first two tasks. The third task could be completed by the CC or possibly in-house by County technical staff. Twenty hours per year was assumed for updating the online database. Depending on the actual database software selected, there could be additional one-time charges and effort required.

6.3.7.4 Accepting/Logging Public Comments

This public outreach task could be completed by CS or the EC. An estimate of 4 hours per month (48 hours per year) was used for this task.

6.3.7.5 Press Releases/Letters to Tribes

This public outreach task could be completed by CS or the EC. An estimate of 2½ hours per month (30 hours per year) was used for this task.

6.3.7.6 Grant Applications

Grant applications would be completed by each individual project proponent so there would not be a monthly expense related to this task.

6.3.7.7 Grant Application Coordination

Administration and coordination of project proponent submitted grant applications will be required by the NSV Board.

This task could be completed by CS or the EC. An estimate of 160 hours per year was used for this task.

6.3.7.8 Public Workshops/Meetings

Public Workshops and Meetings, if needed, will be incorporated into scheduled NSV Board and/or TAC meetings, so no budget is being planned for separate public workshops. As specific needs develop, this budget line item could be revisited in the future budgets.

6.3.7.9 Additional First Year One Time Costs

In addition to the annual costs, several one-time costs will be incurred to transition the website and Data Management System for project and data tracking. Two tasks have been identified:

- Transition of website
- Data Management Site Prep

The assumption is that the website would be transitioned from the current proprietary structure to a common "content management system", possibly hosted by one of the participating counties. This cost is estimated to be approximately $6,000 (mostly staff time costs, but there will also be some hard costs). The SWIM database and other database options were discussed although no decision was made regarding the specific database to use. However, a one-time cost of $60,000 is being used as a "place holder" cost for this line item.

These two one-time tasks could be performed by the CC, or CS.

6.3.8 Discussion, Including Addressing Regional Water Management Issues

The proposed budget and level of effort relies heavily on County Staff to perform most, if not all of the work. To minimize out-of-pocket expenses, it is assumed that tasks would be split among the six participating NSV IRWM Counties with the intent to balance the in-kind costs among the counties, with each county serving as the lead or co-lead for a particular task. As discussed by the NSV Board (and pending support by each County Board of Supervisors), preliminary identification of the possible County to take the lead or co-lead on a particular task is shown in Table 6-3.

Table 6-3. Estimated Future Annual Costs for NSV Board Financing After IRWMP Adoption[a]

Task No.	Tasks	Quantity	Estimated Cost[b]			Notes[c]
			In-Kind	Out-of-Pocket	Total	
1	Board Meetings	2	$ 7,690	$ -	$ 7,690	Two Board meetings per year, all tasks by County Staff. In-Kind support services assumed to be provided by Butte County as lead with support from Tehama County.
2	TAC Meetings	4	$ 15,380	$ -	$ 15,380	Four TAC meetings per year, all tasks by County Staff. In-Kind support service assumed to be provided by Butte County as lead with support from Tehama County.
3	Website	1	$ 6,480	$ -	$ 6,480	All work to be performed by County Staff. In-Kind support services assumed to be provided by Shasta County for server hosting and website maintenance, with Colusa County leading the content management task for website.
4	Data Management System	1	$ 10,440	$ -	$ 10,440	All work assumed to be performed by County Staff (might need some assistance from local computer consultants). In-Kind support services assumed to be led by Shasta County with support from Colusa or Butte Counties.
5	Accepting/logging public comments	1	$ 4,320	$ -	$ 4,320	All work by County Staff. In-Kind support services assumed to be led by Colusa County, with support from Shasta County.
6	Press releases/letters to Tribes	1	$ 2,700	$ -	$ 2,700	All work by County Staff. In-Kind support services assumed to be led by Butte County, with support from Tehama County.
7	Grant Applications and Administration	0	$ -	$ -	$ -	All work by project proponents, no cost to RWMG.
8	Grant Application Coordination	1	$ 14,400	$ -	$ 14,400	RWMG support for grant applications, review, meetings, etc. All work by County staff. In-Kind support services assumed to be led by Sutter County with support from Glenn County.
9	Public workshops/meetings	0	$ -	$ -	$ -	No public workshops assumed to be included in this budget
10	Additional First Year One Time Costs					
	10a Transition of website	1	$ -	$ 6,000	$ 6,000	Website migration by Computer Consultant.
	10b Data Management Site Preparation[d]	1	$ -	$ 54,000	$ 54,000	New Data Management System created by Computer Consultant.
	Task 10 Subtotal			$ 60,000	$ 60,000	$60,000 cost is sum of items 10a + 10b presented in the budget item lines above. Currently assumed that each county will be responsible for contributing $10,000 each.
	Total First Year Cost		$ 61,410	$ 60,000	$ 121,410	First Year cost includes Item 10.
	Total Annual Cost Year 2 onward		$ 61,410	$ -	$ 61,410	

[a] Includes assumed labor cost of County Staff (including County IT Staff) at $90/hour, Engineering Consultant at $190/hour, and local Computer Consultant at $100/hour.

[b] Levels of effort based on historical West Yost levels of effort, or as estimated by West Yost and sub-consultants.

[c] Although the County identified as the tentative lead/co-lead for each task, it is understood that all counties will be actively participating in all tasks.

[d] Could be new site or transition of SWIM site. If no online project tracking, another method to consolidate data obtained by IRWM projects and coordinate with State databases must be developed.

The costs shown in Table 6-3 provide an estimation of County Staff charges and local Computer Consultant charges for illustrative comparison. No estimation has been made for existing/on-going NSV Board or TAC staff efforts currently being provided to support the NSV IRWMP efforts. The in-kind efforts are over and above the county staff's current in-kind contributions.

To provide a reference point baseline to the preferred option summarized in Table 6-3, currently West Yost is providing essentially all support functions for both the NSV Board and TAC meetings, and there are currently four NSV Board meetings and 10 TAC meetings scoped per year.

Following adoption of the NSV IRWMP, there would be two NSV Board meetings per year and four TAC meetings. County Staff would take responsibility for all NSV Board and TAC meeting tasks. Based on the discussions with the 6-County Representatives, Butte County has been tentatively identified to lead this task with support from Tehama County.

County Staff would also complete the day-to-day website maintenance. Colusa County has been tentatively identified to take the lead in providing staff to manage the content of the NSV website, while Shasta and/or Butte Counties have been proposed as possible server hosts for the NSV website (which would include website hosting maintenance and operation). The 6-County TAC Representatives also felt strongly that the database system and upkeep should be locally controlled and managed, to help control both potential cost increases and data consistency. Therefore, it is also being recommended that County Staff assume the responsibility of hosting and maintaining the data management database. Shasta County has been tentatively identified as potentially taking the lead for hosting and providing support for the data management database, with possible support from Colusa or Butte Counties. There may also be the need for some outside computer consultant services.

The remaining tasks such as accept/log public comments would be led by Colusa County with support from Shasta County; press releases and letters to Tribes would be led by Butte County with support from Tehama County; and grant application coordination would be led by Sutter County with assistance from Glenn County.

No tasks would be performed by the Engineering Consultant, but the tasks that only the Computer Consultant could provide, described above, could be completed by "in-house" County IT staff.

While the tasks above cover all activities directly related to costs, they do not address the NSV Board's future level of engagement on water policy or related water resource issues that may arise and impact the NSV IRWM area, either within or outside of the Northern Sacramento Valley IRWMP Region.

The NSV Board can have an important and appropriate role in educating, coordinating, and influencing regional approaches to water issues, recognizing the authority vested in each member agency and organization to act independently according to their authorities and responsibilities. It is important to respect and acknowledge that Tribal Sovereign Nations can be approved by the U.S. Environmental Protection Agency to be treated in the same manner as a state, which allows Tribes to set water quality standards and certification programs under the Clean Water Act.

Individual member organizations and agencies (particularly each of the six county boards of supervisors) speak and act in the political arena. The NSV Board can support this exchange by educating, coordinating, and influencing regional approaches to water issues where there is a common goal or position. The NSV Board supports the opportunity for NSV Board members and the public to discuss water related topics of regional concern at future meetings. At some point, the NSV Board might consider a response or some other sort of involvement as determined by the NSV Board at that time. This does not reflect an additional layer of government, but allows for better education, discussion and involvement on important water policy issues, particularly on a regional basis.

More specifically, the NSV Board supports, for the purpose of discussion in the NSV Draft IRWMP, the following activities:

1. Inform: The NSV Board should maintain the option of providing a forum for mutual education and discussion on regional water issues, and the NSV Board may host or participate in hosting workshops or other educational events on topics of interest. NSV Board meeting agendas, forums, briefings and/or workshops should be scheduled and coordinated through the NSV Board's Joint NSV Board and TAC Executive Committee.
2. Coordinate: The NSV Board should continue to promote coordination among the NSV Board members and other meeting participants related to regional water issues.
3. Influence: The NSV Board should only take a position or offer comments on water issues of regional importance so long as:
    a. The Board of Supervisors from each of the six member counties has had a chance to review and vet the regional water topic (be it project or issue) and
    b. The NSV Board's position does not contradict the outcome of the Board of Supervisors vetting process.

NORTHERN SACRAMENTO VALLEY INTEGRATED REGIONAL WATER MANAGEMENT PLAN

Prepared by

Butte County, Colusa County, Glenn County, Shasta County, Sutter County, Tehama County

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With assistance from

WEST YOST ASSOCIATES
Consulting Engineers