Lahontan Basins

Integrated Regional Water Management Plan

June 2015

Photo: Lassen Land and Trails Trust

HONEY LAKE VALLEY RCD

Prepared By

DYER ENGINEERING CONSULTANTS

Lahontan Basins Integrated Regional Water Management Plan

June 2015

Prepared for:

Honey Lake Resource Conservation District
170 Russell Avenue, Suite C.
Susanville, CA 96130

Prepared By:

9160 Double Diamond Pkwy. Ste A,
Reno Nevada, 89521
Phone: (775) 852-1440
Fax: (775) 852-1441

Acknowledgements

Prepared by:

The Partnership of the
Lahontan Basins Regional Water Management Group

Prepared with funding assistance from:

Proposition 84 Integrated Regional Water Management Planning Grant from the
California Department of Water Resources

With the assistance of:

Dyer Engineering Consultants
Honey Lake Resource Conservation District
Tania Carlone Consulting
Forsgren Associates Inc.

The Partnership would like to thank
the Department of Water Resources, and the many dedicated stakeholders
of the Lahontan Basins Region for their time, guidance, and
thoughtful participation in the creation
of this truly integrated plan.

Lahontan Basins IRWMP

Integrated Regional Water Management Plan

Table of Contents

CHAPTER 1 EXECUTIVE SUMMARY

CHAPTER 2 REGION DESCRIPTION

2.0 Region Description 1

2.1 Selection of Regional Boundary 5

2.1.1 Resource Concerns 6

2.2 Neighboring Regions 8

2.3 Watersheds and Water Systems 9

2.3.1 Groundwater Basins 9

2.3.2 Watersheds 11

2.3.3 Water Supply Systems and Distribution 13

2.3.4 Wastewater 19

2.4.5 Agricultural Water 19

2.3.5 Water Conservation 24

2.3.6 Stormwater and Flood Management 27

2.3.7 Water Conveyance and Storage Infrastructure 30

2.4 Natural Communities and Habitats 33

2.5 Internal Boundaries 40

2.6 Water Supply and Demand 41

2.6.1 Water Supply 41

2.6.2 Water Demand 42

2.7 Water Quality 43

2.7.1 Groundwater Quality 44

2.7.2 Surface Water Quality 55

2.7.3 Drinking Water Quality 57

2.8 Social and Cultural Composition 58

2.8.1 Population and Housing Information 58

2.8.2 Economic Profile 59
2.8.3 Culture and Diversity 61
2.9 Major Water Related Objectives and Conflicts 61
2.10 Potential Effects of Climate Change on the region 62

CHAPTER 3 GOVERNANCE

3.0 Governance 2
3.1 Lahontan Basins IRWMP Governance Structure 2
3.1.1 Regional Water Management Group 3
3.1.2 Technical Advisory Committee (TAC) 5
3.1.3 Special Interest Workgroups / Stakeholders 6
3.2 Entities Adopting the LBRWMP 6
3.3 Public Involvement 7
3.4 Decision-Making Process 7
3.5 Communication 7
3.6 Coordination 7
3.7 Plan Updates 8

CHAPTER 4 OBJECTIVES

4.1 Regional Water Management Issues 3
4.2 Process to Develop Objectives 7
4.3 Water Management Objectives 7
4.4 Prioritizing Objectives 10

CHAPTER 5 RESOURCE MANAGEMENT STRATEGIES

5.1 Resource Management Strategies Considered 3
5.2 Objectives Assessment 3
5.3 Process Used to Consider RMS 6
5.4 RMS Evaluation for the Lahontan Basins Region 6

5.4.1 Reduce Water Demand 6
5.4.2 Improve Operational Efficiency and Transfers 7
5.4.3 Increase Water Supply 9
5.4.4 Improve Water Quality 12
5.4.5 Improve Flood Management 15
5.4.6 Practice Resources Stewardship 16
5.4.7 Other Strategies 20
5.5 Adapting Resource Management Strategies to Climate Change 23

CHAPTER 6 PROJECT REVIEW PROCESS

6.1 Project Solicitation and Submittal Process 4
6.1.1 Integration of Resource Management Strategies 5
6.1.2 Special Circumstances for Project Submittal 5
6.2 Project Scoring Process 5
6.2.1 Scoring Criteria 6
6.3 Summary of Projects Included in the IRWM Plan 11
6.3.1 Summary of DAC and Tribal Community Projects 11
6.4 Communicating the List of Selected Projects 11

CHAPTER 7 IMPACTS AND BENEFITS

7.1 Plan Implementation Benefits and Impacts 3
7.1.1 Regional Benefits and Impacts 3
7.1.2 Interregional Benefits and impacts 6
7.1.3 Benefits and Impacts to DACs, Environmental Justice-Related Concerns, and Native American Tribal Communities 7
7.2 Project or Program Benefits and Impacts 9

CHAPTER 8 TECHNICAL ANALYSIS AND PLAN PERFORMANCE

8.1 Technical Analysis Review 3
8.2 Plan Performance Review 4
8.3 Project-Specific Data Collection and Monitoring Plans 7
8.4 Adaptive Management 8

CHAPTER 9 DATA MANAGEMENT

9.1 Overview of Data Needs 3
9.2 Data Collection Techniques 4
9.3 Data Management System 7
9.4 Quality Assurance/Quality Control Measures 7
9.5 Data Sharing 8

CHAPTER 10 FINANCE

10.1 Funding Sources and Mechanisms for Planning and Implementation 3
10.2 Operation and Maintenance Funding for Implemented Projects 9

CHAPTER 11 RELATION TO LOCAL WATER PLANNING

11.1 Relationship between LBIRWMP and Local Planning Documents and Programs 4
11.1.1 Water Supply and Water Quality Planning 4
11.1.2 Wastewater and Recycled Water Planning 4
11.1.3 Flood Protection and Stormwater Management Planning 4
11.1.4 Natural Resources Planning 5
11.2 Dynamics between LBIRWMP and Local Planning Documents and Programs 5

CHAPTER 12 RELATION TO LOCAL LAND USE PLANNING

12.1 Linkages between Water Management and Land Use Planning 4
12.2 Current Relationships between Water Managers and Land Use Planners 4

12.3 Future Efforts to Establish Proactive Relationships 5

CHAPTER 13 STAKEHOLDER INVOLVEMENT

13.1 Opportunities for Stakeholder Participation 3
13.1.1 IRWM Planning Committee 3
13.1.2 Project Proponents 7
13.1.3 DAC Representation 7
13.1.4 Public Participation 11
13.2 Decision Making Process 13
13.3 Stakeholder Integration 13

CHAPTER 14 COORDINATION

14.1 Coordination within the Lahontan Basins Region 3
14.2 Coordination with Neighboring IRWM Regions 4
14.3 Coordination with Other Agencies 7

CHAPTER 15 CLIMATE CHANGE

15.1 Region Characterization 6
15.2 Climate Change Impacts 6
15.2.1 Water Supply 11
15.2.2 Water Demand 11
15.2.3 Water Quality 12
15.2.4 Flooding 12
15.2.5 Ecosystem and Habitat Vulnerability 13
15.3 Regional Climate Change Vulnerabilities, and Adaptation and Mitigation Strategies 13
15.3.1 Water Supply 13
15.3.2 Water Demand 15
15.3.3 Water Quality 17
15.3.4 Sea Level Rise 21

15.3.5 Flooding 21
15.3.6 Ecosystem and Habitat Vulnerability 24
15.3.7 Hydropower 26
15.4 Prioritizing Vulnerabilities 29
15.5 Further Data Gathering for Identifying and Quantifying Vulnerabilities 31
15.6 Mitigating Climate Change: Reducing Emissions 31
15.7 GHG Inventory Boundaries 32
15.8 Inventory Gathering and Establishing a Baseline 33
15.8.1 Quantifying Emissions 33
15.8.2 GHG Inventory Case Study: City of Susanville 36
15.8.3 Next Steps for Emissions Assessment 37
15.9 Carbon Sequestration 37

Appendices:

Appendix A - Integrated Flood Management Plan

Appendix B - DAC Water Supply, Quality and Flooding Evaluation

Appendix C - Salt and Nutrient Management Plan

Appendix D - RWMG MOU / Bylaws

Appendix E - Meeting Summaries

Appendix F - Completed Stakeholder Information Forms

Appendix G - Project Applications

Appendix H - DWR Project Implementation Funding, Inter-Regional Agreement

Appendix I - DWR Plan Standards Review

Appendix J - 303d Listing

Appendix K - Surprise Valley Incorporation

Appendix L - Proof of Publications

Appendix M - Local Planning Documents and State Database Links

LIST OF ACRONYMS

µg/L	micrograms per liter
ACEC	Area of Critical Environmental Concern
AF	acre-feet
AFY	acre-feet per year
AHHG	area of historic high groundwater
ASR	Aquifer Storage and Recovery
BLM	U.S. Bureau of Land Management
BMO	Basin Management Objective
BMPs	Best Management Practices
CALFED	California Water Storage Facility
CASGEM	California Statewide Groundwater Elevation Monitoring
CEQA	California Environmental Quality Act
cfs	cubic feet per second
Cl	Chloride
COD	Chemical Oxygen Demand
CPDH	California Department of Public Health
CRMP	Pine Creek Coordinated Resource Management Planning group
CS	City of Susanville
CWP	California Water Plan Update 2013
DAC	Disadvantaged Community
DAU	designated analysis unit
DWR	State of California Department of Water Resources
EC	Electrical conductivity
EPA	Environmental Protection Agency

ERP	Emergency Response Plan
ESA	US Endangered Species Act
FMP	Flood Management Practices
GHG	Greenhouse Gas
GIS	geographic information system
gpd	gallons per day
HLVRCD	Honey Lake Valley RCD
IRWMP	Integrated Regional Water Management Plan
LAFCO	Local Agency Formation Commission
LBIRWMP	Lahontan Basins Integrated Regional Water Management Plan
LC	Lassen County
LIC	Lassen Irrigation Company
LID	Low impact development
MCL	maximum contaminant level
mg/L	milligrams per liter
mgd	million gallons per day
MHI	median household income
MOU	Memorandum of Understanding
MTBE	methyl tertiary butyl ether
Na	Sodium
NEPA	National Environmental Policy Act
NO3	Nitrate
NPDES	National Pollutant Discharge Elimination System
NRCS	Department of Natural Resource Conservation Service
NWIS	National Water Information System

PCE	perchloroethylene
ppb	parts per billion
Reclamation	U.S. Bureau of Reclamation
RMS	Resource Management Strategies
RWEP	Regional Water Efficiency Program
RWMG	Regional Water Management Group
RWQCB	Regional Water Quality Control Board
SDAC	Severely Disadvantaged Communities
SEMS	Standardized Emergency Management System
SIR	Susanville Indian Rancheria
State	State of California
SWP	State Water Project
TAC	Technical Advisory Committee
TDS	total dissolved solids
TMDL	Total Maximum Daily Load
TSS	total suspended solids
USACE	U.S. Army Corps of Engineers
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UWMP	Urban Water Management Plan
VOCs	Volatile Organic Compounds

SECTION 1 EXECUTIVE SUMMARY:

The Lahontan Basins Integrated Regional Water Management Plan (LBIRWMP) is the first Integrated Regional Water Management (IRWM) for the Lahontan Basins Region. The LBIRWMP was developed through a stakeholder-driven process, building upon the Region's successful history of collaboration on water resource management issues. The LBIRWMP represents the culmination of years of cooperative and collaborative planning among regional stakeholders.

The LBIRWMP is a shared effort by Honey Lake Valley RCD (HLVRCD), Lassen Irrigation Company (LIC), City of Susanville (CS) and the Susanville Indian Rancheria (SIR) to identify regional and multi-beneficial projects for the Lahontan Basins Watershed. On an individual basis, HLVRCD, LIC, CS and SIR have each investigated and evaluated various water resource and environmental management options for the overall health and well being of the watershed within their jurisdictions. The IRWMP integrates these various efforts as well as other efforts in the greater Lahontan Basins Watershed area in order to identify and prioritize integrated regional water projects to maximize benefits to the broadest group of stakeholders in the region.

The Lahontan Basins IRWMP presents the region's water resources management objectives and recommends an implementation plan for moving the programs forward to achieve IRWM objectives and deliver benefits to the regional stakeholders in the areas of water supply, water quality, flood protection, and environmental protection and enhancement. The LBIRWMP, and this Executive Summary, follow the IRWM Grant Program Guidelines developed by the State Water Resources Control Board and Department of Water Resources.

Together, these sections establish an effective framework for ongoing water resources management to preserve the economic and environmental health and well-being of the Lahontan Basins. The Lahontan Basins IRWMP is dynamic, and will continue to change and grow with time. Regional needs and priorities will evolve over time and the LBIRWMP will adapt to meet the changing needs of the region.

SECTION 2 REGION DESCRIPTION:

Section 2 explains why the Lahontan Basins is an appropriate area for an integrated regional water management plan. This section describes internal boundaries within the region (boundaries of municipalities; service areas of individual water, wastewater, and land use agencies, including those not involved in the Plan; groundwater Basins boundaries, watershed boundaries, county boundaries, etc.), major water related infrastructure, and major land-use divisions.

The Lahontan Basins is approximately 1,939 square miles and it includes most of Lassen county and a portion of northern Sierra County. Its large size contributes to the number of diverse environments, physical features, and land uses within the watershed.

Agriculture and grazing are the dominant rural land uses in these areas but represent a small portion of the total watershed land use, which consists primarily of forest, shrub and grassland. General land use trends in the watershed include significant development of rural and agricultural. The land use trend is a shift in the types of crop grown in the watershed. The shift is generally towards higher value more water intensive crops. Both of these trends need to be addressed through regional water management planning.

Projections from planning efforts were established based on considerations of land development, population projections, and other considerations.

SECTION 3 GOVERANCE:

In 2014, Honey Lake Valley RCD (HLVRCD), Lassen Irrigation Company (LIC) and the City of Susanville (CS) and the Susanville Indian Rancheria (SIR) entered into a Memorandum of Understanding (MOU) for the purpose of coordinating water resources planning and implementation activities watershed-wide. These four agencies are collectively referred to as the Regional Watershed Management Group (RWMG). Their role as the sponsors is leading the development of the LBIRWMP. The LBIRWMP is envisioned to be a living document that shall evolve and be updated in the future as projects are implemented and priorities change. As part of the LBIRWMP process, the RWMG have met and will continue to meet regularly in order to carry out the mission, goals, objectives and strategies of the IRWMP and to solicit and encourage participation from other agencies and stakeholders in the watershed.

The on-going nature of the LBIRWMP process and stakeholder collaboration will facilitate conflict identification and resolution of issues within the watershed. The collaborative approach will provide a forum for identifying and evaluating water supply, water quality, groundwater and surface water management, ecosystem restoration, and other watershed issues.

SECTION 4 OBJECTIVES:

In the LBIRWMP process, development of objectives is a key step, as objectives provide a basis for decision making, guide work efforts, and can be used to evaluate project benefits. In the Lahontan Basins IRWMP process, a mission statement, goals and objectives were developed. The planning objectives are targeted outcomes which benefit the region. When implementing regional projects, the RWMG will strive to meet as many objectives as possible while also recognizing that some objectives may not be fully achieved. The objectives decided upon by the RWMG are as follows:

A. Manage flood flows for public safety, water supply, recharge, and natural resource management
B. Meet demands for all uses, including agriculture, urban, and environmental resource needs.
C. Correct groundwater overdraft conditions.
D. Improve coordination of land use and water resources planning.
E. Maximize water use efficiency.
F. Protect and improve water quality for all beneficial uses, consistent with the Basin Plan.
G. Protect, restore, and improve natural resources.
H. Address water-related needs of disadvantaged communities (DACs).
I. Protect and enhance water-associated recreation opportunities.
J. Establish and maintain effective communication among water resource stakeholders in the Region.
K. Effectively address climate change adaptation and/or mitigation in water resource management.
L. Enhance public understanding of water management issues and needs.

A consensus based approach was used in the development of a mission statement for the Lahontan Basins and associated goals and objectives for the region. During the development of the mission, goals and objectives, the RWMG considered both the needs and issues identified for the region and the statewide priorities. The goals and objectives were presented to stakeholders and then refined based on stakeholder input and consensus. The results of this collaborative effort are the following mission, goals, and objectives.

> *The mission of the Lahontan Basins IRWMP is to preserve the economic and environmental health and well-being for the Lahontan Basins through watershed stewardship and comprehensive management of water resources in a practical, cost effective and responsible manner.*

SECTION 5 RESOURCE MANAGEMENT STRATEGIES

In order to meet the many objectives identified for the Lahontan Basins IRWMP, several water management strategies were considered. Strategies can address multiple IRWMP objectives and each represents a different approach towards addressing needs in water supply, water quality, flood management and environmental protection and enhancement. The strategies considered for inclusion in the LBIRWMP include all of the strategies suggested in the IRWM Grant Program Guidelines. They are:

	CA Water Plan Update 2009 RMS
Reduce Water Demand	Agriculture water use efficiency Urban water use efficiency
Improve Operational Efficiency and Transfers	*Conveyance - Delta Conveyance - Regional/local System Reoperation Water Transfers
Increase Water Supply	Conjunctive Management & Groundwater Storage *Desalination *Precipitation Enhancement Recycled Municipal Water *Surface Storage - CALFED Surface Storage - Regional/local
Improve Water Quality	Drinking Water Treatment and Distribution Groundwater Remediation / Aquifer Remediation Matching Quality to Use Pollution Prevention Salt & Salinity Management Urban Runoff Management
Improve Flood Management	Flood Risk Management
Practice Resources Stewardship	Agricultural Lands Stewardship Economic Incentives (Loans, Grants, Water Pricing) Ecosystem Restoration Forest Management Recharge Area Protection Water-Dependent Recreation Watershed Management
Other Strategies	Crop Idling For Water Transfers *Dewvaporation or Atmospheric Pressure Desalination *Fog Collection Irrigated Land Retirement Rainfed Agriculture *Waterbag Transport / Storage Technology

*RMS deemed inappropriate for the Lahontan Basins Region

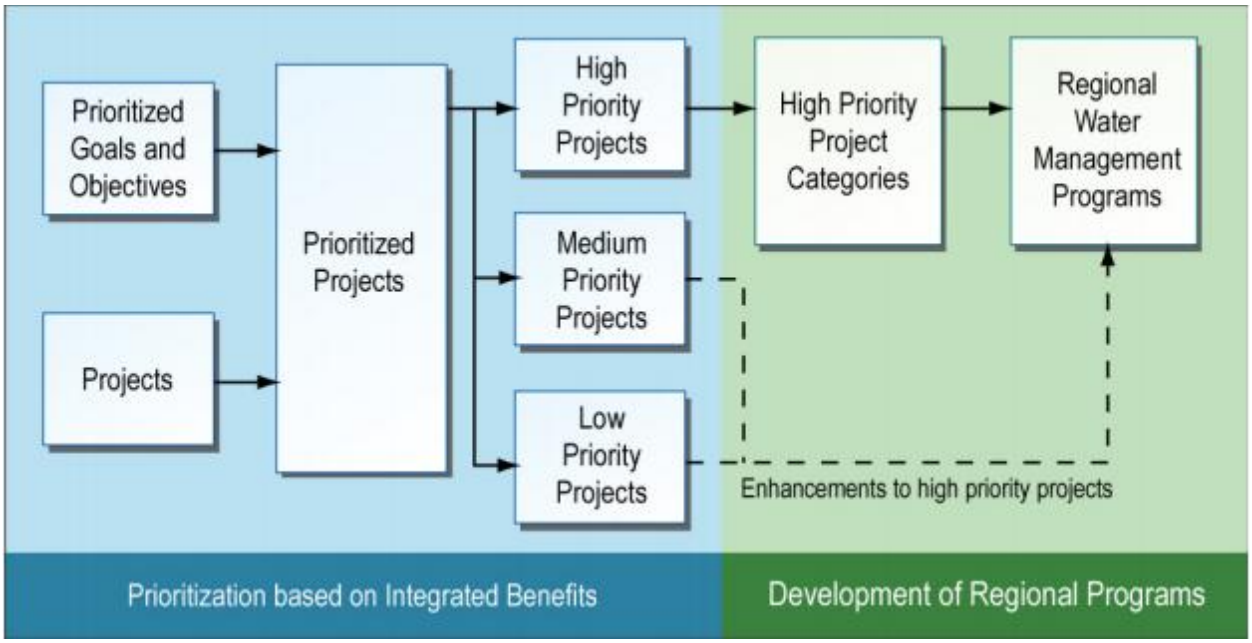
To begin the process of strategy development, the RWMG and Dyer Engineering Consultants, Inc. (DEC) reviewed planning efforts previously completed throughout the watershed and coordinated with stakeholders to identify additional planning efforts and projects being considered. The list of identified projects was then categorized by water management strategy.

Most projects employ a combination of water management strategies; however, each project was categorized based on the water management strategy it most effectively addresses. Strategies and projects were then compared to the LBIRWMP objectives to identify those that meet multiple objectives and provide integrated benefits.

SECTION 6 PROJECT REVIEW PROCESS

All of the water management strategies and projects included in the LBIRWMP were scored to prioritize those that present the highest integrated benefit for the watershed. Additionally, the resulting high priority projects were further integrated and regionalized through the formation of regional water management programs. Integration of projects into regional water management programs promotes coordinated implementation and allows for more effective consideration of regional needs.

To ensure the long-term usefulness of the LBIRWMP, the RWMG worked to create a well-defined integration and regionalization process that can be applied consistently over time. As regional needs change or as projects are implemented, the list of water management projects will evolve and the LBIRWMP will have to be dynamic to accommodate these changes. Some projects will be removed from the list after they have been implemented, and others may be removed from the list if future analyses determine they are not feasible. Still other projects may be added to the list as new alternatives are developed to meet unsolved regional needs. While the list of projects included in the IRWMP will continually change, the process for identifying integrated projects and further integrating projects to develop regional programs, will not change. The figure below illustrates this two stage process.



The first of the two stages in the integration and regionalization process is the prioritization of projects based on integrated benefits. There are three steps involved in the project prioritization:

1. Prioritization and weighting of the goals and objectives
2. Scoring of projects against objectives, and
3. Development of high, medium and low project priorities.
4.

The second of two stages in the integration and regionalization process is the development of regional programs. There are three steps involved in the development of regional programs:

1. Categorization of high priority projects into regional water management programs
2. Integration of medium and low priority projects into the programs, as appropriate, and
3. Enhancement of the programs with environmental projects, as appropriate.

SECTION 7 IMPACTS AND BENEFITS:

Benefits and impacts of the LBIRWMP process and proposed programs are linked to the mission, goals, and objectives. The impacts and benefits are organized into three subsections including:

1) Benefits of LBIRWMP Process
2) LBIRWMP Implementation Benefits and Impacts, and

3) Disadvantaged Community Benefits

Benefits of the LBIRWMP Process

Regional collaboration affords many benefits associated with economies of scale and sharing of knowledge. The advantages to planning and implementing the integrated programs of this IRWMP on a regional scale, rather than each project as an individual effort, are many. The advantages include sharing of knowledge and expertise (such as sharing information, reports, studies, and management strategies), identification of possible overlap or duplicative efforts and their eventual consolidation, labor resource efficiency, cost sharing, better utilization of existing facilities, and collaboration. Additionally, implementing specific programs that integrate projects to collectively achieve LBIRWMP goals and objectives will ultimately be more beneficial to the watershed, as a whole.

Regional planning is advantageous for issues that span the watershed and cross jurisdictional boundaries. The LBIRWMP process provides a forum for sharing experience, insights and knowledge among agencies and for developing solutions that can be effectively implemented at a regional scale.

There are many issues in the watershed that can only be effectively addressed through a coordinated regional planning approach. For example, an effective flood management solution for the Susan River Valley, where the flooding impacts occur, requires consideration of activities by multiple agencies in both the upper and lower portions of the river.

Addressing water quality issues such as Total Maximum Daily Loads (TMDLs) involves concerted efforts to control point source and non-point source pollution by agencies, cities and counties. The Susan River crosses a few jurisdictions and the source of the contaminants knows no agency boundary. Therefore a collaboration of agencies is working together to address the water quality problems in the river.

Surface water reservoirs can be operated to achieve maximum benefit only by understanding the needs and considerations of all downstream users. An agency may be able to provide additional downstream benefits to meet these needs by modifying their operations while maintaining their agency's original project objectives.

Finally, a regional planning process will allow agencies planning single purpose projects to work together and combine efforts to develop multi-objective solutions, or to examine projects for potential enhancements that can address additional issues simultaneously within one project. Examples include tying recreational and public access opportunities to flood management actions, enabling fish migration as a component of water supply projects and restoring native

habitat in conjunction with efforts to address water quality. Developing multiuse projects increases efficiency and public acceptance. It does require a coordinated effort between multiple stakeholders which is best accomplished through the IRWMP process.

Thus far, the LBIRWMP process has identified high priority projects, considered them in the context of regional objectives, and assembled them into water management programs that are representative of a synergistic approach. Relationships and connections between stakeholders which were not apparent previously, are enabled through the regional planning process. From a coordination standpoint, the LBIRWMP process builds relationships and understandings that will be invaluable for working out future issues.

LBIRWMP Implementation Benefits and Impacts

Lahontan Basins IRWMP partners and stakeholders recognize the importance of pursuing and integrating multiple water management strategies to achieve the greatest amount of, and most equitable benefit for, the region. The benefits of implementing the LBIRWMP recommendations will be provided through water management programs, each of which has been developed around a core of related objectives. Implementation of the recommended integrated program strategies will lead to numerous benefits including, at a minimum:

- **Reliable and high quality water supply.** Water supply projects, water transfer and banking agreements lead to enhanced water supply reliability and assist with protection of water quality. Reliable and high quality water supply is directly linked to economic and environmental health and well-being, which is directly from the Lahontan Basins IRWMP statement.
- **Multi-beneficial projects.** Opportunities for multi-beneficial projects, which can achieve a multitude of goals and objectives for several stakeholders rather than a single entity, have increased value for stakeholders and the communities served by projects.
- **Cost effectiveness.** Integrated planning and collaboration can lead to multi-beneficial projects that achieve cost savings through cost sharing opportunities, economies of scale, resource sharing, etc.
- **Sharing experience, resources, and facilities.** Integrated planning and collaboration facilitates sharing of experience, resources and facilities and better equips agencies to overcome future challenges.

Disadvantaged Community Benefits

Given that the majority of the Lahontan Basins currently qualifies as a DAC, protection of the people and economy of DACs is a priority for the RWMG and TAC. The commitment of the RWMG and TAC to providing benefits to DACs now and in the future is evidenced by the

LBIRWMP objective of addressing water-related needs of DACs and the inclusion of two DAC scoring criteria in the project prioritization process. The objective of managing flood flows for public safety, water supply, recharge, and natural resource management, which is one of the region's highest priority objectives, also benefits DACs.
The benefits to disadvantage communities will involve four main categories of benefit:

- Increased Water Supply Reliability
- Assistance to the Agricultural Community
- Improved Water Quality
- Flood Protection

SECTION 8 TECHNICAL ANALYSIS AND PLAN PERFORMANCE

This section includes a discussion of data, technical methods, and analyses used in development of the LBIRWMP, the measures that will be used to evaluate Project/Plan performance, monitoring systems that will be used to gather performance data and mechanisms to adapt project operations and LBIRWMP implementation based on performance data collected.

This section is organized by the water management programs and describes technical analysis and measurement of plan performance on a program level. Plan implementation would be affected if projects or programs were unable to meet expected performance criteria as determined through the monitoring measures. In such cases, changes in project sequencing or priority or substitution of alternate projects, may be necessary.

SECTION 9 DATA MANAGEMENT

Data generated and collected during the course of the LBIRWMP process has been and will continue to be managed to ensure that it will be available to fulfill the needs of stakeholders, the state, and the general public. Dissemination of data to stakeholders, agencies, and the public is integrated into the LBIRWMP process through stakeholder and RWMG agency meetings, newspaper announcements, handouts, e-mail notices, and agency contacts available to provide data files to any requester. Regular stakeholder workshops have served as the main venue for distributing information to stakeholders. Data have also been shared between the five RWMG agencies at monthly meetings. Other information and data are disseminated to agency boards and committees with the presentation of plan components and progress given by RWMG staff and grant staff.

The internet is also being utilized for data dissemination. Public meeting dates and tentative agendas are posted on the existing Honey Lake Valley RCD website, as well as other pertinent information. Annual reports are posted on the HLVRCD website, once available. Whenever

possible, reports and data are made available in electronic format. Other relevant data from this IRWMP process is provided to stakeholders online through the HLVRCD website. The web address is: http://honeylakevalleyrcd.us/irwm/

To date, there have not been a significant number of requests for data, primarily because of the proactive distribution and sharing of data. The LBIRWMP is committed to satisfying future requests for information. Information and data can be requested by stakeholders through the RWMG agencies via email or written requests, and at public meetings and LBIRWMP stakeholder workshops.

Data collection and review will continue to be an on-going activity throughout the LBIRWMP process as new project and planning information and data are developed, completed, or become available. Regionalization of stakeholder efforts was a primary focus of this process in order to reduce duplicate data collection efforts, to identify opportunities for partnership, and to reduce costs. An example of such an effort is the regional partnership to assist and educate growers in regards to water conservation and nitrate management practices throughout the watershed. Data management will be conducted for all projects that are implemented through implementation grant funding, and will be strongly encouraged for all projects included in the LBIRWMP.

SECTION 10 FINANCING

This section describes the funding/financing options for the implementation of LBIRWMP programs. Financing plans include a variety of mechanisms including state grant funding, federal grant funding, and local financing from the sale of municipal bonds, low interest loans, land assessments, water charges, and other sources.

SECTION 11 RELATION TO LOCAL WATER PLANNING

The IRWMP is designed to meet the collective needs of cities, counties, water and wastewater agencies and other stakeholders in the region. These entities have been involved in many planning efforts to develop goals and plans related to land use and water management issues. The planning documents created from these efforts serve as an important foundation for the IRWMP. These include General Plans, Urban Water Management Plans, and other plans covering a number of areas such as recycled water, groundwater management, water resources, and environmental enhancement. The LBIRWMP has integrated the goals, objectives and programs contained in these documents to ensure that it is consistent with local issues and needs.

The LBIRWMP has been coordinated with the elements of local general plans through the stakeholder involvement of cities and counties within the Lahontan Basins. General plans provide land use, environmental, economic, administrative, and other pertinent information with

regard to the use, need, quantity, quality, and management of water resources within a particular jurisdiction. General plans also chart existing and future goals and objectives to be accomplished for the communities they describe, and can provide valuable insight into the needs, priorities, and values of the local community. These elements have been considered and have helped to shape the water resources management needs identified in this IRWMP for the communities of the Lahontan Basins.

The Lahontan Basins IRWMP has been designed to combine and build upon the strategies and recommendations of these local planning documents. As demonstrated by the consistency of the LBIRWMP with local plans and the implementation of projects that help achieve local objectives, the LBIRWMP has been developed as an extension to and integration of, rather than a substitution for, local planning efforts. To avoid conflict with local efforts, stakeholder involvement has been and will continue to be an integral part of the LBIRWMP process. Stakeholder workshops have been conducted to provide a forum for interaction and collaboration and to allow the LBIRWMP to interface with local planning efforts. Such stakeholder involvement and participation ensures that local agency planning (and their respective goals and objectives) are represented and considered in the Lahontan Basins IRWMP process. Local planning strategies are at the heart of this LBIRWMP and have played a dynamic role in its development. Existing planning documents and current planning efforts are, and will continue to be, an integral part of the LBIRWMP process.

SECTION 12 RELATION TO LOCAL LAND PLANNING

This section discusses the relationship between the Lahontan Basins IRWMP process and current Local Land Use Planning efforts. The purpose of this section is to summarize the local planning elements being incorporated into the LBIRWMP and the coordination of the local efforts to maintain consistency with the LBIRWMP and other local efforts within the Region. The specific topics discussed in this section include:

- Link Between IRWM and Land Use Planning
- LBIRWMP Relationship with Land Use Planning Agencies
- Future Efforts to Establish Relationships with Land Use Planning Agencies

The link between LBIRWMP and land use planning has a considerable number of common considerations, both providing an opportunity to garner important input on a multitude of issues. The issues which could be effected include: flood management, groundwater recharge, conjunctive water use, treatment facilities, water conservation, municipal and recreational

development, general plan policies, planning and development review, and land use modification to improve water resource management.

SECTION 13 STAKEHOLDER INVOLVMENT

The Lahontan Basins IRWMP process is built upon the premise that future implementation of an IRWMP would not be possible unless the strategies and options were first identified, prioritized and developed by the affected stakeholders. As a result, stakeholder involvement is a central element to the Lahontan Basins IRWMP process and implementation success will necessarily involve water management strategies that address the concerns of local communities and reflect the public's interests and values within the watershed.

Stakeholder involvement is a central element to the Lahontan Basins IRWMP process. With this in mind, numerous stakeholder groups throughout the Lahontan Basins were identified and contacted, and several public announcements were published in regional newspapers to reach the general public. These outreach efforts were successful in obtaining stakeholder input during the planning process. Stakeholders have participated through various stakeholder meetings and regular correspondence with the Collaborative to develop, influence, and complete the LBIRWMP. It is anticipated that active stakeholder involvement will continue during implementation of the LBIRWMP.

SECTION 14 COORDINATION

In order to adequately plan and implement the recommended integrated water management strategies, it is vital to the success of this IRWMP effort that the appropriate federal, state, and local regulatory and jurisdictional agencies be actively involved. Traditionally, participation of these agencies occurred on a project-specific basis, depending on the requirements and needs of each effort. In the integrated planning process, however the role of these agencies was identified proactively and the potential involvement of each agency during LBIRWMP implementation was determined. The first form of involvement is to help coordinate and/or communicate the LBIRWMP to other stakeholders within the region.

Another form of involvement is to assist in implementation of the LBIRWMP through facilitation or active project involvement. The final form of involvement is through granting of necessary regulatory approvals. In many cases, a given agency can be involved in LBIRWMP implementation in all of these ways. This section describes the state, federal and local agencies active in the Lahontan Basins and identifies opportunities for their involvement and assistance in LBIRWMP implementation through coordination, communication, project implementation, and regulatory approval.

SECTION 15 CLIMATE CHANGE

Climate change has serious implications for the management of California's water resources. Increased temperatures, reduced snowpack, changing precipitation patterns, and accelerated sea level rise are being observed in the state. These impacts vary widely across the state's highly diverse hydrologic, ecological and socioeconomic conditions, and need to be accounted for in regional and local level planning. California's Integrated Regional Water Management (IRWM) process plays an important role in the State's overall water planning, and in its strategy to address climate change impacts on the state's water resources.

Generally water supply and drought related to the changing climate were found to be the most significant issue for the LB region.

In the 2010 IRWM Guidelines, climate change is one of 16 "standards" that IRWM plans must meet in order to receive planning and implementation grant funds through Propositions 84 and 1E. Broadly, the Guidelines require that IRWM plans evaluate regional climate change impacts, identify adaptation strategies, and consider greenhouse gas emissions reductions in reviewing projects. These efforts are to be undertaken within an adaptive management approach that supports updating knowledge about climate change impacts. The Guidelines also include "Climate Change Response Actions" as a Statewide Priority to be considered in prioritizing regional projects. These issues are detailed in the climate change section.

In December 2011, DWR released draft language for a refined "climate change standard" with respect to climate change adaptation. This draft requires a regional vulnerability assessment, prioritization of these vulnerabilities through an IRWM region's decision making process, and development of a plan for further analysis of the prioritized vulnerabilities.

Also in December 2011, the EPA Region 9 and DWR released the Climate Change Handbook for Regional Water Planning. This handbook is intended to help IRWM regions access relevant technical resources and tools to analyze climate change impacts and greenhouse gas emissions.

Lahontan Basins IRWMP Document Organization:

The LBIRWMP was developed based on the Proposition 84 IRWM Program Guidelines finalized in November 2012. Table 1-1 summarizes the sections of the LBIRWMP that address each IRWM Plan Standard.

The Lahontan Basins IRWMP is organized into the following sections:

Table 1-1 LBIRWMP Sections Addressing DWR IRWM Plan Standards

DWR IRWM Standard	Lahontan Basins IRWMP Reference Section
Governance	Chapter 3 Governance
Region Description	Chapter 2 Region Description
Objectives	Chapter 4 Objectives
Resource Management Strategies (RMS)	Chapter 5 Resource Management Strategies
Integration	Chapter 6 Project Review Process, Section 6.1.1 Integration of Resource Management Strategies Chapter 13 Stakeholder Involvement, Section 13.3 Stakeholder Integration
Project Review Process	Chapter 6 Project Review Process
Impact and Benefit	Chapter 7 Impacts and Benefits
Plan Performance and Monitoring	Chapter 8 Technical Analysis and Plan Performance
Data Management	Chapter 9 Data Management
Finance	Chapter 10 Finance
Technical Analysis	Chapter 8 Technical Analysis and Plan Performance
Relation to Local Water Planning	Chapter 11 Relation to Local Water Planning
Relation to Local Land Use Planning	Chapter 12 Relation to Local Land Use Planning
Stakeholder Involvement	Chapter 3 Governance Chapter 13 Stakeholder Engagement
Coordination	Chapter 14 Coordination
Climate Change	Chapter 2 Region Description, Section 2.10 Potential Effects of Climate Change on the Region Chapter 4 Objectives, Section 4.3Water Management Objectives Chapter 5 Resource Management Strategies, Section 5.5Adapting Resource Management Strategies to Climate Change Chapter 6 Project Review Process, Section 6.2.7 Strategic Considerations and Other Regional Priorities Chapter 8 Technical Analysis and Plan Performance, Section 8.3 Adaptive Management Chapter 15 Climate Change

Region Description

Contents

Contents 1

Introduction 4

2.1 Selection of Regional Boundary 5

2.1.1 Resource Concerns 6

2.2 Neighboring Regions 8

2.3 Watersheds and Water Systems 10

2.3.1 Groundwater Basins 10

2.3.2 Watersheds 12

2.3.3 Water Supply Systems and Distribution 14

2.3.4 Wastewater 19

2.4.5 Agricultural Water 20

2.3.5 Water Conservation 26

2.3.6 Stormwater and Flood Management 29

2.3.7 Water Conveyance and Storage Infrastructure 32

2.4 Natural Communities and Habitats 34

2.4.1 Lassen County Area Plan Policies 34

2.4.2 State Wildlife Areas 37

2.4.3 Eagle Lake Rainbow Trout 40

2.5 Internal Boundaries 41

2.6 Water Supply and Demand 41

2.6.1 Water Supply 41

2.6.2 Water Demand 43

2.7 Water Quality 44

2.7.1 Groundwater Quality 44

2.7.2 Surface Water Quality 56
2.7.3 Drinking Water Quality 58
2.8 Social and Cultural Composition 59
2.8.1 Population and Housing Information 59
2.8.2 Economic Profile 60
2.8.3 Culture and Diversity 62
2.9 Major Water Related Objectives and Conflicts 63
2.10 Potential Effects of Climate Change on the region 63

List of Figures

Figure 2.1 Lahontan Basins IRWMP Region 7
Figure 2.2 IRWM Neighboring Regions 9
Figure 2.3 LB IRWMP Groundwater Basins 11
Figure 2.4 Lahontan Basins Watersheds 12
Figure 2.5 Susan River Sub basin Watershed (Drainage) 13
Figure 2.6 Resource Conservation Districts within the Region 15
Figure 2.7 FEMA Designated Flood Zones within the region 31
Figure 2.8 Regional Land Use Map 39
Figure 2.9 Honey Lake Valley Groundwater Basins 47
Figure 2.10 Groundwater Basins (West) 50
Figure 2.11 Groundwater Basins (North) 55
Figure 2.12 Listed Impaired Water Bodies within the Region 57
Figure 2.13 Designated DAC Communities 61

List of Tables

Table 2.1 Historical Flood Levels at Lat: 40.41N, Long: 120.66W 30
Table 2.2 Historical Flooding Damage in Lassen County 30
Table 2.3 Lahontan Basins Structures 33
Table 2.4 Habitat Types in Lassen County 36
Table 2.5 Lassen County Supply and Demand Projections (acre-feet) 42
Table 2.6 Pumping Capacity of Existing City Wells 43
Table 2.7 Susanville Water Use Per Capita, Projected[15] 43
Table 2.8 Susanville Water Use Per Capita, Historic[15] 43

Table 2.9 USEPA 303d Impaired Waters 45
Table 2.10 Known Contaminants in Public Water Supplies..... 58
Table 2.11 2010 Population and Housing Data for the region 59
Table 2.12 Lahontan Basins Medium Household Income..... 60
Table 2.13 2010 Ethnic Composition of the region..... 62
Table 2.14 Lahontan Basins region Vulnerabilities..... 64

Introduction

This chapter addresses the Integrated Regional Water Management (IRWM) Region Description Plan Standard that requires IRWM Plans to describe the IRWM region, including:

- Watersheds and water systems, including major water related infrastructure, flood management infrastructure, and major land-use divisions
- Quality and quantity of water resources within the region
- Areas and species of special biological significance and other sensitive habitats within the region
- Internal boundaries within the region including the boundaries of municipalities, service areas of individual water, wastewater, flood control districts, and land use agencies
- Water supplies and demands for a minimum 20-year planning horizon, including water demands from important ecological processes and environmental resources within the region
- Potential effects of climate change on the region
- Comparison of current and future (or proposed) water quality conditions in the region and water quality protection and improvement needs or requirements
- Social and cultural makeup of the regional community, including important cultural or social values, DACs, economic conditions and economic trends, and efforts to collaborate with Tribal government representatives Major water-related objectives and conflicts in the region, including problems within the region that focus on the objectives, implementation strategies, and implementation projects
- Explanation of how the IRWM regional boundary was determined and why the region is an appropriate area for IRWM planning
- Identification of neighboring and/or overlapping IRWM efforts (if any) and an explanation of the planned/working relationship between regions

2.1 Selection of Regional Boundary

Typical of the Great Basin geography, the proposed IRWM is hydrologically unique. Many of the watershed basins are terminal or closed basins, and the region as a whole generally flows to the east, into terminal lake basins as opposed to neighboring watersheds and IRWM regions to the west that flow west and eventually reaches the Pacific Ocean. The Lahontan Basins Region is outlined in Figure 2.1. The IRWM region is comprised of three distinct major watersheds: Susan River Watershed, Madeline Plains Watershed, and the Smoke Creek Watershed adjacent to the Nevada State line; Figure 2.4 shows these delineated watersheds. Within these major watersheds there are numerous sub-regions with distinct water needs and issues. Yet, in terms of effective resource management, community involvement and culture, these watersheds are best managed as a single IRWM region. The region was approved by DWR through the 2011 Region Acceptance Process, or RAP. Within the defined region there are similarities in the resources issues. Additionally, the individuals, communities, resource agencies and organizations have a history of working and interacting with each other. The entire boundary falls within the area of Lahontan Regional Water Quality Control Board and mostly within Lassen County. There are some jurisdictional distinctions, but the primary basis for the regional boundary derives from a geographically workable area and watersheds with common communities, similar resources and cultures. Basically, there are many more commonalities within this region than differences.

The boundary has been discussed at multiple venues including Susanville City Council, Susan River watershed meetings, Board of Supervisors meetings, and Pine Creek CRMP meetings. The consensus drawn from these discussions along with input from Regional Water Quality Control Board and Department of Water Resources staff, resulted in the selection of the current boundary. The regional boundary includes 14 identified groundwater basins, all under Lassen County jurisdiction which further ties the historical data and governance of the area to the selected region.

The Lahontan Basins Region of California is home to approximately 35,000 people living in many different communities (Figure 2.1). People use water for drinking, household and landscape uses, agriculture, business endeavors, recreation, and to sustain and enhance natural habitats. Agriculture holds a high level of importance to the region. A common need for water links communities together in many ways. When anyone uses water, the ability of other people to use water within the Lahontan Basins Region can be affected.

The Lahontan Basins Region encompasses approximately 1,421,573 acres or 3,170 square miles in Lassen and Sierra Counties. Susanville is the County seat of Lassen County and the only

incorporated city within the region. Other unincorporated communities within the region include: Janesville, Johnstonville, Standish, Wendel, Ravendale, Spalding, Milford, Doyle, Herlong and Madeline.

All of the water currently used in the Lahontan Basins Region occurs naturally within the Lahontan Basins Region as surface water and groundwater accumulated from rain and snow that falls in the Lahontan and surrounding mountains.

2.1.1 Resource Concerns

Resource concerns identified in the region through the Susan River Watershed Group, Pine Creek CRMP, Board of Supervisors, RWMG, and public meetings regarding the IRWM process include:

Water Quality, including: salt/nutrient management/planning; temperature; dissolved oxygen; nutrients; sediment; and bacteria.

River and Stream Channel Erosion, including: down-cutting through mountain meadows; confined channels; in-channel irrigation infrastructure; loss of farmland; riparian corridor communities altered; sedimentation of dams; and sedimentation in Honey Lake.

Hydrologic Functions, including: flooding; flashy watershed flows; reservoir management; transportation network; stream channelization; and large-scale wildfire impacts.

Invasive Plants and Noxious Weeds, including: along road corridors; isolated populations; whitetop (*Cardaria draba);* Scotch thistle (*Onopordum acanthium*); Mediterranean sage (*Salvia aethiopis*); perennial pepperweed (*Lepidium latifolium*); western juniper (*Juniperus occidentalis*) encroachment due to absence of a natural fire regime; correlation between populations and parcel size, absenteeism, and road networks.

Water Use Efficiency, including: seepage in irrigation distribution network; allocation of a limited resource; flow patterns and timing; in-stream structures; groundwater exportation; aging infrastructure within the municipal water system.

Forest and Range Land Health, including: stand density in conifer forests; juniper encroachment; forest health, fire resistance and pest infestations; rangeland health assessment – cover, hydrologic functions, habitat values; cheat grass (Bromus tectorum); and medusa-head (Taeniatherum caput-medusae)

Aquatic and Wildlife Habitat, including: lack of fish and riparian habitat; fish passage; sage-grouse (USFWS candidate), Carson wandering skipper (USFWS Endangered);

lakeshore bird habitat; dynamic summer flows – temperature and turbidity; invasive aquatic mollusks; and native mussel populations (Anodonta sp., Margaritifera sp., and Gondidia sp.).

Data Sharing, including: regional coordination and Inter-regional coordination.

Creation of a proactive, "smart" design for the Lahontan Basins Region makes the IRWM Plan essential to efficient and effective water management.

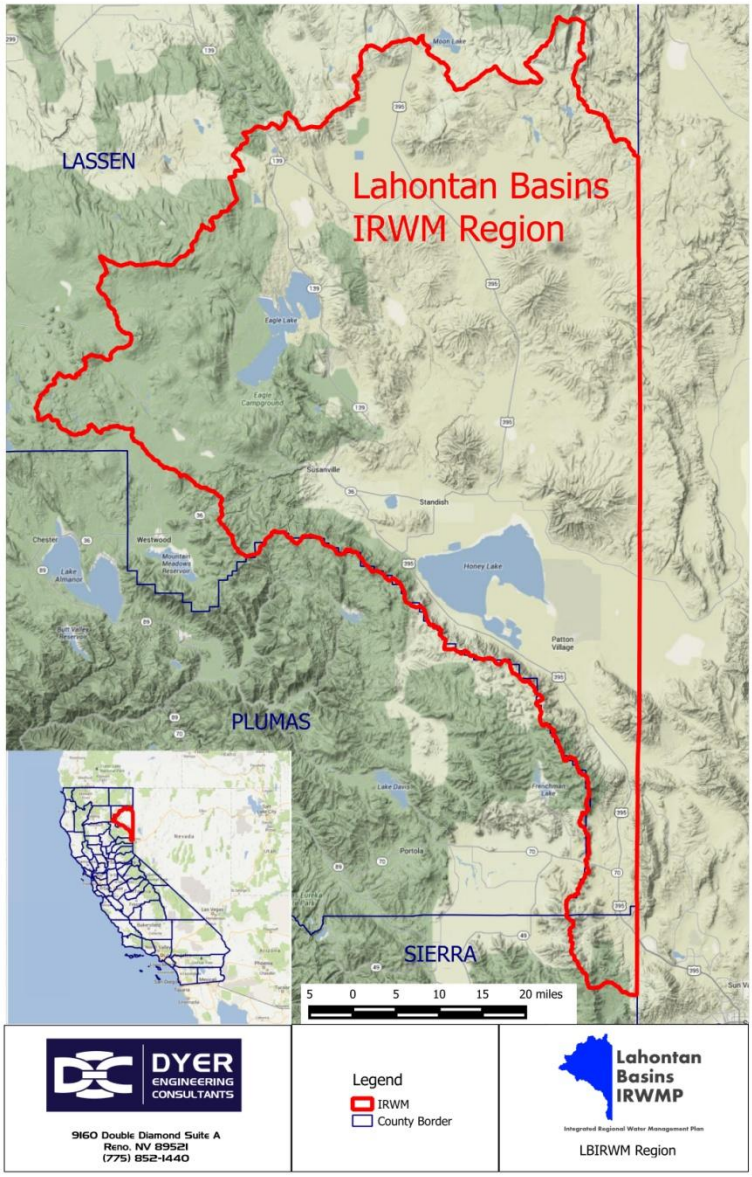


Figure 2.1 Lahontan Basins IRWMP Region

2.2 Neighboring Regions

There are no known overlapping areas with adjacent IRWM regions. There will be coordination with the Upper Pit IRWM and Upper Feather River IRWM particularly with regard to groundwater planning, management, and monitoring. Also, due to the geographic proximity and similarity in resource issues, there is a history of coordination of education and outreach efforts with members of both the Upper Feather and Upper Pit River IRWMs. We expect communication with those groups to continue and, in fact, to likely be enhanced by the formation of the Lahontan Basins IRWMP. The collective efforts of these interconnected IRWMPs will not only benefit their respective regions, but each other and the watersheds of Northern California as a whole. This will be accomplished via information sharing (groundwater and surface water data, potential projects) and planning for the future with each of the neighboring regions in mind.

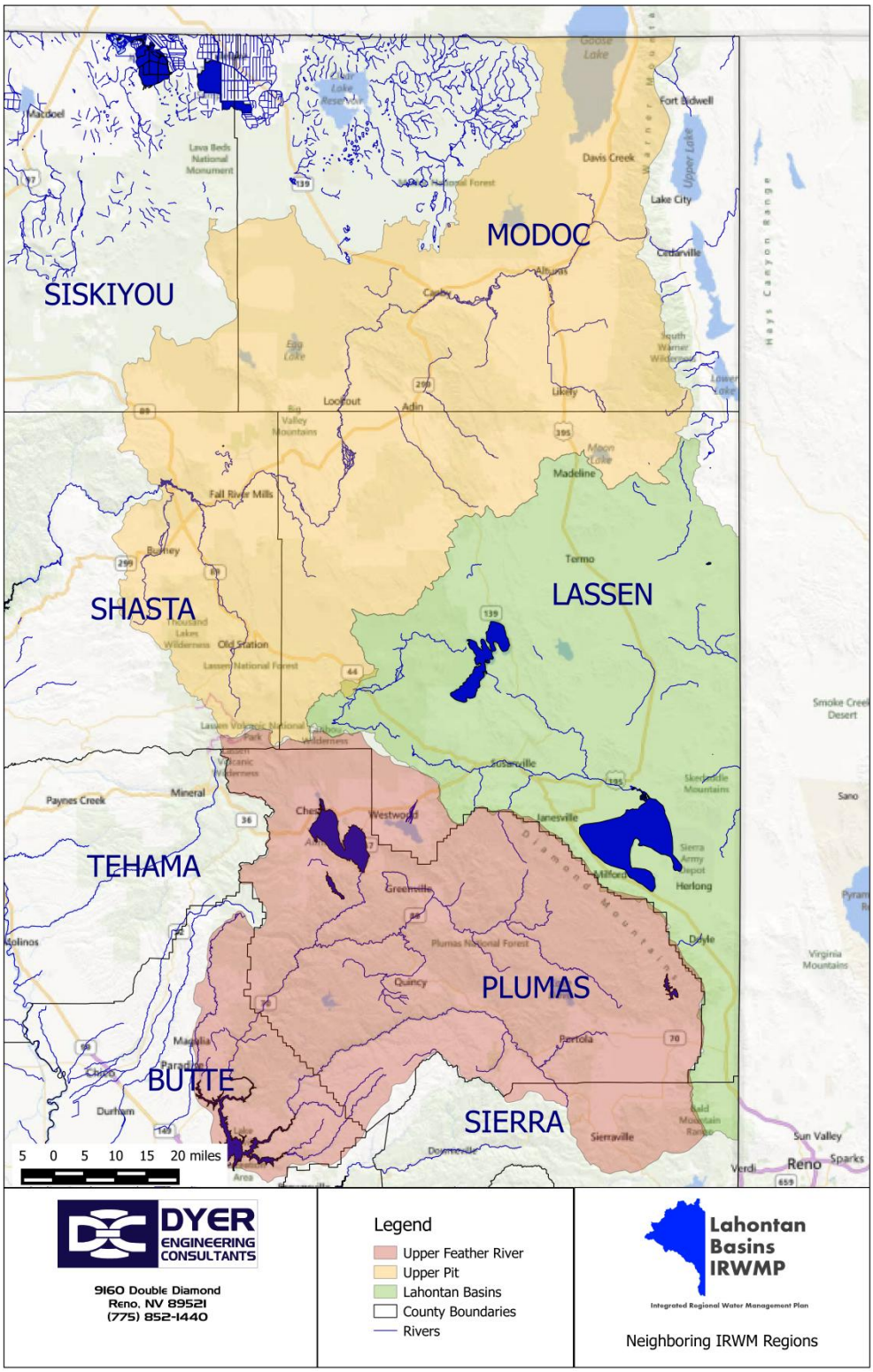


Figure 2.2 IRWM Neighboring Regions

2.3 Watersheds and Water Systems

2.3.1 Groundwater Basins

In 2007, the Lassen County Board of Supervisors adopted a county-wide groundwater management plan for the purpose of guiding the management of the county's groundwater resources and to provide a framework for development of Basin Management Objectives. Basin Management Objectives are flexible guidelines for the management of groundwater resources that describe specific actions to be taken by stakeholders to meet locally developed objectives at the basin or sub-area scale. Lassen County is an authorized groundwater management agency per CWC 2.11. BMO's are in line with the IRWMP as it is a basin wide groundwater management plan adopted by the County.

The plan was developed in close association with a Board-appointed Groundwater Advisory Committee of local water users and stakeholders. The plan provides detailed descriptions of groundwater resources, current uses and groundwater hydrographs created by the Department of Water Resources.

In 2010, the county initiated a new program for the development of Basin Management Objectives (BMO) as described in Lassen County's plan. Twelve groundwater basins and sub-basins have been identified to implement the BMO process in 2011. Lassen County and the committee understand that the integration of surface and groundwater management will be critical to effective long-term management. Furthermore in 2010, Lassen County identified itself as the local groundwater monitoring authority under section 10927 of the California Water Code.

The basin groundwater draw is reported to be close to exceeding ‘prudent perennial yield’. Groundwater levels in the basin declined during the 1990s but have since recovered. The total volume of water stored in the top 100 feet of the aquifer is estimated at 10 million acre-feet, although not all of it is economically recoverable or of acceptable quality for use. Overall the groundwater quality is acceptable; however there are pockets of low quality groundwater. Groundwater quality is generally poor to the east and north of Honey Lake, due to high sodium content. Other impairments, generally to the east and north, may include high levels of boron, arsenic, total dissolved solids, fluoride, and nitrate. Groundwater quality is presumably most suited for designated uses in areas north and west of Honey Lake, where it is predominantly used for irrigation. The reader should refer to the Lassen County Groundwater Management Plan for further information on groundwater management.

Data clearing house portal will be featured at the Honey Lake Valley RCD website under the Lahontan Basins IRWMP: **http://honeylakevalleyrcd.us/irwm/**

Private wells seasonally contribute variable amounts of water for irrigation in the Honey Lake Valley. The proportion of applied irrigation water from surface sources (e.g. diversions from the Susan River) is greater earlier in the season; well water sources become more important in the latter part of the April 15 to August 31 irrigation season.

A 1997 groundwater utilization survey came up with an estimated use of 51,000 acre-feet for agriculture, 15,000 acre-feet for municipal use, and 3,800 acre-feet for environmental wetland uses.

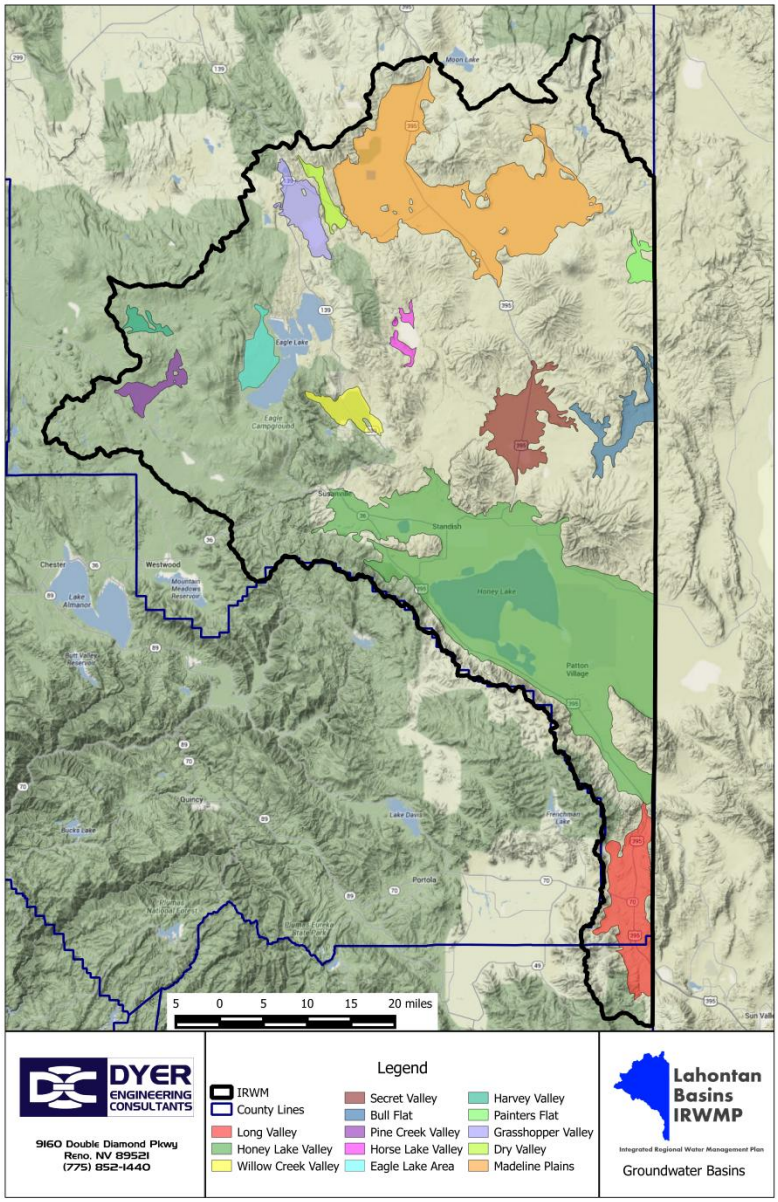


Figure 2.3 LB IRWMP Groundwater Basins

2.3.2 Watersheds

The Lahontan Basin includes the watershed basins of the Susan River, Madeline Plains and the Smoke Creek adjacent to the Nevada state line. (Figure 2.4)

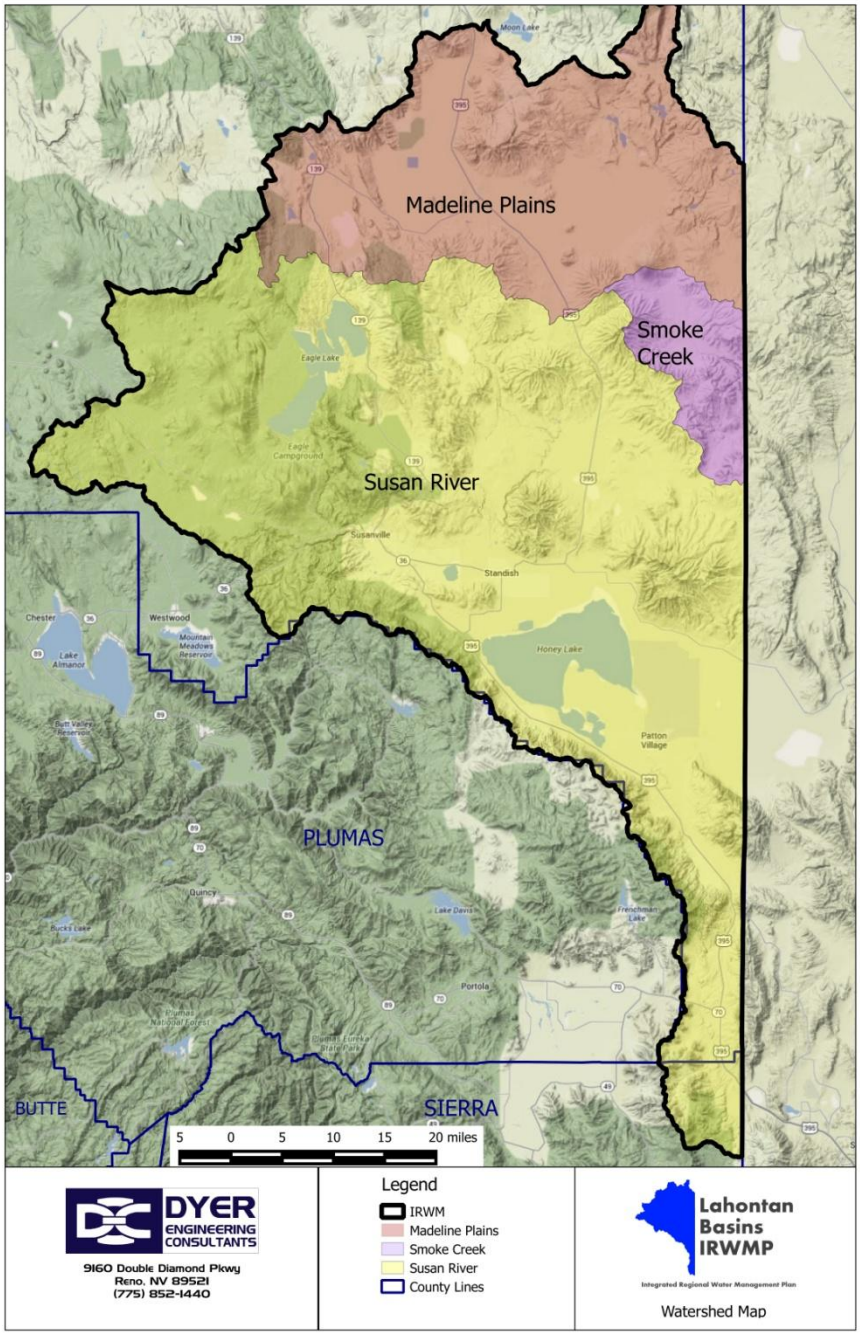


Figure 2.4 Lahontan Basins Watersheds

Susan River Watershed

The Susan River Watershed originates at the southern end of the Cascade Range, immediately east of Lassen National Park (Figure 2.5). Beginning above 7,000 feet in elevation, the Susan River flows for a distance of over 40 miles in a southeasterly direction until it drains into Honey Lake at an elevation of about 4,000 feet. There are four major tributaries of the Susan River Watershed: Paiute Creek, Gold Run Creek, Lassen Creek, and Willow Creek. Paiute Creek enters the Susan River from the north at Susanville. Willow Creek enters from the north near Standish. Gold Run Creek and Lassen Creek enter the Susan River from the south, between Susanville and Johnstonville. Below its confluence with Willow Creek, the Susan River spreads into a complex of delta-like slough channels that carry water and sediments to their terminus at Honey Lake.

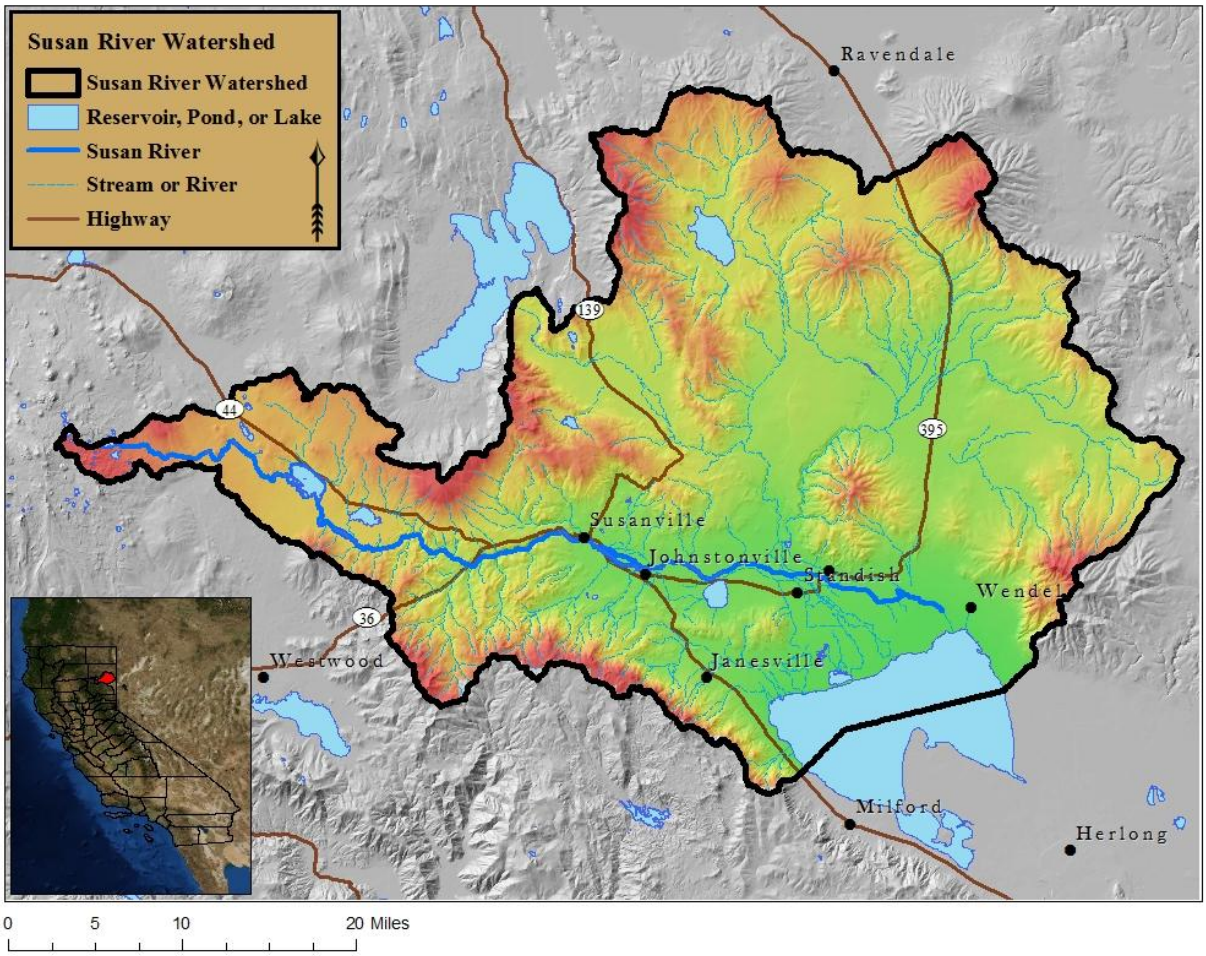


Figure 2.5 Susan River Sub basin Watershed (Drainage)

Madeline Plains Watershed

The Madeline Plains Watershed is an arid region of northwestern California encompassing 793 square miles. The watershed receives water from the Sacramento Hydrologic Region and the Pit River.

Smoke Creek Watershed

The Smoke Creek Watershed is an arid region of northwestern California/Nevada, that lies about 60 miles (97 km) to the north of Pyramid Lake, west of the Fox Range and east of the Smoke Creek Mountains. The southern end of the desert lies on the Pyramid Lake Indian Reservation, and a rail line lies at the eastern edge. The Smoke Creek Watershed is southwest of the Black Rock Desert's South Playa and is between the Granite Range and the Fox Range. The Smoke Creek Desert basin itself is composed of three large oval sub-basins, all of which reach depths to basement of up to about 2 km (1.2 mi).

2.3.3 Water Supply Systems and Distribution

Numerous agencies and organizations supply water throughout the Lahontan Basins region. Domestic water systems within the unincorporated portions of Lassen County are generally small, independent systems providing water to individual communities. Most of the unincorporated areas outside of major communities are designated for agricultural use and receive their water supply from individual groundwater wells; however, agricultural water supply systems also exist to serve irrigation users. Figure 2.6 displays the two Resource Conservation Districts that are encompassed within the Lahontan Basins IRWM region.

In addition to water systems within unincorporated areas of the region, separate domestic systems are provided to the residents of the incorporated city of Susanville. Services provided by the region's incorporated city, in addition to other major water suppliers in the region, are described in the following sections.

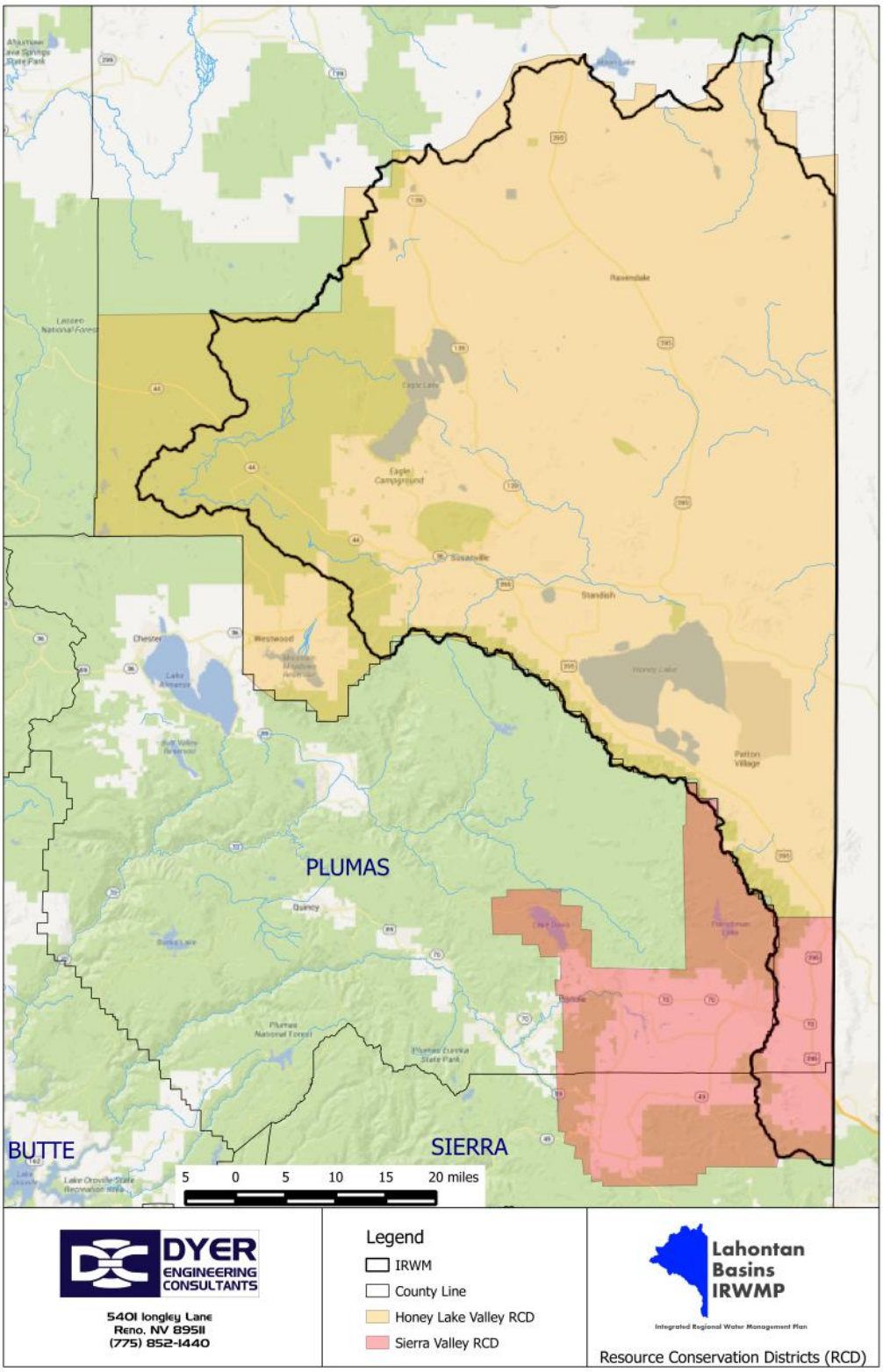


Figure 2.6 Resource Conservation Districts within the Region

2.3.3.1 Municipal Water Suppliers

The following municipal water suppliers provide services to the region.

- High Desert State Prison
- California Correctional Center
- City of Susanville
- Herlong Public Utilities District
- Lake Forest Community Service District
- Spalding Community Service District
- Stones Landing Community Service District
- West Patton Village Community Service District
- Lassen Irrigation Company
- Lassen County Department of Planning and Building Services
- Sierra County Planning Department
- Susanville Indian Rancheria
- Susan Hills

Information on each supplier is provided below.

High Desert State Prison

In September 1995, following completion of construction, HDSP received their first inmates. In order of importance, the first housing units activated were on the Minimum Support Facility (MSF) followed closely by the two level III 270 design facilities. As the final stages were being completed, early in 1996, inmates began arriving for placement in the two High Security level IV 180 design facilities. Shortly thereafter, a 200-bed Reception Center (RC) was established. Since that time, the RC has grown in numbers to approximately as much as 600 inmates, which does fluctuate. In May 1997, one of the level III 270 design facilities was converted to a level IV general population to accommodate departmental needs. In October 2007, HDSP converted their level IV 270 design general population facility to a level IV/III sensitive needs facility based on departmental needs.

HDSP has a total of 2,724 unmetered active service connections with a yearly use of 445.681 million gallons (mg) in 2011. DWR states that their public water system serves 8,963 individuals.

California Correctional Center (CCC)

The prison was built in 1963 as a minimum-security facility and was expanded in 1987 to include facilities to accommodate medium-security inmates.

In 2004, the anti-prison political action group Californians United for a Responsible Budget coalition (which advocates for "lowering the number of inmates and prisons") suggested that CCC and three other prisons be closed as a cost-cutting measure for the state of California, but CCC subsequently continued to operate. A documentary film *Prison Town, USA* was shown as part of the P.O.V. series on PBS television in July 2007; it concerned the impacts of CCC, High Desert State Prison, and the opening of the nearby Federal Correctional Institution, Herlong upon the residents of Susanville. Governor Arnold Schwarzenegger "directed inmate firefighters and staff from the California Department of Corrections and Rehabilitation," including those from CCC, to help fight the October 2007 California wildfires.

CCC has a total of 601 unmetered active service connections with a yearly use of 294.55 million gallons (mg) in 2005. DWR states that their public water system serves 4,500 individuals.

City of Susanville

The service area population for the City of Susanville is 9,791 persons. The 2010 Census indicated that there are 17,554 persons residing within the incorporated City limits of Susanville; there are approximately 200 persons outside the incorporated city that are also served. This brings the total to 17,754. There are also approximately 7,963 institutionalized persons housed in two state prisons (High Desert State Prison and the California Correctional Center), located on the periphery of the City.

The City of Susanville has approximately 3,422 active service connections in a 6.5 square mile incorporated area and 113 active connections outside of the city limits. The City supplies municipal water originating mostly from Cady and Bogwell Springs. The inmate population is approximately 7,963, and is counted in the overall population demographics for the City. However, the two prisons operate independent water systems and therefore, they have been excluded from this water management plan in regards to population and active service connections, both current and projected. In addition, the Diamond Mountain (Emmerson Lake) Golf Club though annexed into the city, maintains an independent irrigation pumping plant and domestic well.

Herlong Public Utilities District

The Herlong Public Utilities District provides domestic water service to residents in the unincorporated community of Herlong. The community of Herlong had a population of 293 in

2010 and is located in southern Lassen County along State Route 395. Municipal water is supplied by groundwater wells.

Spalding Community Service District

Spalding is a summer home tract of approximately 360 acres surrounded on three sides by the Lassen National Forest and on the east by Eagle Lake. On June 11, 1985, the Lassen County Board of Supervisors adopted Resolution 84/85-86 ordering the formation of the Eagle Lake Community Services District (CSD) without election and designated the initial Board of Directors. On September 1, 1992, the CSD Board changed the name of the District from Eagle Lake CSD to Spalding Community Services District.

Stones Landing Community Service District

The Stones Landing Community Service District was formed to answer the growing need for fire protection, Emergency Medical Response, and Waste Water Treatment in the North Shore Communities of Eagle Lake. The communities served include Stone's Landing & Buck's Bay.

West Patton Village Community Service District

The West Patton Village Community Service District provides domestic water service to residents in the unincorporated community of West Patton Village. The community of West Patton Village had a population of 702 in 2010 and is located in southern Lassen County along State Route 395. Municipal water is supplied by groundwater wells.

Sierra County Planning Department

The Sierra County Planning Department addresses agricultural preservation as well as floodplain management and various water supply concerns. Long Valley Creek which is located at the southern end of the Lahontan Basins IRWMP is the only section of the region that is not encompassed in Lassen County as such; Long Valley Creek is located in Sierra County.

Lassen County Department of Planning and Building Services

There are 33,422 residents in all of Lassen County and 15,978 residents in Susanville. The Lassen County Department of Planning and Building Services provided domestic water service to Caltrans in Johnstonville. On November 14, 2014 the City of Susanville took over this responsibility.

Susanville Indian Rancheria

The Upper Rancheria water delivery system currently supplies water to 55 households and over 220 residents. The Upper Rancheria receives water from the City of Susanville community water system. The City system has two springs and three wells. The water system is governed by the Susanville Indian Rancheria (SIR) Tribal Business Council (TBC).

2.3.3.2 Agricultural Water Suppliers

Lassen Irrigation Company is the only formal "Irrigation Company" in the region. However, there are other small scale and private divisions utilizing surface water rights, and the HLVRCD monitors all irrigation water usage from all diversions on the Susan River. The water usage for the Susan River is clearly defined in the Susan River Decree of 1940 from DWR.

Honey Lake Valley Resource Conservation District

The HLVRCD is a conservation district that provides oversight and guidance within the Honey Lake Valley and encompasses approximately 200 water rights holders. The HLVRCD is currently involved in a number of soil conservation, water conservation, water distribution, flood control, erosion control, erosion prevention/ stabilization projects, within or adjacent to the Honey Lake Valley district. These include sage grouse range management, water master services, timber and meadow management, and the Lassen County Special Weed Action Team (SWAT).

Lassen Irrigation Company

Lassen Irrigation Company provides water from the Susan River to irrigate a total of 5,864.7 acres that lie south of the river to the southeast of Susanville. The irrigation company owns and operates three reservoirs: McCoy Flat Reservoir (Diversion 6), Hog Flat Reservoir (Diversion 7), and the Leavitt Lake Reservoir (Diversion 239). McCoy Flat Reservoir (which lies west of Susanville) is situated on the main channel of Susan River and has a maximum capacity of about 13,000 acre feet. The water stored in McCoy Flat Reservoir is released during the summer to supplement the water stored in Hog Flat and Leavitt Reservoirs.

2.3.4 Wastewater

Most of the sanitary sewer systems within the unincorporated areas of the region serve individual small communities. Sanitary sewer service within the unincorporated Lassen County portions of the region is generally provided by special districts including community service districts, public utility districts, sanitary districts, and sewer maintenance districts. Some agencies provide sewer collection service only, and contract with surrounding agencies for wastewater treatment and disposal.

Most of the unincorporated areas outside of Susanville are designated for agricultural use and discharge wastewater through onsite wastewater treatment systems or septic systems. In areas serviced by individual or community systems, property owners are generally responsible for maintenance and improvement. Due to the rural nature of these wastewater systems, wastewater data was not available at the time of research for the IRWMP.

Susanville Sanitary District

The Susanville Sanitary District's boundaries encompass approximately 6.2 square miles. With a few exceptions the boundaries are contiguous to the Susanville City limits. The District has approximately 3,595 connections out of which 3,199 are residential, 387 are commercial and 9 are industrial. Currently the District provides wastewater collection and tertiary wastewater treatment. The District recently went to UV disinfection in lieu of chemical treatment in order to better serve the community and protect the environment. The District owns and maintains 61 miles of collection pipelines, a wastewater treatment plant, two polishing ponds, and a wetland.

Wastewater is collected through 60 miles of gravity-fed pipelines and one mile of pressure sewer mains. The Wastewater Treatment Plant (WWTP) treats approximately 1.0 million gallons of wastewater per day during dry weather and approximately 1.2 million gallons per day (mgd) in wet weather. The WWTP has the capacity to treat and discharge 2.0 mgd average monthly flow and 3.1 mgd peak wet weather flow, with a maximum hydraulic capacity of 4.0 mgd. For planning purposes, the District estimates that each resident uses approximately 250 gallons per day.

Operation costs are covered by rate payers based on the type of use, and property owners through property taxes. Costs associated with new development are paid by private developers while costs for infrastructure as a whole are paid through service and connection fees, as appropriate.

Leavitt Lake Community Service District

The Leavitt Lake Community Service District (LLCSD) is classified as a Special District. It is within Lassen County and is a suburb of the city of Susanville. The LLCSD provides sewer service only to the community that lies within its sphere of influence. The population of the community is less than 1,000 people.

The LLCSD's sewer system consists of approximately 2.5 miles of pipe, ranging from 6 inches to 10 inches in diameter, and two pump stations (Lake Ave and Tamarack Street). The LLCSD does not have any flow from other areas.

The LLCSD maintains its own sewer system and occasionally relies on contract maintenance, such as cleaning and CCTV. The LLCSD has prepared its own SSMP.

2.4.5 Agricultural Water

The Susan River has been a source of irrigation water for agricultural purposes for well over 140 years. Two entities – Lassen Irrigation Company (LIC) and the Honey Lake Valley Resource

Conservation District – administer the delivery of water to irrigation customers in the lower Susan River. The LIC delivers stored irrigation water to the non-riparian agricultural areas of the Lower Susan River. The LIC distribution network serving the non-riparian water users in the Lower Susan River consists of three primary components: storage, conveyance, and distribution. The Susan River begins as two channels draining Silver and Caribou Lakes in western Lassen County. These channels merge and flow through canyons and mountain meadows for 13 miles before entering McCoy Flat Reservoir. Runoff is temporarily stored in McCoy Flat and Hog Flat Reservoirs in the upper watershed over the winter and spring. The LIC delivers this stored water from the two reservoirs to non-riparian agricultural users of the Lower Susan River, with releases to the river completed by no later than July 1. After leaving McCoy Flat, the river flows for another 4.5 miles before being met by the inflow channel from Hog Flat Reservoir. The river soon enters a canyon and flows another 17 miles before entering the city of Susanville and the Honey Lake Valley.

In order to insure adequate supplies of irrigation water to areas having the highest potential for agricultural productivity, Lassen County supports analysis and, when warranted, development of water impoundments and aqueducts to transport water resources to areas within Lassen County which have the foremost agricultural soils.

The primary irrigated crops in the Susan River watershed are pasture, hay, and grain. Pasture and perennial hay (i.e. grass or alfalfa) generally utilize between 3 and 4 acre-feet of applied water per acre per year in the watershed.

The use of wells for irrigation purposes came into being during the early 1890s. By 1910, wells as deep as 1,000 feet were being bored in the eastern Honey Lake Valley. Some wells were fortunate to hit artesian flows. Groundwater occurs throughout most of Lassen County. However, wells that yield over 100 gallons per minute are found mostly in the major ground-water basins

Historically, water use in Lassen County has been dominated by irrigation for agricultural purposes. The Department of Water Resources has conducted periodic land use surveys within Lassen County since 1956. Irrigated lands within Lassen County have increased from about 75,000 acres in 1956 to 100,000 acres in 1988 (Department of Water Resources, 1992). The increase in irrigated acres has mainly resulted from the use of groundwater as opposed to surface water. An estimated 12,000 acre-feet of groundwater was applied in 1956 compared to 96,000 acre-feet in 1988.

Applied water for municipal and industrial purposes is only about three percent of the volume applied for agricultural irrigation.

In 1992, the California Department of Water Resources expressed concerns that Lassen County's available water supply from surface and groundwater sources was nearing total usage. Although only approximately 19 percent of Lassen County's potentially irrigable land is currently irrigated, any significant long-term increase in irrigated area has been judged to be unlikely. Continued expansion of municipal and industrial water use in the Honey Lake Valley, including Susanville, will compete for the apparently limited remaining groundwater resources or would require extensive surface water development.[1]

The safe yield of a groundwater basin is largely a function of recharge. There is a limit to a basin's ability to sustain recharge. Predicting the point when drafting and water use exceeds recharge is often difficult before it has been crossed. Over-drafting a groundwater basin could cause water quality degradation and land subsidence. If groundwater levels decline significantly due to drought or overdraft, pumping lifts may become too high to economically irrigate crops.

An issue which is of serious concern in many areas of the nation is the conversion of agricultural water supplies to serve municipal and industrial uses. Municipal and industrial uses can usually pay more for their water and can tolerate higher pumping lifts. In general, municipal and industrial users can usually afford to pump groundwater long after agricultural users have had to abandon their wells. Such conversion can have a significant impact on groundwater supplies and land uses which rely upon those supplies. The effect of irrigation allows for some water to infiltrate back into the upper geologic stratums and recharge shallow aquifers. Municipal uses, however, tend to concentrate water runoff into sewage and storm drain systems which, unless treated and reapplied through agricultural uses or other methods, is lost to the recharge of the groundwater system.[2] Susanville Sanitary District treats and discharges up to two million gallons of municipal wastewater per day before discharging into an irrigation channel that crosses several large ranches.[3]

Water transfers, or water marketing, is increasingly an issue in rural areas as the steady increase in municipal water needs, as well as agricultural needs in areas of limited water availability, have forced cities and water districts to pursue water supply alternatives. A water transfer involves the sale or transfer of water or water rights from one user or use to another.

---

[1] Lassen County General Plan, Agricultural Element, p. 4-28
[2] Lassen County General Plan, Agricultural Element, p. 4-29
[3] California Regional Water Quality Control Board, Lahontan Region, Order NO. R6T-2008

The potential of water exportation from Lassen County groundwater basins has, over the last several years, become more of a possibility with the promotion by Washoe County, Nevada, and private interests to construct the Truckee Meadows Project. This project proposed to pump and pipe groundwater from the Honey Lake Valley to serve development in the Lemmon and Spanish Springs Valleys north of Reno. Lassen County protested the proposal because a substantial part of the water source area was on Lassen County's side of the valley and the proposed amounts of water that would be extracted were expected to result in a significant drawdown of Lassen County's groundwater resources. It was feared that this drawdown would have had a number of adverse resource and related environmental impacts.

The issue of water transfers may affect areas of Lassen County other then the Honey Lake Valley. For example, it may be possible for water marketers to pump groundwater from the Big Valley area into the Pit River and sell it downstream (e.g., along the Sacramento River) to municipal users or water districts in need of additional water supplies. The greater the need, the higher the price and, consequently, the less regard to local land use water needs and environmental impacts. Refer to the Relation to Local Land Use Planning section for further detail.

Although most groundwater in California is available to anyone who can pump it, existing or potential problems with unrestrained groundwater withdrawals can result in the need for formal management programs. Groundwater districts can play an important role in managing groundwater resources and regulating its use. In 2014 the State of California approved AB 1739 and SB 1168. These two bills are aimed at sustainably managing California's groundwater. AB 1739 would establish a statutory definition of groundwater management and provide for enhanced minimum requirements for local groundwater management plans. It would also enhance and clarify tools and authorities for local agencies to improve groundwater management and outline specific steps for monitoring and reporting groundwater data. SB 1168 would establish a statutory framework to achieve sustainable management of groundwater basins throughout the state. According to SB 1168, all groundwater and subbasins in California would be managed sustainably by local entities and asked to adopt a sustainable groundwater management plan.

In 1980, the California State legislature adopted the Sierra Valley Groundwater Basin Act[4]. This Act authorized the formation of two groundwater districts, one of which became the Long Valley Ground Water District comprised of portions of Lassen and Sierra Counties within the Long

[4] SB 1391, Chapter 449 and amended by Chapter 986, Statutes of 1980

Valley ground-water basin. The need for this district resulted as a response to the drilling of large wells on the Nevada side of Long Valley near Bordertown and concern that the basin would be over-drafted. The act gives the district the power to curtail or suspend pumping and to ban exportation of groundwater out of the basin in the event of overdrafting or water quality impairments.

In 1989, the Honey Lake Valley Ground Water Basin Act[5], modeled after the Long Valley Act, was authorized by legislation. Once again, the impetus for formation of the district and institution of water extraction regulations was largely a response to the intentions of Nevada interests to pump groundwater out of the basin.

Lassen County has also supported formation of the Willow Creek Valley Groundwater Management District to give land owners in the area the ability to manage groundwater resources. Legislation was proposed to form this district in 1993.

Lassen County, in partnership with Modoc County, is part of the Lassen-Modoc County Flood Control and Water Conservation District. The District, formed in 1959, consists of all the territory of Lassen County and the area of Modoc County situated within the Pit River drainage. Among the purposes of the district is the purpose to, "provide for the acquisition, retention, and reclaiming of drainage, storm, flood, and other waters and to save, conserve, and distribute such waters for the beneficial use in said district"[6].

Another example of attempts by outside areas to claim water resources currently serving rural areas such as Lassen County is the "Bay-Delta" issue. Based on conclusions that higher volumes of water are needed in the summer to protect fish populations in California's river deltas, proposals have been made to force holders of water rights in source areas inland to relinquish some of their water rights to provide additional water for downstream use. Proposals have even included curtailing and, to some extent, confiscating long established "pre-1914" water rights. (Lassen County General Plan Natural Resources Element) Although the-Bay-Delta proposals are primarily aimed at surface water resources, related proposals are also seeking to extract groundwater resources. When surface water flows are reduced, especially in drought periods, conjunctive uses (e.g., pumping and transferring ground water to augment surface water deficiencies) are being contemplated.

[5] SB 1721, Chapter 1392, Statutes of 1989
[6] Lassen County General Plan Natural Resources Element

Reductions of water right allocations could significantly affect agriculture irrigation resources and other beneficial uses of water by irrigation districts, community service districts, and individual water users in these source areas. The proposed transfer of water resources out of the water basins may also result in depletion of water resources and significant impacts to dependent vegetation and wildlife habitats. Rural counties, the Regional Council of Rural Counties, and other advocates of the water rights of "counties of origin" have claimed, along with other points of opposition, that the relative volume of water gained by curtailment of water rights in these areas would have minimal benefit for California's bays and deltas compared to the injury which would be incurred in rural areas due to the lack of storage capacity and other water resource alternatives, as well as environmental impacts caused by the depletion of water resources both to fishery and wetland habitats.

2.3.5 Water Conservation

The City of Susanville has implemented several of the Demand Management Measures (DMM) as outlined in the Urban Water Management Planning (UWMP) Act[7] to encourage water conservation in the only urban area of the Lahontan Basins region:

Regulatory Frameworks

State and federal laws mandate conservation practices and help shape existing conservation programs.

Legislation and regulations affecting the region are summarized below:

Assembly Bill 1420 (AB 1420) amended the Urban Water Management Planning Act, effective January 1, 2009, to require, that the terms of and eligibility for any water management grant or loan made to an urban water supplier and awarded or administered by the Department of Water Resources (DWR), State Water Resources Control Board (SWRCB), or California Bay-Delta Authority (CBDA) or its successor agency be conditioned on the implementation of the Water Demand Management Measures (DMMs) described in Water Code Section 10631 (f).

Assembly Bill 1881 (AB 1881), the Water Conservation in Landscaping Act of 2006, mandated increased water efficiency for both new and existing development statewide. The law required DWR to update the Model Water Efficient Landscape Ordinance (MWELO), which established water management practices and water waste prevention for landscape irrigation needs. Cities can elect to either adopt the DWR's MWELO or introduce their own local landscape ordinances. In addition to adopting the MWELO, each city in the region has its own efforts in place to further reduce irrigation needs.

California Water Code Sections 525-529.5 require that urban water suppliers install water meters on all municipal and industrial service connections on or before January 1, 2025 and charge customers based on the actual volume of deliveries as measured by the water meters.

Water Conservation Bill of 2009 (SB x7-7) was enacted in November 2009, requiring all water suppliers – urban and agricultural – to increase water use efficiency. SBx7-7 sets an overall goal of reducing per capita urban water use by 20 percent by 2020, with an interim goal of reducing per capita water use by at least 10 percent by December 31, 2015. Each urban water supplier must develop its water use target and interim target using one of the four methods established by DWR. According to City of Susanville 2010

[7] City Of Susanville Urban Water Management Plan 2010

UWMP, the city's baseline daily per capita water use is 325 gallons per capita day (gpcd). Tables 2.5 and 2.6 illustrate City of Susanville historical and projected population and water use, its interim target and 2030 target. SBx7-7 also requires agricultural districts serving over 25,000 acres to implement Efficient Water Management Practices (EWMPs) and to prepare and adopt an agricultural water management plan per new standards. Districts less than 25,000 acres are required to produce a plan if they receive State funds.

Interior and Exterior Water Survey/Audits for Single Family and Multi-family Customers: (Part 2.6) 10631 (f.1) (a)

The City of Susanville has implemented water audits based on two key indicators; First, when the water meter is being read. If current flow rates seem abnormal the meter reader will immediately perform an exterior site review to identify potential leaks. Additionally, contact is made with the owner to try and identify potential leaks. Second, the utility billing program generates a list of potential leak customers based on prior read and use rates. Contact is made with the water use customers to identify why abnormal flow has occurred. The City will continue to use the computer-based utility billing system to identify and resolve water system problems.

This program has reduced water consumption and water costs by significantly reducing the need to run a second well during the summer months.

The city is currently reviewing other ways to cost effectively promote water conservation. Some items that have been discussed are: single family surveys could be conducted for interior audit of water uses measuring existing plumbing fixtures and tests for water closet leakage using dye tablets; offer and install low-flow water showerheads; adjust hot water heaters temperatures; and other water conservation measures. Further, single family surveys could include exterior water uses audits such as testing sprinkler systems for efficiency and providing information regarding water efficient landscaping, design, and plants. Similar multi-family customer water use audits could result in water conservation.

The potential costs effectiveness of such programs needs to be determined and presented for approval. Budgets would need to be established and approved to perform the audits and any improvements or fixture replacement subsidized by the city. Also, water conservation programs would need to be evaluated to make sure they do not have a negative financial impact on the city water department fund.

Distribution System Water Audits, Leak Detection and Repair: (Part 2.6) 10631 (f.1) (c)

The City of Susanville currently has monthly meter readings for all water entering and leaving the water system. Following meter readings an audit to find leaks is done to evaluate the system as a whole. Water audits and leak detection is a regular program. Leaks are repaired as they are discovered. Leak detection is conducted through meter monitoring and visual inspection. City staff is trained by American Water Works Association (AWWA) – DWR co-sponsored training programs. The water department has a staff of five individuals, two water operators are D-1 certified and two more are D-2 certified. The fifth is a new employee and is training to become certified within two years.

A meter calibration and replacement program was implemented in 1996 and is still underway. On average, City Water Department crews survey and inspect approximately 35 miles of main and laterals each year. The city has an annual valve exercise program using the City Water Department crews and the City Fire Department. In addition, the City Fire Department has standardized the fire hydrants and associated fire protection equipment.

Metering with Commodity Rates for all new connections and retrofit of existing connections: (Part 2.6) 10631 (f.1) (d)

The city is currently fully metered for all customer sectors, including single-family, multifamily, commercial, industrial, institutional and government facilities. Some fire sprinkler systems are not metered. Historically, a monthly service fee was charged for connecting a fire suppression system to the city water supply.

The service fee was removed several years ago, but is currently being reviewed for reinstatement. The city will continue to install and read meters on all services, continue to conduct meter calibration and replacement programs. Meter installation costs are included in the new service fees and the meter replacement and rotation program costs are included in the Water Department Budget.

Conservation programs for commercial, industrial, and institutional accounts/Conservation pricing/conservation coordination: (Part 2.6) 10631 (f.1) (i) (k) (l)

The city has implemented an increasing penalty rate structure that charges higher rates for water used by customers that use water in excess of an established reasonable allotment. The City of Susanville currently promotes water conservation and water waste prevention through zero or

minimal cost efforts associated with and in conjunction with other promotional efforts. However, any dollars spent to promote water conservation have a negative return on investment for the city. Supporting documentation is provided in the DMM "Return on Investment" section below. The city cannot justify a Conservation Coordinator at this time.

Some of the DMM's of the UWMP Act (CWC 10631) above are not locally cost-effective (the present value of the local benefits is less than the present value of the local costs to implement). (See 10631.5(a)) (Or page B-1 of Part II UWMP Supporting Information). This is primarily the case because of the unique geographical location of the city, and the city's water rights that allows the city to obtain 90% of the required Annual Consumption water supply from two springs. These springs have consistently supplied water with very little deviation in the flow rates. During extreme drought years the springs only dropped about 5% in flow. During extreme hot summer weather conditions, pumping is required to meet water demands primarily caused by landscape. Based on winter water demand flow rates and annual water consumption, landscape water demand accounts for 30% of the city's annual water usage. Additionally, during summer months, landscape water consumption accounts for less than 20% of the monthly consumption.

2.3.6 Stormwater and Flood Management

Because of regular flooding along the Susan River, Susanville's earliest residential area was built on the high ground now known as Uptown. Originally, the center of the town was at Main and Lassen, but the commercial area has now extended eastward along Main Street about two miles.

Despite its generally dry conditions, Lassen County, the City of Susanville, and the Susanville Indian Rancheria experience periodic winter storms and thunderstorms that often result in flash floods. Under storm conditions, the region is susceptible to flooding that historically has caused significant property damage and has threatened public safety.

Approximately 40 miles long, the Susan River crosses the southern portion of Lassen County and drains into Honey Lake. Based upon historical records, the Susan River is the primary source of flooding within Lassen County. More specifically, according to the National Oceanic and Atmospheric Administration (NOAA) National Weather Service Advanced Hydrologic Prediction Service for the Susan River, the following are the most significant flooding events and the associated flood levels (Gauge ID: SUSC1 Lat: 40.41N, Long: 120.66W),

Table 2.1 Historical Flood Levels at Lat: 40.41N, Long: 120.66W[8]

Date	Flood Measurement (Feet)
12/23/1955	14.40
02/24/1958	13.93
01/31/1963	15.10
12/22/1964	17.23
01/24/1970	18.47
01/13/1980	14.85
11/23/1981	16.30
02/17/1986	17.26
01/02/1997	17.31
12/31/2005	13.89

Additionally, to indicate the potential for a flooding event, the table below lists an excerpt of large-scale flooding events in Lassen County that have resulted in a presidential emergency declaration and associated damage:

Table 2.2 Historical Flooding Damage in Lassen County[9]

Date	Injuries	Fatalities	Property Damage	Crop Damage	Hazard Description
12/18/1964	1.96	0.64	1,785,714.29	178.57	Flooding
1/8/1973	0	0	0	35,714.29	Flooding - Severe Storm
1/16/1973	0	0	86,206.90	0	Flooding - Severe Storm
2/18/1986	0	0	500,000.00	0	Flooding
2/14/1992	0	0	9,090.91	0	Flooding - Winter Weather
12/10/1992	0	0	1,315.79	0	Flooding - Wind - Winter Weather
3/1/1995	0	0	0	11,241,379.31	Flooding - Severe Storm/Wind
1/1/1997	0.22	0	36,670,000.00	0	Flooding
12/31/2005	0	0	500,000.00	0	Flooding

[8] NOAA, Susan River, Gauge SUSC1
[9] Lassen County Multi-Jurisdictional Hazard Mitigation Plan, 3-41

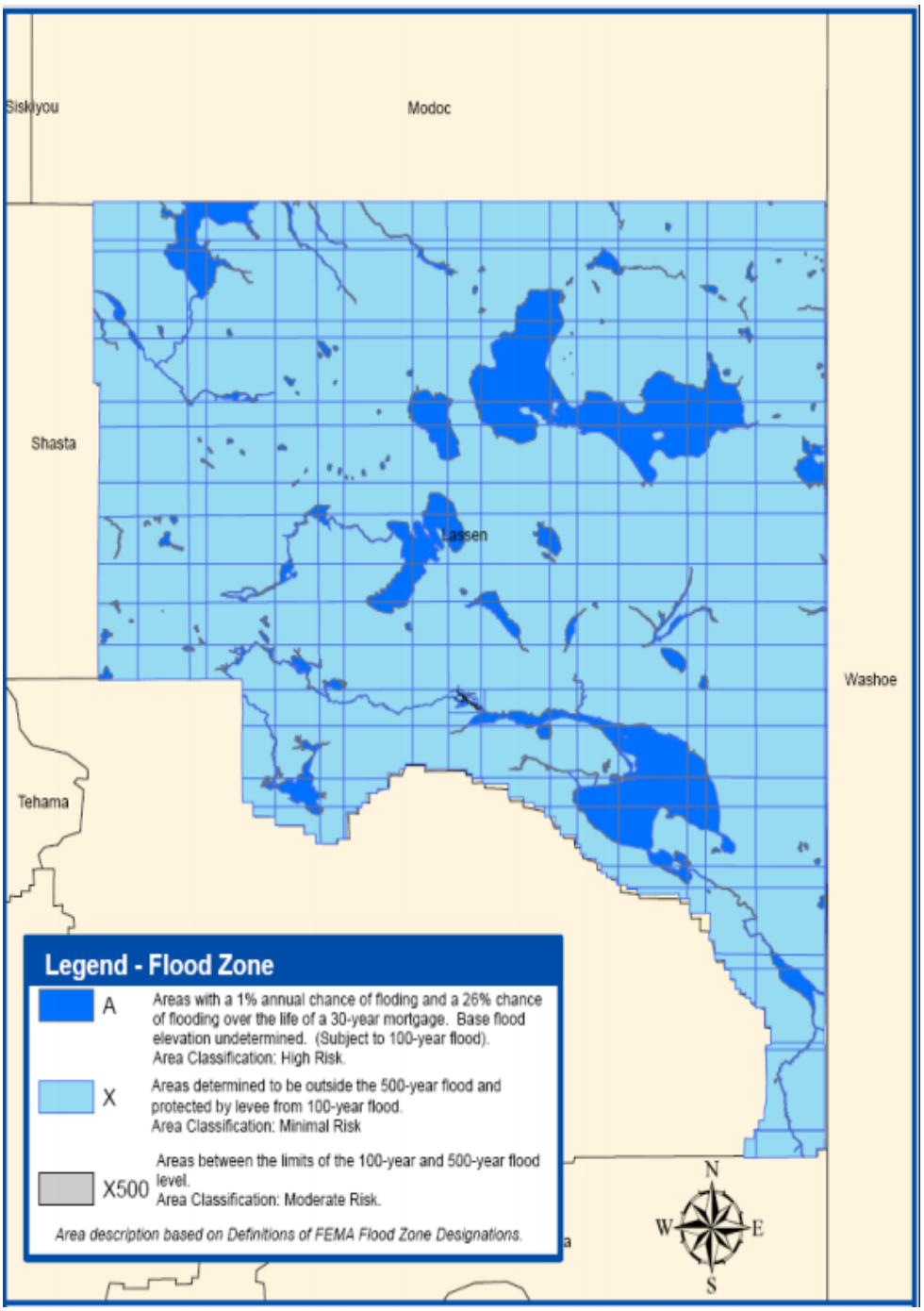


Figure 2.7 FEMA Designated Flood Zones within the region

2.3.7 Water Conveyance and Storage Infrastructure

The LIC contains a network of approximately 31 miles of canals, sloughs, and ditches that rely on stored water from three major reservoirs. The Susan River begins as two channels draining Caribou Lake and Silver Lake in western Lassen County. The first reservoir utilized is McCoy Flat Reservoir where storm water is stored and then released into the Susan River. Hog Flat Reservoir is an offline reservoir that serves the same purpose on the other reach of the Susan River. From here, flows are released into the Susan River where they flow toward Susanville. At the Johnsonville Dam, flows are split from the Susan River into the Leavitt Lake, the third storage reservoir controlled by the LIC.

Johnstonville Dam

Due to the extensive nature of water supply infrastructure – reservoirs, groundwater basins, and inter-regional conveyance facilities – mitigation for the effect of short-term dry periods is implicit for most systems. Defining when a drought begins is a function of drought impacts to water users. Hydrologic conditions constituting a drought for water users in one location may not

constitute a drought for water users elsewhere, or for water users having a different water supply. Individual water suppliers may use criteria such as rainfall/runoff, amount of water in storage, or expected supply from a water wholesaler to define their water supply conditions.

Colony Dam

HLVRCD is charged with governing five main bodies of water. The Susan River, Willow Creek, Gold Run Creek, Paiute Creek, and Lassen Creek all provide conveyance and storage for the riparian water ways. This system eventually terminates into Honey Lake, but in dry years, the flow is reduced to nearly nothing.

Table 2.3 Lahontan Basins Structures[10]

Name	Structure Type
Charpontier Dam	Measurement/Diversion
Johnstonville Dam	Measurement/Diversion

[10] Honey Lake Valley RCD, Inventory and Capital Improvements Plan

100 Inch Weir	Measurement/Diversion
Gold Run Diversion	Measurement/Diversion
Bridge Creek Into McCoy Flat Reservoir	Measurement
Ramsey's Diversion Ditch	Measurement/Diversion
Mill Diversion	Dam
Lassen Street Measuring Device	Measurement
Toscani Dam	Measurement/Diversion
Window Dam	Measurement/Diversion
Colony Dam	Measurement/Diversion
Susan River into McCoy Flat Reservoir	Measurement
McCoy Flat Reservoir Emergency Overflow	Spillway
McCoy Flat Reservoir Outlet into Susan River	Measurement
Hog Flat Parshall	Measurement
Buffum Parshall	Measurement
Virgil's Parshall	Measurement

2.4 Natural Communities and Habitats

The region has diverse and dynamic wildlife resources and a rich assortment of wildlife habitats. Two main parameters can be used to evaluate the quality of wildlife resources; the diversity of wildlife species and, the quality of the habitat available to sustain populations of these species. The maintenance and protection of fish and wildlife are vitally important to the people of Lassen County. The RWMG recognizes that preservation of wildlife habitat must be foremost in all aspects of future development in Lahontan Basins if the region is to maintain these vital resources. Fish and wildlife form one of the most important renewable resources that Lassen County possesses; both for its own residents and for people throughout California.

2.4.1 Lassen County Area Plan Policies

Wildlife as a natural resource has been addressed in all of Lassen County's area plans. Related goals and policies have been adopted and are in effect to establish and support land use and resource management policies. Following is a selection of some of these goals and policies from just three of the county's area plans. (Please consult the applicable area plans of specific planning areas for the complete sets of policies.)

Johnstonville Area Plan

Issue: Wildlife/Fishery Resources

Goal and Objective: Recognize and protect wildlife and fishery resources by maintaining a policy for compatible relationships among habitats, parks and residential development. Protect critical habitats from intrusion by incompatible uses.

Issue: Rare and Endangered Plants and Animals

Goal and Objective: Protect the Planning Area's rare and endangered plants and animals.

Issue: Natural Vegetation Resources

Goal and Objective: Provide for maximum feasible retention of natural vegetation in order to ensure watershed, wildlife, fishery, timberland, and scenic values to the area.

Standish/Litchfield Area Plan

The Standish/Litchfield Area Plan states that, in order to protect wildlife resources, development needs to be limited to large minimum parcel sizes in areas having sensitive wildlife habitat values, including the perimeter of the Fleming and Dakin units of the Honey Lake Wildlife Area and the key deer foraging areas north of Bald Mountain. This recognized need is reflected in Policy 9-A of the Plan:

> 9-A. Lassen County shall conserve and enhance the wildlife and fisheries of the area. Generally, those lands identified as significant wildlife areas by the Department of Fish and Wildlife shall be designated for Intensive or Extensive Agriculture, Conservation or Open Space.

In respect to riparian habitat, the Standish/Litchfield Area Plan contains the following-policy:

> 10-A. The riparian habitat along the Susan River, Willow Creek and various sloughs shall be designated as Conservation Corridor and should be protected from development which would adversely impact the habitat value of such areas. Natural vegetation should be protected and enhanced. Roads and bridges crossing these habitats should be carefully located to minimize disruption of resource value and agriculture.

Susanville Vicinity Area Plan

The Susanville Vicinity Area Plan recognized the value of wild1ife resources, citing that wildlife not only is a resource to watch and enjoy, but also serves an important role in the economy of the

area as many people visit Lassen County to observe wildlife and to hunt and fish. The Plan advised that fish and wildlife habitats near urban areas have special needs and offer unique recreational values if properly managed to minimize the intrusion of development on habitat and the displacement of wildlife living patterns. The Plan contains the goal to:

> Provide for the management and enhancement of wildlife and fishery (Susan River, Paiute Creek) resources by maintaining a compatible relationship between habitats, parks and urban-related development.

Policy 11.1A states:

> 11.1A. Lassen County shall conserve and enhance the wildlife and fisheries of the area and preserve and restore the ecological, recreational and aesthetic benefits of the Susan River and its tributaries.

Wendel Area Plan

As another example, the following policy for "Fish and Wildlife" is contained in the Wendel Area Plan:

> 10-A Lassen County shall conserve and enhance the wildlife and fisheries of the area. Generally, those areas identified as significant wildlife habitat by the California Department of Fish and Game should be designated for intensive agriculture, open space, or extensive agriculture.

Table 2.4 Habitat Types in Lassen County[11]

Habitat	Total Acreage
Red Fir	64,000
Lodgepole Pine	26,000
Mixed Conifer	397,000
Jeffrey Pine	368,000
Juniper	349,000
Montane Hardwood-Conifer	32,000
Montane Riparian	6,000
Low Sage	83,000
Bitterbush	13,000
Sagebush	1,327,000
Montane Chaparral	41,000

[11] Lassen County General Plan, Table WE-1

Mixed Chaparral	11,000
Wet Meadow	19,000
Fresh Wetland	30,000
Riverine-Lacustrine	92,000
Annual Grasslands	8,000
Perennial Grasslands	11,000
Barren	24,000
Total	3,013,000

(NOTE: Habitat types adapted from Calveg (1978) USFS mapping project to reflect habitat types in A Guide to Wildlife Habitats of California, (Mayer and Laudenslayer, 1988). Types from the 1988 Guide not allocated above include subalpine conifer, eastside pine, aspen, alpine dwarf shrub, alkaline desert scrub, and pasture.)

2.4.2 State Wildlife Areas

The State of California owns approximately 69,000 acres of land in Lassen County, most of which is administered by the State Lands Commission whose mission is to serve the people of California by providing stewardship of the lands, waterways, and resources entrusted to its care through economic development, protection, preservation, and restoration. Much of this land is devoted to the provision of wildlife habitat and the protection of wildlife resources under the management of the California Department of Fish and Wildlife (DFW). There are approximately 40,000 acres of state wildlife areas in Lassen County. These areas not only provide habitat for wildlife, they provide areas for hunting, wildlife viewing, and other forms of outdoor recreation.

State wildlife areas in Lassen County include the Honey Lake Wildlife Area, consisting of approximately 7,200 acres divided into the Fleming and Dakin Units and located on the northeast shore of Honey Lake. These wildlife areas offer habitat for waterfowl, upland birds and other wildlife. The objectives of the wildlife areas are to provide waterfowl nesting and production areas as well as migration areas and habitat for the sandhill crane, the bald eagle, and other migrating birds. Habitat for other wildlife is also provided. Areas within the units are used for production of cereal grains as forage for waterfowl and other birds. Located within the path of the Pacific Flyway, a major route of migrating waterfowl, the Honey Lake Wildlife Area offers resources for large numbers of geese, ducks, and shorebirds during peak migration periods in the spring and fall.

Additional wildlife areas managed by DFW in Lassen County include areas near Doyle, Hallelujah Junction, and Bass Hill. These areas primarily serve to provide vital winter habitat for mule deer herds. Other wildlife areas such as those in Willow Creek Valley and Big Valley are primarily intended to provide habitat for waterfowl and other wildlife. The Willow Creek Wildlife Area is over 3,000 acres in size and consists primarily of wetlands. The Ash Creek Wildlife Area in Big Valley is approximately 16,000 acres in size and includes land in both

Lassen and Modoc Counties between the communities of Bieber and Adin. This area provides special habitat for the sandhill crane and cackling geese, among other species. Its management program includes the production of cereal grains as well as the maintenance of wetlands and other habitat for a range of wildlife including waterfowl, upland birds, and big game species.

Acquisition of additional lands by state agencies for wildlife management has been a concern of the Lassen County Board of Supervisors in the last decade. Recent funding for and management of existing wildlife areas is felt to be lacking and inadequate by Lassen County. It is perceived that state-owned wildlife areas threaten or constrict livestock operations and the historic agricultural uses of land and water in those areas. Ownership by the state also removes property from Lassen County's tax rolls; although, under current provisions certain "in-lieu" payments are made by the state to compensate for some of the lost tax revenue.

Lassen County has proposed that improved management and funding of existing wildlife areas would improve wildlife habitat utilization and recreational uses and that better management should, in most cases, be a higher priority than the acquisition of additional lands by the state. It is expected that Lassen County will want to carefully review the proposed benefits of additional state wildlife areas before it supports them.

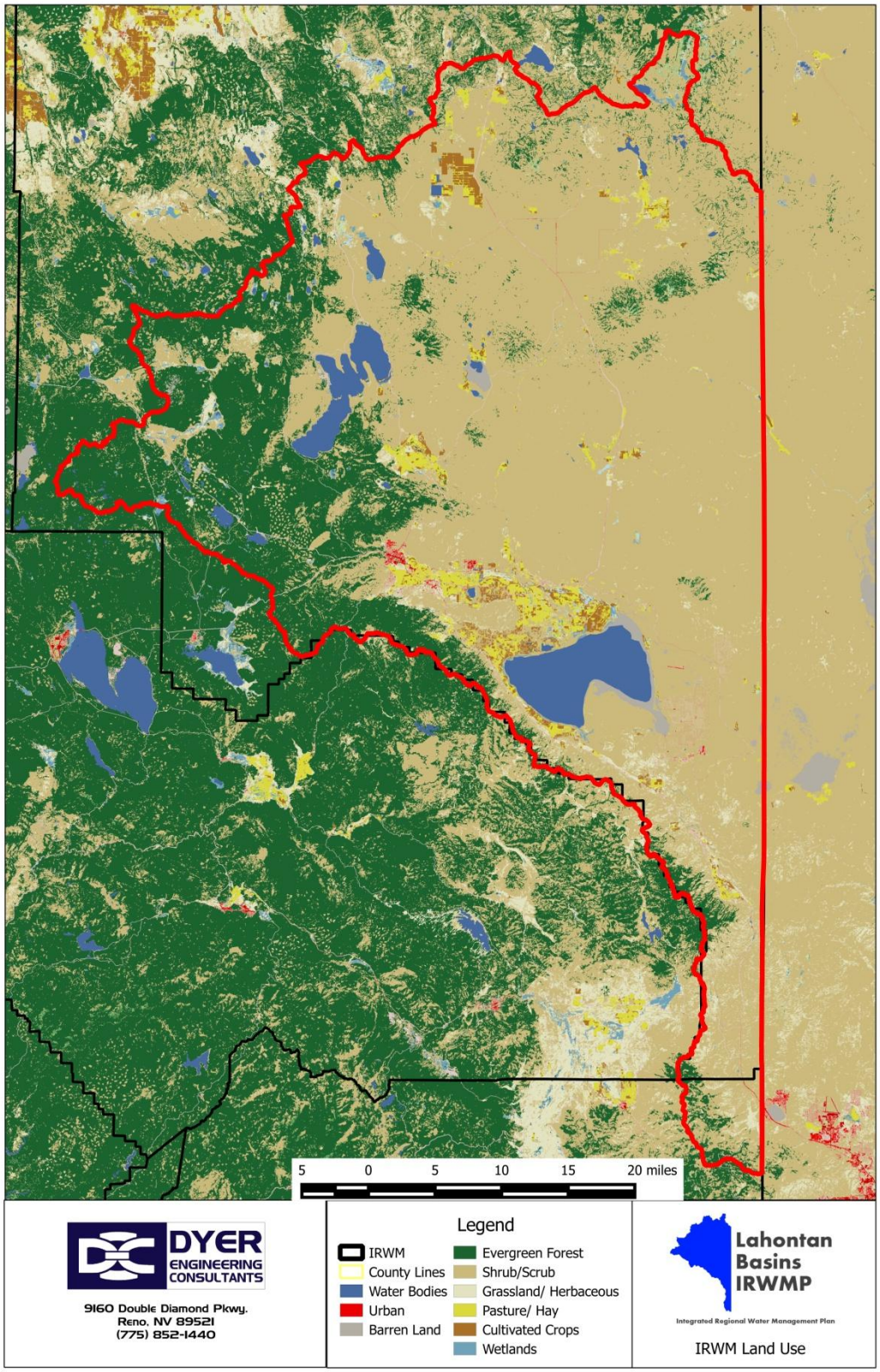


Figure 2.8 Regional Land Use Map

2.4.3 Eagle Lake Rainbow Trout

The Eagle Lake Rainbow Trout (*Oncorhynchus mykiss aquilarum*) is a unique and valuable resource to Lassen County. The species provides recreational opportunities to the people of Lassen County and, as an economic resource, is one of Lassen County's premier attractions for recreationists from outside the area.

For several reasons including historic impacts to its natural habitat, the Eagle Lake Rainbow Trout was advanced in 1994 to Category 2 candidacy under the Federal Endangered Species Act, indicating that it was recognized by the U.S. Fish and Wildlife Service (USFWS) as eligible for possible listing as an endangered species. A number of agencies, including the Eagle Lake Interagency Board of Directors and the Lassen County Board of Supervisors expressed the need to use such programs as the Coordinated Resource Management Planning (CRMP) process to study and provide for the restoration of the Eagle Lake Rainbow Trout and its habitat.

Since the advancement to Category 2 candidacy, the USFWS dropped that category and the Eagle Lake Rainbow Trout now has no official designation by USFWS and there is no current proposal for any level of Federal listing. The proposed listing of the Eagle Lake Rainbow Trout also failed because of the concentrated and cooperative effort made through the Pine Creek CRMP Group with the participation of local land owners, private interests, tribal, and federal and state agencies. Their work and the support of the Eagle Lake Interagency Board of Directors for the recovery and maintenance of healthy, viable populations of Eagle Lake Rainbow Trout precluded the need to list the species.

Eagle Lake Rainbow Trout, however, are a California State Species of Special Concern. DFW recommends clarifying the relationship between the proposed listing and habitat improvement and resource management efforts.

Lassen County is concerned about the long-term health and viability of the Eagle Lake Rainbow Trout. It is also concerned with the consequences that listing as a threatened or endangered species (and, it is assumed, the resulting prohibition in catching and taking the trout) could have in significantly reducing the regional recreational and economic benefits that the species provides. Listing could also significantly constrain other historic resource uses in the watershed (e.g., timber management and grazing).

According to the Department of Fish and Wildlife (October 1997), the assumption that recreation angling would be precluded if the Eagle Lake Rainbow Trout were to be listed is somewhat inaccurate. DFW asserts that the preliminary planning that took place when the possibility of

listing was being proposed never included the proposal to close the sport fishery. It was recognized that there was the possibility that significant changes to various management practices which have contributed to the degradation of the watershed of Pine Creek, including but not limited to railroad and road construction, livestock grazing, timber operations, wetland restoration, etc., may be necessary to restore the viability of the creek for production of Eagle Lake Rainbow Trout. DFW has stated that, had there not been significant changes regarding grazing activities, road construction, etc., the USFWS may have taken an entirely different (and presumably more stringent) position in responding to the petitions which were filed to list the species.

2.5 Internal Boundaries

There are two entities in the Lahontan Basins IRWMP region that use land use jurisdiction: the County of Lassen and the City of Susanville. Both of these entities are contained entirely within the Lahontan Basins IRWMP except for northern Lassen County. The region encompasses the following unincorporated communities: Doyle, Herlong, Janesville, Johnstonville, Litchfield, Milford, Patton Village, and Spalding.

2.6 Water Supply and Demand

Water supply and demand within the region are described in the following sections.

2.6.1 Water Supply

Water supply within the region is primarily groundwater pumped from the Honey Lake Valley Basin. In addition to groundwater sources, there are also local surface water sources. Local surface water sources come from the Susan River and smaller creeks and streams.

The major groundwater basins in the Lahontan Basins are Long, Honey Lake, Willow Creek, Surprise Valley, and the Madeline Plains. Interbasin groundwater flow is limited by geologic structures between basins. Of the 109,000 af of net groundwater used in this area, about 96,000 af are for irrigation and the remaining 13,000 af are for municipal and industrial purposes. Well yields are greatest in alluvial sand and gravel deposits around the margins of the valleys and from buried basalt flows. Some wells yield greater than 3,000 gallons per minute. Yields from

hard rock wells are usually low but are generally sufficient for domestic uses. The total ground water in storage within this group is estimated to be 5,000,000 AF.[12]

The 17,000 af of urban water use within the Lahontan Basins is mostly from groundwater. The 4,000 af of surface water used as an urban water supply is almost all used by the City of Susanville. Susanville, the largest city in the Lahontan Basins, derives most of its municipal water from Cady and Bogwell Springs and some groundwater wells. Pumping rights are in Table 2.6. Increased population and the recent drought have forced Susanville to increase groundwater pumping to supplement reduced surface water supplies. For water supply totals in acre feet refer to Table 2.5.[13]

Table 2.5 Lassen County Supply and Demand Projections (acre-feet)[14]

	Madeline Plains	Susanville	Herlong	Upper Honey Lake	Lahontan Basins Total
Supply Surface Water	31,500	55,600	7,600	28,200	122,900
Supply Groundwater	26,400	38,100	15,400	5,100	85,000
Supply Reuse	3,100	1,500	0	0	4,600
Use Depletion	52,500	79,700	18,900	28,600	179,700
Use Percolation	5,800	13,600	4,000	2,200	25,600
Use Outflow	0	1,900	100	2,500	4,500

The majority of the area irrigated by surface water, has limited water storage facilities and is dependent on snowmelt and spring and summer rainfall. Since most of the surface water irrigation operates with a nonfirm water supply, irrigated acreage and the length of time irrigation water is available fluctuates annually. The crop most subject to these changes is irrigated pasture. Even though acreage in some areas can remain relatively stable, the length of the irrigation season is often shortened since runoff generally decreases as summer progresses. As in most situations when water is in short supply, water is used sparingly and irrigation efficiencies increase. There is no evidence that there will be significant changes in future irrigation efficiencies; however, some increase can be anticipated due to improved irrigation management and the water conservation ethic in the area. The agricultural economy and water users have adapted to the erratic water supply. Table 2.6 and 2.7 show the Susanville groundwater pumping capacity and the projected Susanville water use per capita, respectively.

[12] California Water Plan, North Lahontan Region, Supply with Existing Facilities and Water Management Programs
[13] California Water Plan, North Lahontan Region, Urban Water Use
[14] Susanville Urban Water Management Plan 2010

Table 2.6 Pumping Capacity of Existing City Wells[15]

Name of Facility	Pumping Capacity - AFY
Bunyan Well & Pumping Plant #1	1100
Well & Pumping Plant #3	2100
Well & Pumping Plant #4	1100
Well & Pumping Plant #5	1100
Total	5400

Table 2.7 Susanville Water Use Per Capita, Projected[15]

	2010	2015	2020	2025	2030	2035
Service Area Population	9,791	9,886	10,690	11,224	11,787	12,378
Water Use (MG)	1,163	1,163	1,163	1,163	1,163	1,163
Per Capita Gal/day use	326	322	298	284	270	257

2.6.2 Water Demand

Water demand within the region is variable, depending upon land use, population, and agricultural specifics such as the types of crops grown. Water demand projections for the region are presented in Table 2.5. The projections for urban demands are based on projections from each urban water supplier's most recent UWMP and demands for the unincorporated areas are based on estimates developed for the Lassen County General Plan Update. Table 2.8 provides the historic water use per capita in Susanville.

Table 2.8 Susanville Water Use Per Capita, Historic[15]

	2005	2006	2007	2008	2009	2010
Service Area Population	9,523	9,467	9,351	9,291	9,747	9,791
Water Use (MG)	1,065	853	1,171	1,158	1,027	1,163
Per Capita Gal/day use	306	247	343	341	289	325

The Lahontan Basin is not regulated through a joint powers authority or adjudication. Therefore, there are no defined legal pumping rights or constraints on groundwater pumping for groundwater users in the region. In addition, groundwater demands (groundwater use) are difficult to record within the region, because there are numerous un-metered private groundwater wells. Data analyses indicated that groundwater demands are highest during dry years, likely due to the fact that groundwater is primarily used for agricultural irrigation. Conversely, these

[15] Susanville Urban Water Management Plan 2010

analyses indicate that during wet years when surface water is abundant, groundwater pumping is significantly decreased. This data reinforces the trend noted previously, in which groundwater levels stabilize or recover to a higher elevation during multiple wet years. An integrated groundwater and surface water analysis is being pursued by the region to better characterize water demands.

2.7 Water Quality

Groundwater quality in the Lahontan Basins IRWM region ranges from excellent to poor. Wells that obtain their supply from lake deposits can have high levels of boron, arsenic, and fluoride and a high adjusted sodium absorption ratio. Some domestic wells in the Standish area of Honey Lake Valley have arsenic levels above safe drinking water standards.[16]

The Susan River and Honey Lake appear on the Lahontan RWQCB's 303(d) list as being impaired by salinity and for the presence of metals (Table 2.9). Assessments by NRCS indicated a prevalence of incised channels, sediment deposition, inefficient water diversion and delivery systems and heavy weed encroachment. Surface water users in the lower reaches report relatively high salt content likely accumulated in the tail-water of other fields.

2.7.1 Groundwater Quality

Honey Lake Valley Groundwater Basin

Identified as a priority groundwater basin based on stakeholder input, land use, water source patterns, and existing groundwater well infrastructure, the Honey Lake Valley Groundwater Basin is the source of water for agricultural activities and for the towns of Susanville, Herlong, Doyle, Litchfield, Janesville, Milford, and Standish. It lies at the eastern edge of Lassen County and the western edge of Washoe County, Nevada. The California portion of the Honey Lake Valley Groundwater Basin is approximately 45 miles long and between 10 to 15 miles wide, and includes Lower Long Valley. The Nevada portion of Honey Lake Valley is approximately 9 miles wide, and between 11 and 15 miles long. Figure 2.9 shows the Honey Lake Valley Groundwater Basin. Because the valley lies across state lines, it is the subject of water resource discussions between the two states and groundwater exportation projects have been planned and proposed on the Nevada side of the basin.

[16] California Water Plan, North Lahontan Region

Table 2.9 USEPA 303d Impaired Waters

Water Body	Pollutant/Stressor	Potential Sources	Expected TMDL Completion Date
Eagle Lake	Nitrogen	Agriculture	2019
	Phosphorus	Agriculture	2019
Honey Lake	Arsenic	Natural Sources	2019
	Salinity/TDS/Chlorides	Agriculture/Natural	2019
Honey Lake Area Wetlands	Metals	Natural Sources	2019
	Salinity/TDS/Chlorides	Natural Sources	2019
Susan River (Headwaters to Susanville)	Mercury	Natural Sources	2019
	Total Dissolved Solids	Source Unknown	2021
	Nitrogen	Source Unknown	2021
	Unknown Toxicity	Source Unknown	2019
Susan River (Litchfield to Honey Lake)	Mercury	Source Unknown	2019
	Unknown Toxicity	Source Unknown	2019
Susan River (Susanville to Litchfield)	Mercury	Natural Sources	2019
	Total Dissolved Solids	Source Unknown	2021
	Turbidity	Agriculture	2021
	Unknown Toxicity	Source Unknown	2019

The dominant water feature in Honey Lake Valley is Honey Lake, which covers an area of approximately 90 square miles. Honey Lake is the most prominent surface feature in the basin with an average surface area of 47,000 acres. The lake fluctuates greatly in area and volume. More than 40 streams flow into Honey Lake Valley, most of which are intermittent. Major tributaries to Honey Lake are: Long Valley Creek, the Susan River, and Willow Creek. Long Valley Creek drains Long Valley, and receives water from Dry Valley. The Susan River drains the volcanic plateau located to the west of Honey Lake Valley. Willow Creek drains Willow Creek Valley, north of Honey Lake Valley. The ground surface in Honey Lake Valley slopes towards Honey Lake. The floor of Honey Lake Valley ranges in elevation from 4000 feet msl near Honey Lake, to 4,200 feet msl near the edge of the valley.

Groundwater quality in Honey Lake Valley is generally good with some areas of concern. DWR's Bulletin 118[17] reports that poor quality waters, exist east of Honey Lake, and North of Herlong, near the ordinance depot and that Total Dissolved Solids (TDS) generally increase west

[17] California Department of Water Resources Bulletin 118 Update 2003

to east, and range from 89 mg/L to 2,500 mg/L (DWR 2003). In eastern Honey Lake Valley, there are areas where fault-related water is found, which may be of geothermal origin (Moll 2000)[18]. Water quality concerns regarding trichloroethylene (TCE) are present and are being remediated in the vicinity of the Sierra Army Depot (Brathode 2006)[19]. Nitrate has been reported as a groundwater quality issue near Herlong, and arsenic has been an issue in the playa areas near Honey Lake. Arsenic has been detected in wells at the Sierra Army Depot (Brathode 2006)[7].

Residential septic systems located up gradient from water supply sources (Bagwell springs and Cady Springs) for the City of Susanville represent water quality concerns for nitrates and other pollutants for this municipal supply.[20]

Honey Lake Valley is part of the Basin Range Geomorphic Province that extends into California. The valley is bounded to the north and northeast by Plio-Pleistocene basalt of Antelope Mountain, Shaffer Mountain, Amedee and Skedaddle Mountains, and the Modoc Plateau. The valley is bounded on the southwest by Mesozoic granitic rocks of the Diamond Mountains of the Sierra Nevada Geomorphic Province. Bald Mountain protrudes through the valley floor northwest of Honey Lake.

The basin extends into Washoe County, Nevada. The California portion of the basin is about 45 miles long and varies in width from 10 to 15 miles. The basin is underlain by granitic bedrock at depths of 5,000 to 7,000 feet (USGS 1990)[21]. Annual precipitation ranges from 7 to 15 inches. Surface Area: 311,750 acres (487 square miles).

Groundwater quality:

Characterization: Water quality varies in the basin. Calcium bicarbonate to sodium bicarbonate type waters occur in the Janesville-Buntingville area and south of Herlong and along the southwestern side of Honey Lake. Sodium bicarbonate type waters occur east of Honey Lake and north of the railroad. Poor quality waters, sodium-calcium bicarbonate-sulfate in character, exist east of Honey Lake and north of Herlong near the ordinance depot. Dissolved solids generally

[18] Moll NE. 2000. A Groundwater Flow Model of Eastern Honey Lake Valley, Lassen County, California and Washoe County Nevada
[19] Brathode, James. 27 September 2006. (Lahontan Water Quality Control Board). Telephone conversation with J. Ayres of Brown and Caldwell, Sacramento, California
[20] Lassen County Groundwater Management Plan
[21] Rockwell GL. 1990 Surface-Water Hydrology of Honey Lake Valley, Lassen County, California and Washoe County, Nevada. USGS. OF-90-177

increase west to east and range from 89 to 2,500 mg/L; averaging 518 mg/L (DWR unpublished data)[22].

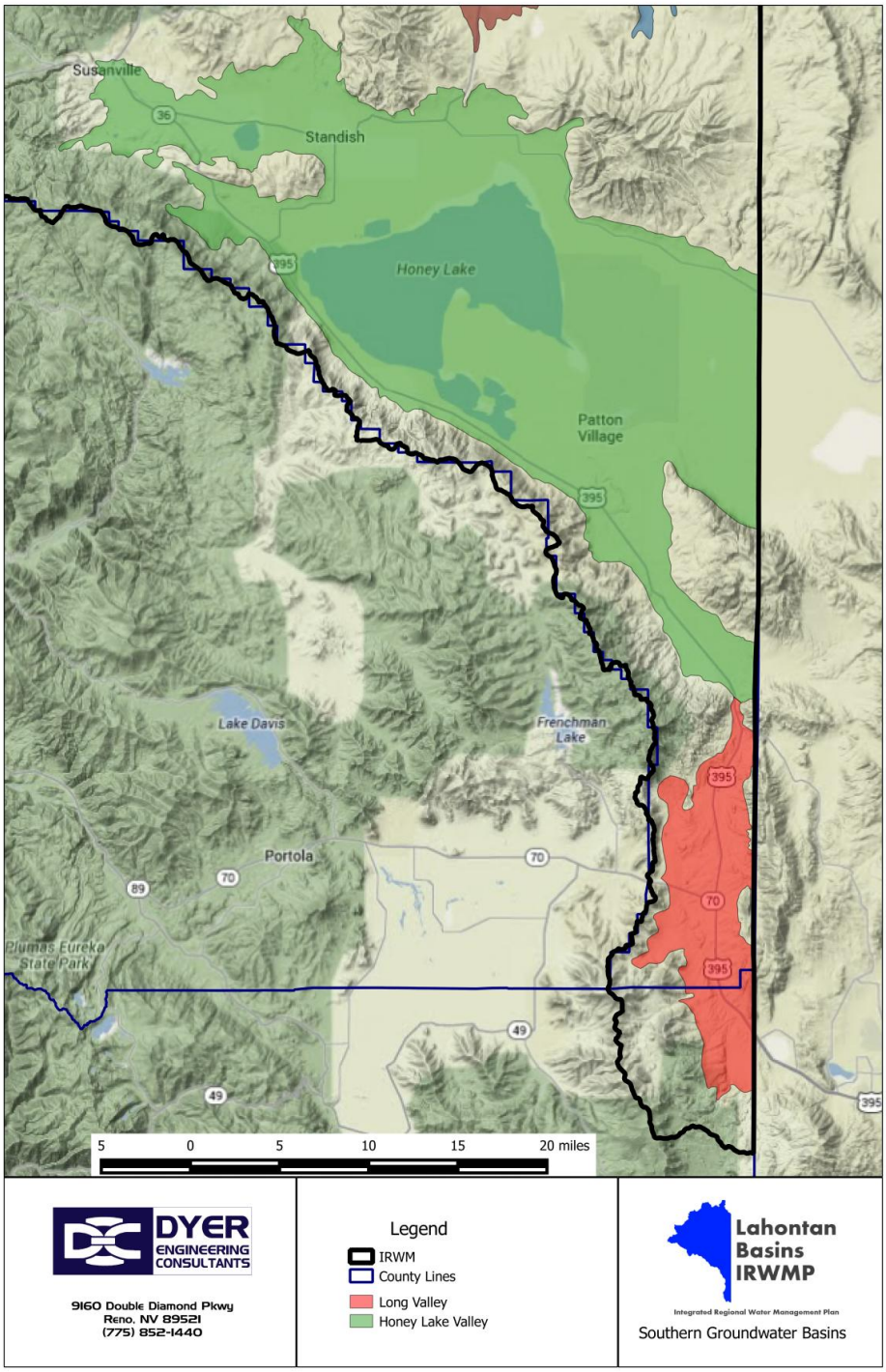


Figure 2.9 Honey Lake Valley Groundwater Basins

[22] Lassen Local Agency Formation Commission (LAFCO) County Service Area 2 Johnstonville Water System *DRAFT*

Impairments: Poor quality water with high boron, arsenic, ASAR, total dissolved solids, fluoride, and nitrate levels occur between Litchfield and Honey Lake, and east of Honey Lake and north of Herlong. Some wells in the vicinity of Standish have high concentrations of arsenic. Thermal waters exist in several areas derived from a fractured bedrock flow system associated with the Honey Lake and Walker Lane fault systems—most notably in the Wendel and Amedee area (Varian 1997). The Juncal and Bohm (1987) investigation indicates that the Wendel-Amedee system is part of a deep flow system with recharge from the Diamond Mountain Range of the Sierra Nevada (Varian 1997). Amedee Hot Springs is on the eastern edge of Honey Lake and is coincident with the extension of Amedee fault (DWR 1968).

Locally, wells have high hardness, boron, fluoride, iron, ammonia, phosphorus, sulfate, manganese, sodium, calcium, chloride, and nitrate levels.

Long Valley Groundwater Basin

Identified as a priority groundwater basin based on stakeholder input, land use, water source patterns, and existing groundwater well infrastructure, the Long Valley Groundwater Basin as identified by DWR in Bulletin 118 underlies Upper Long Valley, which is south of Long Valley, a portion of the Honey Lake Valley Groundwater Basin (Figure 2.9). The boundary between the Long Valley Groundwater Basin and Honey Lake Groundwater Basin occurs at the "narrows", a point on Long Valley Creek where bedrock comes to between 20 and 50 feet below ground surface (NGA 2004). The majority of the Long Valley Groundwater Basin lies in Lassen County, and a small portion of the valley lies in Sierra County. The Lassen County portion of Long Valley is approximately 16 miles long, and 3 miles wide, and the Sierra County portion of Long Valley is approximately 6 miles long, and 2 miles wide. The major water feature in Long Valley is Long Valley Creek, which drains the valley to the north, into Honey Lake Valley, where it is a main source of groundwater recharge.

The Long Valley Groundwater Basin is an elongated north-south trending valley that is bounded by the Diamond Mountains to the west, Peterson Mountains to the east, Peavine Peak to the south, and the Honey Lake Valley to the north. The valley is bordered by Washoe County to the east. Two east-dipping normal faults are inferred to lie along the western and central parts of the valley. The valley is generally an asymmetric half-graben, with sedimentary sequences that dip westward (DWR 2003).

The ground surface regionally in Upper Long Valley slopes locally inward Long Valley Creek and towards the north. The floor of Long Valley ranges in elevation from 4,600 feet msl at the

north end of the valley, to 5,000 feet msl in the upper end of the valley. Long Valley has extensive bench lands and gently sloping hills. Long Valley Groundwater Basin is near Reno, and has been the subject of proposals of interstate water transfers. It is an interstate basin, sharing a watershed with Washoe County, Nevada.

There are 33 domestic well records on file, and no irrigation well records on file for Long Valley. Approximately 50 percent of domestic wells are shallower than 150 feet deep. Annual precipitation ranges from 25 to 27 inches. Surface Area: 1,090 acres (2 square miles).

Dry Valley Groundwater Basin

The Dry Valley Groundwater Basin is a closed basin bounded by Dry Valley Ridge to the east and Grasshopper Ridge to the west (Figure 2.10). The basin is located west of Madeline Plains and is bounded on all sides by Plio-Pleistocene basalt (Lydon 1960). Faulting in the region is generally northwest trending and serves as a basin boundary to the east. Annual precipitation ranges from 13 to 17 inches, increasing to the west. Surface Area: 6,500 acres (10 square miles).

Groundwater quality:

Characterization: Information regarding water characterization is not available. For the Madeline Plains basin to the east, the water type is bicarbonate with mixed cationic character. The concentration of total dissolved solids ranges from 81 to 1790 mg/L; averaging 402 mg/L (DWR unpublished data).

Impairments: Areas of the Madeline Plains basin have high conductivity and salinity concentrations. There are locally high total dissolved solids, hardness, nitrates, iron, boron, calcium, magnesium, sodium, ASAR, sulfate, and chloride that occur in the basin.

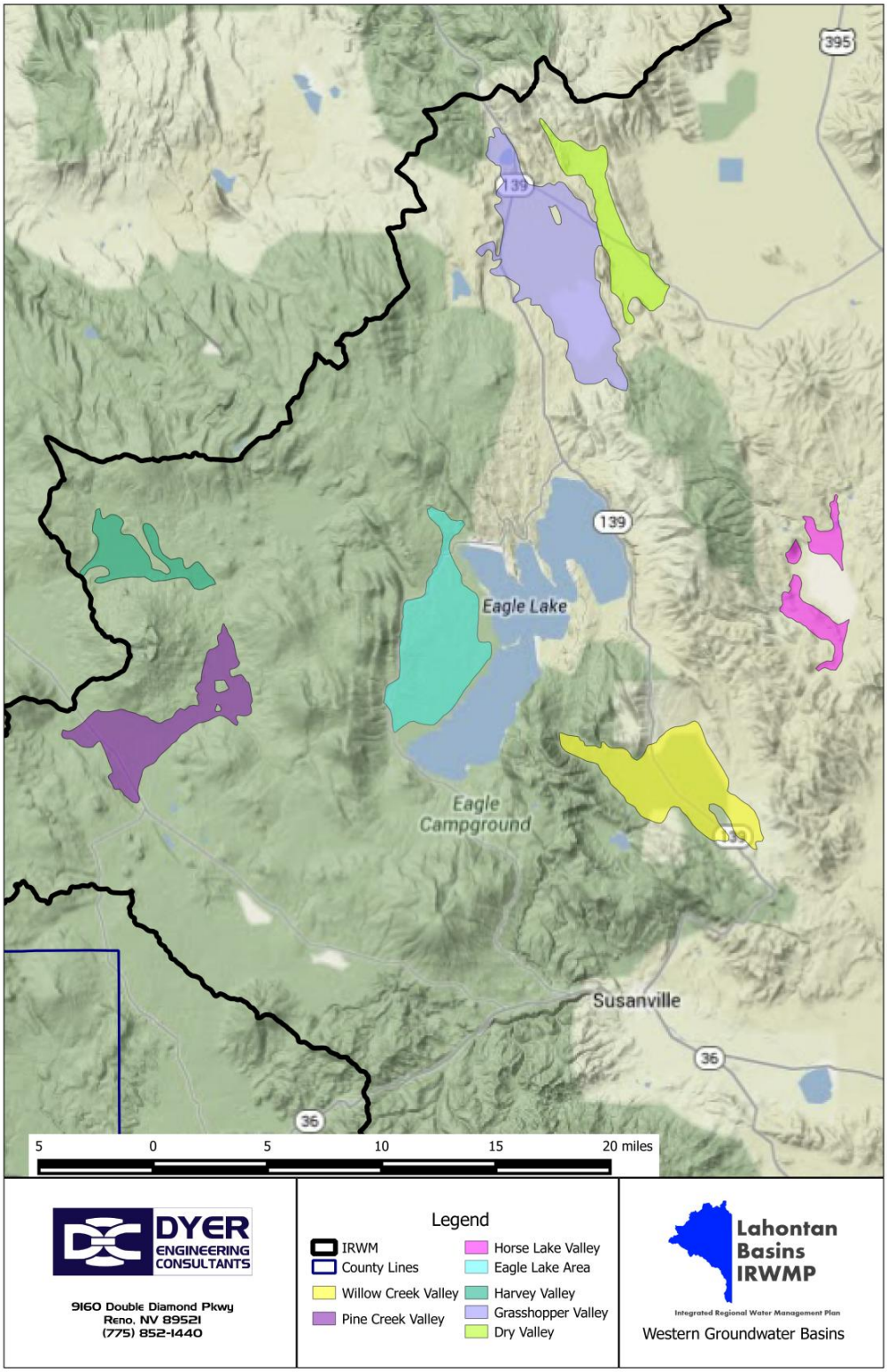


Figure 2.10 Groundwater Basins (West)

Grasshopper Valley Groundwater Basin

The Grasshopper Valley Groundwater Basin is a closed basin bounded primarily by Plio-Pleistocene basalt (Figure 2.10). Miocene basalt bounds the basin to the north (Lydon 1960). Faulting in the region generally trends to the northwest and likely serves as barrier to the east. Grasshopper Ridge separates much of Grasshopper Valley from Dry Valley to the east. Annual precipitation ranges from 13 to 19 inches, increasing to the west. Surface Area: 17,670 acres (28 square miles).

Groundwater Quality:

Characterization: Information regarding water characterization for the Grasshopper Valley Groundwater Basin is not available. For the Madeline Plains basin to the east, the water type is bicarbonate with mixed cationic character. The concentration of total dissolved solids ranges from 81 to 1790 mg/L; averaging 402 mg/L (DWR unpublished data).

Impairments: Areas of the Madeline Plains basin have high conductivity and salinity concentrations. There are locally high total dissolved solids, hardness, nitrates, iron, boron, calcium, magnesium, sodium, ASAR, sulfate, and chloride that occur in the basin.

Eagle Lake Area Groundwater Basin

The Eagle Lake Area Groundwater Basin consists of a narrow strip of Quaternary lake deposits that encircle much of Eagle Lake and that overlie Holocene basalt (Figure 2.10). Groundwater development in the basin is primarily along the west and northwest shore of the lake where sufficient flat shoreline area occurs. The basin is bounded to the north and east by Pliocene volcanic rocks of Bald Hills and Fredonyer Peak. The basin is bounded to the west by recent volcanic basalt of Upper Brockman Flat and bounded to the south and southeast by Pleistocene basalt and recent basalt of Little Merrill Flat and Black Mountain (Grose 1992). Pine Creek, which flows into the basin from the west, is the largest tributary to the enclosed basin. Annual precipitation in the basin ranges from 21 to 25 inches.

Groundwater Quality:

Characterization: Groundwater in the basin is bicarbonate in character and low in dissolved solids (DWR 1992). DWR (1990) notes that numerous wells have exhibited water quality

degradation possibly due to poor construction and proximity to septic system leach fields or shallow groundwater.

Willow Creek Groundwater Basin

The Willow Creek Groundwater Basin is bounded by Pleistocene to Plio-Pleistocene basalt of Horse Lake Mountain to the north, Mesozoic granite rocks of Deans Ridge to the west, and by Pleistocene basalt of Susanville Peak and Antelope and Tunnison mountains to the south (Figure 2.10).

Willow Creek originates from artesian springs in the northwestern part of the valley and flows southeasterly through the valley to Honey Lake Basin. Groundwater generally flows southeasterly in the valley. Annual precipitation ranges from 21 to 23 inches. Surface Area: 11,700 acres (18 square miles).

Groundwater quality:

Characterization: Bicarbonate-type waters occur throughout the basin. The concentration of total dissolved solids ranges from 90 to 1,200 mg/L, averaging 401 mg/L (DWR unpublished data).

Horse Lake Groundwater Basin

The Horse Lake Groundwater Basin is located south of Madeline Plains and east of Eagle Lake (Figure 2.10). The basin encompasses Horse Lake and is bounded to the southeast by Pleistocene volcanic basalt and on all other sides by Pliocene basalt with outcrops of Pleistocene basalt (Gay 1960). Faulting in the region transects the basin in both northwest and north-northeast directions. The primary water-bearing formation in the basin is Holocene alluvium. Annual precipitation is approximately 13 to 19 inches, increasing to the south. Surface Area: 3,800 acres (6 square miles).

Pine Creek Valley Groundwater Basin

The Pine Creek Valley Groundwater Basin is an alluvial filled valley located in southwest Lassen County at the base of Crater Lake Mountain to the south and southeast. The basin is bounded by recent basalt of Crater Lake Mountain to the north. The basin is bounded on all other sides by Pleistocene basalt of Bogard Buttes, South Valley Butte, and Campbell, Antelope, and

Logan mountains (Figure 2.10). Annual precipitation ranges from 29 to 33 inches. Surface Area: 9,530 acres (15 square miles).

Madeline Plains Groundwater Basin

Madeline Plains Groundwater Basin is a closed basin bounded by mountainous terrain consisting predominantly of Plio-Pleistocene basalt. The mountains are dominated by the old volcanic cones of Observation Peak, McDonald Peak, and Heavey Mountain. The basin includes the subbasins of Madeline and Ravendale. The Ravendale and Madeline subbasin boundary is near Termo (Figure 2.11). Annual precipitation ranges from 11 to 17 inches. Surface Area: 156,150 acres (244 square miles).

Groundwater quality:

Characterization: The water type in the basin is bicarbonate with mixed cationic character. The concentration of total dissolved solids ranges from 81 to 1790 mg/L; averaging 402 mg/L (DWR unpublished data).

Impairments: Areas of the basin have high conductivity and salinity concentrations. There are locally high total dissolved solids, hardness, nitrates, iron, boron, calcium, magnesium, sodium, ASAR, sulfate, and chloride that occur in the basin.

Secret Valley Groundwater Basin

Secret Valley Groundwater Basin is bounded by the Plio-Pleistocene to Pleistocene basalt of Five Springs Mountain and the Skedaddle Mountains on the east and south, and Snowstorm Mountain on the north. To the west is South Plateau which is a broad lava field of Pleistocene basalt (Figure 2.11). Secret Creek originates north of Secret Valley, flows southwesterly through the valley, and continues southerly through Balls Canyon to the Honey Lake Basin. The major tributaries to Secret Creek are Snowstorm Creek on the west and Deep Creek on the east. Annual precipitation ranges from 9 to 11 inches. Surface Area: 33,680 acres (53 square miles).

Groundwater quality:

Characterization: Sodium bicarbonate type water is the main water type found in the basin. The concentration of total dissolved solids ranges from 125 to 3,200 mg/L; averaging 818 mg/L (DWR unpublished data).

Impairments: Some high adjusted sodium absorption ratio levels have been found in groundwater in the basin.

Bull Flat Groundwater Basin

The Bull Flat Groundwater Basin is located east of Secret Valley and extends beyond the California border into Nevada (Figure 2.11). The basin consists of elongated valleys that are bounded by Quaternary and Plio-Plistocene volcanic basalt of Five Springs Mountain, Cherry Mountain and the northern extents of Skedaddle Mountains (Lydon 1960). The basin generally trends to the northeast with an arm extending to the northwest along the base of Five Springs Mountain. Basin deposits consist of Quaternary alluvium and Tertiary lake deposits. Annual precipitation ranges from 9 to 11 inches. Surface Area: 18,100 acres.

Painters Flat Groundwater Basin

The Painters Flat Groundwater Basin is part of the Lahontan Drainage Basin and is located east of Madeline Plains extending into Nevada (Figure 2.11). The basin is bounded on all sides by Pliocene basalt (Lydon 1960). Annual precipitation is approximately 15 inches. Surface Area: 6,400 acres (10 square miles).

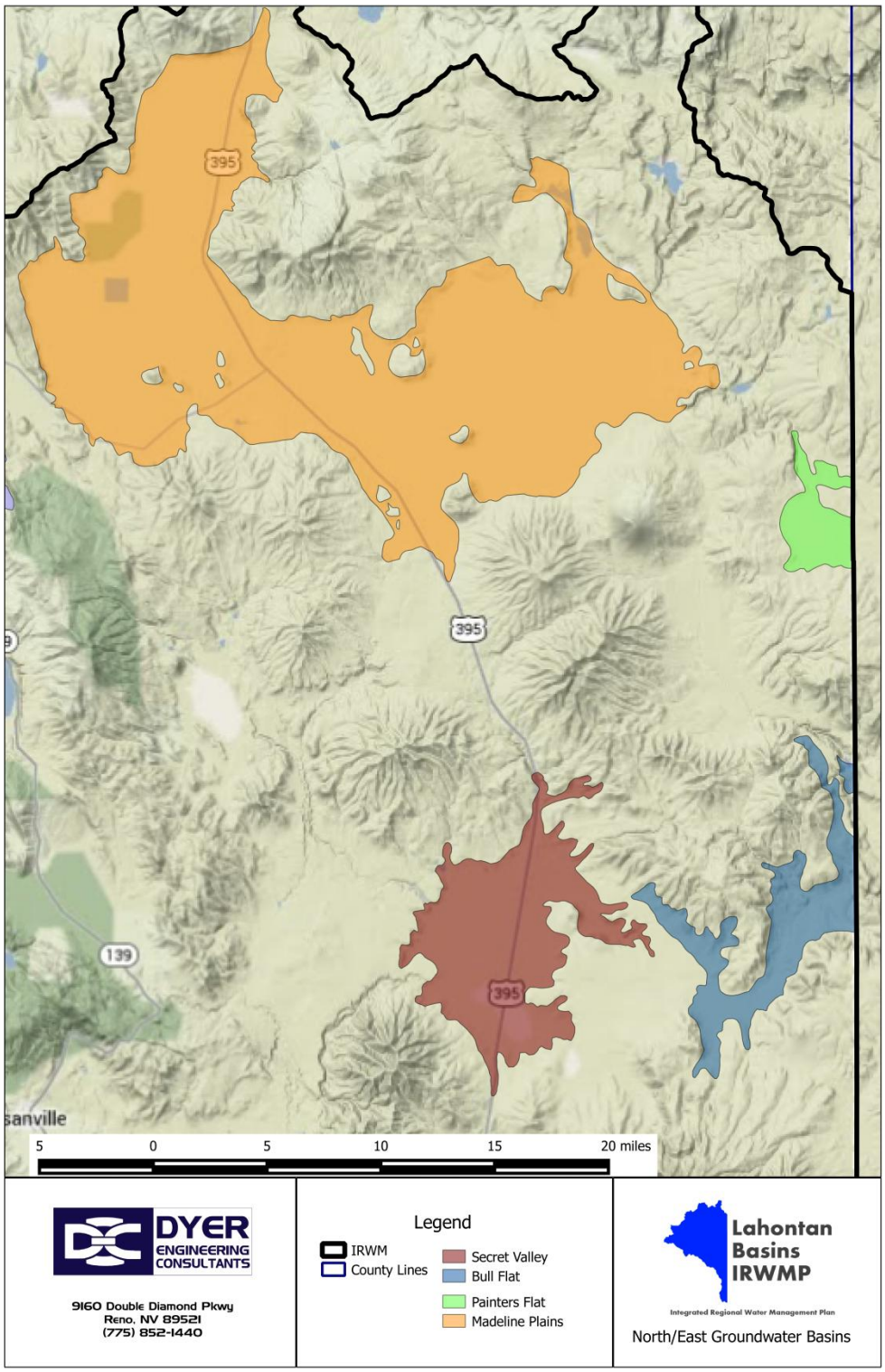


Figure 2.11 Groundwater Basins (North)

2.7.2 Surface Water Quality

The hydrologic characteristics of Lahontan Basin's rivers and creeks vary depending on the watershed of origin, area-elevation relationships, and snowfall accumulation patterns. This section describes flows on two of Lahontan Basin's rivers and creeks: Susan River and Long Valley Creek.

There are three watersheds in the Lahontan Basins IRWMP, including Madeline Plains, Smoke Creek, and Susan River, as shown in Figure 2.4. The Susan River flows easterly to Honey Lake in the central portion of Lassen County. Long Valley Creek flows from Upper Long Valley north into Honey Lake. Honey Lake, the largest lake in Lassen County, receives water from the Susan River, Long Valley Creek, Baxter Creek, and Willow Creek.

Several streams in the Lahontan Basins IRWMP are adjudicated. Adjudication is the process by which the amount of water that may be diverted by users of the stream is prescribed, and usually enforced by a water master. Adjudicated streams in Lassen County include: Ash Creek, Baxter Creek, Hallett Creek, Long Valley Creek, Mill Creek, Parker Creek, and the Susan River (DWR 1992). Figure 2.12 provides a map of listed impaired water bodies within the region.

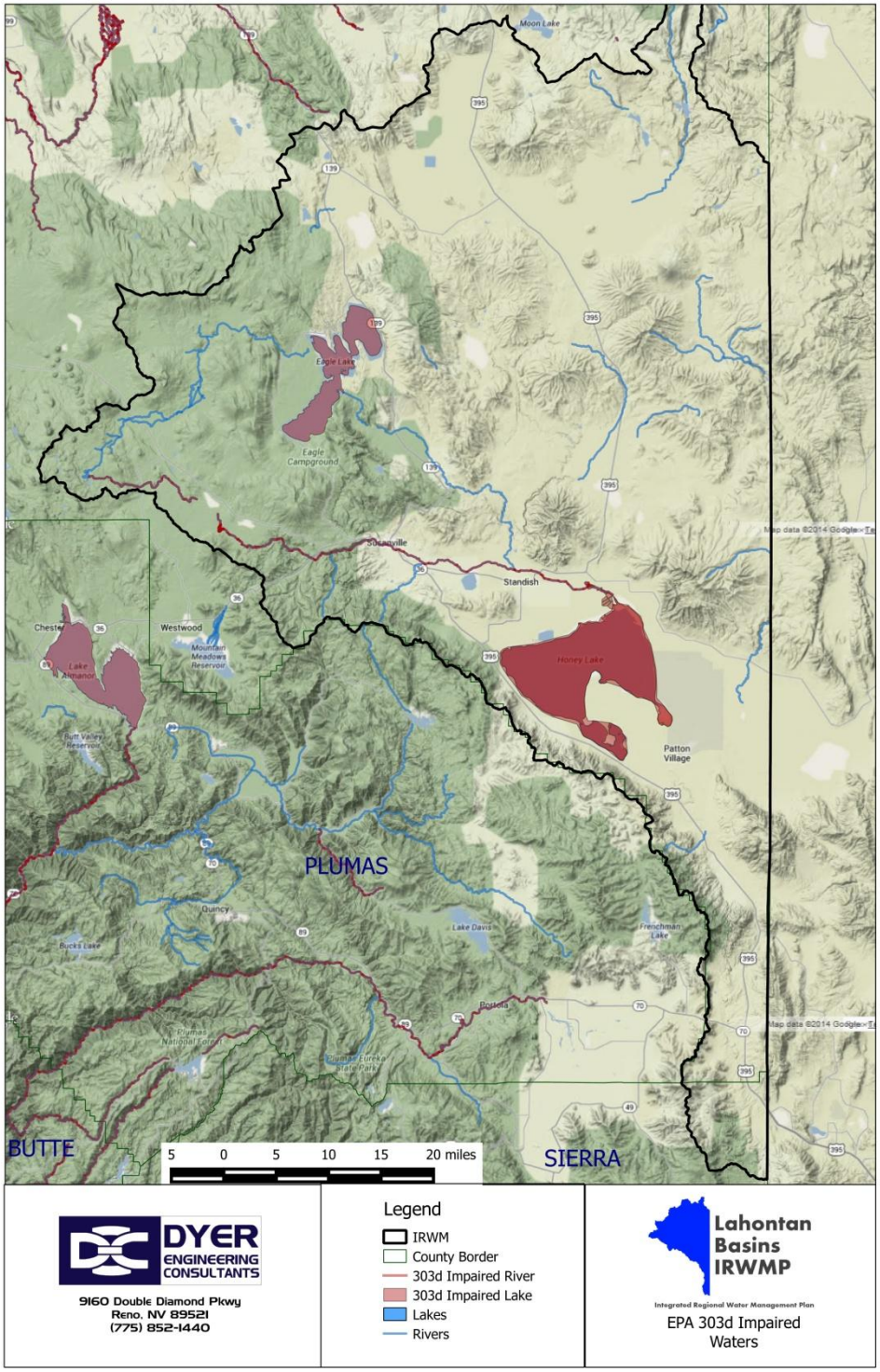


Figure 2.12 Listed Impaired Water Bodies within the Region

2.7.3 Drinking Water Quality

As discussed previously, drinking water is provided within the region via a multitude of water supply agencies. Drinking water quality is regulated through several agencies, including the State Water Board Division of Drinking Water and the United States Environmental Protection Agency (USEPA), entities responsible for setting Maximum Containment Levels (MCLs) for various water quality constituents to protect human health. Drinking water supplied by the region's water purveyors to incorporated cities and unincorporated communities is therefore required to comply with state and federal drinking water quality standards.

The quality of drinking water in the Lahontan Basins varies between excellent and poor. Wells that obtain their supply from lake deposits can have high levels of boron, arsenic, and fluoride and high adjusted sodium absorption ratio. Some domestic wells in the Standish area of Honey Lake Valley have arsenic levels above safe drinking water standards. Much of this contamination is due to naturally occurring deposits, and it is not likely that climate change effects will alter the quality of these groundwater resources.[23]

However, the increased risk of catastrophic wildfire associated with a changing climate, higher temperatures, a longer dry season, and prolonged periods of drought, complemented by extreme storm events, can result in run-off and sedimentation that pose a significant threat to water quality in the Lahontan Basins. The Lassen National Forest component of the Ecological Restoration Implementation Plan focuses on catastrophic fire prevention as important next steps in preparing an ecosystem for adaptability to climate change.

Provided in Table 2.10 is a list of containments that have tested positive in various service areas within the Lahontan Basins IRWM region. This information was provided by the California Health Department with input from the Environmental Health Department.

Table 2.10 Known Contaminants in Public Water Supplies[1]

Area in Lassen County	Nitrate MCL 45mg/L	Arsenic MCL 10 ug/L	Uranium MCL 20 pCi/L	Iron MCL 300 mg/L	Manganese MCL 50 mg/L
Herlong			X	X	X
East of City of Susanville		X			
Richmond		X			
Standish		X			
Johnstonville	X				X

[23] California Water Plan, North Lahontan Region

West Honey Lake	X				
Bieber				X	X

2.8 Social and Cultural Composition

The region is home to a diverse and growing population. The following sections describe regional demographics.

2.8.1 Population and Housing Information

In general, population in the region is growing, with average growth rates for Lassen County growing by 3.2% from 2000 to 2010. Continued population growth within the region has the potential to impact water management as domestic water demands and wastewater generation increase. Historically, agricultural water demands have dominated in the region, so as population increases within the region, water supply management will need to adapt to accommodate increasing municipal and domestic needs associated with urban development (Lassen County 2010).

Table 2.11 provides an overview of population and household statistics for the incorporated city of Susanville, as well as the larger unincorporated communities within the region.

Table 2.11 2010 Population and Housing Data for the region[24]

City or Community	Population	Average Household Size	Housing Units	% Owner Occupied	% Renter Occupied
Susanville*	17,947	2.46	4,256	51.5%	48.5%
Doyle	678	2.6	318	68.2%	31.8%
Herlong	298	3.21	139	0%	100.0%
Janesville	1,408	2.62	615	86.0%	14.0%
Johnstonville	1,024	2.77	395	77.3%	22.7%
Litchfield	195	2.8	94	67.5%	32.5%
Milford	167	2.42	81	69.6%	30.4%
Patton Village	702	2.43	345	62.6%	37.4%

[24] United States Census Bureau
* Includes HDSP/CCC Population

Spalding	178	2.22	665	86.2%	13.8%
California	37,253,956	3.88	13,680,081	57.4%	42.6%

2.8.2 Economic Profile

A DAC is defined by the State of California as a community with an annual Median Household Income (MHI) that is less than 80% of the statewide MHI. The 2010 State MHI was $60,883; therefore, communities with an average MHI of $48,706 or less are DACs by the state's definition. Communities in the Lahontan Basins region which meet the state's definition of a DAC are Doyle, Herlong, Litchfield, Susanville, and Spalding. Table 2.12 shows the medium household income of the communities in the Lahontan Basins region. On the following page, Figure 2.13 provides a map of designated DAC communities.

Table 2.12 Lahontan Basins Medium Household Income[25]

Community	Medium Household Income
Susanville	$45,198
Doyle	$43,185
Herlong	$42,875
Litchfield	$38,162
Spalding	$30,139
Patton Village	$49,375
Milford	$59,125
Janesville	$72,738
Johnstonville	$65,795

[25] California Department of Housing and Community Development

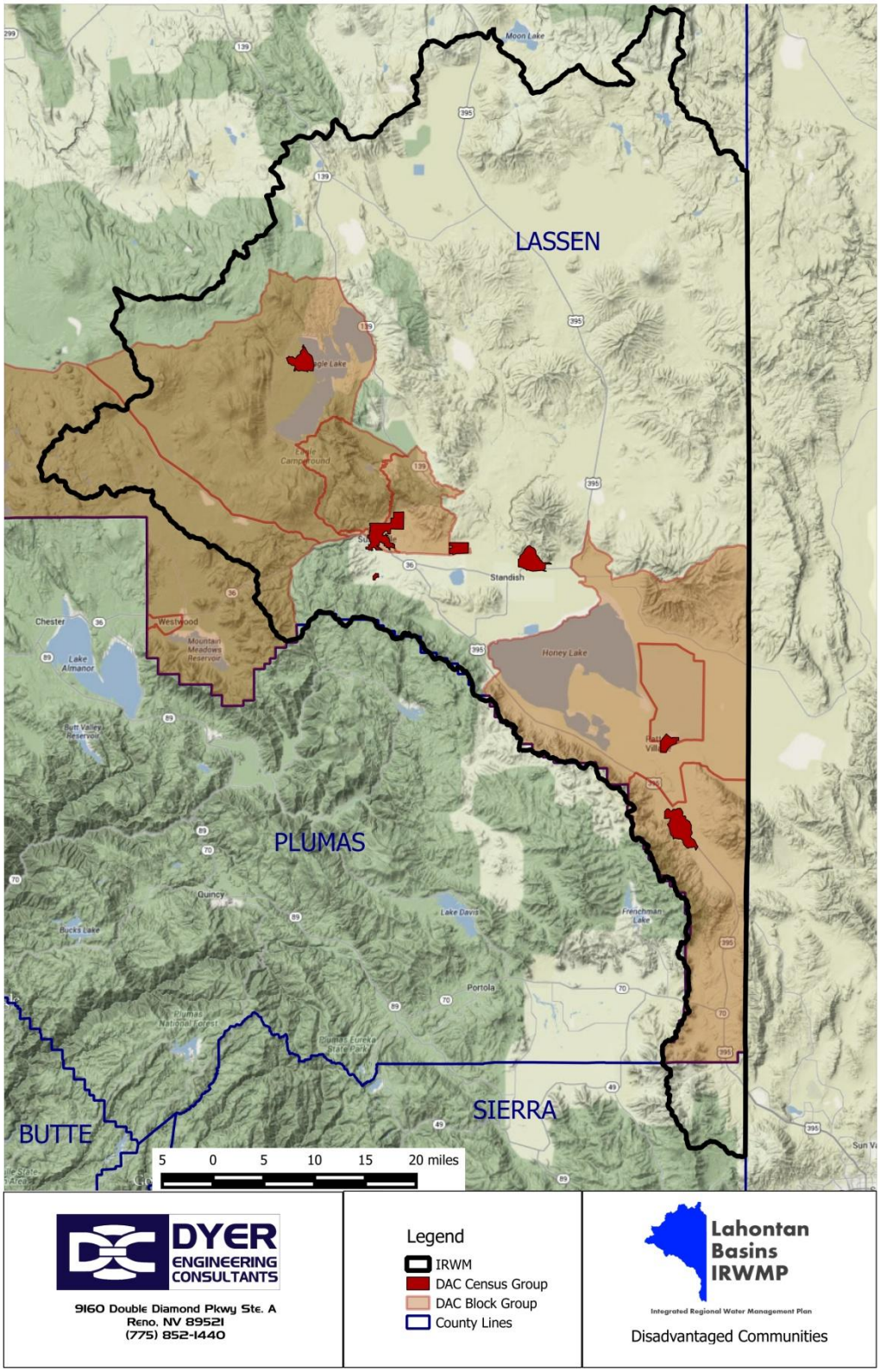


Figure 2.13 Designated DAC Communities

2.8.3 Culture and Diversity

There are a number of distinct Native American tribes with aboriginal territories and historical interest in natural and cultural resources conservation and management in the Lahontan Basin region. One of these is the Susanville Indian Rancheria (SIR) comprised of Mountain Maidu, Northern Paiute, Pit River and Washoe tribes. The SIR was founded in 1923 as a sovereign domestic dependent nation and federally recognized American Indian tribe. The SIR is located in Susanville, CA and has a land base of 1,100.74 acres in trust status and 240 acres in fee status totaling 1340.74 acres. Historically, Lassen County and the Susanville Area was a place of transition where territories of different indigenous people converged. Cultural resources are sacred to the people and include not only artifacts such as hand stones, mortar bowls, metates, projectile points and petroglyphs, but also wildlife, trees, ethnobotanicals, land, streams, lakes and waterways. Native people believe that clean water is a living sacred element that is important for ceremony and life. The SIR is committed to preserving, protecting and maintaining the culture, language, customs, ancestral and sacred sites, and the beliefs of the Maidu, Paiute, Pit River and Washoe people.

The region has a well-established and growing Hispanic/Latino population as well, which constitutes the largest single ethnic group in Lassen County. The ethnic composition of prisoners from the High Desert State Prison and the California Correctional Center is factored into Table 2.13.

Nearly 200 counties nationwide, including seven in California, have at least 5% of their "residents" in prison. Lassen County, home to two large state prisons and one federal penitentiary, has 45% of its residents behind bars. Those prisoners also distort demographic data. More than 90% of blacks in the county are incarcerated. [26]

Table 2.13 2010 Ethnic Composition of the region[27]

City or Community	White	Hispanic/Latino	African American	Other
Susanville*	62.8%	23.7%	12.5%	1.0%
Doyle	86.0%	8.1%	5.5%	0.4%
Herlong	62.8%	15.4	12.8%	9.0%
Janesville	90.1%	8.4%	0.9%	0.6%

[26] *The Prison and the Gallows: The Politics of Mass Incarceration in America,* Marie Gottschalk, PhD.
[27] http://www.dof.ca.gov/research/demographic/state_census_data_center/census_2010/
* Includes HDSP/CCC Population

Johnstonville	90.7%	7.1%	0.7%	1.5%
Litchfield	90.3%	8.8%	0.0%	0.8%
Milford	89.8%	6.6%	0.6%	3.0%
Patton Village	78.6%	8.8%	6.8%	5.8%
Spalding	94.4%	3.4%	0.0%	2.2%
California	40.1%	37.6%	6.6%	15.7%

2.9 Major Water Related Objectives and Conflicts

The LBIRWMP is intended to be a useful future guide to the region. As part of this process, the region has identified major water-related conflicts and objectives, which will guide the IRWM Program as it moves forward. The objectives of the LBIRWMP are presented in Chapter 4 Objectives along with a discussion of the major water related needs that have been identified by stakeholders and which led to these objectives.

2.10 Potential Effects of Climate Change on the region

There is diverse scientific evidence that global climate conditions are changing and will continue to change as a result of the continued build-up of greenhouse gases (GHGs) in the Earth's atmosphere. Changes in climate can affect municipal water supplies through modifications in the timing, amount, and form of precipitation, as well as water demands and the quality of surface runoff. These changes can affect all elements of water supply systems, from watersheds to reservoirs, conveyance systems, and treatment plants.

Perhaps more pressing for the region is the changing and variable climate experienced as an ongoing condition that brings drought periods on a regular basis. Drought is a constant concern in the region and proper planning and conservation measures should be taken to mitigate the climate changes.

Planning for and adapting to anticipated changes in climate will be essential to ensuring water supply reliability for all users and to protecting sensitive infrastructure against more frequent and extreme precipitation and wildfire events. Chapter 14 summarizes anticipated climate change impacts on the State of California and the Lahontan Basins region, evaluates the impacts of those changes with regard to water resource management, assesses the vulnerability of the region to anticipated climate change impacts, and provides recommended adaptation and mitigation strategies to address uncertainty and reduce GHG emissions. In addition, a plan for ongoing data collection to fill data gaps and monitor the frequency and magnitude of local hydrologic and atmospheric changes is provided.

As described in Chapter 14, primary water users in the Lahontan Basins IRWMP region include urban users, agriculture, and the environment. Water supplies include groundwater and surface water, with groundwater coming from the Honey Lake Valley (predominantly), Secret Valley, Madeline Plains, and Eagle Lake and surface water being diverted primarily from the Susan River, Pine Creek, and Long Valley Creek. Declining Sierra Nevada snowpack, earlier runoff, and reduced spring and summer stream flows will likely affect surface water supplies and shift reliance to groundwater resources, which are already over-drafted in many places. This will, in turn, affect critical natural resource issues in the region, such as agricultural land conversion, population growth, air, water and soil quality concerns, and loss of habitat.

Other anticipated regional impacts resulting from climate change (increased air temperatures and variable precipitation) include changes to water quality; increased flooding, wildfires, heat waves, and impacts to ecosystem health. Earlier springtime runoff will increase the risk of winter flooding as capturing earlier runoff to compensate for future reductions in snowpack would take up a large fraction of the available flood protection space, forcing a choice between winter flood prevention and maintaining water storage for summer and fall dry-period use. Under the 'business-as-usual' climate change scenario (A2), wildfires could increase by 100% or more by the end of the century (CNRA 2009). Some of these impacts on water resources management are already being observed within the region.

The identified vulnerabilities within the Lahontan Basins region are summarized in Table 2.14 and further described in the following sections.

Table 2.14 Lahontan Basins region Vulnerabilities

Vulnerability	Description
Water Demand	Vulnerable to increased agricultural demands due to longer growing season, increased temperatures and evapotranspiration rates, and more frequent/severe droughts. Vulnerable to increased urban and commercial, industrial, and institutional (CII) demand due to increased outside temperatures.
Water Supply and Quality	Vulnerable to decreased snowpack in the Sierra Nevada, shifts in timing of seasonal runoff, increased demands exacerbating groundwater overdraft, degraded surface and groundwater quality resulting from lower flows, exaggerated overdraft conditions, a reduction of meadows which can provide contaminant reduction, and more frequent/severe droughts and storm events increasing turbidity in surface supplies.
Flood Management	More severe/flashier storm events and earlier springtime runoff leading

	to increased flooding, and a reduction of meadows which help reduce floods in the winter.
Ecosystem and Habitat	Vulnerable to decreased snowpack, more frequent/severe droughts and wildfires shift in seasonal runoff, increased low flow periods and increased water temperatures (degraded water quality).

Governance

3.0 Governance 3
3.1 Lahontan Basins IRWMP Governance Structure 3
3.1.1 Regional Water Management Group 4
3.1.2 Technical Advisory Committee (TAC) 7
3.1.3 Special Interest Workgroups / Stakeholders 8
3.2 Entities Adopting the LBRWMP 8
3.3 Public Involvement 8
3.4 Decision-Making Process 9
3.5 Communication 9
3.6 Coordination 9
3.7 Plan Updates 9

Figures

Figure 3.1 Lahontan Basins IRWMP Governance Structure 4

Tables

Table 3.1 RWMG Agency Description 5

This chapter addresses the Integrated Regional Water Management (IRWM) Governance Plan Standard, which requires IRWM Plans to:

- Document a governance structure that ensures the IRWM Plan will be updated and implemented beyond existing Sate grant programs
- Describe the RWMG responsible for development and implementation of the plan and explain how the RWMG meets the California Water Code definition
- Identify the RWMG and individual project proponents who adopted the plan
- Describe how the chosen governance addresses public involvement, effective decision making, balanced access and opportunity for participation, effective communication, long-term implementation, coordination with neighboring IRWM regions and State and federal agencies, collaboration and process for updating the plan.

The California Water Code (CWC) defines a Regional Water Management Group as: "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 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 Lahontan Basins IRWM planning process was initiated in 2012 by a RWMG consisting of a consortium of municipal and agricultural water purveyors and other interest groups that includes most of the agencies with water supply, water quality and water management authority in the region. The RWMG has been meeting since 2013 to develop technical data and management strategies to improve the health of the region's water resources. In 2012 the Lahontan Basins RWMG was established to encourage cooperative planning among additional aspects of water resources management beyond groundwater management and to lay the groundwork for development of the LBIRWMP. This RWMG completed the IRWM program RAP application in 2012, which resulted in the approval of the LBIRWMP regional boundary. In November 2013, the Honey Lake Valley Resource Conservation District secured a DWR IRWM Planning Grant to develop the first Lahontan Basins IRWM Plan.

In 2012, RWMG transferred responsibility for the region's IRWM planning to an interim RWMG, comprised of LIC, Honey Lake Valley RCD, City of Susanville and Susanville Indian Rancheria responsible for overseeing the development of the LBIRWMP. In coordination with a consultant, the interim RWMG developed this LBIRWMP, which includes a long-term governance structure for continued planning and implementation of the plan.

3.0 Governance

3.1 Lahontan Basins IRWMP Governance Structure

This section provides a description of the governance structure that oversaw the IRWM planning process as well as governing the implementation of the plan well into the future. The members of this group met on a regular basis (monthly) in order to facilitate the development of the IRWM planning process within the Lahontan Basins. They will continue to oversee and participate in the continued development of the IRWM Plan.

The RWMG was originally formed through a Memorandum of Understanding (MOU) that prescribed the preliminary roles and responsibilities for the RWMG including complying with the IRWM Plan sections of the California Water Code. The RWMG agreed to contribute "in kind contributions" to help develop the IRWM Plan, provide and share information, review and comment on draft sections of the IRWM Plan, and adopt the final IRWM Plan.

It was decided by the RWMG to draft bylaws for the RWMG for the following reasons: MOUs provide a start to governance, though bylaws set operating standards (terms and duties of officials, decision making process, etc.), define meeting type and procedure, and define the role of the RWMG and TAC. Bylaws would stand alone and are not an amendment to the MOU. The bylaws are attached to the governance section as Appendix D.

The RWMG members are listed in Table 3.1 along with a description of how each agency is responsible for statutory authority over water supply or water management within the Lahontan Basins region by noting whether the agency has authority or not. All agencies listed in Table 3.1 have adopted the Agreement (excluding Lassen County) and participate in the financing and governance of IRWM Plan implementation. The composition of the RWMG provides a good cross-sectional representation of all water/natural resource and land-use management activities for the Lahontan Basins region.

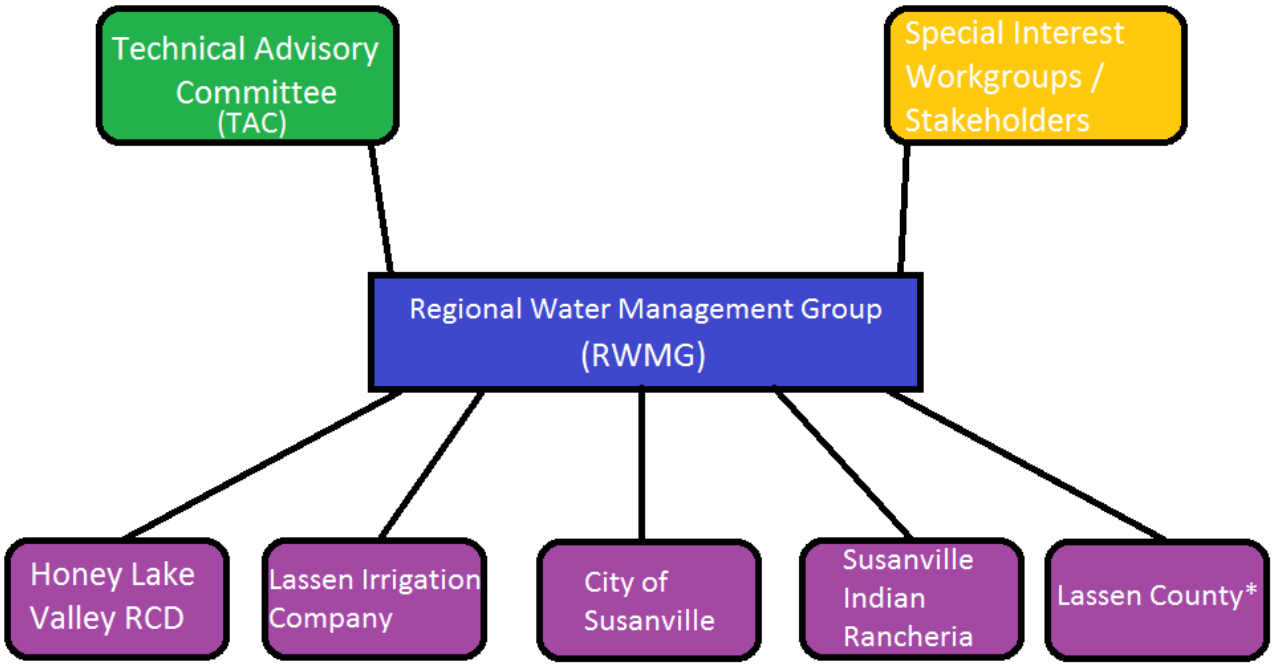
The RWMG identified a preferred long-term governance structure for the Lahontan Basins IRWM planning process, to be implemented following adoption of the Lahontan Basins IRWMP. This will be the same governance structure that oversaw the planning process as the Lahontan region is sparsely populated and the RWMG agreed to provide governance after the plan is implemented. This recommended long-term governance structure, illustrated in Figure 3-1, consists of the following entities:

- A Regional Water Management Group (RWMG) which members include: Honey Lake Valley Resource Conservation District, City of Susanville, Susanville Indian Rancheria and Lassen Irrigation Company. Lassen County plans to join the RWMG after the

IRWMP is finalized. The RWMG is responsible for overall direction, funding and approval for the IRWM planning process. The RWMG consists of local water purveyors that have been selected based on their expertise with multiple water management facets.

- A TAC utilized and appointed as needed by the RWMG represents the broad water-related interests of the region and reviews regional water management issues and needs, plans, projects and work products developed through the ongoing planning process.
- Special Interest Workgroups and Stakeholders are used on an as-needed basis to address specific IRWM planning needs at the request of the RWMG.

Figure 3.1 Lahontan Basins IRWMP Governance Structure



3.1.1 Regional Water Management Group

The proposed membership of the RWMG includes the local agencies that are signatories to the MOU. Specifically, this includes: Honey Lake Valley Resource Conservation District, City of Susanville, Susanville Indian Rancheria, and Lassen Irrigation Company.

*Lassen County was initially going to be a part of the IRWM planning process however they now are considering joining the RWMG after the planning process is complete, they may or may not become a RWMG member.

Collectively, these agencies are actively involved in water management including groundwater management, storm and flood water control, irrigation water management and distribution, water

quality, aquatic habitat, water conservation and recreation. The current make-up of the RWMG is appropriate as these agencies and local governments not only have authority over water, but comprise the foundation of active regional leadership in water and watershed management. These local agencies are linked to a broad network of stakeholder agencies and interested public. Each of the proposed members has expressed clear support for moving forward with the IRWM process including the development of an IRWM plan.

The local agencies comprising the RWMG work in close collaboration with numerous other agencies, non-governmental organization and private stakeholders addressing water management related issues throughout the region. Group governance and relationships with stakeholder agencies and individuals are described in Table 3.1 and in more detail in subsequent sections.

In summary, the RWMG represents broad communication and collaboration with stakeholders and the public.

Table 3.1 RWMG Agency Description

Agency	Nature and Description of Statutory Authority
Honey Lake Valley RCD	Operates as the court appointed Watermaster for the Susan River and Baxter Creek Decrees. California Water Code authorizes the appointment of a local agency to act as Watermaster to assure equitable distribution of water to right holder as described by decree
Lassen County Irrigation Company	Under authority granted by the California Water Code and Susan River Decree, the private water company regulates flow and distribution of irrigation water in Susan River and the McCoy, Hog Flat, and Leavitt Lake Reservoir system
City of Susanville	Operates under the California Water Code to adopt and implement an Urban Water Management Plan. By ordinance requires permits and inspections of wells, street and storm drain maintenance and installation, flood control and prevention. Operates the municipal water system for the city of Susanville and surrounding area by maintaining water supply and distribution facilities.
Susanville Indian Rancheria	By Ordinance requires permit and inspection for well and sewage treatment, road and drainage maintenance, exportation of groundwater, flood control and prevention, and numerous other authorities.
Lassen County[1]	Operates under the California Water Code to adopt and implement a Groundwater Management Plan. By Ordinance requires permit and inspection for well and sewage treatment, road and drainage maintenance, exportation of groundwater, flood control and prevention, and numerous other authorities.

[1] Intended to sign MOU to become a member of the RWMG once the plan is complete

The main difference between the RWMG and stakeholder groups will be the perspective roles in the decision making process. Stakeholders will continue to work at the ground level providing special interest consultation and helping develop an all-inclusive plan and establish project priorities. The RWMG will be the umbrella over such groups and provide oversight of the IRWM process for the region as a whole.

The key groups involved in the Lahontan Basins Integrated Regional Water Management (IRWM) Plan development and implementation are:

- **Lahontan Basins Regional Water Management Group (RWMG)** – The RWMG consists of 4 agencies that have signed the MOU for the purpose of planning the IRWMP. They are the agencies committed to implementing the Plan as well and updating it accordingly. Specifically, this includes: Honey Lake Valley Resource Conservation District, City of Susanville, Susanville Indian Rancheria and Lassen Irrigation Company.

- **Lahontan IRWM Plan Stakeholder Group (Stakeholder Group)** – A broad, current list of potential stakeholders for the IRWM is available (see Chapter 14 – Stakeholder Involvement, Table 14-1) from the current watershed and water management efforts on-going within the region. This list can be augmented by cross referencing additional lists from Madeline Plains to Long Valley Creek. Via public meetings, local media, and local community networks, additional stakeholders will be identified.

- **Technical Advisory Committee to the RWMG** – This is the group that facilitates the development of the Lahontan Basins IRWMP by providing recommendations and technical expertise for the various technical studies identified in the Lahontan Basins IRWM Planning Grant with DWR.

The process to re-establish an RWMG should recognize the potential for changes in priorities, needs, issues, workforce, etc., that can occur over time and necessitate changes in group membership. For example, additional members may be added to the RWMG particularly in instances such as: 1) when water issues arise outside the expertise and authority of group members, or 2) when new and emerging issues in a specific geographic area are not adequately represented in the current structure. The current MOU is structured so that at such time an amended, or new, MOU could be developed to reflect a change in membership.

During the development of the Lahontan Basins IRWMP, one staff member from each of the RWMG member agencies participated in the planning process. The RWMG was responsible for establishing and implementing a work plan for completing the Lahontan Basins IRWMP and

managing day-to-day IRWMP program business. Throughout Lahontan Basins IRWMP development, the RWMG coordinated via emails and monthly in-person meetings. The standing emails provided a forum for RWMG members to discuss IRWM business (e.g. invoicing, progress of technical studies being completed by consultants, on-going public outreach efforts, etc.) and to coordinate preparation of regular, or as needed, TAC meetings, RWMG meetings and periodic public workshops, which were integral to the IRWM planning process.

3.1.2 Technical Advisory Committee (TAC)

The TAC was formed in 2014 to assist in completing the Lahontan Basins IRWMP. Members of the TAC were recruited through an invitation process through the RWMG and various stakeholders. All parties that applied for inclusion on the TAC were formally appointed by the RWMG as members of the TAC. The TAC includes four full members and four alternates representing broad interests and perspectives in the region relating to water management, land use, natural resources and community stewardship. The interests represented by the TAC include:

- Water Supply
- Wastewater
- Stormwater
- Flood Control
- Local Government
- Agricultural
- Other Business (non-agriculture)
- Environmental
- Disadvantaged Community and Environmental Justice
- Recreational
- Community / Neighborhood

During development of the Lahontan Basins IRWMP, the TAC met on a quarterly basis, or as needed, to review progress and provide comments and guidance on key plan elements, including recommendations for the Lahontan Basins IRWMP long-term governance structure.

The possibility of reformulating the TAC following adoption of the Lahontan Basins IRWMP will be considered to provide continued representation of the broad interests of the region in long-term water resources planning. Participants from the TAC will still be encouraged to participate in the long-term TAC; however, current participants are not obligated to continue participation.

3.1.3 Special Interest Workgroups / Stakeholders

Two types of workgroups may be established during the IRWM planning process: standing workgroups and ad-hoc workgroups. Standing workgroups may be convened to help deal with ongoing RWMG business. In contrast, ad-hoc workgroups will be formed, as needed, to help carry out discrete tasks such as project selection for funding opportunities, review of proposed legislation, and other actions. The purpose of ad-hoc workgroups is to enable participants in the IRWM program to work through topics requiring intensive discussions and evaluation to develop recommendations for the larger group.

3.2 Entities Adopting the LBRWMP

Adoption of the Lahontan Basins IRWMP is the formal acceptance of the plan and indicates support of the Lahontan Basin IRWM program. At a minimum, the governing body of each RWMG agency must adopt the Lahontan Basins IRWMP. Other agencies that desire to formally indicate their support for the Lahontan Basins IRWMP are also encouraged to adopt the plan.

The entities that have indicated their intent to adopt this first Lahontan Basins IRWMP include:

- City of Susanville
- Honey Lake V alley Resource Conservation District
- Lassen County
- Lassen Irrigation District
- Susanville Indian Rancheria
- Sierra County

Adoption of the Lahontan Basins IRWMP by additional agencies may occur at later dates.

3.3 Public Involvement

Effective and open collaboration of the RWMG with stakeholders and the interested public will be an important aspect to the overall governance of the RWMG. It will be important to have multiple avenues of public involvement into the RWMG. The primary vehicle for public involvement will be through existing groups and stakeholders engaged in water management. To ensure wide distribution of information and solicitation of input, other means of public involvement will be used including the following:

- Direct contact of existing watershed groups and known stakeholders
- Local media, Lassen County Times and KSUE radio station
- Public meetings, as appropriate including Lassen County Board of Supervisors, Susanville City Council, Honey Lake Valley RCD Board of Directors, etc.

- Creation and management of the IRWMP website to post meeting information link to website at http://honeylakevalleyrcd.us/irwm/
- Use of stakeholder groups and agencies as a broad network of information dissemination

3.4 Decision-Making Process

The RWMG maintains overall decision-making authority for all matters relating to the Lahontan Basins IRWM planning process. IRWM activities requiring (non-binding) legislation or policy decisions will be brought before each RWMG meeting for consideration and require majority voter approval to proceed. Voter authorization will require a majority by quorum, entailing a minimum of three members of the RWMG.

3.5 Communication

Key IRWM program decisions will be made following thorough discussion and vetting by all interested parties. At RWMG meetings, members and alternates assume responsibility for raising issues, concerns, and ideas from their communities and constituents who are not able to attend the meetings. RWMG members are also expected to inform and educate constituents of the information and discussions from each meeting.

Information will continue to be conveyed to the general public through the Lahontan Basin IRWMP website (http://honeylakevalleyrcd.us/irwm/), RWMG partner agency websites and media releases, as appropriate.

3.6 Coordination

The Lahontan Basins region is bordered by three other IRWM regions: Upper Pit River IRWMP, Upper Feather River IRWMP and the Tahoe-Sierra IRWMP. While cooperation with the adjacent regions has not been formalized, representatives of the Lahontan Basins region routinely attend meetings of the Upper Pit River IRWMP to maintain ongoing communication and coordination. Additionally, members from the RWMG routinely meet with members of the Upper Pit River Watershed and Upper Feather River Watershed.

3.7 Plan Updates

The Lahontan Basins IRWMP is intended to be a living document, requiring periodic updates. The current Lahontan Basins IRWMP provides guidance for developing and refining water resources projects at the local level for a 20-year planning horizon based on current regional objectives, priorities, and water management strategies. Recognizing that regional conditions will change within the Plan's 20-year timeframe, the RWMG and TAC appreciate the need to continue to hold regular meetings. Through these meetings, Lahontan Basins IRWMP

stakeholders will continue to discuss and coordinate on critical water-related needs to determine whether shifts in regional objectives or priorities are needed to maintain currency with local conditions and needs.

When changes are dictated, the RWMG in consultation with the TAC will prepare amendments or full updates to the Lahontan Basins IRWMP, as appropriate. Changes to the State's IRWM planning framework may also necessitate updates to the Lahontan Basins IRWMP, and continuation of the RWMG and TAC collaboration will ensure the region is prepared to respond to future changes. The project list is a living document, and the current project list can be accessed through the IRWMP website. The project list can be updated in real-time without requiring a full Plan update or re-adoption.

Lahontan Basins IRWMP

Integrated Regional Water Management Plan

Objectives

4.1 Regional Water Management Issues 3
4.2 Process to Develop Objectives 8
4.3 Water Management Objectives 8
4.4 Prioritizing Objectives 11

Tables

Table 4.1 LBIRWM Plan Objectives 9
Table 4.2 Basis of the LBIRWMP Objectives 10

This chapter addresses the Integrated Regional Water Management (IRWM) Objectives Plan Standard which requires IRWM Plans to:

- Present plan objectives, which must address major water-related issues and conflicts of the region, and must be measurable by some practical means so achievement of objectives can be monitored
- Describe the process used to develop the objectives
- Contain an explanation of the prioritization or reason why the objectives are not prioritized
- Consider climate change

Through a series of facilitated public workshops and meetings, RWMG developed 12 specific IRWM Plan objectives to address regional water management needs and issues. Detailed descriptions and the rationale for development and inclusion of each objective are presented in the following sections.

IRWM Plan Objectives

A. Manage flood flows for public safety, water supply, recharge, and natural resource management.
B. Meet demands for all uses, including agriculture, urban, and environmental resource needs.
C. Correct groundwater overdraft conditions.
D. Improve coordination of land use and water resources planning.
E. Maximize water use efficiency.
F. Protect and improve water quality for all beneficial uses, consistent with the Basin Plan.
G. Protect, restore, and improve natural resources.
H. Address water-related needs of disadvantaged communities (DACs).
I. Protect and enhance water-associated recreation opportunities.
J. Establish and maintain effective communication among water resource stakeholders in the region.
K. Effectively address climate change adaptation and/or mitigation in water resource management.
L. Enhance public understanding of water management issues and needs.

4.1 Regional Water Management Issues

There is a long and colorful history of water use and management in the Lahontan Basins region. Given the relative scarcity of water and its value as the life blood of the area's agriculture, as well as recreational and cultural values, there has been much focus on water management among local government, agencies, and water users.

The following provides a description of current and historical water management issues for the four sub-watersheds within the defined IRWM, including Susan River, Eagle Lake, Long Valley Creek and Madeline Plains.

Susan River

Irrigation of crops from water diverted from the Susan River dates back well over 100 years. The 1915 Honey Lake Valley Soil Survey describes wild flood irrigation practices in the Honey Lake Valley for crops such as alfalfa and pasture.

Water supply in the Susan River system including water diverted for storage by Lassen Irrigation Company is dependent primarily on winter snowpack and spring run-off conditions. Much of the agricultural lands in the valleys receive only 12" or less of annual precipitation primarily in winter months. Available water in the soil profile from natural precipitation is quickly depleted, and therefore irrigation is critical for summer crop production.

Irrigation in the region is provided by a combination of surface and groundwater sources. Surface water irrigation uses natural run-off or river flow as well as water stored in reservoirs. During dry cycles, the reservoir system and flow of river water for irrigation is inadequate to meet demand.

The Susan River, Baxter Creek and Parker Creek water right decrees were established in 1941 and provide legal guidance for the distribution of surface irrigation water within the Susan River Watershed. There are water right holders for the natural flow of the Susan River as well as the Lassen Irrigation Company which has storage water rights for McCoy Reservoir, Hog Flat Reservoir and Levitt Lake. Approximately 30,000 acres have been appropriated irrigation water rights from the Susan River, including roughly 5,000 acres by shareholders to the Lassen Irrigation Company.

Many farms and ranches rely on groundwater to provide full season irrigation even though pumping groundwater is relatively expensive both in terms of capital improvement and annual pumping costs for the region's forage based cropping systems (primarily hay and pasture). Well

data indicated that groundwater recharge has generally been adequate to maintain groundwater aquifers given the current level of use.

The Susan River Watershed group was formed in 2010 to address a list of watershed related objectives for the Susan River. Chief amongst these is improved water use efficiency, better irrigation/diversion infrastructure, improved water quality and control of invasive weeds, primarily perennial pepperweed (Ledpidium latifolium). In May 2011, NCRS completed a Rapid Watershed Assessment for the Susan River and which initiated a watershed plan, which will be consistent with the IRWM process. To date the group has received approximately $1M from the USDA Ag Water Enhancement Program to begin work on irrigation system efficiency, reduce invasive weeds and create riparian filter strips.

Eagle Lake Basin

Eagle Lake is a large highly alkaline lake similar in many ways to other high desert lakes found in the Great Basin. It is unique in the sense that it provides the native habitat for the Eagle Lake rainbow trout. This trout is widely used for stocking in the Sierras and northern California, but nowhere is it more sought after than in its native waters of Eagle Lake. Due in part to its restricted native range and in part to very limited natural spawning, the Eagle Lake rainbow trout has twice been petitioned for listing under the Endangered Species Act.

The Pine Creek Coordinated Resource Management Planning group (CRMP) was established in 1987 and has worked in a collaborative fashion since that time to improve riparian habitat, water quality and fish passage to spawning reaches in upper Pine Creek. Eagle Lake is listed as impaired (Lahontan RWQCB 303(d) list) due to nutrients including nitrogen and phosphorous. One of the long-term objectives of CRMP has been to reduce the inflow of nutrients into the lake.

During the recent dry cycle, the lake level of Eagle Lake has been reduced, which further raises concerns regarding increased alkalinity and effects on Eagle Lake trout and other aquatic species. Low water levels have also reduced recreational opportunities and restricted lake access at some boat ramps.

A number of stakeholders have raised concerns about the Bly Tunnel, which was constructed in the 1920's and 30's to provide irrigation water to Honey Lake. The irrigation project failed and there have been subsequent projects to plug the tunnel entrance to Eagle Lake. Currently water exits the tunnel through an eight-inch pipe installed for the purpose of out-letting subsurface flows that accumulate within the tunnel. It should be noted that during wet cycles fo the 1980's some stake holders called for opening the Bly Tunnel to prevent flooding of lake-side infrastructure.

There is also increasing interest in assessing whether watershed conditions, particularly forest management, may be affecting snow pack accumulation and water yield within the Eagle Lake basin.

Long Valley Creek

Long Valley Creek stretches for nearly 40 miles, running from south to north, before draining into the southeastern quadrant of Honey Lake. Average stream flow peaks in March at about 35cfs dwindling to only a trickle in mid to late summer. Long Valley Creek provides stock water and wildlife habitat for much of its length. The recharge and management of groundwater is of great interest in this watershed due to some extent to the proximity to the Nevada state line and potential groundwater export to Reno and surrounding areas.

Madeline Plains

The Madeline Plains are high elevation, extremely rural and characterized by farming and ranching on the better valley soils, especially where irrigation water is available. Surrounding and interspersed with farmland are vast acreages of sagebrush rangeland. Forage crops such as alfalfa and pasture are predominant among farming enterprises. Several reservoirs capturing snow-melt runoff in the mountains east of the plains provide summer irrigation. A few of these reservoirs such as Dodge and Buckhorn also provide fishing and other recreation value. Groundwater is also a substantial source of irrigation water and as such groundwater recharge and management are important issues in this basin.

Water management issues in the Lahontan Basins region were identified by reviewing existing water management plans in the Region and brainstorming with the RWMG, which represents a broad cross-section of water management interests throughout the region. In addition, a series of technical workshops held were focused on water conservation, groundwater recharge, salt and nutrient management, climate change, and integrated flood management. These workshops, which were publicly noticed and announced through media vehicles including newspaper advertisements and local radio announcements, were open to all interested stakeholders. A key focus of these meetings was to identify specific water management issues in the region and develop objectives to address those issues. Based on input from the RWMG and stakeholders, the following regional water management issues were identified. This list is not in a prioritized order.

- **Inadequate flood control.** Improved flood management should be coordinated with surface storage and/or recharge facilities to maximize use of local supplies. For example, currently minimal flood control is achieved in Lassen Irrigation Company's existing system. There is a combination of factors ranging from undersized dams and canals, to

lack of flow measurement at key sections of the river. Poorly managed flood waters are a contributing factor to fields being damaged and water shortages experienced in the basin.

- **Lack of holistic water management.** Not all water resources are currently being managed in a sustainable way. For example, there are opportunities to improve current water use patterns to enhance the health of the groundwater basin. Converting existing groundwater irrigators to surface water within irrigation or water districts that enjoy surface water rights could result in groundwater basin recharge as opposed to contributing to overdraft conditions. The region could also benefit from an overall policy aimed at planning, financing and operating recharge basins in coordination with surface water purchases made specifically for recharge purposes; the basis of this policy should be agreed upon scientific recommendations. A long-term view must be taken in planning efforts to prevent water management policies from being heavily impacted by political will and other short-term influences.

- **Need for better groundwater information and management.** There is a need for better information related to current groundwater conditions and management actions necessary to maintain the health of the basin for all water users. Water users need to understand how their water use impacts the basin as a whole.

- **Need for groundwater recharge.** There is currently a limited number of managed groundwater recharge operations in the region. Opportunities to increase groundwater recharge in areas that are determined to be most conducive for recharge should be explored, including opportunities to recharge flood waters.

- **Disconnect between land use planning and water management planning.** The Honey Lake/Susan River Subbasin, which serves the majority of demands in the Lahontan Basins region, is in overdraft; however, non significant population growth is projected. Improved coordination between water and land use management is needed to ensure that future development is sustainable.

- **Inefficient water use practices.** Improved water use efficiency could reduce the mismatch between water demands and available supplies. Onsite water reuse, effective use of stormwater and flood flows, increased water conservation, and improved water use efficiency should be explored.

- **Water quality impacts.** Lead IRWM effort to protect and improve water quality for beneficial uses consistent with regional community interests through planning and implementation in cooperation with local and state agencies and regional stakeholders.

- **Inadequate wastewater management.** Wastewater collection and treatment capacity is limited in many parts of the region. Adequate wastewater collection and treatment is necessary to protect water quality.

- **Impacts to sensitive ecosystems.** Lower groundwater levels impact environmental resources. For example, protecting fish habitats by making irrigation systems more efficient in the Honey Lake Valley while still providing adequate water supply. Groundwater levels are also important for sustaining streamflows. Rerouting flows from areas prone to flooding to areas where water levels have been decreasing can improve habitat.

- **Funding challenges.** Water management projects cannot be implemented without funding, and it can be difficult to raise water rates for needed projects. As such, long-term financing alternatives should be explored.

- **Lack of public understanding of water management.** There is a need to educate the general public on issues related to local hydrology, water management, and the potential and need for enhanced water use efficiency. Cultural differences play a role in how water is valued and managed. Public education efforts must consider these cultural differences.

The RWMG Plan Review Committee formulated these goals and objectives with qualitative or quantitative metrics to meet the IRWMP Guidelines. Measures included in the objectives to evaluate progress are implicitly conservative because it is recognized that funding is difficult to secure, permitting and environmental review can have uncertain outcomes, and/or willing landowners may not emerge for a specific project. Regardless of uncertainties, it is the intent of the RWMG and the region's stakeholders to be strategic and cooperative in project development, and especially in seeking funding – by using match opportunities, collaborations, and shared resources to leverage funding to the maximum extent.

Stakeholders expressed their dilemma – that of balancing vision with realism. On the one hand, they wanted to portray a blueprint via these goals, objectives, and metrics that would advance restoration, infrastructure solutions, and stewardship within the current reality that funding and financing are difficult to come by. Stakeholders remain concerned that by offering these measurable objectives as required, they will be judged to have failed if they cannot find the

resources, or meet other requirements, to accomplish the activities and measurements as set forth below.

This IRWMP is an attempt at holistically assessing the Lahontan Basins water-related management; there is currently no catalog of all the restoration or infrastructure needs. But a picture of the depth and scope of need begins to emerge from the numerous projects that stakeholders advanced during Plan preparation.

4.2 Process to Develop Objectives

A set of objectives was developed to address the water management issues identified above. For each objective, performance measures were identified. Performance measures are benchmarks that can be used to measure the Region's progress toward achieving each objective. The Lahontan Basins IRWMP objectives were developed through a series of facilitated workshops and meetings that were advertised and open to the public, including:

- RWMG meetings
- Technical workshops, focused on water conservation, groundwater recharge, salt and nutrient management, climate change, and flood management
- General public meetings

In addition, local water and land use management plans were reviewed to identify local planning objectives that may be appropriate to include in the IRWM Plan.

4.3 Water Management Objectives

Susan River and Honey Lake appear on the Lahontan RWQCB's 303(d) list as being impaired by salinity and the presence of metals. Assessments from NRCS indicate a prevalence of incised channels, sediment deposition, inefficient water diversion and delivery systems and heavy weed encroachment. Surface water users in the lower reaches report relatively high salt content likely accumulated in the tail-water of other fields.

Using the process outlined above, the RWMG established the Lahontan Basins IRWMP objectives and performance measures in Table 4.1. The objectives represent the RWMG's long-term aspirations for the region. The RWMG recognizes that attainment of these objectives necessitates incremental improvements implemented over multiple years. Furthermore, the RWMG has acknowledged that, in some cases, the ideal set by the Lahontan Basins IRWMP objectives may prove to be technically or economically not feasible, but the objectives provide a long-term direction towards which the region desires to move and will attempt to meet to the

greatest extent possible. As regional stakeholders strive towards these long-term goals, the performance measures provide a practical means for the region to monitor the incremental improvement from year to year.

Table 4.1 LBIRWM Plan Objectives

Long-Term Objectives for the Lahontan Basins	Performance Measures
A. Manage flood flows for public safety, water supply, recharge, and natural resource management.	1. Currently, neither the Johnstonville Dam nor the various sections of the Susan River are sized to handle high flood flows 2. Volume of flood water stored and / or recharged 3. Flood-related damages (extent and frequency)
B. Meet demands for all uses, including agriculture, urban, and environmental resource needs.	1. Curtailment of voluntary and/or mandatory water use restrictions 2. Stability of groundwater levels 3. Ability to meet instream flow requirements
C. Correct groundwater overdraft conditions.	1. Groundwater surface elevation 2. Volume of water recharged 3. Reduction in groundwater subsidence 4. Improvement in groundwater quality
D. Improve coordination of land use and water resources planning.	1. Number of cooperative planning meetings held between land use and water resource planning entities 2. Number of General Plans with water resource elements
E. Maximize water use efficiency.	1. Estimated annual savings from demand management programs 2. Volume of water per year put to beneficial reuse 3. Percent of water users with meters and commodity pricing 4. Urban per capita water use
F. Protect and improve water quality for all beneficial uses, consistent with the Basin Plan.	1. New 303(d) listings and / or delistings 2. Surface water and groundwater quality
G. Protect, restore, and improve natural resources.	1. Acres of habitat protection / restoration / enhancement completed 2. Development trends in the largest and most ecologically sensitive areas of Lahontan Basins (including the Susan River and Eagle Lake)
H. Address water-related needs of disadvantaged communities (DACs).	1. Programs implemented that focus on meeting critical water-related needs of DACs 2. Percent of population with drinking water that complies with all applicable standards
I. Protect and enhance water-associated recreation opportunities.	1. Number of programs that include water-associated recreation opportunities
J. Establish and maintain effective communication among water resource stakeholders in the region.	1. Number of stakeholders or their representatives and members of the public attending IRWM-related meetings 2. Number of collaborative projects jointly

	implemented by multiple entities
K. Effectively address climate change adaptation and/or mitigation in water resource management.	1. Number of projects implemented that address climate change
L. Enhance public understanding of water management issues and needs.	1. Number of educational programs / number of people participating in water-focused educational events in the region

Table 4.2 identifies the basis for each of the LBIRWMP objectives. In most cases these objectives were developed to address one or more of the regional water management issues identified in Section 4.1, Regional Water Management Issues. Some of the objectives were added primarily in consideration of the IRWM Guidelines.

Table 4.2 Basis of the LBIRWMP Objectives

LBIRWMP Objective	Basis
A. Manage flood flows for public safety, water supply, recharge, and natural resource management	This objective addresses the region's challenge of inadequate flood control and promotes an integrated approach to flood management.
B. Meet demands for all uses, including agriculture, urban, and environmental resource needs.	This objective addresses the region's need to provide a long-term, holistic approach to the management of the region's water resources. The objective requires a sustainable and coordinated approach among water management agencies to meet the region's various demands. The RWMG identified this objective as one of the most challenging to meet given the economic and technical challenges of meeting all demands with limited supplies, but it is an ideal towards which the region will strive.
C. Correct groundwater overdraft conditions.	This recognizes the need to improve current water use patterns to enhance the health of the groundwater basin and the need to increase recharge opportunities. This was identified by the RWMG as one of the region's highest priorities.
D. Improve coordination of land use and water resources planning.	This objective addresses the regions disconnect between land use management and water management. The objective is intended to ensure that future development is sustainable.
E. Maximize water use efficiency.	This objective addresses opportunities to improve the efficiency of the Region's water use practices. The objective was developed recognizing there are both opportunities to reduce demand as well as opportunities to use water more efficiently and minimize water waste.
F. Protect and improve water quality for all beneficial uses, consistent with the Basin Plan.	This objective addresses potential water quality impacts to both the Region's groundwater and surface waters, including potential water quality impacts from areas with inadequate wastewater collection and treatment systems.
G. Protect, restore, and improve natural resources.	This objective addresses the importance of water management in preventing impacts to sensitive ecosystems. The objective encompasses the need to protect sensitive environmental resources from water-related impacts such as the effect of

	decreasing groundwater levels on stream flows.
H. Address water-related needs of disadvantaged communities (DACs).	The Lahontan Region is unique in that it is almost entirely classified as a DAC. As such, addressing water-related needs of DACs is of critical importance to the region. This objective also addresses the IRWM Guidelines requirement to consider water-related needs of DACs in the area within the boundaries of the Plan.
I. Protect and enhance water-associated recreation opportunities.	This objective addresses the need to provide low-cost, water related recreation opportunities that are an important resource for DACs throughout the region. In addition, the objective recognizes the importance of providing water-related recreation opportunities despite potential trade-offs that can exist between recreation and other areas of water management such as water supply, water quality, and ecosystem restoration.
J. Establish and maintain effective communication among water resource stakeholders in the region.	This objective addresses the importance of engaging key stakeholders and interested parties in water management decision making to enhance coordination and collaboration in the region. This is particularly critical to encourage the development of integrated, multi-benefit water management projects and programs.
K. Effectively address climate change adaptation and/or mitigation in water resource management.	The region has identified several water management areas that are vulnerable to the potential impacts of climate change. This objective supports climate change mitigation and / or adaptation actions that would reduce the region's vulnerability to potential climate change impacts. In addition, this objective reflects the IRWM Guidelines requirement to address both adaptation to the effects of climate change and mitigation of GHG emissions.
L. Enhance public understanding of water management issues and needs.	This objective addresses the importance of public understanding of water management. The objective also assists in addressing the region's funding challenges by increasing public understanding of the need to fund water projects.

4.4 Prioritizing Objectives

The RWMG discussed the benefits and drawbacks of prioritizing objectives. Prioritizing objectives could aid in identifying core issues that all interest groups in the region could agree upon. Prioritized objectives could then be used in the project prioritization process to help the region identify those projects that would provide the greatest benefit to the region as a whole. While establishing highest priority objectives indicates that some objectives are more important than others, it does not mean that the remaining high priority objectives are unimportant. All of the Lahontan Basins IRWM objectives are important to meeting needs of the region and are considered to be high priority objectives.

Recognizing the value of prioritizing objectives, the RWMG went through an exercise at the April 2014 meeting to prioritize objectives through a simple polling approach. Each participant

was asked to identify the top three objectives that were most important to him or her and rank the importance of those objectives, with one being most important and three being least important of the top three. The results of the prioritization clearly indicated that the top three priorities are the objectives associated with flood management, meeting water demands, and correcting groundwater overdraft. The participants all agreed that those three objectives reasonably represent the highest priority concerns of the region.

Despite the dry weather patterns in recent years, flood and storm water concerns are not uncommon on the Susan River and nearby watersheds. Damage assessments and project reports associated with flood events in the mid 1990's indicated damage primarily associated with inadequate road and highway culvers, stream bank instability and impacts to farm land, and some channel instability near residential structures adjacent to the Susan River in Susanville.

The Lahontan Basins region is prone to flooding during extreme storm events. This situation is aggravated by the current condition of the stream systems within the region that are detached from the flood plain and lack natural features to absorb the impact of flood events. The City of Susanville lacks a coordinated and comprehensive drainage infrastructure system for managing stormwater and urban runoff. Stormwater tends to be of poor quality and high in sediment, and is further degraded by urban runoff. In addition, the spread of perennial pepperweed (Lepidium latifolium), a noxious weed that is devastating agricultural and natural resources in the region, is spread through flood events.

The need for regional coordination of flood control efforts becomes more readily apparent as urban development and paved surfaces increase throughout the Lahontan Basins Region. The development of an Integrated Flood Management Plan will eliminate the negative impacts of flooding in the region.

The objective of this task is to develop an Integrated Flood Management Plan (FMP) that prioritizes opportunities to capture and utilize stormwater for other beneficial uses rather than simply mitigating flooding impacts.

The development of the FMP will be performed under the guidance of a Flood Management Committee formed from the LBIRWMP Stakeholder Group and LBRWMG. This group will be tasked with both assisting Lahontan RWQCB with the technical development of an FMP and also providing recommendations for future flood management governance and funding strategies.

Based on the results of the prioritization, the RWMG developed the following objective priority groupings:

Highest Priority Objectives

- Manage flood flows for public safety, water supply, recharge, and natural resource management
- Meet demands for all uses, including agriculture, urban, and environmental resource needs.
- Correct groundwater overdraft conditions.

High Priority Objectives

- Improve coordination of land use and water resources planning.
- Maximize water use efficiency.
- Protect and improve water quality for all beneficial uses, consistent with the Basin Plan.
- Protect, restore, and improve natural resources.
- Address water-related needs of disadvantaged communities (DACs).
- Protect and enhance water-associated recreation opportunities.
- Establish and maintain effective communication among water resource stakeholders in the region.
- Effectively address climate change adaptation and/or mitigation in water resource management.
- Enhance public understanding of water management issues and needs.

As projects are implemented, regulations change, and regional conditions change over time, the region's priorities may change. The Lahontan Basins IRWM Plan is a living document that will be periodically updated to reflect changing conditions.

Lahontan Basins IRWMP

Integrated Regional Water Management Plan

Resource Management Strategies

Contents

5.1 Resource Management Strategies Considered 3
5.2 Objectives Assessment 4
5.3 Process Used to Consider RMS 6
5.4 RMS Evaluation for the Lahontan Basins Region 6
5.4.1 Reduce Water Demand 6
5.4.2 Improve Operational Efficiency and Transfers 7
5.4.3 Increase Water Supply 9
5.4.4 Improve Water Quality 13
5.4.5 Improve Flood Management 17
5.4.6 Practice Resources Stewardship 18
5.4.7 Other Strategies 23
5.5 Adapting Resource Management Strategies to Climate Change 26

Tables

Table 5.1 RMS from the CWP Updated 2009 3
Table 5.2 Resource Management Strategies that Achieve LBIRWMP Objectives 5
Table 5.3 Resource Management Strategies and Greenhouse Gas (GHG) Reduction Opportunities 27

This chapter addresses the Integrated Regional Water Management (IRWM) Resource Management Strategies Plan Standard which requires IRWM Plans to:

- Document the range of RMS considered to meet the IRWM objectives and identify which RMS were incorporated into the IRWM Plan
- Consider the effects of climate change on the IRWM region when considering RMS
- Consider, at a minimum, the RMS found in Volume 2 of the California Water Plan Update 2009 (CWP2009)

A comprehensive range of resource management strategies (RMS) was considered to achieve the Lahontan Basins region's IRWM Plan objectives. This chapter identifies the RMS considered within this LBIRWMP, documents the selection process used to determine appropriate RMS for the region, and describes any existing efforts that are being taken within the Region for each RMS. This section considers all RMS covered in the California Water Plan 2009 Update, assesses the Region's IRWM Plan objectives outlined in Chapter 4 Objectives, and determines how the RMS identified in the California Water Plan 2009 Update can work together to achieve the Region's specific IRWM Plan objectives.

5.1 Resource Management Strategies Considered

The LBIRWMP considered each RMS listed in the CWP2009 as required by the Proposition 84 and Proposition 1E IRWM Guidelines. The CWP2009 identified seven categories of RMS applicable to water management in California. Table 5.1 presents the seven categories of RMS considered for the LBIRWMP. Though all the RMS identified by the CWP2009 were considered for inclusion in the LBIRWMP, not all are appropriate for meeting the region's IRWM plan objectives. The RMS determined to be inappropriate for the region included: conveyance-Delta, desalination, precipitation enhancement, fog collection, dewvaporation or atmospheric pressure desalination, and waterbag transport/storage technology.

Table 5.1 RMS from the CWP Updated 2009

	CA Water Plan Update 2009 RMS
Reduce Water Demand	Agriculture water use efficiency Urban water use efficiency
Improve Operational Efficiency and Transfers	*Conveyance - Delta Conveyance - Regional/local System Reoperation Water Transfers
Increase Water Supply	Conjunctive Management & Groundwater Storage *Desalination *Precipitation Enhancement Recycled Municipal Water *Surface Storage - CALFED Surface Storage - Regional/local
Improve Water Quality	Drinking Water Treatment and Distribution Groundwater Remediation / Aquifer Remediation Matching Quality to Use Pollution Prevention Salt & Salinity Management Urban Runoff Management
Improve Flood Management	Flood Risk Management
Practice Resources Stewardship	Agricultural Lands Stewardship Economic Incentives (Loans, Grants, Water Pricing) Ecosystem Restoration Forest Management Recharge Area Protection Water-Dependent Recreation Watershed Management
Other Strategies	Crop Idling For Water Transfers *Dewvaporation or Atmospheric Pressure Desalination *Fog Collection Irrigated Land Retirement Rainfed Agriculture *Waterbag Transport / Storage Technology

*RMS deemed inappropriate for the Lahontan Basins Region

5.2 Objectives Assessment

Table 5.2 presents the RMS that were determined to be appropriate for the LBIRWMP and illustrates which strategies can be implemented to achieve each objective. In many cases, multiple RMS may be implemented together, or integrated, to fulfill one or more regional objectives. Descriptions of each RMS, including those not appropriate for the region, can be found in Section 5.4.

Table 5.2 Resource Management Strategies that Achieve LBIRWMP Objectives

Objectives / Resource Management Strategies	Agriculture Lands Stewardship	Agriculture Water Use Efficiency	Conjunctive Mgmt and Groundwater Storage	Conveyance - Regional/Local	Crop Idling for Water Transfers	Drinking Water Treatment and Distribution	Economic Incentives	Ecosystem Restoration	Flood Risk Management	Forest Management	Groundwater / Aquifer Remediation	Irrigated Land Retirement	Land Use Planning and Management	Matching Water Quality to Use	Pollution Prevention	Rainfed Agriculture	Recharge Area Protection	Recycled Municipal Water	Salt and Salinity Management	Surface Storage - Regional/Local	System Reoperation	Urban Runoff Management	Urban Water Use Efficiency	Water Transfers	Water-Dependent Recreation	Watershed Management
A. Manage flood flows for public safety, water supply, recharge, and natural resource management	○	–	●	●	–	○	–	●	●	○	○	–	●	○	○	–	○	–	–	●	●	●	–	○	○	●
B. Meet demands for all uses, including agriculture, urban, and environmental resource needs	–	●	●	●	●	●	●	–	–	–	●	●	●	●	–	●	●	●	–	●	●	○	●	●	–	○
C. Correct Groundwater overdraft conditions	–	○	●	●	○	–	●	○	○	○	●	○	○	–	–	●	●	●	–	●	●	○	○	●	–	●
D. Improve coordination of land use and water resources	●	●	–	●	●	○	●	●	●	●	○	●	●	○	●	–	○	●	●	●	●	●	●	●	●	●
E. Maximize water use efficiency	–	●	●	●	●	●	●	○	○	○	–	●	–	○	–	●	–	●	–	–	●	○	●	●	–	○
F. Protect and improve water quality for all beneficial uses, consistent with the Basin Plan	●	–	●	●	–	●	●	●	○	●	●	–	○	●	●	–	●	●	●	●	–	●	–	–	●	●
G. Protect, restore, and improve natural resources	●	–	–	●	–	–	●	●	○	●	●	–	●	–	○	–	●	–	●	–	–	○	–	–	○	●
H. Address water-related needs of disadvantaged communities (DACs)	○	○	○	●	○	●	●	○	●	○	●	○	○	●	●	○	●	●	○	○	●	●	○	○	●	○
I. Protect and enhance water-associated recreation opportunities	○	–	–	–	–	–	○	○	–	○	–	–	●	–	–	–	–	–	–	○	–	○	–	–	●	●
J. Establish and maintain effective communication among water resource stakeholders in the region.	○	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
K. Effectively address climate change adaptation and/or mitigation in water resource management	○	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
L. Enhance public understanding of water management issues and needs	○	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

● RMS can directly contribute to meeting LBIRWMP objective ○ RMS can indirectly contribute to meeting LBIRWMP objective -RMS does not contribute to meeting LBIRWMP objective

5.3 Process Used to Consider RMS

The inclusion of RMS in this IRWM Plan is based on a review of all 33 RMS identified by the CWP2009 and the Proposition 84 and Proposition 1E IRWM Guidelines. The RWMG and Technical Advisory Committee (TAC) together determined that 26 RMS are appropriate for inclusion in the Lahontan Basins IRWM Plan as they are either currently being utilized or may reasonably be utilized in the management of water resources in the region.

The process of identifying RMS that address the regional goals and objectives identified for the Lahontan Basins IRWM Plan involved evaluating all strategies in consultation with the TAC. The full list of RMS was reviewed and discussed by the TAC to determine potential of each strategy to meet the Lahontan Basins IRWM Plan objectives.

5.4 RMS Evaluation for the Lahontan Basins Region

The following sections describe the relevant RMS in further detail and provide examples of efforts currently underway in the region that apply each strategy.

5.4.1 Reduce Water Demand

RMS identified in the Reduce Water Demand category include:

- Agricultural Water Use Efficiency
- Urban Water Use Efficiency

These RMS are discussed in further detail below.

Agricultural Water Use Efficiency

Agricultural water use efficiency can achieve reductions in the amount of water used for agricultural irrigation. This strategy could increase the Lahontan Basins net water savings, improve water quality, provide environmental benefits, improve flow and timing, and increase energy efficiency.

Several strategies recommended by the CWP2009 to achieve agricultural water savings and benefits include:

- Improving irrigation system technology and management of water, both on-farm and at the irrigation district level to minimize water losses;
- Adjusting irrigation schedules to decrease the amount of water applied;

- Installing remote monitoring to allow districts to measure flow, water depth, and improve water management and controls; and
- Developing community educational conservation activities to foster water use efficiency.

Although the extent of agricultural water uses in the region is limited, agricultural water use efficiency will be an important component of the Lahontan Basins region's future water resources portfolio. This RMS is consistent with the overall regional goal to Improve Water Supply Reliability and has been included in the IRWM Plan.

Urban Water Use Efficiency

Urban water use efficiency strategies can assist in managing increasing water needs of growing populations in the Lahontan Basins region. Urban water use efficiency strategies can reduce water demand through technological and behavioral improvements by decreasing indoor and outdoor residential, commercial, institutional, and industrial water use. Several approaches recommended by the CWP2009 to increase urban water use efficiency include:

- Implementing programs such as Best Management Practices (BMPs);
- Reviewing the Urban Water Management Plan to ensure 20 percent water use reductions are achieved by 2020;
- Installing water efficient landscapes;
- Encouraging gray water and rain water capture to increase water conservation and improve water quality;
- Increasing public outreach and encouraging community involvement; and
- Funding incentive programs for small districts and economically DACs.

This RMS is consistent with the overall regional goal to Improve Water Supply Reliability and has been included in the IRWM Plan.

5.4.2 Improve Operational Efficiency and Transfers

RMS identified in the Improve Operational Efficiency and Transfers category include:

- Conveyance - Delta
- Conveyance – Regional / Local
- System Reoperation
- Water Transfers

These RMS are discussed in further detail below.

Conveyance - Delta

Water suppliers in the Lahontan Basins region do not depend on Delta conveyance for water supply. As such, this RMS has been excluded from further consideration.

Conveyance – Regional/local

As described in detail in Chapter 2 Region Description, the Region relies on both groundwater and surface water supplies. Surface water supplies can be used to offset groundwater demands and to recharge local groundwater basins in certain areas in the region, and therefore can be used to correct groundwater overdraft conditions within the region. As such, the region would benefit from improvements in water supply reliability and conveyance infrastructure that increase operational efficiency and transfers of surface water and groundwater supplies. Benefits of improving regional/local conveyance infrastructure include: maintaining/increasing water supply reliability, protecting water quality, augmenting current water supplies, and providing water system operational flexibility.

Several strategies identified by the CWP2009 for improving regional/local conveyance of water supplies include:

- Improving aging infrastructure, increasing existing capacities, and/or constructing new conveyance facilities;
- Replacing or improving canal structures to improve an irrigation district's ability to manage and control water in the district and reduce spillage; and
- Constructing alternative water conveyance pipelines to improve water supply reliability.

The Lahontan Basins region has identified improved interregional connectivity as a strategy to assist in achieving the overall goal to Improve Water Supply Reliability. As such, this RMS has been included for further consideration.

System Reoperation

System reoperation strategies alter operation and management procedures for existing reservoirs and conveyance facilities to increase water-related benefits from these facilities. Changes in water demands and changing climate may require reoperation of existing facilities to increase project yield or address climate change impacts. System reoperation strategies will require making changes to how projects operate to best meet the changing needs of the region. Some of the potential benefits of system reoperation strategies include: increasing water supply reliability, additional flexibility to respond to extreme hydrologic events, and improving the efficiency of existing water uses.

- Establishing a baseline hydrology and enhanced description of present water management system components;
- Considering possible climate change effects in reoperation projects; and
- Collaborating between federal, state, and local agencies on system reoperation studies.

System reoperation could assist the Lahontan Basins region in achieving the overall goal to Improve Water Supply Reliability. As such, this RMS has been included for further consideration.

Water Transfers

Water Transfers are defined in the California Water Plan as temporary or long-term change in the point of diversion, place of use, or purpose of use due to transfer or exchange of water or water rights in response to water scarcity. Benefits to establishing water transfers include improving economic stability and environmental conditions for receiving areas. Compensation for water transfers can fund beneficial projects/activities for the IRWM region, reduce water rates, and/or improve facilities.

Several water transfer strategies identified by the CWP2009 include:

- Developing and implementing groundwater management plans, monitoring programs;
- Allowing community participant for identifying and responding to conflicts caused by transfer;
- Refining current methods of identifying and quantifying water savings for transfers using crop idling, crop shifting, and water use efficiency measures; and
- Improving coordination and cooperation among the local, state, and federal agencies to facilitate sustainable transfers.

Water transfers could assist the Lahontan Basins region in achieving the overall goal to Improve Water Supply Reliability in dry years. As such, this RMS has been included for further consideration.

5.4.3 Increase Water Supply

RMS identified in the Increase Water Supply category includes:

- Conjunctive Management and Groundwater Storage
- Desalination
- Precipitation Enhancement
- Recycled Municipal Water
- Surface Storage – CALFED

- Surface Storage – Regional / Local

These RMS are discussed in further detail below.

Conjunctive Management & Groundwater Storage

The reliability of the region's water supplies can be improved through conjunctive use of both surface and groundwater supplies. Conjunctive management and groundwater storage refers to the coordinated and planned use and management of both surface water and groundwater resources to maximize the availability and reliability of water supplies to meet water management objectives. The conjunctive management and groundwater storage strategy seeks to increase water supply reliability and groundwater sustainability. Several benefits of utilizing conjunctive management and groundwater storage strategies include: improving water supply reliability and sustainability, reducing groundwater overdraft and land subsidence, protecting water quality, and improving environmental conditions.

- Implementation of monitoring, assessment, and maintenance of baseline groundwater levels;
- Encouraging local water management agencies to coordinate with tribes and other agencies involved in activities that might affect long term sustainability of water supply and water quality; and
- Local groundwater monitoring and management activities and feasibility studies to increase the coordinated use of groundwater and surface water.

Conjunctive Management and Groundwater Storage could assist the Lahontan Basins region in achieving the overall goal to Improve Water Supply Reliability in dry years. As such, this RMS has been included for further consideration.

Desalination

Desalination, the process of removing salts and other minerals from saline water, requires complicated technologies and is an energy intensive technology. Desalination offers many potential benefits including: increasing water supply reliability during drought periods, reducing dependence on groundwater supplies, protecting public health, and facilitating water recycling and reuse. Recommendations identified by the CWP2009 to facilitate desalination strategies include:

- Desalination projects should be given the same funding opportunities as other water supply and reliability projects
- Ensure most economical and environmentally appropriate desalination technology is utilized

- Project sponsors need to ensure planning of desalination projects is a collaborative process that engages key stakeholders, the general public, and permitting agencies

Desalination is not currently used within the region. Due to the distance between the Lahontan Basins region and potential saline water sources, desalination is not likely to serve as a future water source for the region and was not considered in the IRWM Plan.

Precipitation Enhancement

Precipitation enhancement strategies seek to artificially stimulate clouds to produce more rainfall or snowfall than would naturally occur. The benefit of this strategy is primarily to increase water supply.

Recommendations identified by the CWP2009 for implementing precipitation enhancement projects include:

- Seeking State support for development and funding of new precipitation enhancement projects
- Collecting data and evaluations of existing California precipitation enhancement projects to perform research on the effectiveness of the technology
- Investigating the potential of augmenting Colorado River Water supply through cloud seeding

Precipitation enhancement has been implemented in the Lahontan Basins region in the past, with uncertain benefits. However, assuming precipitation enhancement is effective in increasing precipitation, it could assist the region in achieving the overall goal to Improve Water Supply Reliability. As such, this RMS has been included for further consideration.

Recycled Municipal Water

One way to offset current and future water demands for the region is to reuse highly treated wastewater for non-potable uses (recycled municipal water). Recycled water use can be a potentially significant local resource that can be used to help reduce groundwater and surface water demands. Further, because recycled water supplies are minimally impacted by changes in hydrology, they are not expected to be significantly impacted by climate change.

Recycled municipal water strategies identified by the CWP2009 and Water Recycling 2030: Recommendations of California's Recycled Water Task Force include:

- Increasing funding availability for water reuse/recycling facilities and infrastructure

- Creating education curriculum for public schools and institutions of higher learning to educate the public about recycled water
- Engaging the public in an active dialogue and encouraging participation in the planning process of water recycling projects including nonpotable and potable applications
- Providing resources (i.e. funding) to agencies that will perform comprehensive analysis of existing water recycling projects to estimate costs, benefits, and water deliveries
- Assessing water recycling technology to determine least costly and environmentally appropriate technology based on location and need

While there is an opportunity to make use of recycled water technology in the region, because of small overall population, dispersed water purveyors, and limited financial resources, this strategy is probably limited. However, there may be potential for use of effluent on pasture or for wildlife habitat.

Surface Storage – CALFED

The Lahontan Basins region does not benefit from surface storage in the Delta. As such, this RMS will not benefit the region and has been screened from further consideration.

Surface Storage – Regional/local

Though groundwater is the predominant supply used in the Lahontan Basins region, the region also uses surface water from Lassen Irrigation Company LIC as well as a system of canals, reservoirs, and dams for conveyance and storage of surface water supplies. Projects that incorporate regional / local surface water storage focus on alternatives to expand local surface storage capacity. Climate change threatens to change the timing of precipitation, with fewer, more intense rainfall events. Increased surface storage can provide flood management benefits, as well as improving the region's ability to capture and store watershed runoff under changing climate conditions. Benefits of expanding regional/local surface storage include: improved flood management, ecosystem management, emergency water supply, river and lake recreation, capture of surface water runoff, and water supply reliability against catastrophic events and droughts.

Regional/local surface storage strategies identified by the CWP2009 include:

- Development of a comprehensive methodology for analyzing project benefits and costs by local agencies
- Continued studies, research, and dialogue to identify a common set of tools for determining costs and benefits of surface storage projects
- Adaptively manage operations of existing surface storage facilities
- Rehabilitation and/or enlargement of existing surface storage infrastructure

- Developing water purchasing agreements to buy water from other agencies that own storage reservoirs with substantial water supplies

Regional/local surface storage could assist the region in achieving the overall goals to maintain and improve water quality through reduced flood impacts, and improve water supply reliability through enhanced storage. As such, this RMS has been included for further consideration.

5.4.4 Improve Water Quality

RMS identified in the Improve Water Quality category include:

- Drinking Water Treatment and Distribution
- Groundwater Remediation/Aquifer Remediation
- Matching Quality to Use
- Pollution Prevention
- Salt and Salinity Management
- Urban Runoff Management

These RMS are discussed in further detail below.

Drinking Water Treatment and Distribution

Providing a reliable supply of safe drinking water is critical for protecting public health. Though the region's water purveyors provide high-quality drinking water that meets regulatory standards, public water systems must continue developing and maintaining adequate water treatment and distribution facilities to ensure that public health is protected.

Climate change could reduce flows in the Susan River and increase saline intrusion in groundwater supplies, impacting the quality of existing supplies and increasing the level of treatment needed to provide drinking water that meets all regulatory requirements. Several benefits of drinking water treatment and distribution strategies include: improving public health, reducing water distribution delivery problems, and ensuring delivery of high-quality drinking water.

Drinking water treatment and distribution strategies identified by the CWP2009 include:

- Working closely with CDPH to quantify the total needs for water system infrastructure improvement and replacement
- Regionalizing and consolidating public water systems
- Developing incentives to allow water systems to reduce waste of limited water resources
- Researching and developing new treatment technologies

- Providing additional funding for water supply, water treatment, and infrastructure projects to ensure safe and reliable supply of drinking water for individuals and communities
- Joining the California Water/Wastewater Agency Response Network (WARN) program, which provides mutual aid and assistance more quickly than through the Standardized Emergency Management System (SEMS)
- Creating source control and reduction programs to address pharmaceuticals and personal care products

Drinking water treatment and distribution projects are critical to providing high quality drinking water to the region's residents. As such, this RMS has been included for further consideration.

Groundwater Remediation/Aquifer Remediation

Groundwater is a valuable local resource that is comprehensively managed through the adopted Groundwater Management Plan. Groundwater Remediation/Aquifer Remediation strategies seek to improve the quality of degraded groundwater for beneficial uses. Groundwater contamination can come from a multitude of sources such as: heavy metals, salts, organic and inorganic pollutants, nitrates, arsenic, pesticides, septic systems, and urban and agricultural activities. Several benefits of adopting groundwater remediation/aquifer remediation strategies include: availability of additional water supplies, avoiding purchasing alternate water supplies, and storage of excess surface water supplies in remediated aquifers.

Groundwater remediation/aquifer remediation strategies identified by the CWP2009 include:

- Limiting potentially contaminating activities in recharge areas
- Identifying historic commercial and industrial sites with contaminated discharges and responsible parties to remediate sites
- Implementing source water protection measures
- Establishing and supporting funding for detecting emerging contaminants by commercial laboratories and installation of wellhead treatment systems

Groundwater sources in the Lahontan Basins region are of high quality. However, as development pressures increase in the future, protection of groundwater recharge areas and groundwater quality will become more and more important to preserving these high quality water supplies. As such, this RMS has been included for further consideration.

Matching Quality to Use

Matching water quality to use is directly linked to four other resource management strategies: pollution prevention, recycled municipal water, salt and salinity management, and

groundwater/aquifer remediation. Matching quality to use strategies recognize that water quality should suitably match its intended use such that water quality constituents do not adversely affect the intended use of water. Several benefits of maintaining and matching water quality to use include: reduction of disinfection byproducts in delivered drinking water sources, opportunities for blending water sources through improvements in treated water quality, potential to reduce energy use due to reduced quality needs, and avoiding costly treatment procedures.

Strategies for matching water quality to use identified by the CWP2009 include:

- Managing water supplies to optimize and match water quality to the highest possible use and to the appropriate technology
- Encouraging upstream users to minimize the impacts of non-point urban and agricultural runoff and treated wastewater discharges
- Supporting the development of salt management plans
- Reviewing projects to determine the potential impacts from wastewater elimination into local streams
- Supporting research into solutions to the potential conflicts between ecosystem restoration projects and the quality of water for drinking water purposes

This RMS may assist the region in achieving its goals to Maintain and Improve Water Quality and to Improve Water Supply Reliability. As such, this RMS has been included for further consideration.

Pollution Prevention

Pollution prevention strategies are vital for protecting and improving water quality at its source, and for preventing costly water treatment options. Preventing pollution throughout watersheds ensures that water supplies can be used and reused for a broad number of applications.

Pollution prevention strategies identified by the CWP2009 include:

- Developing proper land management practices that prevent sediment and pollutants from entering source waters
- Establishing drinking water source and wellhead protection programs to protect drinking water sources and groundwater recharge areas from contamination
- Identifying communities relying on groundwater contaminated by anthropogenic sources for drinking water and take appropriate regulatory action
- Addressing improperly destroyed, sealed and abandoned wells that can serve as potential pathways for groundwater contaminants

Pollution prevention is a critical component of the region's overall goal to Maintain and Improve Water Quality. In addition, this RMS will assist in achieving the overall goal to Practice Resource Stewardship. By reducing water quality variability, this RMS may further assist in addressing the overall goal to Improve Water Supply Reliability. As such, this RMS has been included for further consideration.

Salt and Salinity Management

Accumulation of salts in soil can impair crop productivity, making salinity management a critical concern for the Region's highly productive agricultural industry. Salinity management strategies establish or improve salinity management in the region based on an understanding of salt loading and transport mechanisms. Several potential benefits of establishing or improving salt and salinity management include: protecting water resources and improving water supplies, securing, maintaining, expanding, and recovering usable water supplies, and avoiding future significant costs of treating water supplies and remediating soils.

Salt and salinity management strategies identified by the CWP2009 include:

- Developing a regional salinity management plan, and interim and long-term salt storage, salt collection, and salt disposal management projects
- Monitoring to identify salinity sources, quantifying the level of threat, prioritizing necessary mitigation action, and working collaboratively with entities and authorities to take appropriate action
- Reviewing existing policies to address salt management needs and ensure consistency with long-term sustainability
- Collaborating with other interest groups to optimize resources and effectiveness
- Identifying environmentally acceptable and economically feasible methods for closing the loop on salt
- Providing funding for research and projects and prioritizing funding based on greatest needs.

While salinity management is not an issue for the Lahontan Basins region in the near term, enacting sound management practices can assist in protecting water resources in the long-term, contributing to the overall goal to Maintain and Improve Water Quality. As such, this RMS has been included for further consideration.

Urban Runoff Management

Urban runoff management strategies involve managing both stormwater and dry weather runoff. To successfully manage urban runoff, agencies need to incorporate other resource management strategies such as pollution prevention, land use planning and management, watershed

management, urban water use efficiency, recycled municipal water, recharge area protection, and conjunctive management. Several potential benefits of urban runoff management strategies include: minimizing soil erosion and sedimentation problems, reducing surface water pollution, protecting natural resources, protecting and augmenting groundwater supplies, and improving flood protection.

Urban runoff management strategies identified by the CWP2009 include:

- Coordinating efforts with agencies, stakeholders, and the public to decide how urban runoff management should be integrated into work plans
- Encouraging public outreach and education concerning funding and implementation of urban runoff measures
- Designing recharge basins to minimize physical, chemical, or biological clogging
- Working with community to identify opportunities to address urban runoff management
- Providing incentives for the installation of low impact development features on new and existing developments
- Emphasizing source control measures and strong public education/outreach efforts as being the most effective way to manage urban runoff in this highly arid region

The City of Susanville plans to implement urban runoff management measures, identified in the LBIRWMP. This RMS will be identified for future consideration.

5.4.5 Improve Flood Management

The RMS identified in the Improve Flood Management category is:

- Flood Risk Management

This RMS is discussed in detail below.

Flood Risk Management

The Lahontan Basins region is subject to flooding, and many portions of the region are located within the 100-year flood zone as defined by the Federal Emergency Management Agency (refer to *Chapter 2, Region Description* for more information). Reducing flood risks will require management strategies that enhance flood protection through projects and programs that assist in managing flood flows and to prepare for, respond to, and recover from floods.

Flood risk management strategies identified by the CWP2009 include:

- Structural approaches that can consist of:

- Setting back levees
- Modifying channels to include lining (i.e. concrete, rip rap) to improve conveyance
- Inspection and maintenance programs for canal preservation
- High flow diversions into adjacent lands to temporarily store flows
- Improved coordination of flood operations
- Maintaining facilities to secure the long-term preservation of flood management facilities

➢ Land use management approaches that consist of:
- Floodplain function restoration to preserve and/or restore the natural ability of
- undeveloped floodplains to absorb, hold, and release floodwaters
- Floodplain regulation
- Development and redevelopment policies
- Housing and building codes

➢ Disaster Preparedness, Response, and Recovery for flood risk management approaches such as:
- Information and education
- Disaster preparedness
- Post-flood recovery

Despite the dry weather patterns in recent years, flood and storm water concerns are not uncommon on the Susan River. Nearby watersheds damage assessments and project reports associated with flood events in the mid 1990s indicate damage primarily associated with inadequate road and highway culverts and stream bank instability. Some impacts to farm land have been observed due to channel instability near residential structures adjacent to the Susan River in Susanville.

Flood risk management may assist the region in achieving its goals to maintain and improve water quality and to practice resource stewardship. As such, this RMS has been included for further consideration.

5.4.6 Practice Resources Stewardship

RMS identified in the Practice Resources Stewardship category includes:

- Agricultural Lands Stewardship
- Economic Incentives (Loans, Grants and Water Pricing)
- Ecosystem Restoration
- Forest Management
- Land Use Planning and Management

- Recharge Area Protection
- Water-Dependent Recreation
- Watershed Management

These RMS are discussed in further detail below.

Agricultural Lands Stewardship

Agricultural lands stewardship is the practice of conserving and improving land for various conservation purposes as well as protecting open spaces and rural communities. Several potential benefits of agricultural lands stewardship management strategies include: protecting environmentally sensitive lands, recharging groundwater, improving water quality, providing water for wetland protection and restoration, increasing carbon sequestration within soil, and reducing costs of flood management.

Agricultural land stewardship strategies identified by the CWP2009 include:

- Stabilizing stream banks to slow bank erosion and filter drainage water from the fields
- Installing windbreaks (i.e. trees and/or shrubs) along field boundaries to help control soil erosion, conserve soil moisture, improve crop protection among many other benefits
- Performing conservation tillage to increase water infiltration and soil water conservation and reduce erosion and water runoff
- Encouraging irrigation tailwater recovery to help capture and reuse irrigation runoff water to benefit water conservation and off-site water quality

Agricultural lands stewardship can assist the Lahontan Basins region in achieving its goals to Maintain and Improve Water Quality and Practice Resource Stewardship. As such, this RMS has been included for further consideration.

Economic Incentives (Loans, Grants and Water Pricing)

Economic incentives can influence water management, amount and timing of water use, wastewater volume, and source of supply. Types of incentives include low interest loans, grants, water rates and rate structures. Free services, rebates, and use of tax revenues to partially fund water services have a direct effect on the prices paid by water users. Several potential benefits of establishing or improving economic incentive-based strategies include: promoting efficient water management practices and encouraging the adoption/improvement of water efficient/ on-site water recycling technologies.

Economic incentive management strategies identified by the CWP2009 include:

- Instituting loans and grant programs that support better regional water management
- Adopting policies that promote long-term water use efficiency

- Developing modeling tools for economic analyses of economic incentives as well as guidelines and ranking criteria for grant and loan awards
- Exploring innovative financial incentives

Economic incentives can help to further projects and programs, assisting the region in achieving all of its policies. As such, this RMS has been included for further consideration.

Ecosystem Restoration

Ecosystem restoration strategies are vital for improving modified natural landscapes and biological communities. Restoration of aquatic, riparian, and floodplain ecosystems are of primary concern, as they are most directly affected by water and flood management actions and likeliest to be affected by climate change. Potential benefits of establishing ecosystem restoration strategies include: improved water quality and quantity for wildlife, aquatic species, and human consumption; and increased diversity of native species and biological communities.

Ecosystem restoration strategies identified by the CWP2009 include:

- Increasing the use of setback levees and floodwater bypasses
- Creating programs that support and fund the identification of stream flow needs
- Establishing biological reserve areas that connect or reconnect habitat patches
- Expanding riparian habitat
- Devising climate change adaptation plans that benefit ecosystems, water, and flood management
- Reproducing natural flows in streams and rivers
- Controlling non-native invasive plant and animal species
- Filtering of pollutants and recharging aquifers

This RMS is fundamental to achieving the region's goal to Practice Resource Stewardship, and it may assist in achieving the goals to Maintain and Improve Water Quality and Improve Water Supply Reliability. As such, this RMS has been included for further consideration.

Forest Management

Forest management strategies focus on activities that are designed to improve the availability and quality of water for downstream users on both publicly- and privately-owned forest lands. Water produced by forest has an economic value that equals or exceeds that of any other forest resource (CWP 2009). Several potential benefits of establishing forest management strategies include: interception of rainfall, reduction of urban runoff, energy-efficient shade during hot weather, reduce flooding and increase dry-season base flows, and protection from surface erosion and filtering pollutants.

Several forest management strategies identified by the CWP2009 include:

- Establishing long-term monitoring to understand hydrologic changes resulting from possible climate change effects through the installation of stream gages, precipitation stations, water quality and sediment monitoring stations, and long-term monitoring wells
- Increasing research efforts into identifying effective BMPs for forest management and the effects of wildfires
- Assessing sediment sources and erosion processes in managed and unmanaged forested watersheds
- Increasing multi-party coordination of forest management
- Improving communication between downstream and upstream water users
- Developing public education campaigns for water users

Forest management will be critical to achieving all of the region's overall policies. As such, this RMS has been included for further consideration.

Land Use Planning and Management

Land use planning and management is aimed at developing more efficient and effective land use patterns, recognizing that land use type and intensity influence water supply, water quality, flood management and natural habitat. Integrating land use and water management involves planning for housing and economic development needs while providing for resource protection.
Land use planning and management strategies identified by the CWP2009 include:

- Regulating land use through zoning and subdivision regulations
- Providing incentives for developers to plan and build infill developments and more compact, mixed-use urban developments
- Controlling stormwater through low impact development
- Adopting green building codes with low impact development principles

Land Use Planning and Management could assist the Lahontan Basins region in achieving the overall goal to Improve Water Supply Reliability. As such, this RMS has been included for further consideration.

Recharge Area Protection

Recharge areas provide the primary means of replenishing groundwater. Strategies to protect recharge areas ensure the continual capability for the area to recharge groundwater. Protecting recharge areas requires the implementation of urban runoff management strategies, groundwater remediation strategies, and conjunctive management strategies. Several potential benefits of

establishing recharge area protection strategies include: protecting and maintaining high-quality groundwater, increased amount of groundwater storage, reduction of urban runoff, and some removal of microbes and chemicals through percolation.

Recharge area protection strategies identified by the CWP2009 include:

- Expanding research into surface spreading and the fate of chemicals and microbes in recharge water
- Increasing funding for the identification and protection of recharge areas
- Creating education and media campaigns to increase public awareness and knowledge on the importance of recharge areas and relevancy to groundwater
- Requiring source water protection plans
- Developing methods for analyzing the economic benefits and costs of recharge areas

Recharge area protection is an important component to protecting the region's groundwater supplies, and will assist the region in achieving its overall goal to Maintain and Improve Water Quality. As such, this RMS has been included for further consideration.

Water-Dependent Recreation

Water-dependent recreation strategies are vital to ensuring enjoyment of water recreation activities currently and in the future. Maintaining and protecting water-dependent activities such as fishing, swimming, birding, boating, and others can provide economic, environmental, and social benefits.

Water-dependent recreation strategies identified by the CWP2009 include:

- Using existing data and new surveys to determine recreational needs
- Partnering with schools to provide drowning prevention programs primarily aiming at youth from urban and low income families
- Developing partnerships with universities to coordinate monitoring of public recreation use, equipment, and emerging water recreation trends
- Developing a procedure to incorporate climate change assessments within all infrastructure planning, budgeting, and project development
- Researching, identifying, and mitigating impacts of stream flows that prevent Native Americans from participating in their traditional cultural activities
- Developing invasive species prevention measures.

Water-based recreation holds significant value to the residents and stakeholders in the Lahontan Basins region, and this RMS will assist in achieving the region's overall goal to Practice Resource Stewardship. As such, this RMS has been included for further consideration.

Watershed Management

Watershed management strategies increase and sustain a watershed's ability to provide for the diverse needs of the communities that depend on it. Managing at the watershed scale has proven effective in coordinating and integrating the management of numerous physical, chemical, and biological processes. Watershed management provides a basis for greater integration and collaboration among those policies and actions.

Watershed management strategies identified by the CWP2009 include:

- Creating a scientifically valid tracking and reporting method to document changes in the watershed
- Assessing the performance of projects and programs
- Providing watershed information to better inform local land use decision makers on how to maintain and improve watershed functions
- Using watershed approaches in which all RMS strategies are coordinated

Watershed management has been, and will continue to be, an important framework for managing the water resources in the Lahontan Basins region, and this strategy will assist the region in achieving all of its overall policies. As such, this RMS has been included for further consideration.

5.4.7 Other Strategies

The CWP2009 and the Proposition 84 and Proposition 1E IRWM Guidelines (DWR 2010) identified other potential RMS that may aid in meeting water management goals and objectives; however, these strategies are currently limited in their ability to address long-term regional water planning needs. These strategies include crop idling for water transfers, dewvaporation or atmospheric pressure desalination, fog collection, irrigated land retirement, rainfed agriculture, and waterbag transport/storage technology.

Crop Idling for Water Transfers

Crop idling is a strategy that removes lands from irrigation to make water available for transfers. Several of the potential benefits from implementing this strategy include: enhancing water supplier reliability by making water available for redistribution, enhancing water quality, protecting and restoring fish and wildlife, and helping farm communities (as well as urban areas)

infuse money into the local economy while increasing the reliability of water supply for urban consumers.

Crop idling strategies identified by the CWP2009 include:

- Developing necessary coordination structures to satisfy agency policy requirements
- Consulting with agencies and entities that will be leading crop idling programs
- Understanding the local community impact and third party impacts to develop and implement necessary actions for maintaining economic stability of local communities and mitigating socioeconomic impacts

Agriculture in the Lahontan Basins region is primarily limited to small-scale operations, and the potential benefit associated with crop idling for water transfers is limited. As such, this RMS has been screened from further evaluation.

Dewvaporation or Atmospheric Pressure Desalination

Dewvaporation or atmospheric pressure desalination would heat brackish water until deposits of fresh water as dew are collected from the opposite side of a heat transfer wall. Because brackish supplies are not present in the Lahontan Basins region, this strategy is not considered feasible. As such, this RMS has been screened from further evaluation.

Fog Collection

Fog collection is a form of precipitation enhancement that has yet to be used in California, although it does occur naturally along coastal zones. Though there is interest in using this strategy for increasing domestic water supplies in dry areas, such as California desert regions, this strategy is more appropriate for regions near the ocean.

The potential benefits of fog collection primarily includes increasing water supplies. For example, a fog collection project in Chile yielded about 2,800 gallons per day from about 37,700 square feet of collection net. However, this strategy produces limited volumes of water supply.

Due to climatic conditions in the region leading to negligible amounts of fog, fog collection is not currently being implemented or explored in the Lahontan Basins Region.

Irrigated Land Retirement

Irrigated land retirement is the removal of farmland from irrigated agriculture to make water available for redistribution for other uses. The potential benefits of retiring irrigated land include: enhancing water supply reliability, enhancing water quality, protecting and restoring fish and wildlife resources, reducing drainage volume and associated costs due to drainage disposal.

Strategies for facilitating irrigated land retirement programs identified by the CWP2009 include:

- Evaluating and ensuring urban areas receiving water made available from land retirement have exhausted all means of water conservation
- Making all land retirement programs voluntary
- Studying local community and third party impacts from land retirement such as from reduced agricultural production inputs, reduced farm income, and habitat restoration
- Developing and implementing necessary actions for maintaining the economic stability of local communities and mitigating socioeconomic impacts

Irrigated land retirement is a potential RMS that is not currently being implemented in a formal way in the Lahontan Basins region. As explained above with crop idling, high agricultural productivity and resulting economic outputs from the agricultural industry in the region make this highly unlikely in the near-term future. Irrigated land retirement - including replacing water intensive crops with agricultural uses such as grazing that do not require much, if any, irrigation - could be implemented within the region to reduce agricultural water demands. Although this RMS may be employed in the future to make water available for transfer, it will likely only be employed on a temporary basis. Due to the importance of agriculture to the region's economy, the majority of stakeholders do not support permanent agricultural land retirement.

Rainfed Agriculture

The rainfed agriculture strategy involves irrigating crops with natural rainfall. Potential benefits associated with rainfed agriculture include: increased water supply (though limited), improved postharvest/pre-planting soil management for winter crops, and decreased soil erosion. However, due to the unpredictability of rainfall frequency, duration, and amount, this strategy is highly uncertain and risky. Additionally, the quantification of potential water savings from rainfed agriculture, though small, will not be possible due to lack of available information.

Strategies for implementing rainfed agriculture programs identified by the CWP2009 include:

- Developing new technologies, management, and efficient water management practices for rainfed agriculture
- Providing technical and financial assistance for implementing rainfed agriculture technologies and management practices
- Developing cooperative efforts to link rainfed agriculture runoff and water banking and conjunctive use activities and groundwater recharge

Rainfed agriculture involves performing all crop irrigation with rainfall. Rainfall quantity is difficult to predict, and rainfall is typically experienced in winter months, as opposed to during

the summer growing season. Further, because agriculture in the Lahontan Basins region is primarily limited to small-scale operations, the potential benefit associated with rainfed agriculture is limited. As such, this RMS is considered infeasible and has been screened from further evaluation.

Waterbag Transport/Storage Technology

The waterbag transport/storage technology involves diverting water in areas that have unallocated freshwater supplies, storing the water in large inflatable bladders, and towing them to an alternate coastal region. Currently, this strategy is not used in California though there have been various proposals for this technology worldwide. Potential benefits of waterbag transport/storage technology include: improvements in drought preparedness and water quality; reductions in groundwater overdraft; and environmental, energy and water supply benefits.

The Lahontan Basins region is located inland, and is surrounded by mountains. Because the region lacks access to an ocean port, waterbag transport/storage technology is not currently being planned or explored in the region, and this RMS is not applicable to the LBIRWMP.

5.5 Adapting Resource Management Strategies to Climate Change

The variability of location, timing, amount, and form of precipitation in California expected to result from future climate changes, could present some uncertainty to the availability of surface water supplies for the region. DWR has determined that the Sierra snowmelt is shrinking and that melting is occurring earlier, shifting runoff from spring / summer further into the winter / spring and causing early flooding. Concerns about climate uncertainty have resulted in the need to adapt existing flood management and water supply systems in response to changing conditions.

As vulnerability tools and assessments are developed related to impacts that climate change may have on water resources, additional adaptation strategies will be identified to address the potential region-specific impacts of climate change.

Achievable “no regret” management practices for addressing climate change concerns that the Lahontan Basins region could employ include:

- Continued investment in local water conservation
- Diversification of local water supply portfolio
- Practicing integrated flood management
- Increasing conjunctive use of available water supplies
- Protecting and restoring water-related ecosystems
- Increasing water reuse and recycling

- Monitoring local and regional activities
- Tracking related legislation
- Investigating water supply/energy relationships and coordinating with larger water utilities

RMS that are implemented to manage water resources can also address climate change adaptation and/or mitigation. Table 5.3 summarizes how the RMS selected for inclusion in the LBIRWMP aid in Greenhouse Gas Reduction; additional details are provided in Chapter 16 Climate Change.

Table 5.3 Resource Management Strategies and Greenhouse Gas (GHG) Reduction Opportunities

Management Objectives	Resource Management Strategy	GHG Reduction Opportunities
Reduce Water Demand	Agriculture water use efficiency Urban water use efficiency	Reducing water demands will reduce groundwater pumping demands, which result in GHG emissions.
Improve Operational Efficiency and Transfers	*Conveyance - Delta Conveyance - Regional/local System Reoperation Water Transfers	Improving operational efficiencies can improve the overall efficiency of the region's water system, thereby reducing cumulative energy demands and GHG emissions.
Increase Water Supply	Conjunctive Management & Groundwater Storage *Desalination *Precipitation Enhancement Recycled Municipal Water *Surface Storage - CALFED Surface Storage - Regional/local	Localize water use, and efficiently reuse water to reduce groundwater pumping requirements and associated GHG emissions.
Improve Water Quality	Drinking Water Treatment and Distribution Groundwater Remediation / Aquifer Remediation Matching Quality to Use Pollution Prevention Salt & Salinity Management Urban Runoff Management	Stabilize water cycles by conserving water systems to their natural state.
Improve Flood Management	Flood Risk Management	Controlling flooding in a holistic watershed based nature will potentially reduce the need for construction of intensive flood control systems. This will reduce energy and associated GHG emissions that would be required for construction, operation and maintenance.

Practice Resources Stewardship	Agricultural Lands Stewardship Economic Incentives (Loans, Grants, Water Pricing) Ecosystem Restoration Forest Management Recharge Area Protection Water-Dependent Recreation Watershed Management	Provide opportunities for carbon sequestration, reforestation, and reduce climate change impacts by restoring/maintaining land surfaces.
Other Strategies	Crop Idling For Water Transfers *Dewvaporation or Atmospheric Pressure Desalination *Fog Collection Irrigated Land Retirement Rainfed Agriculture *Waterbag Transport / Storage Technology	Reduce energy requirements and GHG emissions from decreased groundwater pumping demands.

*RMS deemed inappropriate for the Lahontan Basins region

Project Review Process

Contents

6.1 Project Solicitation and Submittal Process 4
6.1.1 Integration of Resource Management Strategies 5
6.1.2 Special Circumstances for Project Submittal 5
6.2 Project Scoring Process 5
6.2.1 Scoring Criteria 6
6.3 Summary of Projects Included in the IRWM Plan 11
6.3.1 Summary of DAC and Tribal Community Projects 11
6.4 Communicating the List of Selected Projects 11

Tables

Table 6-1 - Project Scoring Criteria 10

This chapter addresses the Integrated Regional Water Management (IRWM) Project Review Process Plan Standard, which requires IRWM Plans to:

- Contain a process to select projects for inclusion in the IRWM Plan including procedures for submitting a project, reviewing projects and communicating the list of selected projects
- Consider how the project contributes to IRWM Plan Objectives / Relevance to Plan, how the project is related to resource management strategies selected for use in the IRWM Plan, technical feasibility of the project, specific benefits to disadvantaged community water issues, project costs and financing, project status, contribution of the project in adapting to the effects of climate change in the region, contribution of the project in reducing greenhouse gas emission as compared to project alternatives, whether the project proponent has adopted or will adopt the IRWM Plan and how the project or program will help reduce dependence on the Susan River for water supply
- Promote and prioritize projects in the selection process, while keeping in consideration the unique goals and objectives of the IRWM region

---

In order to identify water resources management projects for implementation, the RWMG implemented a public "Call for Projects" to solicit projects for consideration for inclusion in the LBIRWMP.

Organizations from across the region submitted a total of 14 addressing a wide variety of water supply, water quality, flood management, and habitat protection needs. While all of the projects included in the LBIRWMP are considered to be important to effectively manage water resources in the region, a prioritization process was developed to help manage the project list and determine which projects best meet regional needs and objectives. The prioritization process allows projects to be ranked for implementation using a transparent method. In addition, the process encourages development and identification of projects well-suited to meet the identified needs of the Lahontan Basins region.

Throughout the IRWM planning process, the RWMG has engaged stakeholders across multiple areas of water resource management to identify priorities for the region and to prioritize projects for implementation. As described below, the RWMG played an integral role in reviewing and selecting projects that best achieve the regional goals and objectives. This section presents the process for prioritization and selection of IRWM projects, including:

- Procedures for soliciting and submitting projects to the IRWM Plan
- Procedures for reviewing and prioritizing projects submitted to the IRWM Plan

- Procedures for selecting and communicating the final project list

The following processes for the solicitation and submittal of projects for inclusion in the Lahontan Basins IRWM Plan, and the project scoring method are described in this section. This section also includes summaries of the submitted projects with more detailed project information to be found in the appendices. During the 2014/2015 call for projects, the RWMG received a total of 14 projects.

6.1 Project Solicitation and Submittal Process

The project solicitation process begins with a sub-committee review of previous IRWM Plan project submittals and evaluation followed by a discussion of how potential project submittals will be evaluated and considered for inclusion into the IRWM Plan Update. A draft list of the project scoring criteria will be discussed and made available for comment to the RWMG. The potential project scoring criteria will be chosen to facilitate project comparison, review, selection, and prioritization. The next step of the process will be to collect, evaluate, and review all project submittals. A list of projects will be created; project scoring conducted and all scored projects will be included in the IRWM Plan. The final step of the process will be to discuss the recommendations made with project proponents and stakeholders at a RWMG meeting to formally accept the projects into the plan.

Following agreement on the process, the call for projects was initiated through an email to the RWMG and also posted on the IRWM Plan website. A list containing over 115 names and agencies, developed during the planning grant application process, was used as the list for solicitation for the call for projects. The Project Application Form was provided as an Adobe Acrobat fillable form (.pdf format). A copy of the Project Application Form is included in Appendix E. The call for projects was open for approximately 31 days from 05/01/15 through 05/31/15. Periodic email reminders were sent out to the RWMG and meetings were conducted; to assist project proponents with completion of the form. During the meetings the following topics were completed: review of instructions for completing the Project Application Form, questions individuals had on the project review process, review of the types of projects to be submitted, and examples of a completed Project Application Form. Completed Project Application Forms were returned by email.

Projects that have been previously accepted through previous project solicitations are considered "grandfathered" and may be updated by project proponents as appropriate. Revisions to these projects will occur biennially or as needed. The entire project list will be updated biennially following the same process for the 2014/2015 call for projects, and project proponents will provide a description of what has changed on the project since the 2014/2015 (or previous) call for projects. During the project update process "grandfathered" projects will not need to be re-scored. New projects must go through the project solicitation process and fill out a Project Application Form. The list of the IRWM projects is intended to grow and change as projects are completed and new project concepts added. During the biennial update process, new projects can be added by a simple majority vote and does not require the re-adoption of the Plan.

6.1.1 Integration of Resource Management Strategies

Chapter 5 Resource Management Strategies identifies the RMS deemed appropriate for the Region. Table 5.2 (see Chapter 5 Resource Management Strategies) presents the LBIRWMP objectives and their correlation to each RMS included in the LBIRWMP. Project proponents submitting projects for consideration in the LBIRWMP are required to identify both the IRWM Plan objectives and the specific RMS employed by the project.

IRWM planning is intended to encourage integrated regional strategies for management of water resources that yield multiple benefits, and the number of RMS employed by a project is included in the LBIRWMP project scoring process to give priority to projects that demonstrate greater resource integration.

Appendix F provides a snapshot of projects included in the LBIRWMP and includes analysis of the RMS incorporated by each project.

6.1.2 Special Circumstances for Project Submittal

There may be special circumstances that prompt the need for project proponents to submit new projects for inclusion into the IRWM Plan who previously did not submit during the call for projects or update process. As each situation arises the RWMG will call a meeting to invite the interested project proponents to discuss the need and circumstances. During this meeting the RWMG will decide whether the projects should be included in an amendment to the plan. In this instance, it is the responsibility of the project proponent to communicate sufficient project detail, complete the Project Application Form, and provide project information to the RWMG in an expedited manner for inclusion into the plan amendment. The project proponent is also expected to become an active participating member of the Lahontan Basins IRWMP RWMG.

6.2 Project Scoring Process

After the close of the project solicitation period, the projects were compiled for scoring and review. All submitted projects were determined to be eligible for inclusion in the IRWM Plan for the following reasons: they are located within the Region limits and they address at least one of the plan objectives.

The information in the individual completed Project Application Forms was exported from the pdf form into a master spreadsheet for compiling and scoring. The information exported was checked to ensure data was not lost or altered during the transfer; however, information provided by the project proponent was not reviewed to consider to what extent the information provided was accurate.

Projects were scored using the system presented in Table 6.1 primarily using the information provided on the Project Application Form. The overall score was not intended to be the basis for

final decisions of project prioritization, but was intended to provide a method for understanding the overall set of projects and to provide one indicator of how the projects compare to one another.

All projects submitted to the RWMG were categorized by project proponents into at least one of the following three categories: water supply/wastewater, restoration, and stormwater/flood control. Project scoring meetings with conference calls capability for those who could not attend in person were held for each project category. The project scoring meetings were conducted in a discussion format and relied on the information entered on the Project Application Form and clarification as necessary provided by the project proponent during the scoring meetings. After the scoring meetings, the final project score sheets were shared with the RWMG and project proponents.

Having the project scoring meetings by project category encouraged project proponents to share information and identify opportunities for possible integration. Several organizations submitted projects for water conservation efforts; which were combined into a single regional effort.

6.2.1 Scoring Criteria

Scoring criteria created during the 2014 plan development were used as the foundation for the project scoring; they are based on the 2012 Proposition 84 Integrated Regional Water Management Grant Program Guidelines.

Ten scoring criteria including one leveling criteria were developed. For each criterion a scoring method was established. The point scores for the ten scoring criteria were summed for the total project score.

The scoring points for the leveling criteria were not included in the total score, but were for use prioritizing the projects to ensure geographic and proponent diversity that could be used in the future for an individual grant solicitation. Eligibility for specific grant programs was not considered during the project scoring. The scoring and leveling criteria are summarized in Table 6.1 and described in greater detail below.

The total scores for all 14 projects are presented in Appendix F.

The scoring criterion was developed to meet the IRWM objectives found in section 4 of the IRWM, this is reflected in the weight of the Plan objectives scoring criteria. The criterion was also influenced by the goals indentified by DWR that are typical funding solicitations by the DWR.

The scoring criteria are outlined below further details on the criteria are shown in Table 6.1.

Plan Objectives / Relevance to Plan. This scoring criterion evaluates how the project contributes to achieving the 12 IRWMP objectives outlined in section 4 of the IRWM. The scoring was based on the number of Plan Objectives identified by the project proponent in the Project Application Form. This criterion is more heavily weighted as it represents the IRWMP's selected objectives. Projects can earn one point for each met IRWMP objective for a total of 12 available points on this scorning criterion.

Resource Management Strategies. Whether the project contributes to achieving Resource Management Strategies (RMS) outlined in section 5 of the IRWMP. The RMS's in LBIRWMP are consistent with the *2009 California Water Plan Update*. There are 7 identified RMS strategies in the plan, the criteria evaluates if 2 objectives met (1 point), 3 to 5 objectives met (2 points), or more than 5 objectives met (3 points). A maximum of three points are available for this scorning criteria.

Shovel Ready/ Readiness to Proceed. The current status of the project, and whether the project could be implemented within 2 years (3 point), within 3-5 years (2 points), or in more than 5 years (1 point). For phased projects, the scoring considered whether any of the phases could be completed within the time limit. Completion within the time limit was considered to include completion of construction for construction-type projects or the start/continuation of monitoring-type projects. A maximum of 3 points are available from this scoring criteria.

Matching Funds. The amount of matching funds that has been secured for the project as a percentage of the total project cost provided on the Project Application Form. Only match funds characterized as "secure" (with signed agreements) on the Project Application Form were considered in this criteria. Past matching money specifically used in furthering the project was included. In addition matching in the form of in kind labor was accepted. Scoring was based on the amounts and characterization of funding provided in the Project Application Form, and did not consider changes to the funding status that may have occurred since the submittal of the Project Application Form. The criterion was scored as follows: Less than 10% (1 Point), 10% to 25% (2 points), 25% or greater (3 points). A maximum of 3 points are available from this scoring criteria.

Partners. Whether a project involves multiple organizations for implementation. Formal partners were considered to be organizations or agencies with which the project proponent has a formal relationship such as a memorandum of understanding, funding, or agreements such as property ownership, or organizations that are otherwise jointly implementing the project. Informal partners were considered to include partners such as technical advisory councils or stakeholder groups that are not actively participating or funding the project. The criteria was scored as follows: beneficiaries identified outside of the applying entity (1 point), Informal

partners indentified who are in favor of the project (2 points), Formal Partners with letters of written support (3 points). A maximum of 3 points are available for this scoring criteria.

Climate Change & Green Technology. The extent to which the project contributes to the reduction of greenhouse gases, conserves energy and/or water, uses other green technologies such as improved best management practices, or contributes to adapting to the effects of climate change. Projects with a direct contribution to reduction of greenhouse gases, energy and/or water conservation, or improved best management practices for water quality or infiltration received full points. Projects that contribute to climate change adaptation or support other green technologies were scored as follows: minimal contribution with one specific contribution identified (1 points), two specific benefits to climate change or uses or green technology (2 points), three or more specific benefits to climate change or uses of green technology (3 points). A maximum of 3 points are available for this scoring criteria.

Impact if not Funded. Importance of the project. Projects that would benefit safety, public health, impaired water bodies, flooding, or threatened and endangered species received full points (3 points). Benefit to impaired water bodies was considered to include only direct discharges into the impaired water body and not upstream benefits. Impaired water bodies included not only water bodies with a TMDL, but also aquatic invasive species concerns. A lose of matching fund if the project is not funded received 2 points, and a beneficial missed opportunity received 1 point. A maximum of 3 points are available for this scoring criteria.

Preliminary Engineering & Scientific Backing. The technical feasibility of the project. Projects that have project-specific assessments, studies, or pilot tests, and that referenced equivalent projects consisting of similar procedures or technology. Equivalent projects did not have to include projects that have been completed by the project proponent, rather any similar projects with demonstrated effectiveness. The criteria was scored as follows: Logical evidence of need, however no relevant studies or engineering (1 point), minimal assessment or an equivalent successful project identified (2 points), preliminary engineering or studies, and equivalent projects (3 points). A maximum of 3 points are available for this scoring criteria.

Disadvantaged Community. Whether the project is located in or directly benefits a DAC or tribal community with respect to water supply and water quality needs. Projects that are located within or will have improvements that directly serve DACs including tribal communities received 3 points. Projects that will indirectly, but significantly benefit a DAC received 2 points. Projects that may hire workers from a DAC or that have some minimal improvement to a DAC received 1 point. A maximum of 3 points are available for this scoring criteria.

Number of Dollars requested per Proponent. (**Leveling Criteria**) The total dollar amount requested by any submittal was considered in an effort to "level the playing field" The criteria

was scored as follows: 3 point for less than $500,000 requested. 2 points for less than $1,000,000 requested, 1 point for more than $1,000,000 requested.

Table 6-1 - Project Scoring Criteria

	Points		
Criteria	**1**	**2**	**3**
Relevance to Plan / Objectives	1 point for each plan objective that is met.		
Shovel Ready/ Readiness to Proceed	Implement/construct in more than 5 years	Implement/construct within 3-5 years	Implement/construct within 2 years
Resource Management Strategies	2 RMS met	3 to 5 RMS met	5 or more RMS met
Matching Funds	<10% Match	10%-25% Match	>25% Match
Partners	Beneficiaries identified	Informal partners	Formal partners
Climate Change & Green Technology	1 form of contribution identified	2 specific contributions or green technology uses	3 or more contributions or green technologies used
Impact if not funded	Missed opportunity	Lose matching funds	Safety, public health, impaired water bodies, flood or threatened & endangered species risk
Preliminary Engineering / Scientific Backing	Logical evidence of need	Minimal Assessment or equivalent project	Preliminary Engineering and equivalent project
DAC (including Tribal Communities)	Some Minimal Benefit to DACs	Indirect but significant DAC benefits	Specifically a DAC project
Leveling Criteria	$1 million or more	Less than $1 million	Less than $500,000

6.3 Summary of Projects Included in the IRWM Plan

The projects submitted for inclusion in the IRWM Plan demonstrate the breadth of activities needed to meet the water management objectives in the region. A total of 14 projects were submitted from 8 organizations. All Plan objectives are addressed at least in part, and almost all RMS are included.

The projects included in the IRWM Plan are summarized in Appendix F with their total score and total capital cost as entered in the Project Application Forms. The LBIRWMP website shows the geographic distribution of the projects. It should be noted that Appendix F represents a "snapshot" for this particular edition of the IRWM Plan.

Additional ways to sort and group the projects are included in Appendix F in order to present the projects through multiple perspectives. Stakeholders can study the lists to compare projects and possibly find opportunities for future projects, future collaboration, or other enhancements to existing projects. Copies of the completed Project Application Forms for each project are included in Appendix F.

6.3.1 Summary of DAC and Tribal Community Projects

Of the 14 projects submitted, 9 identified themselves to provide DAC or Tribal benefits either directly or through downstream water quality/water supply improvement. Appendix F provides a list including the specific DAC or Tribal benefit or impact explanation for each. Also, The LBIRWMP website shows the DAC and tribal communities along with the location of the projects providing benefit to them.

6.4 Communicating the List of Projects

The LBIRWMP project list, as of 05/01/15, is included in Appendix F of this LBIRWMP. The up-to-date project list can be accessed through the Honey Lake Valley RCD website, which is accessible through the projects tab of the LBIRWMP (http://honeylakevalleyrcd.us/irwm/project-applications/). This portal allows for projects to be added at any time, update project information, review other projects, and identify integration opportunities to enhance the benefits provided by the projects. The online database allows the project list to remain a "living document", always available for review and update. The LBIRWMP does not require update, revision, or re-adoption following changes to this project list.

The LBIRWMP project list should be periodically updated and reviewed through formal requests for projects to ensure that new projects are continually considered for upcoming funding opportunities and that new projects are added to respond to evolving regional conditions. Further, formal updates provide a reminder for project proponents to update and revise their project submittals as necessary to maintain currency. As new funding opportunities arise, the

RWMG and TAC will communicate new project submittal deadlines and other relevant information to the stakeholder list and the public.

Impacts and Benefits

Contents

7.1 Plan Implementation Benefits and Impacts 3
7.1.1 Regional Benefits and Impacts 3
7.1.2 Interregional Benefits and Impacts 6
7.1.3 Benefits and Impacts to DACs, Environmental Justice-Related Concerns, and Native American Tribal Communities 7
7.2 Project or Program Benefits and Impacts 8

Tables

Table 7.1 Resource Management Strategies for Lahontan Basins IRWMP 9

This chapter addresses the Integrated Regional Water Management (IRWM) Impact and Benefit Plan Standard which requires IRWM Plans to:

- Discuss potential impacts and benefits of plan implementation
- Contain a screening level discussion of impacts and benefits within the IRWM region, between regions, and those directly affecting disadvantaged communities, environmental justice related concerns and Native American Tribal communities
- State when more detailed project-specific impact and benefit analyses will occur

---

This section describes the potential impacts and benefits that could occur through implementation of the LBIRWMP and / or through implementation of projects included in the LBIRWMP. More detailed analyses of project benefits and impacts will occur as projects near implementation. For example, project-specific environmental impacts are evaluated in California Environmental Quality Act (CEQA) and / or National Environmental Policy Act (NEPA) documents prior to project construction / implementation.

The LBIRWMP consists of a planning study and basic data compilation that would not result in the disturbance of any environmental resource. These activities are exempt from CEQA pursuant to CEQA Guidelines §15262 and §15306. As such, programmatic environmental analysis under CEQA is not required. Furthermore, implementation of each project included in the LBIRWMP will be the responsibility of the project proponent and any applicable project partners. If implementing a project, the project proponents bear full responsibility for ensuring all regulatory requirements are met.

7.1 Plan Implementation Benefits and Impacts

The LBIRWMP objectives discussed in Chapter 4 Objectives were developed to address various water management issues faced by the Lahontan Basins region. While the purpose of these objectives is to promote actions which benefit the Lahontan Basins region, the RWMG and TAC recognize that the various resource management strategies employed in the implementation of the LBIRWMP have the potential to result in regional, interregional and / or localized benefits as well as impacts. Potential benefits and impacts are identified in Table 7.1 and discussed in the following sections.

7.1.1 Regional Benefits and Impacts

Implementation of LBIRWMP will lead to numerous benefits including, at a minimum:

- **Improved flood management.** Flooding is a significant challenge for the Lahontan Basins region, and addressing this challenge is one of the region's highest priority objectives. Improved conveyance and storage, system reoperation, and flood risk management strategies can reduce flooding and flood impacts in the region.
- **A more reliable and high quality water supply.** Additional water supplies, conjunctive use, and water use efficiency improvements will lead to enhanced water supply reliability and assist in improving water quality. Water quality projects will ensure that existing water quality is sustained and protected. Reliable and high-quality water is directly linked to economic and environmental health and well-being.
- **Reduced groundwater overdraft/subsidence.** Strategies which reduce dependence on groundwater either through the creation of new supplies or through water use reduction can reduce reliance on the groundwater basin and avoid further subsidence. Water use efficiency strategies which reduce overall water demand can also assist in reducing overdraft of the basin.
- **Improved habitat.** Strategies that improve habitat include those which improve water quality, such as pollution prevention and runoff management strategies, and resource stewardship strategies, such as agricultural lands stewardship, preservation of open spaces, protection or improved management of forest communities, protection or restoration of riparian areas and removal of invasive species.
- **Increased public health and safety.** Flood management strategies and recreational strategies can increase public health and safety. Flood management strategies achieve this by reducing the impacts of floods on homes, water supply sources and infrastructure, and also by reducing the loss of life. Recreational strategies do so by providing safe access to waterways and encouraging communities to be more active.
- **Cost-effective and multi-benefit projects.** Opportunities for multi-benefit projects, which achieve a multitude of goals and objectives for several stakeholders rather than a single entity, provide increased value to stakeholders and the communities they serve. Integrated planning and collaboration can lead to multi-benefit projects that achieve cost savings

through cost-sharing opportunities, economies of scale, resource-sharing, and other mechanisms. Existing resources can be optimized, duplication of efforts avoided, and larger-scale efforts developed to provide cost savings to all involved.

- **No-regrets adaptation.** By promoting and implementing projects that address current conditions and can be easily justified under plausible future conditions, the RWMG, TAC and stakeholders can invest in actions which will reduce the region's vulnerability to future climate change risks while meeting today's needs. As such, these projects provide significant benefit to the region, regardless of whether and to what degree projected climate change impacts are experienced in the future.
- **Shared experience and resources.** The completion and implementation of the LBIRWMP facilitates knowledge-sharing, equips agencies and stakeholders to overcome future challenges by coordinating resources, and more effectively meets the needs of the region as a whole. In addition to direct quantitative benefits of plan implementation, such as new or more reliable water supplies, indirect benefits associated with avoided negative impacts of non-action are expected to be realized.
- **Increased regional understanding.** Agencies and stakeholders are working together as a cohesive group to address regional water resources challenges through a consensus-based process, resulting in a deeper understanding of the effects of each individual project on other agencies and stakeholders. This deeper understanding, in turn, reduces interagency conflicts that could otherwise prevent projects from gaining the necessary support for successful implementation.
- **Improved local understanding of water resources issues.** Through consistent and coordinated public outreach and education, local understanding of regional water resources issues, conflicts, and solutions will improve. Maintaining a consistent message will improve public understanding of water resource management issues and encourage the acceptance and understanding of integrated projects.

Potential impacts of implementation of the LBIRWMP could include the following. Additional impacts may be identified on a project-by-project basis during CEQA and / or NEPA analyses. It is assumed that every effort will be made by project proponents to mitigate any impacts in accordance with CEQA and NEPA requirements:

- **Reduced groundwater recharge**. While water use efficiency strategies can reduce the region's water demands and thereby reduce demands on the groundwater basin, projects which improve irrigation efficiency can lead to reductions in groundwater recharge in areas supplied with surface water.
- **Reduced in-stream flows**. In-stream flows can be impacted by loss of agricultural drainage flow as a result of water use efficiency measures as well as projects which increase reliance on surface water supplies. Additionally, flood management strategies which restore natural floodplain functions and allow flows to leave the stream channel can reduce in-stream flows.

- **Degraded water quality.** While the LBIRWMP promotes strategies to protect and improve water quality for all beneficial uses, various strategies have the potential to negatively affect water quality. For example, by matching quality to use, some users may see a reduction in their water quality, though the quality remains suitable for their uses. For example, recycled water is expected to have a higher concentration of salts than the region's surface water supplies, so replacement of surface water with recycled water could degrade the end user's water quality. Recycled water can also increase salt nutrient loading to the groundwater basin; the Lassen County Groundwater Management Plan suggests that care be taken to not adversely impact recharge areas when using recycled water for agricultural and landscape irrigation. Increased salt loading can also occur from saline groundwater intrusion as a result of increased groundwater pumping. Additionally, surface water may be impacted by increased erosion and sedimentation as a result of increased recreation.
- **Construction-relation impacts.** A variety of temporary construction-related impacts could occur from project implementation, including dust, noise, and traffic generation. Construction of new infrastructure could also lead to long-term disturbance or even loss of habitat and wildlife. For example, a new treatment plant could have long-term noise and traffic impacts that affect wildlife, or a new reservoir could permanently displace wildlife by inundating habitat.
- **Restricted river access.** Strategies that could lead to restricted access or navigation of the region's rivers, such as the creation of new levees or dams, could impact river recreation which is an important no-cost recreational resource for the region. Such strategies are considered to be unlikely in the Susan River corridor.
- **Growth inducement.** Flood management and improved water supply and quality management can enable land development and economic development which in turn can have other adverse impacts.
- **Land use restrictions.** Land use restrictions may be implemented for a variety of reasons including removal of structures from flood zones, protection of recharge areas, and protection of critical habitat and wildlife.
- **Economic impacts.** Improved water management is likely to increase costs to water users and property owners. Additional economic impacts could result from land use restrictions to improve water management or natural resources. The economic incentives RMS can also lead to short-term economic impacts for agencies sponsoring incentives such as water use efficiency rebates.
- **Increased energy use.** Increased energy use in the region increases the region's contribution to greenhouse gas emissions. New water treatment facilities, new conveyance strategies that involve pumping water and system reoperation strategies all have the potential to increase energy use.

7.1.2 Interregional Benefits and Impacts

Meeting the objectives of the LBIRWMP not only benefits the local agencies and residents of the Lahontan Basins region, but also neighboring IRWM regions (Upper Pit and Upper Feather River region). Meeting the objectives of the LBIRWMP also benefits members of the public throughout California by helping to meet statewide priorities. Specific ways in which attainment of the LBIRWMP objectives could provide benefits beyond the Lahontan Basins region include the following:

- **Reduced flooding.** Flood management projects for the region may involve reservoirs and channels upstream of the region; increasing the capacity of these facilities could reduce flooding for communities upstream, within, and downstream of the Honey Lake Valley. Additionally, projects that put flood flows to beneficial use within the Lahontan Basins will reduce flooding for downstream communities.
- **Improved water quality.** The water quality of the Susan River may be enhanced through improved flood/stormwater management techniques, restoration of riparian areas, and rehabilitation of aging water and wastewater infrastructure. Improved quality of runoff and effluent discharges into the Susan River may also benefit water quality further downstream in the Honey Lake Valley.
- **Improved water supply reliability.** Improving water use efficiency in the region and thereby reducing water demands will reduce future competition over interregional surface water supply sources and improve interregional water supply reliability. Correcting groundwater overdraft conditions in the region will also increase water supply reliability outside the region.
- **Protection or improvement of fish and wildlife passage.** The Lahontan Basins region contains a vast amount of open space and agricultural lands. Protecting these land uses maintains wildlife corridors used by species that move in and outside of the region.
- **Climate change response actions.** Climate change affects all of California. Projects that lead to reductions in energy use by water and wastewater systems, or that use or generate green energy, benefit all of California by reducing greenhouse gas emissions.

Potential interregional impacts of LBIRWMP implementation may include:

- **Changes in streamflow.** Increases in flood flows or decreases in in-stream flows downstream of the region resulting from upstream channel modifications, operational changes or land use changes can result in changes to streamflow within and outside the region.
- **Degraded water quality.** Flood management strategies that increase channel capacity within the Lahontan Basins region can lead to increased flows in downstream channels outside the region that may have less capacity. This can cause increased erosion and sedimentation in downstream reaches. Recreational activities can cause erosion and increase downstream

sedimentation. Over-pumping can impact groundwater quality. Recycled water use or other projects designed to match quality to use can increase salt and nutrient loading to the groundwater basin.

- **Reduced water availability and reliability.** Increased dependence by the Lahontan Basins region on interregional surface water supplies will reduce the availability and reliability of these supplies for other regions.
- **Restricted wildlife passage.** Infrastructure projects could cause fragmentation of habitat types and separate wildlife corridors used by species that migrate through the region.
- **Construction-related impacts.** LBIRWMP infrastructure projects physically located outside the Lahontan Basins region could have temporary construction-related impacts as well as permanent loss of habitat (which would be assumed to be fully mitigated in accordance with CEQA and / or NEPA requirements).

7.1.3 Benefits and Impacts to DACs, Environmental Justice-Related Concerns, and Native American Tribal Communities

Given that the majority of the Lahontan Basins currently qualifies as a DAC, protection of the people and economy of DACs is a priority for the RWMG and TAC. The commitment of the RWMG and TAC to providing benefits to DACs now and in the future is evidenced by the LBIRWMP objective of addressing water-related needs of DACs and the inclusion of two DAC scoring criteria in the project prioritization process. The objective of managing flood flows for public safety, water supply, recharge, and natural resource management, which is one of the region's highest priority objectives, also benefits DACs. A few areas in the Lahontan Basins region is located within the 100-year floodplain, and recurring floods in the past several decades demonstrate that many areas in the region are prone to flooding from storm events less severe than a 100-year event. Management of these floods, which endanger the health and safety of communities and threaten the habitability of dwellings, is a critical water quality need for DACs in the region.

Since the majority of the region is a DAC, potential impacts to DACs are the same as the potential impacts identified in Section 7.1.1. Impacts will be kept to a minimum and ongoing coordination and public involvement will aid in preventing a disproportionate share of impacts from being borne by the most economically-distressed communities.

Environmental justice is addressed by ensuring that all stakeholders have access to the LBIRWMP planning decision-making process and that minority and/or low-income populations do not bear disproportionate adverse human health or environmental impacts from plan and project implementation. Construction of project facilities, which can have short-term or long-term impacts such as noise and traffic disruption for neighboring communities, is often an environmental justice concern. Prior to implementing projects as part of the LBIRWMP, the RWMG and TAC will do a preliminary analysis of the areas that could be affected by

construction of project facilities to ensure that construction nuisance impacts and long-term impacts will not be borne predominantly by any minority population or low-income group.

Additional environmental justice issues that the RWMG and TAC will consider include water quality of small community water systems, groundwater quality in private domestic wells, flooding that impacts low income areas and areas with inadequate wastewater collection and treatment capacity. Water quality of small community water systems can be a potential environmental justice issue either as a result of an identified, unaddressed water quality issues or due to the cost of treatment to address an identified issue. A related environmental justice concern is groundwater contamination in areas with private wells that are used for domestic supply and where households cannot afford to purchase bottled water as an alternative drinking water supply. Flooding that disproportionately affects low-income areas could be an environmental justice concern because the benefit-cost ratio for flood projects in affluent areas are typically higher (due to the increased value of at-risk property) than in low-income areas; as such, it may be easier to justify and move forward flood protection projects that benefit more affluent areas. Inadequate wastewater collection and treatment capacity also has the potential to be an environmental justice issue due to the cost of increasing wastewater conveyance, treatment, and disposal capacity. In pursuing future regional grant opportunities, the RWMG and TAC will ensure that agencies and stakeholders representing potential environmental justice areas have equal access to participate in the region's project selection processes. However, local funding match requirements that are often required by grant programs may prohibit these agencies from being able to compete for funding. In situations in which local funding match requirements can be waived or the agencies are able to provide match, the RWMG and TAC will work to ensure small community project are given due consideration and are not consistently deferred in favor of agencies serving greater populations or agencies with greater resources.

There is one California Native American tribal community within the Lahontan Basins region. As such, implementation of the LBIRWMP will directly benefit or impact this California Native American tribal community. Plan and project implementation will have the potential to benefit or impact lands that were historically occupied by California Native American tribal communities. As part of the environmental documentation process, proponents of projects funded through the LBIRWMP under Proposition 84 will be required to provide notification of the proposed project to California Native American tribes that had traditional lands within the area of the proposed project. California Native American Tribes that had traditional lands in the Lahontan Basins region include the Northern Paiute Tribe, Maidu Tribe, Washoe Tribe, and the Astugewi Tribe.

7.2 Project or Program Benefits and Impacts

A summary of projects included in the LBIRWMP and the objectives which they address is included in Appendix F. For each project, potential benefits and impacts are assumed to be similar to those identified for the resource management strategies they employ.

Table 7.1 Resource Management Strategies for Lahontan Basins IRWMP

Resource Management Strategy	Within Lahontan Basins Region		Interregional	
	Potential Benefits	Potential Impacts	Potential Benefits	Potential Impacts
Reduce Water Demand				
Agricultural Water Use Efficiency	Increased water savings Reduced groundwater overdraft/subsidence Improved water supply reliability Decreased operational costs Avoided cost of purchasing new supplies or developing new supply infrastructure Runoff reduction/pollution prevention	Reduced groundwater recharge in areas supplied with surface water Reduced in-stream flows, including loss of agricultural drainage flow to downstream water users	Improved water supply reliability Improved groundwater quality resulting from reduced saline intrusion	Reduced in-stream flows, including loss of agricultural drainage flow to downstream water users
Urban Water Use Efficiency	Increased water savings Reduced groundwater overdraft/subsidence Improved water supply reliability Decreased operational costs Avoided cost of purchasing new supplies or developing new supply infrastructure Runoff reduction/pollution prevention	Reduced groundwater recharge in areas supplied with surface water Reduced in-stream flows, including reduction of municipal wastewater discharges	Improved water supply reliability Improved groundwater quality resulting from reduced saline intrusion	Reduced in-stream flows, including reduction of municipal wastewater discharges
Improve Operational Efficiency and Transfers				
Conveyance-Regional/Local	Reduced flooding Improved water supply reliability Improved water quality, including protection of groundwater quality	Reduced in-stream flows Restricted wildlife passage Increased energy use Construction related impacts, including temporary impacts and long-term disturbance of habitat and wildlife	Reduced flooding	Reduced in-stream flows Restricted wildlife passage Construction related impacts, including disturbance of habitat and wildlife
System Reoperation	Reduced flooding Improved water supply reliability Improved water quality Reduced energy use	Changes in stream flow Increased energy use Construction related impacts, including temporary impacts and long-term disturbance of habitat and wildlife	Reduced flooding Reduced energy use	Changes in streamflow Increased energy use
Water Transfers	Improved water supply reliability Reduced groundwater overdraft/subsidence Improved groundwater quality resulting from reduced saline intrusion	Reduced in-stream flows	Improved water supply reliability Improved groundwater quality resulting from reduced saline intrusion	Reduced water availability and reliability

Resource Management Strategy	Within Lahontan Basins Region		Interregional	
	Potential Benefits	Potential Impacts	Potential Benefits	Potential Impacts
Increase Water Supply				
Conjunctive Management and Groundwater Storage	Improved water supply reliability Reduced groundwater overdraft/subsidence, including reduced threat of flooding from levee subsidence	Reduced in-stream flows Degraded water quality Loss of farmland Construction-related impacts, including temporary impacts and long-term disturbance of habitat and wildlife	Increased water supply reliability Reduced subsidence, including reduced threat of flooding from levee subsidence	Reduced water availability and reliability (competition over interregional supplies) Reduced in-stream flows Degraded water quality
Recycled Municipal Water	Improved water supply reliability Decreased operational costs (through reduced fertilizer requirements) Improved groundwater quality resulting from reduced saline intrusion	Increased salt/nutrient loading Construction related impacts, including temporary impacts and long-term disturbance of habitat and wildlife Growth inducement	Improved water supply reliability Improved groundwater quality resulting from reduced saline intrusion	Increased salt/nutrient loading
Surface Storage - Regional/Local	Reduced flooding Improved water supply reliability	Reduced in-stream flows Construction related impacts, including temporary impacts, long-term disturbance of habitat and wildlife, and loss of habitat	Reduced flooding	Reduced in-stream flows Construction related impacts, including temporary impacts, long-term disturbance of habitat and wildlife, and loss of habitat
Improve Water Quality				
Drinking Water Treatment and Distribution	Improved water supply reliability Improved water quality Public health benefits	Reduced in-stream flows Increased energy use Growth inducement Construction related impacts, including temporary impacts, long-term disturbance of habitat and wildlife, and loss of habitat	Improved water supply reliability (reduced demand on interregional supplies)	Reduced water supply reliability (increased use of interregional supplies) Increased energy use Construction related impacts, including disturbance of habitat and wildlife
Groundwater Remediation/Aquifer Remediation	Improved water supply reliability Improved water quality	Increased groundwater pumping/subsidence Construction related impacts, including temporary impacts and long-term disturbance of habitat and wildlife	Improved water supply reliability (reduced demand on interregional supplies)	Increased groundwater pumping/subsidence
Matching Quality to Use	Improved water supply reliability	Reduction in delivered water quality	Improved water supply reliability (reduced demand on interregional supplies)	None
Pollution Prevention	Improved water quality Improved habitat Decreased treatment costs	None	Improved water quality Improved habitat	None

Resource Management Strategy	Within Lahontan Basins Region		Interregional	
	Potential Benefits	Potential Impacts	Potential Benefits	Potential Impacts
Salt and Salinity Management	Improved water quality Improved water supply reliability Improved groundwater quality resulting from reduced saline intrusion	None	Improved water supply reliability Improved groundwater quality resulting from reduced saline intrusion	None
Urban Runoff Management	Improved water supply reliability Improved water quality Improved habitat Decreased treatment costs	Land use restrictions	Improved water supply reliability Improved groundwater quality resulting from reduced saline intrusion	None
Improve Flood Management				
Flood Risk Management	Reduced flooding Increased aquifer recharge Improved water quality Reduced risk to life and property Decreased flood insurance costs Improved water supply reliability Reduced saline intrusion	Loss of revenue from restricted land use Loss of flows to downstream water users Increased sedimentation and erosion Construction related impacts, including temporary impacts, long-term disturbance of habitat and wildlife and loss of riparian and/or wetland acreage	Reduced flooding Improved surface water quality Reduced risk to life and property Decreased flood insurance costs Improved water supply reliability Reduced saline intrusion	Loss of flows to downstream water users Increased sedimentation and erosion Increased flood flows to downstream communities Construction related impacts, including temporary impacts, long-term disturbance of habitat and wildlife and loss of riparian and/or wetland acreage
Practice Resources Stewardship				
Agricultural Lands Stewardship	Local prosperity Improved water quality Improved habitat Flood control enhancement Improved water supply reliability	Land use restrictions (prevention of future urbanization)	Open space preservation Improved water supply reliability Improved water quality	None
Economic Incentives (Loans, Grants, and Water Pricing)	Improved water supply reliability Local prosperity Improved groundwater quality resulting from reduced saline intrusion	Economic impacts (either for the agency sponsoring loans and grants or customers affected by water pricing)	Improved water supply reliability Improved groundwater quality resulting from reduced saline intrusion	Economic impacts (Loss of revenue)
Ecosystem Restoration	Improved habitat and wildlife passage Improved water quality Increased numbers of native species Increased recreational opportunities including recreational viewing	Land use restrictions Economic impacts (loss of revenue from restricted land use) Construction related impacts	Improved habitat and wildlife passage Improved water quality Open space preservation	None

Resource Management Strategy	Within Lahontan Basins Region		Interregional	
	Potential Benefits	Potential Impacts	Potential Benefits	Potential Impacts
Forest Management	Improved water supply reliability (through protection of snowpack) Improved water quality Improved habitat and wildlife passage	Land use restrictions	Improved supply reliability Improved water quality	Land use restrictions
Land Use Planning and Management	Minimize unintended impacts resulting from land use planning that is not coordinated with water resources planning Improved water supply reliability Improved water quality	Land use restrictions Growth inducement	Improved supply reliability	None
Recharge Area Protection	Improved water quality Increased groundwater recharged/reduced subsidence Improved supply reliability	Land use restrictions	Improved water supply reliability (reduced demand on interregional supplies) Improved supply reliability	None
Water-Dependent Recreation	Increased recreational opportunities for the region Enhanced public safety Local prosperity	Degraded water quality (through increased erosion and sedimentation) Construction related impacts, including temporary impacts and long-term disturbance of habitat and wildlife	Degraded water quality	Degraded water quality (through increased erosion and sedimentation)
Watershed Management	Reduced flooding Improved water supply reliability Improved water quality Improved habitat and wildlife passage Improved local understanding of water resources issues Improved coordination among water resource stakeholders	Land use restrictions Construction related impacts, including temporary impacts and long-term disturbance of habitat and wildlife	Reduced flooding Improved water supply reliability Improved water quality Improved habitat and wildlife passage Improved coordination among water resource stakeholders	Land use restrictions
Other Strategies				
Crop Idling for Water Transfers	Improved water supply reliability	Economic impacts (loss of revenue)	Improved water supply reliability (reduced demand on interregional supplies)	None
Rainfed Agriculture	Improved water supply reliability\	Economic impacts Loss of habitat and open space (through conversion to urban uses)	Improved water supply reliability (reduced demand on interregional supplies)	None
Irrigated Land Retirement	Improved water supply reliability Decreased operational costs	Economic impacts (loss of revenue through reduced productivity)	Improved water supply reliability (reduced demand on interregional supplies)	None

Technical Analysis and Plan Performance

Contents

8.1 Technical Analysis Review 3
8.2 Plan Performance Review 4
8.3 Project-Specific Data Collection and Monitoring Plans 7
8.4 Adaptive Management 8

Tables

Table 8.1 Foundational Documents Used to Create the LBIRWMP 3
Table 8.2 Example Reporting Template: Progress Toward Achieving Plan Objectives 5
Table 8.3 Example Reporting Template: Status of Project Implementation 6

This chapter addresses the Integrated Regional Water Management (IRWM) Plan Technical Analysis and Plan Performance Standard which requires IRWM Plans to:

- Document the data and technical analyses that were used in the development of the IRWM Plan
- Contain performance measures and monitoring methods to ensure the objectives of the Plan are met
- Describe a method for evaluating and monitoring the ability of the Regional Water Management Group (RWMG) to meet the objectives and implement the projects in the Plan

---

The LBIRWMP was developed using sound technical information, analyses, and methods. Information and documents were collected from various sources including Honey Lake Valley RCD, LIC, the City of Susanville, the County of Lassen, DWR, USGS, USBR, USEPA, and other relevant agencies.

Multiple local planning documents were reviewed and used to prepare the LBIRWMP. These include Urban Water Management Plans (UWMPs), Water Management Plans, the Honey Lake Valley Groundwater Basin Groundwater Management Plan, Municipal Service Reviews, documents associated with the Lassen County General Plan and project feasibility studies and assessments. While some of these are project-specific documents, others address water management issues on a local or regional basis. This allows for an understanding of regional issues shared by multiple entities in the Lahontan Basins region as well as more specific, localized issues.

Table 8.1 summarizes some of the key planning reports used in the LBIRWMP planning process. Additionally, the documents cited in the references section were reviewed and used in development of the LBIRWMP.

This chapter describes the process by which the RWMG will periodically verify that the region is efficiently making progress towards meeting the LBIRWMP objectives, is implementing projects listed in the plan, and is ensuring that each project in the LBIRWMP is monitored to comply with all applicable rules, laws, and permit requirements. This chapter describes the general process that will be employed to track plan performance and to monitor progress being made to implement the projects contained in this plan.

Table 8.1 Foundational Documents Used to Create the LBIRWMP

Document Name	Publication Date	Source	Relation to LBIRWMP
City of Susanville 2010 Urban Water Management Plan	August 2011	City of Susanville	Information related to City of Susanville urban water needs, management and planning objectives.
Conservation Plan for Pine Creek and Eagle Lake	June 2007	Honey Lake Valley Resource Conservation District	For general understanding of existing conservation efforts and planning along the Pine Creek and Eagle Lake.
Lassen County Groundwater Management Plan	June 2007	Lassen County	For understanding of Lassen County groundwater needs, management and planning objectives.
Infrastructure Inventory and Capital Improvements Plan	January 2013	Honey Lake Valley Resource Conservation District	Information related to the irrigation distribution system in the Lahontan Basins.
Groundwater Quality Data (Cascade Range and Modoc Plateau)	2010	United States Geological Survey (USGS)	A regional overview of groundwater quality in the Lahontan Basins.
Hazard Mitigation Plan	October 2010	Lassen County, City of Susanville, & Susanville Indian Rancheria	For general information regarding mitigation strategies for reducing potential losses resulting from wildfire, flood and other possible hazards. Directly relates to several projects.
Susan River Area Rapid Watershed Assessment	December 2011	United States Department of Agriculture (USDA)	For general understanding of existing watershed studies and planning along the Susan River.
Susan River Toxicity Report	August 2004	Regional Water Quality Control Board: Lahontan Region	For general understanding of existing water toxicity levels and planning along the Susan River.
Toxicity in California Waters: Lahontan Region	August 2012	State of California Regional Water Quality Control Board Lahontan Region	For general understanding of existing water toxicity levels and planning in the Lahontan Region.
Lassen County General Plan	September 1999	Lassen County	For general understanding of local land use, environmental/water resources, economic, and administrative management issues.
Water Quality Control Plan: Lahontan Region	December 2005	State of California Regional Water Quality Control Board Lahontan Region	For general understanding of local land use, environmental/water resources, economic, and administrative management issues.

8.1 Technical Analysis Review

To supplement existing documents, four special technical studies were commissioned by the RWMG during the development of this LBIRWMP. These studies were:

- DAC Water Supply, Quality and Flooding Evaluation (see Appendix B)
- Integrated Flood Management Plan (see Appendix A)
- Salt and Nutrient Management Study (see Appendix C)

- Climate Change Technical Study (see Chapter 15)

The LBIRWMP includes a list[1] of projects, programs, studies, and planning activities that local and regional planners have found to be technically feasible based on similar projects, pilot studies, technical analyses, benefit analyses, cost estimating, modeling and simulation efforts and data assessments. As each project moves closer to design and implementation, technical and economic analyses will be conducted to confirm project feasibility and to provide any necessary feedback to modify the project's plan to improve its likelihood of success. Appendix F summarizes project-specific documentation that supports the technical feasibility of the projects included in the LBIRWMP, and therefore, the technical feasibility of plan implementation.

In development of the LBIRWMP, the following data gaps were identified:

- Up-to-date, spatially-referenced land use/water use data that impacts water demands in the region
- Groundwater data to assess current groundwater conditions and to determine necessary management activities
- Local groundwater water quality data to determine the suitability of recharge areas
- Current and projected water demands

Land use and water demand information should be developed at the local level, which is beyond the scope of the LBIRWMP as an umbrella document. However, implementation of the LBIRWMP can assist with the collection of groundwater data, which can be readily collected through project-specific monitoring plans as projects are implemented as part of the LBIRWMP. This data will then be organized, managed, and disseminated through the region's central data management system and process.

8.2 Plan Performance Review

A plan performance review will be conducted three years after the initial adoption of the plan and in five-year intervals following the first review. The plan performance review will evaluate progress made toward achieving plan objectives and will be administered by the RWMG and supported by the TAC or a workgroup thereof.

Two tables will be generated with each plan performance review: one that addresses the extent to which the LBIRWMP objectives have been met, and one that describes progress made in implementing the projects listed in the LBIRWMP. The first table, which will be entitled

[1] For a current list of the LBIRWMP projects, programs, studies and planning activities, go to http://honeylakevalleyrcd.us/irwm/

"Progress Toward Achieving Plan Objectives", will report the aggregate of the performance measure data collected and submitted by the reporting agencies for each of the LBIRWMP objectives listed in Chapter 4 Objectives. The second table, which will be entitled "Status of Project Implementation" will list all of the projects within the Lahontan Basins project database that have been IRWMP approved, the project proponent for each, the implementation status, and funding sources. Projects that have been fully implemented will be highlighted separately.

Templates of these tables are provided on the following pages.

Table 8.2 Example Reporting Template: Progress Toward Achieving Plan Objectives

Objective	Performance Measures	Monitoring/Reporting Result	Cumulative Progress To-Date
A. Manage flood flows for public safety, water supply, recharge, and natural resource management	1. Currently, neither the Johnstonville Dam nor the various sections of the Susan River are sized to handle high flood flows 2. Volume of flood water stored and / or recharged 3. Flood-related damages (extent and frequency)		
B. Meet demands for all uses, including agriculture, urban, and environmental resource needs.	1. Curtailment of voluntary and/or mandatory water use restrictions 2. Stability of groundwater levels 3. Ability to meet instream flow requirements		
C. Correct groundwater overdraft conditions.	1. Groundwater surface elevation 2. Volume of water recharged 3. Reduction in groundwater subsidence 4. Improvement in groundwater quality		
D. Improve coordination of land use and water resources planning.	1. Number of cooperative planning meetings held between land use and water resource planning entities 2. Number of General Plans with water resource elements		
E. Maximize water use efficiency.	1. Estimated annual savings from demand management programs 2. Volume of water per year put to beneficial reuse 3. Percent of water users with meters and commodity pricing 4. Urban per capita water use		
F. Protect and improve water quality for all beneficial uses, consistent with the Basin Plan.	1. New 303(d) listings and / or delistings 2. Surface water and groundwater quality		

Objective	Performance Measures	Monitoring/Reporting Result	Cumulative Progress To-Date
G. Protect, restore, and improve natural resources.	1. Acres of habitat protection / restoration / enhancement completed 2. Development trends in the largest and most ecologically sensitive areas of Lahontan Basins (including the Susan River and Eagle Lake)		
H. Address water-related needs of disadvantaged communities (DACs).	1. Programs implemented that focus on meeting critical water-related needs of DACs 2. Percent of population with drinking water that complies with all applicable standards		
I. Protect and enhance water-associated recreation opportunities.	1. Number of programs that include water-associated recreation opportunities		
J. Establish and maintain effective communication among water resource stakeholders in the region.	1. Number of stakeholders or their representatives and members of the public attending IRWM-related meetings 2. Number of collaborative projects jointly implemented by multiple entities		
K. Effectively address climate change adaptation and/or mitigation in water resource management.	1. Number of projects implemented that address climate change		
L. Enhance public understanding of water management issues and needs.	1. Number of educational programs / number of people participating in water-focused educational events in the region		

Table 8.3 Example Reporting Template: Status of Project Implementation

Project	Proponent	Status of Project Implementation	Secured Funding Sources
Carrol Street Flood Wall Project	City of Susanville		
Dakin Unit-Honey Lake WA Pipeline Project	Ducks Unlimited, Inc.		
Leavitt Lake Outflow Canal Lining Project	Lassen Irrigation Company		
Madeline Municipal Water Assessment	Lassen Land and Trails Trust		
Closing Wastewater Retention Pond	Spalding Community Services District		

8.3 Project-Specific Data Collection and Monitoring Plans

Proponents of projects implemented as part of the LBIRWMP will be required to develop project-specific monitoring plans prior to, or in conjunction with, project implementation. Project proponents will be responsible for performing monitoring activities, collecting and validating the data consistent with LBIRWMP requirements, and submitting data to the Lahontan Basins IRWMP database management system and relevant statewide databases (refer to Chapter 9 Data Management). For projects that receive funding for project implementation through the IRWM Program, the RWMG will require each project proponent to provide evidence that it has prepared its project-specific monitoring plan(s) consistent with the requirements outlined in this plan and the funding contract, and that the plan is being implemented accordingly. Each monitoring plan will include a schedule with an estimated timeline of monitoring activities, which the RWMG will use as a guideline for overall program implementation. Consistent with DWR grant requirements which require quarterly reporting as part of the performance monitoring plan, data collected and analyses performed for DWR grant funded projects will be reported to the Lahontan Basins database management system and appropriate statewide databases on a quarterly basis, along with required documentation and an evaluation of project performance. This will help to ensure that implemented projects fulfill LBIRWMP objectives as originally intended.

Project-specific monitoring plan requirements will vary based on the type of project being implemented. All projects must adhere to appropriate State guidelines for monitoring, depending upon the type of data being collected, in order to be implemented through the LBIRWMP. These include:

- Projects that involve surface water quality must meet the criteria for and be compatible with the State Water Resources Control Board (SWRCB) Surface Water Ambient Monitoring Program (SWAMP), http://www.waterboards.ca.gov/water_issues/programs/swamp/tools.shtml.
- All projects that involve groundwater quality must meet the criteria for and be compatible with the SWRCB Groundwater Ambient Monitoring and Assessment (GAMA) program, http://www.waterboards.ca.gov/gama/.
- Projects collecting groundwater elevation should be compatible with the needs of the California Statewide Groundwater Elevation Monitoring (CASGEM) program, http://www.water.ca.gov/groundwater/casgem/.
- All projects that involve wetland restoration must meet the criteria for and be compatible with the State Wetland and Riparian Area Monitoring Plan (WRAMP),

http://www.waterboards.ca.gov/mywaterquality/monitoring_council/wetland_workgroup/docs/2 010/tenetsprogram.pdf

All project-specific monitoring plans must include the following:

- A table describing what is being monitored for the project (e.g. water quality, water depth, flood frequency), and effects the project may have on habitat or particular species (before and after construction).
- Measures to remedy or react to problems encountered during monitoring.
- Location of monitoring.
- Monitoring frequency.
- Monitoring protocols/methodologies and quality assurance and quality control (QA/QC) procedures, including who will perform the monitoring.

8.4 Adaptive Management

The plan performance review process will include an adaptive management component which will allow the RWMG to respond to lessons learned from analyzing collected performance measure and project monitoring data. Adaptive management also allows the region to incorporate new information about the effects of climate change as new tools and information becomes available. With this information, the RWMG, in coordination with the TAC, may consider modifying plan objectives, performance measures, the applicability of selected resource management strategies, and the project review and prioritization process. These actions may, in turn, determine the types of projects that will be selected and implemented in the future.

Local agencies implementing projects as part of LBIRWMP implementation will monitor for the parameters specified in order to determine how well each project is fulfilling its objectives. This information will be fed back into the project's decision-making structure to adapt the project to better meet its overall objectives. Only by consistent monitoring and analysis can projects successfully achieve their objectives. Monitoring will also provide a clear reporting mechanism for the public, decision makers, and regional planners to determine the planned versus actual value of the project. When the LBIRWMP is updated in the future and regional objectives are revisited, the TAC will discuss and evaluate the status of LBIRWMP implementation. The results of project-specific monitoring efforts will be utilized to identify areas where plan implementation may need to be modified to best achieve plan objectives moving forward.

When projects included in the LBIRWMP that are implemented independently from the LBIRWMP program, project sponsors will be encouraged to prepare and administer project-

specific monitoring plans that are generally consistent with the monitoring plans described above. During the plan performance review, the RWMG will assess the extent to which the LBIRWMP objectives have been met based on the projects and programs completed throughout the region. In this way, progress made toward achieving plan objectives by projects implemented outside of the IRWM Program will be assimilated into the plan performance review, though specific monitoring data may or may not be made available by project sponsors within the Lahontan Basins IRWMP database management system.

Lahontan Basins IRWMP

Integrated Regional Water Management Plan

Data Management

Contents

9.1 Overview of Data Needs 3
9.2 Data Collection Techniques 4
9.3 Data Management System 7
9.4 Quality Assurance/Quality Control Measures 7
9.5 Data Sharing 8

Tables

Table 9.1 Potential Sources of IRWMP Data 5

This chapter addresses the Integrated Regional Water Management (IRWM) Plan Data Management Plan Standard which requires IRWM Plans to:

- Describe the process of data collection, storage and dissemination to IRWM participants, stakeholders, the public and the State

---

This chapter describes the process that will be implemented to provide for the efficient use of available data, ensure stakeholder access to data, and integrate the data generated by IRWM implementation activities into existing State databases.

The RWMG have developed standard data management documentation practices that are required to be followed for projects and programs implemented as part of the LBIRWMP. Projects and programs implemented outside of the IRWM Program are encouraged to follow similar protocols to maximize usefulness and compatibility of data collected throughout the region, and to improve potential integration into statewide databases. The data that may be collected and anticipated reporting procedures are presented in the sections below. For the purposes of this plan, the term data includes technical documentation (such as designs, feasibility studies, and reports), as well as technical information collected as part of project or program planning, design, implementation, and operation.

9.1 Overview of Data Needs

Throughout the Lahontan Basins region, a variety of local, state and federal agencies and non-governmental organizations collect valuable water-related data, but that data is not currently assembled in a uniform or collaborative manner. At times, the data that is collected is program-specific with limited region-wide applicability. The Lahontan Basins IRWM planning process can facilitate better information-sharing and identify data needed by the region's agencies and organizations, project proponents, and stakeholders to more efficiently analyze and understand water quality and environmental conditions within the region.

Procedural data needs in the Lahontan Basins region include the following:

- Uniform data management protocols for LBIRWMP projects to allow broader sharing and comparability
- Centralized data management to provide a means for addressing regional questions about the condition of water resources in the region
- Dissemination of data to the general public in a format that improves public understanding of water management issues

In addition, the following specific data needs that are broadly applicable to the Lahontan Basins region were identified through review of existing water management plans, RWMG discussions and public input:

- Up-to-date, spatially-referenced land use data that includes recent agriculture-to-agriculture conversions that impact water demands in the region
- Groundwater data to assess current groundwater conditions and to determine necessary management activities
- Surface Water information. There are gaps in the various surface water data. Uses and loses that could help to inspire integrated projects.
- Local groundwater water quality data to determine the suitability of recharge areas
- Current and projected water demands

Implementation of the LBIWMP will assist in meeting these data needs. The procedural data needs will be addressed through the implementation of the centralized data management system created as part of the development of this LBIRWMP (see Section 9.3 Data Management System), and the identified data gaps will be addressed through project implementation. In some cases, these gaps may be filled by projects specifically designed to collect needed data, and in

other cases, data gaps may be addressed indirectly through data reported in project performance monitoring plans.

9.2 Data Collection Techniques

Data collected in conjunction with LBIRWMP implementation projects will vary based on the type and scope of each individual project, but may include:

- Streamflow
- surface water deliveries
- groundwater elevations
- groundwater pumping
- precipitation
- volume of water impounded or recharged
- water demand
- locations and sizes of water-related facilities
- political and agency boundaries
- land use
- contaminant plume location and extent
- water quality data
- locations of sensitive habitats and species
- hydrogeologic and hydrologic data
- visitor days at recreational areas
- community members served by educational events

Data may also be developed by project sponsors using numerical models such hydrologic models. Working with the project sponsors, agencies, regional stakeholders, the RWMG, and the TAC will continue to seek out data needed to address regional data gaps on an ongoing basis. Identified data gaps will be filled as new data sources and / or new or expanded monitoring activities are identified.

Table 9.1 Potential Sources of IRWMP Data

Federal	State	Local
National Climate Data Center National Resource Conservation District Army Corps of Engineers Bureau of Reclamation U.S. Fish & Wildlife Service U.S. Geologic Survey National Marine Fisheries Service U.S. Environmental Protection Agency The Nature Conservancy U.S. Forest Service	California Irrigation Management Information System (CIMIS) Department of Fish & Game Department of Public Health Department of Water Resources State Water Resources Control Board & the Regional Water Quality Control Board California Natural Diversity Database California Department of Pesticide Regulation	Lassen County Sierra County City Planning Departments Susan River Watershed Group Lassen Irrigation Company Susanville Indian Rancheria Honey Lake Valley Resource Conservation District Stakeholders

Data associated with the design and implementation of projects included in the Lahontan Basins IRWMP will depend upon project type, but may include streamflow, surface water deliveries, groundwater elevations, groundwater pumping, precipitation, water demand, locations and sizes of water-related facilities, political and agency boundaries, land use, contaminant plume location and extent, water quality data, locations of sensitive habitats and species, and hydro-geologic and hydrologic data. These data will be collected from various federal, state, and local sources, some of which are shown in Table 9.1 Data may also be developed by project sponsors using numerical models such as HEC, H2ONet, and various hydraulic and hydrologic models. Working with the project sponsors, the agencies shown in Table 9.1, and regional stakeholders, the LBIRWMP will continue to search for data relevant to the LBIRWMP resource management strategies on an ongoing basis. Any identified data gaps will be filled through the identification of new data sources or new or expanded monitoring activities.

Lahontan Basins IRWMP project proponents implementing projects through the IRWM Program will be required to prepare project-specific monitoring plans. The monitoring plans will clearly identify monitoring and analytical techniques and QA/QC procedures to be implemented, and will describe how those techniques are compatible with the requirements of statewide database(s) relevant to the project. Selected potentially applicable statewide databases are summarized below.

SWAMP: Projects collecting surface water data will be required to adhere to SWAMP data collection protocols. Typical data collection techniques for surface waters include both field measurements and laboratory analysis. Field measurements are either collected using meters or field kits for a common list of constituents including but not limited to: water temperature, pH,

conductivity, dissolved oxygen and turbidity. For an example of a field data sheet and complete list of fields that required SWAMP go to:
http://swamp.mpsl.mlml.calstate.edu/wp-content/uploads/2009/04/swamp_sop_field_measures_water_sediment_collection_v1_0.pdf.

There is a large list of possible constituents that are measured in surface waters that require laboratory analysis. Typical laboratory analysis includes fecal indicator bacteria, metals, nutrients, persistent organic pollutants, and turbidity. SWAMP provides guidance on methods and quality assurance. This guidance can be found at:http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/qapp/qaprp082209.pdf.

Biological monitoring is helpful for determining the health of a system and whether it is able to sustain a diverse community of benthic macro invertebrates. Standard operating procedures for determining a stream's physical/habitat condition and benthic invertebrate assemblages can be found at:
http://swamp.mpsl.mlml.calstate.edu/wp-content/uploads/2009/04/swamp_sop_bioassessment_collection_020107.pdf.

GAMA: Projects collecting groundwater data will be required to adhere to GAMA data collection protocols. The GAMA Priority Basin Project is grouped into 35 groundwater basin groups called "study units." Each study unit is sampled for common contaminants regulated by CDPH, and also for unregulated chemicals. Testing for these chemicals—usually at detection levels well below those achieved by most laboratories—will help public and private groundwater users to manage this resource. Results from the Cascades/Modoc Plateau study unit, which includes the Lahontan Basins, can be found at http://pubs.er.usgs.gov/publication/ds688/. Some of the chemical constituents that are sampled by the GAMA Priority Basin Project include:

- Low-level volatile organic compounds (VOCs)
- Low-level pesticides
- Stable isotopes of oxygen, hydrogen, and carbon
- Emerging contaminants (pharmaceuticals, perchlorate, chromium VI, and other chemicals)
- Trace metals (arsenic, selenium, lead, and other metals)
- Radon, radium, and gross alpha/beta radioactivity
- General ions (calcium, magnesium, fluoride)
- Nutrients, including nitrate and phosphates
- Bacteria: total and fecal coliform bacteria

CASGEM: Projects collecting groundwater elevation should be compatible with the needs of the California Statewide Groundwater Elevation Monitoring (CASGEM) program. DWR's efforts collecting groundwater elevation data must provide well identification number, measurement date, reference point and land surface elevation, depth to water, method of measuring water depth and measurement quality codes. Additional information on the CASGEM program is available at: http://www.water.ca.gov/groundwater/casgem/.

WRAMP: Projects involving wetland restoration must meet the criteria for and be compatible with WRAMP. WRAMP is intended to track trends in wetland extent and condition to determine the performance of wetland, stream, and riparian protection programs in California. The program defines standardized assessment methods and data management with the goal of minimizing new costs and maximizing public access to assessment information. Additional information on the WRAMP program can be found at the following location:
http://www.waterboards.ca.gov/mywaterquality/monitoring_council/wetland_workgroup/docs/2010/tenetsprogram.pdf.

9.3 Data Management System

The Lahontan Basins IRWMP website will serve as the centralized data management system for the Lahontan Basins region, data provided by RWMG, project sponsors and stakeholders. The system includes data entry forms for users to submit data and tools to automate report and chart preparation based on available data. It can be used to fill data gaps, identify additional data gaps, document the status of current water resources problems, detect new problems, and provide information to the RWMG to track progress in LBIRWMP implementation efforts. Having this data organized in a data management system will aid the RWMG's efforts to share collected data. The Lahontan Basins IRWMP and the data in the data management system will be maintained by the RWMG and will be accessible to stakeholders via a link on the Lahontan Basins IRWMP website.

9.4 Quality Assurance/Quality Control Measures

As described in Chapter 8 Technical Analysis and Plan Performance, individual project sponsors will be responsible for reviewing data collection and QA/QC protocols to validate that data was collected in accordance with QA/QC procedures required as part of the project monitoring

program. In addition, project proponents will be responsible for "spot-checking" all data for accuracy at the time of entry to the database to identify any apparent errors. Once data collection and QA/QC has been complete in accordance with provisions of the approved project-specific monitoring plan, the project sponsor will submit the compatible data to the appropriate statewide database, as well as to Lahontan Basins IRWMP data portal.

9.5 Data Sharing

The RWMG, TAC, project proponents, and other IRWM planning participants are all jointly responsible for data dissemination. During development of the Lahontan Basins IRWMP, data was disseminated via public workshops, special technical workshops, TAC meetings and the Lahontan Basins IRWMP website postings. During implementation, an online database created during the Lahontan Basins IRWM planning process will be used to share project information and data collected as part of LBIRWMP. This information will be shared with statewide databases (CEDEN, Water Date Library, CASGEM, CEIC, and CERES).

Lahontan Basins IRWMP website is a tool for locating, connecting, sharing and integrating projects within the region. Basic information must be provided for a project to be included within the project database, and any interested member of the public can register for Lahontan Basins IRWMP to view this information. LBIRWMP is designed to promote collaboration and stakeholders who register as project sponsors can collaborate on projects. The site includes space for collaborators to share notes and documents related to their projects, and the project proponent has the option to make these items visible for public users interested in following the project progress.

Lahontan Basins IRWMP is designed to be a central location for agencies and stakeholders throughout the Lahontan Basins to store and share water-related data. Data collected as part of the LBIRWMP will be made available to stakeholders and other interested parties through the LBIRWMP website. Individuals without internet access may contact one of the RWMG member agencies to request hard copies of specific datasets.

Sponsors of projects implemented through the LBIRWMP will also be required to submit data to the statewide database(s) specified in the approved project-specific monitoring plan. Each project sponsor will provide the RWMG with confirmation that the data has been submitted to the appropriate statewide database(s).

Environmental documentation processes (i.e. CEQA and NEPA) are another method of disseminating data for review by interested stakeholders and the public; completion of environmental documentation will be the sole responsibility of project proponents and will be completed on a project-by-project basis.

Lahontan Basins IRWMP

Integrated Regional Water Management Plan

Finance

Contents

10.1 Funding Sources and Mechanisms for Planning and Implementation..... 3

10.2 Operation and Maintenance Funding for Implemented Projects 9

Tables

Table 10.1 Funding Sources for Development of the IRWM Plan and Implementation of Projects 5

The Integrated Regional Water Management (IRWM) Plan must plan for implementation and financing of identified projects and programs including potential financing for implementation. The financing discussion must include:

- List of possible funding sources for continued development of the IRWM Plan
- List of funding mechanisms for the projects and programs in the Plan
- Explanation of the certainty and longevity of funding for the Plan and projects/programs in the Plan.
- Explanation of how O&M costs for projects that implement the Plan would be covered and the certainty of the funding

---

Given the low density development in the Lahontan Basins region, project financing has always proven to be a major obstacle, often preventing projects from proceeding to implementation. Demands on agencies' and cities' limited funds continue to increase, construction costs continue to rise, existing aging infrastructure requires upgrades to meet growing demands, and future state legislation threatens to shift substantial property tax revenues away from special districts to the state general fund. In this economic climate, agencies are challenged to balance costs associated with supply water for new growth while ensuring the highest standards of water quality and supply reliability for existing customers, protect and enhance the sensitive ecosystems within the region, and minimize costs incurred by end-users. Further, projects that benefit the environment, but do not provide new water or a measurable improvement to water supply reliability and/or water quality are wholly dependent upon public assistance for implementation.

10.1 Funding Sources and Mechanisms for Planning and Implementation

Funding is particularly difficult for the Lahontan Basins region due to the economic distress of its communities. Given the Lahontan Basins region's economic conditions, the RWMG and regional stakeholders are mindful of the need to implement the LBIRWMP, including any projects or programs considered for implementation, in a cost-effective manner.

This LBIRWMP was developed with funding from the DWR IRWM Grant Program in conjunction with significant time and resources from Lassen Irrigation Company, the City of Susanville, the County of Lassen, Honey Lake Valley Resource Conservation District and the Susanville Indian Rancheria. Moving forward, the RWMG recognizes that the bulk of the cost to maintain the LBIRWMP must come from its member agencies. The RWMG is committed to continuing to fund a useful and implementable IRWM Plan. Using in-kind services performed by staff from their respective agencies, supplemented by grant funding when available, the RWMG's member agencies intend to implement periodic plan performance reviews, continue coordinating and participation in meetings of the TAC, organize stakeholder outreach efforts, and update the LBIRWMP as needed in the future to help ensure it responds appropriately to current day conditions and issues. The time commitment from the RWMG is estimated to be approximately 100-120 hours per year for organization and attendance of quarterly TAC meetings (distributed among the staff of the RWMG member agencies) and 40-60 hours per year to organize and attend biannual meetings of the Policy Committee (distributed among elected officials and staff members), as discussed in Chapter 3 Governance.

The estimated costs of projects included in the LBIRWMP range from tens of thousands of dollars to multi-million dollar projects. Estimated costs for the snapshot of projects that was included in the LBIRWMP as of 04/24/2015 is presented in Appendix F. The list of projects in the appendix also identifies local funding sources and existing grants that have been secured by the project proponent; in most cases these amounts are not applicable. The majority of the project proponents have not yet successfully identified local funding sources to support implementation of their proposed projects. The combined estimated cost of the projects within the plan is approximately $16,006,500.00. Of this amount, $3,201,300 million, or 20% of the total estimated costs, have been secured. As illustrated by this snapshot of projects, funding is a real challenge for the region. Many of the projects included within the LBIRWMP were submitted with the hope of securing outside funding for implementation.

The RWMG, TAC, and regional stakeholders understand that in the long run, project and program costs must be borne primarily by local entities. However, outside funding provides assistance critical to moving projects from planning to construction. While grants and loans represent unsecured sources of funding, in a region where some water and sewer enterprise funds have been running at a significant deficit and the rate base is composed of DACs, there is significant uncertainty in local sources of funding. Due to lack of funding, some projects which are "shovel-ready" have not been completed. In other cases, projects to meet critical regional water management needs are unable to move beyond planning phases due to inadequate funding.

The RWMG will fund oversight of the LBIRWMP through in-kind time and limited material commitments, but outside sources of funding will be needed to supplement locally available funds and advance some critical projects.

It should be recognized that each implementing organization has a unique set of revenue and financing methods and sources. The LBIRMWP does not provide an exhaustive list of funding sources available. Many of the same funding sources and/or mechanisms would be used for continued development of the IRWM Plan and for project / program implementation. Potential funding sources for furthering the LBIRWMP and implementing projects are listed in Table 10.1, and the funding mechanisms are further described below.

Table 10.1 Funding Sources for Development of the IRWM Plan and Implementation of Projects

Funding Mechanisms	Continued IRWM Plan	Project/Program Implementation	Certainty & Longevity of Funding
User Rates/Recovery		✓	Dependent upon rate structure adopted by project proponents
Capacity Fees		✓	Dependent upon rate structure adopted by project proponents
User Fees		✓	Dependent upon rate structure adopted by project proponents
Special Assessments		✓	Dependent upon the ability to demonstrate direct and unique benefits to parcels. Once in place this represents high certainty of funding
General or Capital Improvement Funds	✓	✓	Dependent upon budgets adopted by project proponents and participating agencies
Revenue Bonds		✓	Dependent upon debt carried by project proponents & bond market
Local, State, or General Grant Programs	✓	✓	Dependent upon future, state, and federal budgets, and success in application process
Low-interest Loan Programs		✓	Dependent upon future, state, and federal budgets, and success in application process

User Rates/Rate Recovery User rates or rate recovery pays for the operations and maintenance of a water agency or public utility's system. Within a water agency user rate, there is a fixed cost component that covers costs that do not vary with the amount of supplied water, such as labor and overhead expenses, and a variable cost component that covers costs that are based on the amount of pumping and treatment needed to meet the water demands of the customers. These costs, such as electrical and chemical costs, vary with the amount of supplied water. A water agency customer pays a monthly fixed rate and a variable rate based on the metered usage. In some cases, the variable rate includes an allowance for water use and the variable rate is charged only if the customer's usage exceeds the fixed allowance. In tiered water rates, the variable fee increases with water consumption. For services without meters, a single monthly rate is assessed

based on assumed consumption. Unmetered customers may also be assessed miscellaneous fees, including charges for swimming pools.

Regional stakeholders understand the need to fully examine projects before passing the costs of projects onto ratepayers in the form of increased water and wastewater rates. Additionally, regional stakeholders have expressed the need for projects designed to address existing water management needs to be economically sustainable given the current population/ratepayers. As such, the certainty of funding for projects which propose rate increases will be largely dependent on the support garnered for the project and ratepayers understanding of the project need.

Capacity Fees Capacity fees are used almost universally by water agencies as a measure to achieve and maintain equity among its past, present, and future customers. For a growing water agency, capacity fees can represent more than half of the total revenue in any given year, and as such are very important to existing as well as future customers. Capacity fees are typically charged per connection, measured in equivalent dwelling units (EDUs). A single connection may encompass more than one EDU. In addition to the connection fee aspect of capacity fees, water agencies may also assess other fees, e.g., Commercial Acreage Fee (per acre) and Other Service Fees (per acre).

In some cases, if a developer builds a water pipeline or large water facility required by a water agency as a condition of development, then as partial or full payment for the water facility, a water agency may give fee credits to the developer in lieu of the developer paying fees. If the value of the water facility exceeds the amount of credits, a reimbursement agreement is typically executed authorizing payment to the developer of the remaining amount owed over a period of time which does not typically exceed a defined time period. Capacity fees can be controversial if not structured to achieve equity.

User Fees Monthly user fees are assessed by water agencies when facilities are implemented that directly benefit existing customers. This is particularly true for water agencies that are developing conjunctive use water systems in which existing customers may have paid for the groundwater component when they paid the development fee (through the purchase of the home). The surface water and/or recycled water component is a new water supply for a water agency that is needed for conjunctive use with groundwater supplies. Income from this monthly revenue source may be used to pay debt service on debt financed assets.

Special Assessments Upon compliance with Proposition 218, a government agency can impose a special assessment on properties that receive a special benefit from the public project that is being constructed.

As the region works to address critical flood management needs, it may be necessary to form a Flood Control District or a JPA comprised of agencies with authority over flood management. The Flood Control District or JPA could focus on the creation of drainage areas, flood control zones and other special assessment areas to support design, construction and maintenance of flood and stormwater management facilities.

An assessment district for maintaining the groundwater basin, such as the districts authorized under AB3030 could be created and properties could be assessed to support groundwater recharge projects and monetary cost of purchased recharge water.

General or Capital Improvement Funds General or capital improvement funds are monies that an agency sets aside to fund general operations and/or facility improvements, upgrades, and at times development. These funds are usually part of the overall revenue stream and may or may not be project-specific.

Revenue Bonds In cases in which large facilities are needed to support current services and future growth; revenue bonds may be issued to pay for new capital. In this way, large facilities can be paid for by bonded debt service at the time of construction with repayment of the debt service over a 20- to 30-year timeframe. This is a preferred approach to paying for high-cost facilities because it avoids the perceived over-collection of fees from past customers that go toward facilities that serve present and future customers. The drawback to bonded debt is that it cannot be accomplished with capacity fees alone due to the variability and uncertainty of new development over time. A user rate is needed as a bond document covenant in the event that development fees are not adequate to make the required annual payment for the debt service.

Local, State, and Federal Grant Programs. Grant programs typically require that local matching funds be available. The matching fund requirement demonstrates a local commitment to promoting and completing the study or project. Grants typically carry relatively high administration costs because extensive grant reporting may be required, and typically only a relatively small portion of the grant may be used to cover grant administration. The development of this LBIRWMP was partially funded through a Proposition 84 Integrated Regional Water

Management Planning Grant. Grant programs that project proponents within the region have used in the past and/or may consider for the future include the following.

- Proposition 50
  - DWR Water Use Efficiency Grant Programs
- Proposition 84
  - DWR IRWM Grant Program
  - DWR Flood Emergency Response Grant Program
  - State Water Resources Control Board (SWRCB) Storm Water Grant Program
  - SWRCB Agricultural Water Quality Grant Program
  - California Department of Public Health (CDPH) Emergency Grants
- Proposition 1E
  - DWR Stormwater Flood Management Grant Program
- California State Parks Office of Grants and Local Service Annual Grant Programs
  - Habitat Conservation Fund
  - Land and Water Conservation Fund
  - Recreational Trails Program
- U.S. Environmental Protection Agency Environmental Justice Grants and Cooperative Agreements
- U.S. Department of Agriculture Rural Development Grant Assistance
- U.S. Department of Agriculture Natural Resources Conservation Service Financial Assistance Program
  - Agricultural Management Assistance
  - Agricultural Water Enhancement Program
  - Conservation Innovation Grants
  - Environmental Quality Incentives Program
  - Wildlife Habitat Incentive Program
  - Farm and Ranch Lands Protection Program
- U.S. Fish & Wildlife Grant Programs
  - North American Wetlands Conservation Act
  - Cooperative Conservation Initiative
- U.S. Economic Development Administration Investment Programs
- U.S. Bureau of Reclamation Title XVI Water Reclamation and Reuse Program
- U.S. Bureau of Reclamation WaterSMART Program (funded under SECURE Water Act)
- The Nature Conservancy

- Community Alliance with Family Farms

Several funding agencies provide low-interest loans for implementation of water resource-related projects. Low-interest loans can save the implementing agency significant amounts of money by reducing interest payments as compared with traditional bonds. SWRCB offers low-interest loans for wastewater and recycled water projects through its Clean Water State Revolving Fund (SRF) loan program, CDPH administers a similar SRF loan program for drinking water-related projects, and the California Infrastructure and Economic Development Bank (I-Bank) administers the Infrastructure SRF loan program for financing implementation projects such as sewage collection and treatment, water treatment and distribution, and water supply projects.

The Clean Water SRF program generally has approximately $200 to $300 million available in loans each year to help cities, towns, districts, Native American tribal governments, and any designated and approved management agency under Section 208 of the Clean Water Act to construct publicly-owned facilities including wastewater treatment, local sewers, water reclamation facilities, nonpoint source projects, and development and implementation of estuary comprehensive conservation and management plans. The interest rate is half of the most recent General Obligation (GO) Bond Rate at the time of the funding commitment. Over the last five years, the Clean Water SRF loan interest rate has ranged from 1.8% to 3.0%. Amounts available through the CDPH Safe Drinking Water SRF loan program vary, but approximately $100 to $200 million is available annually.

Available loan funding is dependent upon federal appropriations to each program. In the past, DWR has also offered low-interest loans for construction and feasibility studies for new local water supplies to local public agencies. The funding source, Proposition 82, has been exhausted for these loans, therefore, they are no longer available.

10.2 Operation and Maintenance Funding for Implemented Projects

Ongoing support and financing of the operation and maintenance (O&M) of projects in this Plan Update are expected to derive from many of the same sources that were identified to fund project implementation. Support and financing will likely come primarily from local sources, including user rates, fees and assessments. Since regional projects and programs often involve multiple partner agencies, the range of local sources available is broadened. The details of financing these larger, multipartner projects are typically worked out on a project-by-project basis. Large multi-purpose projects typically adhere to standard cost accounting and cost of service principles

which are typically described and codified in the agreements for ownership, and operation and maintenance of facilities is typically developed as part of a project financing package.

O&M costs of proposed implementation projects must be evaluated as the overall viability of a particular project effort is determined. Any project that is advanced for implementation consideration must include an analysis to determine ability to operate and maintain the project and project benefits. The annual fiscal impact on user rates, and the willingness of ratepayers to accept any increased cost of service as may be required for project implementation, must be included in this analysis. The need for water and the economic hardship impacts that would occur, should the new source not be available, may also be considered as part of the analysis. Any benefits derived from replacing and/or updating existing systems can also be considered.

For non-water supply projects, alternate criteria must be considered in evaluating the region's ability to provide ongoing support. For example:

- Wastewater costs, using strict cost-of-service principles, can be considerable (including O&M costs). Cost recovery is primarily a function of an agency's ability to charge fees for wastewater collection and treatment of wastewater.
- Watershed improvement projects are designed to minimize the need for ongoing operation and maintenance expenses. Costs associated with monitoring and/or staff support to track and implement projects and studies can potentially be covered through membership contributions, grants, or by other non-profit funding vehicles not necessarily available to governmental agencies.
- Projects focused on providing water quality benefits must be designed to employ a process that allows for low-cost operation and maintenance. For example, debris build-up (and hence the need for its removal) must be a consideration in the system design.

To improve the Lahontan Basins region's ability to provide ongoing support to priority projects, agencies and stakeholders in the region should work together to minimize associated O&M costs and gain savings from economies of scale.

Relation to Local Water Planning

Contents

11.1 Relationship between LBIRWMP and Local Planning Documents and Programs 4
11.1.1 Water Supply and Water Quality Planning 4
11.1.2 Wastewater and Recycled Water Planning 4
11.1.3 Flood Protection and Stormwater Management Planning..... 4
11.1.4 Natural Resources Planning 5
11.2 Dynamics between LBIRWMP and Local Planning Documents and Programs 5

Tables

Table 11.1 Major Planning Reports Used to Create the Lahontan Basins IRWMP 3

This chapter addresses the Integrated Regional Water Management (IRWM) Relation to Local Water Planning Standard which requires IRWM Plans to:

- List local water plans used in the IRWM Plan
- Discuss how the IRWM Plan relates to planning documents and programs established by local Agencies
- Describe the dynamics between the IRWM Plan and local planning documents

---

The LBIRWMP builds upon a wide variety of existing local water plans and studies, as well as on-going studies being developed in parallel with plan development. The LBIRWMP uses these existing documents, plans and programs to establish a planning baseline for water resources management throughout the region.

Local water planning documents set forth water resources management policies and projections at the local level. Through their role in determining land use and development types, patterns, and densities, these local plans dictate the location and extent of impervious surfaces, quantity and density of population, areas of open space, and other characteristics fundamental to water resources planning. As such, local plans ultimately serve as the basis for water resources management planning, and consequently for LBIRWMP development as well. The relationship and linkages between these local planning documents and the LBIRWMP are described in the following subsections.

Table 11.1 summarizes the local water plans used to develop the LBIRWMP.

Table 11.1 Major Planning Reports Used to Create the Lahontan Basins IRWMP

Document Name	Publication Date	Agency(ies)/Entity(ies)	Relation to IRWMP
Conservation Plan for Pine Creek and Eagle Lake	June 2007	Honey Lake Valley Resource Conservation District	For general understanding of existing conservation efforts and planning along the Pine Creek and Eagle Lake
Lassen County Groundwater Management Plan	June 2007	Lassen County	For understanding of Lassen County groundwater needs, management and planning objectives.
Infrastructure Inventory and Capital Improvements Plan	January 2013	Honey Lake Valley Resource Conservation District	For understanding relationship of Infrastructure condition and prioritizing capital improvements.
Groundwater Quality Data (Cascade Range and Modoc Plateau)	2010	United States Geological Survey (USGS)	A regional overview of groundwater quality in the Lahontan Basins
Hazard Mitigation Plan	October 2010	Lassen County, City of Susanville, & Susanville Indian Rancheria	For general information regarding mitigation strategies for reducing potential losses resulting from fire, flood and other possible hazards. Directly relates to several projects.
Susan River Area Rapid Watershed Assessment	December 2011	United States Department of Agriculture (USDA)	For general understanding of existing watershed studies and planning along the Susan River.
Susan River Toxicity Report	August 2004	Regional Water Quality Control Board: Lahontan Region	For general understanding of existing water toxicity levels and planning along the Susan River.
Toxicity in California Waters: Lahontan Region	August 2012	State of California Regional Water Quality Control Board Lahontan Region	For general understanding of existing water toxicity levels and planning in the Lahontan Region.
Lassen County General Plan	2000	Lassen County	For general understanding of local land use, environmental/water resources, economic, and administrative management issues.
Water Quality Control Plan: Lahontan Region	December 2005	State of California Regional Water Quality Control Board Lahontan Region	For general understanding of local land use, environmental/water resources, economic, and administrative management issues.

11.1 Relationship between LBIRWMP and Local Planning Documents and Programs

11.1.1 Water Supply and Water Quality Planning

Planning departments throughout the region are continually developing documents that establish population projections and water use projections at the local level. These local planning efforts serve as the basis for development of Urban Water Management Plans (UWMPs) and Agricultural Water Management Plans (AWMPs). These documents are developed and adopted by local water agencies and municipalities, and are submitted to the state for acceptance. The information in these UWMPs and AWMPs is local to the preparing water agency or municipality, and builds upon the local planning information presented in local plans such as general plans and municipal service reviews (MSRs). Rather than superseding the local planning documents, the IRWM Plan uses these documents as a basis for developing a wider, regional view of water supply, demand, and quality throughout the region.

In addition to building on these local agency plans, the LBIRWMP compiles information from water resources management plans developed by local agencies, where local planning entities have identified preferred projects for implementation at the local level.

11.1.2 Wastewater and Recycled Water Planning

Local wastewater and recycled water agencies and municipalities create various plans and documents which are used to develop projects for future implementation. These plans and documents include wastewater and recycled water master plans, facilities plans, and feasibility studies. These master plans, facilities plans and feasibility studies build upon the water supply and demand information developed in Urban Water Management Plans (UWMPs) and based on local planning documents such as General Plans to project future wastewater flow quantity and quality. Based on these projections, local wastewater and recycled water agencies and municipalities develop plans to manage these flows. Further, based on the land use types outlined through the general planning process, these agencies are able to evaluate potential markets for recycled water use at the local level. The LBIRWMP compiles and builds upon these local documents to develop a regional picture of wastewater and recycled water planning.

11.1.3 Flood Protection and Stormwater Management Planning

Flood protection and stormwater management intrinsically build upon local planning efforts, such as General Plans and Specific Plans. Dependent on the location and extent of impervious surfaces dictated through the local planning process, flooding issues can be either managed or

exacerbated. In addition, stormwater runoff quality and quantity are directly influenced by the type, location, and density of adjacent development. Further, municipalities are increasingly tasked with development and implementation of stormwater management BMPs at the local level.

The LBIRWMP assembles local information to establish a baseline understanding of flood and stormwater conditions across the Lahontan Basins region. Further, the LBIRWMP builds upon work being conducted at the local level to enhance flood protection and stormwater management by considering the proposed local projects in the context of the greater regional challenges, goals and objectives.

11.1.4 Natural Resources Planning

Ecosystem protection and restoration projects are often closely tied to local land use planning efforts. Restoration of riparian and wetland habitats frequently occurs within urbanized areas, or areas experiencing development pressure. As a result, local municipal approvals are required for implementation and maintenance to be effective. Local planning documents used in preparation of project design, construction, and environmental documents include general plans, specific plans, watershed management plans, habitat conservation plans, and stewardship plans. In addition to local municipalities, water and flood control districts, resource and regulatory agencies, and non-governmental organizations (NGOs) all play key roles in development of local planning documents. These agencies and organizations establish watershed and habitat management policies, programs, and projects which delineate ecosystem restoration activities throughout the Lahontan Basins region.

11.2 Dynamics between LBIRWMP and Local Planning Documents and Programs

As described above, the LBIRWMP serves as an umbrella document, building upon the work developed at the local level into a comprehensive planning document that encompasses all areas of water management. Water management conditions throughout the region are not static; conditions are continually changing, and local planning documents are revised and updated periodically to reflect these changing conditions. The LBIRWMP must, similarly, respond to changing conditions. As described in Chapter 3 Governance, the LBIRWMP will be reviewed and updated periodically. During the revision process, changes in local planning documents will be incorporated into the LBIRWMP. The RWMG will coordinate its water management

planning activities in this way. The LBIRWMP will respond to changing local water management conditions, and will continue to reflect the planning completed at the local level.

Lahontan Basins IRWMP

Integrated Regional Water Management Plan

Relation to Local Land Use Planning

Contents

12.1 Linkages between Water Management and Land Use Planning 4
12.2 Current Relationships between Water Managers and Land Use Planners..... 4
12.3 Future Efforts to Establish Proactive Relationships 5

Figures

Figure 12.1 Land Use within the Lahontan Basins..... 3

This chapter addresses the Integrated Regional Water Management (IRWM) Relation to Local Land Use Planning Standard which requires IRWM Plans to:

- Contain processes that foster communication between land use managers and RWMGs with the intent of effectively integrating water management and land use planning
- Document the current relationship between local land use planning, regional water issues, and water management objectives
- Identify future plans to further a collaborative, proactive relationship between land use planners and water managers.

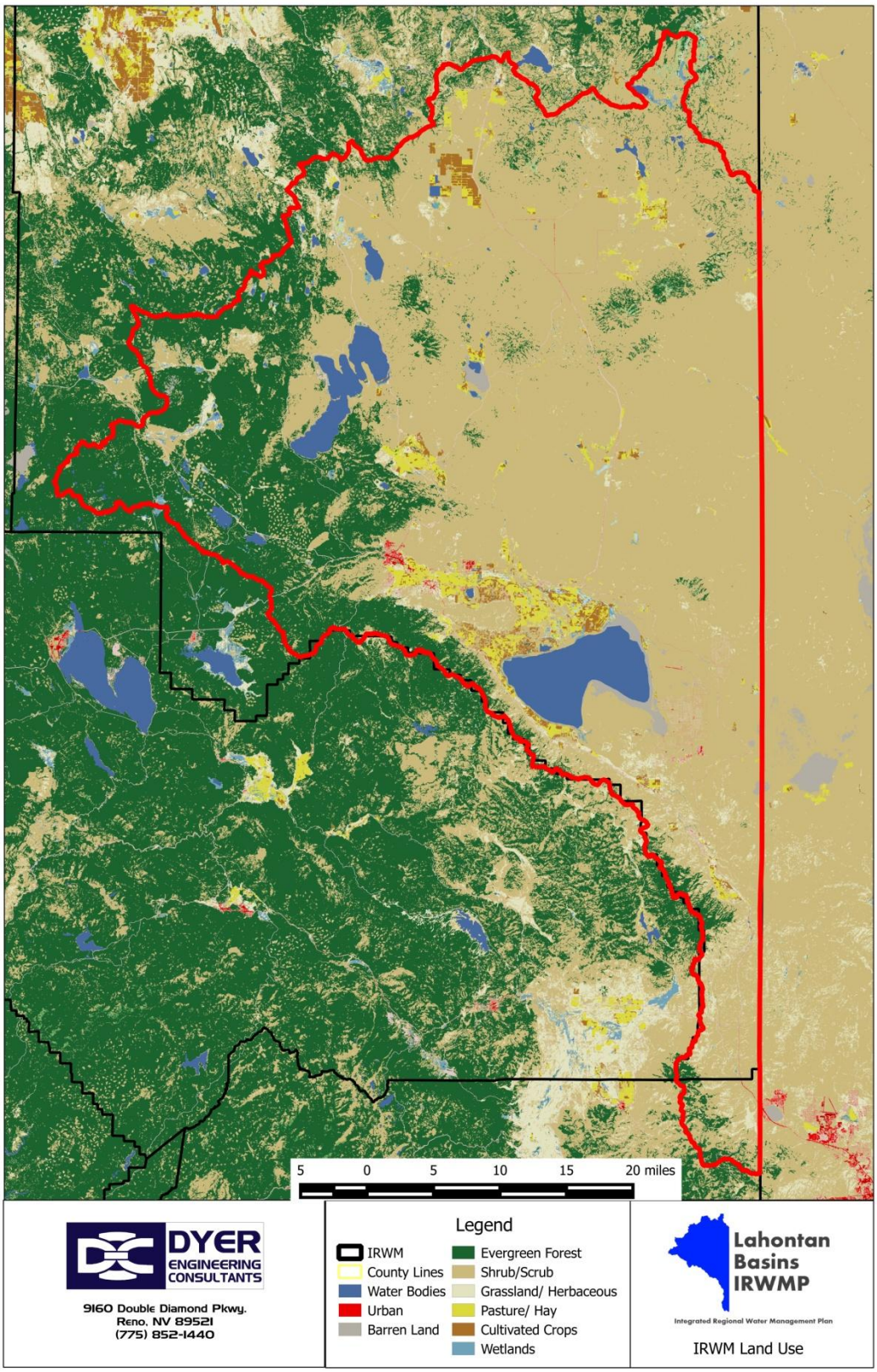
The Lahontan Basins Region appreciates the importance of fostering communication between land use managers and water resource managers to effectively integrate water management and land use planning. This section documents the current relationship between local land use planning, regional water issues, and water management objectives in the Lahontan Basins Region. Additionally, future plans to foster a collaborative, proactive relationship between land use planners and water managers are identified.

California State Law requires every city and county in the state to prepare and maintain a General Plan. General Plans provide a blueprint for future decisions regarding land use and resource conservation. Land use agencies that prepare these plans are responsible for managing growth and development while ensuring a healthy and sustainable economy. In the Lahontan Basins Region, entities with land use authority include:

- County of Lassen
- City of Susanville
- USFS

These agencies implement public outreach efforts to help define the local community's vision for future growth and development. Stakeholders within the Lahontan Basins Region are enthusiastic about the IRWM planning effort and the opportunity for more comprehensive land use considerations in developing future conceptual models for water management issues.

Figure 12.1 Land Use within the Lahontan Basins



12.1 Linkages between Water Management and Land Use Planning

Land use patterns in the Lahontan Basins region are dominated by range land and forest service use, all of which rely on water purveyors/districts, private groundwater wells, and surface water supply sources. Figure 12.1 shows the current land uses within the region.

The interconnected surface water and groundwater system in the Lahontan Basins region is complex, and water quality is both directly and indirectly affected by land use practices throughout the region. Stormwater drainage, precipitation-based sheet flow, agricultural drainage, wastewater effluent, and other contributing sources can dramatically affect surface water quality and quantity. Precipitation, irrigation, and recharge based infiltration through variable surfaces and soil types in different land use settings also affect groundwater quality and quantity. In addition, groundwater additions to surface waters have interrelated impacts to both surface and groundwater resources. Manmade and natural conveyances, including irrigation and flood management projects, have the potential to transfer water sources with significantly different characteristics throughout the Lahontan Basins region. Public, domestic, irrigation and industrial production wells can create highly variable ground water flow patterns and cones of depression affecting groundwater elevations and regional flow directions temporally and spatially, ultimately affecting the quality and quantity of groundwater in the proposed boundary. Led by the RWMG and TAC, the Lahontan Basins IRWM program presents a structured opportunity to integrate water management activities related to natural and manmade water systems, including water supply reliability, water quality, environmental stewardship, recreation, and flood management in the Lahontan Basins region.

Limited portions of the county are devoted to the growing of row and forage crops. These lands generally occupy the level valley floors with the largest concentrations being in the Honey Lake Valley.

12.2 Current Relationships between Water Managers and Land Use Planners

The Lahontan Basins region encompasses a variety of agencies with water management responsibilities. Three of these water management agencies also have local land use jurisdiction: the City of Susanville, USFS, and Susanville Indian Rancheria. This allows for water planning activities to be an integral part of land use planning processes within these agencies' jurisdictions. For the most part, the districts are independent entities created under California State law; each governed by separate elected boards and managed by individual staff. The

Lassen County government does not have any jurisdiction over the districts and is not directly involved in water policy or management; therefore, linking water and land use planning can be challenging. Land use planning is addressed for each of the water and sanitary districts within the Lassen County General Plan.

12.3 Future Efforts to Establish Proactive Relationships

The IRWM program presents a unique opportunity to help water managers, land use planners, and the public work together, identify efficiencies, foster communication, and integrate water management and land use planning. Two of the four agencies recommended to serve on the RWMG under the governance structure for the region (see Chapter 3 Governance) – City of Susanville, and the Susanville Indian Rancheria – have local land use planning authority in the region. Efforts are being made to conduct development discussions between these land use planners and the Watermasters of Lassen Irrigation Company and Honey Lake Valley RCD.

As IRWM planning continues in the region, the following actions will be taken to enhance coordination and communication between water resources managers and land use planners.

- Targeted forums for land use planners and water resource managers will be held to improve understanding of the nexus between land use planning and water management. For example, meetings between water managers and land use planners will be arranged to discuss regional water issues and concerns and identify areas for enhanced collaboration. Ultimately these discussions are expected to generate multi-purpose IRWM projects that will assist the region in meeting its objectives while maintaining consistency with local land use designations.
- Early consultation regarding land use decisions as suggested by the Ahwahnee Water Principles[1] for Resource-Efficient Land Use will be encouraged (Local Government Commission 1991). These principles have not been adopted by the individual agencies representing the RWMG but the Lahontan Basins IRWMP hopes to use these principles as the framework of the Local Land Use Planning chapter. Nine community principles and five implementation measures were developed by leading water experts from the national, state, and local levels. These principles and measures address concerns about stormwater runoff, flood damage, and local water supply reliability for current residents and new development by identifying cost-saving stewardship actions that cities and

[1] This set of nine community principles and five implementation measures was put together by leading water experts from the national, state and local levels. They address concerns about stormwater runoff, flood damage liability and the reliability of local water supplies by offering cost-saving, stewardship actions that cities and counties can implement.

counties can implement. The Lahontan Basins region believes that all five Ahwahnee Implementation Principles for Resource-Efficient Land Use should be applied, as appropriate:

1. Water supply agencies should be consulted early in the land use decision-making process regarding technology, demographics and growth projections.
2. City and county officials, the watershed council, LAFCO, special districts, non-governmental organizations, and other stakeholders sharing watersheds should collaborate to take advantage of the benefits and synergies of water resource planning at a watershed level.
3. The best, multi-benefit and integrated strategies and projects should be identified and implemented before less integrated proposals, unless urgency demands otherwise.
4. From start to finish, projects and programs should involve the public, build relationships, and increase the sharing of and access to information.
5. Plans, programs, projects and policies should be monitored and evaluated to determine if the expected results are achieved and to improve future practices.

Implementing these actions will ultimately benefit the region by:

- Fostering enhanced understanding of water supply and water quality impacts associated with land use planning decisions
- Improving representation of water-related needs and regional objectives related to land use planning
- Identifying IRWM projects and programs that address regional objectives as well as local land use planning goals

As previously described, the IRWM planning process will provide the region's water managers and land use planners with an established forum to engage in discussion regarding water management issues and land use plans. RAC meetings will continue to provide an interface for the water and land use managers to express concerns and propose solutions. In the future, should a more robust and detailed approach be needed to further establish relationships between land use and water planners, some or all of the options previously described may be implemented.

Stakeholder Participation

Contents

13.1 Opportunities for Stakeholder Participation 3
13.1.1 IRWM Planning Committee 3
13.1.2 Project Proponents 7
13.1.3 DAC & Tribal Community Representation 7
13.1.4 Public Participation 11
13.2 Decision Making Process 13
13.3 Stakeholder Integration 13

Tables

Table 13.1 Planning Group (Stakeholders) 4

Figures

Figure 13.1 DAC's in LBIRWMP 8

This chapter addresses the Integrated Regional Water Management (IRWM) Stakeholder Involvement Plan Standard which requires IRWM Plans to:

- Contain a public process that provides outreach and an opportunity to participate in IRWM Plan development and implementation to the appropriate local agencies and stakeholders, as applicable to the region, including wholesale and retail water purveyors, wastewater agencies, flood control agencies, municipal and county governments and special districts, electrical corporations, Native American tribes, self-supplied water users, environmental stewardship organization, community organizations, industry organizations, State, federal and regional agencies or universities and DAC members
- The process used to identify, inform, invite and involve stakeholder groups in the IRWM process including mechanisms and processes that have been or will be used to facilitate stakeholder involvement and communication during development and implementation of the IRWM Plan
- Discuss how the RWMG will endeavor to involve DACs and Native American tribal communities in the IRWM planning effort
- Describe the decision making process including IRWM committees, roles or positions that stakeholders can occupy and how a stakeholder goes about participating in those committees, roles or positions regardless of their ability to contribute to the plan
- Discuss how stakeholders are necessary to address objectives and resource management strategies of the IRWM Plan and are involved or are being invited to be involved in plan activities
- Discuss how collaborative processes will engage a balance of interest groups listed above in the IRWM process regardless of their ability to contribute financially to the IRWM Plan's development or implementation

---

The Lahontan Basins IRWM process is a strongly stakeholder-driven process. While the RWMG retains overall responsibility for ongoing IRWM planning and implementation of the LBIRWMP, the planning and implementation work is primarily generated by the RWMG, a multi-disciplinary group designed to represent the broad interests of the region. Opportunities also exist for individuals not participating on the RWMG or TAC to participate in the IRWM program as discussed in this chapter.

13.1 Opportunities for Stakeholder Participation

Stakeholder participation is an integral part of the local and regional planning process; including development of the LBIRWMP. Stakeholder involvement has provided a forum for collaboration, data sharing, and soliciting feedback from interested or affected individuals and agencies in the Lahontan Basins region. Collaborative efforts have helped to ensure that diverse interests of the region are represented during the development and implementation of the LBIRWMP. These efforts have also led to the development of partnerships that have assisted in the resolution of many of the region's water management issues.

13.1.1 IRWM Planning Committee

The key groups involved in the Lahontan Integrated Regional Water Management (IRWM) Plan development and implementation are:

- **Lahontan Basins Regional Water Management Group (RWMG)** – The RWMG is the body of 4 agencies that have signed the MOU for implementing the IRWM Plan. They are the agencies committed to implementing the Plan and updating it accordingly. Specifically, this includes Honey Lake Valley Resource Conservation District, the City of Susanville, the Susanville Indian Rancheria and Lassen Irrigation Company. This is the group that facilitates the development of the Lahontan Basins IRWMP by providing recommendations for the Stakeholder Group.

- **Lahontan IRWM Plan Stakeholder Group (Stakeholder Group)** – A broad, current list of potential stakeholders for the IRWM is available from the current watershed and water management efforts on-going within the region. Via public meetings, local media, and local community networks, additional stakeholders will be identified.

- **Technical Advisory Committee (TAC)** – This group provides the technical review of all the IRWMP technical studies.

This section provides a description of the RWMG. These groups have begun to meet on a regular basis in order to facilitate the development of the IRMWP process within the Lahontan Basins. They will continue to do so to oversee and participate in the continued development of the IRWM Plan proposed in the work plan.

The RWMG was originally formed through a Memorandum of Understanding (MOU) that prescribed the preliminary roles and responsibilities for the RWMG including complying with the IRWM Plan sections of the Water Code. The RWMG agreed to contribute funds to help develop the IRWM Plan, provide and share information, review and comment on drafts of the IRWM Plan, and adopt the final IRWM Plan.

Collectively, these agencies are actively involved in water management including groundwater management, storm and flood water control, irrigation water management and distribution, water quality, aquatic habitat, water conservation and recreation. The current make-up of the RWMG is appropriate as these agencies and local governments not only have authority over water but comprise the foundation of active regional leadership in water and watershed management. These local agencies are linked to a broad network of stakeholder agencies and interested public. Each of the proposed members has expressed clear support for moving forward with the IRWM process including the development of an IRWM plan. Lassen County plans to join the RWMG as a member of the long term governance structure.

The RWMG members are listed in Table 13.1 along with a description of how each agency is responsible for statutory authority over water supply or water management within the Lahontan Basins region by noting whether the agency has authority. All agencies listed in Table 13.1 have adopted the Agreement and participate in the financing and governance of IRWM Plan implementation. The composition of the RWMG provides a good cross-sectional representation of all water/natural resource and land-use management activities for the Lahontan Basins region.

There is however a number of small mutual water districts within the region that have statutory authority over water supply and water management who are not currently members of the RWMG, but they are part of the Lahontan IRWM Stakeholder Group.

Table 13.1 Planning Group (Stakeholders)

Organization	Statutory Authority
Wholesale, Retail, or Agricultural Water Purveyors/Wastewater Agencies/Flood Management Agencies/Special Districts	
Herlong Public Utilities District	Water supply, water quality management
Lake Forest Community Service District	Water supply, water quality management
Lassen Irrigation Company	Water supply
Spaulding Community Service District	Water supply, water quality management, waste water treatment
Leavitt Lake Community Services District	Water supply, water quality management, waste water treatment
Stones Landing Community Service District	Water supply, water quality management
Susanville Consolidated Sanitary District	Waste water treatment
West Patton Village Community Service District	Water supply, water quality management

Municipal and County Governments and Special Districts	
City of Susanville	Water supply, water quality management, flood management/control, storm water management
Honey Lake Valley Resource Conservation District (RCD)	Water supply
Lassen County Department of Planning and Building Services	Groundwater management, flood management/control, storm water management, well permitting process, water exportation and extraction permits
Sierra County Planning Department	Groundwater management, flood management/control, storm water management
Regulatory and Resource Agencies – State and Federal	
California Department of Conservation (DOC)	Not applicable
California Department Fish and Game (CDFG)	Water Quality Management
California Department of Public Health (DPH)	Water Quality Management
California Department of Water Resources (DWR)	Water Quality Management
Federal Emergency Management Agency (FEMA)	Emergency Preparedness
Lahontan Regional Water Quality Control Board (LRWQCB)	Water Quality Management
Sierra Army Depot (SIAD)	Water supply, water quality management, flood management, storm water management
Sierra Nevada Conservancy (SNC)	Not applicable
United States Department of Agriculture (USDA) Forest Service, Lassen National Forest (LNF)	Water Quality Management
United States Department of Agriculture Natural Resource Conservation Service (NRCS), Susanville District	Water Quality Management
United States Department of Health and Human Services (DHHS), Indian Health Services (IHS)	Water Quality Management
United States Department of Interior Bureau of Indian Affairs (BIA), Redding Regional Office	Water Quality Management
United States Environmental Protection Agency (EPA), Tribal Programs Office	Water quality management
University of California Cooperation Extension, Lassen County	Not applicable
United States Department of Interior Bureau of Land Management, Eagle Lake Field Office	Water Quality Management
Tribal Governments	
Honey Lake Maidu	Not applicable
Honey Lake Paiute (Wadatukuta)	Not applicable
Susanville Indian Rancheria (SIR)	Water supply, water quality management, flood management, storm water management
Pit River Tribe	Not applicable
Washoe Tribe of Nevada and California	Not applicable
Recreational and Environmental Entities	
Lassen Land and Trails Trust	Not applicable
Community Representatives/Social Justice Organizations/Public and Private Interests	
Eagle Lake Coordination Committee	Not applicable
Eagle Lake Guardians	Not applicable
Honey Lake Valley RCD Watermaster Advisory Committee	Not applicable
Lassen County Special Weed Action Team (SWAT)	Not applicable
Susan River Watershed Group (SRWG	Not applicable
Pine Creek Coordinated Resource Management Plan (CRMP)	Not applicable
Lassen County Fire Safe Council (LCFSC)	Not applicable
Lassen County Times	Not applicable
Lassen Ground Water Advisory Committee	Not applicable
Sierra Radio Network	Not applicable
Susanville Indian Rancheria (SIR) Tribal Historic Preservation Office (THPO)	Not applicable
Sierra County Fire Safe and Watershed Council	Not applicable

Agricultural Interests	
Lassen County Farm Bureau	Not applicable
Lassen County Cattlemen's Association	Not applicable
Sierra County Farm Bureau	Not applicable
Sierra County Cattlemen's Association	Not applicable

a) Wholesale, Retail, Agricultural Water Purveyors/Wastewater Agencies/Flood Management Agencies/Special Districts

The wholesale and retail water purveyors, wastewater agencies, flood management agencies, and special districts of the Lahontan Basins IRWM region are focused particularly on the water supply issues pertaining to the region. The water purveyors include agencies that have water supply and water management responsibilities in the Lahontan Basins region and include: Herlong Public Utilities District (HPUD), Honey Lake Valley RCD, Lake Forest Community Services District, Spaulding Community Services District, Stones Landing Community Services District, and the West Patton Village Community Services District.

b) Municipal and County Governments and Special Districts

Municipal and county governments and special districts include local jurisdictions and land use planning agencies that have been integral in moving the IRWM Plan process forward in the Lahontan Basins region. Their participation provides a link between local planning agencies and this IRWM Plan by offering discussion in meetings, providing accurate, consistent land use planning information, and incorporating local planning documents and goals into the project objectives.

c) Regulatory and Resource Agencies State and Federal

Several State and Federal regulatory agencies have been involved in assisting the RWMG with the IRWM Plan process to date in the Lahontan Basins region and will continue to be involved in the identification of issues, formation of objectives, and development of projects for the IRWM Plan. Coordination with these regulatory agencies is essential to the development and implementation of all recommended projects due to the need for regulatory and environmental approval prior to implementation. Their roles and responsibilities are to ensure that this IRWM Plan consider resource management, resource enhancement, and regulatory compliance standards. These agencies include: Lahontan Regional Water Quality Control Board; the California State Department of Fish and Game; the United States Department of Agriculture, Natural Resources Conservation District; the USDA Forest Service, Lassen National Forest; Bureau of Land Management, Eagle Lake Field Office; California Department of Water Resources; Sierra Army Depot (SIAD), California Department of Conservation; Sierra Nevada

Conservancy; Indian Health Service (IHS); Bureau of Indian Affairs (BIA); and the University of California Cooperative Extension, Lassen County.

d) Recreational and Environmental Entities

The role and responsibility of the recreational and open space entities is to ensure that issues and goals related to conservation and protection of the natural resources and habitat within the region are incorporated in the IRWM Plan. The communities involved include the Lassen Land and Trails Trust. They too will continue to be actively involved through the development of the IRWM Plan.

e) Community Representatives/Public and Private Interests

Other Stakeholders involved in the development and implementation of the IRWM Plan include other community representatives such as groups formed around a particular interest such as noxious weeds, sage grouse, fire safety, and Eagle Lake, among others. Representatives of the Lassen County Times will be encouraged to attend RWMG stakeholder meetings and inform their readership of the goals and objectives of this IRWM Plan.

f) Agricultural Interests

Agricultural producers and groups that advocate for agricultural interests have been actively involved in the IRWMP process to date. Agriculture is one of the most important economic industries in the region. Issues relating to water availability, quality, and distribution for agricultural production are the major concerns in this relatively dry region.

13.1.2 Project Proponents

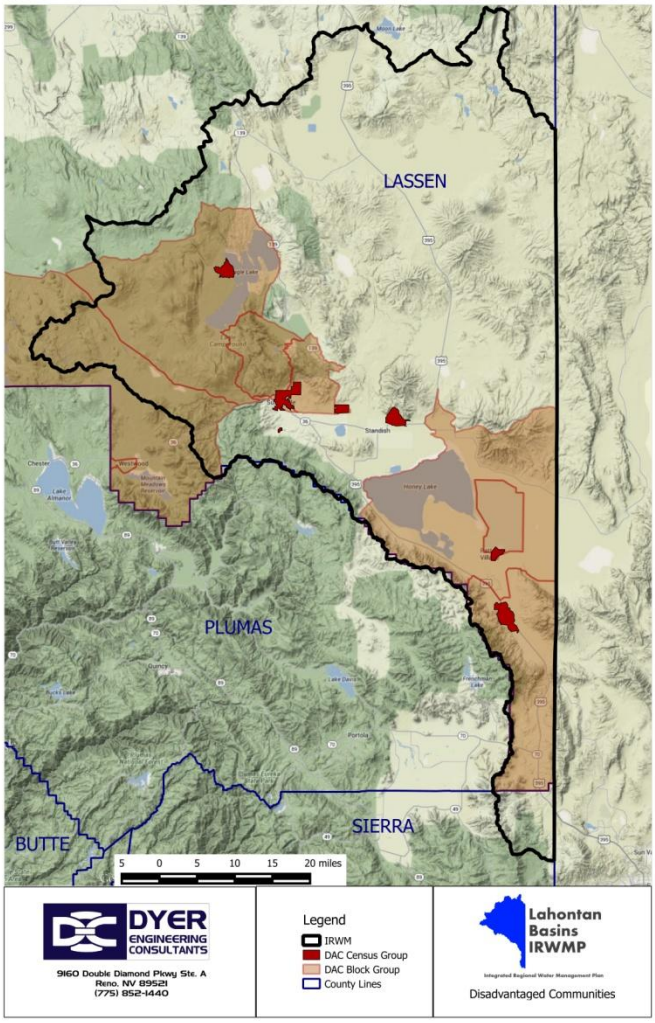
Project proponents are the stakeholders with primary responsibility for implementing projects listed in the LBIRWMP. As with other stakeholders, project proponents are encouraged to maintain active involvement in the IRWM program. Project proponents can volunteer to serve on the stakeholder group by following the process outlined in Chapter 3 Governance, or they may participate as general public participants. Since project proponents are the entities implementing IRWM projects, their involvement is necessary to address objectives and resource management strategies of the LBIRWMP.

13.1.3 DAC & Tribal Community Representation

Outreach included special efforts to connect with the region's disadvantaged communities (DAC), defined as a community with a median household income (MHI) of less than 80% of the

statewide MHI (Proposition 84 guidelines). A number of areas throughout the region are considered DACs. These communities and census tracts are represented below in Figure 13.1.

Figure 13.1 DAC's in LBIRWMP



This section summarizes the process used to identify the region's DACs and how they will be engaged in the IRWM process.

Identification

In Proposition 84, Chapter 8, DACs are defined as having an annual median household income (MHI) that is less than 80 percent of the statewide annual median household income, which is $37,994 using Census 2000 data. To begin identifying disadvantaged areas in the Lahontan Basins region, an initial assessment was conducted using 2000 Census data. In order to provide

the most accurate determination of the DACs in the Lahontan Basins region, MHI was compared at the census tract level. The analysis showed that all of Lassen County and the City of Susanville were considered DACs. The following DACs and their critical water related needs were identified in the Lahontan Basins region:

Lassen County

- Adequate water supply, water quality, and distribution for agricultural production and other economic opportunities in the region
- Treatment and control of noxious weed infestation in the region with particular interest in perennial pepperweed (*Lepidium latifolium*)
- Protection of watersheds through reduction of risk of potential catastrophic wildfires.
- Improvement of rangeland conditions through treatment of invasive western juniper (*Juniperus occidentalis*)
- Development of water and wastewater infrastructure to promote growth in disadvantaged communities
- Maintain and enhance recreational and tourism values of Eagle Lake

City of Susanville

- Protection of water supply for public drinking water system
- Flood management
- Recreational opportunities to promote tourism and community spirit

Susanville Indian Rancheria

- Water supply for future tribal housing
- Protection of existing housing from wildfire
- Protection and enhancement of traditional aboriginal natural resources (fauna, flora, cultural, and water)
- Tribal water rights

The DAC Outreach Plan details how the LBIRWMG will follow up on these issues, seek to identify new ones, and implement strategies to improve the chances of addressing these water related needs of the region's DACs.

a) Rural/Isolated Communities

Many communities that do not face the economic constraints of disadvantaged communities must deal with obstacles due to limited resources and geographic location. Many smaller, rural communities in the area are isolated, both politically and physically, from the agency and organizational happenings in the Lahontan Basins region. These communities will be incorporated into IRWM Plan outreach efforts to address of this isolation.

b) Native American Tribal Identification

Outreach efforts have been made to identify and contact local Native American tribal communities. The Susanville Indian Rancheria (SIR), a federally recognized Indian Tribe with aboriginal ties to the Mountain Maidu, Northern Paiute, Pit River, and Washoe tribes, has agreed to become a member of the Regional Water Management Group and participate in the IRWM Plan process. Additional Native American groups and tribes within the region or as identified by outreach efforts will be encouraged to participate.

Involvement

The DAC outreach strategy and action steps takes advantage of existing efforts and relationships, working directly with community leaders and RWMG members, and gathering and using input from all stakeholders. The members provide technical assistance and other resources, as well as encourage participation from the smaller, disadvantaged communities in the Stakeholder Group.

The proposed governance structure of the IRWM Group has been designed to encourage regional participation and to continue to reach out to DACs and provide technical assistance to those who need it. Representation from DACs in the stakeholder group is beneficial in implementing the Plan in a fair and balanced way.

Outreach efforts will not be limited to DACs, rather they will extend to all communities in the region to include taking the IRWM Plan message to traditionally-isolated and more rural areas of the Lahontan Basins to include the following communities:

- Madeline/Termo/Ravendale
- Spaulding/Stones Landing
- Herlong/Doyle
- Loyalton/Sierraville
- Litchfield/Standish/Wendel
- Janesville/Milford

These are unincorporated communities that are generally very small in population, have fewer resources, and thus, a smaller organizational structure. Most often, these towns are not able to participate in many of the larger projects that municipalities are engaging in with respect to water and environmental resource related issues in the Lahontan Basins region. This approach is believed to be the most effective way to reach the largest possible number of stakeholders and gather information from DACs, underrepresented, rural communities, and, therefore, all areas within the Lahontan Basins region within the short timeframe required by this IRWM Plan schedule.

Outreach efforts will include scheduling outreach meetings in the DACs, presenting information at community events, contacting community groups, providing all information in an accessible way and also new ways to even further promote and increase DAC involvement in the IRWM Plan update.

13.1.4 Public Participation

Collection and dissemination of data to stakeholders, agencies, and the general public will be integrated into the LBIRWM Plan process to ensure overall success. A requirement of the Proposition 84 Guidelines is the routine reporting on project performance. The routine collection of this data naturally lends itself to the routine collection and reporting that is required as part of the LBIRWM Plan process. The stakeholders have suggested, as one potential option which would have to be agreed to by the RWMG, that the Honey Lake Valley RCD (HLVRCD), as the potential grant contracting entity, compile the reporting of this IRWM Plan and work individually with the project proponents to receive updates on individual project progress. It was suggested that a standardized reporting format be created which the HLVRCD could use to compile this data, which could then be uploaded to the project website described in more detail below. Data collected or produced as part of the LBIRWM Plan will then be presented and disseminated during quarterly meetings.

A public website has been created to store data and information about the LBIRWM Plan process so that the public can find information about public meeting dates, agendas, and notes. The website provides information on the LBIRWM Plan process and posts annual reports and relevant documents that can downloaded. Data collected during the LBIRWM Plan process will be available on the website as well. The website will also provide links to other existing monitoring programs to promote data between these programs and the LBIRWM Plan. This will provide a means to identify data gaps (e.g., information needed to provide a more complete

assessment of the status of a specific issue or program) and to ensure that monitoring efforts are not duplicated between programs.

The LBIRWM Plan website (www.honeylakevalleyrcd.us/LBIRWMP) provides a mechanism for stakeholders to upload project information regarding water supply, water quality, and other benefits of the project, which will be collected in a database to manage, store, and disseminate information to the public. A data collection template will be available on the website in the future so that data collected during the LBIRWM Plan can be stored and managed in a consistent format. This template will be compatible with those used in the statewide Groundwater Ambient Monitoring and Assessment (GAMA) and the Surface Water Ambient Monitoring Program (SWAMP) programs to assist in the sharing and integration of data with these programs.

The LBIRWMP is an integral part of a comprehensive and coordinated water management program at a local and regional level. As such, more general outreach to the public and stakeholders on water issues, specific project proposals, and regional water conditions also serves the objectives of the IRWMP. City of Susanville and the Susanville Indian Rancheria and other members of the Regional Water Management Group (RWMG) conduct or participate in dozens of outreach events and activities over the course of a year. Examples include:

• **Public Events**: Public IRWM meetings hosted at Susanville Fire Department and Susanville Indian Rancheria Sierra Water Workgroup Annual Summit,

• **Presentations to Community and Professional Groups**: Susanville Indian Rancheria, Sierra Water Workgroup, Susan River Watershed Group, Leavitt Lake CSD, Honey Lake Valley RCD Annual Community BBQ.

• **Web sites**: The http://honeylakevalleyrcd.us/irwm/ website disseminates information about the plan to the broader public and keeps participants informed between meetings. The website promotes active engagement of stakeholders in the LBIRWMP community.

• **Emails**: The RWMG communicates frequently via emails given the large rural nature of the region. Weekly updates of LBIRWM plan progression was sent out via email utilizing a contact list of over 140 addresses.

• **Other**: RWMG continually seeks opportunities to outreach to the public and stakeholders on water issues in general and the LBIRWMP in particular. RWMG participants frequently address public bodies, including city councils and county boards of supervisors.

13.2 Decision Making Process

The RWMG decision-making process is described in Chapter 3 Governance, Section 3.4 Decision-Making Process. It is also stated in greater detail in the RWMG By-Laws found in Appendix D.

13.3 Stakeholder Integration

The LBIRWMP's recommended long-term governance structure enables a diverse group of stakeholders to participate in all levels of the IRWM planning effort regardless of their ability to contribute financially to the LBIRWMP as required by the California Water Code §10541(h)(2). The RWMG, which is described in Chapter 3 Governance, is designed to encompass diverse interests and does not require financial contributions from its members. The RWMG is also structured to enable participation at all levels of the IRWM program. The foundation of the IRWM program is the planning work that has been and will continue to be completed by the RWMG, TAC and Stakeholders. Other interested parties are able to participate in all levels of the IRWM program as all meetings of the RWMG and TAC. Meetings of the RWMG governing bodies are open to the public as well.

Coordination

Contents

14.1 Coordination within the Lahontan Basins Region 3
14.2 Coordination with Neighboring IRWM Regions 4
14.3 Coordination with Other Agencies 7

Figures

Figure 14.1 Lahontan Basins IRWMP Project Application Page 4
Figure 14.2 Neighboring IRWM Regions 6

This chapter addresses the Integrated Regional Water Management (IRWM) Coordination Plan Standard which requires IRWM Plans to:

- Identify a process to coordinate water management projects and activities of participating local agencies and local stakeholders to avoid conflicts and take advantage of efficiencies
- Identify other neighboring IRWM efforts and the way cooperation or coordination with these other efforts will be accomplished and a discussion of any ongoing water management conflicts with adjacent IRWM efforts
- Identify areas where a State agency or other agencies may be able to assist in communication, cooperation, or implementation of IRWM Plan components, processes, and project or where State or federal regulatory decisions are required before implement the projects

---

The region is coordinating water management activities on multiple levels – within the region, with neighboring IRWM regions and with other agencies.

14.1 Coordination within the Lahontan Basins Region

In addition to the regular coordination meetings of the RWMG and TAC (refer to Chapter 3 Governance), the IRWM program provides web-based venues for local agencies and stakeholders to coordinate and identify opportunities for cooperative projects: the Lahontan Basins IRWMP website.

The Lahontan Basins IRWMP website, http://honeylakevalleyrcd.us/irwm/, was developed early in the IRWM planning process to serve as a source of information for individuals interested in learning basic information about the IRWM program. During the development of the LBIRWMP, the RWMG enhanced the website to include meeting notifications, meeting materials and documents developed throughout the IRWM planning process. All program materials are posted to the website to keep stakeholders informed of activities being pursued at the regional level.

The LBIRWMP Project Application tab, which is the region's online project database (Figure 14.1), was launched during the region's first Call for Projects. Beyond serving the fundamental role of maintaining the region's project list, LBIRWMP Project Application page provides a venue for increased collaboration between and among project proponents. LBIRWMP Project Application page allows any member of the public access to view and follow projects of interest. Stakeholders also have the ability to enter new projects and share projects with other community members, enabling multiple entities to collaborate on a single project.

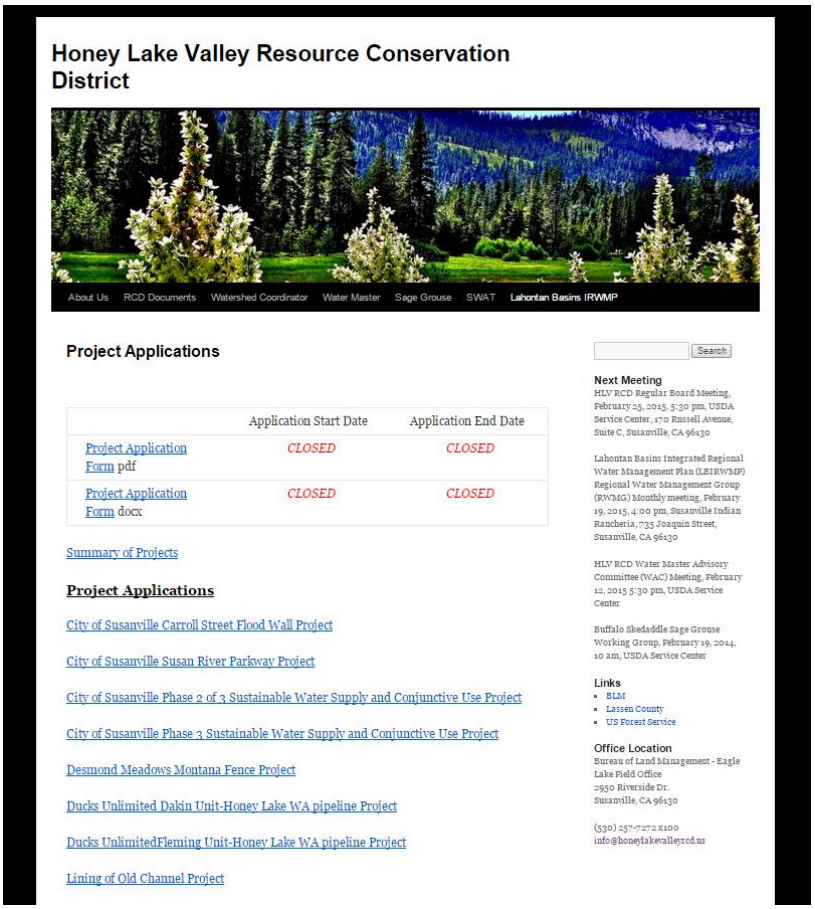


Figure 14.1 Lahontan Basins IRWMP Project Application Page

14.2 Coordination with Neighboring IRWM Regions

Through the RAP and DWR's acceptance of the Lahontan Basins as an IRWM region, the region has clearly demonstrated how water management within its boundaries is distinctly different than its neighboring regions. There are no known overlapping areas with adjacent IRWM regions. The region's boundaries are defined by the eastern boundary of the Feather River watershed to the east, the California/Nevada border to the west, the southern boundary of the Pit River watershed to the north, and Tahoe Basin to the south. The western boundaries of the Lahontan Basins region are critical hydro-geologic features that distinguish the region from neighboring regions. The crystalline basement rock that defines the region's western boundary divides the groundwater/alluvial basin of the Lahontan Basins region from the fluvial and fractured rock systems of the mountainous watersheds of the Feather River and Upper Pit regions.

Although the Lahontan Basins region functions independently of its neighboring IRWM regions, the RWMG and TAC appreciate the importance of coordinating with neighboring regions, particularly given their shared groundwater and surface water resources. There will be

coordination with the Upper Pit IRWM, Upper Feather River IRWM and the Tahoe-Sierra IRWM particularly with regard to groundwater planning, management and monitoring. Coordination with adjacent RWMGs can result in better utilization of these resources and avoid potential conflicts. The value placed upon coordination with neighboring regions is reflected in the region's project review process, which awards additional points to projects that are supported by multiple local project sponsors or contiguous IRWM regions (see Chapter 6 Project Review Process).

The following IRWM Regions are located adjacent to the Lahontan Basins region.

- Upper Feather River
- Upper Pit
- Tahoe-Sierra

Of the neighboring regions (Figure 14.2), the RWMG and TAC are most interested in the Upper Feather River region and Upper Pit region, as activities that occur within these watersheds have the greatest potential to affect the Lahontan Basins region. Lassen County Board of Supervisors is a member agency of Pit River Watershed Alliance; Lassen County's involvement in both the Lahontan Basins IRWM and Upper Pit region provides for regular communication between the two regions and allows for improved coordination between the regions. Similarly, representatives from the Upper Pit and Upper Feather River regions have indicated an interest in Lahontan Basins IRWM planning efforts and have communicated with RWMG members. Members of the RWMG routinely meet with the Sierra Water Workgroup which assists regional efforts to protect and enhance water quality, water supply and watershed health in the Sierras.

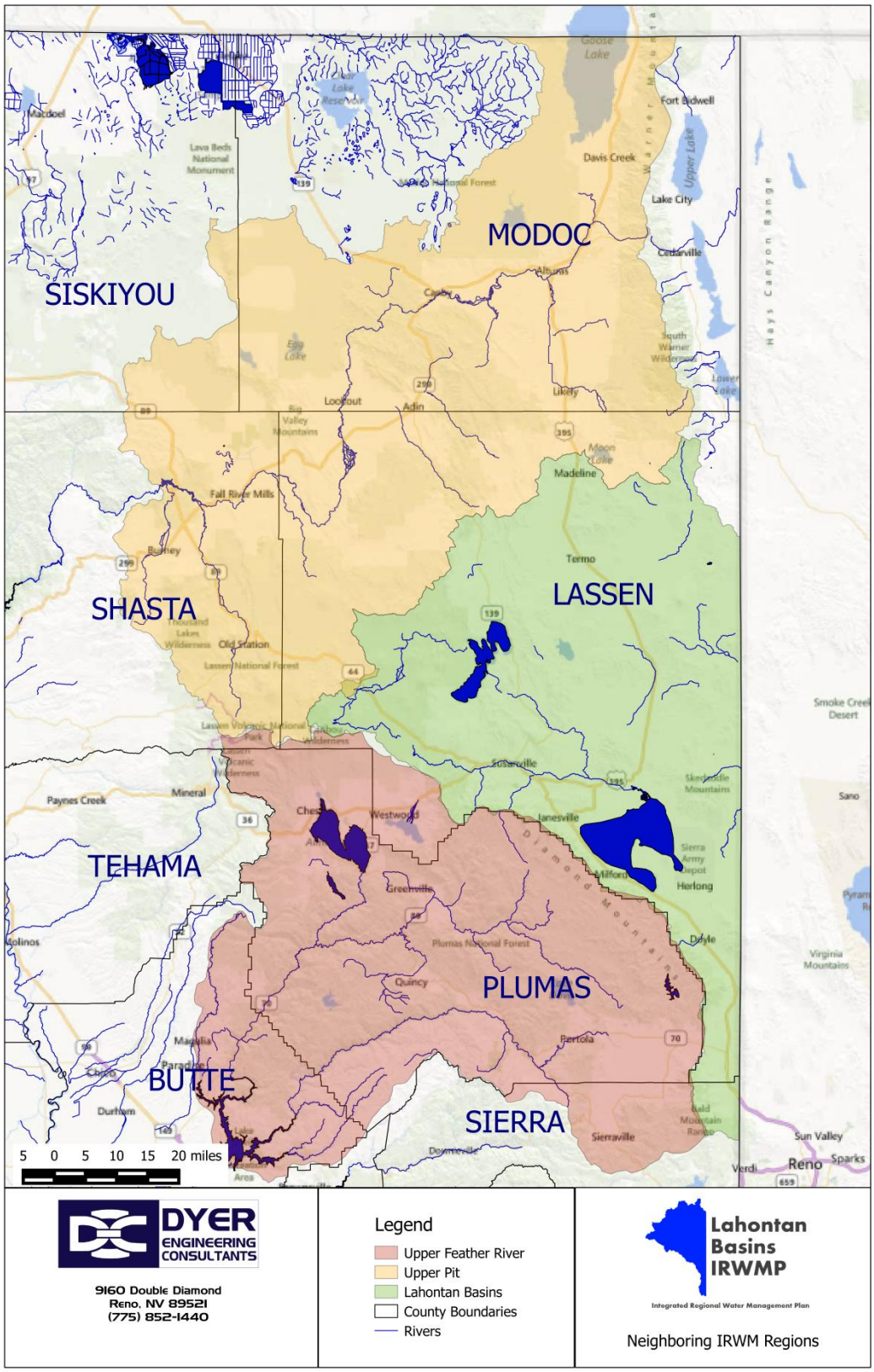


Figure 14.2 Neighboring IRWM Regions

14.3 Coordination with Other Agencies

Continued coordination with local agencies with permitting authority will be critical to the implementation of projects in the LBIRWMP. In the Lahontan Basins region, the primary agency with permitting authority for water projects is the Lassen County Planning Department. Lassen County intends to be engaged in the IRWM program as a member of the RWMG during the long-term governance structure.

The region has identified the need for a streamlined permitting process for environmental enhancement projects which requires improved coordination with state and federal agencies at the regional level. Historically, coordination with state and federal agencies has mainly occurred on a local, project-specific basis as needed to complete necessary permits and CEQA or NEPA documentation. In order to remain current on climate change activities occurring at the State and national levels, the RWMG should stay involved in California Natural Resources Agency's California Adaptation Strategy process to help shape the document through their participation.

Lahontan Basins IRWMP

Integrated Regional Water Management Plan

Climate Change

Table of Contents

Climate Change **1**

15.1 Region Characterization **6**

15.2 Climate Change Impacts **6**

15.2.1 Water Supply 11

15.2.2 Water Demand 12

15.2.3 Water Quality 12

15.2.4 Flooding 13

15.2.5 Ecosystem and Habitat Vulnerability 13

15.3 Regional Climate Change Vulnerabilities, and Adaptation and Mitigation Strategies **14**

15.3.1 Water Supply 14

15.3.2 Water Demand 16

15.3.3 Water Quality 19

15.3.4 Sea Level Rise 23

15.3.5 Flooding 23

15.3.6 Ecosystem and Habitat Vulnerability 27

15.3.7 Hydropower 30

15.4 Prioritizing Vulnerabilities **34**

15.5 Further Data Gathering for Identifying and Quantifying Vulnerabilities **35**

15.6 Mitigating Climate Change: Reducing Emissions **36**

15.7 GHG Inventory Boundaries **36**

15.8 Inventory Gathering and Establishing a Baseline **37**

15.8.1 Quantifying Emissions 38

15.8.2 GHG Inventory Case Study: City of Susanville 41

15.8.3 Next Steps for Emissions Assessment 42

15.9 Carbon Sequestration **42**

Tables

Table 15.1 - General Circulation Models Used by the California Governor's Project..... 7
Table 15.2 - USEPA 303d Impaired Waters (LBR) 21
Table 15.3 - Prioritizing LBR Vulnerabilities by Urgency, Risk, and Cost/Effort 34
Table 15.4 - Sources of Effort and Possible Examples for Identify and Quantifying Vulnerabilities..... 35

Figures

Figure 15.1 weADAPT data grid corresponding with California counties, with the Lahontan Basins Region highlighted in redline. 8
Figure 15.2 Lahontan Basins Region Mean Annual Projected Temperature 9
Figure 15.3 Lahontan Basins Region Historical Mean Temperatures..... 10
Figure 15.4 Lahontan Basins Region Projected Annual Precipitation 10
Figure 15.5 Lahontan Basins Region Historical Annual Precipitation..... 11
Figure 15.6 U.S. Drought Monitoring; photo courtesy of http://drought.gov. 15
Figure 15.7 DWR Map of California Aquifers – enlarged to show detail of the Lahontan Basins Region 18
Figure 15.8 Annual Area Burned by Wildfires in California between 1950 and 2010 (Source: OEHHA 2013 update to Indicators of Climate Change in California)..... 20
Figure 15.9 CNRM Model Wildlife Fire Risk under High Emissions Scenario in Year 2020, 2050, and 2085 (respectively)..... 20
Figure 15.10 USACE Comprehensive 200-Year Floodplain Study (available at http://gis.bam.water.ca.gov/bam/)..... 24
Figure 15.11 Sacramento-San Joaquin Drainage District..... 25
Figure 15.12 FRAP Fire Hazard Severity Zone Maps (LRA and SRA) 27
Figure 15.13 California Hydro-electric Power Generation Facilities..... 31
Figure 15.14 Emissions Scopes as identified by the federal EPA. These emissions, while specifically identified as federal sources, can be extrapolated to any business or organization. . 40

Executive Summary

Warming of the Earth's climate has received increase focus over the last several decades. The Department of Water Resources' (DWR) guidelines require that the Integrated Regional Water Management Plan (IRWMP) address "both adaptation to the effects of climate change and mitigation of greenhouse gas (GHG) emissions." In developing the general information presented in this chapter and identifying an appropriate approach to modeling projected changes at a regional scale, much of the original data and research comes from work previously completed in source water regions, in particular the Lahontan Basins Region (LBR).

There has been much debate on the topic of climate change, its cause and how it will affect us in the future. This document does not attempt to address the merits of the climate change arguments. The discussion here is intended to help the region plan for changing climate conditions such as drought, extreme storm events, and flooding.

In the last decade several studies evaluating past changes as well as potential future changes and vulnerabilities within the LBR have been undertaken. Due to the remote and rural nature of the LBR, extensive information regarding climate change impacts, greenhouse gas mitigation, and adaptation strategies are not available in the same way that they are for a more populated area. Where practical the IRWM program is committed to improving the availability of climate change related information for water practitioners through the continued work of the regional water management group (RWMG) in implementing the Lahontan Basins Integrated Regional Water Management Plan (LBIRWMP). This will be done through partnerships with entities already doing work on climate projections, and through building on current data. Because the region is small, with a significant number of disadvantaged communities, unless a grant opportunity specific to climate change research is made available, the LBR RWMG is not likely to be the primary investigator for future studies. However, because of the RWMG's collaborative and diverse nature, the organization represents an excellent opportunity for partnerships with research institutions, including private research, U.S. Forest Service (USFS) efforts, educational institutions, or state work on water supply and resources.

The discussion in this chapter will focus on anticipated climate change vulnerabilities in the LBR. However, it should be noted that while climate change variability in California generally is predicted to be great in the coming century, preliminary comparisons of variability in the State to variability in the LBR show a similar increase in temperature (increasing an average of 2-4°C in the next century) Figure 15.2, but a characteristically slower and lower decrease in precipitation (of three to five inches in the next century). This slower decline in precipitation is characteristic of mountainous regions that already act as a "wringing sponge", taking the water out of the atmosphere as it passes overhead. However, the LBR has historically dealt with drought conditions; suggesting that continued dry conditions could pose a serious hardship on the

agricultural operations in the region. With annual precipitation as low as seven inches in some areas, such as the Honey Lake Valley, a decrease in precipitation by even one inch could negatively affect activities in those basins. In basins where precipitation can habitually reach 33 inches in a water year, such as the Pine Creek Valley, climate-induced precipitation loss could have less effect. This information is discussed further below, in section 15.2.

When assessing and evaluating climate change impacts and vulnerabilities, DWR's guidelines encourage IRWM regions to bear in mind four documents in particular. These documents, and how they are incorporated in this document, are briefly described below:

California Air Resources Board (CARB): *Climate Change Scoping Plan* (2008):

CARB's Scoping Plan discusses different business sectors, including water management, and recommends specific strategies that may help reduce GHG emissions. In developing projects, proponents considered GHG emissions associated with project development and management, and where possible incorporated practices to reduce GHG emissions or provide alternative, renewable energy sources. Restoration and conservation projects that prevent forest loss and promote sustainable forests that act as a carbon sink are also consistent with CARB's recommendations. There is a balance between fuel loading and a forest fire that sustains the carbon sink when possible.

DWRs' *Managing an Uncertain Future: Climate Change Adaptation Strategies for California's Water* (2008):

This white paper published by DWR urges a new approach to managing California's water and other natural resources in the face of climate change. The document emphasizes IRWM as the mechanism for fostering a collaborative regional approach to water management. At a regional level assessing and understanding vulnerability to the long-term increased risk and uncertainty associated with climate change is a key strategy. IRWM plans are expected to include projects that seek to improve understanding of, for example, groundwater resources in the region, and to consider how they may be impacted by climate change. Understanding hydrology is essential for evaluating the region's vulnerability to climate change. Several statewide strategies identified in the DWR's white paper, particularly those addressing long-term funding for IRWM and management of water infrastructure, are critical to the region.

California Natural Resource Agency's *California Climate Adaptation Strategy* (2009):

California Natural Resource Agency's (CNRA) Climate Adaptation Strategy (CAS) discusses statewide and sector-specific vulnerability assessments, looking, in particular, at which climate factors will be driving impacts within each sector and how impacts interact across sectors. By identifying these inter-relationships the document also highlights opportunities to implement adaptation strategies across sectors. Strategies considered by the LBR RWMG drew primarily from the following sectors addressed in the CAS:

- Biodiversity and Habitat: Potential impacts from climate change identified in the CAS

include increased risk of wildfire, spread of invasive plants and animals, and loss of critical in-stream flows, among others.

- Water Management: Potential impacts from climate change identified in the CAS include reduced water supply due to loss of snowpack or flooding related to increased snow packs and changes in water quality.
- Forestry: Potential impacts from climate change identified in the CAS include changes in forest productivity, tree mortality, species migration barriers, increase in invasive species, changes in natural community structure, spread of diseases and insects, and reduction in ecosystem goods and services. Another important impact is that of increased catastrophic wildfire activity; this could severely impact the LBR.
- Transportation and Energy Infrastructure: While the LBR does not rely heavily on hydropower, hydropower energy facilities exist within the region. A decrease in water availability for hydropower generation is a potential impact from climate change identified in the CAS.

The way in which these sectors are addressed by the strategies identified for the LBR can be seen in Table 5.3, in the Resource Management Strategies chapter (Chapter 5).

Climate Change Handbook for Regional Water Planning (2011):
This document was prepared jointly by DWR, United States Environmental Protection Agency (USEPA), United States Army Corps of Engineers (USACE), and the Resource Legacy Fund to assist IRWM regions in incorporating climate change analysis and methodologies into their planning efforts. This chapter closely follows the suggested guidelines laid out in that document. In particular, one of the core elements is a more detailed vulnerability assessment comprised of a series of questions related to various aspects of water management. The questions from this vulnerability assessment are addressed in Section 15.4 below.

15.1 Region Characterization

Chapter 2, Region Description, provides a thorough description of the LBR, including climate, hydrology, geography, watersheds, and associated ecosystems, human uses, cultural resources, and water supplies and demands. It also contains a brief overview of projected climatic impacts on the region.

15.2 Climate Change Impacts

The climate models utilized by the State of California show a warming trend. This is relatively consistent for general climate change models globally.

While it is important to understand current global climatic trends, regional and local climatic changes are more pertinent to natural resources management, planning, and policymaking. It is possible to understand past climatic trends through observed data, where they are available. Yet in order to predict future climate, scientists must use models, which are inherently imperfect. General circulation models (GCMs) are most commonly used to incorporate information about greenhouse gas emissions and other elements of the atmosphere-ocean system. These models produce large-scale output based on grid cells on the order of several kilometers, which, in mountainous areas, is not a useful scale for natural resources planning and management. Efforts to downscale GCMs and to develop regional climate models (RCMs) have improved over the last few years, although there is some criticism as to the accuracy of these smaller-scale representations.

Perhaps the most criticized part of using models to project future climate is the uncertainty inherent in these models. Each model contains different assumptions about the atmosphere-ocean system and parameterizes elements of the climate differently. Thus, each model delivers slightly different projections of future temperature, precipitation, and other climatic variables. To use just one model as an indication of future climate is, therefore, problematic. Instead, the convention is to use an ensemble of several climate models to create a general picture of future climatic trends. In this way, the uncertainty of each model is accepted, but it does not prevent the use of climate models in climate change analyses.

A 2005-2006 study titled California Governor's Project featured on the weADAPT.org online web database made use of data collected by the California Climate Action Team (CAT)[1] as well as the state's Climate Adaptation Strategy. This study used three GCMs to drive subsequent impact analyses. These GCMs were selected based on their ability to model historical precipitation and temperature patterns and variability, and are listed in Table 15.1, below.

[1] The CAT is made up of a group of California state officials and their staff working in different arenas projected to be affected by climate change.

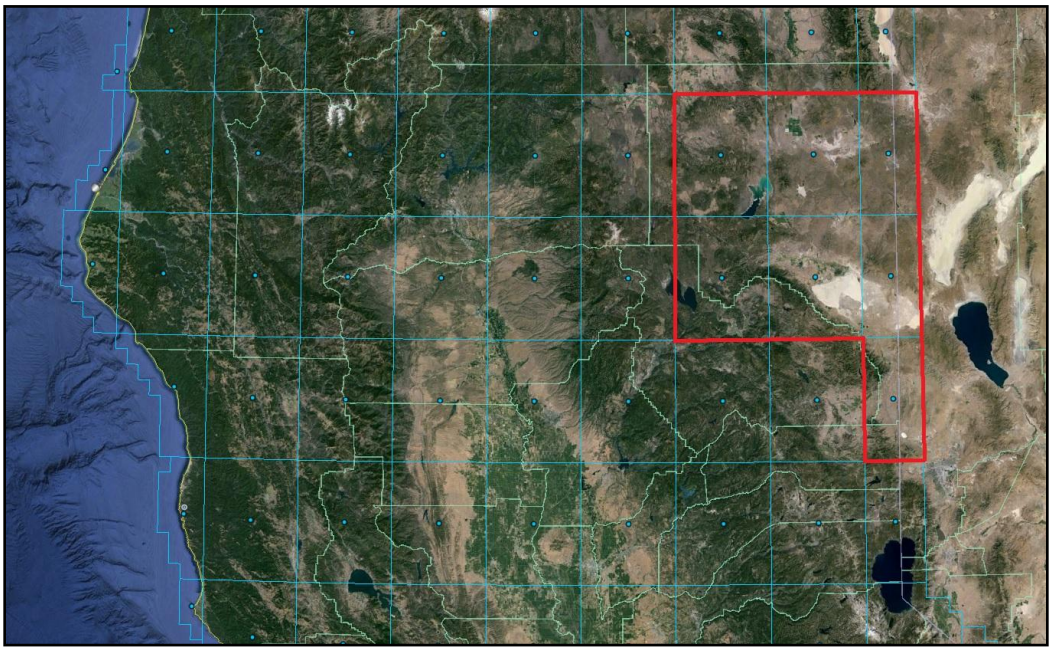
Table 15.1 - General Circulation Models Used by the California Governor's Project

General circulation models used by the California CAT and by those models used here.			
Number	**Model Name; group, country**	**Model ID**	**Primary Reference Year**
1	Parallel Climate Model; National Center for Atmospheric Research (NCAR), USA	PCM1	2000
2	Geophysical Dynamics Laboratory model version 2.1; U.S. Department of Commerce/National Oceanic and Atmospheric Administration (NOAA)/Geophysical Fluid Dynamics Laboratory, USA	GFDL-CM2.1	2006
3	Meteo-France/Centre National de Recharches Meteorologiques, France	CNRM-CM3	2005

One of the primary drivers of GCMs and RCMs are GHG emissions scenarios. The IPCC has developed a set of possible future GHG emissions based on different scenarios of global population growth, economic growth, and government regulations (IPCC 2007). GCMs and RCMs incorporate these emissions scenarios to produce a suite of possible future climatic scenarios. Models can be run with any combination of these three IPCC Special Report on Emissions Scenarios (SRES) — A1B, A2, or B1. These emissions scenarios represent a set of "best guesses" of what future emissions might be based on population, economic conditions, energy sources, technological development, environmental policy, etcetera. A1B is a medium-emissions scenario, reaching approximately 700 parts per million (ppm) CO2 globally by 2100 (global CO2 is currently approximately 400 ppm). A2 is a higher-emissions scenario and reaches 850 ppm globally by 2100, while B1 represents a lower-emissions scenario, leveling-out at just over 500 ppm globally by 2100.

Several different runs of the three GCMs listed in Table 15.1 were used for an analysis of projected climatic changes for the LBR for the 21st century, using the downscaling method described above. Data from weADAPT.org was analyzed to get the results described in this chapter. In order to bind the high and low probabilities of changes in the atmosphere, only the A2 and B1 emissions scenarios were used. Because the model output is only available on a grid scale, it was not possible to request projections for true watersheds. Instead a rectangle including the boundaries of the region was used as a best approximation; please see Figure 15.1, below, as reference.

Figure 15.1 weADAPT data grid corresponding with California counties, with the Lahontan Basins Region highlighted in redline.



Projections of temperature and precipitation were examined for each year through the 21st century. For each year, average temperature was calculated for each of the two emissions scenarios. In addition, the highest temperature value and lowest temperature value were identified in an attempt to elucidate the range of possible temperature scenarios. Similarly, cumulative precipitation was calculated for each year based on the model output and two emissions scenarios. An average was calculated over the three models and then a highest precipitation value and lowest precipitation value were identified in order to acknowledge the uncertainty in the projections and the range of possibilities. Monthly historical temperature and precipitation data was also examined from the year 1949 to 2010. The monthly temperatures were averaged for each year, and the highest and lowest temperature values were identified to define a temperature range for each year. Monthly precipitation data was summed for each year to obtain the historical yearly precipitation.

The graphs below show the outputs for these models for average predicted yearly temperature (Figure 15.2), average historical yearly temperature (Figure 15.3), average predicted yearly precipitation (Figure 15.4), and average historical yearly precipitation (Figure 15.5). For both emissions scenarios, temperature is expected to increase over the next century, increasing on average 0.017°C /year for the B1 scenario and 0.049°C /year under the A2 scenario. This means that under the more extreme A2 scenario, the models show that temperatures would be expected to increase on average by 4.6 °C between 2010 and 2099. For precipitation, the trends in both scenarios are equal with temperature, what is clear is that both scenarios show a similarly decreasing annual expected precipitation from a linear regression line. The A2 scenario showed,

on average, between 2010 and 2099, precipitation is expected to fall 0.038 inches/year. Similarly, the B1 scenario showed an annual decrease of 0.040 inches/year. A finer analysis might also reveal changes in timing or concentration of precipitation. These would be interesting topics for future investigation by members of the RWMG.

Figure 15.2 Lahontan Basins Region Mean Annual Projected Temperature

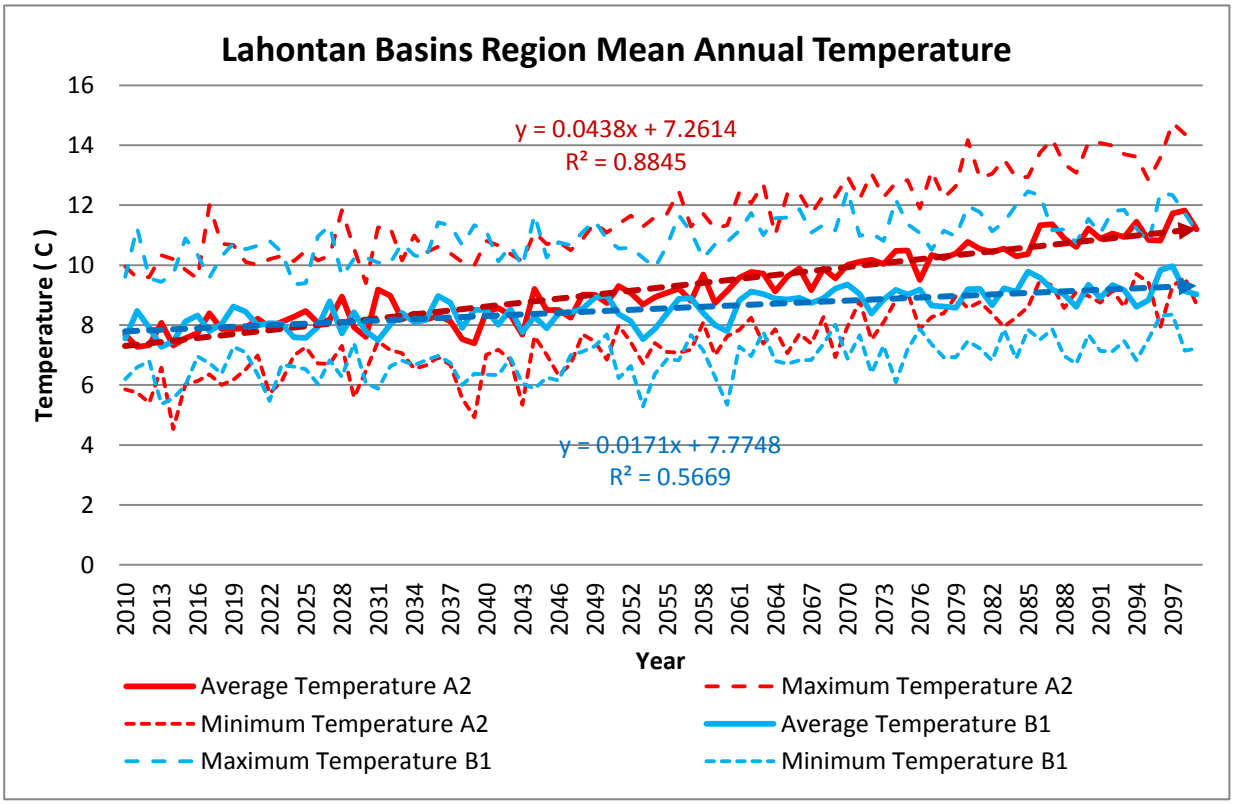


Figure 15.3 Lahontan Basins Region Historical Mean Temperatures

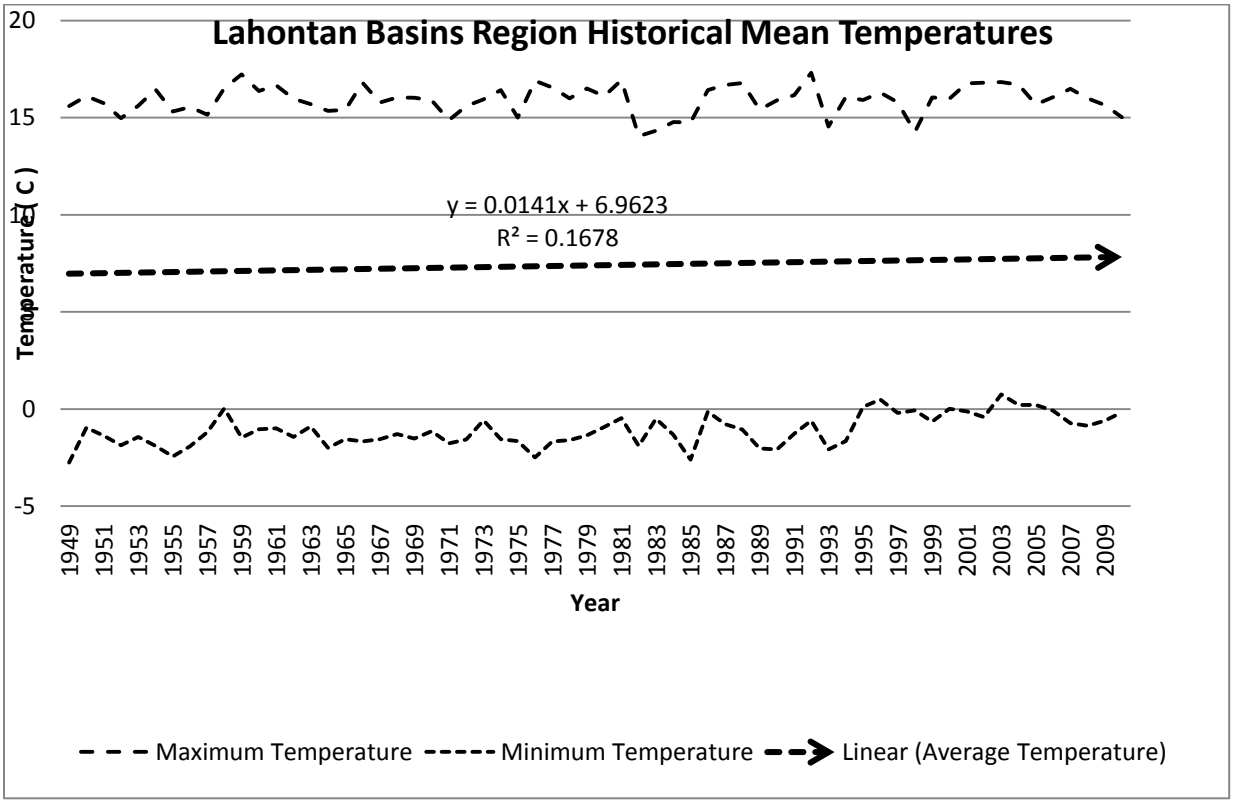


Figure 15.4 Lahontan Basins Region Projected Annual Precipitation

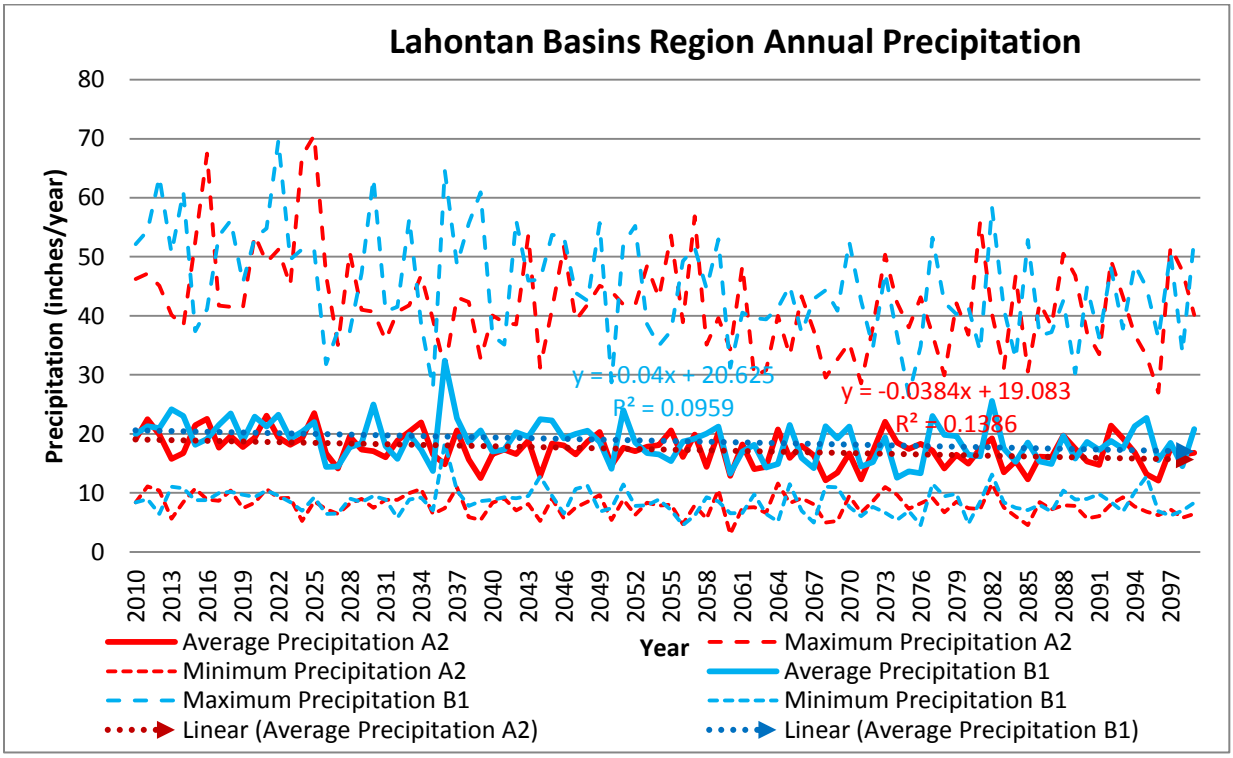
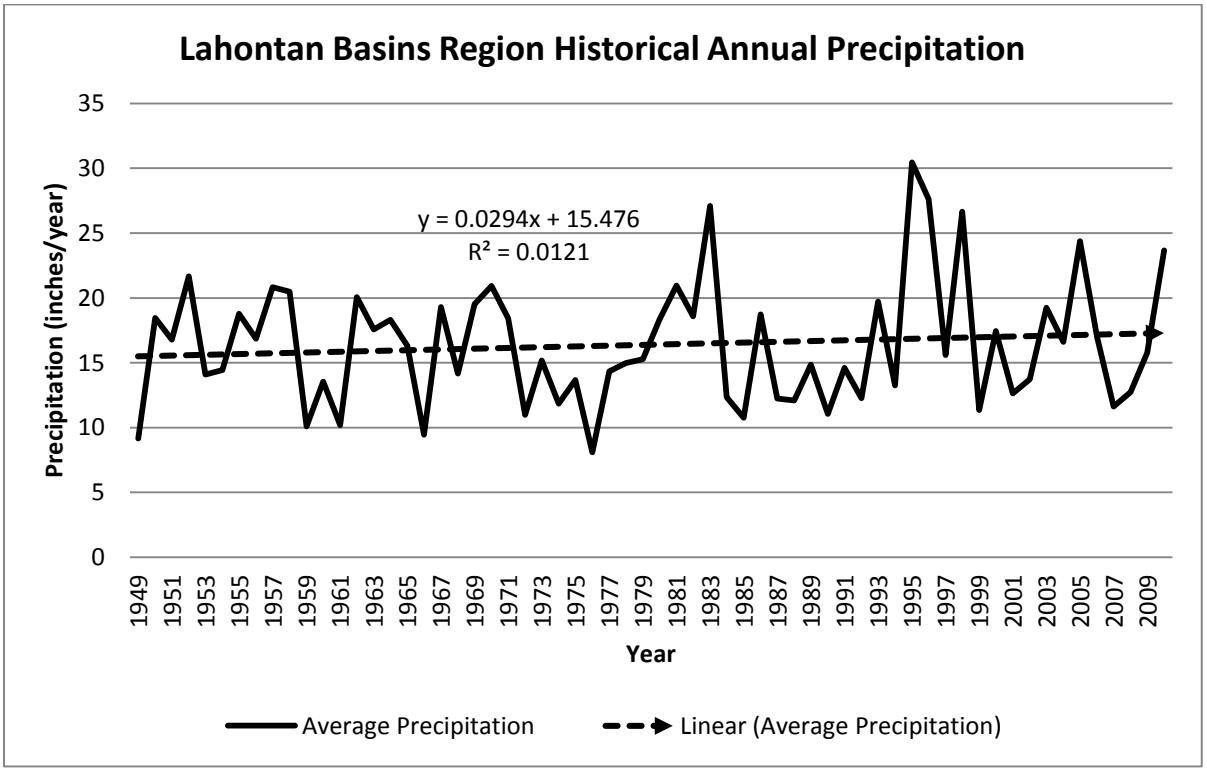


Figure 15.5 Lahontan Basins Region Historical Annual Precipitation[2]



15.2.1 Water Supply

When considering how climate change could impact water resources in the LBR, the primary considerations are the winter snowpack and long-term impacts on groundwater. The connection between precipitation (snow and rain) that falls on the surrounding mountain ranges that comprise the watersheds of the LBR and the groundwater and springs supplying much of the water supply for the residents of the region is only beginning to be understood. According to DWR, "[a]bout 75 percent of the region's 1990 level water supply comes from surface sources. Ground water supply amounts to 23 percent."

Research done by the United States Geological Survey (USGS) on the Klamath Basin (northwest of the LBR, where geologic conditions may be similar due to a volcanic pattern), indicate that, while groundwater dependence and the occurrence of springs do buffer users somewhat from climate change, the "ground-water system in the upper Klamath Basin responds to external stresses such as climate cycles, pumping, lake stage variations, and canal operation. This response is manifest as fluctuations in hydraulic head (as represented by fluctuations in the water-table surface) and variations in groundwater discharge to springs. Basin-wide, decadal-scale climate cycles are the largest factor controlling head and discharge fluctuations. Climate-

[2] The data are distinct from reanalysis products in that precipitation is a gridded product derived directly from observations, and both the land surface water and energy budgets balance at every time step. The data taken from: Maurer, E.P., A.W. Wood, J.C. Adam, D.P. Lettenmaier, and B. Nijssen, 2002, A Long-Term Hydrologically-Based Data Set of Land Surface Fluxes and States for the Conterminous United States, J. Climate 15(22), 3237-3251.

driven water-table fluctuations of more than 12 feet have been observed near the Cascade Range, and decadal-scale fluctuations of five feet are common throughout the basin. Ground-water discharge to springs and streams varies basin-wide in response to decadal-scale climate cycles" (USGS, 2010).

Forest management adaptations to extreme precipitation, higher temperatures, and more extreme weather events are paramount to how the LBR, surrounding regions, and much of northern California adapts to climate change with respect to water supply and ecological needs. Understanding how specific management strategies affect the forests' response to climate change will continue to grow in importance. The USFS program Forests to Faucets is a good example of the growing understanding surrounding urban regions' and economies' dependence upon forested watersheds for water supplies.

15.2.2 Water Demand

The potential impacts of climate change on water demand in the LBR have the potential to affect the agricultural community in a significant way. Urban culinary water is not expected to be as critically impacted as agricultural irrigation. Because of the Region's sparse population (compared to other areas of California), overall culinary water demand is not high; however, according to the California Department of Finance[3], population is expected to increase to 36,000 by 2020, and by 14% in the following 20 years, to approximately 41,000 in 2040. This increase will result in a greater future residential and urban water demand. In addition, energy companies in the area are looking to integrate geothermal heating energy supplies to their systems, which could increase water demand significantly. Assuming population growth, the integration of geothermal heating energy supplies, and unchanged current residential practices, it is likely that water usage will increase as time, temperature, and population increases. To decrease the effect of rising water demand during the warm season, regional jurisdictions may want to investigate the potential for temporary storage options, such as additional water tanks, and obtaining water rights to high mountain reservoir storage facilities.

Investment in the condition of the current aging storage infrastructure should also be considered as a way to help ensure the availability of water storage in drought conditions. There is a major portion water infrastructure in the Susan River basin that has exceeded its anticipated design life.

15.2.3 Water Quality

The quality of groundwater in the LBR widely varies between excellent and poor. Wells that obtain their supply from lake deposits can have high levels of boron, arsenic, and fluoride and high adjusted sodium absorption ratio. Some domestic wells in the Standish area of Honey Lake

[3] Information available at: http://www.dof.ca.gov/Research/demographic/reports/projections/P-1/, and gathered on May 7, 2014.

Valley have arsenic levels above safe drinking water standards. Much of this contamination is due to naturally occurring deposits, and it is not likely that climate change effects will alter the quality of these groundwater resources.

The risk of catastrophic wildfire associated with a changing climate, changes in temperatures, changes in precipitation, and periods of drought, complemented by extreme storm events, can result in run-off and sedimentation that pose a significant threat to surface water quality in the LBR.

The Lassen National Forest component of the Ecological Restoration Implementation Plan[4] focuses on catastrophic fire prevention as important next steps in preparing an ecosystem for adaptability to climate change.

15.2.4 Flooding

Localized flooding has historically occurred in the region and is a concern for the region, the flooding is not generally associated with loss of life however, there is always that potential during a flood event. According to the North Lahontan Region California Water Plan Update, in the past, flooding has affected the North Lahontan area by washing away roads and critical flood protection infrastructure, and even destroying homes along waterways. The impacts of changing temperatures and changing precipitation patterns on both of these types of events could result in earlier storm events and earlier springtime runoff, leading to increased risk of flooding and debris flows. It is possible that meadow restoration may help in attenuating these additional flows, but more research and investigation is necessary before making a large investment.

Potential damage to agricultural land: destruction of topsoil, killing perennial crops, damage to irrigation infrastructure, and spread of invasive species (spread of white top) are all potential effects of regional flooding.

The region should consider studding the Susan River and other critical waterways in order to prepare an improvement plan to prioritize the use of funds for storm water controls and flooding mitigation.

15.2.5 Ecosystem and Habitat Vulnerability

Impacts of a changing climate on terrestrial and aquatic ecosystems have been studied worldwide. One of the primary concerns related to climate change impacts on ecosystems is the movement of animal and plant species and the availability of habitat of suitable temperature. The LBR hosts large swings in topography, allowing for “up-migration”, or the migration of affected

[4] Available at http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5411436.pdf, and accessed on May 7, 2014.

species "up" in elevation to get to lower temperatures and, at times, higher amounts of precipitation. This habitat availability could mitigate some of the negative effects of climate change on endemic and threatened species, however, it is easier for animal than for plant species to migrate to preferred locations due to mobility and the speed of generation.

In addition to being affected by overall air temperature, aquatic species will be affected by water temperature. This makes the connectivity of their habitats of utmost importance when planning for adaptive management.

15.3 Regional Climate Change Vulnerabilities, and Adaptation and Mitigation Strategies

This section examines major vulnerabilities related to water resources following the categorized impacts of the previous section. The questions posed follow the guidance provided in the *Climate Change Handbook for Regional Water Planning* (2011). Following each category are resource management strategies that could be employed to enhance regional adaptation to climate change impacts in addition to reducing anthropogenic pollutants. An important point for the LBR is that any adaptive strategy must be practical and pragmatic: projected effects of climate change are vague and cannot be pinpointed, thus, it is important to preserve the adaptive capacity of the region through increasing systemic flexibility and preserving resource managers' available options.

15.3.1 Water Supply

1) *Does a portion of the water supply in the region come from snowmelt?*
   Yes. Most communities in the region rely on groundwater sources that are recharged primarily by snow that falls on the slopes of various mountains in the Sierra Nevada mountain range. Major bodies of surface water derived from this include, Eagle Lake and Honey Lake/Susan River. According to DWR, the major groundwater basins in the area rely on recharge from precipitation infiltration.

2) *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?*
   No. The LBR does not rely on water diverted from the Delta, Colorado River, or other climate-sensitive systems outside of the region.

3) *Does part of your region rely on costal aquifers? Has salt intrusion been a past?*
   No, the LBR does not rely on coastal aquifers. Salt intrusion is not possible due to the distance from the sea and general absence of saline water in the LBR.

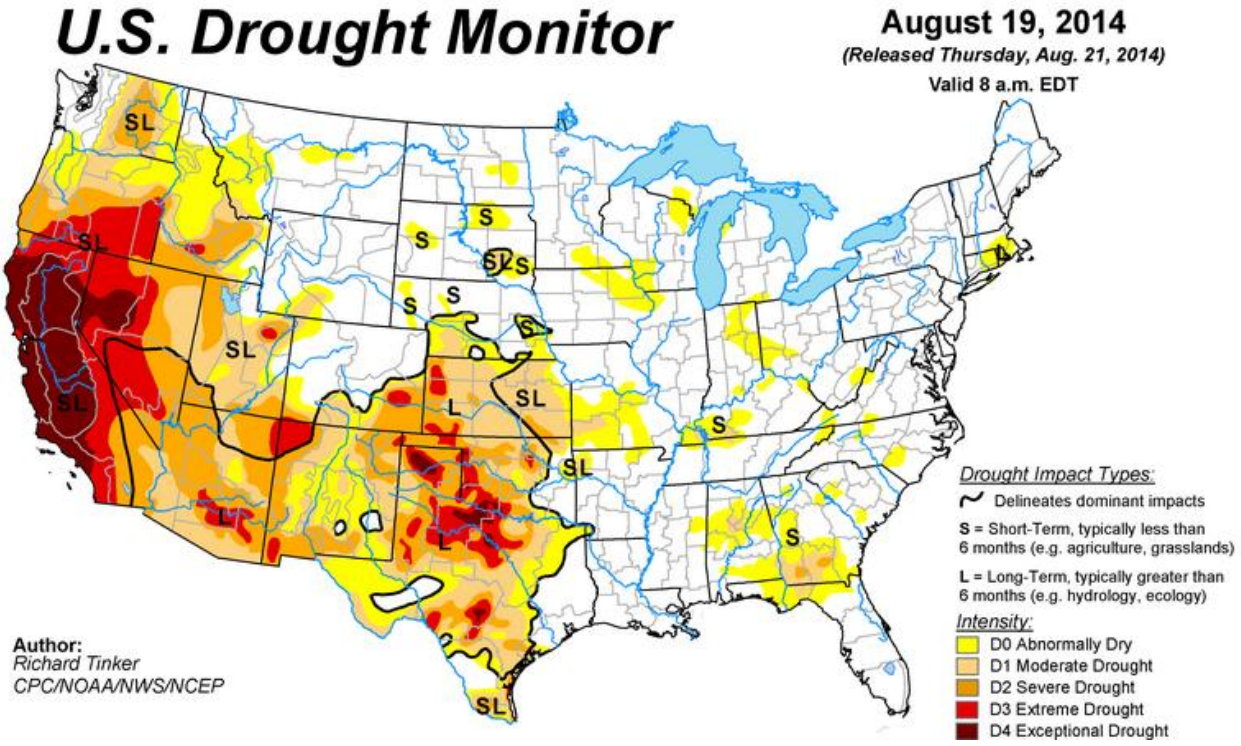
4) *Would the region have difficulty in storing carryover supply surpluses from year to year?*

Yes. There is almost no long-term storage capacity within the region associated with water supply. The California Water Plan Update 2009 has indicated limited storage facilities in the region, and a dependence on snowmelt and rainfall for groundwater recharge. Based on an infrastructure inventory performed for Honey Lake Resource Conservation District, evidence was found that existing infrastructure, such as dams, channel and diversions, are leaking, failing or unsuitable for optimal performance. This indicates that other purveyors in the region may also be at risk, and further investigations should be considered.

5) *Has the region faced a drought in the past during which it failed to meet local water demands?*

In the past couple years, the LBR has experienced droughts, which has impacted water deliveries. California is experiencing its third consecutive dry year (2014), which will culminate in the upcoming summer. The outcome of this drought period on water delivery will likely set a new standard of water service and delivery in a dry period. Current monitoring by the US Drought Monitor shows that the LBR is categorized in extreme drought condition. Further monitoring should be completed to track the region's response and adaptive capacity.

Figure 15.6 U.S. Drought Monitoring; photo courtesy of http://drought.gov.



6) *Does the region have invasive species management issues at its facilities, along conveyance structures, or in habitat areas?*

While Tall whitetop is threatening the viability of Lassen County's agriculture by decreasing grazing land productivity, hay quality, hay marketability, and forage yields, and the invasion by perennial pepperweed and Western juniper in the Susan River area creates erosion problems, there are no invasive species issues that are currently impacting water infrastructure in the region.

Resource Management Strategies (RMS) for adapting to water supply vulnerabilities:

- Drinking Water Treatment and Distribution: ensure that distribution systems are efficient and effective
- Conjunctive Management and Groundwater Storage: high-flow/precipitation years could result in greater groundwater storage if surface water could be utilized during wet years
- Precipitation Enhancement: assuming precipitation enhancement is effective in increasing precipitation, it could assist the region in achieving the overall goal to improve water supply reliability
- Recycled Municipal Water: effluent could be used on pasture or to meet wildlife needs, contracts could be initiated with ranches
- Regional/local Surface Storage: expand carryover capacity for rainwater throughout the region
- Ecosystem Restoration: functional ecosystems help to provide a more consistent water supply and avoid flooding, while controlling invasive species will help the natural ecosystem to adapt without competition, creating a water sink.
- Groundwater Management: closely monitor seasonal flows to understand the groundwater/surface water dynamic and preserve infiltration and storage capacity
- Forest Management: see Ecosystem Restoration
- Watershed Management: see Ecosystem Restoration
- Land Use Planning and Management: identify recharge areas, and areas of low groundwater dependability, and avoid development in those areas
- Pollution Prevention: protect water supplies through maintaining beneficial uses

15.3.2 Water Demand

Again, note that the questions posed follow the guidance provided in the *Climate Change Handbook for Regional Water Planning* (2011).

1) *Are there major industries that require cooling/process water in the planning region?*
   There is a geothermal energy plant currently being built by Surprise Valley Electrification Corporation (SVEC). All of the major energy companies of the area, SVEC, Plumas-Sierra Rural Electric Corporation (PSREC), and Lassen Municipal Utility District (LMUD), are currently studying the feasibility of integrating geothermal energy extraction

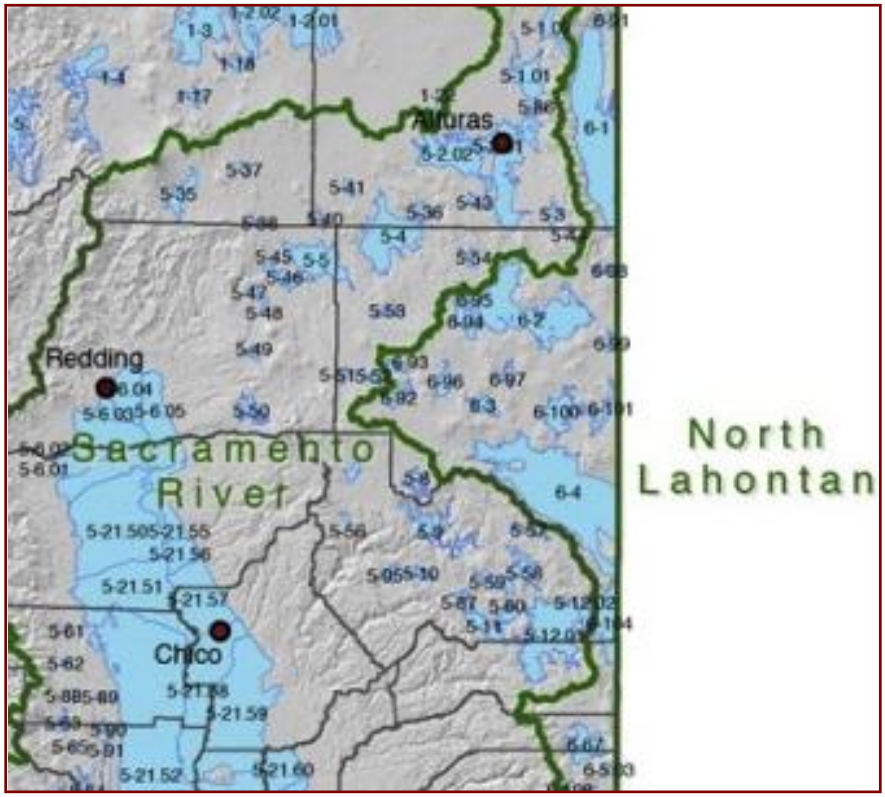
plants in the area. Aside from this there are no other major industries that require cooling/process water.

2) *Does water use vary by more than 50% seasonally in parts of the region?*
   Yes. Most of the surface water irrigation operates with varying water supply, causing fluctuations in irrigated acreages and duration permitted irrigation water is available fluctuates annually. Although DWR reports that less than 4% of the region's land area is considered irrigated, that about 90% of the annual net 514,000 acre feet of water is used for irrigated agriculture. Most of the irrigated agriculture is for commercial use while irrigated pasture for cattle grazing is secondary.

3) *Are crops grown in the region climate-sensitive? Would shifts in daily heat patterns, such as how long heat lingers before night-time cooling, be prohibitive for some crops?*
   The main crop grown in the LBR is alfalfa, which is used for cattle and, at times, shipped out of the region. Alfalfa is not reported to be particularly climate sensitive, and naturally thrives in warmer temperatures.

4) *Do groundwater supplies in the region lack resiliency after drought events?*
   There are minimal monitoring activities in the region. This lack is understandable due to the small population and limited demand on these resources, however, the drought conditions currently being faced in California could affect the region in ways that threaten the groundwater supply. Per the State Water Plan (2009), there is concern that present supplies in the North Lahontan Region will be insufficient to meet water present and future demands without additional water management programs.

Figure 15.7 DWR Map of California Aquifers – enlarged to show detail of the Lahontan Basins Region



5) *Are water use curtailment measures effective in your region?*

Yes. In the Lahontan Basins region, the City of Susanville (an urban area) has implemented several of the Demand Management Measures (DMM) as part of the Urban Water Management Planning Act, helping to promote urban water conservation in order to stretch water supplies further within the region.

6) *Are some in-stream flow requirements in the region either currently insufficient to support aquatic life, or occasionally unmet?*

Yes. The Susan River Area Rapid Watershed Assessment has identified low summer flows limiting fish habitat quality in the Susan River. There are no flow requirements for any river in the region – Susan River is adjudicated, but there are no required flows. The watershed is small which doesn't allow for enough base flow to permit summer flows.

<u>RMS for adapting to water demand vulnerabilities</u>:

- Agricultural Water Use Efficiency: increased water use efficiency through application and timing practices could increase the Lahontan Basins net water savings, improve water quality, provide environmental benefits, improve flow and timing, and increase energy efficiency
- Urban Water Use Efficiency: increase efficiency, especially for summer uses

- Watershed Management: increase knowledge regarding groundwater interactions
- Ecosystem Restoration: quantify ecosystem needs
- Conjunctive Management and Groundwater Storage: reliability of the region's water supplies can be improved through conjunctive use of both surface and groundwater supplies
- Land Use Planning and Management: use low-impact-development design wherever possible to minimize water use and maximize return flows during storm water conditions
- Economic Incentives: could be used to encourage conservation

15.3.3 Water Quality

Again, note that the questions posed follow the guidance provided in the *Climate Change Handbook for Regional Water Planning* (2011).

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

   Yes. Wildfire is a pervasive threat to communities and water resources throughout the region. All reservoirs have vegetative borders, the absence of which could result in increased sediment loads into the water bodies. Fighting wildfires is expensive, and investing in catastrophic wildfire prevention through fuels control and/or the removal of biomass could represent significant financial benefit for the region and for the state as a whole.

   The potential for more frequent, extreme fire behavior is undoubtedly a risk associated with predicted temperature increases; longer dry periods, and, potentially, more storms. All major storage and water management infrastructure in the region are surrounded by mature, often over-stocked timber stands that are susceptible to natural or anthropogenic fire ignition. Potential impacts from wildfires on water quality are prevalent throughout the LBR; areas of particular concern include areas of wild land-urban interface due to the increased risk of ignition along roads and in regularly travelled and visited locations.

   The California Office of Environmental Health Hazard Assessment (OEHHA) recently updated their 2009 report: Indicators of Climate Change in California. In this report, OEHHA states that "the area burned by wildfires each year is highly variable, ranging from 31,000 acres in 1963 to 1.4 million acres in 2008, making it difficult to determine long-term trends. However, the data suggest a trend toward increasing acres burned statewide since 2000. The three largest fire years since 1950 have occurred in the past

decade (2003, 2007 and 2008), and the annual average since 2000 (598,000 acres) is almost twice that of the 1950–2000 period (264,000 acres).”

Figure 15.8 Annual Area Burned by Wildfires in California between 1950 and 2010 (Source: OEHHA 2013 update to Indicators of Climate Change in California)

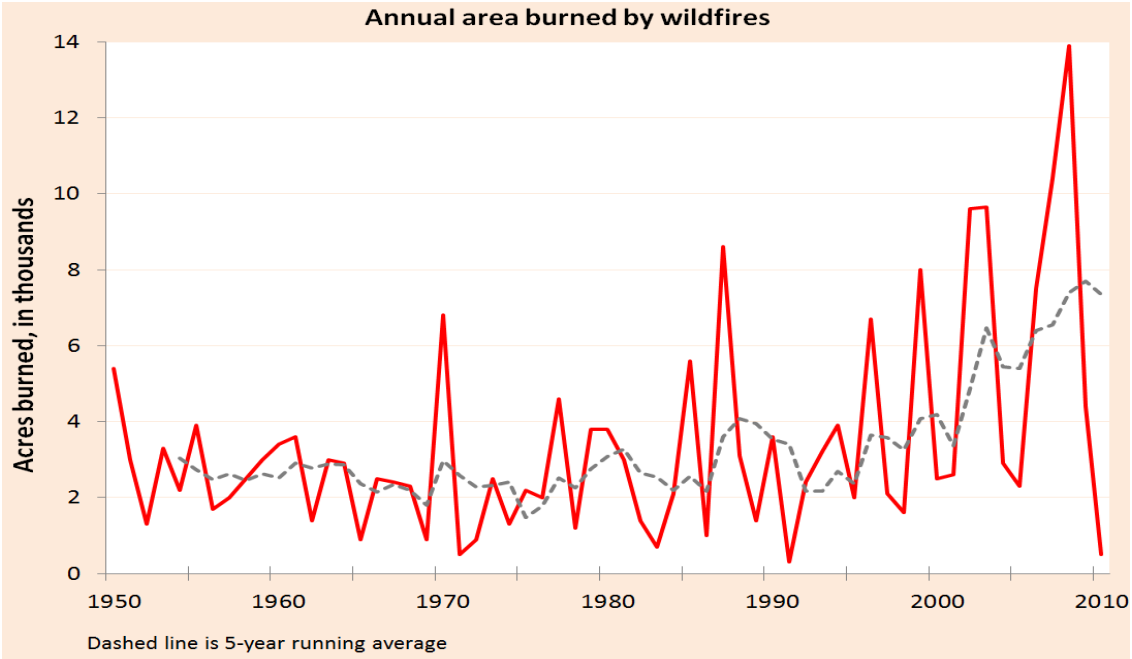
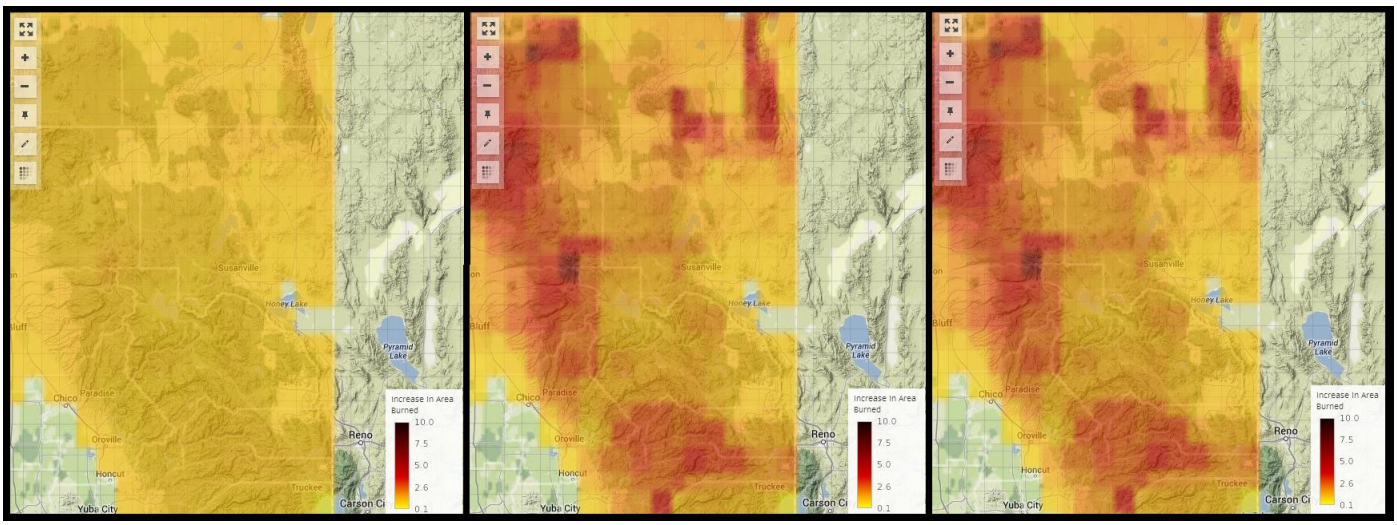


Figure 15.9 CNRM Model Wildlife Fire Risk under High Emissions Scenario in Year 2020, 2050, and 2085 (respectively)



2) *Does part of the region rely on surface water bodies with current or recurrent water quality issues? Are there water quality constituents potentially exacerbated by climate change?*

Yes. Eutrophication[5] occurs in Eagle Lake. The Susan River and Honey Lake appear on the Lahontan RWQCB's 303(d) list as being impaired by salinity and the presence of metals. See Table 15.2.

As the western portion of the region is largely forested, greater understanding of the role the forests play in preserving and improving water quality is an important consideration. Specific forest management strategies, such as meadow restoration, could aid in preserving summer base flow, supplying water of adequate temperature and quantity for endangered species, and attenuating extreme precipitation events.

Table 15.2 - USEPA 303d Impaired Waters (LBR)

Water Body	Pollutant/Stressor	Potential Sources	Expected TMDL Completion Date
Eagle Lake	Nitrogen	Agriculture	2019
	Phosphorus	Agriculture	2019
Honey Lake	Arsenic	Natural Sources	2019
	Salinity/TDS/Chlorides	Agriculture/Natural	2019
Honey Lake Area Wetlands	Metals	Natural Sources	2019
	Salinity/TDS/Chlorides	Natural Sources	2019
Susan River (Headwaters to Susanville)	Mercury	Natural Sources	2019
	Total Dissolved Solids	Source Unknown	2021
	Nitrogen	Source Unknown	2021
	Unknown Toxicity	Source Unknown	2019
Susan River (Litchfield to Honey Lake)	Mercury	Source Unknown	2019
	Unknown Toxicity	Source Unknown	2019
Susan River (Susanville to Litchfield)	Mercury	Natural Sources	2019
	Total Dissolved Solids	Source Unknown	2021
	Turbidity	Agriculture	2021
	Unknown Toxicity	Source Unknown	2019

[5] Eutrophication is the ecosystem response to the addition of artificial or natural substances, such as nitrates and phosphates, to an aquatic system. It may be natural (the deposition of leaf materials and/or sediment over many years) or human-caused (such as effluent contributions).

3) *Are seasonal low flows decreasing for some water bodies in the region? Are the reduced flows limiting the water bodies' assimilative capacity?*

   Areas in the LBR were recorded to be flowing at 28%-66% of the 50-year average rate during the low-flow season. These low flows limit the capacity to which a river can assimilate pollutants – including high temperature – potentially having negative effects on aquatic species and drinking water sources.

4) *Are there beneficial uses designated for some water bodies in the region that cannot always be met due to water quality issues?*

   Yes. Susan River and Honey Lake appear on the Lahontan RWQCB's 303(d) list as being impaired by salinity and the presence of metals. Currently they are listed as Category 5A, being water bodies where standards are not met, and a total maximum daily load definition is required but has not been completed. This effectively limits the uses of water extracted from these bodies of waters for use as, for example, freshwater replenishment, municipal and domestic supply, and water contact recreation. According to the Public Policy Institute of California (PPIC), of the average 6.9 maf of water available from precipitation between the years 1998 and 2005, only 2.2 maf was listed as unimpaired.

5) *Does part of the region currently observe water quality shifts during rain events that impact treatment facility operations?*

   Yes. During significant precipitation events there is increased inflow and infiltration into wastewater collection pipes, as well as sedimentation, some of which makes its way into municipal treatment systems. The challenge, however, is not so much the constituents of this runoff, but the volume of the runoff that must be treated. WWTPs for water service utilities in the region's major communities have limited capacities that are unable to handle high volumes during significant rain or rain-on-snow events.

   <u>RMS for adapting to water quality vulnerabilities</u>:

   - Drinking Water Treatment and Distribution: identify potential threats and work to remediate those; ensure that infrastructure is efficient and managed to a high standard
   - Groundwater/aquifer Remediation: as development pressures increase in the future, protection of groundwater recharge areas and groundwater quality will become more and more important to preserving these high quality water supplies
   - Matching Quality to Use: this may stretch LBR water supplies, and is part of regional goals to improve water supply reliability and maintain and improve water quality
   - Pollution Prevention: take action to protect all waters from pollution
   - Urban Runoff Management: prevent avoidable urban runoff

- Agricultural and Urban Water Use Efficiency: taking less water out of streams could allow for greater instream flow, and great dilution capacity
- Agricultural Lands Stewardship: agricultural lands could represent a carbon sequestration opportunity, and best management practices encourage on-farm runoff management
- Ecosystem Restoration: a functional ecosystem will help to filter polluted water, and will keep water at a temperature that is good for aquatic biota
- Forest Management: address catastrophic wildfire risk with fuels control efforts, address capacity of roads to withstand larger precipitation and post-fire runoff events, and maintain adequate forest cover to ensure clear cold-water streams
- Watershed Management: see Ecosystem Restoration, also, effective groundwater management will maintain the resource for use by all
- Water-dependent Recreation: ensure that recreation activities are designed and managed to protect water quality

15.3.4 Sea Level Rise

The LBR is not close to the sea, and thus is not at risk of sea level rise. However, sea level rise could change population distribution throughout California. Though the LBR is one of the least populated regions in the state, it is possible that migration from coastal areas could result in additional population growth in the region. This will be tracked on a state level as well as by the affected counties, and action will be taken if/when a trend is identified.

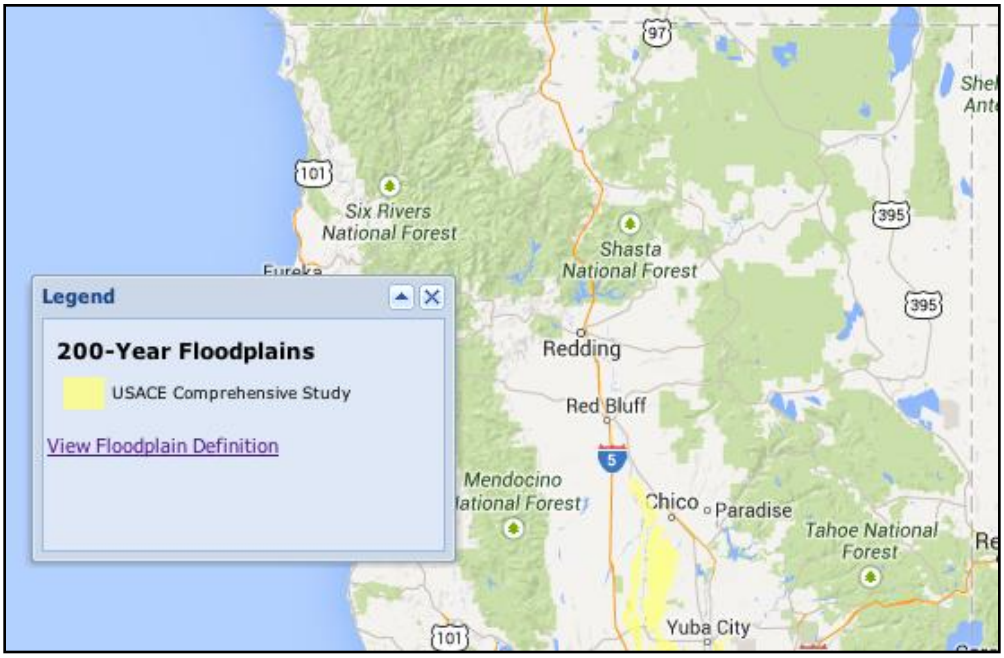
15.3.5 Flooding

Again, note that the questions posed follow the guidance provided in the *Climate Change Handbook for Regional Water Planning* (2011).

1) *Does critical infrastructure in the region lie within the 200-year floodplain?*

No. From a comprehensive study performed by the USACE, the LBR does not lie on the 200-year floodplain. See the map below for a depiction of the 200-year floodplain.

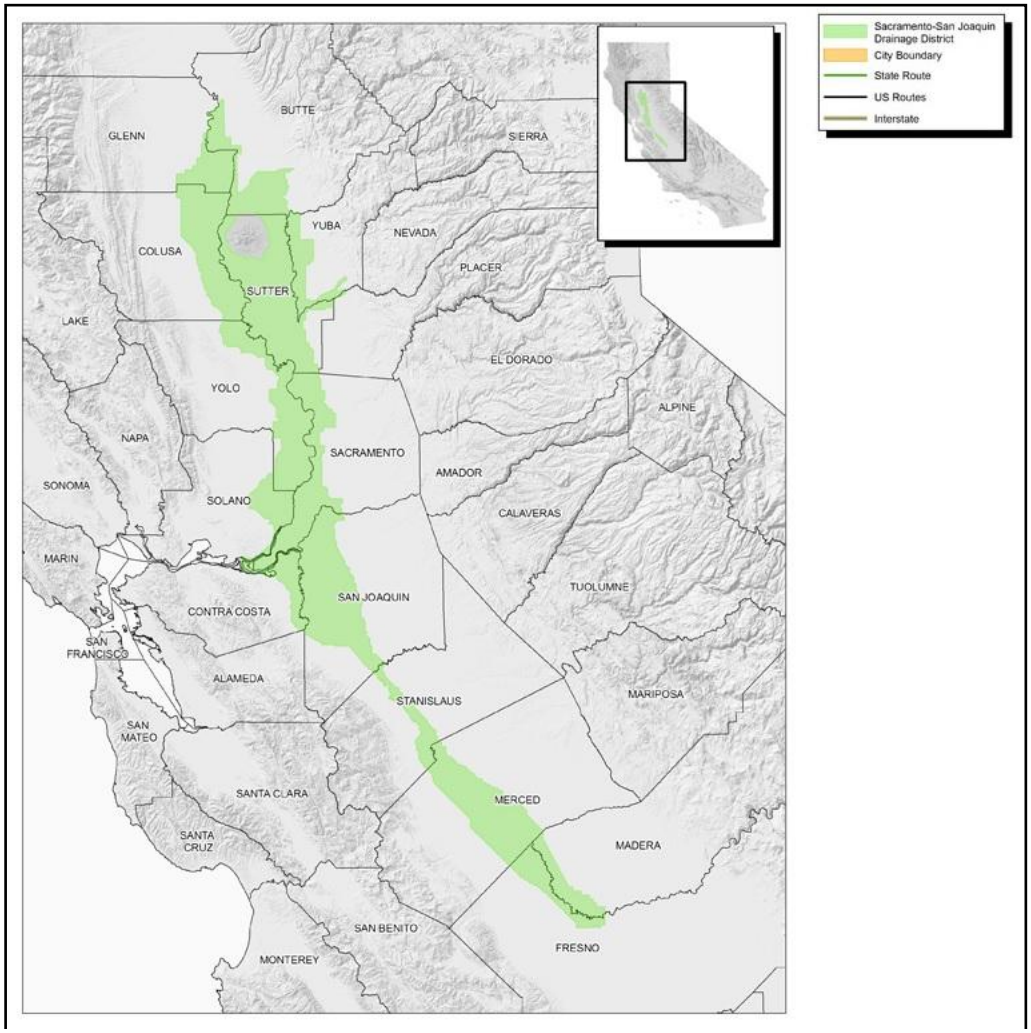
Figure 15.10 USACE Comprehensive 200-Year Floodplain Study (available at http://gis.bam.water.ca.gov/bam/).



2) Does part of your region lie within the Sacramento-San Joaquin Drainage District?

No, the Sacramento-San Joaquin Drainage District does not reach the LBR. See the Figure 15.11, below.

Figure 15.11 Sacramento-San Joaquin Drainage District



3) Does aging critical flood protection infrastructure exist in your region?

Despite its generally dry conditions, Lassen County, the City of Susanville, and the Susanville Indian Rancheria experience periodic winter storms and thunderstorms that often result in flash floods. Under storm conditions, the region's stream systems pose a significant threat. Most of the irrigational infrastructure is over 60 years old and vulnerable to severe flooding damage, i.g., Johnstonville Dam.

DWR has been conducting geotechnical subsurface investigations on levees around California, however none of these investigations have included flood protection infrastructure in the LBR (information gathered from the Levee Repairs Program report between 2005 and 2011). There are some older levees, but their extent to which these occur is undetermined. Many of these older levees were built under earlier flood control and flood management goals, are exposed to scouring, and are at risk of failure.

4) Have flood control facilities (such as impounded structures) been insufficient in the past?

According to the North Lahontan Region 2013 Hydrologic Region Report (HRR),

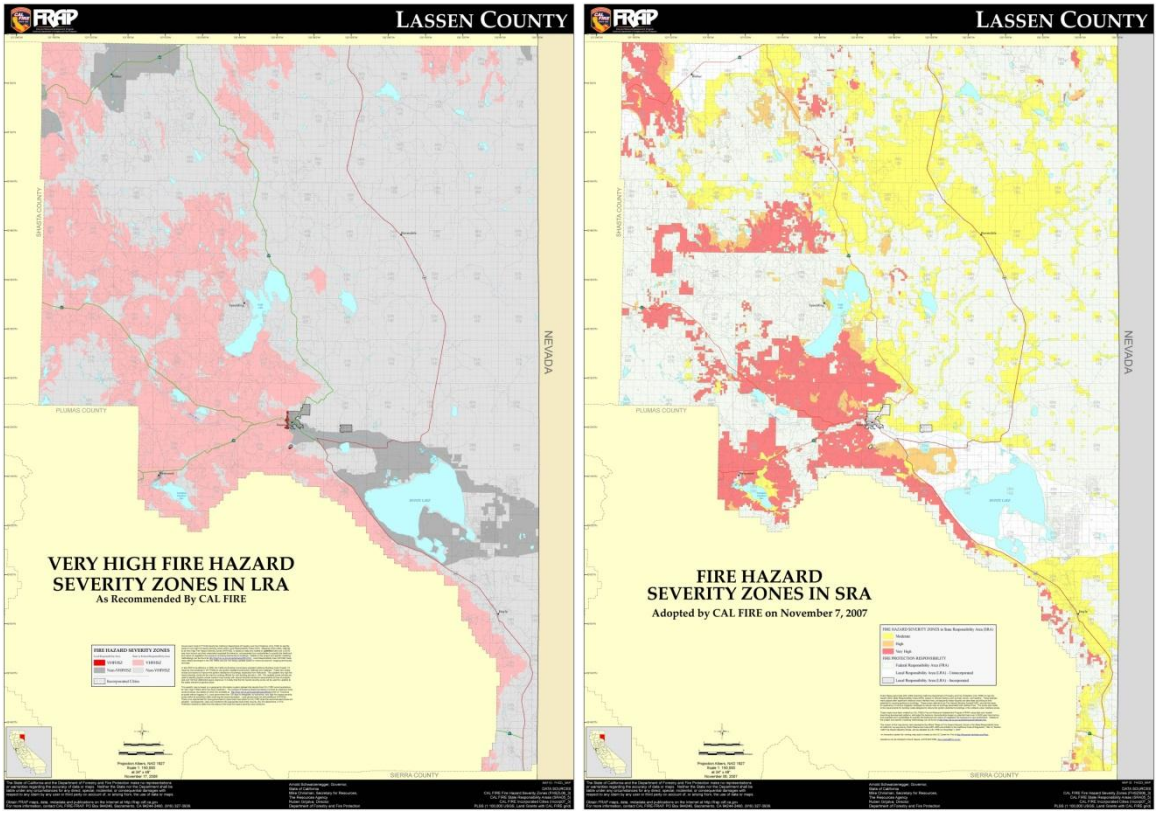
> *"Major floods occur less regularly in the North Lahontan Hydrologic Region compared with the rest of the state. Major historic floods in the hydrologic region include floods in February 1968, February 1986, and January 1997. In February 1968, continuous rain for nearly a week caused extensive flooding in the Honey Lake watershed. The Susan River and storm drains overflowed, inundating roads and stranding travelers in Susanville. Flooding in Honey Lake Valley isolated many ranchers from emergency services. In January 1997, an intense rainstorm falling on a large snowpack caused catastrophic flooding throughout the hydrologic region."*

Despite this, "Major floods occur less regularly in the North Lahontan Hydrologic Region compared to the rest of the state," according to the HRR. This may be due to the good planning done by Susanville planners in the early days of the town: because of regular flooding along the river, Susanville's earliest residential area was built on the high ground now known as Uptown.

5) *Are wildfires a concern in parts of the region?*

Yes. Wildfires and potential flooding as a result of the loss of vegetation is a serious concern. See discussion regarding wildfires under Question 1 in Section 15.3.3, above. The following Fire Hazard Severity Zone Maps, provided by the Fire Resource and Assessment Program (FRAP) of California, depict fire severity Area of the LBR by responsibility: Local Responsibility Area (LRA) and State Responsibility Area (SRA).

Figure 15.12 FRAP Fire Hazard Severity Zone Maps (LRA and SRA)



<u>RMS for adapting to flooding vulnerabilities</u>:

- Flood Risk Management: identify the flood risk throughout the LBR
- System Reoperation: manage water storage and conveyance facilities with climate projections in mind to better protect infrastructure from flooding
- Regional/local Surface Storage: additional storage, or re-operated facilities, could contribute to flood security for local communities and infrastructure
- Agricultural Lands Stewardship: best management practices encourage water infiltration, which could attenuate peak flows
- Ecosystem Restoration: restoring mountain meadows and riparian habitat could attenuate flood flows
- Forest Management: addressing catastrophic wildfire risk with fuels management projects will decrease the "flashiness" of flows that could off of a burned landscape
- Watershed Management: see Ecosystem Restoration
- Land Use Planning and Management: avoid urban development in flood-prone areas

15.3.6 Ecosystem and Habitat Vulnerability

Again, note that the questions posed follow the guidance provided in the *Climate Change Handbook for Regional Water Planning* (2011).

1) *Does the region include aquatic habitats vulnerable to erosion and sedimentation issues?*
   Yes. The invasion by perennial pepperweed and Western juniper in the Susan River area creates erosion problems as well as a reduction in species diversity; it also alters rangeland hydrology. Because of the complex and variable regional topography and the presence of numerous waterways, erosion is an ongoing occurrence. As discussed earlier, the most significant threat to aquatic habitats is erosion exacerbated by extreme wildfire events.

2) *Does the region include estuarine habitats which rely on seasonal freshwater flow patterns?*
   Estuaries are not present in the LBR due to its distance from the sea.

3) *Do climate-sensitive fauna or flora populations live in the region?*
   All plant and animal species are sensitive to shifts in climate in some way, although some species have broader tolerances than others. Generally wide-ranging or broadly distributed species like deer, bear, mountain lion, and ponderosa pine are better able to adapt to changing conditions. Species with narrow distributions or those whose presence in the LBR is already at the edge of their habitat envelopes are at greater risk. For example, Eagle Lake Trout, and Lahontan cutthroat trout are all native species to the LBR, which only occur in a few small upper watershed streams, may be vulnerable to more frequent or extended dry periods. Overall, there has been little research on the potential impacts of climate change on species within this particular region.

4) *Do endangered or threatened species exist in the region? Are changes in species distribution already being observed in parts of your region?*
   California Department of Fish and Wildlife has indicated that the Honey Lake Wildlife Area, located near the southern portion of Lassen County, provides important habitat for 36 threatened or endangered species, including the bald eagle, sandhill crane, and bank swallow. While shifts in the presence of these species have not been monitored, it is likely that they are moving uphill, and possibly down-canyon, per many other species impacted by climate change in the Sierra-Cascade region.

5) *Does the region rely on aquatic or water-dependent habitats for recreation or other economic activities?*
   Yes. Tourism, including hunting and fishing, is a significant industry in this area. Based on the 2000 Lassen County General Plan, social and economic benefits associated with wildlife resources involve the use of wildlife as a "consumptive" or harvested resource, including hunting and fishing for recreational purposes.

6) *Are there rivers in your region with qualified environmental flow requirements or known water quality/quantity stressors to aquatic life?*

Yes. The Susan River Watershed Group identified the riparian and wetland habitats, fish habitat, water quality and quantity, and water use efficiency as management concerns. The 2000 Lassen County General Plan indicated that river and lake habitats are important to many fish and wildlife species in Lassen County as they are threatened by changes in water quality, including changes in runoff caused by soil compaction and erosion.

7) *Do estuaries, coastal dunes, wetland marshes, or exposed beaches exist in your region? If so, are coastal storms possible/frequent in your region?*
No. The LBR is located far east of coastal waters.

8) *Does the region include one or more of the habitats described in the Endangered Species Coalition's Top 10 habitats vulnerable to climate change?*
The southern part of the LBR is covered under the Endangered Species Coalition's listing of the Sierra Nevada Mountain Range as a top 10 habitat vulnerable to climate change. The variability of the Range has lent itself to the development of many endemic species; many of which may have nowhere to go if the mountains areas warm. Amphibians, bighorn sheep, and the American pika are the most severely affected, but the entire region is vulnerable due to changes in climate and hydrologic patterns.

9) *Are there areas of fragmented aquatic or wetland wildlife habitat within the region? Are there movement corridors for species to naturally migrate? Are there infrastructure projects planned that might preclude species movement?*
Because of the rural nature of the region, terrestrial and wetland habitats are fairly intact, allowing for relatively unobstructed movement of most wildlife in a north-south pattern, allowing for access to a variety of elevations. Highways may be an obstacle to some wildlife movement (largely north-south due to roads placement, but also east-west across highway 395.

<u>RMS for adapting to ecosystem and habitat vulnerabilities</u>:

- Agricultural and Urban Water Use Efficiency: increased efficiency could maintain higher summer base flows and, therefore, lower overall in-river temperatures
- Ecosystem Restoration: good habitat and ecosystem values adds flexibility into the system that should accommodate projected climate change impacts
- Forest Management: catastrophic fire is one of the most — if not the most — important and high-profile vulnerabilities for ecosystems, terrestrial and aquatic; fuels management is an important component of adaptation to climate change
- Land Use Planning and Management: a careful identification of areas of high habitat value could result in avoided development in order to preserve these locations

- Recharge Area Protection: protecting known recharge areas will result in sustained habitat values, as well as a sustained water table to allow for in-river flows of adequate quantity and temperature
- Watershed Management: address catastrophic wildfire risk with fuels control efforts
- System Reoperation: address projected climate effects through system reoperation (low base flows, etcetera)
- Conjunctive Management and Groundwater Storage: make use of this strategy where possible to keep flows in the river when in a dry year
- Agricultural Lands Stewardship: implementing species management on grasslands could enhance the habitat value of agricultural lands

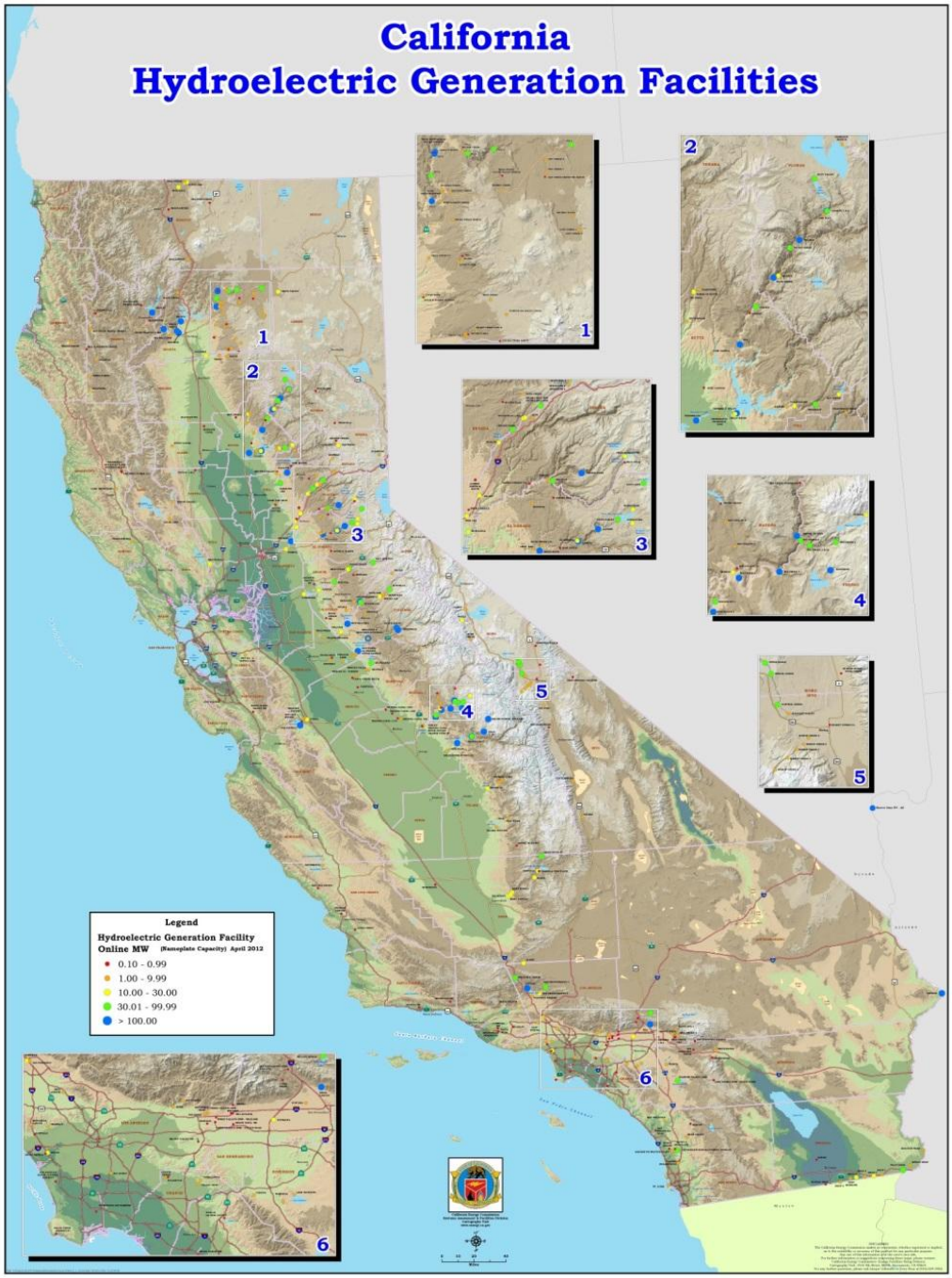
15.3.7 Hydropower

Again, note that the questions posed follow the guidance provided in the *Climate Change Handbook for Regional Water Planning* (2011).

1) *Is hydropower a source of electricity in the region?*

Lassen Municipal Utility District (LMUD), Surprise Valley Electrification Corp. (SVEC), and Plumas-Sierra Rural Electric Co-op (PSREC) are the primary provider of electricity in the LBR. LMUD purchases a partial amount of hydroelectricity from the Lake Almanor area. This facility is owned by Pacific Gas and Electric (PG&E) exists in a neighboring area outside Lassen County. See the Figure 15.13, below, for reference.

Figure 15.13 California Hydro-electric Power Generation Facilities



2) *Are energy needs in the 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?*

While energy use throughout California has decreased as population has increased — due to efficiencies and public information campaigns — statewide energy needs are expected to increase if temperatures warm which could increase use and dependence on cooling technologies. LMUD, PSREC, and SVEC do not indicate any large increase in demand,

though both PSREC and SVEC are currently looking into expanding their system to integrate geothermal electricity sources. There is no indication that future plans include hydropower development.

RMS for adapting to hydropower production vulnerabilities:

- System Reoperation: this could be examined in order to accommodate hydropower production under projected climate change effects
- Regional/local Surface Storage: additional storage could provide for additional resources for hydropower production

Table 15.2, below, shows a succinct summary of the climate change impacts, vulnerabilities, and adaptive strategies associated with each category of water use and resources, as described in the text above.

Table 0.2 - Impacts, Vulnerabilities, Adaptation Strategies, and Opportunities

The impacts, vulnerabilities, and adaptation strategies based on different categories of water use and resources in the LBR.			
Category	***Impacts***	***Vulnerabilities***	***Adaptive Strategies***
Water Supply	• Changes in amount of snowpack water equivalent • Timing of snowmelt, runoff and streamflow • Increased rain-on-snow events • Decrease In Overall Precipitation • Extreme precipitation events • More rain, less snow • Groundwater recharge and storage • Greater demands on storage infrastructure	• Storage capacity • Protecting recharge zones for springs recharge • Knowledge of groundwater supply • Agricultural water supply needs and practices	• Conjunctive Management and Groundwater Storage • Precipitation Enhancement • Recycled Municipal Water • Regional/local Surface Storage • Ecosystem Restoration • Groundwater Management • Forest Management • Watershed Management • Land Use Planning and Management • Pollution Prevention • Drinking Water Treatment and Distribution
Water Demand	• Longer, drier summers • Increase in summer water demand • Less water to share between a growing number of users • Increased drought periods	• Competing groundwater uses • Landscape irrigation • Municipal water use	• Agricultural Water Use Efficiency • Urban Water Use Efficiency • Watershed Management • Ecosystem Restoration • Conjunctive Management and Groundwater Storage • Land Use Planning and Management • Economic Incentives
Water Quality	• Intensified summer recreation • Unknown impacts to groundwater quality • Greater pressure on standards for WWTP effluent	• Increasing wildfire • Wildfire & sedimentation • In-stream water temperature • Wastewater treatment • Recreation	• Drinking Water Treatment and Distribution • Groundwater/aquifer Remediation • Matching Quality to Use • Pollution Prevention

The impacts, vulnerabilities, and adaptation strategies based on different categories of water use and resources in the LBR.			
Category	***Impacts***	***Vulnerabilities***	***Adaptive Strategies***
	• Catastrophic fire • Limited functionality of dirt roads	• Storm water	• Urban Runoff Management • Agricultural and Urban Water Use Efficiency • Agricultural Lands Stewardship • Ecosystem Restoration • Forest Management • Watershed Management • Water-dependent Recreation
Flooding	• Increased rain-on-snow events • Extreme precipitation events • Increased wildfire incidence • Unknown impacts of altered snowpack, snowmelt, and streamflow	• Transportation infrastructure • Aging flood control infrastructure • Increased risk of wildfire • Increased risk of debris flows	• Flood Risk Management • System Reoperation infrastructure from flooding • Regional/local Surface Storage • Agricultural Lands Stewardship • Ecosystem Restoration • Forest Management • Watershed Management • Land Use Planning and Management
Terrestrial and Aquatic Ecosystems	• Changes to species distributions • Novel and unpredictable species relationships and interactions • Competitive advantage of invasive species • Hydrological impacts – changes to water temperature, pH, DO, turbidity, and flow regimes	• Increasing wildfire • Wildfire & sedimentation • Climate sensitive species • Aquatic-habitat-reliant recreation • Fragmented aquatic and terrestrial habitat • In-stream water temperature	• Agricultural and Urban Water Use Efficiency • Ecosystem Restoration • Forest Management • Land Use Planning and Management • Recharge Area Protection • Watershed Management • System Reoperation • Conjunctive Management and Groundwater Storage • Agricultural Lands Stewardship
Hydropower	• Changes in amount of snowpack • Timing of snowmelt, runoff and streamflow • Increased rain-on-snow events • Extreme precipitation events • More rain, less snow • Groundwater recharge and storage • Greater demands on storage infrastructure • Changes to species distributions	• Storage capacity • Increased energy needs • Decreased reliability of flows	• System Reoperation • Regional/local Surface Storage

15.4 Prioritizing Vulnerabilities

All of the vulnerabilities listed above represent important issues and considerations for the LBR as a whole. Some vulnerabilities will be of high-priority to a certain suite of stakeholders because of their area of expertise, interests, or employment; these will likely differ from another interest group for the same reasons. Thus, it is not possible to base an evaluation of priority on the relative importance of each from a qualitative perspective.

Identifying vulnerabilities for such a diverse group of stakeholders and issues should be an exercise in assessing how soon that vulnerability may occur, if it's not already (urgency); the degree of probability that the vulnerability will become a hazard, if it's not already (risk); and the relative level of effort and/or cost to address the vulnerability in addition to the efforts already occurring. While it's possible that a variety of scenarios may change the status of any of the vulnerabilities listed below (for example, the award of grant funds may make a wastewater treatment plant a low-cost effort, though without that grant it may otherwise be a very high cost and effort activity), these possible scenarios are not considered in this evaluation.

Table 15.3, below, displays the vulnerabilities on the left, and assesses their urgency, risk, and the cost/effort of addressing each, and assigns a level of priority based on those findings. A higher priority generally goes to something that has a higher urgency, higher risk, and lower cost/effort input — this is a way of identifying what some call "low hanging fruit". With that said, these vulnerabilities were ranked by the members of the Regional Water Management Group (RWMG). It is important to make the distinction that these priorities are relative to responding to climate change and not IRWM project prioritization.

Table 15.3 - Prioritizing LBR Vulnerabilities by Urgency, Risk, and Cost/Effort

Prioritizing LBR vulnerabilities via High, Medium, or Low (H, M, or L) Urgency, Risk, and Cost or Effort to address the vulnerability. The list is organized first by Urgency (High to Low), then Risk (High to Low), then Cost or Effort.

Vulnerability	Urgency	Risk	Cost or Effort	Priority
Municipal Water Supply	H	H	H	1
Decreased reliability of flows	M	H	H	
Storm water	M	L	H	
Increased energy needs	L	L	H	
Reservoir storage capacity (adequate)	M	M	H	2
Transportation infrastructure	M	M	H	
Aging flood control infrastructure	M	M	H	
Natural system storage capacity (groundwater and meadows)	H	H	M	3
Spring recharge	H	H	M	

Competing uses for groundwater	H	H	H	
Agricultural and landscape irrigation	L	M	M	
Fragmented aquatic and terrestrial habitat	M	H	H	4
Recreation (general and aquatic)	L	H	M	
Increasing Wildlife	H	H	M	5
Sedimentation associated with catastrophic wildlife	H	H	M	
In-stream water temperature	H	H	M	
Climate sensitive species	H	H	M	
Loss of forest ecosystem function (habitat and catastrophic fire protection)	H	H	L	6

15.5 Further Data Gathering for Identifying and Quantifying Vulnerabilities

Per Table 15.3 and the description of vulnerabilities in prior sections, it is clear that vulnerability identification and prioritization is based on a general understanding of projected effects, in the LBR, of climate change. Actual investigations of these changes and quantifiable projections have not been completed for the majority of the vulnerabilities listed. Going forward, the LBR RWMG expects to track these vulnerabilities, working with in-region stakeholders to further understand those representing regional priorities. This work may take the form of local initiatives, partnerships within the RWMG, partnerships with other in-region organizations, or out-of-region partnerships. The work may also be done in total by external organizations, at which point it will be important for LBR stakeholders to track and ground-truth that data and the associated findings. Examples of this work are included in Table 15.4, below.

Table 15.4 - Sources of Effort and Possible Examples for Identify and Quantifying Vulnerabilities

Source of Effort	Possible Examples
Local Initiatives	City- or county-sponsored GHG tracking and reporting; population tracking for purposes of climate-immigration
RWMG Partnerships	Land-based species migration tracking with land owners and regional entities (RCD or the NRCS)
In-region Partnerships with non-RWMG Members	Working with the Sierra Water Work Group to identify particular water storage vulnerabilities and the ways in which storage could be improved or amended
External Partnerships	Work with an out-of-region entity to implement in-region objectives, such as with an educational institution (UC or CSU) to implement locally-driven and –requested climate change research
External Work	An external body, such as the Western Governors Association, chooses to implement a study located, in part, in the LBR

15.6 Mitigating Climate Change: Reducing Emissions

Climate change could have serious implications for managing water resources as changes in sea-level, precipitation, snowpack, and temperatures occur. Though there is still debate over the anthropogenic (or man-made) contribution to climate change, most climate scientists insist that human-derived sources of greenhouse gases have sped up, if not caused, the reported warming in the last century. In particular, studies specific to California have reported that emissions related to water management, transport, and end use may account for up to 20% of the state's annual emissions. In an effort to help determine the types of projects that could help reduce GHG emissions the Department of Water Resource has provided a list of statewide climate change actions:

- Reduction of GHG emissions
  - Reduce energy consumption of water systems and uses
  - Use cleaner energy to move and treat water
- Reduction of energy consumption
  - Water use efficiency
  - Water recycling
  - Water system energy efficiency
  - Runoff reuse

15.7 GHG Inventory Boundaries

GHG emissions inventory are available through the California Air Resource Board database. The inventory for the LBR is primarily focused in Lassen County due to how reporting is managed. Table 15.5, below, shows the potential GHG emission sources relevant to water utilities. Direct emissions will be those emissions via activities within the region itself (i.e. motor vehicles) while indirect emissions are emitted outside of the region, but are due to activity in the region (i.e. electrical use, which demands generation at some point in the system). Direct and indirect emissions are commonly referred to as Scope 1 and Scope 2 emissions, respectively.

Table 0.5 – Water Related Emissions from Direct and Indirect Sources

Scope Type	Emissions Type	Source Sector	Source Category
1	Direct	Waste	• Wastewater Treatment
1	Direct	Transportation	• On-road motor vehicles (e.g. cars, trucks, buses) • Off-road vehicles: (e.g. boats, motorized landscape equipment, snowmobiles)
1	Direct	Fuel Combustion	• Natural gas (commercial and residential) • Other fuel (e.g. wood, propane, etc.)
2	Indirect	Energy	• Energy Consumption • Wastewater Treatment

Through understanding the water use process and identifying the drivers of energy use (those facilities using large amounts of energy), projects may be identified to address emissions and energy use, thereby saving money and reducing GHG emissions. The process for water management and delivery is, generally, as follows:

1. Diversion from the source
    a. Often includes pumping
    b. Reservoirs can have an element of GHG emissions when the water level is below the high-level mark
2. Conveyance
    a. This often includes pumping into and through a pressurized system
3. Treatment (as appropriate)
    a. Energy use is required for all forms of first-world water treatment
    b. Pumping the water, once treated, into the distribution system is essential to maintain a particular level of service
4. Distribution
    a. Pumping is inherent in water delivery
    b. Vehicular use is an essential component of most water management systems: distribution operators must travel the system for maintenance
5. End use
    a. Water heating for showers and washing
    b. Water softening systems can be big energy users
6. Wastewater treatment
    a. Energy is required to push water through the wastewater treatment process
    b. Methane and other emissions are produced by the wastewater treatment process
    c. Once the solids are separated, they must be delivered to a landfill or other station for disposal

15.8 Inventory Gathering and Establishing a Baseline

Establishing a baseline is an important part of tracking emissions. Knowing where a region begins in GHG emissions allows for a better understanding of status, which leads to more effective goal setting and tracking. While the year 2005 is preferable for use as a baseline, as it aligns with legislative and regulatory goals, the year 2011 will be referenced as the baseline for the LBR, as the 2012 and 2013 records for the fuel and electricity use were not readily available for the utilities included in this document. Emission trends relating to efficiency and conservation measures tor indirect effects should be conducted annually in order to get a better understanding of the connections between population, weather, other trends, and their effects on energy use and emissions.

15.8.1 Quantifying Emissions

In order to quantify GHG emissions, data was obtained relating to the type of activity, various emission factors, and the global warming potential (GWP) of the specific gasses being emitted.

Activity: The type of activity can refer to the amount of fuel consumed, population served, and vehicles miles traveled.

Emissions Factors: The emission factors are directly related to the amount of GHG emitted via the type of activity.

GWP: This is a measure of how much heat a gas can trap in the atmosphere. In measuring this, the baseline is carbon dioxide, which is CO_2; all other gasses are compared to CO_2. For example, the 20-year GWP of methane is 86, so 1 ton of methane over 20 years is equal to 86 tons of CO_2 over 20 years.

Emissions come from a variety of sources, and there are usually multiple ways to calculate those emissions. While the descriptions below are quite general and describe some of the more accurate ways of calculating emissions (required when reporting to national and international databases for baseline development and tracking), the methods used in calculating emissions from water management, conveyance, and processing plants in the LBR was usually done in a more general way, making use of the number of miles, number of customers, etcetera. This is indicated for each individual agency as appropriate.

15.8.1.1 Scope 1-Direct Emissions

Direct emissions, or Scope 1 emissions, are those emissions generated from sources that are owned or controlled by the entity being evaluated. Scope 1 can include emissions from fossil fuels burned on site, emissions from entity-owned or entity-leased vehicles, and other direct sources.[6]

15.8.1.2 Stationary Combustion

Water facilities sometimes burn fuel to generate heat and/or create electricity. Burning fuel is also referred to as stationary combustion. Wastewater treatment plant processes and water district facilities, such as boilers and generators, are common sources of stationary combustion.

To calculate emissions from stationary combustion, emission coefficients for carbon dioxide (CO_2), nitrous oxide (N_2O) and methane (CH_4) are multiplied by the emissions from natural gas, diesel, and propane.

15.8.1.3 Mobile Emissions

Vehicles that are provided by the utility districts to build and maintain infrastructure and provide services eject mobile emissions. Carbon dioxide emissions are based on total volume of fuel

[6] From the EPA, available at: http://www.epa.gov/greeningepa/ghg/; information accessed on May 9, 2014.

burned, and CH_4 and N_2O emissions include a coefficient value multiplied by the number of vehicle miles travelled.

15.8.1.4 Wastewater

Methane and nitrous oxide are developed during the biological process of decomposition of organic materials during wastewater treatment. This biological process creates direct emissions. Wastewater treatment also creates indirect emissions. Common sources for indirect emissions come from vehicle fuels used during transporting, disposing and treating of wastewater and its by-products. Purchased electricity to run systems and treatment plants is another source of indirect emissions.

As discussed in the Region Description (Chapter 2), most of the sanitary sewer systems within the unincorporated areas of the Region serve individual small communities. Sanitary sewer service within the unincorporated County portions of the Region is generally provided by special districts including community service districts, public utility districts, sanitary districts, and sewer maintenance districts. Some agencies provide sewer collection service only, and contract with surrounding agencies for wastewater treatment and disposal.

Most of the unincorporated areas outside of Susanville are designated for agricultural use and wastewater generated onsite is discharged via onsite wastewater treatment systems or septic systems. Individual wastewater treatment systems – septic systems – can also result in emissions, though these are usually slight if the system is managed well and maintained regularly. In areas serviced by individual or community systems, property owners are generally responsible for maintenance and improvement.

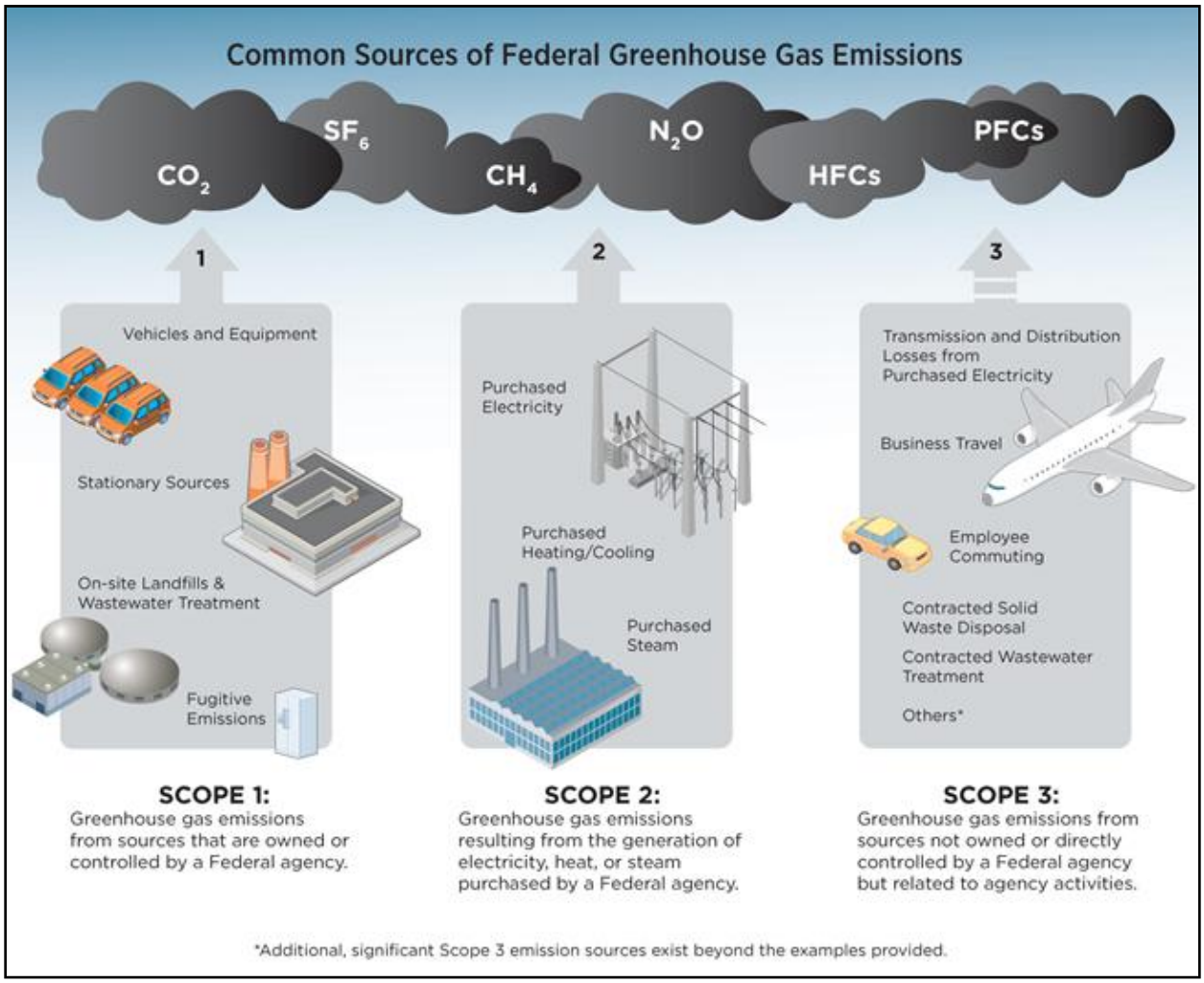
15.8.1.5 Indirect Emissions: Scope 2 and 3

Emissions generated by electrical generation, heating and cooling, or steam generated off site may be termed as Scope 2 emissions. These emissions may also include transportation and distribution losses, which are usually built into a power emissions factor, which is a number used to estimate emissions by multiplying it by the total MWh used. Districts purchasing electricity from power plants at locations other than where the demand is located creates indirect emissions.

Other indirect emissions can include the emissions from employees' vehicles as they drive to and from work, the power it takes to produce the materials used in daily work environment, emissions from leased office space, or the emissions from the product sold (such as that of compost in the garden, etcetera). These types of emissions are usually termed "Scope 3", and their inclusion depends on the organization's defined boundary.

In a "normal" emissions evaluation, scope 2 emissions, or those from power production, are the only indirect emissions included in the evaluation. The graphic below, generated by the EPA, shows how emissions are quantified in these different scopes.

Figure 15.14 Emissions Scopes as identified by the federal EPA[7]. These emissions, while specifically identified as federal sources, can be extrapolated to any business or organization.



15.8.1.6 Emissions Quantification

While emissions are present from just about every activity within the watershed, the emissions quantification done for the LBR has focused on those emissions coming from water management, conveyance, and delivery. This is partially due to a limitation on resources, but also limitations on data availability. While there is more and more data available regarding the projected effects of climate change throughout the region, data regarding total emissions has not been recorded, much less made available publically. If the region is interested in quantifying a regional GHG footprint, essential data must be identified and a concerted effort made to obtain that information through reaching out to individuals and organizations. The benefits of having this information are two-fold:

[7] Available at http://www.epa.gov/greeningepa/ghg/ and accessed on May 9, 2014.

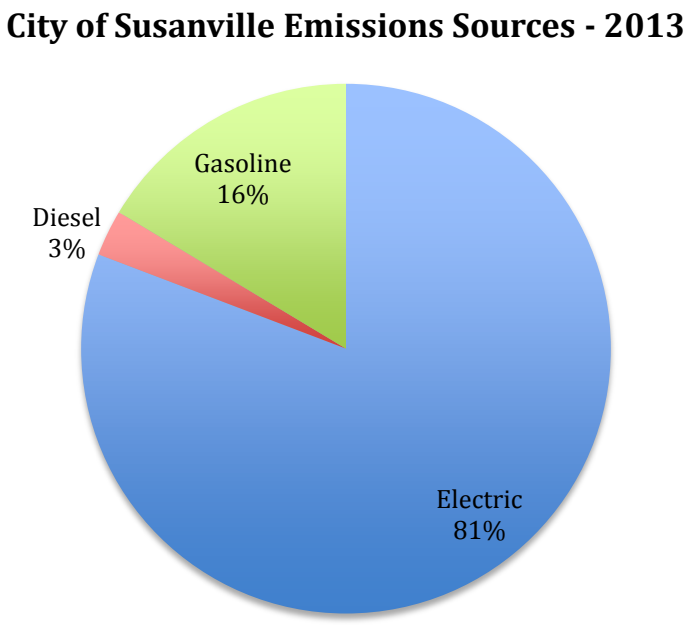
1. Knowing regional emissions can allow a region to identify areas where increased efficiency may lead to both a decrease in emissions and a decrease in overall cost of doing business; and
2. Developing a baseline of emissions could be extremely helpful as emissions regulation becomes more of a reality for much of California. While it's not likely that rural regions will be included in any type of regulatory imperative, the good faith effort of beginning to assess emissions can generate good will with beneficial outcomes from a legislative and regulatory perspective.

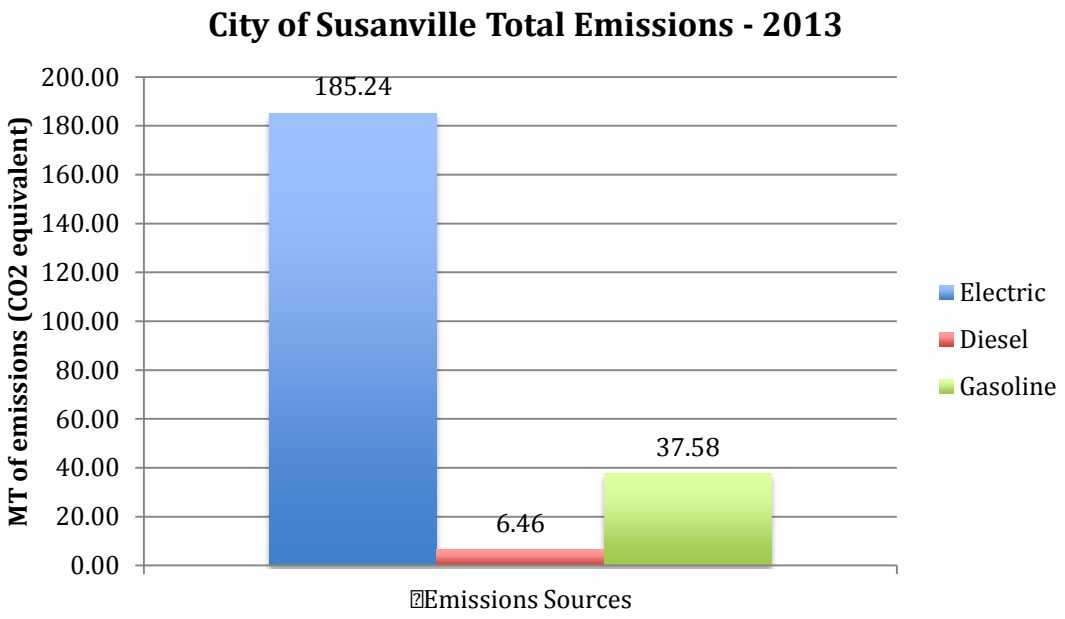
Below is an assessment of GHG emissions for the City of Susanville. While data was pursued with other public water agencies within the LBR, this data was not available in time for the compilation of this chapter.

15.8.2 GHG Inventory Case Study: City of Susanville

The City of Susanville provides water service to a total of 17,754 individuals, both within and outside of City limits. The inmate populations are served on separate water connections. Potable water is provided to 3,535 active service connections. The City does not provide wastewater services. Water delivered comes from spring sources throughout the immediate area, resulting in electrical usage for pumps and treatment. In addition to electricity, the water operators make use of fleet vehicles, heavy duty trucks, and construction equipment. The data below was collected from City of Susanville water service managers in May of 2014.

Emissions Assessment:





15.8.3 Next Steps for Emissions Assessment

The emissions accounting done here was restricted to the limited data available. Continuing GHG assessment, calculations, and evaluation to manage emissions from a collective perspective into the future will require all emitting entities collect and report energy use and vehicle miles travelled data on an annual basis. In addition, emissions from water-related activities in the LBR were the only ones considered in this report. A more accurate accounting may be made by considering all emitting activities throughout the region. In this way, the "low-hanging-fruit" may be better identified and action taken to the betterment of the region.

15.9 Carbon Sequestration

Carbon sequestration is the act of removing CO_2 from the atmosphere and storing it in vegetation or soils. In the Lahontan Basins region, the dry climate results in relatively sparse vegetation. In addition, soils hold little organic matter and have high mineral content. There has been minimal deforestation due to logging and other anthropogenic disturbances, resulting in little opportunity for reforestation. It seems likely that the best option for mitigation of GHGs in the region is to reduce emissions through energy conservation, lowering vehicular use, or implementing technologies to minimize emissions. These actions may include the installation of solar panels at remote sites requiring power (such as pumping stations), implementing public transit where appropriate and feasible, or installing flares to burn off methane emissions at wastewater treatment plants before those emissions can reach the atmosphere. Better yet, those emissions might be used to power wastewater treatment plant activities, minimizing emissions to the atmosphere as well as lowering the electrical demand of the plant.

References

Ahwahnee Water Principles. 1991.

California Department of Housing and Community Development

City of Susanville. 2010. Urban Water Management Plan.

City of Susavnille. 2000. General Plan.

DWR. 2003. Bulletin 118.

DWR. 2005. Upper Feather River Integrated Regional Water Management Plan.

DWR. 2007. Tahoe-Sierra Integrated Regional Water Management Plan.

DWR. 2013. American River Basin Integrated Regional Water Management Plan.

DWR. 2013. Gateway Integrated Regional Water Management Plan.

DWR. 2013. Upper Pit Integrated Regional Water Management Plan.

DWR. 2014. California Water Plan.

DWR. 2014. Integrated Regional Water Management Guidelines for Proposition 84.

DWR. Bullentins and Publications.
http://www.water.ca.gov/waterdatalibrary/docs/historic/bulletins.cfm

DWR. California Data Exchange Center (CDEC). http://cdec.water.ca.gov/

DWR. California Irrigation Management Information System (CIMIS).
http://wwwcimis.water.ca.gov/

DWR. California Water Data Library. http://www.water.ca.gov/waterdatalibrary/index.cfm

DWR. Integrated Water Resources Information System (IWRIS). http://www.water.ca.gov/iwris/

Honey Lake Valley Resource Conservation District. 2007. A Conservation Plan for Pine Creek and Eagle Lake Rainbow Trout.

Honey Lake Valley Resource Conservation District. 2013. Infrastructure Inventory and Capital Improvements Plan.

Lassen County. 2007. Groundwater Management Plan.

Lassen County. 2010. Hazard Mitigation Plan.

Lassen County. Lassen Local Agency Formation Commission (LAFCO) County Service Area 2 Johnstonville Water System.

NOAA. 2014. Susan River, Gauge SUSC1.

Regional Water Quality Control Board, Lahontan Region. 2004. Susan River Toxicity Testing Project.

Regional Water Quality Control Board, Lahontan Region. 2005. Water Quality Control Plan for the Lahontan Region.

RMC. 2007. Antelope Valley IRWMP, DAC Water Supply, Quality, and Flooding Data.

SB 1391, Chapter 449 and amended by Chapter 986, Statutes of 1980

SB 1721, Chapter 1392, Statutes of 1989

State Water Resources Control Board. 2012. Toxicity in California Waters: Lahontan Region.

State Water Resources Control Board. 2013. Recommendations Addressing Nitrate in Groundwater.

State Water Resources Control Board. Califronia Environmental Data Exchange Network (CEDEN). http://www.ceden.org/

State Water Resources Control Board. GeoTracker. http://www.waterboards.ca.gov/water_issues/programs/gama/geotracker_gama.shtml

State Water Resources Control Board. Groundwater Ambient Monitoring & Assessment Program (GAMA). http://www.waterboards.ca.gov/water_issues/programs/gama/

State Water Resources Control Board. Surface Water Ambient Monitoring Program (SWAMP). http://www.waterboards.ca.gov/water_issues/programs/swamp/

The Prison and the Gallows: The Politics of Mass Incarceration in America, Marie Gottschalk, PhD.

UC Davis. 2005. Monitoring Helps Reduce Water-Quality Impacts in Flood-Irrigated Pasture.

United States Census Bureau

University of Nevada, Reno. 2008. A Stochastic Approach to a Groundwater Flow Model of Southern Honey Lake Valley in Lassen County, CA and Washoe County, NV.

USDA. 2011. Susan River Area Rapid Watershed Assessment.

USGS. 2010. Groundwater-Quality Data in the Cascade Range and Modoc Plateau Study Unit, Results from the California GAMA Program.