Promoting Sustainability in the Inyo-Mono Region: Understanding Regional Groundwater Resources and Upgrading Infrastructure in Disadvantaged Community Water Systems

Attachment 1: Authorization and Eligibility Requirements

Authorizing Documentation

The Inyo County Board of Supervisors passed Resolution No. 2013-13 on March 12, 2013, which authorizes the County of Inyo to act as grantee for the Proposition 84 Round 2 Implementation Grant. The resolution can be found on the next page.

RESOLUTION NO. 2013-13

A RESOLUTION OF THE BOARD OF SUPERVISORS OF THE COUNTY OF INYO, STATE OF CALIFORNIA, AUTHORIZING INYO COUNTY TO ACT AS GRANTEE FOR PROPOSITION 84 ROUND TWO IMPLEMENTATION FUNDING FOR GRANT FUNDS FROM THE STATE OF CALIFORNIA DEPARTMENT OF WATER RESOURCES AND AUTHORIZING THE DIRECTOR OF THE INYO COUNTY WATER DEPARTMENT TO ACT AS PROJECT DIRECTOR

WHEREAS, the State of California, under the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006 (Public Resource Code (PRC) Section 75001 et seq.), is providing financial assistance in the form of Integrated Regional Water Management Implementation Grants to further the objectives of the Act; and

WHEREAS Inyo County is a member of the Inyo-Mono Integrated Regional Water Management Group (RWMG), and Integrated Regional Water Management Plans are becoming the State of California's principal vehicle for distributing State water grants and loans to local governments and agencies; and

WHEREAS the California Department of Water Resources grant application process required that each RWMG have a single point of contact (grantee) to act as grantee for any funds awarded by DWR

NOW, THEREFORE, BE IT RESOLVED THAT THE INYO COUNTY BOARD OF SUPERVISORS HEREBY:

1. Pursuant and subject to all of the terms and provisions of the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006 (Public Resource Code (PRC) Section 75001 *et seq.*), authorizes the County of Inyo to Act as grantee for Round Two implementation funding for grant funds from the State of California Department of Water Resources.

2. Authorizes Robert Harrington, Director of the Inyo County Water Department or his designee, to act as Project Director for the Proposition 84 Round Two Implementation Funding to receive, disburse, and account for grants funds, and to ensure financial reporting to comply with terms of any grant agreement.

PASSED AND ADOPTED by the Board of Supervisors of the County of Inyo, State of California, this 12th day of March, 2013, by the following role call vote:

AYES: Supervisors Arcularius, Griffiths, Pucci, Tillemans and Kingsley
NOES: -0-
ABSTAIN: -0-
ABSENT: -0-

Linda Arcularius
Linda Arcularius, Chairperson
Inyo County Board of Supervisors

Attest: *KEVIN D. CARUNCHIO*
Clerk of the Board

by: Patricia Gunsolley
Patricia Gunsolley, Assistant

Eligible Applicant Documentation

- The County of Inyo is a local public agency as defined in Appendix B of the 2012 IRWM Guidelines. As a County, is it's a political subdivision of the State of California.

- The County of Inyo was created by an act of legislature approved in 1866.

- As a county jurisdiction, the County of Inyo has the legal authority to enter into a grant agreement with the State of California.

- Inyo County currently and in previous years has managed several contracts and grants with state agencies. One current contract is with the State of California for a Wildlife Conservation Grant. Inyo County also has a Community Sponsorship Grant Program in which grants are provided to local agencies and managed through the County and audited through staff as well as the Inyo County Auditor.

- As appropriate, Inyo County will enter into sub-contracts with individual project proponents or with contractors performing work directly for Inyo County-sponsored projects.

Groundwater Management Plan Compliance

- The one project that may impact groundwater levels is the Inyo County Disadvantaged Communities Meters Project. It is unknown to what extent groundwater levels may be impacted, but it is possible that water consumption in the three communities will change once water use is more accurately measured. It is expected that water use would likely decrease. All domestic water supplies for the three water systems come from groundwater.

- This project will be implemented by the Inyo County Department of Public Works.

- The Inyo County Department of Public Works is subject to the "Long Term Groundwater Management Plan for Owens Valley and Inyo County" that is a part of the 1991 Long Term Water Agreement between Inyo County and the City of Los Angeles and that complies with CWC §10753.7. All three systems in the Inyo County Disadvantaged Communities Meters Project are located in the Owens Valley groundwater basin.

- None of the other three projects are expected to impact groundwater levels or quality.

Progress on Meeting Current IRWM Plan Standards

Table 1 – IRWM Plan Standards Questionnaire		
Standard	**Specific Standard Questions**	**Status/Response**
Governance	Will the governance structure need to be altered in the Updated IRWM Plan in order to ensure that balanced access and opportunity for participation in the IRWM effort is provided?	No. The current governance structure allows for participation from any entity wishing to be involved with water planning for the Inyo-Mono IRWM region. Currently, the Inyo-Mono Regional Water Management Group is governed by a non-legal, non-binding memorandum of understanding. Stakeholders may sign or un-sign the MOU at any time. In the update of the Inyo-Mono IRWM Phase II Plan that will take place through the Round 2 Planning Grant award, the RWMG will re-examine the governance structure and investigate other governance structures that would provide the same benefits and level to access as the current MOU. While it is not expected that the governance structure will change, this work will allow the RWMG to ensure it is employing the most effective structure for the current purposes and objectives of the Inyo-Mono region.
Region Description	Has the regional description changed significantly from the current IRWM Plan?	The region description changed very little from the Inyo-Mono IRWM Phase I Plan (2010) to the Phase II Plan (2012). A few updates were made. It is expected that the same will occur in the next revision of the Plan.
Objectives	Will your objectives change from those in the current IRWM Plan? If so, how?	Two new objectives were added in the Phase II Plan (2012) to the six objectives of the Phase I Plan (2010) (see Chapter 7 of Phase II Plan). As part of the Round 2 Planning Grant work, and as outlined in Chapters 12 (Plan Implementation) and 13 (Plan Performance and Monitoring) of the Phase II Plan, the Inyo-Mono RWMG will continue to revisit objectives to ensure that they are being met by projects and other efforts undertaken by the RWMG, and will consider new objectives if it becomes apparent that the current objectives do not adequately address the water-related issues and needs in the region.
Resource Management Strategies	Will the Updated IRWM Plan consider the resource management strategies from the California Water Plan, Update 2009?	Both the Phase I and Phase II Plans considered resource management strategies from the California Water Plan Update 2009 and performed an examination of whether each RMS has been addressed in the Plan. See Chapter 7 of the Phase II Plan.
Integration	Will the process used in the Updated IRWM Plan allow, encourage, and actively pursue integration in both the planning process and project formulation and implementation?	A primary task of the RWMG through the Round 2 Planning Grant is to examine the concept of integration as it applies to the Inyo-Mono IRWM region. As a very large and diverse region, the application of integration to the planning and project formulation process is not intuitive, yet common water-related themes run throughout the region. The updated Phase II Plan will contain a substantially enhanced treatment of integration and how it can be more fully realized in the region.
Project Review Process	Will the project review process consider climate change vulnerabilities	The project review process utilized by the Inyo-Mono RWMG already includes criteria that address climate change vulnerabilities (and adaptation measures) and greenhouse gas

	and greenhouse gas emissions (for both construction and operation)?	emissions reductions. These criteria will be updated and further refined in future iterations of the project review process.
Technical Analysis	Have any data gaps been identified and how will the Updated IRWM Plan help fill the gaps?	The Phase II Plan (2012) identified data gaps within the Data Management/Technical Analysis chapter (4). Currently, data collected to fill gaps can be submitted to the Inyo-Mono GIS Analyst/Data Management Coordinator, who will ensure data conform to standards set within the Inyo-Mono IRWM Program Data Management Plan (Appendix A of Phase II Plan). The updated Phase II Plan will identify any additional data gaps and will make recommendations for filling those gaps, whether that includes data collection by the RWMG itself or data accessed through RWMG stakeholders' databases.
Relation to Local Water Use Planning	Will changes to the existing IRWM Plan be needed in order to improve coordination with local water use planning efforts?	The Phase II Plan identifies local and regional water plans and planning efforts. This list will be updated in the updated plan to reflect changes in the existing efforts and to include new efforts. The Inyo-Mono RWMG is confident that the current coverage of water-related planning efforts in the Phase II Plan (Chapter 11) allows for needed coordination among stakeholders and the public.
Relation to Local Land Use Planning	Will changes to the existing IRWM Plan be needed in order to improve coordination with land use planning efforts?	The Phase II Plan identifies local and regional land use plans and planning efforts. This list will be updated in the updated plan to reflect changes in the existing efforts and to include new efforts. The Inyo-Mono RWMG is confident that the current coverage of land use planning efforts in the Phase II Plan (Chapter 11) allows for needed coordination among stakeholders and the public, and indeed, the list of planning efforts provided in the Phase II Plan has already inspired coordination between the IRWM Program and Member agencies to begin integrating information.
Stakeholder Involvement	Will changes or improvements to the stakeholder involvement process be needed to ensure effective stakeholder participation?	The model utilized throughout the life of the Inyo-Mono IRWM Program has ensured successful and effective stakeholder participation. The Inyo-Mono RWMG will continue to use the same model for further stakeholder outreach. No substantial changes or improvements to the process are anticipated.
Coordination	Has the RWMG identified a need for changes/improvements to the ongoing coordination efforts?	The Inyo-Mono RWMG has recognized that there is opportunity for more coordination to take place within the region, both between the RWMG and Member organizations and among Member organizations. Early steps towards enhanced coordination are beginning, and the updated Phase II Plan will include lessons learned from these coordination efforts and a plan to ensure continued and effective coordination within the region.

Climate Change	Will the Updated IRWM Plan contain: • A climate change vulnerability assessment of the IRWM region that is at least equivalent to the qualitative check list assessment in the Climate Change Handbook for Regional Water Planning (Handbook)? • A list of prioritized vulnerabilities derived from the vulnerability assessment and the IRWM's decision making process? • A plan, program, or methodology for further data gathering/analyzing of the prioritized vulnerabilities?	The Phase II Plan already contains a recently-completed climate change vulnerability assessment modeled off the Climate Change Handbook for Regional Water Planning. In the updated Phase II Plan, the Inyo-Mono RWMG will prioritize these vulnerabilities as required in the 2012 Plan Standards. The RWMG will also develop an approach for further refining and understanding these regional vulnerabilities. The Phase II Plan also includes a qualitative climate change impacts analysis, a region-specific evaluation of water-related adaptation strategies recommended in DWR's "Managing an Uncertain Future" (2008), and early greenhouse gas emissions inventories for three water systems in the Inyo-Mono region.

Project Consistency with an Adopted IRWM Plan

All four projects submitted for funding under the Proposition 84 Round 2 Implementation Grant are included in the Inyo-Mono IRWM Phase II Plan. As described below, three of the projects were included in the Plan (Chapter 15) at the time of the Plan's adoption (November 14, 2012). The fourth project, along with some others not put forth for funding in this round, was added to the Plan's list of projects through an amendment process outlined in Chapter 5 of the Phase II Plan. This amendment, which only provides additional information to Chapter 15, was approved by the Inyo-Mono RWMG January 23, 2013 and is included as part of Attachment 2. The summary page of the meeting notes, which reflects this approval, is included on the next page.

<u>Projects included in Phase II Plan as of date of adoption:</u>
Big Pine Fire Protection Improvement Project
Inyo County Disadvantaged Communities Meters Project
Indian Wells Valley Groundwater Basin Brackish Water Resources Study

<u>Project included with the Phase II Plan amendment:</u>
Amargosa Basin Water, Ecosystem Sustainability, and Disadvantaged Communities Project

Meeting Summary
Inyo-Mono Regional Water Management Group
Regular Meeting

Wednesday, January 23, 2013
Mammoth Community Water District
1315 Meridian Boulevard
Mammoth Lakes, CA93546
9:30 am – 12:30 pm

Call-in option:
1-866-862-2138
passcode: 1678718

Decision Items:

- Mark Drew moves to approve the following composition of the Admin. Committee (New Members: Justin Nalder, Malcolm Clark, and Alan Bacock; and Existing Members: Leroy Corlett, Irene Yamashita, and Heather deBethizy). Wesley Hawks seconds the motion. All approve.
- Wesley moves to approve the Phase II Plan amendment as presented. Darla Heil seconds the motion. All approve.
- Mark moves to approve both sets of RWMG meeting notes as amended. Wesley seconds the motion. All approve.
- Bob Harrington moves to approve the revised process for the Program Office Generic Letter of Support. Malcolm Clark seconds the motion. All approve.

Action Items:

- Program Staff is looking to put together a Data/Technology working committee to brainstorm a way to provide more helpful data to the Group. If you're interested in being a part of this committee, email janet@inyo-monowater.org. A more formal solicitation will occur regarding this committee at a later date.
- Program Staff will work with other Stakeholders to begin brainstorming on next steps regarding the Phase II Plan in an effort to address some of the suggestions regarding Plan Implementation in today's discussion. Program Staff will also provide regular updates to the rest of the RWMG on progress on this endeavor.
- The Program Staff is putting together a grant writing and proposal development workshop on February 6. It will be geared towards applying for DWR funds specifically for disadvantaged communities and Native American tribes. It will be held at the Big Pine Paiute Tribe Council Room. Please RSVP by emailing Holly at holly@inyo-monowater.org.
- Program Staff will post a request for applications on the website in regards to looking for a film crew to make a local water documentary.
- Maya Weinhart and Janet Hatfield have updated the online match forms. If you have a match form to submit please do so by February 15, 2013, to Maya at maya@inyo-monowater.org. The form is available online: http://inyo-monowater.org/documents/downloadable-forms/

INYO-MONO INTEGRATED REGIONAL WATER MANAGEMENT PLAN

November 14, 2012

Striving toward Integrated Regional Water Management in the eastern Sierra

Prepared by:

Holly Alpert, Ph.D., Mark Drew, Ph.D., Janet Hatfield, Rick Kattelmann, Ph.D., and Austin McInerny, on behalf of the Inyo- Mono Regional Water Management Group

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Executive Summary

To say that the Eastern Sierra region of California is unique is to understate its features and beauty. High mountain peaks, low-elevation valleys, conifer forests, Great Basin sagebrush steppe, and arid deserts are but some of the remarkable landscapes of this region. Paiute and Shoshone peoples have inhabited the region for thousands of years. One hundred years ago, Los Angeles engineers and politicians recognized that the water resources of the Owens Valley could help a budding city grow into one of the major metropolises of the world. Today, the region depends on recreation-based tourism to drive its economy. The rich and varied natural resources of the Eastern Sierra provide ample opportunity for diverse activities such as hiking, skiing, cycling, snowmobiling, fishing, and boating.

At the heart of it all is water. Water has played and continues to play an infamous role in the region's story. Once used only locally by indigenous peoples, farmers, ranchers, and local communities, the water resources of much of the Eastern Sierra are now shared with a distant city. And what was once a unique situation of exporting and transporting water great distances is now observed throughout California and the western United States. The movement of water has been and continues to be a source of cultural and political conflict. But moving forward, we must use collaboration, instead of conflict, as the model through which we plan for and manage our limited water resources. Only in this way will we ensure that our water is distributed in an equitable manner, is of a high quality, and is used to support and enhance both human communities and ecosystems.

This document is a reflection of that new collaborative model. The Inyo-Mono IRWM Phase II Plan is a result of more than four years of public meetings and open, transparent communication among stakeholders about important water related issues faced by the region. Written largely by the Inyo-Mono IRWM Program Office staff, the content of this Plan has been reviewed, vetted, and approved by the Inyo-Mono Regional Water Management Group (RWMG)

as a document that represents the Group's current thinking about water resources management in eastern California. While the Plan contains general descriptive information about the region's physical, cultural, and economic attributes; the governance and other activities of the Inyo-Mono RWMG; and current water-related project needs of the region, it also puts forth a vision for water planning now and into the future. The Inyo-Mono IRWM Phase II Plan is very much a living document; it will be updated and modified as necessary to reflect the most current statewide priorities and regional needs. Indeed, we hope that this Plan will serve as a primary reference for anyone wanting to learn about water resources in the Inyo-Mono region. We intend that this document will be used by state-level water planners and legislators, as well as by local water-related stakeholders, decision-makers, and the general public.

Acknowledgements

The authors would like to recognize and thank the Members of the Inyo-Mono Regional Water Management Group. Without their vision and commitment, this Plan would not exist. The 32 Members of the Inyo-Mono RWMG are:

- Amargosa Conservancy
- Big Pine Community Services District
- Big Pine Paiute Tribe of the Owens Valley
- Birchim Community Services District
- Bishop Paiute Tribe
- Bureau of Land Management – Bishop Office
- Bridgeport Indian Colony
- California Trout
- Central Sierra Resource Conservation & Development
- Crystal Crag Water and Development Association
- Eastern Sierra Audubon
- Eastern Sierra Land Trust
- Eastern Sierra Unified School District
- Fort Independence Tribe
- Indian Wells Valley Cooperative Groundwater Management Group
- Indian Wells Valley Water District
- Inyo County
- June Lake Public Utilities District
- Lone Pine Paiute –Shoshone Reservation
- Mammoth Community Water District
- Mojave Desert Mountain Resource Conservation & Development
- Mono County
- Mono County Resources Conservation Development
- Mono Lake Committee
- Mountain Meadows Mutual Water Company
- Owens Valley Committee
- Owens Valley Indian Water Commission
- Round Valley Joint Elementary School District
- Sierra Club Range of Light Group
- Town of Mammoth Lakes
- U.S. Forest Service
- Wheeler Crest Community Services District

The authors are grateful for the work done by Sara Pfeifer to compile the Plan and ensure consistency throughout. She graciously took on an enormous task within weeks of starting her job and helped to create a beautiful document.

The Program Office would also like to recognize Austin McInerny of the Center for Collaborative Policy for not only his authorship of several chapters but also for his dedication to the successful launch of the Inyo-Mono IRWM Program. Involved since 2008, Austin has traveled many miles and spent countless hours facilitating meetings, performing outreach and offering guidance to Program Office staff. Without his efforts, the Inyo-Mono IRWM Program would not be where it is today. In addition to Austin, several other staff members from the Center for Collaborative Policy have provided logistical and administrative support in preparing documents and grant applications.

We also want to thank RWMG Members who reviewed individual Plan chapters, especially Irene Yamashita of Mammoth Community Water District and Bob Harrington of Inyo County Water Department. We appreciate your efforts on the Plan despite busy schedules.

The RWMG is grateful for funding received by the Sierra Nevada Conservancy and the Department of Water Resources to support the planning and project implementation phases of the Inyo-Mono IRWM Program.

On behalf of the Inyo-Mono RWMG, we want to thank California Trout. This organization has provided financial and staff resources since the inception of the IRWM Program in 2008. The staff and RWMG are grateful for the organization's ongoing support and recognize that the progress made thus far would not have been possible without California Trout's support.

Finally, we would like to thank all those who have provided emotional, moral, and financial support to the Inyo-Mono Integrated Regional Water Management Program and who are committed to securing and providing the necessary resources to support the families, communities, and ecosystems in our remote but beloved corner of California.

Plan Adoption Resolution

A RESOLUTION OF THE INYO-MONO REGIONAL WATER MANAGEMENT GROUP APPROVING THE "INYO-MONO INTEGRATED REGIONAL WATER MANAGEMENT PLAN – PHASE II" AND AUTHORIZING MARK DREW, PROGRAM DIRECTOR, TO SIGN THE PLAN AND SUBMIT IT TO THE CALIFORNIA DEPARTMENT OF WATER RESOURCES

WHEREAS, by Memorandum of Understanding ("MOU"), a broad array of governments, agencies, and organizations created the Inyo-Mono Regional Water Management Group ("Group"); and

WHEREAS, the Group prepared and approved an Integrated Region Water Management Plan – Phase I in 2010;

WHEREAS, the Group was awarded a Proposition 84 Planning Grant from the California Department of Water Resources to update the Inyo-Mono IRWM Plan; and

WHEREAS, staff and representatives of the Group have prepared the "Inyo-Mono Integrated Regional Water Management Plan—Phase II" ("Phase II Plan") and,

WHEREAS, the Phase II Plan is consistent with the 2010 Plan Guidelines released by DWR, and it addresses the major water-related issues and needs of the Inyo-Mono planning region;

THEREFORE, BE IT RESOLVED THAT in accordance with the provisions of the MOU, the Members of the Group, acting through the Members' designated representatives to the RWMG, hereby approve the Phase II Plan and direct the Group's Program Director, Mark Drew, to sign this Phase II Plan Adoption Resolution and to submit the Phase II Plan to DWR.

Passed and adopted this 14th day November, 2012, by consensus of a quorum of the Inyo-Mono Regional Water Management Group.

SIGNED:

_____

Mark Drew
Program Director, Inyo-Mono Integrated Regional Water Management Program

ATTEST:

_____

Holly Alpert
Program Manager, Inyo-Mono Integrated Regional Water Management Program

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Acronyms and Abbreviations

Admin. Committee:	Administrative Committee
AF(Y):	Acre-feet (per year)
BCSD:	Biased-Corrected Spatial Downscaling
BLM:	Bureau of Land Management
CASGEM:	California Statewide Groundwater Elevation Monitoring
CAT:	Climate Action Team
CDEC:	California Data Exchange Center
CEDEN:	California Environmental Data Exchange Center
CEIC:	California Environmental Information Catalog
CEQA:	California Environmental Quality Act
CERES:	California Environmental Resources Evaluation System
CMIP3:	Coupled Model Intercomparison Project Phase 3
CWC:	California Water Code
DAC:	Disadvantaged community
DMP:	Data Management Plan
DWR:	California Department of Water Resources
EIR:	Environmental Impact Report
EPA:	Environmental Protection Agency
ESRI:	Environmental Systems Research Institute
FGDC:	Federal Geographic Data Committee
GCM:	General Circulation Model
GHG:	Greenhouse Gas
GWP:	Global Warming Potential
HUC:	Hydrologic Unit Code
ICLEI:	International Council for Local Environmental Initiatives

Inyo-Mono IRWM(P): Inyo-Mono Integrated Regional Water Management (Plan/Program)

Inyo-Mono RWMG: Inyo-Mono Regional Water Management Group

IPCC: Intergovernmental Panel on Climate Change

IRWIS: Integrated Regional Water Information Systems

IWVWD: Indian Wells Valley Water District

JLPUD: June Lake Public Utilities District

LAA: Los Angeles Aqueduct

LADWP: Los Angeles Department of Water and Power

LAFCO: Local Agency Formation Commission

MCL: Maximum Contaminant Load

MCWD: Mammoth Community Water District

MHI: Median Household Income

MOU: Memorandum of Understanding

NEPA: National Environmental Policy Act

NPS: National Park Service

NWIS: National Water Information System (USGS)

Prop. 84: California Proposition 84 (2006)

PSP: Proposal Solicitation Package

RAP: Region Acceptance Process

RCM: Regional Climate Model

RWMG: Regional Water Management Group

RWQCB : Regional Water Quality Control Board

SRES: Special Report Emissions Scenario

SWAMP: Surface Ambient Water Monitoring Program

SWE: Snow Water Equivalent

SWRCB: State Water Resources Control Board (California)

TMDL: Total Maximum Daily Load

USDA:	United States Department of Agriculture
USDI:	United States Department of the Interior
USFS:	United States Forest Service
UWMP:	Urban Water Management Plan
WDL:	Water Data Library (DWR)
WRCP:	World Climate Research Programme

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Chapter 1: Development Process for the Inyo-Mono IRWM Program

History, Purpose, and Status of State of California IRWM Program

History

In the Implementation Plan of the California Water Plan Update 2009, the first objective listed is to "promote, improve, and expand integrated regional water management to create and build on partnerships that are essential for California water resources planning, sustainable watershed and floodplain management, and increasing regional self-sufficiency." State-level water managers in California began to recognize the need for local- and regional-scale water planning in the late 1990s. Over the past decade, California has made significant steps in implementing Integrated Regional Water Management (IRWM). In 2002, voters passed Proposition 50, which developed the Integrated Regional Water Management Grant Program as a joint effort between the California Department of Water Resources (DWR) and the State Water Resources Control Board (SWRCB). Proposition 50 provided competitive grant funding through the IRWM Program for projects that protected communities from drought, protected and improved water quality, and reduced dependence on imported water. Approximately $380 million were made available through two rounds of funding.

Subsequently, voters passed Proposition 84 and Proposition 1E in 2006. These propositions created additional funding through the IRWM Grant Program for projects that assist local agencies to meet the long-term water needs of the State, including delivery of safe drinking water and protection of water quality and the environment. To be eligible for this funding, projects and project sponsors must be involved in a Regional Water Management Group (RWMG) that has adopted an IRWM Plan.

Purpose

The IRWM Program is intended to promote and implement integrated regional water management to ensure sustainable water uses, reliable water supplies, improved water quality, environmental stewardship, efficient urban development, sustainable agriculture, and a strong economy. This planning and implementation framework is intended to comprehensively and concurrently address challenges of water supply, water quality, flood management, and ecosystem protection. It also implements integrated solutions through a collaborative multi-partner process that includes water managers; Native American tribes; non-governmental organizations; federal, State, and local government agencies; and disadvantaged communities. IRWM is a portfolio approach for determining the appropriate mix of water-related resource management strategies, water quality actions, and steps to enhance environmental stewardship

for the planning region. The goal is to provide long-term, high-quality, and reliable water supplies for all users at the lowest reasonable cost and with highest possible benefits for economic development, environmental quality, and other societal objectives (CA Water Plan Update, 2009).

Status

Proposition 50 money allocated for the IRWM Program has already been expended through two funding rounds to RWMGs throughout the State. Since 2008, all IRWM Program funding has come from Proposition 84. There have been two rounds of Planning Grant funding (2009 and 2012) and one round of project Implementation funding (2011). It is expected that there will be two additional rounds of implementation funding in 2013 and 2014-15. Beyond Prop. 84, long-term sustainable funding for the IRWM Program is uncertain. A water bond that was slated for the 2012 ballot has been delayed to at least 2014. It may fall to individual RWMGs to ensure continuity of funding for their planning regions.

Eighty-two percent of California's land area is included in an IRWM effort, up from 54% during the Prop. 50 funding rounds. Similarly, 98% of California's population is now included in an IRWM region, slightly up from 94% during Proposition 50. In 2009 the Department of Water Resources administered the first round of a Region Acceptance Process (RAP), in which IRWM regions submitted applications to have their boundaries approved by DWR. In 2009, 46 regions submitted applications and 41 were approved. An additional eleven regions were approved through the second RAP round in 2011, some of which had not been approved (or were conditionally approved) during the first round.

Statewide Priorities for IRWM Program

DWR's IRWM Grant Program encourages development of integrated regional strategies for management of water resources by providing funding through competitive grants. Eligible projects must implement IRWM plans that meet the requirements of Section 75026 of Proposition 84. As required, IRWM plans should identify and address the major water-related objectives and conflicts within the region, consider all resource management strategies identified in the California Water Plan Update, and use an integrated, multi-benefit approach for project selection and design. Plans shall include performance measures and monitoring plans to document progress toward meeting Plan objectives. Projects that may be funded pursuant to this section must be consistent with an adopted IRWM Plan or its functional equivalent as defined in the Department's Proposition 84 IRWM Guidelines. Furthermore, funding preference will be given to projects that address the following Program Preferences:

- Include regional projects or programs
- Effectively integrate water management programs and projects within a hydrologic region identified in the California Water Plan; the Regional Water Quality Control Board region or subdivision; or other region or sub-region specifically identified by DWR
- Effectively resolve significant water-related conflicts within or between regions
- Contribute to attainment of one or more of the objectives of the CALFED Bay-Delta program
- Address critical water supply or water quality needs of disadvantaged communities within the region

- Effectively integrate water management with land use planning
- For eligible Stormwater/Flood Management (SWFM) funding, projects which a) are not receiving State funding for flood control or flood prevention projects pursuant to PRC §5096.824 or §75034 or b) provide multiple benefits, including, but not limited to, water quality improvements, ecosystem benefits, reduction of in-stream erosion and sedimentation, and groundwater recharge
- Address Statewide priorities specific to the IRWM Grant Program:
  - Drought preparedness
  - Use and reuse water more efficiently
  - Climate change response actions
  - Expand environmental stewardship
  - Practice integrated flood management
  - Protect surface water and groundwater quality
  - Improve tribal water and natural resources
  - Ensure equitable distribution of benefits

The text of Proposition 84 specifically directs that projects funded under the IRWM Program should include one or more of the following elements:

1) Water supply reliability, water conservation and water use efficiency
2) Storm water capture, storage, clean-up, treatment, and management
3) Removal of invasive non-native species, the creation and enhancement of wetlands, and the acquisition, protection, and restoration of open space and watershed lands
4) Non-point source pollution reduction, management and monitoring
5) Groundwater recharge and management projects
6) Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution to users
7) Water banking, exchange, reclamation and improvement of water quality
8) Planning and implementation of multipurpose flood management programs
9) Watershed protection and management
10) Drinking water treatment and distribution
11) Ecosystem and fisheries restoration and protection

Inyo-Mono Regional Water Management Group

History and Funding

The Integrated Regional Water Management planning process was initiated in the central-eastern region of California in early 2008 in response to funding opportunities provided by Proposition 84. The initial group consisted of about 15 stakeholders, and at early meetings, the group recognized the benefits of having a multiple-agency and multiple-purpose perspective, and that water resource needs in eastern California are highly interconnected and require a broad and integrated approach. One of the first tasks of the initial stakeholder group was to determine the boundaries of the planning region. After considerable discussion and input from many parties, the boundaries were drawn as depicted in Figure 1-1 (see also Chapter 2). Because there was some overlap between the Inyo-Mono IRWM planning region and other IRWM planning regions, the Inyo-Mono RWMG initiated conversations with neighboring regions

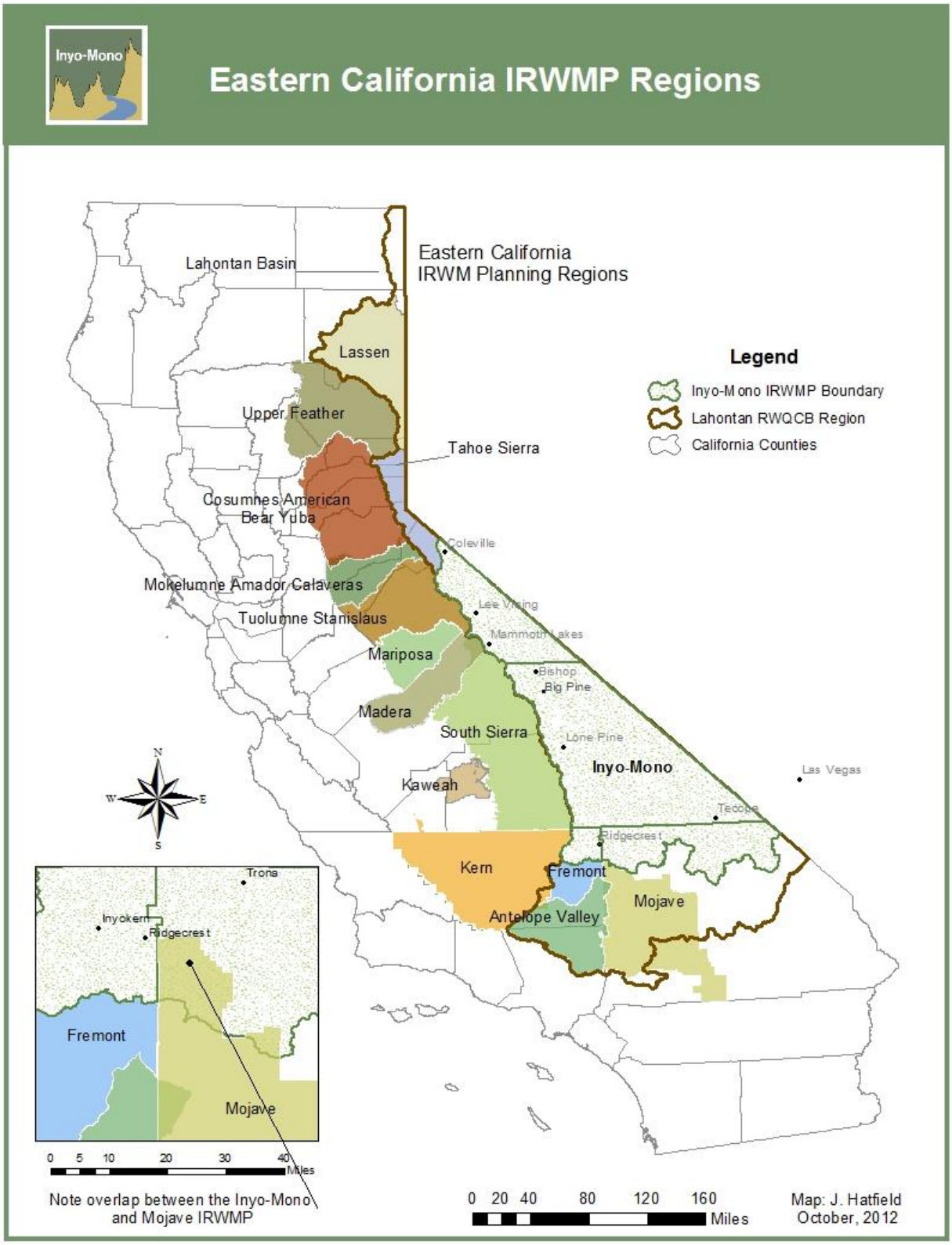
to discuss and agree upon shared boundaries and areas of overlap (see Chapters 6 and 8 for further discussion of this topic).

The Inyo-Mono RWMG received a project launch grant from the Sierra Nevada Conservancy in the summer of 2008. This grant allowed for the hiring of a Project Assistant, the involvement of a meeting facilitator, and the recruitment of a grantwriter for the first round of Prop. 84 Planning Grants. This grant was frozen at the end of 2008 due to statewide budget concerns, which meant the discontinuation of meeting facilitation and grantwriting assistance. The RWMG pushed ahead nonetheless and prepared an application for the 2009 Region Acceptance Process. This process resulted in the unconditional approval from DWR of the Inyo-Mono regional boundaries and an affirmation of the overall planning process being employed by the RWMG.

Because funding remained limited, the RWMG prepared a Round 1 Planning Grant application in-house. This application was submitted in September, 2010, and was fully funded by DWR. This funding provided support for the ongoing operations of the RWMG as well as an opportunity to revise the Phase I IRWM Plan prepared by the RWMG in late 2010. It was recognized that the Phase I Plan only minimally addressed some of the Plan Standards required by DWR in order to be eligible to apply for a Round 1 Implementation Grant. The RWMG submitted a Round 1 Implementation Grant proposal in early 2011 that contained 15 projects and requested just over $4 million in grant funding. The preliminary funding recommendations provided no funding for the Inyo-Mono application; however, after working with DWR during the public comment process, the region eventually received $1,075,000. This funding allowed seven on-the-ground projects to be implemented throughout the region (see Chapter 9).

An additional funding opportunity was made available from DWR in 2010 to identify, engage, and work with disadvantaged communities (DACs). As a region that contains a large number of DACs, the Inyo-Mono RWMG recognized the opportunity and worked to secure one of five available grants. Funding from this grant was made available in 2011, and work on the project will continue through 2013. Additional DAC grant money was secured in 2012 to supplement and enhance the work being done through the original grant. The Inyo-Mono RWMG will continue to pursue Prop. 84 funding opportunities but, recognizing the finite amount of time and funding remaining through Prop. 84, will begin to look for and pursue other funding options. See Chapter 9 for more information on financing the Inyo-Mono IRWM Program.

Figure 1-1. Boundaries of Eastern California IRWM Planning regions



IRWM Planning Regions relative to the Inyo-Mono region noting overlap between the Inyo-Mono and Mojave Regions

Composition and Structure

The Inyo-Mono IRWM Program consists of a main group (RWMG), an advisory committee (Administrative Committee), paid staff, and ad-hoc working committees. The RWMG is the largest and most inclusive group and is the main decision-making body for the Inyo-Mono IRWM planning and implementation processes. The RWMG has been organized as a non-binding, non-regulatory, voluntary entity governed by a Memorandum of Understanding (MOU; more information on governance can be found in Chapter 5). Signatories to the MOU are considered "Members" of the RWMG and can participate in the decision-making process. There is no monetary requirement for Members, and Members may leave the RWMG at any time. During the pre-planning phase of the IRWM Program, 28 RWMG participants signed an initial MOU which described the governance structure and provided "ground rules" that defined roles and responsibilities, stakeholder engagement, and decision-making for the RWMG. A substantially revised MOU was developed in the first half of 2010 to govern the group in the planning and implementation phases of the IRWM planning process. This MOU took effect November 15, 2010. Since that time, minor revisions have been made to the planning/implementation MOU. The RWMG will continue to revise and/or amend the MOU as necessary. As of the writing of this Plan, there were 32 signatories to the planning/implementation MOU. A list of the current signatories can be found in Chapter 5. All organizations involved with the IRWM Program, regardless of membership in the RWMG, as well as members of the public, are welcome to attend RWMG meetings and provide input on decisions. The RWMG meets in-person at various locations within the planning area approximately once per month and always provides a conference call option for Members and others who cannot attend in person, given the large size of the region.

The Inyo-Mono RWMG is comprised of a broad array of stakeholders from throughout Inyo and Mono Counties as well as stakeholders from northern San Bernardino and Kern Counties, including agencies with statutory authority over water (see Chapter 5). Those entities involved represent interests ranging from federal, state, and local government; resource and water agencies; non-profit and conservation organizations; American Indian tribal organizations; educational organizations; business interests; agriculture and ranching groups; and individuals having vested interests in how water is managed in eastern California. In addition to those entities that are Members of the RWMG and/or regularly participate in the planning process, there is a large number of organizations and individuals who are on the Inyo-Mono RWMG contact list and regularly receive updates and notices of meetings. Some of these entities have been regular participants in the past but do not currently participate at a high level. Other entities have had little contact with the RWMG or Program Office but wish to stay informed of issues being addressed by the RWMG. In total, more than 200 people, representing 106 organizations, are included in the Inyo-Mono contact list (Table 1-1).

Table 1-1. Organizations included in the Inyo-Mono IRWM Program contact list.

Inyo-Mono IRWM Program Contact List Organizations			
▪ A/E Consultants Information Network	▪ Desert Fishes Council	▪ Inyokern CSD	▪ San Bernardino County
▪ Amargosa Conservancy	▪ Devils Postpile National Monument	▪ June Lake Advocates	▪ The Sheet
▪ American Land Conservancy	▪ Eastern Kern County RCD	▪ June Lake PUD	▪ Sierra Business Council
▪ Ash Meadows National Wildlife Refuge FWS	▪ Eastern Sierra Audubon Society	▪ Keeler CSD	▪ Sierra Club, Toiyabe Chapter, Range of Light Group
▪ Benton Paiute Reservation	▪ Eastern Sierra Cattleman's Association	▪ Kern County	▪ Sierra Nevada Alliance
▪ Big Pine CSD	▪ Eastern Sierra Institute for Collaborative Education	▪ Kern County Water Agency	▪ Sierra Nevada Conservancy
▪ Big Pine Paiute Tribe of the Owens Valley	▪ Eastern Sierra Land Trust	▪ L.A. Department of Water and Power – Bishop Office	▪ Sierra Pacific Power
▪ Birchim CSD	▪ Eastern Sierra Unified School District	▪ Lee Vining PUD	▪ Small Inyo/Mono water systems
▪ Bishop Paiute Tribe	▪ EM Hydrology	▪ Lone Pine Paiute-Shoshone Reservation	▪ Snow Survey Associates
▪ Breeze-Martin Consulting	▪ Farm Service Agency	▪ Lundy Mutual Water Company	▪ Southern Cal Edison-Mammoth Service Center
▪ Bridgeport Indian Colony	▪ Fort Independence – Amalgamated Reservation	▪ Mammoth Community Water District	▪ Southern Sierra IRWM Program
▪ Bridgeport PUD	▪ Friends of the Inyo	▪ Mammoth Lakes Trails and Public Access	▪ TEAM Engineering
▪ Bridgeport Ranchers Association	▪ Great Basin Unified Air Pollution Control District	▪ Mammoth Mountain Ski Area	▪ Town of Mammoth Lakes
▪ Bureau of Land Management - Bishop Office	▪ High Sierra Energy Foundation	▪ Manzanar National Historic Site	▪ Tri-Valley Groundwater District
▪ Bureau of Land Management - Nevada Office	▪ Hot Creek Ranch	▪ Marine Corps Mountain Warfare Training Center	▪ U.S. Bureau of Reclamation
▪ Bureau of Land Management - Ridgecrest Office	▪ Humboldt-Toiyabe National Forest	▪ Mariposa County Resource Conservation District	▪ U.S. Fish and Wildlife Service
▪ California Department of Fish and Game	▪ Independence Civic Club	▪ Mojave Desert Mountain RC&D	▪ University of California Cooperative Extension Inyo and Mono Counties

Inyo-Mono IRWM Program Contact List Organizations			
▪ California Native Plant Society - Bristlecone Chapter	▪ Independence CSD	▪ Mono County	▪ Valentine Eastern Sierra University of California Natural Reserve
▪ California Rural Water Association	▪ Indian Wells Valley Cooperative Groundwater Management Group	▪ Mono County RCD	▪ Virginia Lakes Mutual Water Company
▪ California State Lands Commission	▪ Indian Wells Valley Water District	▪ Mono Lake Committee	▪ Walker Irrigation District
▪ California Trout	▪ Inland Aquaculture Group	▪ Mountain Meadows Mutual Water District	▪ Wheeler Crest CSD
▪ Central Nevada Regional Water Authority	▪ Inyo County	▪ Natural Resource Conservation Service - Bishop Office	▪ White Mountain Mutual Water Company
▪ Central Sierra Resource Conservation & Development Council	▪ Inyo County Water Department	▪ Natural Resource Conservation Service - Minden Office	▪ The Wilderness Society
▪ City of Bishop	▪ Inyo Mono Farm Bureau	▪ Owens Valley Committee	
▪ Crowley Lake Mutual Water District	▪ Inyo Mono RCD	▪ Owens Valley Indian Water Commission	
▪ Crystal Crag Water & Development Association	▪ Inyo National Forest	▪ Lahontan Regional Water Quality Control Board	
▪ Death Valley National Park	▪ Inyo/Mono Agricultural Commissioner's Office	▪ Round Valley School	

During the project launch phase, a Coordinating Committee served as an advisory or steering group for the Planning Committee (which is now known as the RWMG), Program Office, and working committees, and was comprised of a subset of Planning Committee Members. Starting November 15, 2010, an Administrative (Admin.) Committee took over the roles and responsibilities of the Coordinating Committee. The Admin. Committee consists of six RWMG Members that serve on a voluntary basis. Membership on the Admin. Committee rotates through the RWMG. Each year, three new Admin. Committee members are appointed, so that each Admin. Committee member will serve for two years, thus providing continuity among years. More information on the composition and the role of the Admin. Committee can be found in Chapter 5.

Specialized ad-hoc working committees made up of RWMG participants are established as needed to perform functions, develop programs, and work through concepts (such as organizational structure, internal project ranking processes, etc.). Working committees deliver products to the RWMG and the Administrative Committee for approval and/or adoption.

Finally, the Inyo-Mono IRWM Program Office staff consists of a Program Director, a Program Manager, a Program Assistant, an Outreach Specialist, and a Project Development

Specialist/Grantwriter. The Program Office staff is tasked with the overall coordination and day-to-day operations of the RWMG. Their duties include grantwriting, grant administration, research, outreach, data management, GIS, communicating with RWMG Members and participants, participating in Statewide IRWM meetings, and Plan writing. The staff has grown substantially since the receipt of the Round 1 Planning Grant, but employment by the Inyo-Mono RWMG always is dependent on available funding. All staff, except the Program Director, are independent contractors through California Trout, which has been the grantee for all DWR grant applications except the Round 1 Implementation Grant. The Program Office is based in Mammoth Lakes, California.

Purpose, Mission, and Vision

The purpose of the Inyo-Mono IRWM Program is to foster coordination, collaboration, and communication among water-related stakeholders in the region for the purpose of developing water management strategies and projects that will benefit multiple entities and enhance water supply, water quality, and watershed health. Specific objectives and resource management strategies derived from the purpose are presented in Chapter 7.

After a visioning exercise undertaken in early 2010, the following mission and vision statements were adopted by the RWMG:

> ***Mission:*** *To research, identify, prioritize, and act on regional water issues, and related social and economic issues, so as to protect and enhance our environment and economy. Working together, we create and implement a regional water management plan that complies with applicable policies and regulations and promotes innovative solutions for our region's needs.*
>
> ***Vision:*** *Our vision is a landscape that is ecologically, socially, and economically resilient. As diverse stakeholders, we identify and work toward our common goals. We achieve a broad-based perspective that benefits our regional ecosystems and human communities by combining our interests, knowledge, expertise and approaches. We strive to have every voice heard within our region and our collective voice heard in the state and nation.*

Communication, Meetings, and Workshops

Communication with the RWMG primarily takes place through email. Notices and agendas for upcoming RWMG meetings are sent to all people on the email contact list, as are meeting summaries and any other relevant information about the Inyo-Mono IRWM process or issues related to water planning/management in the region. In addition, Program Office staff is available by phone and by email for questions and information requests. When warranted, staff will travel within the region, or to Sacramento, to meet with stakeholders, members of the public, and DWR officials. The project website (www.inyo-monowater.org) has become an increasingly visible and important tool for sharing information with current Members and reaching out to new stakeholders. On this website, visitors can find topics such as introductory information about the Inyo-Mono IRWM Program, member organizations, meeting summaries and other important documents, and links to other IRWM groups (see next section for more information). Because

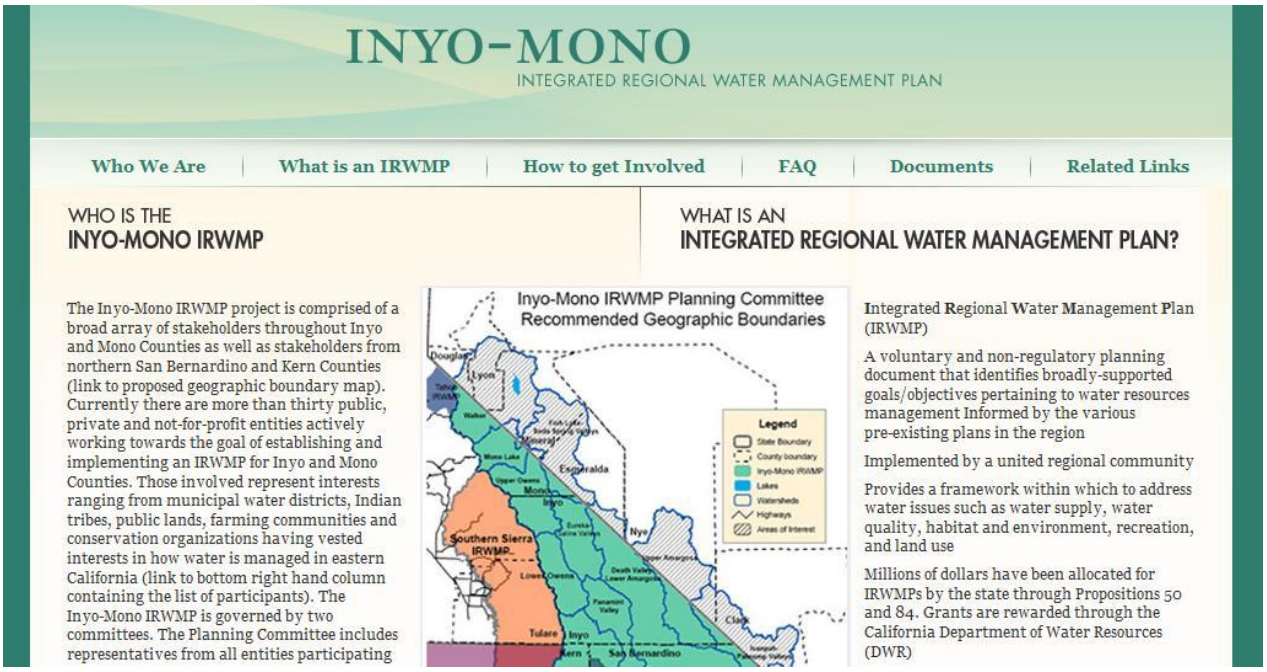
of the rural nature of the Inyo-Mono region, not all stakeholders have regular access to the Internet, and it has been necessary at times to reach people through other means (such as phone, U.S. mail, in- person, etc.).

RWMG meetings are held approximately once per month. Meetings take place throughout the region, although attendance is highest when meetings are held in Bishop or Mammoth Lakes. A call-in option is available during all RWMG meetings for those who cannot or prefer not to attend in person. Administrative Committee meetings are typically held via conference call, as are working committee meetings, though there is always an in-person option. All RWMG and Admin. Committee meetings are open to the public and meeting notices and agendas are posted to the Inyo-Mono IRWM Program website as well as in public locations and newspapers throughout the region.

Website

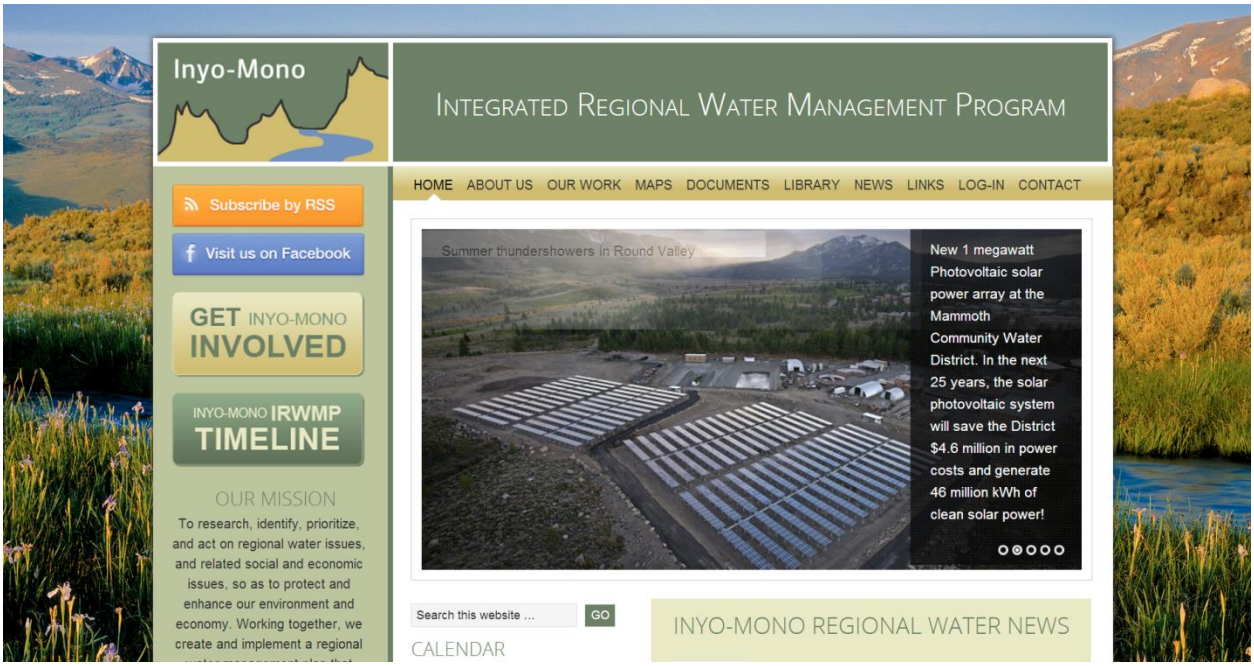
The initial Inyo-Mono IRWM Program website (www.inyo-monowater.org) was launched in 2008 as part of the project launch grant through the Sierra Nevada Conservancy. This website provided general information about the IRWM Program and also more specific information on the history, composition, and activities of the Inyo-Mono RWMG. There was also an events calendar and a documents page where users could access meeting summaries and other documents relevant to the IRWM process. The general theme of this first website is depicted in Figure 1-2.

Figure 1-2. Inyo-Mono IRWM Program original website homepage



In 2011, the Inyo-Mono IRWM Program website was overhauled (Figure 1-3). This new website contains all the information from the initial website and adds a substantial amount of additional content and functionality. More capacity was built into the website to house specific project information, a documents library, mapping capabilities, a news feed, and log-in pages for controlling secure content. In addition to the e-mail contact list, the website has become a primary tool for communicating with the RWMG. New stakeholders and members of the public are also directed to the website as a way to introduce the IRWM planning concept and provide basic information about the Inyo-Mono RWMG and its processes. The website is maintained by Program Office staff, and the content is continuously being updated and improved. The staff will continue to add content and functionality as needs arise.

Figure 1-3. Homepage of updated Inyo-Mono IRWM Program website.



Public Involvement and Outreach

Any member of the public who is interested in water issues within the Inyo-Mono planning region is welcome to participate in the Inyo-Mono IRWM Program. Initial outreach in 2008 was primarily directed towards informing major water-related stakeholders in the region and inviting them to be part of the process. More recent outreach has targeted any entity or individual in the region working on water planning or management, with the intent being to assess needs and bring needed resources to the region. Throughout the existence of the IRWM Program, staff and other stakeholder volunteers have attended numerous public meetings throughout the planning region in order to identify additional stakeholders, provide basic information about the Inyo-Mono IRWM Program and related funding opportunities, and learn about water issues and concerns from those living and working in the planning region. In these meetings, Program Office staff also emphasizes that the goal of the IRWM Program is to increase local participation

in water management issues and provide a more unified voice in California water planning. A primary goal of the most recent outreach efforts has been to identify and reach out to the more remote and rural communities within the region as well as to economically disadvantaged communities. Many times these two types of communities overlap. Because of the size of the region, it has been difficult to reach every potentially affected stakeholder or community. However, it has been the priority of the Inyo-Mono RWMG from the beginning to maintain an open, transparent, and inclusive process, and public outreach efforts have been fundamental to the success of the Program. At all times, Inyo-Mono RWMG meetings have been open to the public, and notices of the meetings are publicly available on the website (www.inyo-monowater.org), on the Facebook page (https://www.facebook.com/pages/Inyo-Mono-Integrated-Regional-Water-Management-Group/287154034655884), in local media outlets, and at public locations throughout the region. More information on the Program's outreach activities can be found in Chapter 6.

Disadvantaged Communities and Native American Indian Tribes

From the beginning of the Inyo-Mono IRWM planning process in early 2008, the RWMG prioritized outreach to and engagement of disadvantaged communities (DACs) and tribes. It was quickly recognized that because of the rural and remote nature of the region, there would likely be a large number of DACs. Indeed, it was discovered that all of Inyo County (the second largest county in California) was a DAC. As described below, the DACs in the Inyo-Mono planning region include unincorporated communities in Inyo, Mono, San Bernardino, and Kern Counties, as well as federally-recognized and non-federally-recognized American Indian tribes.

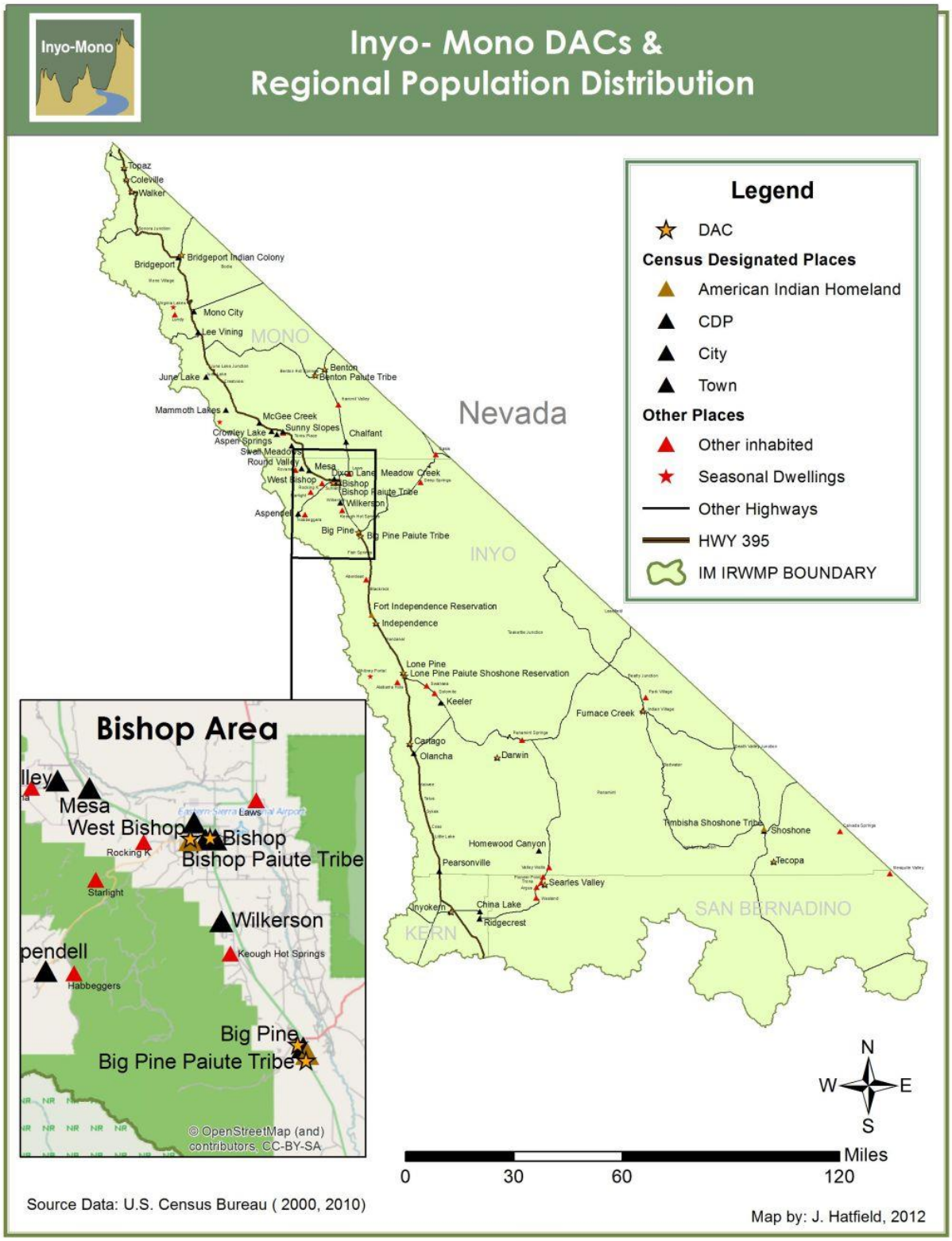
Throughout the pre-planning and planning phases, effort has been made to reach out to DACs; share information about IRWM Program activities, objectives, and funding opportunities; and, more importantly, listen to their water-related needs and concerns. Program Office staff has targeted outreach to DACs both with individual meetings/presentations and through the larger outreach campaign initiated in 2010. Of those identified as DACs in Table 1-2 below, most have received some level of outreach and information from the IRWM Program, and many have signed the MOU or remain on the RWMG contact list.

As described above, the Inyo-Mono RWMG secured funding from DWR in 2011 specifically for DAC outreach and engagement. Through this funding, additional individual and public meetings are being held throughout the region with the intention of fully integrating as many DACs in the area as possible into the planning process. The RWMG has recognized that the success of the IRWM planning effort in the region cannot be fully realized without the participation of DACs. Indeed, inclusion of DACs into the process helps to provide a stronger voice in support of the needs of rural communities.

It was also recognized early on that it would be imperative to have tribal involvement in the RWMG as there are several federally-recognized (and a few non-federally-recognized) tribes in the area that contribute significantly to the economy and culture of the region and have been involved in regional water issues for centuries. Targeted outreach efforts yielded good results, and all tribes in the region but two are signatories to the Inyo-Mono MOU.

A disadvantaged community is defined by California statute as a community with an annual median household income (MHI) that is less than 80% of the statewide annual MHI (Assembly Bill 1747 [2003]). MHI data were not made available at the community level from the 2010 U.S. Census; instead, we have used 2006-2010 American Community Survey (ACS) data to perform an initial identification of DACs within the Inyo-Mono region (http://www.census.gov/acs/www/about_the_survey/american_community_survey/). Because of the remote and rural nature of the Inyo-Mono region, as well as its sparsely-distributed and often small population centers, neither U.S. Census nor ACS data are available for all communities in the region. Thus, the number of identified DACs in the Inyo-Mono region is likely underestimated. Through the DAC grant from DWR, the Inyo-Mono RWMG is developing a set of metrics that could be used to define and identify DACs and that are not dependent on inconsistent data sources. One of the goals of this effort is to influence the law setting the definition of DACs and help to make it more inclusive. In the meantime, however, the discussion of Inyo-Mono DACs in this Plan will be limited to those meeting the MHI standard as determined by 2006-2010 ACS data. Locations of DACs in the Inyo-Mono region identified using ACS data are shown in Figure 1-4.

Figure 1-4: Disadvantaged Communities of the Inyo-Mono Region



The above map indicates DAC's of the Inyo Mono region as well as illustrates problems using Census data in rural regions where numerous communities are excluded from Census derrived data.

The statewide annual MHI in California based on the 2006-2010 ACS is $60,883. Communities with annual MHIs less than $48,706 are considered disadvantaged communities by the AB 1747 definition. Using this definition, the entirety of both Inyo and Kern Counties are disadvantaged based on county-wide MHI estimates (Table 1-2). Based on the 2006-2010 ACS data, the MHI for the whole of Inyo County is $44,808, which is below the statewide 80% of MHI threshold. Eighteen communities in Inyo County qualify as disadvantaged using the current definition. All of the American Indian Reservations in Inyo County qualify as disadvantaged communities. The population of the disadvantaged communities in Inyo County is at least 12,600 (some population data are not available; see Table 1-2), representing 68.5% of the total county population.

The MHI for Mono County is $55,807, which is higher than Inyo County but still below the statewide MHI. Nine communities in Mono County qualify as disadvantaged, accounting for at least 12% (more than 1,750 people; not all population data are available) of the total population of Mono County. All American Indian Reservations in Mono County qualify as DACs. In addition, there are "pockets" of disadvantage within more wealthy communities that do not officially qualify as DACs. The Inyo-Mono RWMG is working to determine how best to identify these pockets and bring resources to them.

MHI estimates for Mono and San Bernardino Counties are approximately $7,000 above the statewide 80% MHI threshold. The Kern County MHI is $47,089, which is also below the DAC MHI threshold. A very small portion of Kern County is located within the Inyo-Mono planning region; however, two communities qualify as disadvantaged, representing 3,229 people.

Similarly, a small portion of northern San Bernardino County is located within the Inyo-Mono planning region. The MHI for San Bernardino County is $55,845, which is higher than the DAC threshold but still below the statewide MHI. Within the Inyo-Mono portion of San Bernardino County, two communities are considered disadvantaged, representing 2,015 people.

In total, approximately 20,000 people live in disadvantaged communities in the Inyo-Mono region. Given the small population of the region, this represents approximately one-third of the overall population, yet still may not adequately represent the disadvantaged nature of some communities within the region. The work taking place through the DAC grant will attempt to more accurately portray the definition of "disadvantaged" for rural, remote, mountainous, and/or headwaters regions.

Table 1-2. Identified disadvantaged communities in the Inyo-Mono IRWM planning region based on 2010 5-year American Community Survey data (unless otherwise noted)

Community *(As recognized by the U.S. Census Bureau)*	Population	Annual Median Household Income
Inyo County	***18,434***[6]	***$44,808***
Big Pine Paiute Reservation of the Owens Valley	262	$43,214
Bishop	3,826	$37,005

Community *(As recognized by the U.S. Census Bureau)*	Population	Annual Median Household Income
Bishop Paiute Tribe	1,828	$46,384
Darwin	30	$30,893
Dixon Lane-Meadow Creek	2,660	$48,542
Fort Independence Tribe	81	$30,417
Furnace Creek	64	$27,813
Homewood Canyon	109	$14,706
Independence	551	$47,883
Keeler	27	$44,500
Lone Pine	2,309	$40,176
Lone Pine Paiute-Shoshone Reservation	148	$37,188
Pearsonville	5	Not available[5]
Shoshone	33	$28,750
Tecopa	101	$21,806
Timbisha-Shoshone Reservation	32	$23,063
Valley Wells	Not available	Not available
Wilkerson	563	$44,356
Kern County	***815,693***	***$47,089***
China Lake Acres	1,553	$35,102
Inyokern	1,676	$31,925
Mono County	***13,905***	***$55,087***
Benton	289	$40,119
Benton Paiute Reservation	75[1]	$9,938[1]
Bridgeport Indian Colony	35[2]	$10,625
McGee Creek	29	Not available
Topaz	Not available	Not available
Walker River Reservation	508	$25,227

Community *(As recognized by the U.S. Census Bureau)*	Population	Annual Median Household Income
Walker	677	$30,682
Woodfords Community of the Washoe Tribe[4]	139	$25,417
San Bernardino County	***2,005,287***	***$55,845***
Searles Valley [3]	2,088	$35,147
Trona	17	Not available

[1]From 2009 5-year ACS
[2]From 2010 Dicennial Census
[3]Consists of the communities of Argus, Trona, Pioneer Point, and Searles Valley, CA
[4]Woodfords Community is the sole branch of the Washoe Tribe located in CA
[5]Communities with MHI listed as "Not available" are listed as DACs based on their DAC designation using DWR's DAC mapping tool:
http://www.arcgis.com/apps/OnePane/basicviewer/index.html?&extent={%22xmin%22:-15522106.757711068,%22ymin%22:3383875.113067463,%22xmax%22:-11562057.196313709,%22ymax%22:5663533.044643953,%22spatialReference%22:{%22wkid%22:102100}}&appid=c034d1f8f9f34afeb98f20be2a2fb790
[6]Overall population numbers for counties may be slightly different from numbers referenced in other sections of the Plan due to differences between 2010 Census and 2006-2010 ACS data.

Principal Water Concerns and Issues in the Inyo-Mono Region

Through the process of working with RWMG Members, participants, and other water-related stakeholders in the region, and through extensive outreach to the communities of the Inyo-Mono planning region, three principal categories of water issues have been identified. Many other issues exist in the region, but these three categories stand out as themes impacting the entire region.

1) **Water Quality**. Many communities in the Inyo-Mono planning region primarily depend on groundwater as their potable water supply. Due to the chemical composition and weathering processes of the granitic bedrock that underlies much of the region, natural contaminants are commonly found in surface water and groundwater sources - primarily arsenic and uranium. As a result, water systems in many communities within the planning region regularly exceed state and federal maximum contaminant levels; however, because of the limited resources of many of these rural communities, they are unable to bring their drinking water sources into compliance. Such water quality issues are truly region-wide, from Coleville in the north of the region to Keeler near the center and Tecopa in the southeast corner. Several communities rely on expensive bottled water as their primary source of drinking water.

2) **Water Infrastructure.** Several communities have identified concerns about old, outdated, and/or poor-quality water infrastructure. These problems include pipes, tanks, wells, diversion structures, and underground mainlines. Poor or failing water infrastructure results in substantial water loss, degraded water quality, and inadequate fire-fighting capabilities.

Even though the planning region encompasses a wide variety of landscapes and ecosystems, both water infrastructure and fire water storage concerns are found throughout the region.

3) **Institutional/Human Capacity**. Although capacity is not directly a water issue, the RWMG has come to see limited capacity and resources as a major obstacle to improving water quality, water supply, and watershed health in the region. Throughout the region, representatives from communities, particularly those that are small and/or disadvantaged, have expressed the need for both technical and financial resources to address water resources concerns. Many of these communities lack the expertise necessary to develop engineering plans, conduct environmental review, write grant proposals, and implement projects, nor do they have the financial resources to hire expensive outside contractors to support these activities. Furthermore, many communities have expressed concern that even after a project is built, they often cannot find the resources to operate and maintain the project, and quality and project longevity may be compromised as a result.

Approach and Relation to Other Planning Efforts within the Region

The Inyo-Mono IRWM Plan is not a legally binding document; however, many of the member organizations and other stakeholders must adhere to various other plans, policies, and regulations that govern water management in the region. Therefore, it is necessary to know of and understand these documents as the Inyo-Mono RWMG develops and implements water resource projects. Planning documents that have been completed and/or implemented before the start of or during the process of the Inyo-Mono IRWM Program are introduced and discussed in Chapter 11. The RWMG relies on the knowledge and community involvement of its Members and participants to stay informed about new or ongoing planning efforts. If possible, Program Office staff attends stakeholder meetings or otherwise communicates with other planning entities to (1) stay updated about the planning effort and (2) to provide input on behalf of the RWMG, if warranted. For example, in 2010, the Bishop Paiute Tribe Environmental Management Office received funding to develop a Bishop Creek Watershed Management Plan. Program Office staff and other RWMG stakeholders participated in meetings related to the development of the plan and provided input to drafts of the plan. The relationship of the Inyo-Mono IRWM Plan to other planning efforts in the region is further discussed in Chapters 8 and 11.

Coordination with Other IRWM Programs

Throughout the planning process, RWMG participants and Program Office staff have communicated and coordinated regularly with other IRWM planning regions in the State. During the launch phase, coordination with adjacent and neighboring IRWM planning regions was essential to ensure agreement regarding common boundaries, overlapping boundaries between proposed IRWM planning regions, and gaps between existing and proposed IRWM planning regions. An initial meeting among neighboring IRWM planning regions took place in 2008 to begin a focused dialogue amongst the various IRWM planning regions specific to boundary issues. During the initial meeting, those participating agreed that further coordination would take place. This communication resulted in a series of Letters of Agreement between neighboring IRWM planning regions that then became part of each region's Region Acceptance

Process application. The entities included in these letters of agreement were: Tahoe-Sierra IRWM Program, Southern Sierra IRWM Program, Antelope Valley IRWM Program, Mojave IRWM Program, and Kern County (Figure 1-1). At times, Madera and Mariposa Counties were also included in these boundary discussions, although the formation of IRWM Programs in their areas was not finalized at the time. Another goal of this outreach to neighboring regions was to lay the groundwork for future collaboration on shared water resource issues.

These meetings with neighboring IRWM groups allowed the Inyo-Mono IRWM planning region to learn how other IRWM planning regions formed, invited and involved stakeholders, wrote IRWM Plans, and implemented projects. Program Office staff has used contacts from other IRWM planning regions throughout California, particularly those at advanced stages of IRWM planning, for advice and input. Likewise, after four years of existence, the Inyo-Mono IRWM Program has now become a resource for "younger" programs as they develop their governance, outreach processes, and Plans. The Inyo-Mono RWMG has also begun to look for possibilities of collaborative projects with neighboring IRWM planning regions.

The Inyo-Mono RWMG and Program Office staff have participated in a number of other efforts involving IRWM regions in various parts of California. Program Office staff regularly participates in the IRWM Roundtable of Regions meetings. This informal group provides an excellent venue for sharing information among IRWM Programs, receiving updates from DWR, and providing feedback about the statewide IRWM Program. The Inyo-Mono RWMG also participates in the Sierra Water Workgroup (SWWG), which is a consortium of IRWM groups in the Sierra Nevada. This group seeks to raise the profile of the Sierra in statewide water policy as well as to provide a forum for Sierra IRWM Programs to share information and resources. The Inyo-Mono IRWM Program was heavily involved in the development of the July, 2012, SWWG Summit and participated on three different panels during the conference. The RWMG will continue to communicate and partner with other Sierra IRWM Programs as there are many shared interests and concerns.

Integration of Stakeholders and Institutions

The four-and-a-half years of RWMG meetings, outreach efforts, and daily operations of the Inyo-Mono IRWM Program have resulted in a truly grassroots, bottom-up, integrated approach to water planning. The composition of the RWMG is unparalleled anywhere else in the region and reflects the open, transparent, and inclusive nature of the Inyo-Mono IRWM process. The RWMG membership includes town and county government agencies; federal, state, and regional resource agencies; American Indian tribes; small and large water purveyors; conservation organizations; private businesses; community advocacy organizations; and

educational institutions. Indeed, other multi-stakeholder efforts in the region have looked to the Inyo-Mono RWMG as a model of collaborative planning.

Integration of stakeholders and resources within the IRWM planning process has been formalized through the RWMG meetings that have been held since February, 2008. At these meetings, representatives from disparate organizations, often with conflicting opinions on water resources topics or representing very different areas within the larger region, come together to discuss the RWMG and the future of water management in the Inyo-Mono region. It is expected that dialogue that takes place at the meeting will be transparent, open, and respectful. As a result of these ongoing meetings, water-related stakeholders that had not previously known each other now communicate about their needs and seek assistance from one another. For example, smaller water districts in the planning region have recognized that they can learn and draw experience from larger water districts, and in turn, larger districts have been willing to lend assistance. Another result of these ongoing meetings is that RWMG participants, while recognizing differences, have found that they share many common interests and concerns with respect to water and the challenges that stem from living in a rural, remote region. This commonality has created a larger sense of obligation and commitment to the planning process among the Members.

Integration of resources has also taken place through the sharing of information within the RWMG and on the Inyo-Mono website. At each RWMG meeting, there is an agenda item for announcements. This opportunity is utilized by RWMG Members and participants to share information about recent or upcoming events, current practices/efforts of their organization, and general water-related news relevant to the region. These announcements are captured in the meeting notes, which are shared with the entire RWMG contact list and are available on the website.

With the development of the upgraded website, capacity has been added for housing and sharing information and data. One goal of the Inyo-Mono website is to become a storehouse for relevant documents and information. The first example of achieving this goal is the creation of a documents library, which was used for the analysis of relevant planning documents in Chapter 11 and has now become an online resource for all interested users (http://nyo-monowater.org/library/). The library is organized by geographical scale (i.e., federal, state, regional, etc.), and each document listed is hyper-linked to a PDF or a website where the document can be found. Another example is the combining of data and data sources discussed in Chapter 4. This effort has just begun, but it is anticipated that this sharing of data sources will benefit many stakeholders in the region. Finally, the development of Geographic Information System capacity within the Inyo-Mono IRWM Program has greatly increased the integration and sharing of information. It is now possible to perform analyses and create depictions of large amounts of data in a user-friendly format. This capacity is enhanced by the inclusion of static maps and dynamic mapping tools on the Inyo-Mono website. Users can download individual maps or work within interactive mapping platforms to find the information they need (http://inyo-monowater.org/maps/). It is expected that the continued improvement of technology will allow for increasingly integrated efforts and the creation of additional tools to enhance water planning in the region.

It has been acknowledged by the RWMG that "integration" is a difficult concept to implement in a region as large and diverse as the Inyo-Mono. Some RWMG Members have argued that it is impossible to integrate stakeholders and processes from the northern part of the region with those in the southern reaches, or to integrate processes from the high-elevation mountains with the low-elevation deserts. Yet we know that there are common water issues and concerns throughout the region, as described earlier in this chapter. This hesitance to fully embrace the concept of integration has resulted in Members pursuing their own water projects in isolation, despite their participation in the larger RWMG. The goal moving forward is to begin to consider opportunities to integrate projects either by geography, by topic (e.g., water quality, aging infrastructure, etc.), or by Inyo Mono objectives and/or resource management strategies (see Chapter 7), and to take advantage of the many potential benefits created by agencies and organizations working together in a collaborative manner.

Plan Development and Updating

Phase I vs. Phase II Plan

When the Inyo-Mono IRWM Program was initiated in early 2008, the RWMG intended to submit a Prop. 84 Planning Grant application to DWR in late 2008 or early 2009. Because of the budget constraints and the bond freeze in late 2008, the RWMG was not able to fulfill that goal. Instead, the RWMG decided to begin work on an initial Plan, without planning grant funds, so that it could be eligible for the first round of Prop. 84 Implementation grants. While all Prop. 84 Plan Standards were at least minimally addressed in the Phase I Plan, the RWMG desired to have an opportunity to more fully consider each Plan Standard and revise the Plan as necessary. The Phase I IRWM Plan was adopted in December, 2010, just ahead of the Round 1 Implementation Grant deadline.

The Round 1 Planning Grant application focused on revising the Inyo-Mono Plan to be more comprehensive and to more fully meet the Prop. 84 IRWM Plan Standards. This document is a result of the 17 months of Round 1 Planning Grant work and is considered the Phase II Plan. Updated Prop. 84 IRWM Program Guidelines and Plan Standards are forthcoming, and the Inyo-Mono Plan will be updated, using Round 2 Planning Grant funds, to meet the revised standards. This next revision of the Plan is expected to take place in late 2013 and early 2014. In addition to fully meeting Plan standards, the next iteration of planning will also include a consideration of the concept of "integration" and what it means for the Inyo-Mono IRWM region; the development of a sustainable finance/funding strategy to support the future of IRWM planning in the Inyo-Mono region; further development of data management techniques and GIS; and enhanced analysis of climate change impacts and adaptation options for the Inyo-Mono region.

Future Plan Revisions

The Inyo-Mono IRWM Plan will be revised and/or updated as necessary every two years, beginning two years after the adoption of the Phase II Plan. The full process for revising and adding projects to the Inyo-Mono IRWM Plan is discussed in detail in Chapter 5.

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Chapter 2: Region Description

Overview and Boundaries

The Inyo-Mono IRWM planning region is not exactly what most Americans picture when they think of California. Located east of the Sierra Nevada, the region is isolated from the population, economic activity, politics, and even precipitation of much of California. The region is characterized by very low population density compared to most of the state and vast open spaces. Except for the steep mountain front immediately east of the Sierra Nevada crest, the region is arid, with portions classified as hyper-arid. However, snowmelt runoff from the Sierra Nevada flows into some parts of the region with little direct precipitation. Water from the three largest rivers of the region is largely exported to Nevada and southern California. Consequently, limited water supplies as well as a low proportion of private land ownership have constrained local land use and human settlement. The towns and communities of the region are located either where water was available or where some other exploitable resource outweighed concerns about water supply. Many of the small water systems serving communities of the region suffer from "dis-economies of small-scale" where the tiny customer base is insufficient to meet basic technical, financial and managerial needs to maintain the system. Limited economic opportunities, particularly in tribal communities, further compound the difficulties of building and operating residential water delivery systems to a standard that most Californians take for granted.

Diversity is a key descriptor of the physical geography of the Inyo-Mono IRWM planning region. The area includes the topographically highest and lowest points of California (and the contiguous United States), places with the highest summer temperatures in the country (Death Valley) and occasionally the lowest winter temperatures in the country (Bodie), deep winter snowpacks along the Sierra Nevada crest, and entire years without rainfall in some of the desert portions. These extremes are within a couple of hundred miles of each other.

Explanation of Regional IRWM Boundary

The Inyo-Mono IRWM planning region covers a large area of the central California portion of the

western Great Basin. The planning region consists of several large watersheds with internal drainage and no natural outlet to an ocean. The principal river basins or watersheds of the planning area include (from north to south): West Walker River, East Walker River, Mono Basin, Owens River, Amargosa River and Death Valley, Panamint Valley, and Indian Wells Valley. Several other closed basins are included in the southern portion of the planning area.

Boundaries of the Inyo-Mono IRWM planning region enclose Inyo and Mono Counties, northern portions of San Bernardino County and the northeastern corner of Kern County (Figure 1-1). In the northwest, the Inyo-Mono IRWM planning region boundary follows the divide between Alpine and Mono county jurisdictions. On the western edge, the Inyo-Mono IRWM regional boundary follows the crest of the Sierra Nevada and jurisdictional borders of Mono and Inyo Counties with Tuolumne, Mariposa, Madera, Fresno, Tulare and Kern counties. The southwestern boundary also follows the crest of the Sierra Nevada in Inyo County plus a small portion of Kern County. To the south and southeast, the planning region follows watershed boundaries that share more common water resource issues with Inyo County than with other watersheds in Kern and San Bernardino counties. These watersheds include Indian Wells, Searles, Upper Amargosa, Death Valley/Lower Amargosa, Pahrump-Ivanpah, and Panamint Valleys. The east side of the planning area follows the California-Nevada state line. The Nevada side of the watersheds shared by California and Nevada is recognized as an area sharing water resources issues with the Inyo-Mono IRWM planning region and is included in the Inyo-Mono IRWM planning area as an “Area of Interest.” Thus, within California, except for the southern boundary where watersheds extend into Kern and San Bernardino Counties, the Inyo-Mono IRWM planning region boundaries are delineated by both watershed and jurisdictional lines. The planning region is wholly contained within the Regional Water Board Region 6 (Lahontan Region) boundaries.

Inyo County, which makes up most of the Inyo-Mono planning region, is the second largest county in California in total area (10,140 square miles) but has a comparatively small population of about 18,550. Mono County covers approximately 3,100 square miles and has a population of about 14,200 (2010 Census). The region is generally rural and sparsely settled with residents concentrated in and around communities such as Bishop, Ridgecrest, Independence, Big Pine, Lone Pine, Bridgeport, June Lake, and Mammoth Lakes. Primary land uses include livestock grazing (mostly on federally-owned and City of Los Angeles-owned lands), agriculture, and recreation.

Description of Watersheds and Water Systems

Major drainage systems in the region are the Walker, Owens, and Amargosa river systems. The Walker River system flows from the eastern slope of the Sierra Nevada into Nevada where it terminates at Walker Lake. Prior to the construction of the Los Angeles Aqueduct, the Owens River historically terminated at Owens Lake; presently, the Los Angeles Aqueduct is the sole means by which runoff from the region can drain to the Pacific Ocean. The headwaters of the Amargosa River are in Nevada, from which it flows into California, terminating in Death Valley. Numerous other internally drained basins exist wholly or mostly within the region, including Mono, Saline, Eureka, Deep Springs, Indian Wells, Panamint, and Searles Valleys. Naturally occurring perennial lakes are uncommon except at high elevations in the Sierra Nevada and in

the adjacent valleys receiving runoff from the eastern slope of the Sierra Nevada. The largest natural lake in the region is Mono Lake. Historically, a large lake existed at Owens Lake; however, irrigation for agriculture, drought, and diversions from tributaries to the Owens River and the Owens River itself resulted in the lake declining to a small brine pool in the 1920s and 1930s. Surface water is rare and ephemeral in the arid desert basins south and east of Owens Valley.

The Inyo-Mono IRWM region is comprised of 12-18 large hydrographic units or major watersheds, depending on how certain basins are lumped together in the watershed-delineation schemes of the U.S. Geological Survey and Calwater (Tables 2-1, 2-2, and 2-3). The Calwater basins are illustrated in Figure 1-1.

Table 2-1. Inyo-Mono IRWM region watersheds based on USGS HUC designation.

USGS Hydrologic Unit Code	Watershed Name
16050301	East Walker
16050302	West Walker
16060010	Fish Lake – Soda Springs Valleys
18090101	Mono Lake
18090102	Crowley Lake
18090103	Owens Lake
18090201	Eureka - Saline Valleys
18090202	Upper Amargosa
18090203	Death Valley - Lower Amargosa
18090204	Panamint Valley
18090205	Indian Wells - Searles Valleys
16060015	Ivanpah - Pahrump Valleys

Table 2-2. Inyo-Mono IRWM region watersheds based on Calwater designation.

Calwater Code	Watershed Name
121 8630	East Walker River
122 8631	West Walker River
134 9601	Mono
135 9602	Adobe

Calwater Code	Watershed Name
136 9603	Owens
137 9604	Fish Lake
138 9605	Deep Springs
139 9606	Eureka
140 9607	Saline
141 9608	Race Track
142 9609	Amargosa
143 9610	Pahrump
144 9611	Mesquite
146 9613	Owlshead
153 9620	Ballarat
154 9621	Trona
155 9622	Coso
156 9623	Upper Cactus
157 9624	Indian Wells

Table 2-3. Correspondence between USGS and Calwater naming conventions

USGS HUC	Calwater
East Walker	East Walker River
West Walker	West Walker River
Fish Lake – Soda Springs	Fish Lake
Mono Lake	Mono
Mono Lake	Adobe
Crowley Lake	Owens
Owens Lake	Owens
Eureka-Saline	Deep Springs
Eureka-Saline	Eureka
Eureka-Saline	Saline
Eureka-Saline	Racetrack
Upper Amargosa	Amargosa

USGS HUC	Calwater
Death Valley – Lower Amargosa	Amargosa
Death Valley – Lower Amargosa	Owlshead
Panamint Valley	Ballarat
Indian Wells – Searles	Trona
Indian Wells – Searles	Coso
Indian Wells – Searles	Upper Cactus
Indian Wells – Searles	Indian Wells
Ivanpah - Pahrump	Pahrump
Ivanpah - Pahrump	Mesquite

The only hydrographic units that are not entirely included in the IRWM planning region are those that cross the Nevada border. The other units are fully contained in the planning region and largely define the rationale for the extent of the planning region. Although the inclusion of areas in southeast Inyo County, northern San Bernardino County, and northeastern Kern County was debated due to the remote nature of the region, it was decided by the RWMG that it was logical to include all of Inyo County yet still make the boundary watershed-based (thus including parts of San Bernardino and Kern Counties). These watersheds include Indian Wells Valley, Searles, Upper Amargosa, Death Valley/Lower Amargosa, Pahrump-Ivanpah, and Panamint Valley. A similar debate and resolution occurred for the northern part of the region in the East Walker River and West Walker River units.

The Inyo-Mono IRWM planning region not only reflects watershed boundaries but areas of common water management history and interest as well. All the water in the western portion of our region, east of the Sierra Nevada crest, flows east into water bodies that are important for fisheries, stream habitat, recreation, and water supply for communities in Nevada, southern California, and the planning region itself. The watersheds in the south of the planning region share common issues such as low population density, rural water management, large tracts of federal land, an arid climate, and complex topography. One of the larger hydrographic units in the planning region is the Owens, which spans two counties and provides water to the Los Angeles Aqueduct (LAA) and the four million residents of Los Angeles. Through the Los

Angeles Department of Water and Power (LADWP), the City of Los Angeles is one of the participants in Inyo-Mono RWMG meetings, but is not yet a signatory to the IRWM group. The Inyo-Mono IRWM region boundaries include all water-related infrastructure associated with the source waters of the LAA.

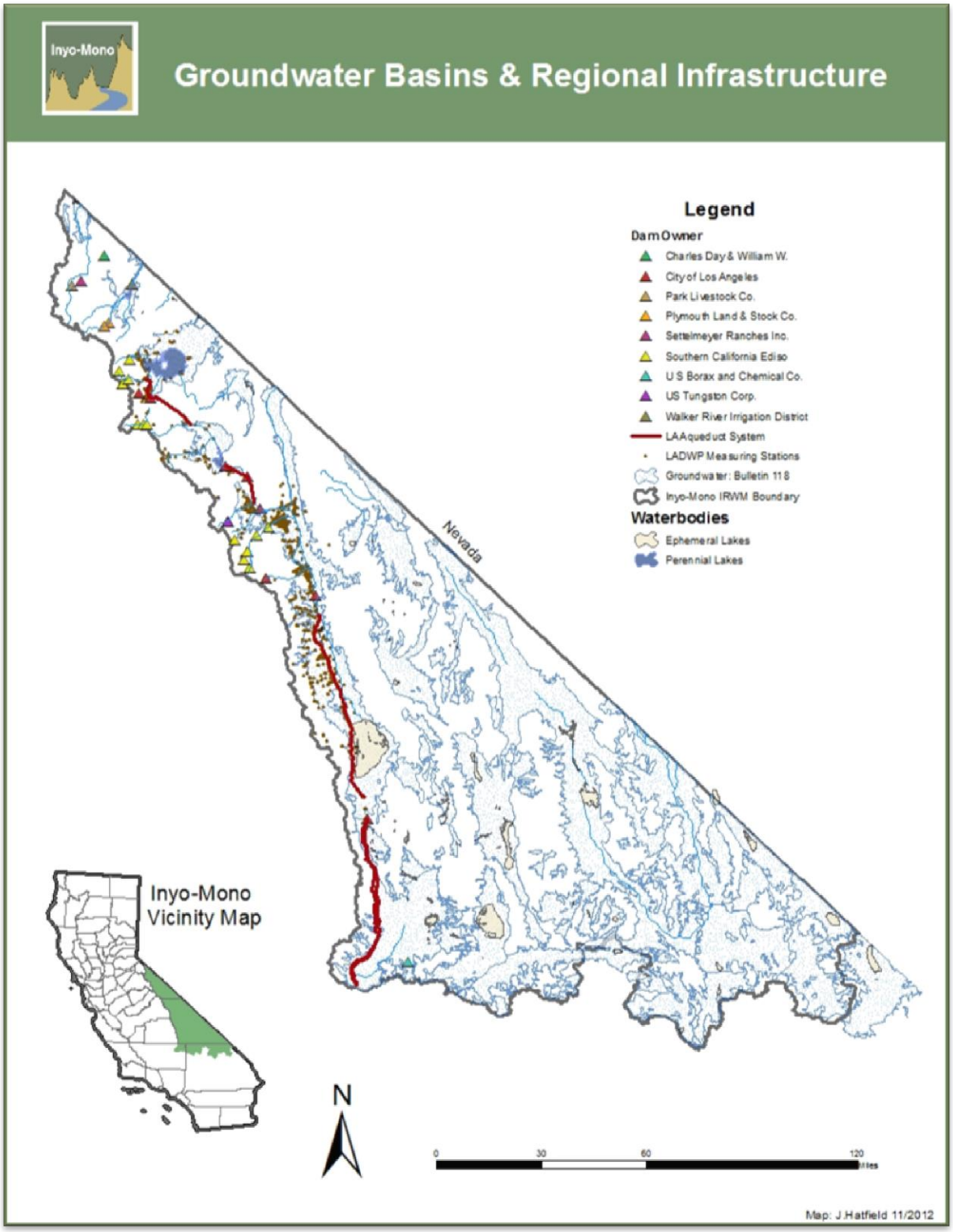
Numerous groundwater basins underlie the region, and include Antelope Valley, Bridgeport Valley, Mono Basin, Long Valley, Owens Valley, Mojave, Indian Wells and Searles Valleys, and California Valley Groundwater Basins. California DWR Bulletin 118 groundwater basin areas are shown on Figure 2-1 and listed in Table 2-4. Inyo and Mono Counties have not adopted Groundwater Management Plans, which use existing government bodies and authorities to proactively monitor and manage groundwater resource issues. Instead, the counties have groundwater ordinances in place, which employ land-use planning and police powers of locally elected county boards to manage groundwater resources. Inyo County has a groundwater management agreement with the City of Los Angeles. The Mammoth Community Water District completed a groundwater management plan for the Mammoth Basin watershed in July 2005. More recent efforts responding to the California Statewide Groundwater Elevation Monitoring (CASGEM) requirements are discussed in Chapter 4.

Table 2-4. DWR Bulletin 118 Groundwater basins in the Inyo-Mono planning region.

Basin Number	Basin Name	Basin Number	Basin Name
6-7	Antelope Valley	6-55	Coso Valley
6-8	Bridgeport Valley	6-56	Rose Valley
6-9	Mono Valley	6-57	Darwin Valley
6-10	Adobe Lake Valley	6-58	Panamint Valley
6-11	Long Valley	6-61	Cameo Area
6-12	Owens Valley	6-62	Race Track Valley
6-13	Black Springs Valley	6-63	Hidden Valley
6-14	Fish Lake Valley	6-64	Marble Canyon Area
6-15	Deep Springs Valley	6-65	Cottonwood Spring Area
6-16	Eureka Valley	6-66	Lee Flat
6-17	Saline Valley	6-68	Santa Rosa Flat
6-18	Death Valley	6-69	Kelso Lander Valley
6-19	Wingate Valley	6-70	Cactus Flat
6-20	Middle Amargosa Valley	6-71	Lost Lake Valley
6-21	Lower Kingston Valley	6-72	Coles Flat
6-22	Upper Kingston Valley	6-73	Wild Horse Mesa Area
6-23	Riggs Valley	6-74	Harrisburg Flats
6-24	Red Pass Valley	6-75	Wildrose Canyon
6-25	Bicycle Valley	6-76	Brown Mountain Valley

Basin Number	Basin Name	Basin Number	Basin Name
6-7	Antelope Valley	6-55	Coso Valley
6-8	Bridgeport Valley	6-56	Rose Valley
6-9	Mono Valley	6-57	Darwin Valley
6-10	Adobe Lake Valley	6-58	Panamint Valley
6-11	Long Valley	6-61	Cameo Area
6-12	Owens Valley	6-62	Race Track Valley
6-13	Black Springs Valley	6-63	Hidden Valley
6-14	Fish Lake Valley	6-64	Marble Canyon Area
6-15	Deep Springs Valley	6-65	Cottonwood Spring Area
6-16	Eureka Valley	6-66	Lee Flat
6-17	Saline Valley	6-68	Santa Rosa Flat
6-18	Death Valley	6-69	Kelso Lander Valley
6-19	Wingate Valley	6-70	Cactus Flat
6-20	Middle Amargosa Valley	6-71	Lost Lake Valley
6-21	Lower Kingston Valley	6-72	Coles Flat
6-22	Upper Kingston Valley	6-73	Wild Horse Mesa Area
6-23	Riggs Valley	6-74	Harrisburg Flats
6-24	Red Pass Valley	6-75	Wildrose Canyon
6-25	Bicycle Valley	6-76	Brown Mountain Valley
6-26	Avawatz Valley	6-77	Grass Valley
6-27	Leach Valley	6-78	Denning Spring Valley
6-28	Pahrump Valley	6-79	California Valley
6-29	Mesquite Valley	6-80	Middle Park Canyon
6-30	Ivanpah Valley	6-81	Butte Valley
6-34	Silver Lake Valley	6-82	Spring Canyon Valley
6-35	Cronise Valley	6-84	Greenwater Valley
6-46	Fremont Valley	6-85	Gold Valley
6-49	Superior Valley	6-86	Rhodes Hill Area
6-50	Cuddeback Valley	6-88	Owl Lake Valley
6-51	Pilot Knob Valley	6-105	Slinkard Valley
6-52	Searles Valley	6-106	Little Antelope Valley
6-53	Salt Wells Valley	6-107	Sweetwater Flat
6-54	Indian Wells Valley		

Figure 2-1: DWR Bulletin 118 groundwater basins of the planning region



The above map depicts Bulletin 188 Groundwater basins as well as major water-related infrastructure and select water bodies in the region.

Major Water Systems

Water storage and transfers in the Inyo-Mono IRWM planning area are dominated by the Los Angeles (LA) Aqueduct system. All other water engineering within the area is minor by comparison. The project involves extensive infrastructure (Figure 2-1) and vast land holdings (Figure 2-2). Major components of the Los Angeles Department of Water and Power (LADWP) water export and power generation system include a series of diversions and a tunnel for exporting water from the Mono Basin to the Owens River headwaters; the Crowley Lake reservoir in Long Valley; diversions in the Owens River Gorge for power generation; hydropower generation on Big Pine, Division, and Cottonwood Creeks; the Tinemaha, Pleasant Valley, and Haiwee Reservoirs; extensive groundwater pumping capacity; and the Los Angeles Aqueduct (Figure 2-1). Los Angeles' land and water ownership and extensive infrastructure along the east slope of the Sierra link many water management issues in the western part of the Inyo-Mono IRWM planning region.

Within the Mono Basin, the LADWP constructed diversion works on the main tributaries to Mono Lake (except for Mill Creek), a dam creating Grant Lake, and a tunnel to the Upper Owens watershed. Diversions out of the Mono Basin began in 1941 and greatly increased following completion of the second aqueduct in the Owens Valley in 1970. Diversions were halted by court order from 1989 to 1994. Starting in 1995, diversions up to 16,000 acre-feet per year resumed under California State Water Resources Control Board Decision 1631

Southern California Edison operates a series of dams and powerhouses on Mill Creek, Lee Vining Creek, Rush Creek, and Bishop Creek. The Mammoth Community Water District regulates storage in and discharge from a relatively small lake above the town of Mammoth Lakes..

In the upper Owens River watershed (commonly defined as upstream of the Owens Gorge), Crowley Lake was created by construction of Long Valley dam in the early 1940s. The reservoir is the main storage within the LA Aqueduct system and has a capacity of 183,000 acre-feet. At the other end of the Owens Gorge, Pleasant Valley Reservoir was built in 1955 to modulate flows released from the hydroelectric facilities in the Owens Gorge. This reservoir can store up to 3,825 acre-feet.

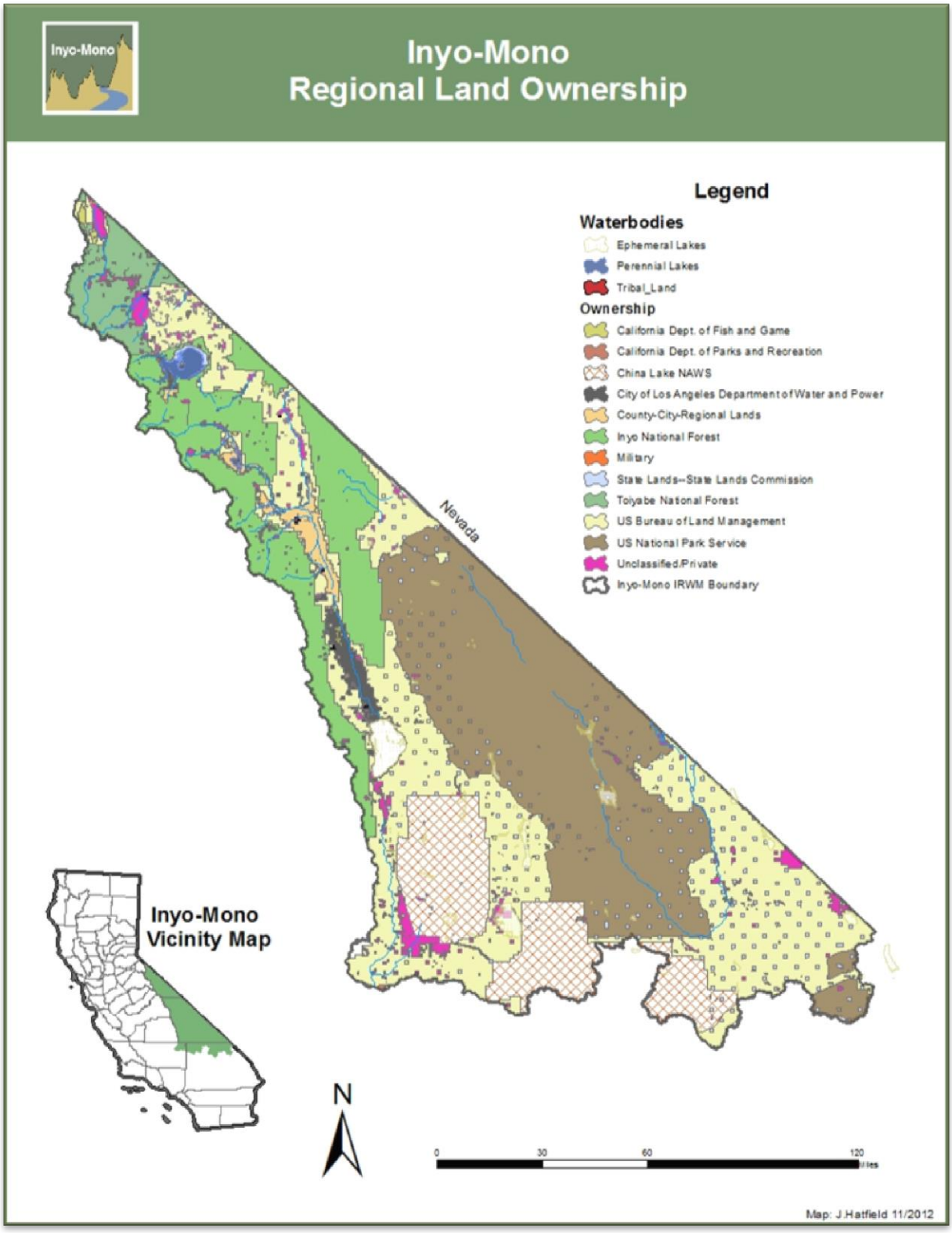
Surface and groundwater exports from the Owens Valley to Los Angeles vary greatly from year to year, with an average of about 356,000 AF between 1970 and 2011 (LADWP, 2011a). Since the dry period of 1987 to 1992, exports have been well below that average in most years. Between 2000 and 2011, export volumes have been as low as 110,000 AF in 2007 and above the 40-year average in 2005, 2006, and 2011 (Harrington, 2009; LADWP, 2011a).

LADWP provides water for different uses within the Owens Valley such as irrigation, livestock

watering, recreation, wildlife, environmental enhancement and mitigation (with respect to groundwater pumping) projects, the Lower Owens River Project, and an extensive dust abatement project on the Owens Lake playa that currently relies heavily on shallow flooding to control dust. Water use by LADWP within the Owens Valley in the 2011-12 runoff year was estimated to be 202,000 AF. That total was distributed among the uses as 95,000 AF potentially available (less was applied) for the dust abatement project, 55,000 AF for irrigation, 16,500 AF for the Lower Owens River Project, 11,000 AF for stockwater, 10,500 AF for enhancement and mitigation projects, 10,400 AF for recreation and wildlife, and 3,900 AF for Indian lands (LADWP, 2011a).

At the northern end of the Inyo-Mono IRWM region, both the West Walker and East Walker Rivers have been developed for irrigation. Stream diversions, canals, and distribution ditches have irrigated Antelope and Bridgeport valleys for more than a century. In the 1920s, the Walker River Irrigation District constructed reservoirs on both the West Walker and East Walker Rivers. Although water stored in Topaz and Bridgeport reservoirs is exported from the stateline-defined watersheds included for the Inyo-Mono IRWM planning area, that water is applied to irrigation within the Walker River Basin, downstream of the state border in Nevada.

Figure 2-2. Land ownership of the Inyo-Mono planning region.



This map illustrates the small percentage of privately owned land in the Inyo-Mono region of which LADWP owns a large proportion.

Description of Internal Boundaries

Political Boundaries

The Inyo-Mono IRWM region includes Inyo and Mono counties in their entirety and small portions of Kern and San Bernardino counties (Figure 1-1). Ridgecrest, Bishop, and Mammoth Lakes are the only incorporated cities or towns in the region and have populations of about 30,000, 3,900, and 8,200, respectively.

Land Ownership and Administrative Boundaries

Almost all the Inyo-Mono IRWM region is public land administered by agencies including USDI-Bureau of Land Management, USDI-National Park Service, USDA-Forest Service, Department of Defense, Los Angeles Department of Water and Power, California State Lands Commission, California Department of Fish and Game, and California Department of Parks and Recreation. Compared to other parts of California, there is remarkably little private or tribal land. The general ownership patterns are illustrated in Figure 2-2. Figure 2-2 also shows the locations of the two cities (Ridgecrest and Bishop), one town (Mammoth Lakes), and some of the small communities (north to south: Coleville, Bridgeport, Lee Vining, Benton, Tom's Place, Laws, Big Pine, Independence, Lone Pine, Keeler, Death Valley, Cartago, Olancha, Shoshone, Tecopa, Trona, and Inyokern).

Several dozen small water districts and other water purveyors (if aggregated) cover less than one percent of the area of the Inyo-Mono IRWM region (Figure 2-1). Most of these entities have considerable financial and operational difficulties related to their small scale and modest customer base. The Indian Wells Water District dwarfs the other districts in size and population served (approximately 30,000 people). The Mammoth Community Water District and the Indian Wells Valley Water District are the only two urban water management districts (serving more than 3,000 connections) in the region.

Identification of Neighboring / Overlapping IRWM Region Boundaries

Several IRWM planning groups adjoin the Inyo-Mono region on the west side of the crest of the Sierra Nevada (north to south: Stanislaus–Tuolumne, Mariposa, Madera, South Sierra, and Kern). The Tahoe-Sierra IRWM planning region meets the northern extent of the Inyo–Mono region along the watershed divide between the Carson and Walker river basins. The Mokelumne–Amador–Calaveras IRWM planning region does not share a boundary with the Inyo–Mono IRWM region, but it is close to the northern part of our region. The Mojave IRWM planning region and Inyo–Mono IRWM region share a portion of the Indian Wells–Searles basin within northern San Bernardino County. The Antelope Valley IRWM planning region is within 20 miles of the southern extent of the Inyo–Mono IRWM region in Kern County. The Fremont IRWM planning region was recently formed and shares part of the southern border of the Inyo-Mono planning region. The geographic relationships of the neighboring IRWM regions with the Inyo–Mono IRWM region are illustrated in Figure 1-1.

Descriptive Geography

With respect to climate and hydrology, the Inyo-Mono region can be split into two broad zones: eastern Sierra Nevada and northern Mojave Desert. Much of the description that follows in this

section generalizes conditions within these two zones. The northern part of the Inyo-Mono region (West Walker, East Walker, Mono, and Owens watersheds) is the eastern Sierra Nevada zone. The southern and southeastern portions of the planning area (Indian Wells Valley, Searles, Upper Amargosa, Death Valley/Lower Amargosa, Pahrump-Ivanpah, and Panamint Valley watersheds) are the northern Mojave Desert zone. Largely because of the far-greater availability of water resources in the eastern Sierra Nevada zone, there is a correspondingly greater amount of information available for the watersheds in the eastern Sierra Nevada zone than those in the northern Mojave Desert zone.

Much of the otherwise uncited information in this section is excerpted from assessments of four watersheds in Mono County (Kattelmann, 2007a, 2007b, 2007c; Kattelmann and Johnson, 2012). Because of these sources, there is an obvious bias toward Mono County. This bias results simply from the availability of information. The comparatively small amount of relevant information about the northern Mojave Desert portion of the planning area is reflected in the small proportion of text devoted to the southern area.

Climate and Potential for Climatic Change

The climate of a region can be considered to be the "average" weather as well as the extremes over some period of time. We are usually limited to the historical period and then often only a few decades during which some systematic measurements of precipitation and temperature were made and recorded. The term "normal" is a convention that typically includes only the past 30 years, although within the region, the Los Angeles Department of Water and Power uses a 50 year average. Similar to the warnings that accompany a financial investment prospectus, we should remember that past climate is no guarantee of future conditions. Nevertheless, recent climate is the best indicator we have of what to expect in the near future. Where inferences are available regarding prehistoric climate, such information is valuable to suggest the range of extremes that are possible in a given region.

Most of the eastern Sierra Nevada region is subject to the Mediterranean-type climate of California, characterized by wet, cool winters and warm, dry summers, and is subject to the orographic rain-shadow effect of being on the lee side of the Sierra Nevada with respect to the prevailing southwest-to-northeast storm direction. An exception to the general rain-shadow pattern occurs when small storms travel south from eastern Oregon into Nevada and then produce upslope flow and orographic lifting on the eastern slope of the Sierra Nevada. Storms typically begin to affect California in October and November and occur at irregular intervals through March in most years. An average of 15 to 20 discrete storms affects central California each winter. Intervals of clear, cool weather lasting one to several days separate these storms, although an extended dry period of three to six weeks occurs in many winters. December, January, and February tend to be the months of greatest precipitation. Storm frequency and intensity typically decrease in April and May, although a few significant storms can occur during the spring. Rain/snow levels of 5,000 to 7,000 feet are typical for most winter storms. The amount of precipitation has been highly variable from year to year.

Summers tend to be dry and warm because of the dominance of high pressure and the absence of a storm track through California during the summer months. Convective thunderstorms

occasionally develop when adequate moisture enters the region. When the "Arizona monsoon" pattern delivers moist air far enough west and north, significant thunderstorms can occur each afternoon and evening for several days at a time in the eastern Sierra Nevada.

Precipitation is greatest in the headwater areas just east of the Sierra Nevada crest. There is a steeply declining gradient in precipitation with distance east from the crest. This rain-shadow effect is largely due to the descent of air in the lee of the crest, which causes warming and evaporation of clouds (Powell and Klieforth, 2000). The areas immediately east of the crest also benefit from wind-driven carryover of precipitation that resulted from the lifting and cooling on the west side of the Sierra Nevada and some wind transport of snow initially deposited west of the crest. Precipitation increases again as air rises up the various ranges on the western edge of the Basin and Range geologic province (*e.g.,* Sweetwater Mountains, Bodie Hills, Glass Mountains, White-Inyo Mountains).

Annual precipitation measured at a few automated sites and inferred from snowpack measurements has mean values exceeding 30 inches per year above 9,000 feet in the Sierra Nevada and tends to decline from north to south. Annual precipitation amounts decline rapidly to the east of the crest with average amounts of 8 to 12 inches in Antelope Valley, 9 inches at Bridgeport, 8 to 15 inches around Mono Lake, 10 inches at Long Valley Dam, and 5 inches at Bishop.

The water equivalence of the snowpack (the depth of water at a point if the snowpack is melted) is measured at about 400 locations throughout the snow zone of California by the Department of Water Resources and cooperating agencies. These measurements are made near the beginning of each month in the winter to supply data for forecasting the amount of snowmelt runoff in streams between April and July. Measurements taken near the beginning of April have been found to approximate the peak accumulation of the snowpack. On average, storms contribute little additional snowfall after April 1, and snowmelt begins to deplete the water storage of the snowpack in early April. Therefore, the April 1 snow survey measurements have been used in many hydrologic studies as a proxy for the season-long accumulation of precipitation in mountain areas where almost all of the precipitation falls as snow and accumulates throughout the winter (the caveat being that some snow melts and sublimates during the winter, thereby reducing the April 1 snowpack). For example, the Mammoth Pass snow course has a continuous record of 81 years (1931 to current [2012]). The long-term April 1 (peak accumulation) average at this site is 43 inches, with a minimum in 1977 of 8.6 inches and a maximum in 1969 of 86.5 inches. Long-term averages of April 1 snow water equivalence from snow courses in the major river basins range from 17 to 51 inches in the West Walker, 18 to 39 inches in the East Walker, 27 to 34 inches in the Mono Basin, 11 to 42 inches in the Upper Owens, and 10 to 31 inches in the Owens south of Crowley Lake. These values are only indicative of precipitation in the highest portions of the respective watersheds just east of the crest of the Sierra Nevada.

The northern Mojave desert zone is characterized by minimal rainfall and great variability in what rainfall does occur. The few precipitation measuring stations in the zone show average annual amounts of only a few inches: 2.4 inches at Furnace Creek in Death Valley, 4.1 inches at Trona, 4.8 inches at Inyokern, 6.7 inches at Mojave, and 6.9 inches at Randsburg (source: http://usclimatedata.com). At a U.S. Geological Survey research station in the upper Amargosa watershed (in Nevada, downstream of Beatty), annual precipitation averaged 4.4 inches from 1981 to 2005 and ranged from 0.14 inches to 8.9 inches (Johnson, et al., 2007). Although the bulk of a year's precipitation tends to fall during the winter months, summer thunderstorms can contribute significant quantities of water to isolated areas every few years. In general, summer precipitation tends to be a greater proportion of the annual total in the eastern part of the Mojave zone (Hereford, et al., 2003). The sparse array of precipitation gages cannot capture any indication of the variability of rainfall over the desert zone, but measured rainfall in individual summer seasons varied from 0 to 5 inches (Hereford, et al., 2003). Geomorphic evidence, such as debris flows in some canyons but not adjacent ones, suggests how rainfall exceeding average yearly amounts can occur in a few hours in small areas. Conversely, several months may pass without any rainfall in a particular area.

Within the Indian Wells Valley watershed, average annual precipitation varies from 5 to 10 inches per year, with less than 5 inches per year in the Ridgecrest/China Lake area and in the El Paso Mountains to the south, up to about 6 inches per year in the Argus Range to the east and the Coso Range to the north, and up to about 10 inches per year in the Sierra Nevada (Indian Wells Valley Water District 2002, cited by Couch, et al., 2003). Most of the precipitation occurs between October and March, with a typical peak in January.

Analysis of all available precipitation records from stations in the Mojave Desert (Hereford, et al., 2003) demonstrated substantial variation throughout the 20th century. There appear to have been some persistent patterns in precipitation during the past century: 1893-1904 was relatively dry, 1905-1941 was relatively wet, 1942-1975 was mostly dry, and 1976-1998 was the wettest portion of the century (Hereford, et al., 2003).

Throughout the region, air temperatures vary markedly both seasonally and daily. There is also considerable variation among years for any given day, making averages a poor descriptor (Howald, 2000a). Records of air temperature are even more limited than those of precipitation or snowpack water storage. The small amounts of water vapor in the air and the absence of

large water bodies allow the air temperature to fluctuate greatly between day and night compared to more humid parts of the country.

Data from a few stations within the eastern Sierra Nevada portion of the Inyo-Mono planning area illustrate the general air-temperature regime. Parts of the East Walker River watershed are well-known as cold spots in California. Bridgeport and Bodie are occasionally in the winter-season news as the coldest locations in the nation when the upper Midwest is unusually warm. Over the past century at the Bridgeport climate station, the average annual maximum temperature was 62°F and the average annual minimum temperature was 24°F. The recorded extremes at Bridgeport have been 96°F and -37°F (California Department of Water Resources, 1992). At Bodie, the average annual maximum temperature was 56°F and the average annual minimum temperature was 19°F (Western Regional Climate Center at http://www.wrcc.dri.edu).

The mean temperature at Cain Ranch, the station in the Mono Basin with the longest record of air temperature, from 1931 through 1979, was 43ºF with a maximum of 94ºF and a minimum of -18ºF (LADWP, 1987). Two sites in and near Lee Vining have monitored air temperature for the periods 1950-88 and 1988-2005. The averages from these sites are remarkably close with an average maximum of about 62ºF and an average minimum of about 34ºF (data from Western Regional Climate Center: http://www.wrcc.dri.edu).

A description of air temperatures at Valentine Camp in Mammoth Lakes (Howald, 2000a) provides some insight into the temperature regime of the mid-elevation forest zone. During summer, mean daily maxima ranged between 65°F and 80°F and mean daily minima ranged between 40°F and 50°F. Nighttime low temperatures, especially at ground level, can drop below 32°F at any time of year, although rarely for more than a few hours on even the coldest summer nights. Radiational heat loss in meadows and cold air drainage from surrounding uplands can result in locally low nighttime temperatures. This cold air pooling during periods of low wind is a feature unique to topographically-complex areas. The forest canopy maintains warmer temperatures among the trees. During winter, mean daily maxima ranged between 35°F and 45°F, and mean daily minima ranged between 15°F and 25°F. However, on many winter days, air temperatures do not rise above 32°F. In some winters, minimum air temperatures can drop to about -20°F during outbreaks of polar air (Howald, 2000a).

At the Sierra Nevada Aquatic Research Laboratory on Convict Creek south of Mammoth Lakes, average annual air temperatures from 1988 to 1998 ranged from 40°F to 45°F, with a mean of 43°F. The mean summer air temperature was 59°F, and the mean winter temperature was 19°F. Maximum temperatures in summer ranged from 73°F to 85°F, with summer minimum temperatures between 32°F and 43°F. July and August are typically the only frost-free months, although frost may occur at any time of the year. Winter diurnal temperature fluctuations are less than in summer. Daytime high temperatures ranged from 30°F to 52°F, and nighttime lows ranged from 0°F to 23°F.

Table 2-5. Air temperature (°F) for several stations in the northern Mojave Desert zone (source: http://www.wrcc.dri.edu):

	Monthly Maximum		Monthly Minimum		Annual Average	
Site	Winter	Summer	Winter	Summer	Maximum	Minimum
Haiwee	53	92	30	63	73	46
Inyokern	61	99	32	65	81	47
Trona	61	102	34	70	81	52
Randsburg	55	96	36	66	75	51
Wildrose RS	53	93	31	62	72	45
Death Valley	67	114	41	85	91	62

Water loss to the atmosphere is a large component of the annual water balance of watersheds in arid environments. Because of low atmospheric humidity, abundant solar radiation, high air temperatures, and moderate wind speeds, there is great potential for large amounts of water to evaporate throughout the Inyo-Mono planning area, especially in the northern Mojave Desert zone. However, water is usually not available to be evaporated; therefore, actual evapotranspiration (evaporation from open water and soils plus transpiration from plants) is a limited fraction of potential evapotranspiration at the watershed scale.

Potential evapotranspiration as estimated from water loss in evaporation pans exceeds 100 inches per year at two sites in the northern Mojave Desert zone. At Mojave from 1948 to 2005, the average water loss is 112 inches per year, with a monthly high in July of 17 inches. At Death Valley from 1961 to 2005, the average annual amount is 140 inches. At this site, the maximum monthly amount is 21 inches in July (http://www.wrcc.dri.edu/htmlfiles/westevap.final.html).

Actual evapotranspiration has been estimated in a few studies within the Inyo-Mono planning area. In the Mammoth Creek watershed, actual evapotranspiration was estimated to average 13 inches over the watershed area (California Department of Water Resources, 1973). In the Mono Basin, Vorster (1985) estimated an average growing season evapotranspiration rate of 24 inches. In the Bridgeport Valley, annual evapotranspiration has been estimated as about 29 inches (Lopes and Allander, 2009).Evapotranspiration in the Antelope Valley area was estimated as 33,000 AF from agriculture and 3,600 AF from phreatophytes (Glancy, 1971).

Significant water loss occurs where water is available, principally from lakes and from

phreatophytes (plants with roots accessing the local water table). Evaporation from the larger natural lakes in the Inyo-Mono planning area has been estimated in a few studies. Open water evaporation from Mono Lake was estimated at about 40-45 inches per year in several studies through the 1960s and at 39 inches per year by the Los Angeles Department of Water and Power (1984). An estimate of 48 inches per year (apparently derived from a 1992 modeling study) was used in an EIR water balance (Jones and Stokes Associates, 1993a: Appendix A). Evaporation from June Lake has been estimated as 38 inches per year (California Department of Water Resources, 1981). Open-water evaporation from lakes above 9,000 feet has been estimated at about 20-25 inches per year, and is limited by ice cover.

Evaporation has also been estimated from some of the region's reservoirs. The average annual total loss at Topaz Lake has been about 69 inches. At Bridgeport Reservoir, with winter ice cover, the average loss has been estimated at 43 inches (Lopes and Allander, 2009). Average annual evaporation from Grant Lake, which also has winter ice cover, has been variously estimated at 26, 36, and 43 inches (Lee, 1969; Los Angeles Department of Water and Power, 1987). Evaporation has been measured by the LADWP at the Long Valley dam during ice-free months with evaporation pans both in the lake and on shore. The pan located on land had an average loss from eight non-freezing months of 41 inches, and the floating pan lost an average of 52 inches over nine non-freezing months (from the same year; Jones and Stokes Associates, 1993a: table 3A-4).

Although water managers would like climate and other environmental conditions to remain "stationary" over time so that measurements in the recent past can indicate what to expect in the future, we are well aware that conditions do change over time. Paleohydrologic studies suggest that both severe floods and extended droughts have occurred in the Inyo-Mono planning area and can certainly happen again. In addition to natural climatic variability, human-induced changes in the atmosphere have the potential to alter future climatic conditions in the area.

The most recent glacial advance peaked about 3,000 years ago (Minnich, 2007). Several lines of vegetation evidence also suggest that period was wetter and cooler than periods before and after. The climate also cooled and had relatively high precipitation during the so-called Little Ice Age, between roughly 1300 and 1800 (Minnich, 2007; USDA-Forest Service, 2011).

Evidence of severe and persistent drought in prehistoric times has been found in the northern part of the planning area, indicating periods of 140 to 220 years with very little precipitation (Stine, 1994). Dozens of Jeffrey pine (*Pinus jeffreyi*) stumps are rooted in the main channel of

the West Walker River upstream of Walker. These trees could survive in that location only if streamflow was so low that the roots of the trees were not submerged for more than a few weeks each year. Radiocarbon dating of the wood showed that an older group of trees was alive between about AD 900 and 1100 and another set of trees grew in the bottom of the channel between about AD 1210 and 1350 (Stine, 1994). The channel is narrow and stable enough that changes in the location of the channel cannot explain the presence of the stumps. The age of the trees in the West Walker River corresponds to the age of other old stumps found in Tenaya Lake and near Mono Lake, suggesting that dry conditions during the same periods allowed establishment of trees in other locations in the region (Stine, 1994). In modern times, the period of 1928 through 1934 is regarded as an extended drought within the Walker River basin.

Records of streamflow in the Owens Valley since the 1920s allow comparison of flood peaks over time. There appears to be a cluster of relatively extreme events in the 1970s and 1980s (Kattelmann, 1992). Five of the largest eight to eleven snowmelt floods (in terms of volume) occurred from 1978 to 1986. Five of the smallest thirteen or fourteen snowmelt floods occurred from 1987 to 1991. Instantaneous peak flows show similar clustering. For example, in Rock Creek, four of the ten largest annual floods and three of the six smallest annual floods happened in the 1980s. Such events support theories developed by some climatologists that because of an observed shift in hemispheric flow patterns, extreme events are becoming more common in North America.

As global temperatures continue to rise as a result of anthropogenic increases in atmospheric greenhouse gases, changes in the climate of the Sierra Nevada can be expected. A wide variety of reports issued in the past decade suggest regional temperatures will rise, precipitation will decline, there will be more rain and less snowfall, there will be a smaller snowpack, the snowpack will begin to melt earlier, and the snowpack will melt faster. However, the situation and the underlying physical processes are not quite so simple. For example, snowmelt in the Sierra Nevada has surprisingly little direct response to air temperature. Solar radiation input to the snow surface is a far more important factor in energy exchange (and therefore, snowmelt) than processes involving the temperature of the air. Water managers relying on the water resources of the planning area need to anticipate the possibility of changes in climate and hydrology compared to the recent past, but should not assume that the common predictions of less snow are the only reasonable scenario (see also Chapter 3).

Under various global climate change scenarios, California is likely to see average annual temperatures rise by 4°F to 6°F in the next century, assuming actions are taken to reduce emissions of greenhouse gases. If no such changes are made, a “higher-emissions scenario” projects statewide temperature averages in California 7°F to 10.5°F higher. The range of figures comes from two models whose projections were summarized by the Union of Concerned Scientists in 2004. A theory suggests that high-elevation areas, such as the upper portions of the eastern Sierra Nevada, may warm more rapidly than regions as a whole.

The Department of Water Resources estimates that a 3ºF temperature increase could mean an 11% decrease in annual statewide water supply. Under the coolest climate change projections,

there could be a loss of about 5 million acre-feet/year in snowpack water statewide. In the eastern Sierra Nevada, the snowpack would not be affected as much as in lower-elevation watersheds of the western slope because most of the heavy snowpack zone in the eastern Sierra Nevada watersheds is at higher elevations (above 8,500 feet) that would still receive mostly snow except under severe warming scenarios. There are also predictions of greater cloudiness in the Sierra Nevada under a warmer climate. However, clouds can either cool an area by blocking sunlight or keep it warm, functioning as a blanket in cold weather. There is uncertainty about how the effects of clouds might play out.

Under various scenarios, it is possible that the glaciers and permanent snowfields of the eastern Sierra Nevada will disappear by mid-century. For example, the Dana Glacier in the headwaters of Lee Vining Creek has already shrunk dramatically since the late 1800s. Chapter 3 contains a more in-depth analysis of possible localized climate change impacts for the region.

Topography, Geology, and Soils

Topography

The geology and land-forms of the Inyo-Mono IRWM planning area are difficult to characterize because of the diversity of the region. One of the few consistent traits is that the entire region is within the Great Basin – all watersheds have internal drainage with no natural outlets to an ocean. Therefore, there is a sense of hydrologic isolation of each of the component watersheds. This region lacks the natural hydrologic connectivity of IRWM groups organized by river basin. Again, it is useful to separate the region into an eastern Sierra Nevada zone and a northern Mojave Desert zone.

The eastern Sierra Nevada zone spans the border between two major geologic provinces: the Sierra Nevada and the Basin and Range. The earth's crust in this region has been stretched apart, leaving a series of alternating mountain ranges and valleys. The mountain slopes tend to be quite steep with relatively little horizontal distance separating points differing in elevation by thousands of feet. The intervening valleys tend to be comparatively level and are composed mostly of materials eroded from the adjacent mountain slopes.

The crest of the Sierra Nevada is the western edge of the planning area and is largely above 10,000 feet in elevation. The crest includes much terrain above 12,000 feet and a few summits above 14,000 feet. The lowest parts of the crest (8,000 to 9,000 feet) are in the northwestern part of the West Walker River watershed, and the highest elevations are found west of Lone Pine and Big Pine. The steepest slopes in the region tend to be near the crest. At the extreme, small areas of the mountain front are vertical, and many areas along the mountains require technical climbing skills for travel. Slopes trend toward lower gradients with distance from the Sierra Nevada crest.

To the east of the Sierra Nevada are several broad valleys: (from north to south) Slinkard Valley (6,550 to 5,750 feet), Antelope Valley (5,600 to 5,000 feet), Bridgeport Valley (6,750 to 6,450 feet), Mono Valley and Mono Lake (6,700 to 6,380 feet), Long Valley (7,000 to 6,750 feet), Round Valley (4,900 to 4,400 feet), and Owens Valley (4,300 to 3,550 feet). There is a second group of intermontane valleys north of Owens Valley: Adobe, Benton, Hammil, and Chalfant.

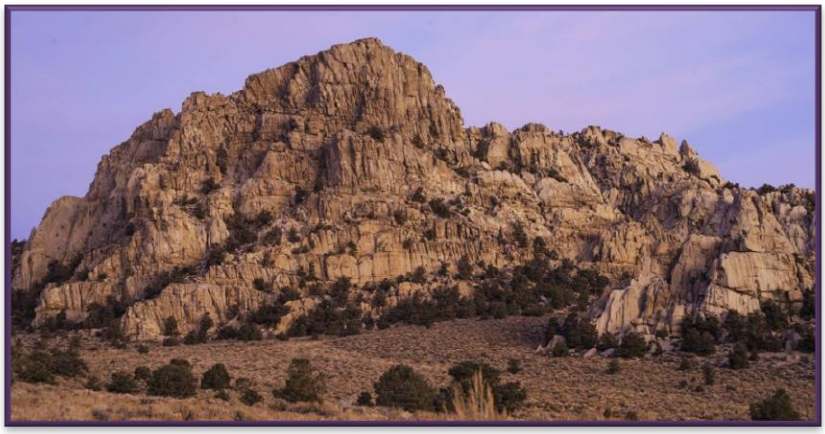
To the east of the main valleys, the terrain rises in a series of north-south oriented mountain ranges, which are the westernmost ranges of the Basin and Range geologic province. The larger of these ranges include the Sweetwater Mountains, Bodie Hills, Glass Mountains, and White-Inyo Mountains. These ranges also have steep topography and rise to between 10,000 and 14,000 feet.

The northern Mojave Desert zone is also part of the Basin and Range geologic province with steep mountain slopes and broad valleys between the ranges. The principal valleys are Saline Valley, Eureka Valley, Death Valley, Rose Valley, Panamint Valley, and Indian Wells Valley. The eastern slope of the southern Sierra Nevada defines the western extent of this southern zone. Among the main mountain ranges in this part of the Inyo-Mono planning area are the southern portion of the White-Inyo Mountains, Panamint Range, Grapevine Mountains, Funeral Mountains, Argus Range, Black Mountains, Greenwater Range, Slate Mountains, Owlshead Mountains, and Lava Mountains. Telescope Peak in the Panamint Range is the high point at 11,049 feet. Less than 20 miles to the east from Telescope Peak is the lowest topographic point in the nation at Badwater, 279 feet below sea level.

Geology

The geology of each watershed influences many of the characteristics of water between its entry via precipitation and departure as streamflow or evaporation back into the atmosphere. There may also be a relatively small amount of water that leaves some watersheds as deep groundwater outflow -- obviously influenced by geology as well. Some of the important influences of geology with respect to hydrologic processes include serving as the parent material for soils, which in turn controls whether water remains on the surface or penetrates into the ground; storage and transport of water below the surface; chemical reactions and contributions of chemical substances to the water; potential for erosion and mass movement of soil and rocks; formation and control of stream channels; and substrate for vegetation, which removes much of the water stored in the soil.

Geology of the eastern Sierra Nevada zone is well described in a wide variety of sources (*e.g.,* Hill, 1975; Bailey, et al., 1976; Whitney, 1979; Lipshie, 1979 and 2001; Rinehart, 2003), and only a basic summary that relates to hydrology is included here. This zone occupies the junction of the Sierra Nevada and Basin and Range geologic provinces. The basic form of the main watersheds is a result of the uplift (and tilt to the west) of the Sierra Nevada relative to the valleys lying to the east of the range. The form of the upper Owens River watershed was further determined by the formation of the Long Valley caldera by a massive volcanic eruption about 760,000 years ago (Bailey, et al., 1976).



Subsequent volcanic activity, earthquakes, erosion and deposition by glaciers, and stream channel processes have contributed to the present-day landscape. Glacial till from eight to twelve glacial advances covers much of the elevation zone between 6,500 and 8,000 feet near the main creeks from the Sierra Nevada.

A variety of rock types occupies the surface and the subsurface zones of the watersheds. Granitic rock of the Sierra Nevada batholith is exposed along the Sierra Nevada front in many places. Metamorphosed sedimentary and volcanic rocks are found on top of the granitic rock in places where erosion did not reach the granitic rock, such as Laurel, Convict, and McGee creeks. Volcanic rocks such as andesite, basalt, and the rhyolitic Bishop tuff (fused ash from the Long Valley caldera eruption with an average thickness of 500 feet [Gilbert, 1938]) are found above the older metamorphic and granitic rocks as well.

The northern Mojave Desert portion of the planning area is mostly composed of sedimentary and meta-sedimentary rock that formed from sediments deposited in shallow coastal waters and tidal flats. Volcanic activity and intrusive magma added basalts, rhyolites, and granitic rocks in localized areas. About 14 million years ago, the area started to be pulled apart by crustal movements, which resulted in a series of uplifted and tilted mountain ranges with valleys in between.

These various rock types have been further rearranged by the numerous faults in the area. The area beneath the town of Mammoth Lakes is particularly complex: interleaved layers of volcanic materials, glacial till, and stream deposits that are further stirred up by faulting. Volcanic processes have also formed many of the uplands throughout the eastern Sierra Nevada zone, such as the Bodie Hills, Anchorite Hills, Cowtrack Mountains, Glass Mountains, Mono Craters, Volcanic Tablelands, Crater Mountain, and Red Mountain.

The intermontane valleys initially formed as down-dropped fault blocks and subsequently filled with sediment transported from the adjacent mountain ranges. Sediment from glacial erosion, mass movements, surface processes, and channel erosion has filled the valleys to depths of hundreds of feet. The Owens Valley has some areas with up to 7,500 feet of alluvial fill. These sediment-filled depressions contain significant groundwater resources as water has filled the pore space between the sediment particles.

The magnitude 6 earthquake of May, 1980, in Long Valley prompted a great deal of local geological research. Dozens of scientific papers have provided a detailed understanding of the geologic history, structure, and activity of the Long Valley caldera (a roughly elliptical volcanic-tectonic depression measuring 18 miles from east to west and 10 miles from north to south). Some of this work is quite relevant to understanding groundwater storage, movement, chemistry, and interactions with surface flows.

The volcanic activity also creates a geothermal energy resource that is directly tied in with the groundwater system. The heat source for various hot springs, fumaroles, and hydrothermal alteration zones is presumed to originate from magma chambers at depths of a few thousand feet. Groundwater is warmed by heat rising from such areas and by water circulating from deep fractures. The presence of hot water at relatively shallow depths causes problems for

municipal/domestic water production that seeks to avoid hot water with a high mineral content but provides the opportunity to extract heat for generation of electricity. The development of geothermal energy near the junction of U.S. Highway 395 and State Route 203 led to the creation of the Long Valley Hydrologic Advisory Committee, a technical group that monitors wells, springs, and streams down-gradient of the geothermal plant for signs of any changes that might be related to the geothermal development and/or overuse of water from Mammoth Creek in the town of Mammoth Lakes. Another large-scale geothermal generating facility is located at Coso, between Haiwee Reservoir and Little Lake.

Over geologic time, hot water circulation has contributed to concentrations of economically valuable minerals in many parts of the planning area. Prospecting for gold and silver occurred almost everywhere except in granitic rocks and lake sediments. Mines around Bodie were the most successful in the region. There were also substantial mining operations in Lundy Canyon, Mammoth Lakes, Onion Valley, Cerro Gordo, and Panamint City. Pine Creek, west of Bishop, was the location of one of the world's largest tungsten mines for several decades.

During the Pleistocene geologic epoch (2.6 million to 12,000 years ago), the Inyo-Mono planning area had a much wetter climate and abundant runoff. The water formed a series of huge lakes that covered many of the intermontane valleys. Lake Russell filled the Mono Basin to a depth about 700 feet above the present Mono Lake. Water from Owens Lake overflowed to the south and formed Fossil Falls enroute to China Lake. The ancestral Amargosa River formed Lake Tecopa and filled much of Death Valley with Lake Manly. Panamint Lake and Searles Lake were also enormous bodies of water during the Pleistocene.

After the climate became much drier, the water evaporated and left vast mineral deposits behind on the lakebeds. Various salts, most importantly borax, were mined from these playa deposits during the late 1800s. Some operations, such as on the west shore of Owens Lake, continued until recent times.

Soils

Soils of the various watersheds throughout the planning area have formed from the underlying geologic parent material and consequently vary with the rock types as well as the localized moisture regime and weathering situation, biological influences, slope position and erosion potential, and time period for soil development. Most of the soils throughout the planning area tend to be shallow, coarse-textured, and poorly developed. The most common texture class is probably gravelly loam. Soils found on steeper soils tend to be shallow, loose, and unconsolidated, whereas soils found on relatively level areas in meadows and other alluvial deposits tend to be deeper, better developed, and less prone to erosion. Because many areas have very young parent materials, only a few hundred to a few thousand years in age, soils tend to be incompletely developed with minimal stratification.

Throughout the eastern Sierra Nevada zone, the soils at lower elevations are generally derived from granitic and volcanic parent material and are sandy loams and decomposed granite. Soil depth ranges from very shallow with lots of rocks to deep alluvium in the valleys (Thomas, 1984). At higher elevations, soil depths range from a few inches to 3 or 4 feet. Sandy loam is the most common texture, but rock content is commonly up to 35 percent, especially on steeper slopes. Water retention tends to be low and decreases when rock occupies a greater proportion of the volume (Thomas, 1984).

Soils on steeper mountain slopes are generally somewhat excessively to excessively drained, coarse-textured, and shallow. Soils that formed on the foothills are well to excessively drained, are shallow to moderately deep, and generally have coarse-textured surfaces with some having coarse-to-fine- textured subsoils. Soils developed on the high terraces are well to moderately well drained on nearly level to sloping terrain. Soils developed on low terraces are somewhat poorly to poorly drained on nearly level terrain. Most terrace soils lie above a heavy textured subsoil with a variety of surface textures. Soils on alluvial fans include well- to excessively-drained soils except where groundwater is present (Mono County Resource Conservation District, 1990).

Soils on floodplains are generally loamy and sandy in texture, and are deep to moderately deep with coarse-textured subsoils. Drainage is somewhat poor to very poor, and soils are eroded by past and present channels of the rivers. Soils formed in topographic depressions are generally clayey throughout and have high organic matter content. These soils also exhibit poor drainage conditions (Mono County Resource Conservation District, 1990). Nevertheless, soils on the valley flats are the best developed and most productive soils in the region. Such soils have allowed reasonably productive agriculture in the Antelope Valley, Bridgeport Valley, and Owens Valley for more than a century.

Within the once-proposed Sherwin Ski Area, which is somewhat representative of portions of the eastern slope of the Sierra Nevada, soils were limited to topographic benches, isolated pockets, and lower-angle swales (Inyo National Forest, 1988). On these low-angle portions of the terrain, soils up to 2 feet thick were noted, and organic layers of several inches depth were found in pocket meadows. Water holding capacity was generally less than 4 inches. Where thin soils were present on steeper slopes, they tended to be highly erodible, especially if disturbed (Inyo National Forest, 1988).

In the valleys once occupied by Pleistocene Lakes, as the water level dropped, salts accumulated in the more recent sediments, particularly on the gently sloping gradients. Soils derived from these sediments tend to have high salt content. In addition, salts and alkali affect many areas of poorly and very poorly drained soils on the floodplains, basins, and low terraces (Mono County Resource Conservation District, 1990).

The greatest potential for soil erosion occurs with sandy soils on steep slopes where water may flow over the surface and entrain soil particles. Areas where vegetation has been removed and soils mechanically compacted (*e.g,* roads, trails, construction sites, off-road vehicle routes) are much more subject to erosion than undisturbed areas. Wind erosion of exposed soils can be significant during high-wind events.

Upland and Riparian Vegetation

Upland Vegetation

Distribution and type of vegetation throughout the Inyo-Mono IRWM planning area are dependent on soils, moisture availability, air and soil temperature, and sunlight. Different vegetation communities tend to be associated with elevation zones because of the combination of environmental factors favoring different plants species. Slope aspect can also play a major role in plant distribution with greater moisture stress on south-facing slopes than on shaded north-facing slopes. The declining gradient in precipitation from west to east results in a rapid transition in vegetation -- from conifer forests in the Sierra Nevada to open woodlands in the hills to sagebrush scrub in the valleys just east of the Sierra Nevada (California Department of Water Resources, 1992). In the northern Mojave Desert zone, water availability also controls the composition and distribution of plant communities. Although trees can survive at elevations above 6,000 feet if sufficient moisture is available, most of the northern Mojave Desert zone is dominated by drought-tolerant shrubs.

At the Sierra Nevada crest on the western margin of the planning area, vegetation cover is sparse with the most wind-exposed locations nearly barren. In more protected locations, grasses, forbs, dwarf shrubs, and even a few whitebark pine (*Pinus albicaulis*) can be found. Moving downslope, the numbers of species and individual plants increase. In addition to the whitebark pine, mountain hemlock (*Tsuga mertensiana*) and western white pine (*Pinus*

monticola) account for the tree species in the subalpine zone, which extends down to about 9,000 feet in the eastern Sierra Nevada watersheds. These trees merge into the red fir (*Abies magnifica*)-lodgepole pine (*Pinus contorta* ssp. *murrayana*) forest. The density of trees and the litter layer of accumulated needles are much greater here than among the scattered subalpine trees. The red fir-lodgepole pine forest merges into the Jeffrey pine (*Pinus jeffreyi*) forest at about 7,500 to 8,000 feet. Some white fir (*Abies concolor*) can be found among the Jeffrey pines. Western juniper (*Juniperus occidentalis* var*. occidentalis*) are also scattered in the east-side forests. Aspen (*Populus tremuloides*) clones are found where soil moisture is high and along creeks (USDA-Forest Service, 2004).

As in most other parts of the Sierra Nevada, decades of fire suppression have markedly changed the composition and density of the mixed conifer forest of the eastern Sierra Nevada. Dense stands of white fir and Jeffrey pine have taken over the former open stands of large Jeffrey pine that were maintained by relatively frequent low-intensity fires (Lucich, 2004). Conifers have also entered former aspen groves and reduced regeneration of aspen (Lucich, 2004).

At upper elevations in the eastern Sierra Nevada zone, shrub communities are comprised of tobacco brush(*Ceanothus velutinus*) and chokecherry (*Prunus emarginatus*). At lower elevations, the brush community is mostly sagebrush (*Artemesia tridentata*), bitterbrush (*Purshia tridentata*), mountain mahogany (*Cercocarpus ledifolius*) and snowberry (*Symphoricarpus albus*) (USDA-Forest Service, 1988).

The lower slopes of the Sierra Nevada (below 6,000 feet) are largely covered by a sagebrush (*Artemisia tridentata*) community, intermingled with meadows and some curlleaf mountain mahogany (*Cercocarpus ledifolius*). Typical species of the sagebrush community include bitterbrush (*Purshia tridentata*), rabbitbrush (*Ericameria* spp.), wheatgrass (*Agropyron* spp.), bluegrass (*Poa* spp.), wild-rye (*Elymus glaucus*), needle-grass (*Stipa* spp.), and June grass (*Koelaria cristata*) (Thomas, 1984).

In the eastern ranges of the northern portion of the planning area, the main plant community is pinyon-juniper (*Pinus monophylla*, *Juniperus scopulorum*) woodland. Bitterbrush and sagebrush dominate the forest understory. The grass composition is similar to that of the lower-elevation Sierra Nevada front to the west (Thomas, 1984).

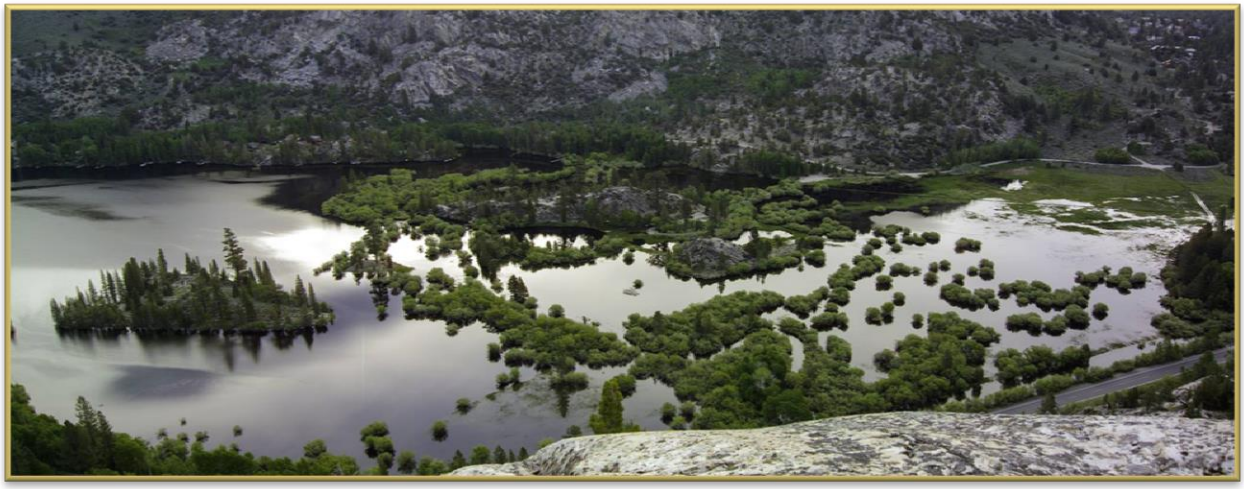
The vegetation at the lower elevations of the West Walker River basin (5,000 to 7,000 feet) has changed substantially since the 1860s from bunchgrass range to bitterbrush and sagebrush (*e.g.,* Thomas, 1984). Prior to the arrival of Euroamericans in the mid-19th century, portions of the West Walker River basin below and between the coniferous forest stands were primarily habitat for pronghorn and desert bighorn sheep. As overgrazing by thousands of domestic sheep during the late 1800s and early 1900s removed the bunchgrass, brush species became established. Consequently, the bighorn sheep and pronghorn left the area, and mule deer moved in, taking advantage of the browse species (Thomas, 1984). The native grasses, sedges, and rushes of the meadows were also converted to alfalfa and other forage species.

Plant communities of the northern Mojave Desert zone are completely different than those of the

eastern Sierra Nevada zone because of the severely limited availability of water in the desert. Only plants able to survive high temperatures, low humidity, little soil water, and saline soils (in some places) are found in the northern Mojave Desert zone. The upper portions of the desert ranges receive several times more precipitation than the surrounding lowlands and are able to support pinyon-juniper woodlands above 6,000 to 7,000 feet (Tweed and Davis, 2003). Limber pine (*Pinus flexilis*) and bristlecone pine (*Pinus longaeva*) grow above 9,000 feet in the southern part of the White-Inyo Mountains and Panamint Mountains. Joshua trees (*Yucca brevifolia*) occur below the pinyon-juniper woodlands at about 4,000 to 6,000 feet (Ingram, 2008). At successively lower elevations and correspondingly drier sites, a wide variety of drought-tolerant shrubs are found. Common plants include sagebrush (*Artemisia tridentata*), rabbitbrush (*Ericameria nauseosus*), burrobush (*Ambrosia dumosa*), brittlebush (*Encelia farinosa*), creosote bush (*Larrea tridentata*), and mesquite (*Prosopis* spp.) (Tweed and Davis, 2003). Several cactus species (about 14) grow in the northern Mojave Desert zone and are well adapted to the arid conditions (Ingram, 2008). They tend to be more abundant in the eastern portion that has greater summer rainfall (Rowlands, 1995).

Riparian Areas and Wetlands

Riparian zones are the areas bordering streams, springs, and lakes that provide a transition from aquatic to terrestrial environments. In arid regions, such as the Inyo-Mono IRWM planning area, riparian areas and the water body they surround are the most ecologically important portions of a watershed. The presence of water allows much life to thrive close to the stream course that would otherwise not exist. As streams rise and fall, the lower parts of the riparian corridor may be inundated for days to weeks. Soil moisture is much higher within the riparian zone than farther up slope and is often saturated close to the stream. Plants within riparian corridors are adapted to the high soil moisture and occasional submergence. Depending on the nature of the soils, topography, and the stream, the riparian zone may be narrow or wide and have an abrupt or gradual transition to upland vegetation (Swanson, et al., 1982; Gregory, et al., 1991; Kattelmann and Embury, 1996).



Riparian areas are considered to be among the most ecologically valuable natural communities because they provide significantly greater water, food resources, habitat, and favorable

microclimates than other parts of the landscape. The extra water alone leads to greater plant growth and diversity of species in riparian areas compared to other areas. The enhanced plant productivity, greater species richness, availability of water and prey, and cooler summer temperatures of riparian areas draws wildlife in greater numbers than in drier areas. Below the forest margin in the eastern Sierra Nevada, riparian areas are a dramatic change from the surrounding sagebrush scrub. In arid lands, streams, springs, and riparian zones are especially critical.

Streams and their adjacent riparian lands allow for the transport of water, sediment, food resources, seeds, and organic matter (Vannote, et al., 1980). Riparian corridors act as "highways" for plants and animals between natural communities that are stratified with elevation. The continuity of riparian corridors is one of their most important attributes. If the upstream-downstream connection is interrupted by a dam, road, or other development, the ecological value of the riparian system is greatly diminished.

In watersheds of the eastern Sierra Nevada, riparian corridors along the major creeks cross through several upland vegetation communities in just a few miles because of the steep topography. In the headwater areas, typical riparian vegetation includes lodgepole pine (*Pinus contorta* spp. *murrayana*), aspen (*Populus tremuloides*), mountain alder (*Alnus incana* spp. *tenuifolia*), currant (*Ribes* sp.), and willow (*Salix* sp.). Jeffrey pine (*Pinus jeffreyi*), black cottonwood (*Populus balsamifera* ssp. *trichocarpa*), and wild rose (*Rosa woodsii*) are present in some of the mid-elevation canyons. At elevations between the glacial moraines and the valley floor, water birch (*Betula occidentalis*), Fremont cottonwood (*Populus fremontii*), and other species of willow add to the mix (Howald, 2000a and 2000b).

Along the streams of the eastern Sierra Nevada, riparian environments offer critical resources for a large, though unknown, fraction of insect and other animal species. For some, the riparian zone is primary habitat. For other species, the riparian resources of water, food, higher humidity and cooler summer temperatures, shade, and cover are used on occasion. Insects are more abundant near streams and are an important food for fish, amphibians, birds, and mammals. Open water and moist soils are both critical for amphibians. Almost all species of salamanders, frogs, and toads native to the Sierra Nevada spend much of their life cycles in riparian zones (Jennings, 1996). Birds tend to be far more numerous and diverse in riparian zones than in drier parts of the watershed. Most mammals at least visit riparian areas occasionally to take advantage of resources that are less available elsewhere in the watershed. The mammal most obviously dependent on the riparian zone is the beaver.

Riparian areas are fundamentally limited to the margins of streams, springs, creeks, and lakes. With their restricted width (generally tens of feet on either side of a stream, wider along flatter portions of the principal streams), riparian areas occupy very a small portion of the landscape. An evaluation of proposed hydroelectric projects in the eastern Sierra Nevada considered riparian zones to cover less than one percent of the surface area of their watersheds (Federal Energy Regulatory Commission, 1986).

Most of the riparian corridors at the higher-elevation portions of the Humboldt-Toiyabe and Inyo

National Forests are relatively undisturbed (except by historical grazing), but many of the riparian areas in lower valleys have been changed by road construction, overgrazing, groundwater pumping, dams, water exports, and recreation. Some of the principal paved roads of the region follow streams for many miles and are often within the riparian zone. Forest roads are within the riparian zone in hundreds of places within the two National Forests of the eastern Sierra Nevada.

Although very important in their limited extent where they exist, there are few riparian areas within the northern Mojave Desert zone. Most are very short segments along channels downslope from springs and seeps that may only be tens to hundreds of feet in length. The Amargosa River canyon south of Tecopa is the best example of an extensive riparian area in the northern Mojave Desert zone. Due to the presence of cooler and wetter conditions and better soil, many washes support greater plant and animal diversity and productivity than the surrounding uplands, and the BLM has begun closing roads in washes in order to protect these biological resources.

Wetlands are areas that are flooded with water for enough of each year to determine how the soil develops and what types of plants and animals can live in that area. They are often called marshes, swamps, or bogs. The critical factor is that the soil is saturated with water for at least a portion of the year. This saturation of the soil leads to the development of particular soil types and favors plants that are adapted to soils lacking air in the pores for a portion of the year. The federal Clean Water Act defines the term wetlands as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."

General acceptance of the ecological values of wetlands has occurred relatively recently (National Research Council, 1995). Drainage and deliberate destruction of wetlands were widely accepted practices until the mid-1970s. California has lost a greater fraction of its wetlands than any other state. Only about 9 percent of the original wetlands (454,000 acres out of about 5 million acres) remain in California (National Research Council, 1992). The recognition of the importance of the small fraction remaining has led to a variety of regulatory efforts to minimize the further loss of wetlands. The relatively recent concept of wetlands as valuable to nature and the public at large has generated conflicts with individuals who own wetlands and do not see any personal benefit.

The largest areas of wetlands in the region are flood-irrigated lands in Antelope Valley, Little Antelope Valley, Bridgeport Valley, and Long Valley. Most of these areas would not be classified as wetlands without the artificial application of water for more than a century. Wetlands in much of Mono County have been inventoried and described in a project of the Lahontan Regional Water Quality Control Board and U.C. Santa Cruz in the 1990s (e.g., Curry, 1996).

The primary loss of wetlands in the upper Owens River watershed occurred with the filling of the Long Valley dam in 1940. A natural dam at the top of the Owens Gorge, caused by the relative rise of the Volcanic Tableland fault block (Lee, 1906), led to the low gradient of the Owens River

through Long Valley and consequent conditions that favored wetlands along the river channel (Smeltzer and Kondolf, 1999). USGS topographic maps made circa 1913 during the studies by Charles H. Lee show more than 4,000 acres of wetlands within Long Valley (Smeltzer and Kondolf, 1999, esp. figure 20).

Within Inyo County, the primary wetlands occur in topographically flat portions of the Owens Valley where springs and seeps bring water to the surface. Wetlands that are important for wildlife are found at Fish Slough, north of Bishop, and near the Lower Owens River. Within the northern Mojave Desert zone, locally important wetlands include: Grimshaw Lake near Tecopa, Saratoga Springs in southern Death Valley, Saline Valley marshlands at foot of Inyo Mountains, Salt Creek and Cottonball Marsh north of Furnace Creek, and Warm Sulphur Springs at Ballarat in Panamint Valley. Several inventories and studies of springs have been conducted in Inyo County (e.g., King and Bredehoeft, 1999; Sada and Herbst, 2001; SGI, 2011; and Steinkampf and Werrell, 1998).

Alpine and sub-alpine meadows also provide many ecosystem services for humans and wildlife yet are in danger of being largely eradicated from the Sierra Nevada. These wetland ecosystems store and filter water that is diverted downstream for human uses; they provide high-quality habitat for invertebrate, birds, and mammals; and they can serve as indicators of past climatic and fire conditions as well as future changes in the climate.

Invasive Weeds

The term weed is typically used to describe any plant that is unwanted and grows and spreads aggressively. The term noxious weed describes an invasive unwanted non-native plant and refers to weeds that can infest large areas or cause economic and ecological damage to an area (USDA-Forest Service, 2004). The USDA-Natural Resources Conservation Service maintains a list of federally- and state-designated noxious weed species (http://plants.usda.gov/java/noxiousDriver#federal). In general, the Inyo-Mono region has thus far remained relatively free of major week infestations, but as visitations to the area increase, there will be an increased risk of significant alterations to native ecosystems. Already, as described below, tamarisk and cheatgrass pose major threats to the region.

At higher elevations, several invasive weeds have been identified, but a detailed description is beyond the scope of this plan. At lower elevations, invasive plants are even more aggressive and have caused widespread problems. Tamarisk or salt cedar (*Tamarix* spp.), a listed noxious weed, has invaded riparian zones, areas with high water tables, and water spreading basins below about 7,000 feet. It readily crowds out most beneficial riparian shrubs and trees and uses

large amounts of water because of its ability to establish deep roots that extend below the water table adjacent to streams. In the Mono Basin, tamarisk is established at levels currently under control (due to an interagency effort) along the lower reaches of Rush and Lee Vining Creeks. Tamarisk has become well established along the lower Owens River and is being treated by the Inyo County Water Department and Los Angeles Department of Water and Power. In the northern Mojave Desert zone, tamarisk removes much of the scarce water from springs and ephemeral stream channels that would otherwise benefit many plants and animals.

Perennial pepperweed (*Lepidium latifolium*) is of increasing concern in the region because of tendency to contribute to erosion of streambanks and the sides of ditches and canals, its tendency to develop monocultures, as well as its aggressive invasive nature and resistance to control. As another example, cheatgrass (*Bromus tectorum*) has been found to produce between 400 and 3400 lbs of vegetative matter per acre (depending on irrigation, soil, etc.), reduces soil moisture several inches below soil surfaces before native plants begin germinating, tends to increase fire frequency and severity, and is affecting pollinator populations and predator-prey relationships on the east slopes of the Sierra Nevada. Other invasive plants, such as woolly mullein (*Verbascum thapsus*), Russian thistle (*Salsola* sp.), Russian olive (*Elaeagnus angustifolia*), and knapweed (*Centaurea* spp.) also have serious implications for terrestrial and aquatic ecosystems. Several other problematic species are targeted by property owners, agencies, and a group formed to combat invasive weeds.

Most of the eastern Sierra Nevada zone of the Inyo-Mono IRWM planning area is covered by the Eastern Sierra Weed Management Area, a consortium of land management agencies and other entities formed in 1998. The mission of this group is the control and eradication of noxious weeds through integrated management activities. Members of the group include Inyo/Mono Counties' Agricultural Commissioner's Office, Inyo County Water Department, California Department of Food and Agriculture, Los Angeles Department of Water and Power, Bureau of Land Management Bishop Field Office, Bureau of Land Management Desert District, Inyo National Forest, Humboldt-Toiyabe National Forest, Inyo/Mono Resource Conservation District, Inyo/Mono Counties' Cattleman's Association, Natural Resources Conservation Service, California Department of Forestry and Fire Protection, California Department of Transportation District 9, Bishop Paiute Tribe Environmental Office, and California Department of Parks and Recreation.

Role of Wildfire

Wildfires are a major watershed management issue as well as natural hazard within the eastern Sierra Nevada zone of the Inyo-Mono IRWM planning area. Wildfires are not much of a concern (except in localized areas and under unusual conditions) within the northern Mojave Desert zone because of the sparse vegetation.

Fire is a natural disturbance feature of the landscape. Prior to the 20th century, the primary cause of fire was lightning, coinciding with summer thunderstorms. When ignited at higher elevations, the fires were typically not large. Lower elevations experience fewer lightning ignitions, but the shrublands have the potential to burn more extensively, and have in the past. Fire suppression policies were instituted in the early days of the National Forest System. With

the near absence of wildfire in the past century, fuel loads in forest and shrublands far exceed natural levels. Therefore, modern fires are likely to be both intense and extensive.

Analyses of tree stumps and cores have suggested that pre-1900 intervals between wildfires were highly variable in the upper Owens River watershed. Before active fire suppression, fires occurred in the Jeffrey pine and mixed conifer stands about every 10 to 20 years on the average, and in red fir stands about every 30 years on the average (Millar, et al., 1996). Wildfires appear to have been low intensity in both pine and fir forests; however, the structure of some red fir stands indicates that stand-replacing fires occurred. The studies of fire history show that the size, frequency, and distribution of fires changed markedly with the beginning of suppression (Millar, et al., 1996).

In the high-elevation subalpine zone, wildfires are uncommon, infrequent, and usually limited to only a few trees. No large historical fires have been documented at elevations over 8,000 feet in the eastern Sierra Nevada zone. Fires intensities tend to be low, and large fires rarely develop. The subalpine zone tends to be cooler and wetter than areas at lower elevation. Forest structure is probably the closest to reference conditions in the subalpine zone because of the scarcity of fire. Most of the late successional forest stands are found at these higher elevations (USDA-Forest Service, 2004).

Fish and Wildlife

Fish, particularly trout, are a highly valued recreational resource of the streams of the eastern Sierra Nevada. Much of the tourism economy of the area is dependent on fishing. The streams and lakes of the region have hundreds of thousands of angler-days of use each season. Introduced in the late 1800s, trout have become thoroughly integrated into the aquatic ecology of eastern Sierra Nevada watersheds, often at the expense of native fish and amphibians. The extent and numbers of non-native trout increased dramatically when aerial stocking of trout became widespread in the 1950s. Before the artificial stocking, most waters in the eastern Sierra Nevada did not contain trout, except for a few creeks that contained native Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*) (Milliron, et al., 2004). Many strains of rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), and brook trout (*Salvelinus fontinalis*) have been planted in lakes and tributaries of the main rivers, and many of these trout have successfully spawned, producing "wild trout" progeny. The term "wild trout" is distinct from "native trout," which refers to trout that existed in streams prior to European settlement and have a defined natural range without

human intervention (Milliron, et al., 2004).

The Lahontan cutthroat trout (*Oncorhyncus clarki henshawi*) is the prominent species of native fish in the Walker River basin. The original range of the Lahontan cutthroat trout has been reduced more than 90 percent by changes in streamflows, channel conditions, and overfishing (Knapp, 1996). Predation by, competition with, and hybridization with introduced trout have also greatly impacted the remaining groups of these fish (Gerstung, 1988). As the once huge population in Walker Lake has declined drastically with increasing salinity, efforts have begun to ensure survival of the species in streams of the upper watershed. When only a few isolated populations could be found, the Lahontan cutthroat trout was listed as endangered under the Endangered Species Act in 1970 and then reclassified as threatened in 1975. The fragmentation of habitat leading to the isolation of small groups of fish is a primary concern.

Native fishes of the Long Valley streams include Owens sucker (*Catostomus fumeiventris*), Owens tui chub (*Gila bicolor snyderi*), toikona tui chub (*Gila bicolor* subspecies), and speckled dace (*Rhynichthys osculus*) (Hubbs and Miller, 1948; Miller, 1973, Chen et al., 2007). The U.S. Fish and Wildlife Service (1998) recommended four “Conservation Areas” within Long Valley to help with recovery of Owens tui chub and Long Valley speckled dace: Little Hot Creek, Whitmore, Little Alkali, and Hot Creek. Within the Owens Valley, the Owens pupfish (*Cyprinodon radiosus*) was the primary native fish. However, the species was reduced to just two locations by 1934 and was thought to be extinct by 1948 (Pister, 1995). After a small population of surviving Owens pupfish was found in 1956, the California Department of Fish and Game, LADWP, and BLM cooperated in creating refuges for the species in the Fish Slough area north of Bishop. Introduced non-native fish, such as largemouth bass (*Micropterus salmoides*), remain a threat to the continued survival of the pupfish.

Fish introductions to the Owens River basin began in the late 1800s with Lahontan cutthroat trout from the Walker River and golden trout from the Kern River. Rainbow, brown, and eastern brook trout from hatcheries in other parts of California were first introduced in about 1900 (Pister, 1995). The Mount Whitney State Fish Hatchery, built in 1917, lead to significant fish rearing and stocking programs in waters of the eastern Sierra Nevada.

The upper Owens River through lower Long Valley, before the reservoir started filling in 1941, was regarded as a "superb stream fishery". The subsequent lake is also a highly productive fishery. The growth rates of rainbow trout and brown trout in Crowley Lake are among the highest ever recorded for a resident trout population in a mountain environment (Von Geldren, 1989). Crowley Lake's high productivity results in trout that gain from three to 40 times their stocked weight before harvest (Milliron, 1997).

In the northern Mojave Desert zone, there are a few isolated populations of pupfish that have remained after Lake Manly dried up. Four species and ten subspecies of pupfish are found in streams, springs, and wetlands of the northern Mojave (Tweed and Davis, 2003). Within California, these fish are located in the Amargosa River, Saratoga Springs, Salt Creek, and Cottonball Marsh.

Amphibians are assumed to be scattered throughout the Sierra Nevada watersheds, but have

been depleted by introduced trout (e.g., Knapp and Matthews, 2000). The larger populations are found in waters without fish. Amphibian populations are also assumed to be declining in the eastern Sierra Nevada as is the case in most of the Sierra Nevada due to disease and predation (e.g., Jennings, 1996). In past decades, anecdotal accounts suggested that frogs and toads were very common, abundant, and widespread. During the 1980s, biologists began to note that amphibians were becoming relatively uncommon and detected diseases and deformities that have not been noticed or at least widely described in the past. A recently identified disease, chytridiomycosis,caused by a fungal pathogen, appears to be spreading at an alarming rate and greatly reducing population size of some amphibian species (Rachowitz, et al., 2006). The principal amphibians of the eastern Sierra Nevada watersheds are Yosemite toad (*Bufo canorus*), mountain yellow-legged frog (*Rana muscosa*), and Pacific tree frog (*Hyla regilla*). Salamanders--including the poorly described Kern Plateau slender salamander (*Batrachoseps robustus,* imperiled) and a southern species of web-toed salamander (*Hydomantes platycephalus)*--are present in some areas as well. The Humboldt-Toiyabe National Forest has established several "critical aquatic refuges" to promote recovery of threatened amphibians. The Kirkwood Lake refuge was established for the mountain yellow-legged frog. It covers 840 acres at the higher elevations of the West Walker River watershed. Surveys of the refuge in 2000 found a total population of more than 10,000 frogs, among the heaviest concentrations in the Sierra Nevada. In addition to these frogs, Yosemite toad larvae were also found in this refuge in the 2000 survey. The Koenig Lake refuge was established for Yosemite toads. It includes 2000 acres in the Latopie, Koenig, and Leavitt lakes subwatersheds. Recent surveys found Yosemite toad tadpoles in the wetlands surrounding Koenig Lake and in unmapped ponds between Koenig and Latopie lakes (USDA-Forest Service, 2004). At the lower elevations surrounding Mono Lake and in the Owens Valley, Great Basin spadefoot toads are common.

A few species of amphibians and reptiles eke out an existence at isolated springs and seeps in more arid reaches of the project area. These include the Panamint alligator lizard (*Elgaria panamintina*, threatened and in decline), the black toad (*Anaxyrus exsul*), threatened but apparently stable), the Inyo slender salamander (*Batrachoseps campi*, a California species of special concern), the Great Basin spadefoot toad (*Spea intermontana*), the red-spotted toad (*Bufo punctatus*), and the western toad (*Bufo boreas*).

Terrestrial Wildlife

In a watershed context, the animals that have the greatest impact on watershed processes are those largely unseen and unappreciated creatures that live below the soil surface and perform an immense amount of work in the soil. The activities of burrowing mammals, reptiles, insects, worms, and amphibians process organic matter and alter the physical structure of the upper part of the soil. Animals in the soil can have a huge effect on the pore space and structure of the soil and, consequently, on the infiltration capacity and water storage capacity of the soil. Human activities that impact soil organisms, such as excavation, compaction, vegetation removal, and pollution, can have secondary impacts on the water relations of the soil.

Animals that are traditionally considered as "wildlife" are primarily of interest in the watershed context with respect to riparian habitat. The eastern Sierra Nevada does not have any wildlife species with either the behavior (*e.g.,* bison) or numbers (*e.g.*, elk in Rocky Mountain National

Park) to make substantial changes in soil properties, vegetation, or stream conditions to alter hydrologic response of the watershed. Nevertheless, all native species have ecological roles, and one could imagine some hydrologic consequences if the population of some species were drastically changed. Fish and wildlife habitat of the upper elevations of the Inyo-Mono IRWM planning area tends to be in excellent condition while the lower portion, below about 7,000 feet elevation, tends to be in less satisfactory condition (Inyo National Forest, 1988).

Most wildlife species are dependent on the riparian zone, at least occasionally, for water, food, or shelter. Changes in riparian and associated wetland vegetation composition, density, and continuity can have serious impacts on wildlife. In most of the Inyo-Mono IRWM planning area, the stream corridors are critically important because of the lack of water elsewhere in the landscape. Wildlife dependent on the creek water and riparian habitat include mule deer (*Odocoileus hemionus*), white-tailed jackrabbits (*Lepus townsendii*), Nuttall's cottontail (*Sylvilagus nuttallii)*, montane vole (*Microtus montanus*), mink (*Mustela vison*), Yosemite toad, and mountain yellow-legged frog. Many birds also use eastern Sierra Nevada riparian habitat, including mourning dove (*Zenaida macroura*), Sooty grouse (*Dendragapus fuliginosus*), band-tailed pigeon (*Columba fasciata*), red-winged blackbird (*Agelaius phoeniceus*), song sparrow (*Melospiza melodia*), northern goshawk (*Accipiter gentilis*), osprey (*Pandion haliaetus*), and red-tailed hawk (*Buteo jamicensus)*. Kestrels (*Falco sparverius*), ravens (*Corvus corax*), goshawks (*Accipter gentilis*), red-tailed hawks (*Buteo jamaicensis*), prairie falcons (*Falco mexicanus*), and golden eagles (*Aquila chrysaetos*) also utilize riparian zones as part of their habitat.

Of the several wildlife species that use eastern Sierra Nevada riparian habitats for foraging, nesting, or cover, some are threatened or endangered or are of special concern. These species include the willow flycatcher (*Empidonax traillii*), greater sage grouse (*Centrocercus urophasianus*), peregrine falcon (*Falco peregrinus*), bald eagle (*Haliaeetus leucocephalus*), osprey (*Pandion haliaetus*), yellow warbler (*Dendronica petechia*), mountain beaver (*Aplodontia rufa*), and Inyo shrew (*Sorex tenellus*) (USDA Forest Service, 1989; California Department of Fish and Game, 1990). Long-distance migrant birds depend on riparian habitats as they travel through the arid Great Basin. The greater sage grouse within Mono County is currently the subject of considerable attention in a Nevada-California effort to avoid the species being listed under the Endangered Species Act (e.g., Casazza, et al., 2009). The Mojave population of desert tortoise is listed as threatened under the federal

endangered species act, and the Fish and Wildlife Service updated its recovery plan for the population in 2011 (US Fish and Wildlife Service, 2011).

One species with direct hydrologic impacts is the beaver (*Castor canadensis*), with their dam-building behavior. Beaver were not known to exist in the Owens and Long valleys when EuroAmericans began settling the area. After World War II, there was a debate within the California Department of Fish and Game about the benefits and risks of introducing beaver. Within the West Walker River watershed, beaver were present along several streams in 1967: Little Walker River, West Walker River, Mill Creek, and Lost Cannon Creek (memo in CDFG files in Bishop office, no date). Beaver were introduced along Mill Creek in the Mono Basin by the Department of Fish and Game in the 1950s. The population thrives above Lundy Reservoir for nearly the entire length of upper Lundy Canyon and in recent years has been spreading to nearby creeks, including Wilson Creek, DeChambeau Creek, and Lee Vining Creek.

Mule deer (*Odocoileus hemionus*) are the most prominent big game species of the eastern Sierra Nevada. The West Walker deer herd is a significant wildlife resource within the basin and affects many land management decisions. The Round Valley deer herd is of similar importance between Bishop and Mammoth Lakes.

Human History, Land Use, Ownership, Demographics, Economy

Human History

Pre-history

Native Americans of the Piute and Washoe tribes lived in the Walker River basin for at least several hundred years. The tribes established settlements in valley bottoms along rivers and lakes. Smaller temporary settlements and campsites were occupied at higher elevations during warmer months and while on food gathering and trading forays. The Miwok from west central California also used the Sonora Pass area and crossed over Tioga Pass (USDA-Forest Service, 2004).

The North Mono Basin is the ancestral home to the Mono Lake Piute (or Kuzedika Piute) Indians and has been occupied continuously for the last 10,000 years. The population and geographical distribution of the native people of the Mono Basin is not known, but they survived upon the natural resources of the basin and traded surpluses with people to the west. After Euro-americans arrived in the 1860s, logging deprived the Kudezika Piute of pine nuts from pinyon pines and caterpillars from Jeffrey pines; sheep grazing damaged the meadows that were the source of seeds, roots, and bulbs; and hunting reduced the pronghorn, bighorn sheep, and sage grouse (Gaines, 1989).

The upper Owens River watershed was probably mostly

occupied in the summer months by the Piute people who could find more favorable year-round conditions in the Owens Valley or to the east. The persistent snowpack and low temperatures were likely to keep Native Americans out of the area during winter and early spring. However, there is some evidence for year-round occupancy of Long Valley, at least in the 1800s (Burton and Farrell, 1992). Presumably, there were good hunting opportunities in the watershed during the snow-free part of the year, and people from adjoining areas lived at the higher elevations during the summer. The Glass Mountains and Obsidian Dome provided high-quality obsidian for projectile points and tools. Volcanism, including ash falls as recently as 660 and 1,210 years ago (Wood, 1977), may have affected the vegetation, wildlife, and water of the upper Owens River watershed enough to limit Native American use of the area for periods of time (Hall, 1984).

Piute people had villages near Owens Lake and presumably farther north in the Owens Valley for centuries. There is evidence of dams and irrigation canals on Bishop and Big Pine Creeks dating back about 1,000 years. At least two square miles of bottomlands were irrigated by these canals to enhance the growth of native vegetation (Steward, 1934; Lawton, et al., 1976).

In the northern Mojave desert zone, semi-nomadic people had camps near the receding Lake Manly for at least 10,000 years (Tweed and Davis, 2003). There is little archaeological evidence of habitation between 7,500 and 4,500 years ago when the region dried out. After the climate moderated somewhat about 4,500 years ago, the archaeological record indicates occupation of the area resumed. The Kawaiisu people lived in the Indian Wells and Panamint valleys and the foothills of the southeastern Sierra Nevada. Southern Piutes lived in the vicinity of present-day Tecopa, and Western Shoshone lived in the most arid parts of the area, such as Saline and Death valleys. Villages near water sources were estimated to be occupied by about 50 to 60 people and total population of the northern Mojave desert region was probably less than 1,000 people (Tweed and Davis, 2003).

1820-1855

Trappers, including Jedediah Smith and Joseph Walker, apparently crossed the lower Walker River basin in 1827 and 1833. The first Euro-Americans known to have visited the West Walker River basin were in the Bartelson-Bidwell party, who were the first overland emigrants to California. This group came through Antelope Valley in October, 1841, and struggled over the Sierra Nevada somewhere north of Sonora Pass. The earliest exploration of the upper Owens River watershed by Euro-Americans is uncertain. LeRoy Vining began prospecting in the Mono Basin in 1852 or 1853.

In 1834, Joseph Walker descended into Indian Wells Valley from Walker Pass and may have entered the southern portion of Owens Valley. He was back in 1843, passing Owens Lake with a party of 50 emigrants before ascending Walker Pass (Tweed and Davis, 2003). John C. Fremont traveled through the Owens Valley in October of 1845 and named the lake, river, and valley for one of his guides, Richard Owens, who was not present during that part of the expedition (Chalfant, 1933).

Traveling west from the vicinity of present-day Las Vegas, a party led by Antonio Armijo

followed part of the Amargosa River and passed through the southern end of Death Valley during the winter of 1829-30 (Tweed and Davis, 2003). This route later became known as the "Spanish Trail". In the autumn and winter of 1849, several parties of emigrants ventured into Death Valley and experienced great hardships. Not all members survived – leading to the eventual name of the valley.

1855-1900

Antelope Valley was settled in the late 1850s and began to produce hay for Carson City and Virginia City (Mono County Resource Conservation District, 1990). Irrigation ditches were soon constructed to expand the land under cultivation. In addition to hay fields and pastures, farmers in the valley grew beans, melons, corn, tomatoes, and berries and started orchards that produced apples, peaches, and plums.

Settlers moved into the Owens Valley during the 1850s. During the winter of 1861-62, the greatest floods of the historical period were observed throughout the Sierra Nevada. Although the upper Owens River watershed was probably unoccupied at the time, persistent rainfall intermixed with snow led to extreme flows in the streams entering the Owens Valley. At the peak of the floods, the Owens River was estimated to be one-fourth to one-half mile wide. The harsh winter and inundation of the Owens Valley led to violent conflicts over food between Piutes and early white settlers (Chalfant, 1933).

Although gold was discovered near Bodie in 1859 and in Aurora in 1861, these mining areas did not take off until the late 1860s and early 1870s. The mining booms drew lots of travelers through the West Walker River and East Walker River watersheds and produced heavy demand for agricultural products from the rapidly growing farms of the Antelope and Bridgeport Valleys. N.B. Hunewill established a sawmill in Buckeye Canyon to supply lumber for Bodie. Sheep herding expanded in the uplands in response to the demand from the mining towns, and continued in large numbers into the early 1900s.

In the Mono Basin, prospecting led to towns in Lundy Canyon, upper Lee Vining Creek, and Rattlesnake Gulch. Farms and ranches in the basin supplied food to these gold-mining communities. Irrigation ditches were developed at that time to bring water from creeks to pastures and farm fields. LeRoy Vining operated a sawmill in Lee Vining canyon in the 1860s.

A group of prospectors continuing the search for the "Lost Cement Mine" in 1877 found a rich gold-silver vein in "Mineral Hill" or "Red Mountain" just east of Lake Mary (DeDecker, 1966). They called it the "Mammoth Vein" and organized the Lake mining district. Word of the new strike spread quickly, and miners rushed to the area. Mining camps were built nearby, including Mammoth City, Pine City, Mill City, and Mineral Park. The combined population in 1879 was thought to exceed 1,500 (DeDecker, 1966). A dam was constructed at Twin Lakes to supply hydro-mechanical power. The mining boom led to construction of a wagon road from Benton, a toll road up the Sherwin Grade from Bishop, and a toll trail from Oakhurst to supply beef cattle (DeDecker, 1966).

During the mining boom, the Owens Valley became home to farmers and ranchers and had a population of several thousand people by the turn of the century (Irwin, 1991). Some Owens

Valley ranchers drove cattle and sheep into the highlands of Long Valley and the upper Owens River area for summer and fall grazing in the 1880s (Burton and Farrell, 1992). There are no records of the extent or intensity of grazing for the first few decades. When the Inyo National Forest took over administration of the forested federal lands from the Sierra Timber Reserve in 1908, one of the first tasks was to control overgrazing (Millar, et al., 1996).

The mining town of Kearsarge in Onion Valley was destroyed by avalanches in 1864. Silver was discovered in 1865 at Cerro Gordo, east of Owens Lake. In 1872, the strongest earthquake in California's history devastated Lone Pine, which had about 250 residents at the time.

1900-1930

Many of the farms and ranches of Antelope Valley were consolidated in the 1880s by cattle baron Thomas B. Rickey. By the turn of the century, Rickey's operations were using enough water that downstream ranchers in Smith and Mason valleys believed that their water rights were being infringed upon. In 1899, work began on Topaz Reservoir and was later completed by downstream water interests that formed the Walker River Irrigation District in 1919. Water storage began in 1921, and by May 1924, about 30,000 AF of water were stored in Topaz Reservoir (California Department of Water Resources, 1992).

As more people in southern California accumulated wealth and leisure time in the early 1900s, the eastern Sierra Nevada, including the Mammoth Lakes area, became a destination for summer recreation. An automobile trip from Los Angeles required about two and a half days in 1914. A paved road along the eastern escarpment of the Sierra Nevada (close to the present route of U.S. Highway 395) would not be completed until 1931 (Irwin, 1991).

Large-scale development of the water of the Owens River began in 1903 when the U.S. Reclamation Service began a study of water resources in the eastern Sierra Nevada. Establishment of the Inyo National Forest was apparently linked to potential water development (Martin, 1992). Watershed protection was proclaimed as the reason for creating the Inyo National Forest by President Theodore Roosevelt in May, 1907. After the lands were surveyed in 1905, one of the Forest Service employees wrote: "This addition will protect and regulate the water flow of the Owens River and its tributaries" and [the lands] "were set aside to protect the Owens River watershed, to protect the water supply of the City of Los Angeles" (Ayres, 1906; quoted in Martin, 1992). The City of Los Angeles began acquiring land and water rights in the Owens Valley as well as performing initial engineering work for an aqueduct and storage facilities in the early 1900s. Construction began in 1908, and water was flowing through the completed aqueduct in 1913. During a dry period in the 1920s and early 1930s, Los Angeles completed approximately 170 new wells in

the Owens Valley to supplement water exports via the first aqueduct using groundwater from underlying aquifers in the Owens Valley.

1930-Present

The capacity of Topaz Reservoir was increased to about 60,000 acre-feet in 1937. The Marine Corps Mountain Warfare Training Center in Pickel Meadow was established in 1951.

Construction of the Mono Craters Tunnel and stream diversion works began in 1934, Grant Lake dam was enlarged in 1940, and water export from the Mono Basin began in 1941. Export capacity was increased in 1970 with completion of the second barrel of the Owens Valley aqueduct to Los Angeles. Several lawsuits regarding Mono Lake and tributary streams were settled in the 1980s, resulting in minimum flows for Rush and Lee Vining Creeks. In 1994, the State Water Resources Control Board issued decision D-1631, amending LADWP's water diversion licenses.

In 1932, the Los Angeles Department of Water and Power purchased Fred Eaton's ranch in Long Valley and began construction of the Long Valley dam. In the following years, the Department purchased other properties in Long Valley to secure water rights of the tributaries to the Owens River. After water from the Mono Basin began to flow through the tunnel in 1941, the upper Owens River served as a canal with extra flows averaging 50,000-100,000 acre-feet per year for the next 50 years. The Pleasant Valley Dam was constructed in 1957.

In 1970, Los Angeles completed its second aqueduct and filled it with 1) increased groundwater exports from the Owens Valley; 2) increased surface water exports from the Owens Valley (obtained from reductions in irrigation water previously supplied to Owens Valley ranchers), and 3) increased surface water diversions from the Mono Basin. The consequent groundwater pumping impacts to Owens Valley springs and ecosystems stimulated a series of legal actions that resulted in a joint groundwater management agreement for Inyo County in 1991, the partial rewatering of 62 miles of the lower Owens River in 2006, and several other environmental mitigation projects, some of which have not yet been completed. By the 1930s, Owens Lake was completely dry due to diversions.

Land Use

As automobiles became more common, the driving public pushed for more roads and those roads, in turn, influenced land use. Growth accelerated after World War II and winter recreation began to be a potent economic force. The first chairlift at Mammoth Mountain Ski Area was installed in 1955. Twenty-five lifts were in service by the mid-1980s, and snowmaking equipment began to be installed in the early 1990s. In 2004, the resort recorded 1.5 million skier-days, second only to Vail ski area in Colorado.

The Town of Mammoth Lakes began to grow significantly in the late 1960s. In 1971, the Inyo National Forest plan stated that Mammoth Lakes was the "fastest growing community in the country" (Millar et al., 1996). The 1990 census reported a population for the town of 4,785. Another period of dramatic growth occurred in the late 1990s, with census results of 7,100 in 2000 and 8,200 in 2010.

The Inyo-Mono IRWM planning area is largely in public ownership for conservation and management of natural resources. Only about 1.7 percent of Inyo County is in private ownership, and there is only slightly more private land in Mono County. Outdoor recreation on public lands by visitors from outside the region drives the local economies. Agriculture is the dominant land use on private property in the area. About 71,000 acres of Mono County and 22,000 acres of Inyo County are under irrigation for alfalfa, miscellaneous hay, and irrigated pasture. Agricultural activities also occur on public land in the planning area. Land is also dedicated to military uses at the Naval Air Weapons Station at China Lake and Mountain Warfare Training Center east of Sonora Pass.

Recreation is a major land use and dominant economic force throughout the Inyo-Mono IRWM planning area because of the scenic beauty and high proportion of public land. The Inyo National Forest receives about ten million visitor-days of use per year. Recreation is also popular on lands of the Humboldt-Toiyabe National Forest, Bureau of Land Management, Death Valley National Park, and Los Angeles Department of Water and Power.

The Mammoth Mountain Ski Area is potentially the largest single source of sediment within the upper Owens River watershed. Mammoth Mountain has more than 30 ski lifts on a permit area of 3,200 acres with a design capacity of 19,000 skiers at one time. Ski areas have an inherent conflict between providing good skiing conditions with shallow snow and maintaining enough vegetation to minimize erosion. The steep slopes of ski runs also allow flowing water to apply sufficient force to readily dislodge soil particles. Besides these fundamental issues common to all ski areas, the pumice and poorly developed soils on Mammoth Mountain are prone to erosion once disturbed and stripped of vegetation. The ski area has an active erosion control program and has successfully established grasses on many of the ski runs. Most of the runoff from open ski runs is also channeled through sediment detention basins in an effort to reduce the movement of sediment beyond the ski area boundaries.

Compared to other parts of the Sierra Nevada, the potential for significantly increased erosion and sedimentation from off-highway vehicle (OHV) use is relatively small in the eastern Sierra Nevada because of the limited rainfall and snowmelt runoff. However, a critical exception to that statement occurs near and in water courses. When vehicles enter riparian areas and cross streams, there can be significant sediment movement, simply because of the presence of water. There have been anecdotal observations of OHV caused erosion in Glass and Deadman creeks in the past decade. The Inyo National Forest has attempted to address the problem through restricting vehicle use in the Glass/Hartley area.

Grazing

There was a period of severe overgrazing in the late 1800s to early 1900s throughout the Sierra Nevada that resulted in widespread changes in vegetation cover and composition and active channel erosion. The northern portion of the planning area was assumed to have been impacted in a manner similar to the bulk of the mountain range. An estimated 200,000 head of sheep grazed the Walker River country around 1900 (USDA-Forest Service, 2004). The rangelands have been recovering ever since under less intense grazing pressure.

The upper Owens River watershed may not have been as severely overgrazed in the second half of the 19th century as many other parts of the Sierra Nevada because of the greater distance to markets and population centers. Although we know that Owens Valley ranchers drove livestock into Long Valley and beyond for summer and fall grazing in the 1880s (Burton and Farrell, 1992), there is little other documentation of the extent and intensity of grazing in the upper Owens watershed before 1900. When the first rangers of the Sierra Timber Reserve arrived in Mono County in 1903, their orders were to keep trespassing sheep out of the reserve (Millar, et al., 1996). Overgrazing apparently persisted through the 1940s. In 1944, the Inyo National Forest attempted to bring rangeland use, quantified by animal unit months (AUMs), closer to range productivity and resolve grazing damage to and conflicts with other resources (Millar, et al., 1996). Within six years of adopting that plan, grazing intensity on the whole forest had dropped by 40 percent.

The City of Los Angeles Department of Water and Power leases grazing rights on much of the land in the planning area. Riparian fencing projects for grazing and recreation management on tributaries to the Upper Owens River that were installed in the 1990s demonstrated considerable improvement in riparian conditions (Jellison and Dawson, 2003).

Agriculture and Forestry

In the northern portion of the region, agriculture, primarily cattle ranching, is the dominant land use in the broad Antelope and Bridgeport valleys. Pasture irrigation is the largest single use of agricultural water in Antelope Valley (DWR, 1992). Other areas of large-parcel private land include Little Antelope Valley and the Sonora Junction area. In the early 1970s, there were approximately 38 farms and ranches operating within the West Walker River watershed with a combined area of about 15,870 acres (USDA Nevada River Basin Survey Staff, 1975).

In the 19th century, agriculture was the most extensive land use in the Mono Basin and relied on water diverted from the creeks on the west side of the basin. By the 1890s, perhaps 4,000 acres were irrigated for both crops and pasture (Vorster, 1985). The amount of land under irrigation probably peaked at about 11,000 acres in 1929 (Harding, 1962; cited by Vorster, 1985). As the City of Los Angeles acquired land and water rights in the 1930s, the amount of land under cultivation in the Mono Basin decreased.

Irrigated agriculture in the Owens Valley was practiced for hundreds of years by the native Piute people who constructed artificial channels to enhance the growth and volume of vegetative resources (Steward, 1934; Lawton, et al., 1976). Euro-Americans began to settle in the Owens Valley in the 1860s and rapidly cleared native vegetation to enable farming (Vorster, 1992).

Irrigation canals were constructed, and more than 250 miles of canals and ditches were in place by 1890 (Babb, 1992). This extensive irrigation network allowed most of the average annual flow of the Owens River to be diverted and spread across tens of thousands of acres of cropland and pasture. By 1900, about 15,000 acres were cultivated and another 21,000 acres were intermittently irrigated for pasture (Vorster, 1992). By 1905, the diversion of water from the Owens River for irrigation had led to a 33-foot drop in the level of Owens Lake over the preceding 30 years. By 1913, in response to a few relatively-wet years and reduced irrigation on lands just purchased by the City of Los Angeles, the level of Owens Lake rose about 15 feet (Lee, 1915; Babb, 1992). As the City of Los Angeles acquired most of the land and water rights in the Owens Valley, agriculture declined rapidly. By the early 1990s, about 3,000 acres of alfalfa and other forage crops were irrigated along with about 8,000 acres of pasture, mostly under lease from the City of Los Angeles (Vorster, 1992).

The Walker River watersheds and the Mono Basin were major sources of lumber and fuel wood for the mines near Bodie and Aurora. A five-ton steamer was brought from San Francisco in 1879 to tow barges filled with lumber from Lee Vining Canyon across Mono Lake (Hart, 1996). Apparently, there were so few trees remaining near Lee Vining in the 1920s that lumber had to be brought from Mammoth and Bodie to build the school. In the early 1880s, a railroad was constructed on the east shore of the lake to transport lumber from Mono Mills, on the southeast side, toward Bodie. The logging camp at Mono Mills operated intermittently until 1917 (Hart, 1996).

Timber management on lands of the Inyo National Forest within the upper Owens River watershed has been a relatively small-scale activity compared to other national forests in the Sierra Nevada. Most of the harvesting has occurred in the Dry Creek, Deadman Creek, and Hartley Springs portion of the Glass Creek watershed on the west side of U.S. Highway 395 and the area northeast of Crestview. In the 1960s and 1970s, eight timber sales totaling about 60 million board feet were conducted in the watershed. These harvests removed large Jeffrey pines of high value per tree until about 30 percent to 40 percent of the large trees were cut. By the late 1960s, most of the forest east of the highway had been harvested in this manner, leaving half to two-thirds of the mature trees (Millar, et al., 1996). In 1979, the Inyo National Forest adopted a new plan for the area north of Mammoth Lakes that emphasized timber harvesting with only watershed consequences as a major constraint. Between 1979 and 1988, seven timber sales were harvested with about 30 million board feet of timber cut. As public and agency values shifted during the 1980s and 1990s, an old-growth forest management strategy was developed by the Inyo National Forest (USDA-Forest Service, 1992). During the 1990s wintertime logging was conducted over snow cover in order to protect soils. By 2000, logs were no longer being trucked north out of the area. Currently, most timber harvest is used locally for fuelwood and lumber.

Mining

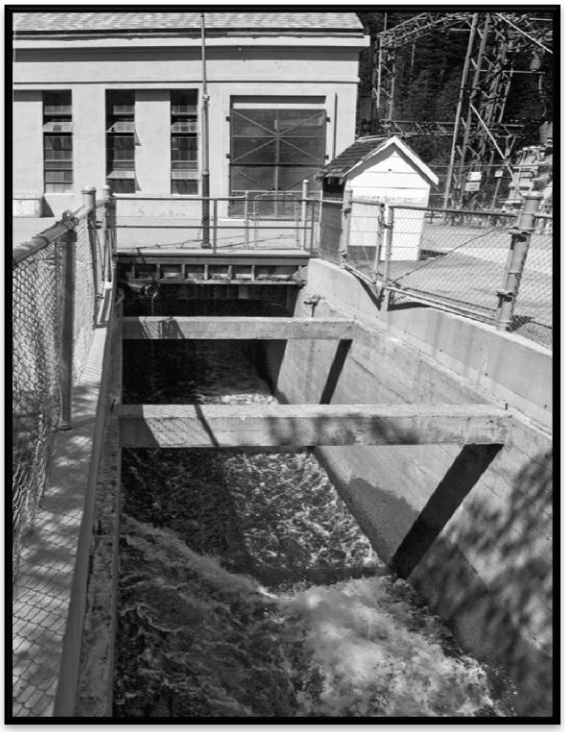
Following the discovery of gold at Dogtown in the East Walker River watershed, in 1857, prospectors moved south into the Mono Basin and found gold in and near Rattlesnake Gulch in 1858 or 1859 (Fletcher, 1987). The first town in what was to become Mono County, Monoville, grew rapidly around the Mono Diggings. The miners needed water to work the placer deposits

and soon built a ditch from Conway Summit to import water from Virginia Creek (DeDecker, 1966).

The headwaters of Lee Vining Creek and Mill Creek were extensively prospected and mined in the 1870s and 1880s. The Great Sierra Silver Mine and Bennettville were established in Mine Creek, a tributary to Lee Vining Creek, between 1878 and 1888. The efforts of hauling mining equipment from Lundy, building the Great Sierra Wagon Road (eventually part of the route of the Tioga Pass road) from the west, boring deep tunnels in hard rock, as well as living at 10,000 feet, made Bennettville and the Tioga Mining District legendary (DeDecker, 1966).

Mining began in the Mammoth Lakes basin in the 1870s and played out relatively quickly. Prospecting throughout the watershed led to active mining in a few locations, but none of the mines was particularly successful. Prospecting and mining occurred all along the eastern slope of the Sierra Nevada, often for short periods following the boom and bust of mineral strikes. For example, Kearsarge City, serving the mines above Independence, was briefly the largest community in Inyo County in the mid-1860s. Mining and processing activities that produced tungsten and molybdenum in Pine Creek were a rare exception to the short mining cycle and persisted for several decades (Kurtak, 1998).

Mining in the northern Mojave region began in the late 1860s and peaked quickly during the 1870s with successful silver mines at Cerro Gordo, Panamint City, Darwin, and Tecopa. Mining of various salts from the lakebeds and playas of the region followed the silver boom. Extraction of borax from Death Valley and Searles Lake was profitable until supply overwhelmed demand by 1888. Gypsum, table salt, talc, potash, and soda ash were profitably mined from China Ranch, Saline Valley, Searles Lake, and other deposits. Mining operations still continue at Searles Lake (Tweed and Davis, 2003) with more than 1.75 million tons of chemicals exported from the Trona processing plant in 2005.



Hydroelectric Generation

In 1893, a hydroelectric generating facility on Green Creek above the Bridgeport Valley began supplying alternating current to the Standard mill in Bodie.

Water from Mill Creek was diverted to generate hydroelectric power in the early years of the 20th century. In 1911, the Lundy Project was completed by the Southern Sierra Power Company (Perrault, 1995). Construction of a dam raised the natural outlet of Lundy Lake 37 feet to an elevation of 7,803 feet (Stine, 1995). Lundy reservoir has a surface area of 130 acres and a usable capacity of about 3,800 AF

(Perrault, 1995). The diversion to the Lundy powerhouse has a capacity of about 70 cfs. Southern California Edison assumed ownership and control of the hydroelectric facilities in 1962 as Federal Energy Regulatory Commission project 1390.

Regulation of the flows in Lee Vining Creek for hydroelectric generation began in 1921 (now FERC project 1388). Ellery, Tioga, and Saddlebag reservoirs in the headwaters of Lee Vining Creek have a combined storage capacity of 13,600 acre-feet. Much of the creek's flow is contained within a penstock between Ellery Lake (9,490 feet) and the Poole Powerhouse (7,840 feet). About 27,000 acre-feet of water flows through the powerhouse each year.

Between 1916 and 1925, dams were constructed to enlarge Agnew and Gem lakes and at Rush Creek Meadows to form Waugh Lake to allow storage and regulation of water for the Rush Creek powerhouse near Silver Lake. Waugh, Gem, and Agnew reservoirs can store 4,980; 17,060; and 860 acre-feet, respectively, for Southern California Edison's FERC project 1389.

Following the completion of the Long Valley dam, which regulates Crowley Lake, the LADWP constructed a series of penstocks and power houses downstream in the Owens Gorge. The system began operation in 1953, and the Owens River was effectively dried up within the Gorge. In 1991, an error in the operation of the system damaged a penstock, and water was released back into the natural channel. Once the river began to flow again, the total diversion could not legally resume under the state Fish and Game Code. Managed streamflow, riparian vegetation, and a trout fishery have been restored within the Owens Gorge.

The Bishop Creek hydroelectric system diverts water from the south and middle forks of Bishop Creek and generates electricity at four powerhouses. The system began more than a century ago when the Nevada Power, Mining, and Milling Company began to transmit electricity from their Bishop Creek powerhouse to Tonopah in 1905. Over the following eight years, the Nevada-California Power Company constructed dams that formed South Lake and Lake Sabrina and built five powerhouses that utilized more than 3,500 feet of head. The original wood-stave pipe was replaced between 1949 and 1983 (JRP Historical Consulting Services and California Dept. of Transportation, 2000). The system is now operated by Southern California Edison under FERC license 1394.

LADWP operates hydroelectric facilities on Big Pine Creek, Division Creek, and Cottonwood Creek. The Division Creek powerplant was built in 1905 to supply electricity to help with construction of the aqueduct. In 2008, LADWP proposed the concept of a new hydroelectric plant at Tinemaha Reservoir.

Large-scale solar power projects were proposed on and near Owens Dry Lake in 2010, as well as within the Owens Valley and in more remote parts of southeast Inyo County.

Roads

Many of the roads in eastern Sierra Nevada watersheds have direct impacts on channels and riparian systems because the roads are built on floodplains, in the riparian zone, and/or make frequent crossings of the stream. The most obvious example is U.S. Highway 395 through Walker Canyon. Slopes disturbed by the road placement and construction were long-term

sources of sediment to the West Walker River. This section of road was largely destroyed by the flood in January 1997. Portions of other paved roads are often adjacent to or cross major streams. Unpaved forest roads have many areas of contact with streams and riparian zones and are sources of sediment. GIS analyses by Mono County found that the West Walker River watershed contains more than 490 miles of mapped roads that cross streams in at least 380 places, and more than 38 miles of roads are within 100 feet of a stream. In the upper Owens River watershed, the total length of roads is about 1,750 miles, there are more than 1,200 stream crossings by roads, and more than 120 miles of road are within 100 feet of a stream.

Wild and Scenic River Status

The California Wild and Scenic Rivers Act of 1972 preserves designated rivers possessing "extraordinary scenic, recreational, fishery, or wildlife values" in their free-flowing condition. The act prohibits construction of dams, reservoirs, and most water diversion facilities on river segments included in the system (California Department of Water Resources, 1992). The major difference between the national and state acts is that if a river is designated wild and scenic under the state act, the Federal Energy Regulatory Agency can still issue a license to build a dam for hydropower generation on that river. Because of this difference, designation under the National Wild and Scenic Rivers Act (1968) affords enhanced protection (Horton, 1996).

The main channel of the West Walker River from the headwaters near Tower Lake to the confluence with Rock Creek near the town of Walker and Leavitt Creek downstream from Leavitt Falls were added to California's Wild and Scenic River System in 1989. The designated section includes about 33 river miles of the main stem and about 5 miles of the tributary Leavitt Creek (DWR, 1992).

A special provision of the California Wild and Scenic Rivers Act applies to the West Walker River because it is an interstate stream and a source of agricultural water and domestic water:

"The California Wild & Scenic Rivers Act does not prohibit the replacement of diversions or changes in the purpose of use, place of use, or point of diversion under existing water rights, except that no such replacement or change shall operate to increase the adverse effect, if any, of the preexisting diversion facility or place or purpose of use, upon the free-flowing condition and natural character of the stream, and no new diversion shall be constructed unless and until the Resources Secretary determines that the facility is needed to supply domestic water to the residents of any county through which the river or segment flows and that the facility will not adversely affect the free-flowing condition and natural character of the stream."
(http://www.dot.ca.gov/ser/vol1/sec3/special/ch19wsriverschap19.htm#ch19WestWalker)

In 2009, federal Wild and Scenic River status was granted to the headwaters of the Owens River, including Glass Creek and Deadman Creek and portions of the Amargosa River.

Aquatic Conservation Areas

The Sierra Nevada Forest Plan Amendment (aka Sierra Nevada Framework) process of the USDA-Forest Service initiated a series of new aquatic conservation measures. The Humboldt-Toiyabe National Forest applied this management direction to the establishment of several "critical aquatic refuges." These refuges were identified in the Framework amendment as small

watersheds that contain:

- known locations of threatened, endangered, or sensitive species
- highly vulnerable populations of native plant or animal species
- localized populations of rare native aquatic- or riparian-dependent plant or animal species

The primary management goal for critical aquatic refuges is to preserve, enhance, restore or connect habitats distributed across the landscape for sensitive or listed species to contribute to their viability and recovery (USDA-Forest Service, 2004).

Land Ownership and Interagency Cooperation

Land ownership in the Inyo-Mono region is primarily public (Figure 2-2). Approximately 94% of Mono County is publicly owned: 88% is owned by the federal government (US Forest Service, National Park Service, Bureau of Land Management, and Department of Defense), 6% by city and state governments, and the remaining 6% is privately owned. The City of Los Angeles owns about 63,000 acres of land in the southern portion of Mono County. Ninety-two percent of Inyo County is federally owned, about 2% is state-owned lands, and the City of Los Angeles owns approximately 4% of the land in Inyo County. The Shoshone and Paiute Indian tribes also own Reservations or Colonies throughout the region.

At the watershed level, a couple of examples from the northern portion of the region illustrate the prevalence of public land. More than 85% of the West Walker River watershed is in public ownership by the U.S. Forest Service, Bureau of Land Management, and the California Department of Fish and Game for resource management purposes (USDA Nevada River Basin Survey Staff, 1975). More than 90 percent of the Mono Basin is USDA-Forest Service, Bureau of Land Management, or Los Angeles Department of Water and Power land. Since 1981, the California Department of Parks and Recreation has also been involved, following the creation of the Mono Lake Tufa State Reserve. The state reserve consists of approximately 6,000 acres of the shoreline of Mono Lake, including landscapes ranging from alkali flats to highly productive wetlands, and the bed and waters of the lake itself. The Inyo National Forest administers the Mono Basin National Forest Scenic Area, established by Congress in 1984. A management plan for the Scenic Area includes some provisions for private property within the boundaries. Mono County and the USDA-Forest Service have different land-use restrictions, both of which must be met by private landowners.

Land use planning within the Inyo-Mono IRWM region is fragmented with respect to the varied ownership of the land. Two federal agencies (U.S. Forest Service and Bureau of Land Management) and the LADWP administer most of the land area. Private land is subject to zoning and planning controls of the county governments or the three incorporated jurisdictions (Ridgecrest, Bishop, and Mammoth Lakes). Within Mono County, the Mono County Collaborative Planning Team has been somewhat successful in coordinating land use planning among the different agencies since its formation in 1996. Although information exchange has been its primary influence to date, there is great potential through this mechanism to affect general policies and decisions that have widespread consequences.

Part of the public land administered by the Bureau of Land Management, mostly in the vicinity of Crowley Lake, is covered by "watershed withdrawals" made by Congress and the President in the 1930s. The original purpose of these withdrawals was to prevent speculative homesteading in anticipation of acquisition by the City of Los Angeles. The particular status of these lands prevents their sale or exchange, may influence federal water rights appurtenant to these lands, and gives the BLM additional legal status with respect to any hydropower licenses within the designated area.

Demographics, Residential Development, and Economy

Compared to most of California, the Inyo-Mono IRWM region is very sparsely populated. Mono County has a population density of about four people per square mile, and Inyo County has only two people per square mile. The City of Ridgecrest within the small part of Kern County that is in the Inyo-Mono IRWM region constitutes about half of the total population of the region (27,616; 2010 Census).

Table 2-6. Population of Inyo and Mono Counties between 1970 and 2010

	1970	1980	1990	2000	2010
Inyo	15,571	17,895	18,281	17,945	18,546
Mono	4,016	8,577	9,956	12,853	14,202

The West Walker River watershed contains four communities: Walker, Coleville, Camp Antelope, and Topaz. The population of Antelope Valley was 574 in 1970 and 1,187 in 1980. The footprint of these communities is quite small. Similarly, in the East Walker River watershed, Bridgeport (county seat of Mono County) is the only community with much population (about 1,000). The economies of these basins are based on agriculture, tourism, government services, and the U.S. Marine Corps Mountain Warfare Training Center and its affiliated housing compound near Coleville.

There are three communities within the Mono Basin: June Lake, Lee Vining, and Mono City. Private property is limited outside these communities. Lee Vining has a population of about 350 people, includes about 20 businesses along U.S. Highway 395, and occupies about 30 acres. Mono City is a community of approximately 100 residents near the junction of U.S. Highway 395 and State Route 167. The year-round population of June Lake is about 650. The communities of Lee Vining and June Lake have economies focused on travelers and tourism. The June Mountain Ski Area attracts winter visitors. These communities serve as centers for hiking, mountain biking, fishing, camping, and skiing.

Mammoth Lakes is the largest community in the upper Owens River watershed, with an area of four square miles and a population of about 8,200. The peak population during holiday periods and busy weekends in 2005 was about 35,000. These large variations in population from day to day have created an unusual set of problems for planning and operations for water supply and

sewage disposal as compared to municipalities with relatively stable water demand. The Mammoth Mountain Ski Area is a major driving force in the local economy and the largest employer in Mono County. Other tourism-dependent businesses constitute a significant fraction of economic activity. Residential construction is an episodically important source of employment in southern Mono County.

Ranches along the upper Owens River have remained as relatively large undeveloped parcels, and a few upland areas with access to water along the old Highway 395 have been subdivided in the communities of Aspen Springs, Hilton Creek/Crowley Lake, McGee Creek, Long Valley, and Sunny Slopes. Beyond these communities and Mammoth Lakes, the upper Owens River watershed contains only a few scattered homes.

In the Owens Valley, the principal communities with their respective populations (where available) are Swall Meadows (250), Paradise, Rovana, Starlite, Aspendell, Bishop (4,000), Big Pine (1,400), Independence (600), Lone Pine (700), Keeler (<100), Cartago (110), and Olancha (130). North of Bishop, principal communities are Chalfant and Hammil (700 combined) and Benton and Benton Hot Springs (400 combined). People older than 64 constitute 20 percent or more of the population of the larger communities of the Owens Valley (versus 11 percent of California's population), which suggests that the area is favored by retirees, and a significant proportion of the valley's total income is from transfer payments. The Los Angeles Department of Water and Power is a major employer throughout the Owens Valley.

In the northern Mojave desert zone, the principal communities are Furnace Creek (50), Darwin (50), Trona, Ridgecrest (30,000), Inyokern (1,000), Shoshone (50), and Tecopa (100). Ridgecrest has a vastly greater impact on water resources than the smaller communities. The economy of Ridgecrest is fundamentally tied to the adjacent China Lake Naval Weapons Station.

Descriptive Hydrology

Runoff Generation and Water Balance

The eastern Sierra Nevada part of the Inyo-Mono IRWM planning area has a runoff pattern dominated by snowmelt from April through July that is typical of most Sierra Nevada rivers. A winter snowpack usually begins to accumulate in November at the higher elevations, attains maximum water storage in late March or early April, and then melts over the next 2-3 months.

After several months of low discharge during autumn and winter, the streams begin to rise during April with the initial snowmelt and carry sustained high flows through May and into June. As the snowpack gets thinner and snow cover disappears from successively higher elevations, streamflow declines through summer and eventually reaches the minimal flows of autumn. For example, approximately 81 percent of the annual runoff of Mill Creek in the Mono Basin has been attributed to snowmelt, occurring from April through September, and the remaining 19 percent of the annual streamflow occurs as base flow from October through March (Perrault, 1995). Occasionally, a warm winter storm brings enough rainfall over enough of the watershed to raise streamflow for a few days. On rare occasions, these storms lead to significant rainfall and runoff that have generated the largest floods on record.

The northern Mojave Desert zone generates very little runoff, and that runoff is isolated in time and space. Occasional winter storms produce sufficient rainfall to generate runoff from overland flow or downslope water movement through soil layers to a nearby channel. Intense summer thunderstorms can also put a lot of water into channels in a short period of time, creating flash floods. Runoff is also produced by groundwater outflow at seeps and springs. Even where there is some runoff, it often infiltrates back into the bed of the channel not far from the source. Most of the time, most of the channels in the northern Mojave Desert are dry.

A water balance is a useful tool for understanding the various quantities of water involved in different parts of the hydrologic cycle within a particular watershed. Water balances basically show what fraction of incoming precipitation becomes runoff versus what fraction is lost to the atmosphere or adds to groundwater storage.

For example, a coarse water balance (starting with generated runoff from small tributaries) of the entire Walker River basin estimated that 184,700 AF of runoff enter the upper West Walker River and 1,000 AF evaporate before the river enters Antelope Valley. Within Antelope Valley, another 28,700 AF enter and 38,400 AF are lost to evapotranspiration (31,300 AF from irrigated fields, 2,800 AF from phreatophytes, and 4,300 AF from lake surfaces) for a net export from Topaz Lake of 174,000 AF (Carson River Basin Council of Governments, 1974).

A thorough water balance of part of the Owens Valley aquifer system showed how groundwater storage can change over a period of years before and after the second aqueduct to Los Angeles began operation (Table 2-7; Hollett, et al., 1991; Danskin, 1998).

Table 2-7. Water balance for part of the Owens Valley aquifer system for water years 1963-1969 and 1970-1984.

Average Annual Values (AF)		
Component	**WY 63-69**	**WY 70-84**
Precipitation	+2,000	+2,000
Evapotranspiration	-112,000	-72,000
Tributary streams	+106,000	+103,000

Average Annual Values (AF)		
Component	**WY 63-69**	**WY 70-84**
Mtn front non-stream recharge	+26,000	+26,000
Runoff from outcrops within fill	+1,000	+1,000
River & Aqueduct seepage	-16,000	-3,000
Spill gates	+6,000	+6,000
Lower Owens River	-5,000	-3,000
Lakes & reservoirs	+1,000	+1,000
Canals, ditches, & ponds	+32,000	+31,000
Irrigation and watering of stock	+18,000	+10,000
Pumped and flowing wells	-20,000	-98,000
Springs and seeps	-26,000	-6,000
Underflow into aquifer system	+4,000	+4,000
Underflow out of aquifer system	-10,000	-10,000
Total recharge	+196,000	+184,000
Total discharge	-189,000	-192,000
Change in groundwater storage	-7,000	+8,000

In this water balance, negative change in storage means water is entering groundwater storage and a positive change in storage means that groundwater is flowing out of storage. The terms are thoroughly explained in the cited reports. The summary is provided here just as an example of a water balance within the Owens Valley.

Streamflow Averages and Extremes

The eastern Sierra Nevada region, especially Owens River watershed, has an unusually high density of streamflow measuring stations, in part because of the high value of the water resources in the area. Streamflow in the eastern Sierra Nevada is highly variable over time, so information about the range in values and the time period considered is at least as important as averages. For example, even on an annual basis, the maximum annual volume for the East Walker River near Bridgeport over the 1926-2011 period of record was more than ten times the minimum annual volume: 321,000 AF in 1983 vs. 27,000 AF in 1931. This range of variability is also illustrated in the extremes in observed annual flow of some of the tributaries to the upper Owens River (Table 2-8; Smith and Aceituno, 1987).

Table 2-8. Annual flow for five upper Owens River tributaries (cfs)

Stream	Mean	Minimum	Maximum
Convict Creek	26	10	75
Glass Creek	8	2	20
Deadman Creek	6	2	20
Rock Creek	26	13	70
Upper Owens R.	30	15	70

Tributaries to the Owens River from the Sierra Nevada contribute significant volumes of water each year, primarily during the April through July snowmelt-runoff season. Only two streams on the east side of the Owens Valley have any appreciable flow: Coldwater Canyon and Silver Canyon Creek; however, these streams typically discharge less than 2,000 acre-feet/year. In the Inyo Range, Mazourka Creek (USGS station 10282480) was monitored between 1961 and 1972. No flow was recorded all days except during two brief periods in 1967 and 1969. During these periods, discharge peaked at more than 1,300 and 600 cfs, respectively (Hollett et al., 1991; Danskin 1998).

Droughts and Floods

As noted in the climate section, severe and persistent droughts occurred in the West Walker River watershed during AD 890-1110 and 1210-1350 (Stine, 1994). These dry periods had so little streamflow that Jeffrey pine trees grew on the bottom of the channel in the Walker River Canyon. Modern dry spells are short and wet by comparison.

During the past century, periods with well-below average precipitation in the West Walker River watershed occurred in 1924-25, 1928-34, 1960-61, 1976-77, and 1988-92. Topaz reservoir was drained below its operating capacity at times during these dry years. Downstream in Nevada, the Walker River stopped flowing at the Wabuska stream gage in 1924-25 and 1931 (California Department of Water Resources, 1992).

Two serious multi-year droughts occurred in most of the region in the past century: 1923 through 1935 and 1987 through 1992 (Jones and Stokes Associates, 1993a: Appendix H). Streamflow was also much below average in 1976 and 1977. In addition to an occasional dry year, there have been five periods over the past century in which precipitation and resulting runoff in the upper Owens River were well below average for multiple years: 1928 to 1934, 1959 to 1961, 1976 to 1977, 1987 to 1992, and 2000 to 2004. These periods did not correspond exactly with dry periods noted above for the West Walker River.

At the opposite extreme, floods are a basic attribute of channels in the eastern Sierra Nevada and northern Mojave Desert. Hydrologic and geomorphic processes that create alluvial channels tend to make the channel capacity adequate only to handle peak flows that happen with an average frequency of about 1.5 years (or a probability of about 0.67). Peak flows above

the channel capacity spill out onto the floodplain and are termed floods. Routine floods rarely have much impact beyond continuing to shape the channel and its adjacent floodplain. However, every few years, various conditions combine to generate considerably larger floods that catch our attention. As the magnitude of floods increases, the frequency of such flows decreases. For example, a very large flood may occur only once in a century (on the average over a very long period of time). This average frequency (sometimes called a return period or recurrence interval) can also be expressed as a probability of occurrence in any given year (*e.g.,* a "one-hundred year flood" has a probability of 0.01 in a particular year).

In the West Walker River, damaging floods occurred in 1950, 1955, and 1997. Prior to the January 2, 1997, peak of about 12,500 cfs, the flood peak of record at the West Walker River near the Coleville gage was 6,500 cfs on December 11, 1937 (California Department of Water Resources, 1992). By contrast, in the adjacent East Walker River, the 1997 flood was only about one-third higher than the previous peak of record (1,910 cfs in 1997 vs. 1,390 cfs in 1963). Floods that cause widespread damage throughout an entire watershed are relatively uncommon. Types of floods in the northern portions of the planning region include winter rain floods, spring snowmelt floods, and localized floods often associated with summer thunderstorms.

Flood damage from the winter rainstorms is most significant in Antelope Valley where low-lying lands can be inundated in even relatively small rainstorms (California Department of Water Resources, 1992). Many lots in the community of Walker, especially between North River Lane and Meadow Drive, are within the 100-year flood plain of the West Walker River.

Snowmelt runoff in 2005 largely filled the channel of the West Walker River within Antelope Valley. In late May, water levels ranged between 8 and 9.2 feet at a gage where 9.0 feet is considered flood stage. Minor flooding was reported between Walker and Topaz. Snowmelt runoff again filled the West Walker River to near flood stage in May, 2006.

In the Mono Basin, floods that were significant from a watershed management perspective occurred in 1967 and 1969 in Rush and Lee Vining creeks. These snowmelt floods of the late 1960s greatly eroded the channels and moved enormous amounts of sediment.

Within the Town of Mammoth Lakes, the 100-year (0.01 probability) peak flow in Mammoth Creek was estimated at 550 cfs (Environmental Sciences Associates, 1984). Some houses

adjacent to the Snowcreek Meadow and immediately downstream could get wet under extraordinary flood conditions, especially if debris jammed the bridges on Minaret and Old Mammoth roads.

Because of the large size of the Owens River watershed (425 mi^2 at Round Valley and 1,975 mi^2 at Big Pine) and its wide range of hydrologic conditions, flood peaks tend to be influenced by the relative timing of peaks in the tributary streams and areal distribution of runoff along with the total volume of water flowing in the main channel (Kattelmann, 1992). Therefore, the largest peak flows at one place along the river do not necessarily coincide with those at other sites along the channel. For example, the largest flood of record (December 12, 1937) on the Owens at Round Valley and Pleasant Valley was attenuated to a comparatively average event by the time it reached Big Pine and Lone Pine. Four floods exceeding twice the mean annual-flood at the gage near Big Pine have occurred during the past century. This index of flood activity is similar to the average for rivers of the western slope of the Sierra Nevada (Kattelmann, 1992). The Los Angeles Aqueduct has been significantly damaged by floods within the Owens Valley on at least four occasions: January, 1943, October, 1945, December, 1966, and August, 1989.

The Amargosa River floods in response to prolonged winter storms as well as intense rainfall during summer. Of the 33 annual peaks recorded at the gage at Tecopa, 20 occurred from July through October and 13 occurred from November through March. The flood of record on the Amargosa at the Tecopa gage was about 10,600 cfs on August 19, 1983. The second highest peak was about 5,000 cfs on February 26, 1969.

Groundwater

Groundwater resources are important throughout the Inyo-Mono IRWM planning area but are particularly valuable in the northern Mojave Desert zone where surface water is severely limited. Most of the aquifers that are pumped in the region are unconsolidated alluvial or lakebed deposits in the vicinity of major streams or Pleistocene lakes. Groundwater infrastructure is most developed in the Owens Valley and Indian Wells Valley. The California Department of Water Resources in its Bulletin 118 (2010) identified about 60 distinct groundwater basins within the Inyo-Mono IRWM planning area (Figure 2-2 and Table 2-4). None of these basins has sufficient data to calculate an adequate groundwater budget. A few of these basins are described below as examples of groundwater resources and use.

Within the West Walker River basin, groundwater is found in two relatively distinct portions of the hydrologic system. Some water is below the ground surface for short periods of time (hours to months) as it flows downslope toward a surface channel or one of the three groundwater basins. This shallow groundwater can be considered as the slow portion of the runoff generation, and most of it ends up as streamflow or is captured by plant roots and lost to the atmosphere. The second type of groundwater can be considered to be in long-term storage (years to centuries), either within fractured bedrock or in the deep groundwater basins of Antelope Valley, Little Antelope Valley, or Slinkard Valley. Alluvial sediments have accumulated to depths of dozens to hundreds of feet within these structural basins and have vast storage space in the pores between the particles. The estimated storage capacities of the groundwater basins of Antelope and Slinkard valleys are 160,000-170,000 and 72,000 AF, respectively

(DWR, 1964). These estimates were based on a storage interval between 10 and 100 feet and a specific yield of 5 percent to 15 percent.

A recent report by the California Department of Water Resources contained a little information on groundwater levels within the Antelope Valley. Based on 85 well completion reports, depths ranged from 48-415 feet with an average of about 200 feet. As of now, there is no routine monitoring of well levels reported to the state (DWR, 2004) although that may change with the recent CASGEM reporting requirements. Agricultural irrigation is a significant contributor to groundwater recharge throughout the Antelope Valley. Water infiltrates from the canals, and a lot of applied water infiltrates below the root zone of crops (DWR, 1992).

Because of the lack of data about both the depth of the porous fill material in the Bridgeport Valley and its specific yield, guesses about the storage capacity of the Bridgeport Valley groundwater basin have ranged from 250,000 to 4,000,000 AF.

Groundwater in the Long Valley caldera portion of the upper Owens River watershed can be grouped into three basic categories: a relatively shallow cold-water system (less than 800 feet), a shallow thermal system, and a deep thermal system. The cooler waters are of excellent mineral quality while the warmer (> 80°F) waters have higher concentrations of dissolved solids (USDA-Forest Service, 1994). More than 45 wells have been drilled in the Mammoth Lakes basin since 1976 (USDA-Forest Service, 1994). Out of the first 24 wells, only one yielded good quality water at pumping capacities greater than 200 gallons per minute (well #1, 600 gpm, 500 acre-feet yield). Most of this yield was believed to come from fractured volcanic rocks (Mammoth County Water District, 1981; Gram / Phillips, 1985). Additional wells drilled since 1987 have been more productive (Mammoth Community Water District, 2005).

The main aquifer for the warm springs at the Hot Creek fish hatchery is a fractured basalt flow (Lipshie, 1979). Materials filling the Long Valley caldera include interbedded volcanic rocks (lava flows and tuffs) and sedimentary deposits (lakebeds, stream deposits, and glacial outwash). Fractured lava flows tend to be more permeable than poorly sorted sediments, such as glacial materials (California Department of Water Resources, 1973:31-36). The overall circulation of shallow groundwater is from west to east. An order-of-magnitude estimate of the time required for groundwater to circulate through the system from recharge in the west to discharge at the hot springs along Hot Creek is 100 to 1,000 years (Lipshie, 1979).

The Owens Valley groundwater basin has a surface area of just over 1,000 square miles and a productive aquifer about 1,200 feet thick. Total storage capacity has been estimated to be between 30 and 35 million acre-feet (California Department of Water Resources, 2004). Between 1970 and 1990, groundwater pumping by the Los Angeles Department of Water and Power averaged 104,000 acre-feet per year in the Owens Valley. Since Los Angeles and Inyo County settled litigation over the second aqueduct in 1990, groundwater pumping has averaged 72,000 acre-feet per year. The water table within the city limits of Bishop is largely within ten feet of the surface (Nolte Associates, 2008a).

The Indian Wells Valley groundwater basin (DWR Bulletin-118 #6-54) has a surface area of approximately 600 square miles and is enclosed by the Sierra Nevada on the west, the Coso

Range on the north, the Argus Range on the east, and the El Paso Mountains to the south (DWR, 2004). The average depth of basin fill sediments is about 2,000 feet, with more than 7,000 feet of fill in the western portion of the valley (Couch, et al., 2003). A near-surface aquifer that may have been contaminated in parts of the Naval Air Weapons Station at China Lake overlies a regional aquifer at depths of a few tens of feet to several hundred feet below ground surface. Clays deposited in the Pleistocene-age lakes that constitute much of the Indian Wells Valley groundwater basin form a barrier between the shallow and deep aquifers.

The regional aquifer has been extensively utilized to supply water for agriculture, the city of Ridgecrest, town of Inyokern, scattered residences, and the Naval Air Weapons Station at China Lake. The use of water for irrigation in the Indian Wells Valley dates back to an early alfalfa farm in about 1910. Current pumping for irrigation supports alfalfa and various field and orchard crops. In 2001, the largest producers of groundwater in the basin were the Indian Wells Valley Water District (production of approximately 8,400 acre-feet per year), private agricultural users (7,900 acre-feet per year), Naval Air Weapons Station at China Lake (2,800 acre-feet per year), and Searles Valley Minerals (2,700 acre-feet per year) (Couch, et al., 2003).

A large pumping depression is found in the vicinity of the Intermediate Well Field of the Indian Wells Valley Water District. Between 1921 and 1988, groundwater levels declined about 80 feet in this area (Indian Wells Valley Water District, 2002; cited by Couch, et al., 2003). Groundwater levels continue to decline at a rate of 1.0 to 1.5 feet per year near this well field and under Ridgecrest. This groundwater depression results from pumping of the District's water supply wells, agricultural wells, and private supply wells (Couch, et al., 2003).

Concern has been expressed regarding the sustainability of groundwater as a resource in the Indian Wells Valley. Groundwater production has decreased from about 30,000 acre-ft/yr in the mid-1980s to about 25,000 acre-ft/yr currently. Estimates of overdraft range between 16,000 and 29,000 acre-ft/yr. The primary limitations on quantifying the amount of overdraft are accurately determining recharge into the basin and quantifying well production, particularly from individual agricultural landowners. Groundwater flow directions and gradients are now primarily controlled by pumping from water supply wells (Couch, et al., 2003). A groundwater budget estimated that the volume of annual pumping is about twice the amount of recharge under 1985 conditions (Bean, 1989).

A cooperative groundwater management group is attempting to manage the aquifer system of the Indian Wells Valley. The major users of groundwater in the valley - Indian Wells Valley Water District, Naval Air Weapons Station at China Lake, and Searles Valley Minerals - have prepared a plan with the goal of extending "the useful life of the groundwater resources to meet current and foreseeable user needs in the Valley" (Indian Wells Valley Cooperative Groundwater Management Group, 2006).

Water Demand and Projections

The principal uses for water in the Inyo-Mono IRWM planning area are agriculture and export. A best guess for water applied to irrigated fields and pastures is 250,000 to 350,000 acre-feet per year, based on about 90,000 acres of irrigated land in the two counties and an average

application of 3 to 4 feet of water per season. The applied amount varies from 2.4 feet in the Bridgeport Valley (Lopes and Allander, 2009) to about 5 feet on lower-elevation fields leased from LADWP. The quantity of surface and groundwater exported to Los Angeles is better known with an average of 356,000 acre-feet per year between 1970 and 2011 (LADWP, 2011a). Over the past ten years, the average export amount has dropped to about 228,000 AF (based on data from LADWP, 2011a). Environmental water demands in the region are primarily related to LADWP mitigation programs. In 2011, these uses amounted to about 95,000 AF for Owens Lake dust abatement, 16,500 AF for the Lower Owens River Project, 10,500 AF for enhancement and mitigation projects, and 10,400 AF for recreation and wildlife (LADWP, 2011a). Residential/commercial demands involve much smaller quantities of water because of the low population in the region. Industrial and military demand is very small outside of the Ridgecrest and China Lake area.

In rural parts of Mono County, households with extensive lawn and garden irrigation have used between 200 and 400 gallons per day per capita (Gram/Phillips Associates, 1980). Where outside watering is modest, per capita water use in Mono County is 125 to 150 gallons per day. A national survey of water use (Kenny, et al., 2009) suggested that average per capita use in Mono County is about 270 gallons per day. A different interpretation of presumably the same data produced a figure of 472 gallons per day (Sacramento Bee, 11/26/2008 – web page not currently active). Because very little land is available for development, significant population growth is not anticipated in Mono County, and domestic consumption totals should grow at relatively slow rates (less than 0.1 percent per year). Nevertheless, there could be local inadequacies in water supply because whatever growth occurs will be concentrated in relatively small areas.

Within the town of Mammoth Lakes, water demand grew rapidly until the past few years when it has declined in response to delivery of recycled water to a golf course, water conservation, and reduction of leaks. Total water use within the town was 2,565 acre-feet in 1992; 2,641 acre-feet in 1995; 3,287 acre-feet in 2001; 3,421 acre-feet in 2005; and 2,961 acre-feet in 2010 (Mammoth Community Water District, 2005 and 2011a). Based on the town's population of 8,200 in the 2010 census, annual water use of 2,169 acre-feet per year is equivalent to about 243 gal per day per capita. However, the town hosts a large transient population of recreational visitors, owners of second homes, and seasonal workers that account for a significant fraction of the water use (Kattelmann and Dawson, 1994; Mammoth Community Water District 2011a). In summer, much of the landscaping around housing units is irrigated regardless of occupancy and accounts for significant water demand. The town's current Urban Water Management Plan (Mammoth Community Water District, 2011a) projects demand for 2020 at about 3,400 acre-feet per year and for 2030 at about 4,200 acre-feet per year.

In Bishop, average daily demand per capita between 1997 and 2006 ranged from 400 to 490 gallons per day (Nolte Associates, 2008a). A national survey of water use (Kenny, et al., 2009) suggested that average per capita use in Inyo County is about 470 gallons per day. A different interpretation of presumably the same data produced a figure of 439 gallons per day

(Sacramento Bee, 11/26/2008 – web page not currently active). About 1.6 million gallons of water per day were supplied by the City of Bishop Department of Public Works in 2004. The maximum daily demand was 4 million gallons per day. About half the city's water use occurs from June through September. There is very little undeveloped private land within the boundaries of Bishop and therefore, little opportunity for growth and related increases in water demand. However, if vacant properties currently owned by LADWP within the Bishop city limits were to be made available and developed, then the average water demand at full build-out could rise to 5.7 million gallons per day (70 percent commercial and 30 percent residential) (Nolte Associates, 2008a).

Water demand within the Indian Wells Valley Water District has averaged about 8,800 acre-feet per year or about 280 gallons per day per capita. Potential increases in demand have been forecast in the Indian Wells Valley groundwater basin (Couch, et al., 2003). Although demand within the Indian Wells Valley Water District is anticipated to increase about 2 percent per year through 2020 and individual well use is forecast to increase about 1 percent per year, decreased demand by the Naval Air Weapons Station at China Lake and the Inyokern Community Services District results in a net increase in demand of only about 0.1 percent per year (Couch, et al., 2003).

Environmental water demand can be considered as either natural or regulatory. Evapotranspiration from lakes, soils, and native (or at least unmanaged) vegetation uses a large fraction of the precipitation that falls in the planning area – about half in high-elevation catchments and approaching 100 percent in low-elevation desert areas. In recent years, the term "environmental water demand" has also come to be used for managed water that is required to be used for some environmental benefit, such as a minimum instream flow to maintain fish and other aquatic species or sufficient water to support wetlands and riparian areas. As part of their water rights licenses, LADWP must now leave defined amounts of water in Mono Lake tributaries, and the Mammoth Community Water District does not divert water from Mammoth Creek when prescribed minimum flows are not met.

Water supplies for the Inyo-Mono IRWM region are forecast to remain largely as they are today: variable and uncertain. Water is not imported into the region, and there are no plans to do so. Political and legal action in the Walker River basin could eventually result in transfers of water out of irrigation to provide more water for Walker Lake. Litigation over water rights to Mammoth Creek in 2012 could affect water supplies to the Town of Mammoth Lakes. Climate change has the potential to increase variability of precipitation, change the average amount of precipitation, increase the proportion of rainfall (versus snowfall), and alter the timing of snowmelt runoff. In the Indian Wells Valley, declining groundwater levels may increase pumping costs and thereby

increase the cost of water supply.

Diversions, Storage, and Use

Water storage and transfers in the Inyo-Mono IRWM planning area are dominated by the Los Angeles Aqueduct system Major components of the LADWP water export and power generation system include a series of reservoirs and a tunnel for exporting water from the Mono Basin to the Owens River headwaters; the Crowley Lake reservoir in Long Valley; diversions in the Owens River Gorge for power generation; hydropower generation on Big Pine, Division, and Cottonwood Creeks; the Tinemaha, Pleasant Valley, and Haiwee Reservoirs; extensive groundwater pumping capacity, and the Los Angeles Aqueduct. Los Angeles' land and water ownership and extensive infrastructure along the east slope of the Sierra Nevada link many water management issues in the western part of the Inyo-Mono IRWM region and to other IRWM planning regions in southern California.

Within the Mono Basin, LADWP diverted as much as 134,600 acre-feet and as little as 15 acre-feet between 1941 and 1980. After the completion of the second aqueduct, LADWP diverted more than 100,000 acre-feet annually, except during 1976-77 drought (Hashimoto and Qasi, 1981). Diversions were halted by court order from 1989 to 1994. Starting in 1995, diversions up to 16,000 acre-feet per year resumed under SWRCB Decision 1631.

In the upper Owens River watershed, Crowley Lake was created by construction of Long Valley dam in the early 1940s. The reservoir is the main storage within the LA Aqueduct system and has a capacity of 183,000 acre-feet. At the other end of the Owens Gorge, Pleasant Valley Reservoir was built in 1955 to modulate flows released from the hydroelectric facilities in the Owens Gorge. This reservoir can store up to 3,825 acre-feet. Closer to the aqueduct intake, Tinemaha Reservoir stores up to 16,000 acre-feet.

LADWP also operates an extensive dust abatement project on the Owens Lake playa that relies heavily on shallow flooding to control dust. The dust abatement project currently budgets about 95,000 AFY and has used up to 75,800 AFY. LADWP also provides water for other uses within the Owens Valley that include irrigation, stockwater, enhancement and mitigation projects, the Lower Owens River Project, and recreation and wildlife projects. Water volume for all uses within the Owens Valley added up to about 202,000 AF in the 2011-12 runoff year (LADWP, 2011a).

The largest diversions from the West Walker River occur at the Nevada end of the state-

boundary-defined watershed. In the northern portion of the Antelope Valley, water from the West Walker River is diverted into Topaz Reservoir, where it is stored for controlled release to irrigators downstream in Nevada. The Walker River Irrigation District created Topaz Lake by constructing a diversion and three-mile-long canal from the West Walker River into a small closed basin in 1921. A tunnel and canal release water back into the river on the Nevada side (DWR, 1992).

Within Antelope Valley, the West Walker River has been diverted into canals for local irrigation for more than a century. About 11 miles of the river are affected by these diversions, which can reduce the late-summer discharge to a series of marginally connected pools (Lahontan Regional Water Quality Control Board, 1975).

Upper and Lower Twin Lakes reservoirs on Robinson Creek were constructed around 1900 to regulate irrigation supplies for the Bridgeport Valley. The two reservoirs have a combined storage of 6,100 acre-feet and have water rights for refilling during the irrigation season. Bridgeport Reservoir was constructed in 1924 by the Walker River Irrigation District to store water for summer irrigation downstream in Smith and Mason Valleys. The reservoir has a storage capacity of about 44,000 acre-feet (California Department of Water Resources, 1992).

In the Mono basin, water from Mill Creek was diverted to generate hydroelectric power in the early years of the 20th century. The diversion to the Lundy powerhouse has a capacity of about 70 cfs. Regulation of the flows in Lee Vining Creek for hydroelectric generation began in 1921 (now FERC project 1388). Ellery, Tioga, and Saddlebag reservoirs in the headwaters of Lee Vining Creek have a combined storage capacity of 13,600 acre-feet. About 27,000 acre-feet of water pass through the powerhouse each year. Between 1916 and 1925, dams were constructed to enlarge Agnew and Gem lakes and at Rush Creek Meadows to form Waugh Lake to allow storage and regulation of water for the Rush Creek powerhouse near Silver Lake. Waugh, Gem, and Agnew reservoirs can store 4,980, 17,060, and 860 acre-feet, respectively, for Southern California Edison's FERC project 1389. There is a small dam on Walker Lake operated by LADWP that formerly was used to fill additional storage in May and was emptied in November. Due to extremely low flows that killed fish in Walker Creek below the dam during the May 2003 filling, the reservoir is now kept full year-round.

In the Mammoth Lakes basin, Lake Mary, Lake Mamie, and Twin Lakes are controlled by outlet structures, and their water levels change seasonally. The Mammoth Community Water District has appropriative water rights to 5 cfs or 2,760 acre-feet/year to divert water from Mammoth Creek (Lake Mary) subject to State licenses and permit conditions and a Master Operating Agreement with the U.S. Forest Service.

During a period of great interest in small hydroelectric projects in the eastern Sierra Nevada in the late 1970s and 1980s, the Department of Fish and Game compiled statistics about the proportion of average discharge diverted in each stream and the stream length affected by the upstream diversion on each stream (Shumway, 1985). The following table illustrates the effects of diversion of some example streams within the upper Owens River watershed:

Table 2-9. Diversion effects on streams in the upper Owens River watershed

Stream	Average discharge (acre feet)	% Diverted	Length affected/total (miles)
Convict	18,600	29	7.0/7.1
Crooked	9,100	63	1.1/1.4
Hilton	8,130	17	1.4/4.4
Laurel	6,180	27	4.0/4.7
Mammoth	21,900	38	8.4/11.6
McGee	22,400	29	5.4/6.6
O'Harrel Cyn	72	3	0.5/3.0
Sherwin	4,700	<1	1.0/1.7

The Bishop Creek hydroelectric system diverts water from the south and middle forks of Bishop Creek and generates electricity at four powerhouses. The system began more than a century ago when the Nevada Power, Mining, and Milling Company began to transmit electricity from their Bishop Creek powerhouse to Tonopah in 1905. During the following eight years, the Nevada-California Power Company constructed dams that formed South Lake and Lake Sabrina and built five powerhouses that utilized more than 3,500 feet of head. The system is now operated by Southern California Edison under FERC license 1394. Lake Sabrina and South Lake have storage capacities of about 7,500 and 12,500 acre-feet, respectively.

Water Suppliers

The following paragraphs describe a sample of the water suppliers in the region. Areas not otherwise mentioned have individual wells or other household supply or are served by mutual water companies with a small service population. The populations served by water systems within the planning area are summarized in Table 3-10.

Bridgeport Public Utilities District

The Bridgeport Public Utility District supplies water to the town (population 600) from two wells. In 1990, the total demand was about 243 acre-feet (DWR,1992). BPUD connections are not metered. BPUD also provides water to the Bridgeport Indian Colony reservation.

Lundy Mutual Water Company

The Mono City water system had 71 hookups as of August, 2005, served by a community well and storage tank. The water use is not currently metered, and there is no chlorination on a regular basis. Annual water use is about 27 acre-feet with about half of that lost to the atmosphere (USDA-Forest Service, 2003). A member of the Mono City water board mentioned at the August, 2000, Mono County planning commission meeting that the water system was "about maxed out."

Lee Vining Public Utility District

After World War II, the population of Lee Vining reached about 200, and the Lee Vining Public Utility District was formed. The district extended an existing supply pipe upstream above where there was any possibility of contamination from the Log Cabin Mine and built Mono County's first sewer system. The next upgrade was relocation of the intake to the forebay of the lower SCE powerhouse on Lee Vining Creek. In the 1950s, a 180,000-gallon storage tank was constructed on land provided by SCE, and investigations began of a spring as an alternative to the creek water. After the spring was developed and connected to the Lee Vining supply system, the town's residents no longer suffered a seasonal ailment, locally known as the "Lee Vining pip," that was thought to result from lodgepole pine pollen in the water supply from the creek. The spring continues to serve Lee Vining and has been a reliable water source for a half century. A second storage tank was added about a decade ago in order to meet summertime peak hourly demand. The Lee Vining water system is routinely inspected and tested by technicians from the June Lake PUD. Lee Vining PUD began adding chlorine to its system a few years ago to meet state requirements.

June Lake Public Utility District

The June Lake Public Utility District serves the June Lake Loop area. The boundaries include an area of approximately 1,720 acres of unincorporated residential, commercial and undeveloped land. The district provides water to three distinct areas: the Village, West Village and Down Canyon, as well as the outlying areas of Pine Cliff, Oh! Ridge, and June Lake Junction. Water is obtained from Snow Creek, June Lake, Fern Creek, and Yost Creek (Boyle Engineering Corporation, 2004).

Initial construction of the Village water system, including the Snow Creek diversion facility, occurred in the 1940s. In 1972, an intake from June Lake was added, along with a filtration plant and storage tank. All of the water was drawn from June Lake between 1975 and 1978. After the Snow Creek diversion and filtration plant were completed in 1978, Snow Creek became the primary water source, and June Lake water was only used in summer months (Triad/Holmes Associates, 2004).

Water demand in the entire service area corresponds to the number of visitors to the area. The water needs of the permanent population (about 700) constitute a relatively small portion of the total water demand. The visitor population can exceed 3,000 persons on weekends and holidays (Boyle Engineering Corporation, 2004). The annual demand in 2004 was about 143 acre-feet in the Village system and about 225 acre-feet in the Down Canyon system (ECO:LOGIC Consulting Engineers, 2006).

If the proposed Rodeo Grounds development is built, that area could be densely populated with accommodations for as many as 7,000 visitors and permanent residents. Estimation of potential water demands for the development at buildout assumed the average day demand for visitors would be 75 gallons per capita per day (gpcd) and 100 gpcd for permanent residents. A more recent study estimated the total annual demand for the proposed project as about 33 million gallons or about 102 acre-feet (ECO:LOGIC Consulting Engineers, 2006).

Mammoth Community Water District

Beginning in 1958, the Mammoth County (now Community) Water District has supplied water and wastewater services to Mammoth Lakes. Until the mid-1970s, water diverted from Mammoth Creek was adequate to meet needs of up to 1,400 acre-feet/year. In 1978, the district obtained a permit from the State Water Resources Control Board to divert additional water. The permit includes several conditions that attempt to limit the impacts of the water diversion on the Mammoth Creek fishery. The District has also pursued groundwater well development, promotion of water conservation, system leakage repairs, and production of reclaimed water for irrigation. Although the resident population is currently about 8,200, instantaneous population on weekends and holidays often increases by up to four times for short periods. This high variability in demand is unusual among water supply utilities. The Mammoth Community Water District has applied the Town's estimates of peak population numbers and transient occupancy rates to determine an "effective annual population" to account for the variability in daily demand in its current Urban Water Management Plan (Mammoth Community Water District, 2011a).

Total water use (delivered plus unaccounted water) within the district was 2,565 acre-feet in 1992; 2,641 acre-feet in 1995; 3,287 acre-feet in 2001; 3,421 acre-feet in 2005; and 2,691 acre-feet in 2010 (Mammoth Community Water District, 2005 and 2011a). The District's most recent assessment determined that there is sufficient water from existing supplies and one new planned groundwater production well to meet demands under a range of water year types. The existing supplies and current use were quantified as a maximum of 2,760 acre-feet from surface water and 3,400 acre-feet from groundwater. A study for the district estimated that a total volume of 3,800 acre-feet could be pumped from groundwater within the Mammoth Basin (generally within town boundaries) without significant impacts to streams or springs within the basin (Wildermuth Environmental, Inc., 2003).

Communities of Southern Mono County

The communities of Hilton Creek/Crowley Lake, Sunny Slopes, Pinyon Ranch, Paradise, and portions of Swall Meadows rely on groundwater supplied by community service districts or mutual water companies. In the Hilton Creek/Crowley Lake community, water use in 1980 was estimated at approximately 150 gallons per capita per day. Based on the average population figures for Crowley Lake, the estimated total domestic water use in the service area was about 50 AF per year in 1980 and was projected to be 110 AF per year in 1998 (Gram/Phillips Associates, 1980). Another estimate of typical water-use in the area is 440 gallons per day (gpd) for a single-family residence (Triad Engineering, 1994). The equivalent per capita rate is 125 gpd, assuming an average household of 3.5 people. During the summer irrigation season, daily demands typically approach 1,350 gpd per household or three times the annual average (Triad Engineering, 1994).

Three studies of groundwater resource availability in the Hilton Creek/Crowley Lake community were reported for the Mountain Meadows Mutual Water Company (Triad Engineering, 1994):

Table 2-10. Groundwater availability in Hilton Creek/Crowley Lake

Groundwater Resource Availability in the Hilton Creek/Crowley Lake Community	
Slade and Blevins, 1979	25-30 acre-feet/year
Gram/Phillips, 1980	330 acre-feet/year
Kleinfelder, 1983	407 acre-feet/year

The eventual water system demand has been estimated at 160 acre-feet/year (Triad Engineering, 1994).

In the past few years, one of the principal wells for the Hilton Creek/Crowley Lake community has been found to contain excessive levels of naturally-occurring radionucleides.

City of Bishop

The City of Bishop Department of Public Works supplies water to all residents and businesses within the city limits that enclose about 1.8 mi^2. The basic infrastructure consists of three wells, a million-gallon storage tank, disinfection facility, and pipelines. The average daily demand per capita over the period 1997 through 2006 varied between 390 and 490 gallons per day (Nolte Associates, 2008a).

Communities of Southern Owens Valley

Water is supplied to Big Pine by the Big Pine Community Services District and Rolling Green Utilities, Inc. Inyo County currently supplies water to the communities of Laws, Independence, and Lone Pine, but a community services district structure is planned for these communities. The Cartago Mutual Water Company is the water supplier for Cartago.

The largest industrial water user in the Owens Valley is also a water exporter because its product is bottled water. The Crystal Geyser Roxane facility at Cartago on the west side of Owens dry lake pumps groundwater for bottling and has a design capacity of about 150 acre-feet per year (Quad Knopf, Inc., 2004).

Indian Wells Valley

In the largest population center of the Inyo-Mono IRWM region, the Indian Wells Valley Water District is the primary water supplier for the city of Ridgecrest. The District's domestic water system consists of 12 well pumping plants, 9 booster pumping plants, 10 water storage reservoirs, and more than one million linear feet of transmission and distribution pipelines (Krieger & Stewart 1998). Recently, IWVWD constructed two arsenic treatment facilities to help alleviate the water quality issues of their pumped groundwater. Growth in the District's service area is forecast to increase from approximately 27,000 in 2000 to approximately 34,100 by 2020 (Indian Wells Valley Water District, 2002). Total groundwater pumping in the Indian Wells Valley by the District and other users is forecast to rise from 21,400 acre-feet per year in 2002 to about

22,900 acre-feet per year in 2020 (Couch, et al., 2003).

The Inyokern Community Services District serves approximately 420 households according to U.S. Census Bureau data for 2000. In 2001, the Inyokern Community Services District used 97 acre-feet/year of water. Water use has been steadily declining since the mid-1980s. This can be primarily attributed to reductions in the work force at NAWS China Lake.

Table 2-11: Mono, Inyo, Kern, and San Bernardino County water systems in the Inyo-Mono IRWM planning region (sources: Environmental Working Group: http://www.ewg.org/tap-water/home and personal communication)

Mono County Water System	Population Served
Mammoth Community Water District	8,200
Bridgeport Public Utility District	600
Marine Corps housing at Coleville	360
June Lake PUD – Down Canyon	330
June Lake PUD – Village	308
USMC Mountain Warfare Training Center	250
Lee Vining PUD	250
Crowley Lake Public Utility District	250
Mountain Meadows Mutual Water Company	225
Lower Rock Creek Mutual Water Company	200
Crowley Lake Trailer Park	130
Birchim Community Services District	130
Mammoth Mountain Ski Area	100
Wheeler Crest Community Services District	80
Lundy Mutual Water Company	70
Bridgeport Indian Colony	45
Camp Antelope	40
Whitmore Ballfields	30
Crowley Lake Campground	25
McGee Mobile Home Park	20
Total	**11,643**

Inyo County Water System	Population Served
City of Bishop	3,532
Lone Pine via Inyo County	1,800
Bishop Paiute Tribe	1,572
Highland Mobile Home Park	1,500
Indian Creek / Westridge CSD	1,030
Coso Junction Ranch Store[1]	1,000
Meadowcreek Mutual Water Company	934
Big Pine Community Services District	855
Rolling Green Utilities, Inc. Big Pine	800
Big Pine Paiute Tribe	600
Independence via Inyo County	574
Sierra Highland Community Services District	500
Pine Creek Village	350
Lone Pine Tribe	350
Charles Brown Water Company	330
Glenwood Mobile Estates	300
Owens Valley Water Company	300
CDF Owens Valley Conservation Camp	250
Park West Mutual Water Company	200
Sierra Grande Estates Mutual Water Comp.	200
Starlite Community Services District	175
NPS Death Valley Cow Creek	150
NPS Death Valley Stovepipe Wells	150
Aberdeen Resort	150
Brookside Mobile Home Park	136
Cartago Mutual Water Company	132
Wilson Circle Mutual Water Company	100
Foothill Lone Pine Mobile Home Park, LLC	100
Rawson Creek Mutual Water Company	100
Valley Vista Mutual Water Company	75
North Lone Pine Water District	70

Inyo County Water System	Population Served
Ranch Road Estates Mutual Water Company	65
Keeler Community Services District	65
Darwin Community Services District	60
Aspendell Mutual Water Company	60
Brookside Estates Mutual Water Company	45
Sierra North Community Services District	45
Fort Independence	43
Sunland Village Mobile Home Park	42
Keough Hot Springs	40
SCE Bishop Creek Plant 4	38
Control Gorge Power Plant	36
Primrose Lane Apartments	36
Meadow Lake Apartments	35
Laws via Inyo County	30
Olancha RV Park	30
Rocking K Estates Mutual Water Company	27
Mountain View Trailer Court	25
Timbisha Village at Furnace Creek	16
NPS Death Valley Grapevine Ranger Station	11
Total	**19,064**

Kern & San Bernardino County Water Systems	Population Served
Indian Wells Valley Water District	34,900
Naval Air Weapons Station China Lake	9,500
Inyokern CSD	984
East Inyokern Mutual Water	87
Searles Valley Minerals Operations, Inc.	2,300
Total	**47,771**

Urban Runoff and Stormwater Management

Concerns about pollution from stormwater runoff from urban areas began to be raised in the 1950s and 1960s. The principal pollutants that can be expected in urban runoff include sediment, oils and grease, rubber compounds, nutrients, pesticides, bacteria and viruses, and metals. The materials that are likely to be found on streets, gutters, and parking lots typically get removed in the first flush of stormwater runoff. The concentration of these pollutants usually depends on the time since the previous storm, and intensity and amount of rainfall. The efficiency of the gutter and storm sewer system can greatly affect the size and timing of peak flows collected by the system.

Mammoth Lakes is the only community in Mono County with an engineered stormwater collection system. In 1984, only a few parts of the community of Mammoth Lakes had storm drains. Most of the town was drained by a combination of natural and constructed surface channels, which led to a variety of drainage problems (Brown and Caldwell, 1984). Up until the late 1980s, much of the runoff from the developed area flowed as sheet-flow to roads or flowed in unimproved channels or ditches to topographically lower channels. In 1976, a storm drain system was constructed for a portion of the town, which eventually discharged directly to Murphy Gulch (Brown and Caldwell, 1984).

In association with the Main Street storm drain, a 260,000 ft^3 siltation basin was constructed at the downstream end of the Murphy Gulch channel, approximately 1/4 mile above its junction with Mammoth Creek. Although the basin trapped a significant volume of silt and sediment each year, there was evidence that it did not capture enough of the sediment input. During peak runoff, sediment deposition efficiencies are drastically reduced (due to high flow-through velocities), resulting in visibly turbid effluent discharges. The old earth-fill dam was in relatively poor condition as of 1984, and there were signs of seepage on its downstream face (Brown and Caldwell, 1984).

The drainage master plan proposed by Brown and Caldwell (1984) included construction of new storm sewers, capture of runoff that formerly went directly into Mammoth Creek, detention storage of runoff, additional local sediment retention basins, and reconstruction of the sediment retention basin in Murphy Gulch. The estimated capital cost was $18 million, and annual operating costs were estimated at $100,000 to $250,000 (Brown and Caldwell, 1984). In the early 1980s, about 1,600 acres of the town of Mammoth Lakes' area of four square miles (about 60 percent) were considered to be impervious (Environmental Sciences Associates, 1984). Summer rain events and winter rain-on-snow events can produce localized flooding in

Mammoth Lakes, particularly within the lower-income neighborhoods. Funding from the Round 2 Prop. 84 Planning Grant will be used to develop a stormwater master plan for Mammoth Lakes.

The Indian Wells Valley contends with its own stormwater, drainage, and flooding issues, primarily resulting from heavy rains during the summer monsoon season. Although there is anecdotal evidence as to the frequency and severity of these events, there is a need to better quantify such events to improve stormwater planning and management.

Wastewater Treatment and Disposal

The cities, towns, and larger communities of the planning region have wastewater collection and treatment systems, while smaller communities and isolated homes do not. In the north, residences and businesses in Coleville and Walker rely on septic tanks and leach fields for sewage disposal. There are concerns about effectiveness of some of these systems in areas with high water tables. The USMC Mountain Warfare Training Center has a 100,000 GPD package waste treatment plant and leach fields (Mono County, 1992).

The Lee Vining Public Utility District sewage system includes the main part of town, but not the SCE plant, the Mobil station or the Pumice Plant. Waste enters into a large community septic tank, which is pumped periodically. The effluent passes through the septic tank into sewage ponds located below the community center. Mono City, Conway Ranch, Lundy Canyon, and other scattered homes are on individual septic systems.

The June Lake Public Utility District provides sewerage service to three major service areas: June Lake Village, Down Canyon, and the U.S. Forest Service's Silver Lake Tract. Additional service is provided by contract to campgrounds and several parking facilities along the June Lake Loop (Boyle Engineering Corporation, 2005). Between 1995 and 2003, daily flow at the treatment plant ranged from 0.16 to 0.4 mgd with an average of 0.25 mgd. Based on an average daily water demand of 0.34 mgd, about three-quarters of the supplied water is returned to the sewer system. The remainder is presumably used for landscape irrigation. Average monthly flows ranged from 5.1 million gallons to 10.5 million gallons with an average of 7.6 million gallons. The projected average daily wastewater flow at buildout of the service area is 0.66 mgd (Boyle Engineering Corporation, 2005).

The primary wastewater treatment facility within the upper Owens River watershed serves the town of Mammoth Lakes (and cabins and campgrounds upstream of town) and is operated by the Mammoth Community Water District. An annual average of 1,500 acre-feet of water was treated at the facility between 1983 and 1997 (Bauer Environmental Services, 1998). In 2005 and 2010, 1,920 and 1,430 acre-feet of water was treated at the facility, respectively, (Mammoth Community Water District 2011a). The disinfected secondary-treated effluent from the facility is piped several miles to the Laurel Ponds where it is discharged. The treated water percolates into the ground at this location or evaporates. The maintenance of Laurel Ponds to at least 18 acres of surface area is considered beneficial for waterfowl by the Inyo National Forest, which administers the site. The Mammoth Community Water District recently completed a project to treat the wastewater to Title 22 standards for unrestricted irrigation use and began delivering

reclaimed water to one of two local golf courses in 2010. The Mammoth Lakes wastewater treatment plant is a permitted wastewater facility as are the treatment plants of the Hilton Creek Community Services District, Mammoth Mountain Ski Area, and Convict Lake campground.

In the mid-1970s, the community of Hilton Creek/Crowley Lake had an estimated population of about 300 and was served entirely by individual disposal systems consisting primarily of septic tanks and leach fields or leach pits. Because of the presence of adverse soil and groundwater conditions, these individual systems had abnormally high failure rates for many years. Many of the disposal systems were located less than 100 feet from surface waters or in areas of shallow groundwater. Percolation rates throughout the community area are quite high, which is typical for glacial outwash soils. About two-thirds of the residences and at least five commercial establishments in the community obtained their domestic water supplies from the direct diversion of the surface waters of Hilton Creek. Mono County health officials were aware of problems from at least 1966. A study prepared by the Lahontan RWQCB for the county in that year reported alarming coliform concentrations at sample points in natural surface streams as well as in private water supply systems. The report attributed the majority of this contamination to the use and misuse of septic tank / leach field sewage disposal systems. Water quality sampling and public health investigations in the vicinity of Hilton Creek indicated that the continued use of individual disposal systems posed significant health hazards and adverse water quality impacts. Mono County and the Lahontan RWQCB both adopted restrictions and prohibitions on the installation of new septic tank / leach field disposal systems within the Hilton Creek service area in 1976. Furthermore, the Lahontan RWQCB prohibited use of existing disposal methods after January 1, 1985, and recommended that a community sewerage system be constructed for the area (Gram/Phillips, 1977).

The communities of southern and eastern Mono County rely on septic tanks and leach fields for sewage disposal as do most of the smaller communities of Inyo County.

The City of Bishop Public Works Department provides sewer service to the central portion of Bishop. A gravity collection system routes sewage to the wastewater treatment plant east of town. The plant processes about 800,000 gallons per day and has a capacity of 1.6 million gallons per day. Average wastewater flow is forecast to be 4.7 million gallons per day if Bishop was fully built out, including lands currently owned by the Los Angeles Department of Water and Power within the city limits (Nolte Associates, 2008b). One week per month, the City's wastewater treatment plant also treats sewage from the Eastern Sierra Community Services District, which operates its own treatment plant the other three weeks per month.

Other agencies that provide wastewater collection, treatment, and disposal services in Inyo County include Big Pine Community Services District, East Independence Sanitary District, Lone Pine Community Services District, and Inyo County.

The City of Ridgecrest's wastewater treatment system collects, processes, and disposes domestic wastewater from the city of Ridgecrest and the Naval Air Weapons Station at China Lake. The treatment facility has a design capacity of 3.6 million gallons per day and was treating an average of 2.6 million gallons per day in 2000, or about 2,900 acre-feet per year. About one-

third of the effluent evaporates, and the remainder percolates to groundwater. As of 2010, a proposed solar electricity generating facility was pursuing use of the treated effluent as a coolant.

Description of Water Quality

Compared to most of California, water throughout most of the Inyo-Mono IRWM planning area is of very high quality, simply because of the small population and high proportion of public lands. There are not many opportunities for contamination compared to parts of the state with high population, industries, and intense land uses. Many of the identified water-quality issues in the Inyo-Mono planning region result from naturally-occurring minerals.

The Lahontan RWQCB water body fact sheet for the West Walker River lists sedimentation, agricultural drainage, and water diversions as the primary water-quality problems in the West Walker River. The State of Nevada considers the water crossing the state line to not support beneficial uses because of excessive nutrient load. Similarly, the Lahontan RWQCB identified sedimentation, ammonia, fecal coliform, and metals as problems in the East Walker River. Bridgeport Reservoir has been known to have high nutrient loads and consequent excessive primary productivity for at least 20 years. The Lahontan RWQCB has established a “conditional waiver” program for the agricultural lands of the Bridgeport Valley as a means of cooperatively reducing discharge of nutrients and bacteria from the grazing lands.

The Lahontan Basin Plan of 1975 characterizes the waters of the Mono Basin as generally excellent in quality, with total dissolved solids (TDS) levels of less than 50 parts per million (ppm) in surface water and less than 100 ppm in groundwater. Surface water is ionically dominated by calcium carbonate and classified as soft. Heavy metal concentrations are below detectable limits or only present in trace amounts. Dissolved oxygen is at or near saturation. Coliform bacteria are below detectable limits in groundwater; surface waters were not analyzed for bacteria (Triad Engineering, 1987). Independent sampling by Lee (1969) in several Mono Basin streams including Mill and Wilson creeks found that the waters were calcium bicarbonate type and had TDS ranging from 31 to 81 ppm.

Water quality in the major tributaries (Lee Vining, Walker, Parker, and Rush creeks) is typical of eastern Sierra Nevada snowmelt runoff streams. This area is largely undeveloped and undisturbed above the LADWP diversion structures, except for recreation-residential developments near June Lake and on Rush and Walker creeks and recreational facilities on Lee Vining Creek and Mill Creek. Natural weathering and erosion processes are the main factors affecting water quality in these streams. A seasonal difference in quality between groundwater-fed baseflow and snowmelt runoff has been measured (Jones and Stokes Associates, 1993b).

The upper Owens River watershed is used as a water source for export to the city of Los Angeles. Although geologic sources contribute phosphates, arsenic, and other minerals to the water, the overall quality is still excellent and quite suitable for human consumption at its urban destination.

The first Basin Plan for the Lahontan Region (Lahontan RWQCB, 1975) mentioned that

analyses of water entering Crowley Lake found excellent quality for constituents measured except for arsenic, which sometimes exceeds federal drinking water standards. Most environmental documents relating to parts of the watershed routinely cite excellent water quality in the area's streams that is suitable for all beneficial uses. The principal exception is Mammoth Creek within and downstream of the town of Mammoth Lakes.

A major assessment of surface water quality in the Mammoth Creek watershed was conducted by a team of graduate students and faculty from UCLA in the summer of 1972 (Perrine, et al., 1973). This study judged the overall surface water quality to be excellent with respect to chemical constituents. One exception to the low chemical concentrations was relatively high concentrations of phosphorus that could contribute to excessive growth of aquatic plants, although natural sources were believed responsible. Fecal coliform bacteria counts in lower Mammoth Creek were high and believed to result from leaching from campground pit toilets in the Lakes Basin, septic systems in Old Mammoth, and pet waste. This study was conducted before the connection of the campgrounds and many of the houses in Old Mammoth to the sewer system. Several of the groundwater production wells in the Mammoth Lakes basin contain unsafe levels of arsenic that become problematic when water supplies are heavily dependent on groundwater contributions.

Over the entire Inyo National Forest (lands in the upper Owens River watershed are not distinguished separately), 97 percent of the water flowing off the forest was judged to meet water quality objectives as of 1988. The remaining 3 percent contained excessive sediment (USDA-Forest Service, 1988).

Water samples from various tributaries to the Owens River have been analyzed by LADWP since the 1930s and 1940s. During the Mono Basin Environmental Impact Report process, these data were summarized along with a special water quality survey in 1991 by Jones and Stokes Associates (1993b). All except Hot Creek had low concentrations of minerals and nutrients.

Every two years, the State Water Resources Control Board submits a report on the quality of streams and lakes in California to the U.S. Environmental Protection Agency. Part of that report refers to section 303(d) of the federal Clean Water Act, which directs the states to identify priority water quality issues in individual water bodies. The following water bodies in the Inyo-Mono IRWM region were on the 2010 list:

Table 2-12. Water bodies in the Inyo-Mono planning region on the 2010 impaired water bodies list from SWRCB.

Name	Pollutant
Amargosa River	Arsenic
Bodie Creek	Mercury
Bridgeport Reservoir	Nitrogen, phosphorus, sediment
Buckeye Creek	Pathogens
Crowley Lake	Ammonia, dissolved oxygen
East Walker River above BP res.	Pathogens
East Walker River below BP res.	Manganese, sediment, turbidity
Haiwee Reservoir	Copper
Hilton Creek	Dissolved oxygen
Mammoth Creek	TDS, mercury, metals
Mesquite Springs	Arsenic, boron
Mono Lake	Salinity, TDS, chlorides
Pleasant Valley Reservoir	Organic enrichment, dissolved oxygen
Robinson Creek	Pathogens
Rock Creek	TDS
Searles Lake	Salinity, TDS, chlorides, petroleum HC
Swauger Creek	Pathogens, phosphorus

Constituents: Measurements and Biological Indicators

Systematic sampling of water quality parameters has not occurred in the Inyo-Mono IRWM planning area. Therefore, our knowledge about region-wide water quality is based on irregular reporting of isolated sampling and analysis done sporadically over the past few decades.

Sediment

The Environmental Impact Statement for the Land and Resource Management Plan ("Forest Plan") of the Inyo National Forest (USDA-Forest Service, 1988:315) states that the "primary threat to water quality on the Inyo is sedimentation." The document indicates that the most significant sources of sediment are the ski areas and rangelands, particularly wet meadows, disturbed by historical overgrazing. In a subsequent section on cumulative effects that also addresses sources on private land, the Forest Plan states that suspended sediment in Mammoth Creek during spring-summer runoff increases ten-fold between the outlet of Twin Lakes and U.S. Highway 395.


Photo 3.31

Measurements of suspended sediment, turbidity, or bed load are not known to have been made within the Mono Basin until the past few years. A study of sediment budgets (R2 Resource Consultants, 2000) estimated about 13 acre-feet of sediment supply per year for Lee Vining Creek (range 3.0-2,770), about 0.9 acre-feet for Walker Creek (range 0.2-40), and about 3.8 acre-feet per year for Parker Creek (range 0.8-35). The various dams across Rush, Lee Vining, and Mill creeks have retained most of the sediment produced in the headwater areas and have increased channel scour below the dams to an unknown extent.

The June Mountain Ski Area was reported to produce "considerable sediment during peak runoff periods, causing a shutdown of water treatment systems for 30 days or more each year. Implementation of the [erosion prevention program] for the ski area has reduced these impacts over the past few years, and discharge will soon meet state requirements" (USDA-Forest Service, 1988).

The Inyo National Forest (1988b) has noted a significant increase in sediment and turbidity levels during peak runoff events in Mammoth Creek. These increases appear to be the result of disturbances in the developed area and the sensitivity of the local soils to disturbance. The impact of runoff from urban development is reflected in the increase in sediment and turbidity levels in Mammoth Creek as it flows through the town. Based on USFS data developed on Mammoth Creek at U.S. Highway 395 from October, 1981, to September, 1982, the total annual sediment discharge is estimated to be 5,100 tons or approximately 0.20 ton/acre of watershed. This sediment yield is one-third of the average for the Sierra Nevada (0.75 ton/acre) and one-tenth of the average for California (2 ton/acre) (Kattelmann, 1996).

Minerals

The limited water quality data suggest that the mineral content of the Mono Lake tributaries is very low and similar to other high quality Sierra Nevada streams. Concentrations of all minerals that were measured were low enough to rate as excellent drinking water quality (Jones and Stokes Associates, 1993b).

Total dissolved solids (TDS) were measured in samples collected from Mammoth Creek and some of the lakes in the Mammoth Lakes Basin during the summer of 1972 by the UCLA team and found to be generally less than 50 mg/l, with a couple of samples around 100 mg/l (Perrine, et al., 1973). Drinking water standards are about 500 mg/l for comparison. Measured concentrations of sodium, calcium, and magnesium were less than 10 mg/l. The Mammoth Community Water District has measured water from Lake Mary for various constituents since

1983. Values for TDS over this period have ranged from 10 to 50 mg/l with a mean of 31 mg/l.

Conductivity is often used as a proxy for TDS because it is relatively easy to measure. Specific conductance of water released from Grant Lake reservoir has been monitored by LADWP since 1934 and has ranged from 40 µS/cm to 100 µS/cm with an average of about 60 µS/cm (Jones and Stokes Associates, 1993b). Specific conductance was also measured for many years in Lee Vining Creek and found to range between 25 and 75 µS/cm.

Table 2-13. Spot measurements of conductivity made in various portions of the upper Owens River watershed during October 1985 by the Department of Fish and Game (Deinstadt, et al., 1986)

Waterway	Conductivity (µS/cm)
Owens River	120, 130, 120, 170
Rock Creek	20, 25, 30, 20, 8
McGee Creek	40, 75, 70
Mammoth Creek	77, 85, 128, 108, 115, 35
Hot Creek	580
Laurel Creek	50
Sherwin Creek	20
Glass Creek	30

Table 2-14. Conductivity measurements by LADWP and Jones and Stokes Associates (1993b)

Waterway	Conductivity (µS/cm)
Owens River at Big Springs	166-223
Owens River at Benton Crossing	295-560
Mammoth Creek	50-200
Hot Creek	200-650
Convict Creek	125-175
McGee Creek	56-175
Hilton Creek	24-62
Crooked Creek (1991 only)	43-128
Rock Creek	25-125

Nutrients

Nutrient loading is a major issue in the East Walker River basin. Bridgeport Reservoir is eutrophic and is afflicted with blooms of blue-green algae each summer. The Bridgeport Valley upstream of the reservoir is extensively grazed from June through September. Phosphorus and pathogen concentrations in tributaries to Bridgeport Reservoir, measured in April-June, 2000, increased significantly downstream of pastures (Horne, et al., 2003). However, biochemical processes in the wet soils of the pastures are converting and capturing most of the applied nitrogen (Horne, et al., 2003).

Limited sampling suggests very low concentrations of nutrients in streams of the Mono basin. The 1991 sampling of Grant Lake found only minimal concentrations of nitrogen and phosphorus, both in the lake and the outlet. Chlorophyll *a* values in Grant Lake reservoir ranged from 0.9 to 13.3 µg/l, with an average of 5.8 µg/l, indicating low nutrient status and consequent low biological productivity (Jones and Stokes Associates, 1993b).

A mix of historical water quality results reported by the Los Angeles Department of Water and Power (1984) included measurements of nitrate that ranged from 0 (below detection) to 2 mg/l. Besides that one value of 2 mg/l, all other reported values were 0.4 mg/l or less.

In June Lake, nutrient concentrations from limited sampling were quite low with combined nitrate plus nitrite concentrations below detection in three samples and 0.02 mg/l in a fourth sample. Ammonia was 0.03 mg/l or less. Orthophosphate was not detected, and total phosphorus concentrations were 0.02 mg/l or less (Brown, 1979). This study found that although nitrate plus nitrite was below detection limits in Gull Lake, concentrations of ammonia and orthophosphate were relatively high: up to 0.54 and 0.16 mg/l, respectively. Both nutrients were believed to be derived from anaerobic decomposition of algae and other organic matter in the near-bottom layers of the lake (Brown, 1979). The study hypothesized that nutrients released from the surrounding homes prior to the sewer system might contribute to the high fertility of Gull Lake (Brown, 1979).

In Silver Lake, nutrient concentrations were below detection limits except for total phosphorus concentrations of 0.01 and 0.02 in two samples. The study judged that there was a minor enrichment of Silver Lake from nutrients contributed by Gull Lake via Reversed Creek (Brown, 1979).

The 1994 samples from Rush Creek above Grant Lake (USGS station 10287400) and the Rush Creek power plant tailrace (USGS station 10287300) had the following results (concentrations in mg/L):

Table 2-15. Rush Creek nutrient concentrations as measured in 1994

Rush Creek Nutrient Concentrations	
Total nitrogen	< 0.05
Ammonia	0.01-0.02
Phosphorus	<0.01-0.02
Orthophosphate	<0.01

The nutrient budget of Crowley Lake has received greater attention than other parts of the Inyo-Mono IRWM planning area because of the eutrophic state of the reservoir. Almost all (96 percent) of the observed phosphorus loading to Crowley Lake comes from the Owens River, which only provides about half of the water input to the lake (Jellison and Dawson, 2003). The known sources for this phosphorus are Big Springs and numerous sites along Hot Creek.

The Owens River accounts for 79% of the nitrogen input to Crowley Lake and McGee Creek accounts for 13% (Jellison and Dawson, 2003). Ammonia, nitrate, and total nitrogen concentrations are relatively low in all other tributaries. Total nitrogen concentrations increased somewhat across the irrigated pastures of Convict and McGee creeks. This increase is about 6 percent of total nitrogen loading to Crowley Lake. Hot Creek fish hatchery contributes a significant amount of ammonia and total nitrogen to Hot Creek. The communities of Mammoth Lakes, McGee Creek, and Hilton Creek had little apparent effect on nutrient concentrations downstream (Jellison and Dawson, 2003). Three to four times more nitrogen leaves Crowley Lake than enters it, presumably because of nitrogen-fixing cyanobacteria (blue-green algae) in the lake.

Nitrate concentrations were measured in Mammoth Creek in the summer of 1972 by the UCLA team and were less than 0.5 mg/l in 99 percent of the samples (Perrine, et al., 1973). Phosphate concentrations were generally less than 0.1 mg/l, although a few samples were up to 0.3 mg/l.

There is potential, but no direct evidence, for contamination from excessive use of chemical fertilizers on gardens, lawns, and parks. Nutrients from fertilizers that are not incorporated in plant tissue can be leached from soils and enter local streams.

Metals

Mercury has been a concern in the Walker River basin after elevated concentrations of mercury were found in tui chub and common loons at Walker Lake. Recent sampling of water, sediment, and aquatic invertebrates suggests that the primary source areas are associated with the Bodie and Aurora mining districts in the Rough Creek watershed, which is part of the East Walker basin. Samples from the West Walker River had total mercury concentrations within the range of natural background amounts: 0.62 ng/L in the water and 8 to 44 ng/g in the sediment (Seiler, et al., 2004). By contrast, the East Walker River above the confluence with the West Walker had

a total mercury concentration of about 60 ng/L in the water and more than 1,000 ng/g in the sediment. The greatest total-mercury concentration in sediment was found in the bed of Bodie Creek at 13,600 ng/g (Seiler, et al., 2004). The absence of major mining and milling operations in the West Walker watershed appears to have minimized mercury contamination in marked contrast to the adjacent Carson and East Walker rivers.

Trace element concentrations were frequently undetectable or very low in water at the Grant Lake reservoir outlet, but lead, zinc and boron were found in sediments in concentrations slightly higher than background (Jones and Stokes Associates, 1993b).

The 1994 samples from Rush Creek above Grant Lake (USGS station 10287400) found concentrations of boron between 10 and 20 mg/L, concentrations of iron between 12 and 24 mg/L, and concentration of manganese between 3 and 11 mg/L.

Metals, primarily arsenic and mercury, have been measured in the Crowley Lake water column and sediments (as has uranium more recently; Lahontan RWQCB, 1994). These substances are believed to originate from natural sources resulting from the particular chemical composition of the watershed's geology. Arsenic concentrations high enough to be a health concern for fish and humans have been measured in the upper Owens River below the confluence of Hot Creek as well as in Hot Creek itself (Ebasco Environmental, et al., 1993). A detailed study of arsenic in Crowley Lake waters confirmed the geologic nature of the sources (Jellison, et al., 2003).

When the level of Crowley Lake fell rapidly in 1989, tributary streams eroded new channels in their deltas in response to the dropping base level. Large volumes of sediments were transported into deeper areas of the lake. Stirring up these sediment deposits also released mercury that had been in storage, and elevated mercury levels were found in water samples collected by LADWP at the dam in February 1990 (Milliron, 1997). Subsequent analyses of trout tissue found no detectable levels of mercury or other heavy metals (Milliron, 1997).

Organics

In 1999, the June Lake Public Utility District tested all its water systems for various organic chemicals. Dichloromethane, an insecticide and industrial by-product, was detected in water from June Lake and Snow Creek in one sampling but not found again in follow-up tests (Boyle Engineering Corporation, 2004). No other records of analyses of organic contaminants for the Mono Basin were located.

Fuel spills from crashes of tanker trucks have contaminated Slinkard Creek and the East Walker River in recent years. Major clean-up operations were performed in both cases. Fuel spills may

have occurred within the June Mountain Ski Area during slope grooming operations.

Monitoring wells at the Benton Crossing landfill have detected low concentrations (about one or two parts per billion) of three volatile organic compounds (Mono County Planning Department, 2004). Although the concentrations appear to be stable and well below the so-called maximum contaminant levels, a monitoring program reports results from sampling and analysis to the Lahontan Regional Water Quality Control Board.

Temperature

Temperatures of stream water are determined by the source of water (direct snowmelt runoff, overland flow, and seepage from soil and groundwater) and energy inputs (primarily solar radiation). Shading of the stream by terrain features and vegetation regulates the amount of solar energy received by the water. The volume of flow is also critical because a given amount of energy can raise the temperature of a large volume of water only a small amount but can raise the temperature of a small volume perhaps several degrees.

Herbst and Kane (2004) found that summer stream temperatures rarely exceeded 59°F in the control streams of their study within the West Walker River watershed. Summer temperatures of some of their treatment streams that had comparatively little riparian vegetation were well above 59°F. Maximum temperatures in their Poore Creek site exceeded 80°F in 2002.

Water temperature in the streams of the Mono Basin has been altered by water management activities. Water is stored in several reservoirs in the Mono Basin where the timing of the releases affects the volume of water in the stream, and the depth of the outlet determines whether warm surface water or deeper cool water enters the stream below the dam. The diversions for export greatly reduced flow and consequently raised temperatures below the diversions. Flow reductions also decreased the amount of riparian vegetation that provided shade to the streams.

Water temperatures were monitored at four locations on the upper Owens River between June 1 and September 30, 1991 (Ebasco Environmental, et al., 1993). The average temperatures, as well as the variation in daily temperature values, tended to increase downstream. Daily average temperatures ranged from 52°F to 65°F at the powerline crossing above Hot Creek and from 56°F to 72°F at Benton Crossing. Maximum temperatures ranged up to 80°F (Ebasco Environmental, et al., 1993).

Water temperatures in upper Mammoth Creek were measured during the summer of 1972 and found to be in the range of 54°F to 75°F and did not exceed 82°F. The daily temperature range varied within 2°F to 10°F (Perrine, et al., 1973).

Water temperatures in Hot Creek and Convict Creek apparently rise several degrees where warm irrigation return flow enters the creeks following flood irrigation of adjacent pastures.

Dissolved Oxygen

Limited sampling above and below Topaz Reservoir suggested that stratification of the stored water behind the dam results in less dissolved oxygen downstream of the reservoir than is

present in the West Walker River upstream (Humberstone, 1999).

June Lake mixes twice a year, usually in May and October. In summer and winter, June Lake is stratified with dissolved oxygen near saturation (and therefore favorable to trout) only at middle depths during summer (Brown, 1979). Decomposition of organic matter, mainly algae, depletes the oxygen below about 50 feet in June Lake. In Gull Lake, dissolved oxygen was not present below 40 feet, and the lake was judged to be eutrophic with excessive algal productivity. Dissolved oxygen in Silver Lake was near saturation except for some depletion noted in a 1979 sample (Brown, 1979).

Dissolved oxygen levels in upper Mammoth Creek were measured in the summer of 1972 by the UCLA team and found to be 6 to 8 mg/l, a range quite suitable for trout and close to theoretical saturation at the ambient temperatures of the streams and lakes (Perrine, et al., 1973). This study also found biochemical oxygen demand in Mammoth Creek was quite low, almost always below 2 mg/l.

Dissolved oxygen was measured in Crowley Lake during August, 1993 (when the lake was stratified), by the Department of Fish and Game. Below a depth of 33 to 43 feet, dissolved oxygen was only 2 mg/l (Milliron, 1997). Concentrations of dissolved oxygen between 3 to 5 mg/l restrict growth of trout, and levels below 3 mg/l can be lethal to trout after long exposure (Milliron, 1997).

Pathogens

The UCLA team measured concentrations of total coliform and fecal coliform bacteria in water samples from Mammoth Creek and lakes in the Lakes Basin during the summer of 1972. This study found a wide range of variability from 0 to 10,000 colonies per 100 ml for total coliform and 0 to 1,000 colonies per 100 ml for fecal coliform (Perrine, et al., 1973). Naturally occurring soil bacteria were believed to be the main constituent of the total coliform counts. The highest fecal coliform counts were found in lower Mammoth Creek and believed to result mainly from leaking septic systems in Old Mammoth and pet waste.

Most sites sampled by Setmire (1984) in upper Mammoth Creek had fecal coliform bacteria counts below 10 colonies per 100 ml. Mammoth Creek at U.S. Highway 395 had 250 colonies per 100 ml, and Hot Creek below the hatchery had more than 1,000 colonies per 100 ml (Setmire, 1984).

There have been anecdotal reports of bacterial contamination of the small channels over the Hilton Creek fan (Hilton Creek distributaries) by neighboring outhouses and septic systems. For example, a routine water sample within the Crowley Lake Mutual Water Company system tested positive for fecal coliform in November, 2002 (Mammoth Times, 2002).

pH and Alkalinity

The pH of water is an index of the hydrogen ion concentration, which in turn causes water to be acidic or alkaline. A pH value of 7 is neutral, values less than 7 (increasing hydrogen ion concentration) are acidic, and values greater than 7 [to a maximum of 14] (decreasing hydrogen ion concentration) are alkaline. Lakes in the upper Owens River watershed had pH values

averaging about 8.3 in an early survey. Slightly alkaline waters such as these lakes tend to have more plants and animals than neutral or acidic waters.

Alkalinity is a measure of the capacity of water to buffer changes in hydrogen ion concentration. Water with greater alkalinity is more resistant to changes in pH. Alkalinity depends on the amount of carbonate, bicarbonate, and hydroxide ions.

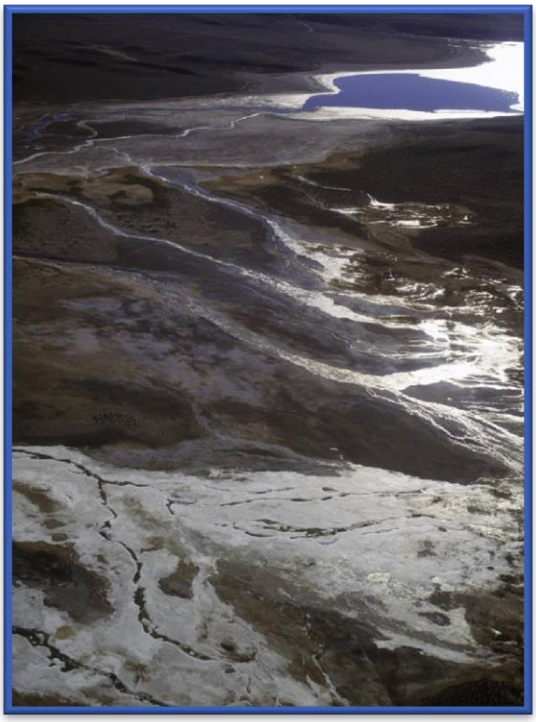
A study of Crystal Lake relating to acidic precipitation found that the pH of the lake was 6.7 to 6.1, and the acid-neutralizing capacity varied from 56 to 82 microequivalents per liter (µeq/l). Acid-neutralizing capacity declined rapidly during the snowmelt season as very pure runoff water entered the lake, and then slowly increased during the remainder of the year (Melack, et al., 1992).

Water imported from the Mono Basin lowered the alkalinity of the upper Owens River and consequently might have had some potential effects on the toxicity of naturally occurring metals.

Groundwater Quality

Boron, fluoride, and arsenic have been found in water from artesian wells near the center of Antelope Valley. Among five wells sampled in Antelope Valley, one had a concentration above a Maximum Contaminant Level for inorganics-primary, and two had a concentration above a Maximum Contaminant Level for radiological (DWR, 2004).

Occasional measurements of samples from wells and springs have been made over the years. For the Mammoth Creek watershed, the California Department of Water Resources (1973) reports TDS and electrical conductivity for several dozen wells and springs. TDS values ranged from 30 to 300 mg/l for cold water sources and 500 to 1,600 mg/l for geothermal sources. Electrical conductivity ranged from 60 to 400 micromhos/cm for cold water sources and between 500 and 2,300 for geothermal sources.



Water issuing from the Mammoth Mine adit had a TDS concentration of 95 mg/l, and a spring near the YMCA camp had an electrical conductivity of 50 micromhos/cm (DWR, 1973).

Some of the groundwater pumped by MCWD contains arsenic. After treatment, the average arsenic concentration in MCWD supplies is below the maximum contaminant levels (MCL). In April, 2009, MCWD conducted a public notification when arsenic MCLs were exceeded. In 2009, the average arsenic level was 8.9 parts per billion, with a range of 0 to 33 ppb (I. Yamashita, personal communication). The drinking water standard for arsenic was changed from 50 ppb to 10 ppb in January, 2006. MCWD has instituted changes to its

pumping management and improved treatment plant operations that meet arsenic MCLs.

In recent years, the presence of uranium compounds at concentrations above drinking water standards has been identified in some community water supplies and private wells within the region. Trace amounts of uranium occur in some of the geological substrates of the area, and local groundwater partially reflects the chemical composition of materials in contact with the water. The extent and severity of the issue is uncertain as of 2010. The Environmental Health Department of the County of Mono is monitoring the situation. The next iteration of this plan should contain additional details.

Groundwater in the vicinity of the Benton Crossing landfill is monitored with a series of wells to detect any changes in groundwater quality resulting from materials leaching out of the landfill.

As of 1998, there were 12 known cases of leaking underground storage tanks (presumably gasoline or other volatile fuels) within the upper Owens watershed (Lahontan Regional Water Quality Control Board, 1998). A large gasoline spill occurred at the Mammoth Mountain garage facility on January 12, 1999 (Buckmelter, 2000). Approximately 7,500 gallons of gasoline entered the soil, and about a quarter of that amount was recovered within the first few months after the spill. A series of monitoring wells was installed to observe the plume within the groundwater.

Some overly generalized information on groundwater quality for Long Valley between 1994 and 2003 was tabulated in a recent report of the California Department of Water Resources (2004). Two of six public supply wells tested in Long Valley exceeded the maximum contaminant levels for radiological contaminants. All four of the public supply wells tested in Long Valley exceeded the maximum contaminant level for some inorganic secondary contaminant (chloride, copper, iron, manganese, silver, specific conductance, sulfate, total dissolved solids, or zinc).

In recent years, one of the wells supplying water to the Mountain Meadows Mutual Water Company for part of the Hilton Creek/Crowley Lake community has had concentrations of uranium sufficiently high to be a matter of concern.

Natural Sources of Constituents

Big Springs and Deadman Creek provide natural sources of phosphorus, which encourages abundant growth of aquatic plants in the upper Owens River and in Crowley Lake. Big Springs was found to be the primary source of phosphorus for Crowley Lake (Melack and Lesack, 1982). Hot Creek is the largest tributary to the upper Owens River and contributes additional nutrients as well as some heavy metals. Arsenic is found at high levels in some of the Hot Creek geothermal springs within the creek (Ebasco Environmental, et al., 1993).

Anthropogenic Sources of Constituents

A water quality modeling study demonstrated that reducing diversions from the West Walker River would improve water quality in the river as well as Walker River, largely by providing additional water for dilution of dissolved salts (Humberstone, 1999).

A recent study in the Bridgeport Valley (Elkins, 2002) may provide some indications about

nutrient and fecal coliform pollution from livestock operations. Elkins (2002) found that:

1) more than half of the annual nitrogen and phosphorus loads to Bridgeport Reservoir were delivered by snowmelt runoff,
2) total inorganic nitrogen (nitrate and ammonia) was removed by biochemical processes in the saturated soils of the Bridgeport Valley,
3) water that remained in the channels and was not in contact with the soils retained any inorganic nitrogen already present,
4) dissolved organic nitrogen was the primary form of nitrogen entering Bridgeport Reservoir and was readily leached from manure and irrigated soils,
5) phosphorus was not retained by the soils and was readily transported on eroded soil particles,
6) fecal coliform from livestock manure appears to survive for months even in the cold temperatures of Bridgeport Valley and is readily transported in snowmelt runoff and irrigation return flow.

Unpaved roads are the principal source of sediments from human activities throughout the Sierra Nevada (Kattelmann, 1996). That situation is likely to be the case within the Inyo-Mono IRWM planning area as well, although grading for residential construction may be the main source in local areas, such as the town of Mammoth Lakes. Activities that remove vegetation and leaf litter, expose soil directly to rainfall and runoff, and compact soil greatly increase the potential for erosion. If the disturbance is near a stream channel, then there is a high likelihood that the eroded sediment will be transported into a stream rather than just relocated. The Mammoth Mountain Ski Area was also identified as a major source of human-caused sediment (USDA-Forest Service, 1988). However, erosion control efforts and sediment detention basins have presumably greatly reduced the amount of sediment leaving the ski area boundaries.

A variety of petroleum- and rubber-based materials are washed off paved roads into storm sewers and small channels. Nitrogen and phosphorus enter streams from several sources: leakage and failure of septic and sewage systems; overapplication of fertilizers on lawns, gardens, golf courses, and ski runs; release of some household cleaning products; and pet waste. Pathogenic bacteria, such as *E. coli*, enter surface waters from leakage and failure of septic and sewage systems, pet waste, livestock waste, human waste from recreationists, and indiscriminate flushing of RV waste tanks.

A standard septic system uses a septic tank and a leach field. If properly designed, installed well above the water table and in adequately draining soil, constructed, and operated, then a regular septic system is capable of nearly complete removal of fecal coliform bacteria, suspended solids, and biodegradable organic compounds (EDAW, 2005). The most critical factor in determining effectiveness of septic systems for treating the contaminants above is the time that leachate takes to travel between the leach lines and the water table. Deep soils that drain slowly allow for maximum biological processing of the wastewater. Unfortunately, in most soils, septic systems are relatively ineffective for removing nitrogen, pharmaceuticals, and other synthetic organic compounds (EDAW, 2005).

The State Water Resources Control Board is currently (2006) drafting new regulations to address septic systems, also known as on-site wastewater treatment systems (OWTS). California currently lacks statewide regulations or standards on septic systems, and practices vary greatly between regional water quality control boards and local jurisdictions. Depending on what criteria are ultimately adopted, the new regulations could result in greatly increased costs for on-site wastewater disposal or building moratoria in some areas.

Description of Major Water-related Objectives and Conflicts

The objectives of the Inyo-Mono RWMG are thoroughly discussed in Chapter 7.

Ongoing conflicts over water in the Inyo-Mono IRWM region as of 2012 are best seen in the context of historical water conflicts of the eastern Sierra Nevada.

Water-related conflicts in the Inyo-Mono IRWM region began soon after the arrival of Euro-American settlers in the 1850s. The most severe winter on record brought widespread flooding to the area in 1862. The scarcity of food and shelter amid the high water in the southern Owens Valley led to violent conflicts between native Paiutes and the new settlers (Chalfant, 1933; DeDecker, 1966).

As irrigation of fields and orchards throughout the Owens Valley grew rapidly in the late 1800s, discharge in the Owens River dropped dramatically and Owens Lake began to shrink. By 1890, about 250 miles of canals and ditches had been constructed with a combined capacity of about 1,200 cfs (exceeding flow the of Owens River much of the year). After the turn of the century, engineering plans, financing, deals for land and water rights, and construction were organized to move water from the Owens Valley to Los Angeles. With completion of the Los Angeles Aqueduct in 1913, water demand for export began to compete with water demand for local irrigation. From 1913 through 1922, the City of Los Angeles and Owens Valley irrigators apparently got along with an adequate distribution of water, largely because the intake for the aqueduct near Aberdeen was downstream of the principal agricultural areas of the valley (Vorster, 1992). An agreement was almost reached to guarantee water supplies to existing irrigated lands in 1913, but a legal challenge from a private citizen in Los Angeles disrupted the negotiations (Vorster, 1992). A series of dry years from 1921 through 1925 led to the City's effort of purchase additional land and water rights from 1923 through 1927. There is a wide range of accounts of the circumstances and practices of acquisition during that period (e.g, Chalfant, 1933; Hoffmann, 1981; Kahrl, 1982; Reisner, 1986; Smith and James, 1995). Despite much controversy surrounding the real-estate deals, actual prices paid for land and water rights in almost all cases were at least fair-market value and occasionally quite favorable to the sellers (Vorster, 1992; Libecap, 2007). Landless agricultural workers, especially Native Americans, lost work as cultivated acreage declined.

As growth accelerated in Los Angeles in the 1920s and 1930s, LADWP sought to increase its water supplies from the eastern Sierra Nevada. The City filed for appropriative water rights on streams in the Mono Basin, acquired streamside parcels in the Mono Basin, constructed diversion structures, built a dam forming Grant Lake reservoir, and tunneled through the Mono Craters to get water from the Mono Basin to the upper Owens River. Water began to flow

through the Mono Craters Tunnel in 1941. Although initially considered in the 1920s, a second aqueduct was not designed until 1963 and completed in 1970. The resulting sixty percent increase in aqueduct capacity (480 cfs to 780 cfs) allowed for additional water exports from the Mono Basin, provided rationale to reduce irrigation of City-owned lands, and created an opportunity to export additional quantities of groundwater. All three activities had environmental consequences and led to strong objections from some eastern Sierra residents.

Inyo County filed a lawsuit in 1972 intended to force a reduction in groundwater extraction and export. The legal action used the new California Environmental Quality Act, and courts limited groundwater pumping by LADWP until an Environmental Impact Report was completed. While litigation proceeded in the courts, the county and city attempted to negotiate an agreement to meet the water needs of both regions (e.g, Smith and James, 1995). Focused primarily on groundwater management, the Inyo / LA Long Term Water Agreement provides the basis for resolving some of the conflicts over water allocation in the Owens Valley. A primary goal of the agreement was to "to avoid certain described decreases and changes in vegetation and to cause no significant effect on the environment which cannot be acceptably mitigated while providing a reliable supply of water for export to Los Angeles and for use in Inyo County." The agreement specifies baseline conditions for native phreatophytic vegetation, prescribes water supplies for irrigated areas, manages pumping according to soil water and vegetation conditions, provides for a number of mitigation projects, and puts in place technical and policy making committees (Harrington, 2012, personal communication).

The agreement also provided for the rewatering of the Owens River channel downstream of the primary intake for the Los Angeles Aqueduct. A 1997 Memorandum of Understanding expanded the scope and terms of the 62 mile-long "Lower Owens River Project" and provided for additional mitigation. Water was released into the channel in December, 2006, and flows are used to enhance the river's riparian corridor, improve wildlife habitat in the Blackrock and Delta Habitat Areas, and to maintain off-river lakes and ponds for recreation.

Although irrigation diversions had markedly reduced Owens River inflows to Owens Lake in the late 1800s and the lake's water level had dropped by about 33 feet between 1878 and 1905 (Lee, 1915), water export to Los Angeles beginning in 1913 completely diverted inflow from entering Owens Lake. By 1924, the lake was essentially gone, exposing over 60 square miles of lake bed and creating the largest monitored source of windblown dust (PM-10) in the United States. In 1987, the U.S. E.P.A. found that the southern Owens Valley was in violation, and subsequently in 1993, in "serious non-attainment" of PM-10 particulate matter air-quality standards. Because of the connection between removing the inflows to the lake and the consequent empty lakebed, the Great Basin Unified Air Pollution Control District, the California Air Resources Board and the U.S. Environmental Protection Agency determined the City of Los Angeles is responsible for controlling the air pollution emissions from the dry lakebed. In 1998, the Great Basin Unified Air Pollution Control District and the City of Los Angeles entered into a memorandum of understanding to control dust emissions from the lakebed. Over the past decade, the City has expended over a half billion dollars and has recently applied up to 76,000 acre-feet of water per year to control dust (Great Basin Unified Air Pollution Control District, 2008; LADWP, 2011a). An Owens Lakebed Master Plan is currently (December, 2010) being

developed to resolve issues such as continued dust control and water use, wildlife habitat, and possible solar power generation at Owens Lake. The air pollution levels dropped about 90 percent between 2000 and 2009 as dust controls were implemented.

Following completion of the second aqueduct, export of water from the Mono Basin became a widely recognized controversy. When diversions out of the basin approximately doubled in 1970, the rate at which Mono Lake level dropped increased significantly, which resulted in increased salinity. In 1978, the Mono Lake Committee was formed with the initial goal of restoring Mono Lake back to the water level it had in 1976, which would limit some of the ecological consequences of diverting its tributary streams. The water diversion conflict in Mono County generated a large amount of press coverage and public attention. Inevitably, the issue entered the legal system. An initial suit, brought by the National Audubon Society, advanced relatively quickly on appeal to the California Supreme Court. The court's decision in February, 1983, found that the allocation of the waters of the Mono Basin needed to be reconsidered, based on public trust values. In autumn of 1984, another lawsuit based on a section of the California Fish and Game Code led to a decision to maintain flows below Grant Lake dam adequate to maintain the fishery that became reestablished during the big winters of 1982 and 1983. Further legal actions led to an injunction in 1991 to maintain the then-current lake level while the State Water Resources Control Board studied the diversions of water from the Mono Basin streams. In September, 1994, the Board issued its decision, amending the licenses so as to partially restore Mono Lake and its tributary streams (Hart, 1996).

Comparatively minor operational conflicts continue over the progress and form of Mono Basin stream restoration efforts. In the past decade, a local controversy has ensued over the distribution of water between Mill Creek and Wilson Creek in the northwestern part of the basin. The matter is expected to be addressed through the hydropower relicensing process of the Federal Energy Regulatory Commission.

At the north end of the planning region, the long-term trade-off between irrigation and maintaining Walker Lake is the fundamental conflict over water. The dramatic decline in the level and volume of Walker Lake and the consequent increase in salinity and changes in the lake's fishery have attracted national attention. Between 1882 and 1994, as irrigation consumed water from the Walker River, the surface elevation of Walker Lake fell by about 140 feet and the volume decreased by about 75 percent (e.g., Sharpe, et al., 2008; Collopy and Thomas, 2010). Concentration of salts has increased five-fold over this period. Anecdotal accounts suggest that

Lahontan cutthroat trout ceased to exist within Walker Lake during 2009 or 2010 (e.g., Gregory, 2011). The volume of water subject to appropriation through existing water rights is 40 percent greater than the average annual inflow to the lake. Most of the water that actually reaches the lake enters during major floods that exceed the upstream capacity of storage reservoirs. Although there is potential to improve water supplies by conjunctive use of groundwater and surface water and greater water conservation through ditch lining, upgrading distribution systems, and irrigation scheduling, the political will to acquire or alter water rights is lacking. Although the volume of water evaporated through irrigation on the California side of the stateline is small compared to that downstream in Nevada, opportunities for purchase or lease of water rights are being explored within the California portion of the basin.

The primary water issue within the upper Owens River watershed is supplying water for the town of Mammoth Lakes without adversely affecting aquatic habitat in Mammoth Creek or water quantity and/or temperature at the Hot Creek hatchery springs. This water supply concern has been a persistent issue since the 1970s and became more acute with the town's growth. In 2011, MCWD adopted a project described in an Environmental Impact Report identifying monthly Mammoth Creek flow amounts that would restrict diversions for town water supply. These flow amounts are intended to protect the aquatic habitat of the creek. In addition, in 2011, the District updated its Urban Water Management Plan that evaluates current and projected water supplies under various water year scenarios and compares these supplies with projected town growth. The UWMP concluded that the development of one new groundwater well and maintaining water conservation efforts will result in adequate supplies for projected town growth. Since these reports were completed, the City of Los Angeles, through the Department of Water and Power, has filed legal challenges to the UWMP and the District's EIR addressing the environmental impacts of the District's water right licenses and permit (Mammoth Community Water District, 2011b). These legal challenges have generated new uncertainties and controversies over supplying water to the town of Mammoth Lakes and the USFS recreational facilities in the Mammoth Lakes Basin, which remain unresolved in 2012.

The development of geothermal energy near the junction of U.S. Highway 395 and State Route 203 led to the creation of the Long Valley Hydrologic Advisory Committee, a technical group that monitors wells, springs, and streams down gradient of the geothermal plant for signs of any changes that might be related to the geothermal development and/or overuse of water from Mammoth Creek in the town of Mammoth Lakes.

The southeastern part of the Inyo-Mono region has been identified as a favorable location for solar power development. One project in the California portion of Pahrump Valley was in the California Energy Commission permitting process as of May, 2012, and at least four other projects are in various stages of planning in the Nevada portion of the basin. Projects have also been proposed in the Middle Amargosa basin and Owens Valley. Water use by these projects depends on the power generation and cooling technology used, and because the southeastern part of the region has scant surface water, the water needs of these projects will be supplied with groundwater. Supplying large amounts of groundwater to projects in the southeastern part of the region may be problematic because the Nevada State Engineer has declared that the Pahrump basin is in overdraft.

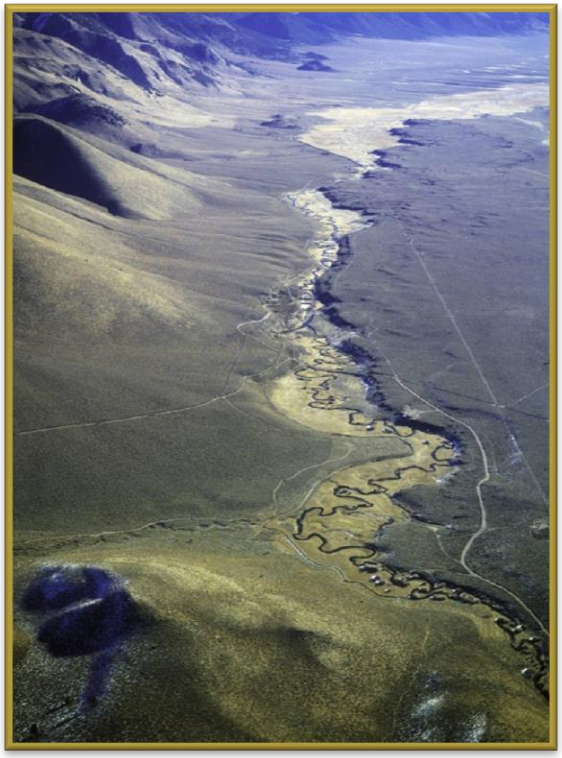
Because of the lack of comprehensive data on the safe yield of the region's many isolated aquifers, new residential developments frequently face opposition based on the inadequacy of water supply data. Although the CEQA process addresses this issue and individual water availability analyses are performed, these studies are frequently viewed with skepticism by those within close proximity to the development, who fear their own water supplies will be impacted. Without major advances in localized groundwater data, this problem will likely continue. CASGEM reporting should provide much-needed information.

In the Mono Lake and Owens Rivers basins, about 460 miles out of 530 miles of streams are affected by water diversions (Inyo National Forest, 1987). During the 1980s, under the favorable conditions created by the Public Utilities Regulatory Policy Act, at least a dozen small-scale hydroelectric projects were proposed on streams of the eastern Sierra Nevada. None of those projects were built, although plans occasionally resurface (*e.g*, on Pine Creek).

Historical conflicts over water resources in the Inyo-Mono region have centered on water exports, impacts on closed-basin lakes, and groundwater pumping. Current conflicts seem both milder in intensity as well as focused on other issues, such as water quality, community water supply, water conservation, and allocations supporting environmental benefits. Today, the level of controversy within the region seems greatly reduced compared to our history. Although disagreements certainly persist over water in such an arid region, there appears to be a greater willingness by most parties to attempt to resolve differences though negotiation and collaborative processes and avoid litigation. The Owens Lakebed Master Plan effort and the Inyo-Mono Regional Water Management Group are examples of this current direction.

Chapter 3: Climate Change

Introduction



Warming of the Earth's climate has become evident over the last several decades, though there is still debate over the anthropogenic (or man-made) contribution to climate change. The overwhelming consensus among climate scientists is that human-derived sources of greenhouse gases have at the very least sped up, or even caused, the observed warming in the last century. In the most recent report from the Intergovernmental Panel on Climate Change (IPCC), which is a body of international scientists and climate experts established by the United Nations, the authors state: "Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level" (IPCC 2007).

In terms of managing water resources in a changing climate for a region as diverse and complex as the Inyo-Mono planning region, it is necessary to have access to information at scales that are meaningful for planning and decision-making. The Inyo-Mono IRWM process attempts to provide information at the appropriate scale. An additional challenge is that, given the remote and rural nature of the Inyo-Mono region, information regarding climate change impacts, greenhouse gas mitigation, and adaptation strategies originating from academic institutions, or State or federal agencies, is not always readily accessible. Thus, the Inyo-Mono RWMG is committed to improving availability of climate change-related information for water practitioners in the area, through the IRWM Plan, other targeted documents, and workshops.

Climate Change Vulnerabilities and Impacts in the Inyo-Mono Region

Globally, air temperature has increased 1.3°F (0.7°C) over the last century (1906-2005) (IPCC 2007). This warming is not uniform, however. Polar regions are showing more warming than mid-latitude regions, at up to twice the global average rate in the last 100 years. High-elevation/mountainous regions are also experiencing increased warming. Trends in precipitation have also been observed, although not in consistent directions. Some areas, such as the Sahel, southern Africa, and parts of southern Asia have experienced decreased precipitation, while eastern North and South America and northern Europe have experienced increased precipitation. Other impacts related to these climatic changes include sea level rise, melting glaciers and polar ice caps, warming oceans, decreased snow cover, melting permafrost, droughts, and more extreme weather events. All of these changes are expected to continue, if not accelerate, in the coming decades.

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 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 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.

One of the primary drivers of GCMs and RCMs are greenhouse gas (GHG) emissions scenarios. The IPCC has developed a set of possible future GHG emissions based on different scenarios of global population growth, economic growth, government regulations of GHGs, etc. (IPCC 2007). GCMs and RCMs incorporate these emissions scenarios to produce a suite of possible climatic changes.

In general, GCMs show good agreement with respect to temperature changes, showing long-term warming over the globe. There may be some exceptions to this warming. For instance, northern Europe, whose climate is moderated by the North Atlantic ocean circulation, may actually experience cooling if ocean currents slow. For California, there is strong consensus that temperatures will continue to increase in the coming century. Using two GCMs and two emissions scenarios, Hayhoe et al. (2004) found that summer temperatures are likely to increase more rapidly than winter temperatures (see also Cayan et al. 2008), and that the north and northeast portions of the state may warm more than the southwest portion. Furthermore, warming is expected to be greater further inland in California due to the moderating effects of the ocean on air temperature in the coastal regions (Cayan et al. 2008).

A regional climate modeling effort analyzed temperature and precipitation changes specifically for the ten California Department of Water Resources hydrologic regions (Snyder et al. 2004). The North Lahontan and South Lahontan regions (in which the Inyo-Mono planning region resides) exhibited larger temperature increases than the other hydrologic regions, particularly in winter months (Snyder et al. 2004). This difference is likely due to the high elevations in these regions as well as their inland locations.

Projected precipitation patterns are much less certain than projected changes in temperature. Despite widespread regional differences over the globe, high-latitude regions are expected to experience increased precipitation amounts, while sub-tropical regions are expected to dry (IPCC 2007). For California in general, the seasonal patterns of precipitation resulting from the Mediterranean-type climate are not expected to change (Cayan et al. 2008). Projections of changes in the magnitude of precipitation, however, are not as straightforward. While earlier projections of precipitation showed large increases by 2100, more recent projections show only slight increases or slight to moderate decreases

(Cayan et al. 2008, Hayhoe et al. 2004). Thus, it is difficult to develop expectations of precipitation changes with much certainty. Models show that precipitation patterns will continue to exhibit considerable monthly, interannual, and interdecadal variability (Cayan et al. 2008, Hayhoe et al. 2004), which may serve to mask any medium-term change in precipitation trends.

Perhaps more significant for California water resources than direct changes in temperature and precipitation will be the impacts of these climatic changes to the hydrological cycle. In California, almost 75% of annual water resources originate and are stored in Sierra Nevada snowpack (DWR 2008). This natural reservoir captures and stores water in the winter, when it is least needed throughout the state, and slowly releases it in the spring and summer through snowmelt runoff and streamflow, when statewide precipitation is limiting. Climate change-induced alterations to the amount of snowpack and to the timing of snowmelt and streamflow can impact both the quantity and quality of water resources available to urban and agricultural users. Expected hydrologic changes specific to the Inyo-Mono region will be discussed throughout this chapter.

DWR, in conjunction with the U.S. EPA and the Army Corps of Engineers, released in late 2011 the *Climate Change Handbook for Regional Water Planning* (DWR, 2011). The analysis that follows is largely in step with the guidance provided in the handbook.

Region Characterization

Chapter 2 (Region Description) provides a thorough description of the Inyo-Mono planning region, including climate, hydrology, geography, watersheds and associated ecosystems, and water supplies and demands.

Climate Change Impacts

Water Supply

When thinking about climate change impacts to water resources in the Inyo-Mono region, we are most concerned with changes to winter snowpack and spring snowmelt and runoff. As with other regions in California that depend on water supplies from the west slope of the Sierra Nevada, snow provides a natural water reservoir for eastern Sierra Nevada communities and for the water that is exported to Los Angeles. Although changes in the amount of snow and rain received each year could impact water supplies, the projected impact of warming temperatures on the timing of snowmelt and streamflow is more certain and therefore may be of greater immediate concern. For years, water operators have depended on a peak in runoff during the late spring or early summer and have developed their water operations protocols accordingly. Changes in this timing will require development of flexible water operations protocols and better forecasting tools.

Already, changes in snowmelt runoff timing have been observed in western North America (Stewart et al. 2004). Snowmelt-dominated peak streamflow has shifted 10-30 days earlier since 1948 in many parts of the western U.S. (Stewart et al. 2004). It is expected that this trend towards earlier peak streamflow will continue throughout the 21st century, with many rivers eventually exhibiting a peak streamflow 20-40 days earlier than the mid-20th century (Snyder et al. 2004, Stewart et al. 2004). Models show that these observed and projected changes in streamflow timing are most likely caused by warming air temperatures rather than by changes in precipitation amounts (Stewart et al. 2004).

Although changes to the timing of events may be predicted to create the largest impacts to water supplies, changes in the amount of snowpack and other forms of precipitation can also have effects. Snowpack is expected to decrease in most areas of the West, both because of increased winter rain and more winter snowmelt due to higher temperatures (Snyder et al. 2004). Increased incidence of rain-on-snow events can cause winter flooding and help to speed up snowmelt and streamflow. Already, observed April 1 snow water equivalent (SWE), which is commonly used as the benchmark for measuring the amount of water delivered during the winter, has declined throughout the West, although not uniformly so (Mote et al. 2005). For the second half of the 20th century, the largest losses in April 1 SWE occurred in Washington, Oregon, and northern California, while the southern Sierra Nevada actually exhibited an increase in April 1 SWE (Mote et al. 2005). For the future, overall decreases in SWE are expected to continue and may perhaps even accelerate (Mote et al. 2005).

It is expected that the largest decreases in SWE will occur at lower elevations in western mountain ranges where the temperature currently hovers around freezing and will most likely increase. In the Sierra Nevada, the northern extent of the range will likely experience more dramatic impacts than the southern end of the range, which is higher in elevation. This projection may bode well for the Inyo-Mono region, which reaches from the central to southern Sierra Nevada. A much greater proportion of the snow zone of the eastern slope of the Sierra Nevada is at relatively high elevation than that of the western slope. This greater proportion of watersheds at elevations above those most likely to be impacted by changes in freezing level may also moderate hydrologic impacts of rising temperatures.

It is also expected that winters will become shorter and summers will be longer. Whether this results in an overall net loss in precipitation is unknown, but we might expect that snowfall that used to arrive in the autumn and spring might be delivered as rain in the future. This extended growing season will also mean more plant growth, which will increase the plant water demand.

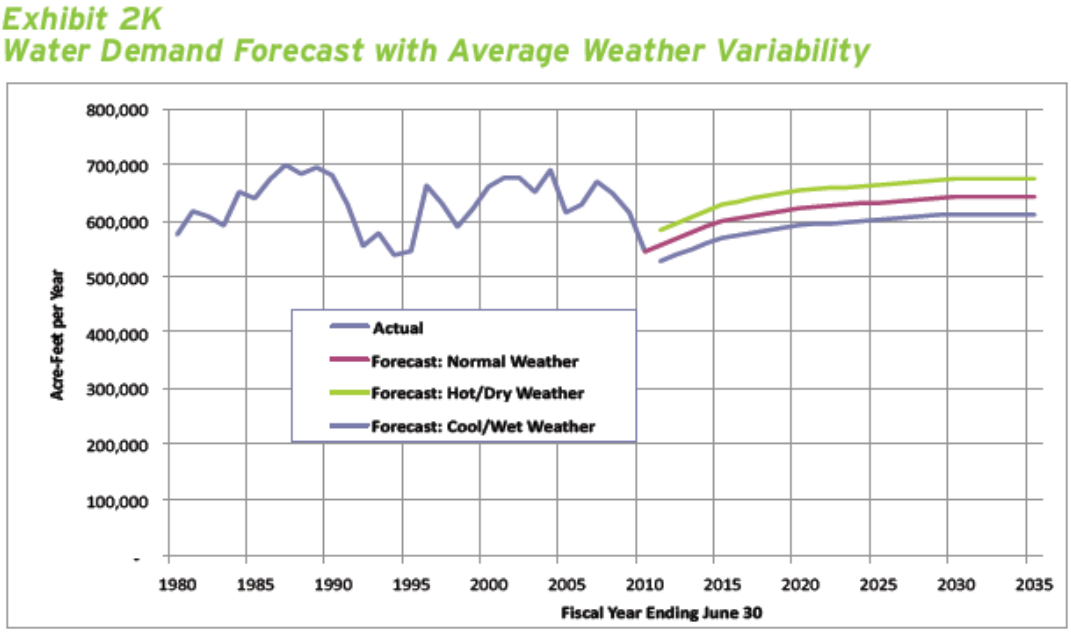
As important but much less known are the impacts of climate change to groundwater supply. It might be expected that altered streamflow amounts and/or timing could affect recharge to groundwater basins in the region, but there are presently few data to support that assumption. However, as surface water supplies become more variable and unpredictable, communities, landowners, and resource managers may increasingly turn to groundwater to make up water supply deficits.

Water Demand

Because of the sparse population in the region, local water demand is not large. Demand does fluctuate seasonally to satisfy landscape irrigation and air conditioning needs (through the use of swamp coolers) in the summer. This seasonal demand could increase as summers become longer and warmer. Efforts to encourage native landscaping in communities throughout the region may help to mitigate some of this increase.

A second main source of water demand comes from the City of Los Angeles in the form of water exports from the Inyo-Mono region. The 2010 Los Angeles Department of Water and Power Urban Water Management Plan shows that, under average climate variability, overall water demand for the city is likely to increase slightly over the next 10-15 years and then level out around 2030 (LADWP, 2010; Figure 3-1). No analysis of demand under a changing climate is available. In general, it might be expected that demand from the Los Angeles Aqueduct will increase not only because of the expected increase in overall water demand, but because other sources used by the City, such as Colorado River water and State Water Project water, are likely to become increasingly unreliable.

Figure 3-1. Overall projected water demand for the City of Los Angeles through 2035.



Water Quality

Currently, most anthropogenic problems related to surface water quality in the region come from roads, recreation and grazing. While these activities do take place at high elevations, surface water quality high in the watersheds tends to be good. As high-elevation streams move downhill, anthropogenic impacts reduce the quality of the water. Climate change could impact water quality by intensifying summer recreation, which brings more visitors to the area than winter recreation. Longer growing seasons could also mean longer grazing seasons, and along with those, attendant impacts to water quality.

There are also naturally-occurring water quality contaminants in the region. These are mostly found in groundwater and largely occur as arsenic and uranium. Although there have been no known studies specific to impacts of climate change on groundwater quality in the region, altered recharge rates and amounts could impact the concentration of these substances in underlying aquifers. Additional groundwater pumping resulting from variable or unreliable surface water supplies may also increase the concentration of arsenic and uranium in the aquifer, depending on the mixing among layers. A current study in Mammoth Lakes by the Mammoth Community Water District will examine various layers of the underlying aquifer to determine if some sources are better than others, but the study will not be directly

linked to climate change.

Flooding

Although the Inyo-Mono region does not experience flooding on the scale of the Sacramento-San Joaquin Delta or the Central Valley of California, localized flooding can be a major concern. Many communities on the Highway 395 corridor have experienced flooding from nearby streams and rivers, especially in years with large amounts of precipitation. In the Inyo-Mono region, flooding is typically a concern either (1) during rain-on-snow events in the winter or (2) during the spring snowmelt and runoff, although summertime flooding can occur as well. Some communities in the Inyo-Mono region have limited infrastructure to deal with large amounts of stormwater, which results in flooding. In the wildland areas of the region, flooding and erosion can become problematic especially after fire, and problems that originate upslope can affect downslope communities.

The more extreme weather events expected to accompany changes in the climate may have implications for flooding in the region. In particular, extremely large precipitation events or increased rain-on-snow events may be of concern. It is less clear whether the altered timing of snowmelt and streamflow will affect flooding in the region. The RWMG is working to better understand not only current flooding patterns and causes but also projections of future flooding.

Terrestrial and Aquatic Ecosystems

Impacts of a changing climate on terrestrial and aquatic ecosystems, and their living inhabitants, have been studied worldwide. From this research, some general principles have been established, although it is difficult to completely generalize as impacts are expected to differ ecosystem-to-ecosystem and even species-to-species.

One of the primary concerns related to climate change impacts on ecosystems is the movement of animal and plant species. If the climate in a species' current range changes to the point of being beyond that species' tolerance, the species must either adapt or move (Aitken et al. 2008). While some evidence of climate-related adaptation has surfaced, it has become more apparent that species are starting to move to more favorable climate regimes. This migration is particularly evident in mountainous and topographically-complex regions, such as the Inyo-Mono. As lower elevations warm, species may migrate to higher elevations in mountain ranges. This adjustment has already been observed in some bird species. Species may also shift their ranges north or south as the climate changes. However, direction of movement may not always be predictable. For example, while it is thought that most species in the Sierra Nevada will move up in elevation over time with a warming climate, some models show that, on the east side of the Sierra, the conifer forest could actually move down in elevation into the sagebrush steppe in certain scenarios of altered precipitation regimes (Lenihan et al. 2003).

Mobile animal species will have an easier time shifting their ranges than sessile plants. Plants will need to depend on seed dispersal and seedling establishment into habitat with more favorable climate. Furthermore, it is not expected that all species will move in the same direction – even species that currently reside in the same habitat or ecosystem. Such differences in movement will alter relationships among species and may create novel and unexpected consequences. For those species that are not able to migrate to more favorable conditions, local extirpation or even extinction may become a reality.

Climate change may favor some invasive plant and animal species, particularly if it places stress on their

native competitors. Conversely, as species move, invasive species may encounter new competitors that are able to limit their spread. Again, such movement and interactions will vary by species and ecosystem. Although the Inyo-Mono region and adjacent Great Basin and Mojave deserts have been relatively free of invasive species, there are a few of considerable concern, including cheatgrass, red brome, quagga mussels, and zebra mussels.

Changes in hydrology may significantly impact aquatic ecosystems. Altered timing of streamflow and changes in flooding regimes are two physical changes that could impact these systems. Also, increased water temperature and associated impacts to other parameters such as dissolved oxygen, pH, and turbidity may affect fitness or survival of individuals and species. Given the importance of these aquatic systems to recreation, livelihoods, and the water supply of the region and distant urban areas, impacts to aquatic species are important to understand.

Climate Change Vulnerabilities

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).

Water Supply

1) Does a portion of the water supply in the region come from snowmelt?

Yes. All communities that utilize surface water originating from Sierra Nevada snowpack, and all communities that utilize groundwater recharged by infiltration of Sierra Nevada snowmelt, rely on snowmelt for water supply. This dependence on snowmelt includes both local communities and the City of Los Angeles.

2) Would the region have difficulty in storing carryover supply surpluses from year to year?

It depends. Given the sparsely-populated and rural nature of the region, there has not yet been a need for major water storage infrastructure. However, because of the Los Angeles Aqueduct, there is more storage in the region than might be expected. While currently, this infrastructure is only being used to store and convey water belonging to Los Angeles, there is potentially the capacity to use this infrastructure to help store surpluses from wet years for use by local communities. In other parts of the region outside of the Mono and Owens watersheds, new surface storage would need to be considered. Alternatively, water storage in underlying aquifers may prove to be a viable option, depending on changes in recharge rates, as several communities in the region are starting to look more seriously at conjunctive use. Yet small, rural water districts may have difficulty in finding increased storage capacity. Usually these water districts use small lakes or tanks to store water, and adding storage facilities is expensive.

3) Has the region faced a drought in the past during which it failed to meet local water demands?

There are several examples of inability to meet local water demands. First, the LADWP is required to provide irrigation water to its agricultural lessees. During the drought of 1976-1977, it sought to eliminate the supply of irrigation water so that it could meet the water needs for the City. Although it was not

allowed to do so until adopting a water conservation plan, irrigation supplies were reduced during this time period.

During the 1988-1991 drought, the Mammoth Community Water District applied for emergency waivers to avoid requirements to comply with fishery bypass flows on Mammoth Creek in order to make more surface water available for community needs. In 2007 and 2012, both of which were drought years, MCWD instituted water restrictions on outdoor irrigation due to the lack of surface water availability and the necessity to use only groundwater.

In the Indian Wells Valley, communities are faced with perpetual drought conditions. The area receives, on average, less than four inches of rain per year. Thus, these communities fully rely on groundwater, which is being overdrafted at a rate of about 1.5 feet/year.

4) Does the region have invasive species management issues at water resources facilities, along conveyance structures, or in habitat areas?

Due to the remote nature of the region, the Inyo-Mono planning area thus far has been relatively free of aquatic invasive species. Quagga mussels have recently gained more attention in the area because of the problems they have created in nearby Lake Tahoe and the Colorado River basin. Checkpoints are set up each summer throughout the Eastern Sierra to help control the spread of this species and to educate visitors about their impacts. Thus far, however, quagga mussels have not created problems in the waterways or infrastructure of the region.

The presence of New Zealand mud snails in local fish hatcheries has limited the use of fish from infested hatcheries.

Tamarisk occurs along many natural and man-made waterways in the region and is becoming an ever-increasing threat throughout the West.

Water Demand

1) Are there major industries that require cooling/process water in the planning region?

The industrial water users in the region rely almost entirely on groundwater. Currently, there is a geothermal energy plant outside of Mammoth Lakes that pumps groundwater and moves it to their facility. They are currently looking to expand their plant and operations. There is a water bottling facility near Cartago that utilizes groundwater. Of concern to some stakeholders in the region are the many solar developments being proposed for the desert in southeast Inyo County and beyond. These facilities would require some amount of water, which would mostly be extracted from underlying aquifers. Finally, Coso Operating Company operates a wet-cooled geothermal plant in the Coso Range between Rose Valley and Coso Valley. Currently, this facility is injecting 4,800 AFY of groundwater from Rose Valley into the geothermal field to slow or reverse the depletion of fluids from the geothermal reservoir.

2) Does water use vary by more than 50% seasonally in parts of the region?

Yes. Water use in communities within the Inyo-Mono region increases substantially in the summer, primarily for landscape and air conditioning purposes. Also, water for agricultural irrigation is highly

seasonal and increases in the spring and summer. Finally, water use for dust abatement on Owens dry lakebed is greatest in the winter and spring.

3) Are crops grown in the region climate sensitive?

Most of the agriculture that occurs in the Inyo-Mono region is sheep and cattle grazing. This type of agriculture will be sensitive to changes in the naturally-occurring plant community resulting from climate change. There are a few areas within the region that grow crops, such as alfalfa. These tend to be the lower-lying areas in the regions and will be vulnerable to climatic warming, altered precipitation regimes, altered snowmelt and streamflow timing, and flooding. Other types of crops occurring in the region are mostly grown on small family farms.

4) Do groundwater supplies in the region lack resiliency after drought events?

Little is known about most of the aquifers in the Inyo-Mono region, except for perhaps the Owens groundwater basin. This is a topic that needs more thorough examination throughout the region. What is known, however, is that long-term intensive pumping can lead to impacts both to the groundwater itself and to the above-ground resources.

5) Are water use curtailment measures effective in the region?

Water conservation measures have been implemented primarily in the two largest communities in the region – Mammoth Lakes and Ridgecrest. Both of the water districts serving these communities have begun water education and conservation outreach programs. While these programs have been effective so far, both are fairly new, and their long-term efficacy is yet to be seen. Other parts of the region have not yet focused heavily on water conservation. There is a perception in much of the region that because the communities are relatively high in the watershed and/or close to the source water, there is plenty of water available and conservation is not a main priority.

6) Are there export demands from the region?

The City of Los Angeles has exported water from the Owens Valley and Mono Basin since 1913. These exports will continue into the future. Although the LADWP has put a substantial amount of effort into water conservation with the city of Los Angeles through retrofits, education, and restrictions, these measures will likely not decrease the demand for water exports from the Inyo-Mono region. The uncertainty and unreliability of State Water Project and Colorado River water add to the continued demand for Los Angeles Aqueduct water.

In addition to the Los Angeles Aqueduct, there is a Crystal Geyser bottling facility in Cartago. Water pumped for bottling ends up being moved out of the region, essentially creating an export of water. This facility plans to double its bottling capacity in the next few years.

Water Quality

1) Are increased wildfires a threat in your region?

Absolutely, yes. In recent years, several fires have burned close to or even within communities in the region. As is true for much of the West, forests in the region are overgrown due to a century of fire suppression, though thinning projects have reduced the density in treatment areas. It is expected that there will continue to be larger, more intense forest fires. By the end of the century, the incidence of fire in the higher elevations of the region could increase five-to-seven-fold. While sagebrush and other desert vegetation naturally have a lower fire return interval than the region's predominant mid-elevation Jeffery pine forests, the increasing presence of humans and potential drought conditions could create higher fire hazard. Furthermore, as cheatgrass becomes more established throughout the region, we can expect an altered fire regime in high desert plant communities, including a shortened fire-return interval.

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?

Some streams in the region experience water quality degradation due to use by wildlife, grazing livestock, and recreationalists. This same surface water is then used by local communities or provided as export to the City of Los Angeles. Climate change may intensify the use of waterways if drought becomes more common. This is an area that needs further study for the Inyo-Mono region.

3) Are seasonal low flows decreasing for some waterbodies in the region? Are reduced low flows limiting the waterbodies' assimilative capacity?

In particularly dry years, such as 2007, some streams in the region experience very low flows. If those dry years start to stack up into multi-year drought periods, low flows could become a concern for water quality and for in-stream and terrestrial wildlife. For example, the Amargosa River, stretches of which are designated as Wild and Scenic, is currently partly ephemeral due to its desert location. Prolonged drought could impact its Wild and Scenic designation and affect the wildlife that depends on the river. Analyses of past low-flow conditions for area streams and rivers have not been done.

4) Does part of the region rely on groundwater supplies with current or recurrent water quality issues?

Yes. As described above, some of the groundwater pumped in the region exhibits naturally-occurring arsenic and/or uranium that exceed the maximum load regulations. Yet there are some wells that produce groundwater without these elements. More information is needed about the locations of arsenic and uranium contamination as well as the movement of groundwater within or among aquifers.

5) ***Does part of the region currently observe water quality shifts during rain events that impact treatment facility operation?***

In at least two of the more densely populated communities within the region, stormwater management is a growing concern. Not only does poor stormwater management result in flooding in these communities, but it also affects the initial quality of water being treated. Increases in storm intensity and/or rain-on-snow events will exacerbate these concerns.

Flooding

1) ***Does critical infrastructure in the region lie within a 200-year floodplain?***

Two hundred-year floodplain data are not available for the Inyo-Mono region. Instead, 100-year floodplain data were used. The vulnerable areas include the upper East and West Walker River Watersheds, parts of the Owens Valley, the Tri-Valley, and some of the inter-mountain valleys in southeast Inyo County, particularly those in Death Valley National Park. There is critical water conveyance and water storage infrastructure in the Walker, Owens, and Tri-Valley areas.

2) ***Does aging critical flood protection infrastructure exist in your region?***

Yes. Where there is flood protection infrastructure, much of it is aging and in need of repair or replacement. For example, the diversion ditches and gates in the Antelope Valley (West Walker Watershed) are old and were damaged by a recent flood, rendering them virtually non-operational.

3) ***Have flood control facilities been insufficient in the past?***

Yes. Refer to the example of the Antelope Valley above. The bigger issue, however, is lack of flood mitigation programs in much of the region.

4) ***Are wildfires a concern in parts of the region?***

Yes. This hazard is discussed above. The loss of vegetation caused by wildfires has led recently to intensified erosion and flooding, impacting habitat, fisheries, and communities.

Terrestrial and Aquatic Ecosystems

1) ***Does the region include aquatic habitats vulnerable to erosion and sedimentation issues?***

Yes. Because of the complex topography of the region and the numerous large and small waterways, erosion is an ongoing occurrence. However, erosion exacerbated by wildfires or extreme precipitation events can lead to increased water quality concerns and degraded in-stream habitat.

2) ***Does the region include estuarine habitats which rely on seasonal freshwater flow patterns?***

There are no estuaries in the Inyo-Mono region as there is no connection to the ocean. All of the region lies inland.

3) ***Do climate-sensitive flora or fauna live in the region?***

All plant and animal species are sensitive to climate in some way. Some species have larger tolerances (or climate envelopes) than others. Some species, such as sagebrush, saltbush, some tree and bird

species, deer, and mountain lions are able to tolerate the large diurnal and seasonal fluctuations in temperature and precipitation in the region. Other species, particularly those that live at the highest elevations in the region, are more specialized and thus may be impacted disproportionately by climatic changes. Terrestrial species including pika, mountain yellow-legged frog, willow flycatchers, desert tortoise, and desert bighorn sheep have been garnering increased attention due to climate change, while pupfish and hydrobiid snails are examples of aquatic species that show sensitivities to climate-driven habitat changes.

4) Do endangered or threatened species exist in the region?

Yes. There are endangered and threatened plant and animal species in the region, some of which occur only within this region. A full list specific to this effort has not yet been developed.

5) Are changes in species distribution already being observed in parts of the region?

Again, high-elevation species with limited habitat and smaller climatic tolerances seem to be moving to more favorable habitat (or are running out of favorable habitat). Most evidence of species movements in the region thus far has been anecdotal. More quantitative observations are needed.

6) Does the region rely on aquatic or water-dependent habitats for recreation or other economic activities?

Absolutely, yes. Tourism drives the economies of virtually every community within the region except Ridgecrest. In the winter, tourism is largely snow-based and includes skiing and snowmobiling, both of which are fully dependent on winter snowfall. Summer recreation revolves mostly around watersports – fishing, boating, etc. Several fish spawning and rearing facilities operate in the region and rely on water from natural streamflow. It could be argued that most jobs in the region can be related to the central position of water in the region's economy.

7) Are there rivers with quantified environmental flow requirements or known water quality/quantity stressors to aquatic life?

Yes. There are now quantitative environmental flow requirements for several waterways in the Inyo-Mono region, including Mono Lake tributaries, Mammoth Creek, and the lower Owens River. Some of these requirements are currently under discussion, and it is unknown whether climate change is being considered as a potentially complicating factor.

8) Do other sensitive habitats occur in the region?

Yes. Meadows and other wetland-type habitat occur at both the higher and lower elevations of the region. These habitats are dependent on unimpeded seasonal water availability and support a large number of species.

9) Does the region include one or more of the habitats described in the Endangered Species Coalition's Top 10 habitats vulnerable to climate change?

Yes. The Inyo-Mono region includes two of these habitats: the Sierra Nevada and the Southwest deserts. In addition, one of the Endangered Species Coalition's other ecosystems of focus is the sagebrush steppe.

10) Are there areas of fragmented habitat in the region? Are there movement corridors for species to naturally migrate? Are there infrastructure projects planned that might preclude species movement?

Fortunately for wildlife, much of the land in the Inyo-Mono region is undeveloped. Because much of the land area is owned and managed by federal or local resource agencies, threats to wildlife coming from development are relatively few, and species are able to move relatively freely throughout the region and into adjacent regions. There are some more localized examples of fragmented habitat, such as that occurring from groundwater pumping in the Owens Valley. Meadows and wetlands seem to be particularly vulnerable to fragmentation in the region because they occur in otherwise development-friendly areas. While large-scale infrastructure is not typically a problem in the Inyo-Mono region, the proposed large solar developments in southeast Inyo County have become a growing concern. Not only would these developments alter habitat quality, but they could also create barriers to species movement, such as for the desert tortoise.

Table 3-1. Summary of climate change impacts and vulnerabilities in the Inyo-Mono region by category.

Category	Impacts	Vulnerabilities
Water Supply	• Changes in amount of snowpack, SWE • Timing of snowmelt, runoff and streamflow • Increased rain-on-snow events • Extreme precipitation events • More rain, less snow • Groundwater recharge	• Snowpack • Storage capacity • Drought tolerance
Water Demand	• Longer, drier summers • Increase in summer water demand • Increased demand from City of L.A.	• Solar energy developments • Agriculture • Landscape irrigation • City of Los Angeles • Water conservation
Water Quality	• Intensified summer recreation • Longer grazing seasons • Unknown impacts to groundwater quality	• Wildfires • Erosion • Stormwater/flooding • Recreation • Seasonal low flows • Groundwater contaminants
Flooding	• Increased rain-on-snow events • Extreme precipitation events • Increased wildfire incidence • Unknown impacts of altered snowpack, snowmelt, and streamflow	• Lack of, inadequate, or aging infrastructure • Wildfires

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	• Aquatic habitats • Meadows, wetlands, estuaries • Climate sensitive species • Threatened and endangered species • Species distributions • Reliance on aquatic ecosystems for recreation and livelihoods • In-stream environmental flow requirements

Prioritizing Vulnerabilities

This section will be completed in the next Plan update.

Measuring Impacts of Climate Change for the Inyo-Mono Region

After assessing which water-related resources in the Inyo-Mono region are vulnerable to the impacts of climate change, it is important to attempt to understand to what degree these resources will be impacted. A full quantitative impacts analysis for these resources (water supply, water demand, water quality, flooding, terrestrial and aquatic ecosystems) is beyond the scope of this iteration of the Inyo-Mono IRWM Plan; instead, a brief qualitative assessment of likely impacts is provided in the previous section. Future updates of the Inyo-Mono Plan will incorporate regional data to allow for more robust and quantitative impact analyses for each of these resources. In order to understand potential impacts of climate change, however, it is important to first consider what changes in the climate might be expected.

Changes in the Climate

As discussed at the beginning of this chapter, the most currently-accepted means of understanding possible future climatic patterns is through computer models. Because different models have different strengths and weaknesses, many climate change practitioners have taken to using a suite or “ensemble” of models to develop an average and range of projected future conditions. A 2009 study commissioned by the California Climate Action Team (CAT), a group of state government officials working to implement greenhouse gas emissions reductions programs as well as the state’s Climate Adaptation Strategy, used six GCMs to drive subsequent impact analyses (DWR 2010). These GCMs were selected based on their ability to model historical precipitation and temperature patterns and variability, as well as the El Niño Southern Oscillation, and are listed below.

Table 3-2. General circulation models used by Climate Action Team and Inyo-Mono RWMG

No.	Model name; modeling group, country	Model identification	Primary reference year
1	Parallel Climate Model; National Center for Atmospheric Research (NCAR), USA	PCM	2000
2	Geophysical Dynamics Laboratory model version 2.1; US Dept. of Commerce / National Oceanic and Atmospheric Administration (NOAA) / Geophysical Fluid Dynamics Laboratory (GFDL), USA	GFDL-CM2.1	2006
3	Community Climate System Model; National Center for Atmospheric Research (NCAR), USA	CCSM3	2006
4	Max Planck Institute (MPI) for Meteorology, Germany	ECHAM5/ MPI-OM	2006
5	Center for Climate System Research (University of Tokyo), National Institute for Environmental Studies, and Frontier Research Center for Global Change (JAMSTEC), Japan	MIROC3.2 (medres)	2004
6	Meteo-France / Centre National de Recherches Meteorologiques (CNRM), France	CNRM-CM3	2005

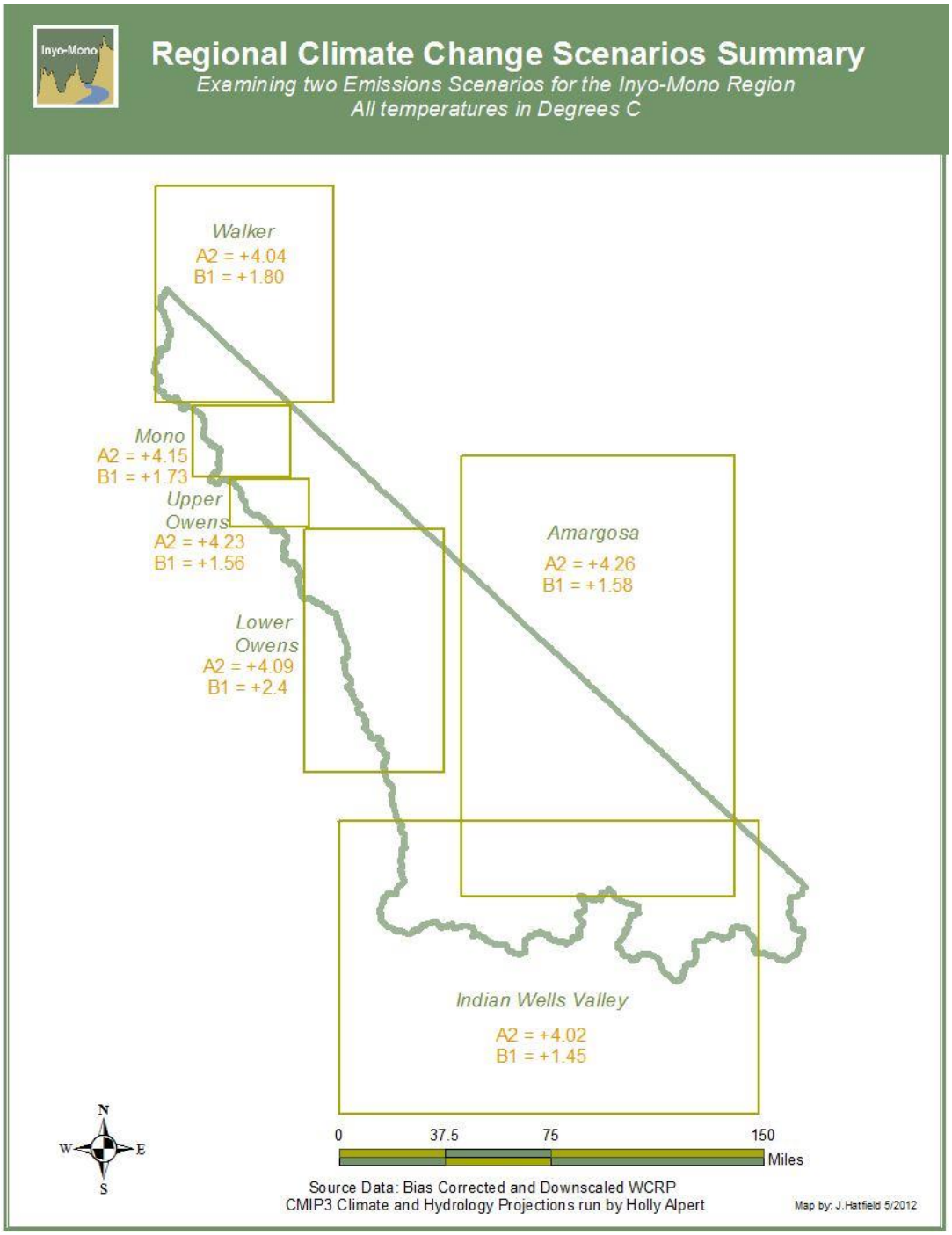
A collaboration of research institutions and federal agencies has made these models, along with others, readily available through the World Climate Research Programme's (WRCP's) Coupled Model Intercomparison Project Phase 3 (CMIP3) model output archive (http://gdo-dcp.ucllnl.org/downscaled_cmip3_projections/dcpInterface.html#Welcome). Through the archive's website, the user can request biased-corrected spatial downscaled (BCSD) model output for any geographic region and for any time period within the 21st century. Both temperature and precipitation projections are available. This set of projections has been widely reviewed and used by scientists and practitioners in California. Models can be run with any combination of 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, etc. A1B is a medium-emissions scenario, reaching approximately 700 ppm CO_2 by 2100 (global CO_2 is currently appx. 390 ppm). B1 is a lower-emissions scenario, leveling out at just over 500 ppm by 2100, while A2 is a higher-emissions scenario and reaches 850 ppm by 2100.

The same six GCMs listed in Table 3-2 were used for an analysis of project climatic changes for the Inyo-Mono region for the 21st century, using the downscaling method described in the previous paragraph. Only the A2 and B1 emissions scenarios were used, in order to bound the high and low probabilities of changes in the atmosphere. Six geographic areas within the region were chosen, based on watersheds and/or areas where most of the population resides. Because the model output is only available on a grid scale, it was not possible to request projections for true watersheds. Table 3-3 lists the approximate watersheds for which projections were downloaded, and Figure 3-2 shows the geographic extent.

For each region, projections of temperature and precipitation were examined through the 21st century. For each year, average temperature was calculated for the output of the six models and 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 six 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.

Figure 3-2. Geographic area for each downscaled climate model analysis.



Below, graphs are presented for each watershed/area of interest. The top graph in each geographic region is for temperature and shows the mean value of average annual temperature as well as the highest value and lowest value for the two emissions scenarios. For both emissions scenarios, temperature is expected to increase over the next century, though less so under the B1 scenario. The bottom graph shows precipitation over the next century based on projected average cumulative precipitation for both emissions scenarios as well as the highest value and lowest value as explained above. For all areas analyzed, there is no discernible trend in precipitation amounts through 2100. This result matches with literature cited at the beginning of this chapter stating that model projections of future precipitation patterns are inconsistent.

Figure 3-3. Temperature Projections for Amargosa Basin

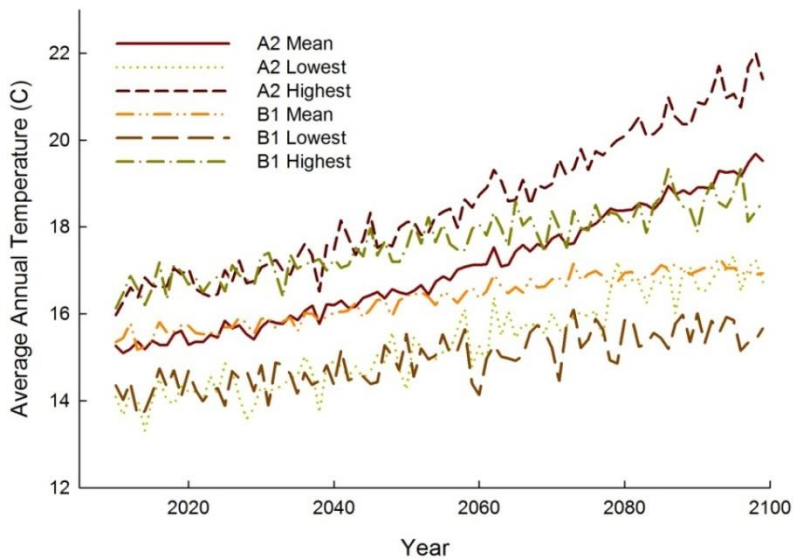


Figure 3-4. Precipitation Projections for Amargosa Basin

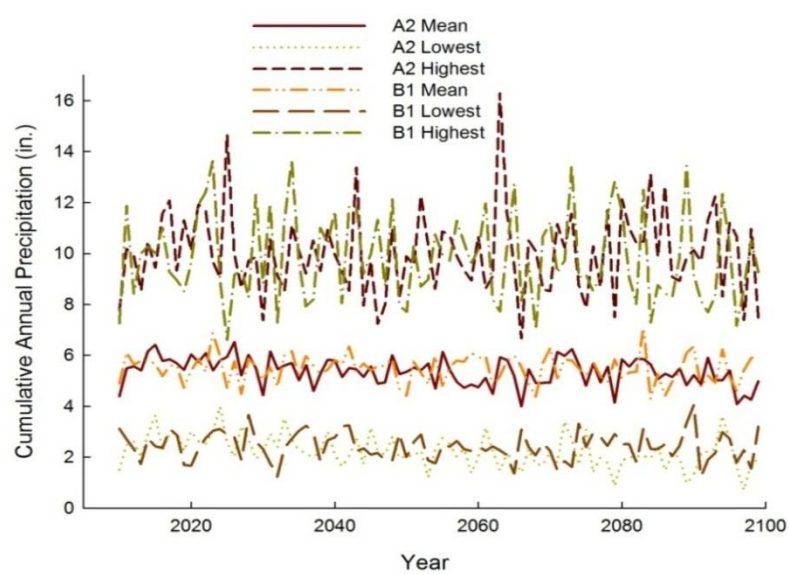


Figure 3-5. Temperature Projections for the Indian Wells Valley

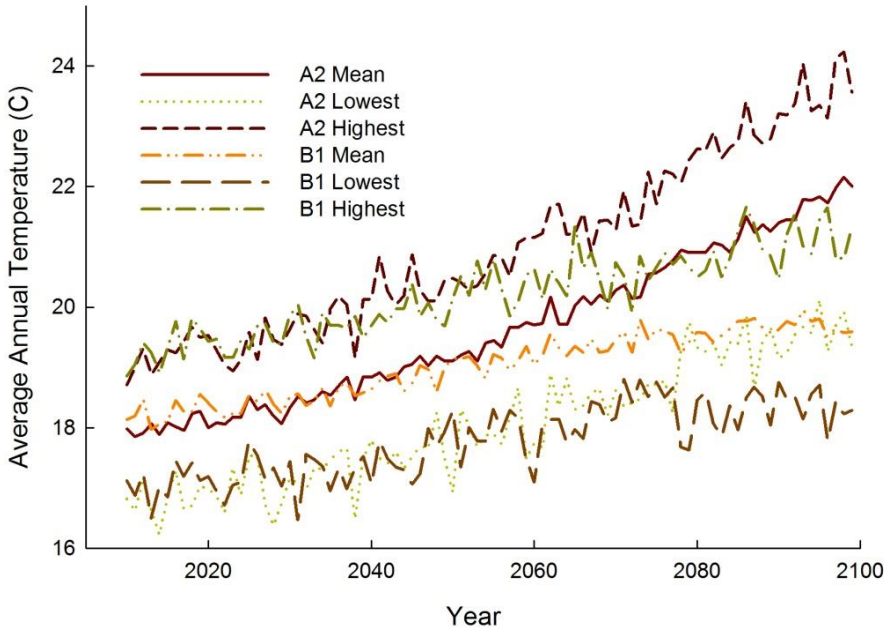


Figure 3-6. Precipitation Projections for Indian Wells Valley

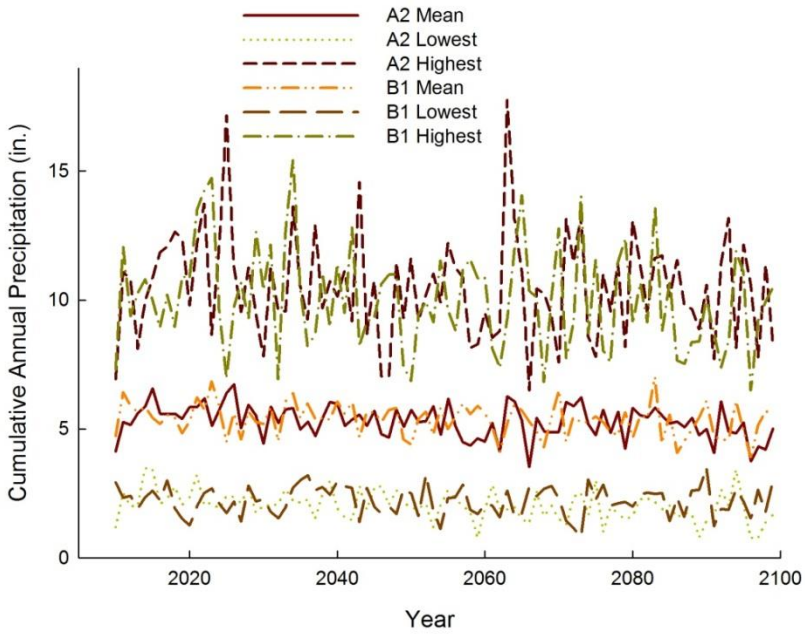


Figure 3-7. Temperature Projections for the Lower Owens River

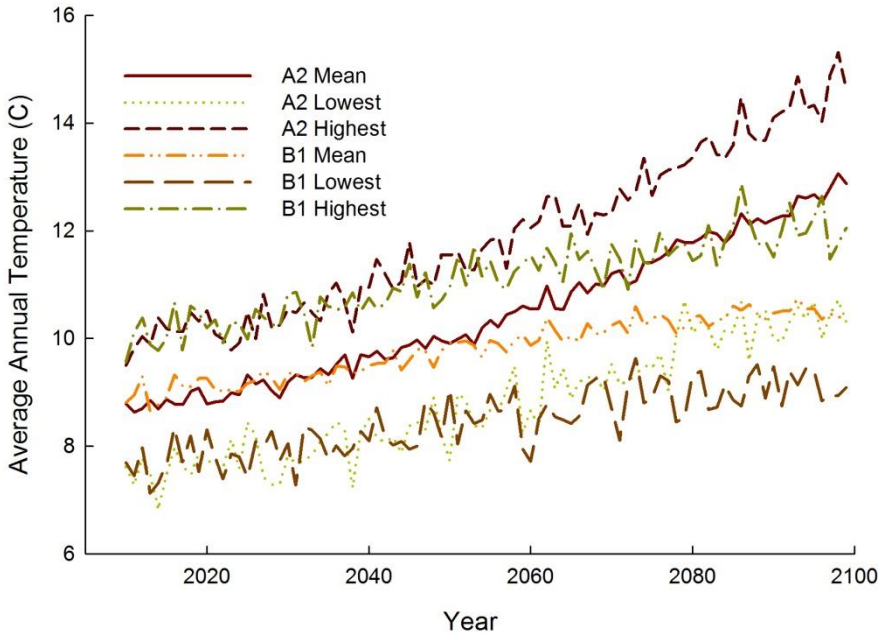


Figure 3-8. Precipitation Projections for Lower Owens River

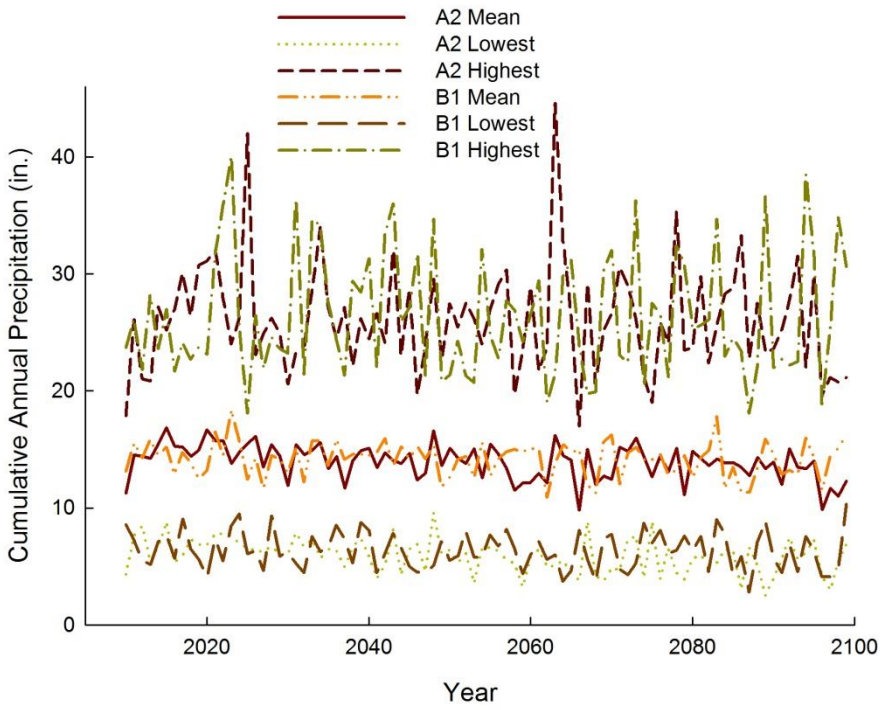


Figure 3-9. Temperature Projections for the Upper Owens River

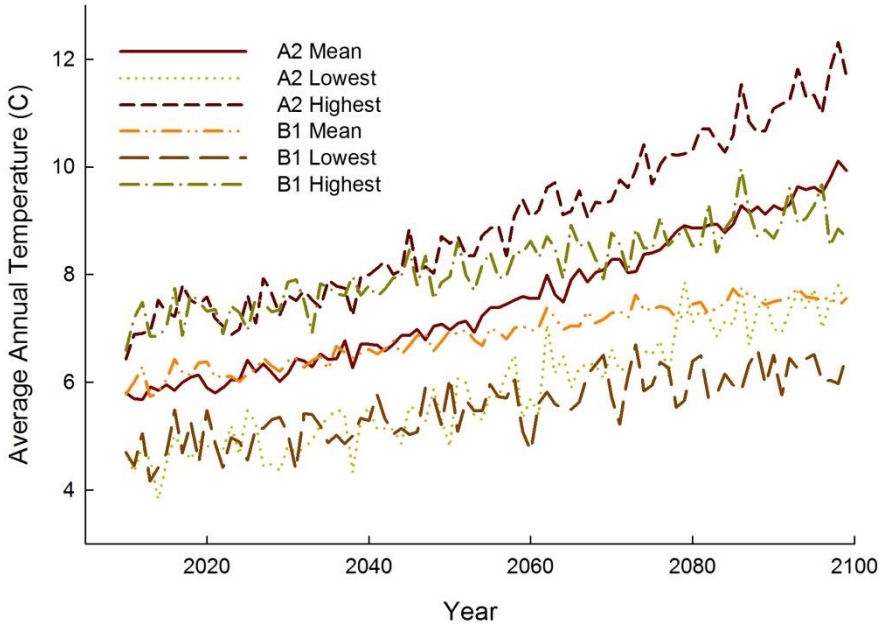


Figure 3-10. Precipitation Projections for Upper Owens River

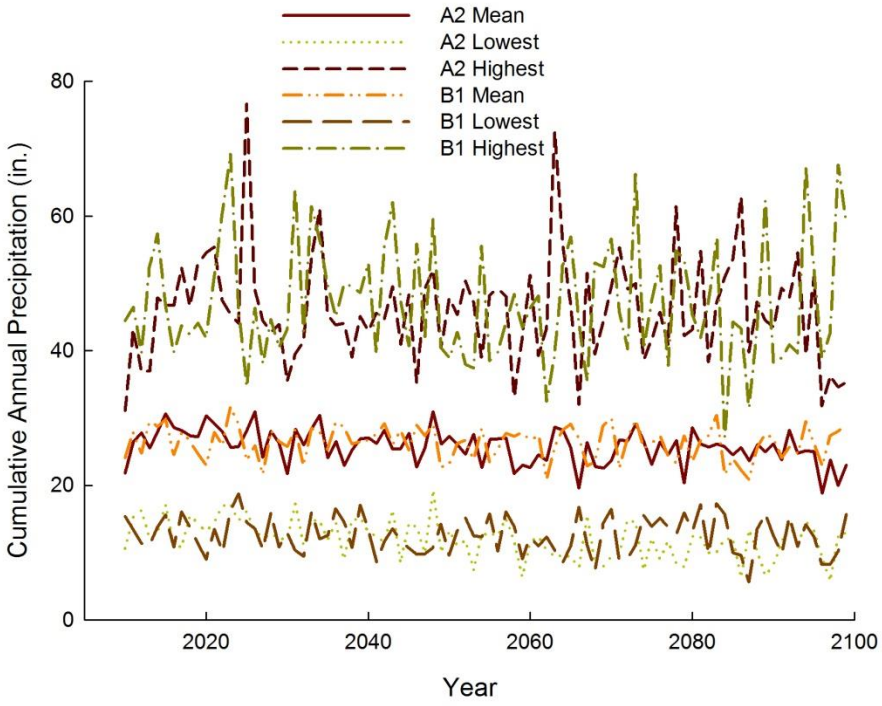


Figure 3-11. Temperature Projections for the Mono Basin

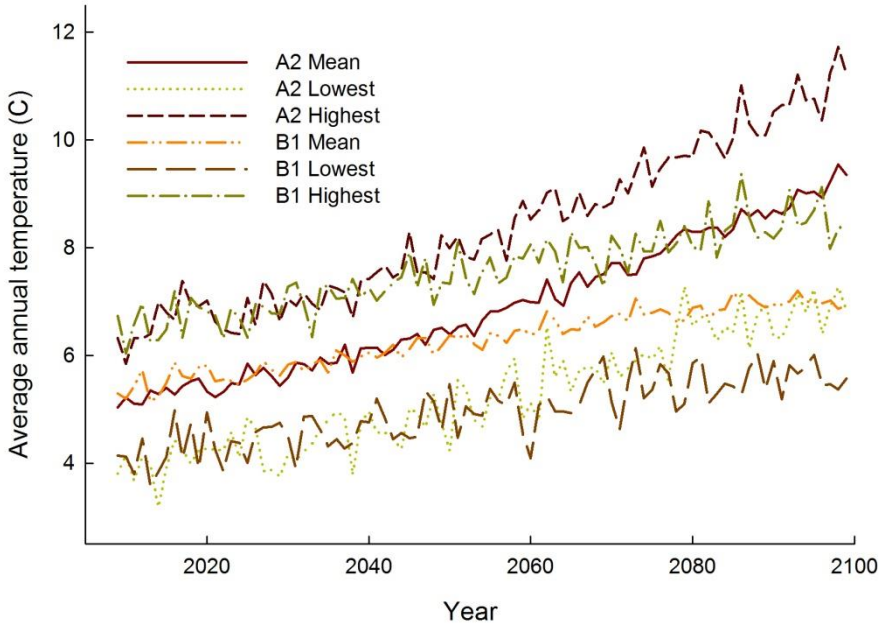


Figure 3-12. Precipitation Projections for the Mono Basin

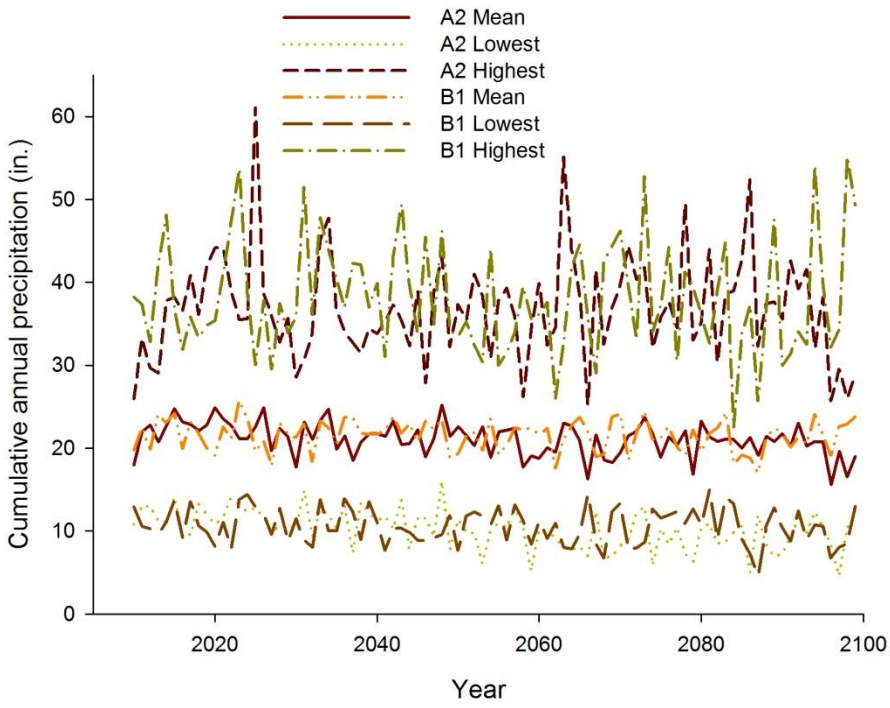


Figure 3-13. Temperature Projections for the East-West Walker

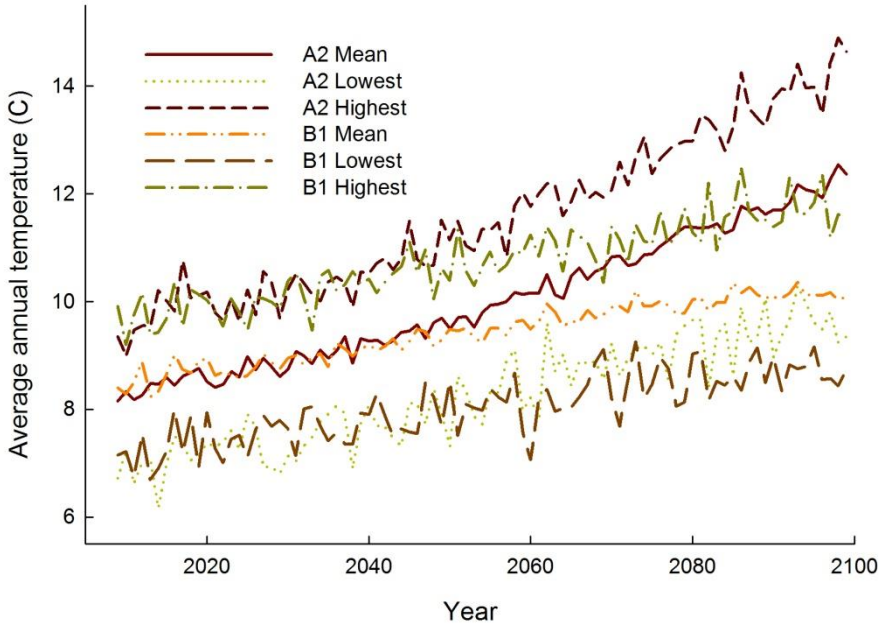
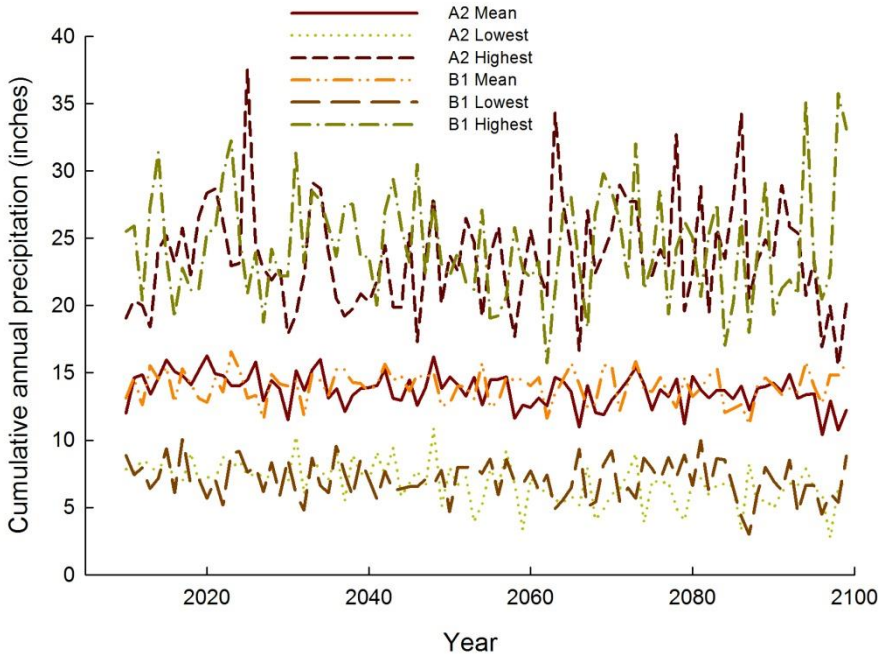


Figure 3-14: Precipitation Projections for the East-West Walker



Future Analysis for the Inyo-Mono Region

Although a substantial amount of work has been done to understand the impacts of climate change to the Sierra Nevada snowpack and streamflow, much of this work has been focused on western Sierra watersheds because of their importance to the Bay-Delta system and urban water supplies. Relatively little analysis has been performed on eastern Sierra hydrology, despite the importance of our waterways not only for local communities and in-stream uses, but for water exports to Los Angeles and urban uses. The analysis of climate change projections presented above is a first step to understanding possible changes to snowpack and streamflow in the Inyo-Mono region; the next step is to incorporate these climate projections into models of streamflow in order to try to understand more directly impacts to water supplies, water quality, and ecosystem health. While streamflow modeling is beyond the scope of this iteration of the Inyo-Mono IRWM Plan, it will be pursued by the RWMG as a part of upcoming work on climate change as a way to better understand climate change impacts to the region, and results will be incorporated into a future version of the Plan. In the meantime, we will use the best available science to provide information to water resource managers and practitioners as they prepare to deal with and respond to climate change.

Climate Change Adaptation Strategies for the Inyo-Mono Region

In the context of climate change, *adaptation* is defined as "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects" (http://climatechange.worldbank.org/climatechange/content/adaptation-guidance-notes-key-words-and-definitions). Climate change adaptation strategies as they relate to water resources management have gained increasing attention and momentum over the last decade. Researchers and state and federal agency officials have put much thought into the subject and have produced a plethora of reports, papers, and guidance. While examples of adaptation practices are increasing, published case studies are still lacking. DWR published a report in 2008 titled "Managing and Uncertain Future: Climate Change Adaptation Strategies for California's Water". In this report, DWR proposes 10 adaptation strategies for water resources management (DWR 2008):

1) **Provide sustainable funding for statewide and integrated regional water management**
2) **Fully develop the potential of integrated regional water management**
3) **Aggressively increase water use efficiency**
4) **Practice and promote integrated flood management**
5) **Enhance and sustain ecosystems**
6) **Expand water storage and conjunctive management of surface and groundwater resources**
7) **Fix Delta water supply, quality, and ecosystem conditions**
8) **Preserve, upgrade, and increase monitoring, data analysis, and management**
9) **Plan for and adapt to sea level rise**
10) **Identify and fund focused climate change impacts and adaptation research and analysis**

While not all of these strategies are relevant for the Inyo-Mono region, many of them are, and using this list as a guide will allow water managers to begin thinking about how to manage their water supplies in response to climate change impacts. Below is a consideration of the most relevant of the DWR adaptation strategies for the Inyo-Mono region.

1) **Provide sustainable funding for statewide and integrated regional water management**
2) **Fully develop the potential of integrated regional water management**

These first two adaptation strategies are closely related. While the first strategy is extremely pertinent for, and is strongly supported by, the Inyo-Mono planning region, it is not within direct control of the region. The Inyo-Mono RWMG is committed to maintaining a long-term presence in the region and will continue to build its program, including finding funding opportunities for high-priority projects as well as bringing other needed resources to the region. In addition, the RWMG will continue its involvement in statewide water fora so as to have a voice in determining management and funding priorities.

3) Aggressively increase water use efficiency

Awareness of water conservation has increased throughout the region over the past several years, as have water conservation practices. These measures have included encouraging water-efficient and native landscaping, installing water meters, and educating water consumers about efficient landscape irrigation. Regardless of climate, all communities within the region can benefit from increasing water use efficiency. Furthermore, those water districts that have successfully implemented water conservation measures can serve as a resource for smaller districts that have yet to implement programs.

4) Practice and promote integrated flood management

It has become more apparent to the RWMG that flood management is a common issue shared by several areas in the region. Integrated flood management does not take on the same meaning in the Inyo-Mono region as it does in other parts of California, such as the Central Valley. However, because of the large amount of undeveloped and public land in the region, managing the land use-water use nexus requires a great deal of thought and collaborative planning. More careful planning around flood management needs to take place, and such planning will help land and water managers address climate change impacts such as rain-on-snow events, increased wildfire incidence, and earlier peak streamflow**.**

5) Enhance and sustain ecosystems

Many organizations and individuals are working in the Inyo-Mono region to enhance and sustain ecosystems. The Inyo-Mono RWMG has adopted an objective related to ecosystem stewardship and has committed to promoting projects that would help meet this objective.

6) Expand water storage and conjunctive management of surface and groundwater resources

This adaptation strategy represents perhaps one of the most significant opportunities within the Inyo-Mono region. In certain parts of the region, groundwater resources have been thoroughly monitored over time (see Chapter 4: Data Management and Technology for more information). In other areas, the recent implementation of the CASGEM program will help to ensure more accurate information on groundwater basins. In general, however, opportunities for aquifer recharge and storage have not been thoroughly explored.

8) Preserve, upgrade, and increase monitoring, data analysis, and management

This adaptation strategy represents another large opportunity for the Inyo-Mono region. Again, while some geographical and topical areas within the region have been well explored, others have received little attention. The RWMG has been working with individual entities in the region to identify their data collection and data management efforts, and a summary of the findings is provided in the Data

Management chapter. The RWMG, through its data management program, can help identify the gaps in monitoring and data, and develop plans and identify resource for filling those gaps.

10) Identify and fund focused climate change impacts and adaptation research and analysis

Over time, the RWMG will identify climate change-specific projects and seek out funding opportunities. An alternative may be that projects focus on a different issue but have a benefit related to climate change adaptation. In a region where basic water supply and water quality issues are of utmost concern to the residents, climate change simply is not at the forefront of water managers' thinking. However, it is possible that climate change impacts and adaptation strategies can be incorporated into our thinking about water management and planning simply as an extension of our current ways of thinking.

Climate Change Mitigation

In contrast to adaptation, which consists of actions that respond to the impacts of climate change, climate change mitigation refers to strategies to reduce the causes of climate change, such as limiting the amount of greenhouse gases being emitted. Recently, increasing attention has been paid to reducing the amount of energy used in water resources management. The nexus of energy and water is increasingly identified as having large potential for greenhouse gas (GHG) mitigation. In California, 19% of the state's electricity and 30% of the state's non-power plant natural gas is used for conveyance, treatment, distribution, and end use of water (Climate Action Team 2008). This statewide baseline assessment is very important because identifying the largest sources of water-related emissions helps to prioritize projects by taking into account the potential emissions reduction, which often corresponds closely to cost savings, thus creating a more accurate cost-benefit analysis. Conducting a similar analysis on the IRWM region scale will ideally improve project prioritization and cost savings for the Inyo-Mono region.

In the Inyo-Mono region, little to no accounting of water-related energy use and greenhouse gas emissions has taken place. While techniques to perform such accounting have improved, most water agencies and rural water districts in the region do not have the resources to perform these tasks. In partnership with the Sierra Nevada Alliance, we have begun performing initial assessments of energy use and emissions for the larger water districts within the region: Mammoth Community Water District, Indian Wells Valley Water District, and June Lake Public Utilities District. It is the intention that by performing emissions inventories for the larger districts first, the methodologies can be worked out, and this experience will make it easier to then communicate with the numerous small community services districts, mutual water companies, and the like, in order to perform individual emissions inventories.

GHG Inventory Methodology

Boundaries and Sources

The initial GHG inventory for the Inyo-Mono region focuses on the larger water utilities within the region, partly because of the availability of information within these agencies, and partly because of their larger energy use compared to smaller water districts and individual wells and septic systems. Once the emissions inventory protocol is established, future inventories will be easier to conduct, particularly for smaller water purveyors that may not have data readily accessible.

Table 3-4 shows the potential GHG emission sources relevant to water utilities. Direct emissions are those emitted by activities within the region itself (i.e. motor vehicles) while indirect emissions are emitted

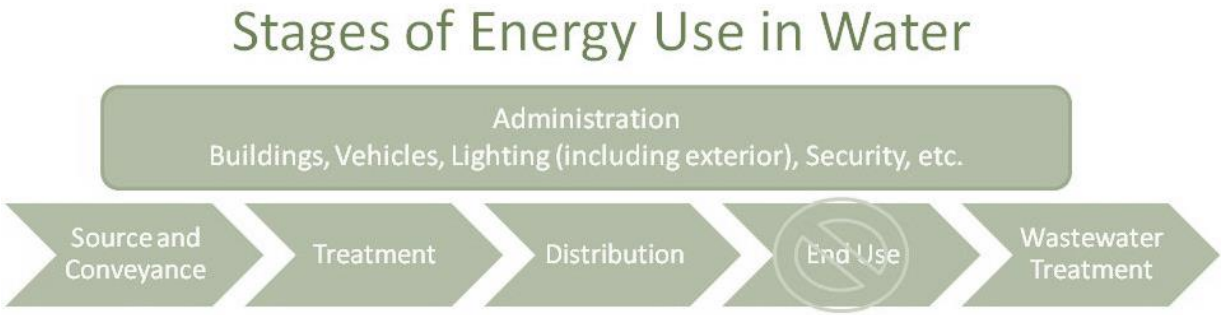
outside of the region, but are due to activity in the region (i.e. electricity generation). Notice wastewater is included in both categories because the utility may have onsite treatment or may send its wastewater to another site for treatment. Direct and indirect emissions are commonly referred to as Scope 1 and Scope 2 emissions, respectively. There is a Scope 3 that includes activities such as workers' commutes and emissions from the manufacture of goods used by the region (lifecycle emissions), but these are not included in this inventory.

Table 3-3. Direct and indirect water-related emission sources

Emissions Type	Source Sector	Source Category
Direct (Scope 1)	Transportation	On-road mobile sources (motor vehicles: passenger cars, trucks, buses)
		Off-road vehicles (boats, snowmobiles, lawn and garden equipment, etc.)
	Fuel combustion	Natural gas combustion (residential and commercial)
		Other fuel combustion (propane, wood, etc.)
	Waste	Wastewater treatment
Indirect (Scope 2)	Energy	Electricity consumption
		Wastewater treatment

When discussing the energy-water nexus, it is important to identify which steps of the water use process produce the most emissions. Those steps with the most emissions are often the most costly, due to energy prices. Figure 3-2 shows the different stages of water-related energy use. This inventory does not look at the end user (i.e. water heating), although that may be possible to calculate in future inventories using resources such as the Residential Energy Consumption Survey.

Figure 3-15. Stages of Energy Use in Water



Base Year and Inventory Frequency

In California, a base year of 2005 is preferable because it aligns with legislative goals such as AB 32 and SB 375. Unfortunately, complete fuel and electricity use records for past years were not readily available from the utilities addressed here. With that caveat, it is important to establish a year that has consistent and accurate data across all of the emitters in question. Based on these criteria, the year 2011 was chosen as a baseline for the Inyo-Mono region. In order to identify emission trends, such as the effects of deliberate efficiency and conservation measures or indirect effects (e.g., economic trends), inventories should be conducted at least every five years, although annual inventories are preferable. Going forward, we recommend that the water utilities actively track the sources identified in this inventory.

Quantifying Emissions

Quantifying GHG emissions follows a straightforward path: multiplying "activity data" by "emissions factors" and the Global Warming Potential (GWP). Activity data are the amount of fuel consumed, vehicle miles traveled, population served, etc., and emissions factors are the amount of each GHG emitted by each activity (e.g., burning fuel or driving miles). Global warming potential weights each of the GHGs in terms of strength and the amount of time they spend in the atmosphere. Each relevant fuel source and type is discussed below.

Direct Emissions (Scope 1)

Stationary Combustion

Stationary combustion is the burning of fuels within the region (water district) to generate heat or electricity. For water districts, this generally means remote generators or boilers to create heat for buildings or processes such as wastewater treatment.

Emissions for natural gas, propane and diesel are each calculated by multiplying the amount of fuel by the emissions coefficient for carbon dioxide (CO_2), nitrous oxide (N_2O), and methane (CH_4). Indian Wells Valley uses diesel for both stationary combustion and motor vehicles, but they do not break out these uses so all diesel emissions were calculated as mobile sources, as described next.

Mobile Emissions

Mobile emissions apply to the vehicles used by the utility districts to service and build infrastructure and to read water meters if applicable. Calculating CO_2 emissions is straightforward: gallons of gasoline and diesel were provided by each utility and those amounts were multiplied by the emissions coefficient for CO_2. Emissions of CH_4 and N_2O are more dependent on miles traveled and year and type of vehicle than gallons burned. June Lake provided mileage and vehicle year and type, so the emissions were calculated by multiplying miles driven by the appropriate emissions coefficients. Indian Wells Valley supplied gallons of gasoline and diesel, but not miles. Additionally, IWV uses diesel for stationary combustion and vehicles but does not differentiate them. For this inventory, all diesel emissions were calculated using the alternative mobile sources equations, based on gallons, with coefficients for CO_2, N_2O, and CH_4.

Wastewater

Direct emissions from wastewater treatment arise from the actual biologic process of decomposing the organic materials in wastewater when methane and nitrous oxide are released, and from on-site electricity or heat generation from burning fossil fuels. In the Inyo-Mono region, the three water utilities

analyzed use aerobic digestion which releases negligible amounts of CH_4 and N_2O. In accordance with the Local Governments Protocol and the U.S. EPA, these negligible process emissions are not included in the inventories. Mammoth Community Water District burns some propane in their wastewater treatment plant for space heating, and these emissions are included in the MCWD inventory. On-site burning of natural gas and propane are calculated as above ("Stationary Combustion").

Indirect emissions from wastewater treatment include the purchased electricity and vehicle fuels used to in order to transport, treat, and dispose of wastewater and its byproducts. Indian Wells Valley sends their wastewater to the city of Ridgecrest for treatment. Those emissions are not included in this inventory. Mammoth and June Lake own their wastewater treatment plants, and the electricity purchased to run the plants are included in their respective inventories. The emissions from purchased electricity are calculated as described below ("Purchased Electricity"). Mammoth found that wastewater treatment was the district's top single use of electricity and responded by installing a 1 megawatt solar array to offset that demand; see the Mammoth inventory for more details.

Indirect Emissions (Scope 2)

Purchased Electricity

Purchased electricity tends to be a large source of emissions, but is indirect because the fuels are burned at the power plant in another location while the electricity demand and use is in the water district. Nationally, the U.S. EPA maintains a database of region-specific emissions factors based on the mix of fuels (i.e. natural gas, coal, renewable, etc.) used at each power plant. Most California utilities, either in the past or currently, calculate a specific and more accurate emissions factor. Southern California Edison, the electricity provider to all of the water districts inventoried here, last updated their emissions factor in 2007, so that was the number used.

GHG Inventory Case Study: Indian Wells Valley Water District

Background

Indian Wells Valley Water District (IWVWD) is a medium-sized public water retailer, providing water to about 12,000 residential and commercial connections, totaling approximately 30,000 residents, in the Ridgecrest area of Kern and San Bernardino Counties, California. The district service area is approximately 38 square miles of the Indian Wells Valley, which lies in the northern Mojave Desert, southeast of the Sierra Nevada and south of Owens Valley (Krieger & Stewart 2011). The water source for Indian Wells Valley is a single aquifer, which is a naturally-occurring underground reservoir, and area residents and businesses pump nearly 30,000 acre feet (AF) per year, while replenishment from rain and snow is closer to 10,000 AF (Mulvihill 2008). The water district was incorporated in 1955, and groundwater levels have been dropping since the 1960s (IWVWD 2011).

Although seldom seen by the public, IWVWD has over 200 miles of pipeline as well as storage tanks, wells, pumping plants, boosters, arsenic treatment plants, and office headquarters. The District currently operates 10 active wells with capacities ranging from 1,000-1,400 gallons per minute (Mulvihill 2010). There are eleven storage tanks with capacities ranging from 100,000 gallons to 5 million gallons at strategic locations throughout the District, with at least one tank located in each of five service zones. The district's largest recent capital investment (about $15 million) was to support two arsenic treatment plants.

Greenhouse Gas Inventory

Indian Wells Valley Water District has direct emissions from their vehicle fleet, gasoline and diesel, and burning of natural gas. Indirect emissions are a result of electricity purchased from Southern California Edison and wastewater treatment, which is carried out by the city of Ridgecrest. Greenhouse gas emissions for CO_2, N_2O, and CH_4 were calculated following the *Local Government Operation Protocol* developed and adopted by the California Air Resources Board, the California Climate Action Registry, ICLEI-Local Governments for Sustainability, and The Climate Registry (May 2010). See the methodology section for full details.

Fuel and electricity use records were available for 2011, so this will be the baseline year going forward. Year-to-date data are available for 2012, and the District is encouraged to update these numbers on a monthly basis. Wastewater treatment is by far the largest source of GHGs, largely due to the methane emissions from anaerobic digestion. Indirect emissions from purchased electricity are an order of magnitude larger than the direct emissions of diesel fuel use. Gasoline and natural gas, respectively, make up the rest of IWVWD's GHG emissions profile. Figure 3-16 shows the annual emissions for the baseline year of 2011, and Figure 3-17 shows the monthly emissions for 2011. In the first three months of 2012, emissions are down 16.5% from 2011 emissions, largely because of an almost 50% decrease in gasoline and diesel use. Figure 3-18 shows GHG emissions by activity (water production, administration, etc.)

Figure 3-16

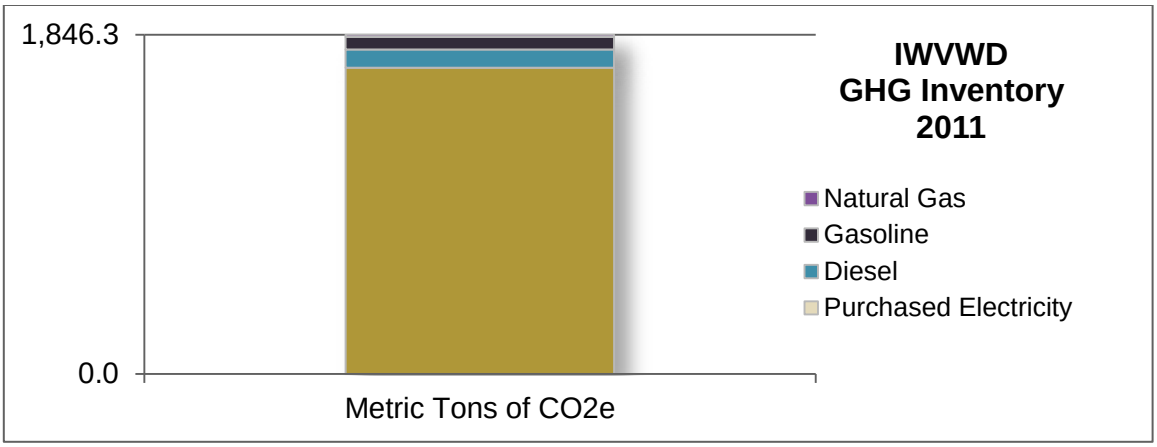


Figure 3-17

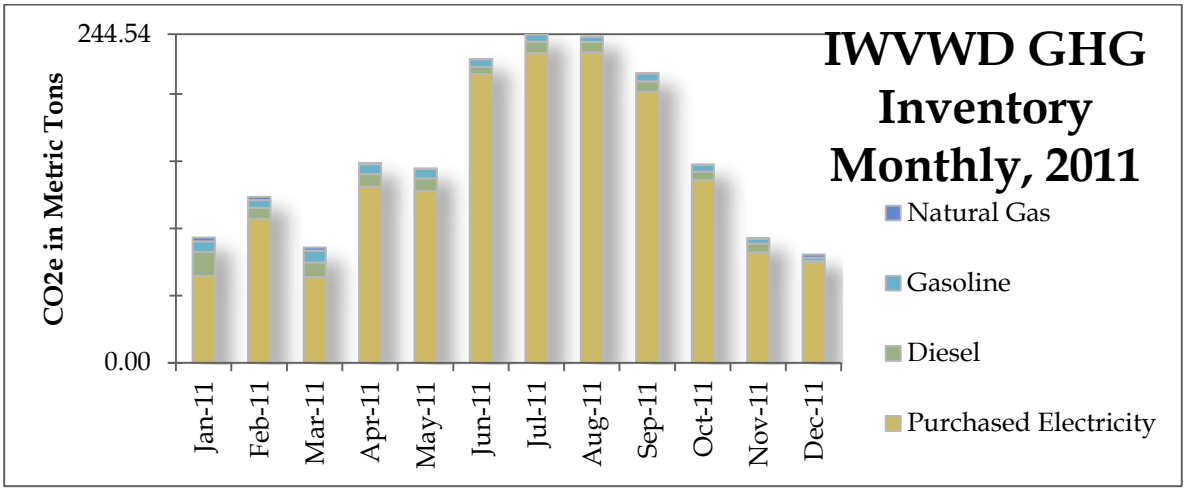
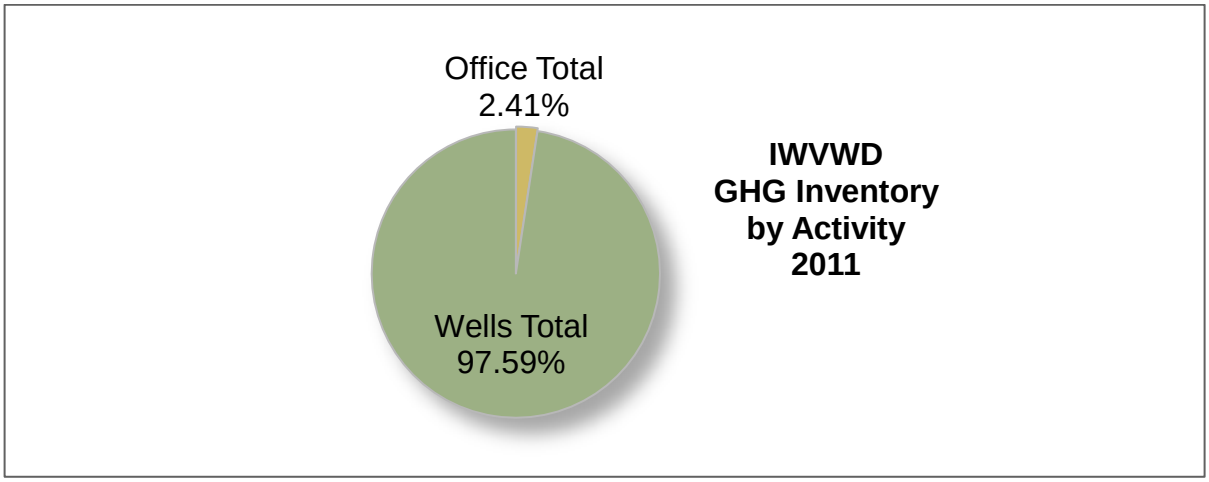


Figure 3-18



GHG Inventory Case Study: June Lake

Background

The June Lake Public Utility District (JLPUD) serves a full-time residential population as well as a substantial visitor population. The district provides water treatment and distribution, sewer collection and treatment, and mosquito abatement services (Mono County LAFCO 2009). According to the 2010 census, the year-round residential population of the town of June Lake is approximately 629 people, while the seasonal visitor population peaks at approximately 2,500 people-at-one-time for a plethora of winter and summer recreational activities (U.S. Census 2010). The JLPUD's water consumption is difficult to predict accurately. The fluctuating tourist population and the small permanent population, along with weather conditions and the economy, all contribute significantly to the oscillating water consumption (Mono County LAFCO 2009). According to the Rodeo Grounds Water Demand Project, which can serve as a proxy for the rest of JLPUD's service area, peak winter months are from December through March (averaging 2,000,000 gallons per month), while peak summer months are June through September (averaging 4,000,000 gallons per month) (Hansford 2006). Peak summer months double the amount of water used each month due to increased residential use and resort irrigation. The Mono County General Plan section specific to June Lake concludes that estimated water demands are expected to peak only for a few days per year, and the system has been designed to meet those peak demands. However, the water system may not be able to meet the projected maximum month-average day demand at build-out (Mono County LAFCO 2009).

The JLPUD provides water and sewer service to an area of 1,720 acres within the June Lake Loop (Highway 158 to the west of Highway 395). The June Lake Loop houses a majority of the developed community and is situated against the west rim of the Great Basin and Range Province, adjacent to the steep eastern escarpments of the Sierra Nevada. The Inyo National Forest allotted surface water diversion rights to the JLPUD for both the Village System and the Down Canyon system, totaling approximately 1,116,000 US gallons per day, which is serviced by almost nine miles of pipes (Mono County LAFCO 2009). Both the Village System and the Down Canyon System have sufficient storage capacity to meet existing and fire flow demands, although the Water Master Plan recommends that both systems build 500,000-gallon reservoirs to meet future demands at build out (Mono County LAFCO 2009). The utility district provides sewer service to three major service areas: the June Lake Village, Down Canyon areas of June Lake, and U.S. Forest Service campgrounds. The sewer system currently includes 14 miles of pipeline, 29 lift stations, 5 pump stations, and the wastewater treatment plant. The treatment plant provides secondary improvements to the system to meet current and projected future demand (Mono County LAFCO 2009).

Greenhouse Gas Inventory

June Lake Public Utility District has direct emissions from their vehicle fleet, which largely uses gasoline. They do not track the minimal diesel use. Indirect emissions are a result of electricity purchased from the utility Southern California Edison and wastewater treatment, which is carried out by the utility district itself. The district does not use any other fuels directly (i.e. propane, natural gas). Greenhouse gas emissions for CO_2, N_2O, and CH_4 were calculated following the *Local Government Operation Protocol* developed and adopted by the California Air Resources Board, the California Climate Action Registry, ICLEI-Local Governments for Sustainability, and The Climate Registry (May 2010). See the methodology section above for more details.

Full fuel and electricity use records were available for 2011, so this will be the baseline year going forward. Year-to-date data are available for 2012, and the district is encouraged to update these numbers on a monthly basis. Electricity purchased from Southern California Edison is the largest source of GHGs, followed by wastewater treatment (largely methane emissions), and gasoline used in the small vehicle fleet. Figure 3-19 shows the annual emissions for the baseline year of 2011, Figure 3-20 shows the monthly emissions for 2011, and Figure 3-21 breaks down electricity emissions into water and sewer categories (a negligible amount is used for administration and maintenance buildings). In the first three months of 2012, emissions are up about 8% from 2011, largely due to an almost 38% increase in gasoline use.

Figure 3-19

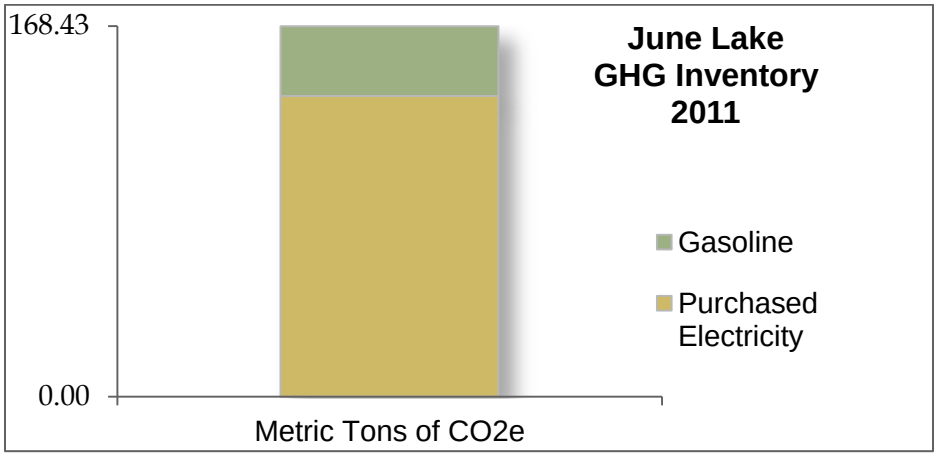


Figure 3-20

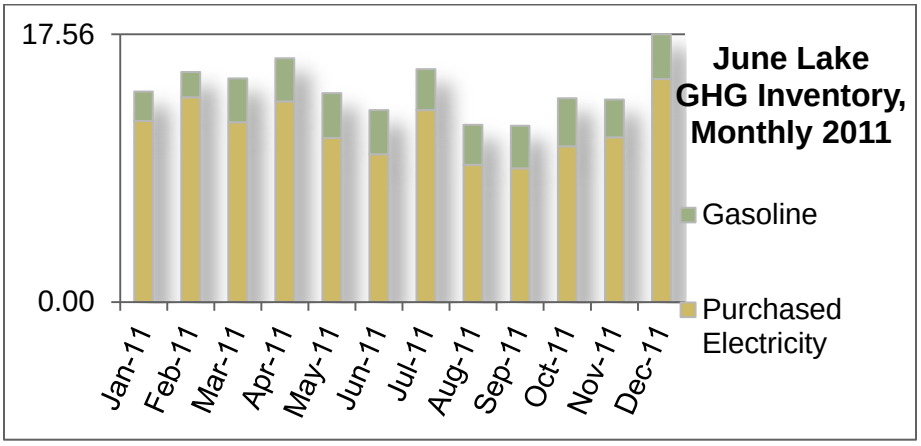
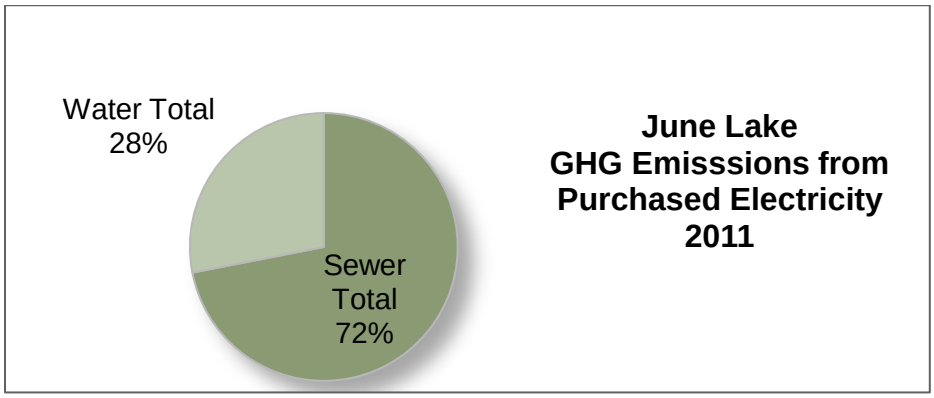


Figure 3-21



GHG Inventory Case Study: Mammoth Community Water District

Background

The Mammoth Community Water District (MCWD) provides water and sewer services to the Town of Mammoth Lakes in Mono County, California. This small resort community is located on the eastern slope of the Sierra at an elevation of approximately 8,000 feet above sea level. The economy of the area is primarily based on recreation and tourism, and visitation is bimodal between the winter ski season and the summer recreation season. Mammoth Lakes has a year-round population of about 8,500, but during peak tourism the population swells to about 35,000 people (US Census 2010, Town of Mammoth Lakes 2007). Most of the area's precipitation comes as winter snowfall, with the area receiving an average of about 17 feet of snow (equating to approximately 24 inches of water) annually (1993-2010; MCWD 2010). The population and precipitation seasonality creates an interesting set of water management considerations and is visible in the water district's emissions profile.

The MCWD provided fuel and electricity use data for the years 2008-2011, broken down into water supply, wastewater treatment, and administration. The district also provided data on water supply and wastewater treatment. Tracking emissions along with the amount of water delivered allows us to looks at "emissions intensity," metric tons of greenhouse gas emissions per millions of gallons of water. Not only does the emissions intensity provide a more detailed view of the district's efficiency, but it allows a direct comparison between water utilities.

Greenhouse Gas Inventory

The Mammoth Community Water District has direct emissions from their vehicle fleet and on-site burning of propane for space heating. Indirect emissions are a result of electricity purchased from Southern California Edison, as well as wastewater treatment carried out by the water district itself. The MCWD treats its wastewater aerobically; therefore, process emissions from wastewater treatment are considered negligible and not included in this inventory. Greenhouse gas emissions for CO_2, N_2O, and CH_4 were calculated following the *Local Government Operation Protocol* developed and adopted by the California Air Resources Board, the California Climate Action Registry, ICLEI-Local Governments for Sustainability, and The Climate Registry (May 2010). See the methodology section for full details.

The GHG inventory for MCWD reveals a number of interesting trends and highlights some of MCWD's efficiency measures. Figure 3-22 shows GHG emissions for all of MCWD's activities from 2008 through 2011 as bar graphs, and the amount of water procured and treated as a line graph. Purchased electricity is the largest single source of emissions and is also where the district has made the most efficiency gains. Between 2010 and 2011 in particular, the district successfully reduced its electricity demand while maintaining approximately the same level of water supply and treatment, largely due to the focus on maximizing the use of surface water. Surface water is gravity-fed, thereby decreasing demand for electricity for groundwater pumping, and saving MCWD a significant amount of money. In fact, many days the district is able to completely shut off pumps between noon and 6pm, when electricity is the most expensive. In 2008, 50% of the electricity used was for water supply and 45% was used for wastewater treatment, with the last 5% used in administration buildings. In 2011, only 19% of the electricity was used for water supply while 73% and 8% was used for wastewater and administration, respectively. This shows the large effect that water management decisions can have on energy use. Figure 3-24 shows emissions by activity for 2011. The district is now focusing on reducing GHG emissions from wastewater

treatment by installing solar panels (see case study) and increasing efficiency in the administration category by following recommendations provided from a recent energy audit.

Looking at monthly emissions from 2011 (Figure 3-23), water supply and treatment spikes during the winter and summer due to increased recreation population. Emissions increase in the summer as surface water begins to dwindle and the district must pump more groundwater. Gasoline and diesel used in the district's vehicle fleet is included in administration and these emissions spike in the summer when the majority of construction and maintenance takes place. In the winter, propane is used for heating, which drives the higher emissions seen in the cold winter months. October is generally the least water- and emissions-intense month because there is virtually no tourist population in Mammoth Lakes, and there is little outdoor water use as the short growing season ends.

As 2012 data become available, MCWD will update the charts and graphs. The Inyo-Mono RWMG will follow up with MCWD to determine how the solar panels and energy audit have affected the amount of electricity purchased by MCWD and the resulting emission inventory. By reducing electricity demand through water management and technical upgrades, MCWD successfully decreased the amount of electricity it needs to deliver water, and by generating clean energy on-site, the district is able to reduce GHGs on the supply side.

Figure 3-22

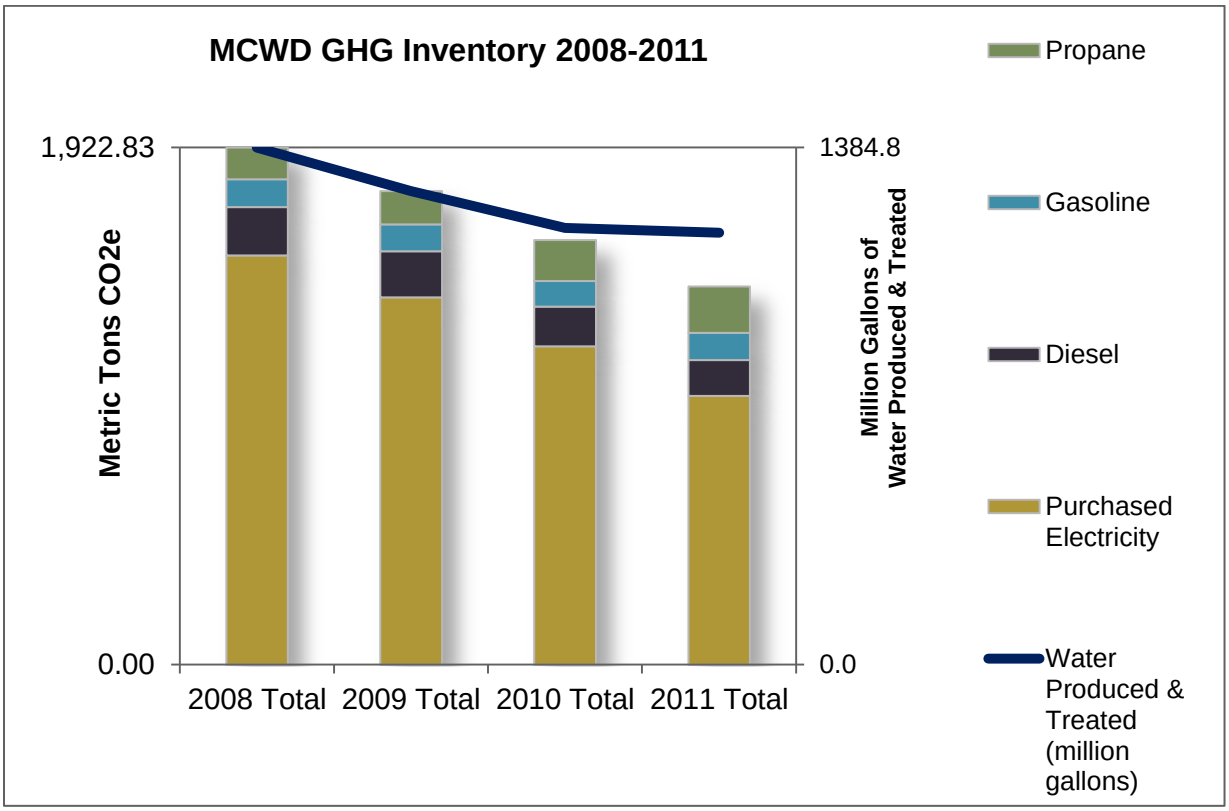


Figure 3-23

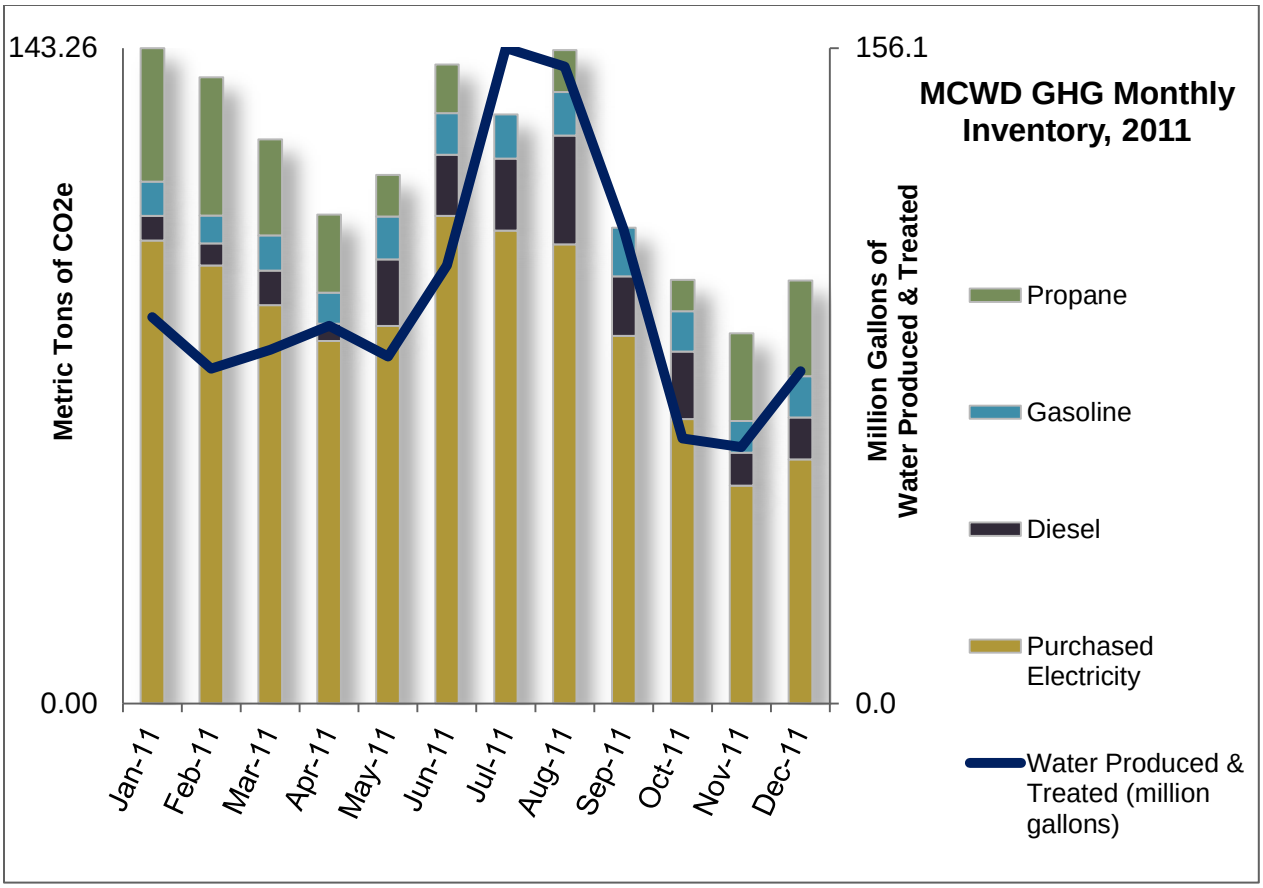
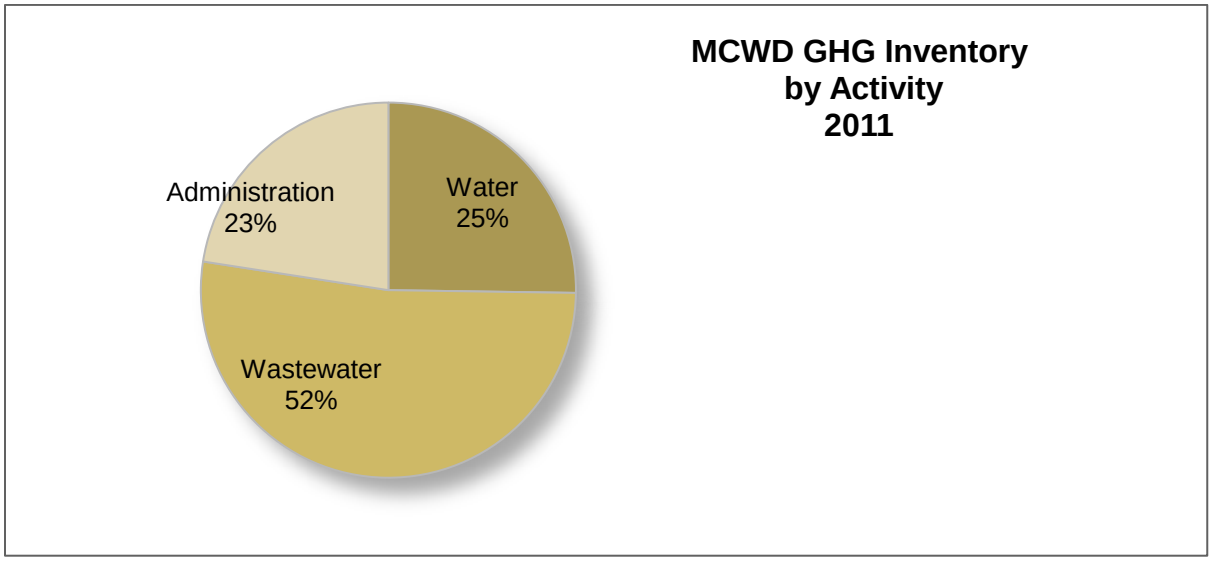


Figure 3-24



Case Study: Mammoth Community Water District's Solar Array

Up front cost: $5.5 million

Estimated payback period: 9 years

Life of solar panels: 20 years

State and Federal Incentives: $3.5 million

MCWD 1MW Solar Photovoltaic Power Plant

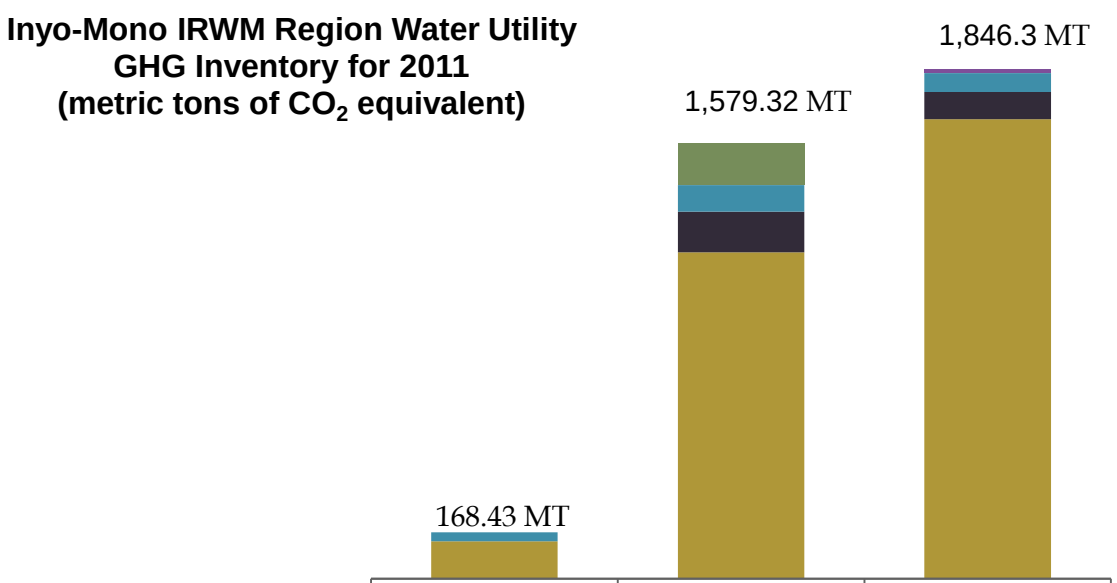
In 2009, the MCWD Board began discussing the possibility of installing arrays of solar panels on or around its property in Mammoth Lakes. The largest single demand for electricity is the wastewater treatment plant, costing about $17,000 per month to power. In order to save costs and reduce its environmental impact, the MCWD Board started discussing the possibility of installing solar panels in 2009. There is not enough roof space on MCWD buildings to support a large solar array, so MCWD staff decided to site the project on a retention pond. The three acre site covers the emergency overflow pond as well as some adjacent land and, rated at 1 megawatt, covers about 80% of the electricity load for the wastewater treatment plant. The four large arrays of solar panels follow the sun and automatically lay flat in high winds to protect the panels from damage. Due to the cutting-edge design of the panels and the cool weather and clear skies, the system has been performing at about 115% of expected power generation since the system went live in October, 2011. The water district considered a number of ways to pay for the system but in the end was in the fortunate position to be able to pay the upfront costs. Including state and federal incentives, the system should pay for itself within nine years. The panels have a life expectancy of about 20 years, but the framework is expected to last longer and will be able to support more advanced solar panels as they become available and affordable.

For more information: http://www.mcwd.dst.ca.us/Solar Page/MCWDSolar.htm

Comparison of Three Water Districts

Figure 3-25 shows the GHG inventories for the three water utility districts in the baseline year of 2011. A direct comparison of gross 2011 GHG emissions is misleading given the significant disparity in size among the three water districts, but it is instructive to see emissions quantified and sources identified. A common metric must be used in order to fairly compare the three districts' GHG emissions. Emissions per population served would be convenient, but due to the large seasonal population swings, especially in June Lake and Mammoth Lakes, this is not a reliable method. Emissions per amount of water (metric tons of CO_2-equivalent emissions per million gallons of water procured and wastewater treated) may be a better common metric, but as the Mammoth Community Water District inventory details, the source of the water each district relies on (groundwater vs. surface water) largely determines how much electricity is needed to extract the water. In future IRWM Plan updates, we will explore the idea of finding a common metric, possibly by using the amount of water handled by each district or integrating monthly populations, if either of those data are available, or some other metric discovered through a more extensive literature review.

Figure 3-25. Comparison of emissions inventories for the three water systems



	June Lake Public Utility District	Mammoth Community Water District	Indian Wells Valley Water District
Propane	0.00	152.25	0.00
Natural Gas	0.00	0.00	12.16
Gasoline	31.79	95.54	68.39
Diesel	0.00	147.06	98.98
Purchased Electricity	136.64	1184.48	1666.76

Next Steps

As discussed above, 2011 will serve as the baseline year for GHG emissions. It is important to collect energy use data at least annually in order to track progress and minimize the time and cost required to conduct inventory emissions. Actively compiling the data in a form such as Excel, on a monthly basis, will further reduce the time needed at the end of the year while allowing real-time tracking of emission-reducing measures.

Based on emissions inventories, water districts can pinpoint the largest sources of emissions and the most energy-intensive activities. This information can help prioritize projects in order to reduce emissions for the region and save money for the water districts. A key outcome of emissions tracking and identifying successful emissions-reduction measures undertaken by water districts in the Inyo-Mono IRWM region will be information sharing and mutual assistance among area water purveyors.

Finally, by identifying the energy use data and district-specific information needed, and by working through the three case studies included in this inventory, a proof-of-concept was developed. With the knowledge gained, it will be faster and easier to help similarly-sized districts inventory their emissions.

Moving forward, the Inyo-Mono RWMG would like to explore and test methods to help and encourage smaller water districts, as well as households and communities on individual wells and septic systems, to inventory their water-related emissions. Additionally, referring back to Figure 3-15, inventorying water-related emissions at the end user point (e.g., water heating) would help to paint a more complete picture of the energy embedded in water. A more detailed description of the water-energy nexus in the Inyo-Mono region will more fully inform water management and allow the IRWM Program to continue to act as a model for the Sierra and similar rural, mountain regions.

Carbon Sequestration

Carbon sequestration is a climate change mitigation action that aims to remove carbon dioxide from the atmosphere and store it in vegetation or soils. In regions with climates that support carbon-rich soils, or that have a large potential for reforestation, carbon sequestration may be a viable option for mitigating GHG emissions. Due to the very dry climate and relatively sparse vegetation in the Inyo-Mono region, soils hold little organic matter and have high mineral content. Thus, soil sequestration is not a viable option. Carbon sequestration in vegetation also does not hold much promise in this region. There has been little deforestation due to logging and other anthropogenic disturbances, so there is little opportunity for reforestation. Furthermore, most of the forests in the region are overgrown due to fire suppression, so they will likely become a source of carbon emissions rather than a sink. It seems that the best option for mitigation of GHGs in the region is to reduce emissions from the sources.

Conclusion

The Inyo-Mono RWMG and Program Office staff will continue to work to understand the potential (and current) impacts of climate change in the region as well as options for responding to those impacts. A key need for water and land managers in the region is better access to up-to-date climate change information, as well as information (such as models) developed on scales appropriate for land and water management and planning. The RWMG will continue to serve as a liaison between agencies and institutions producing information, and agencies and organizations requesting that information.

Chapter 4: Data Management/Technical Analysis

Introduction

A major goal of the Inyo-Mono IRWM Program is to foster a broad foundation in technology and to develop a robust set of water resource tools and relevant data for our stakeholders, who are entities with water interests within the Inyo-Mono Region, and more broadly our fellow IRWM regions. These data and associated tools will enable all participants to better understand local water related issues, participate in Inyo-Mono RWMG processes, and more effectively communicate the critical water needs of the Inyo-Mono region to policy makers in Sacramento as well as to all other interested parties.

Since the inception of the Inyo-Mono IRWM Program, the RWMG has emphasized the responsible use of State and local funds. The RWMG's philosophy is that less money spent on expensive outside consultants means more money for high priority regional water issues. Further, this philosophy encourages capacity building and program development, which leads to the long-term betterment of the IRWM program and its stakeholders.

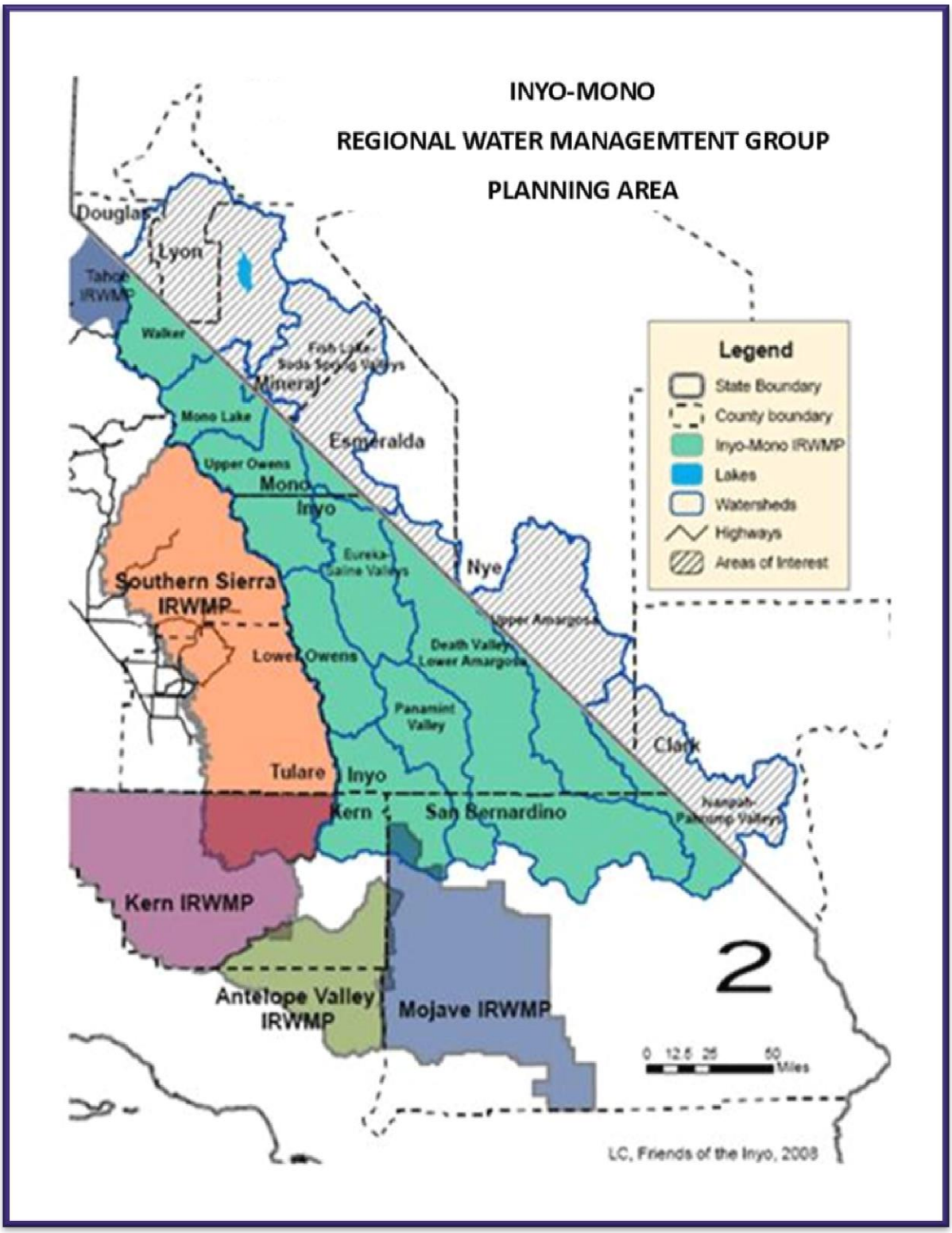
While the RWMG recognizes that in certain instances, consultants may be integral to certain key steps in the process, it also recognizes that technology has developed to a point that no longer requires advanced technical expertise in many situations. In recognizing the availability of alternatives, the Inyo-Mono IRWM Program Office staff strives to leverage existing open-source technologies and services to enable the current small staff to keep pace with the larger, financially well-supported IRWM regions.

History of Data Acquisition and Management

Prior to and independent of California's IRWM Program, water data have been collected by a variety of entities for a wide variety of local purposes. The data acquisition effort began with the USGS in the early 1900s and has continued with entities such as the Los Angeles Department of Water and Power stepping up and contributing significantly to the knowledge of surface and groundwater characteristics in the region.

Once the Integrated Regional Water Management planning effort began in the Inyo-Mono region, the focus fell to assessing and addressing fundamental issues and needs of the region. Data acquisition mirrored current needs and remained fairly basic in its extent, consisting of baseline stakeholder data and some fundamental maps (Figure 4-1). As expected, minimal data collection, coupled with a limited IRWM Program staff, equated to the low prioritization of an official data management program. With the attainment of the first Planning Grant, the RWMG was able to hire additional staff that brought a complementary set of skills to the Program, further broadening the scope of possible deliverables using spatial data and technology to the Inyo-Mono RWMG.

Figure 4-1. Example of preliminary maps of the Inyo-Mono Region



Original boundary map used in the Regional Acceptance Process (RAP), made possible by in-kind contributions from an early RWMG participant, The Friends of the Inyo.

The Inyo-Mono RWMG acknowledges that redundant efforts in data acquisition and management are a financial drain, as well as waste of personnel resources. A fundamental concept of *integration* calls for collaboration of entities involved in the research, planning and management efforts of common or related resources. In concert with this notion, the Inyo-Mono IRWM Program acknowledges historical and current water monitoring efforts underway in the Inyo-Mono region and aspires to utilize and build off knowledge gained through those efforts to support and enhance Inyo-Mono IRWM planning efforts.

Data Collection & Monitoring Efforts

The majority of these pre-existing efforts stem from federal, State or local mandates to monitor or evaluate water resources within the region. In other instances, research was spurred by volcanic unrest or resource exploration. Current as well as past efforts to provide water related data are discussed in an organized manner, by lead agency in the paragraphs below.

United States Geological Survey

The United States Geological Survey (USGS) provides a comprehensive suite of water quantity and in fewer instances quality, data throughout the region, provided in the National Water Information System (NWIS) online database: http://waterdata.usgs.gov/nwis. An abundance of surface water, groundwater, and water quality data may be obtained from this website.

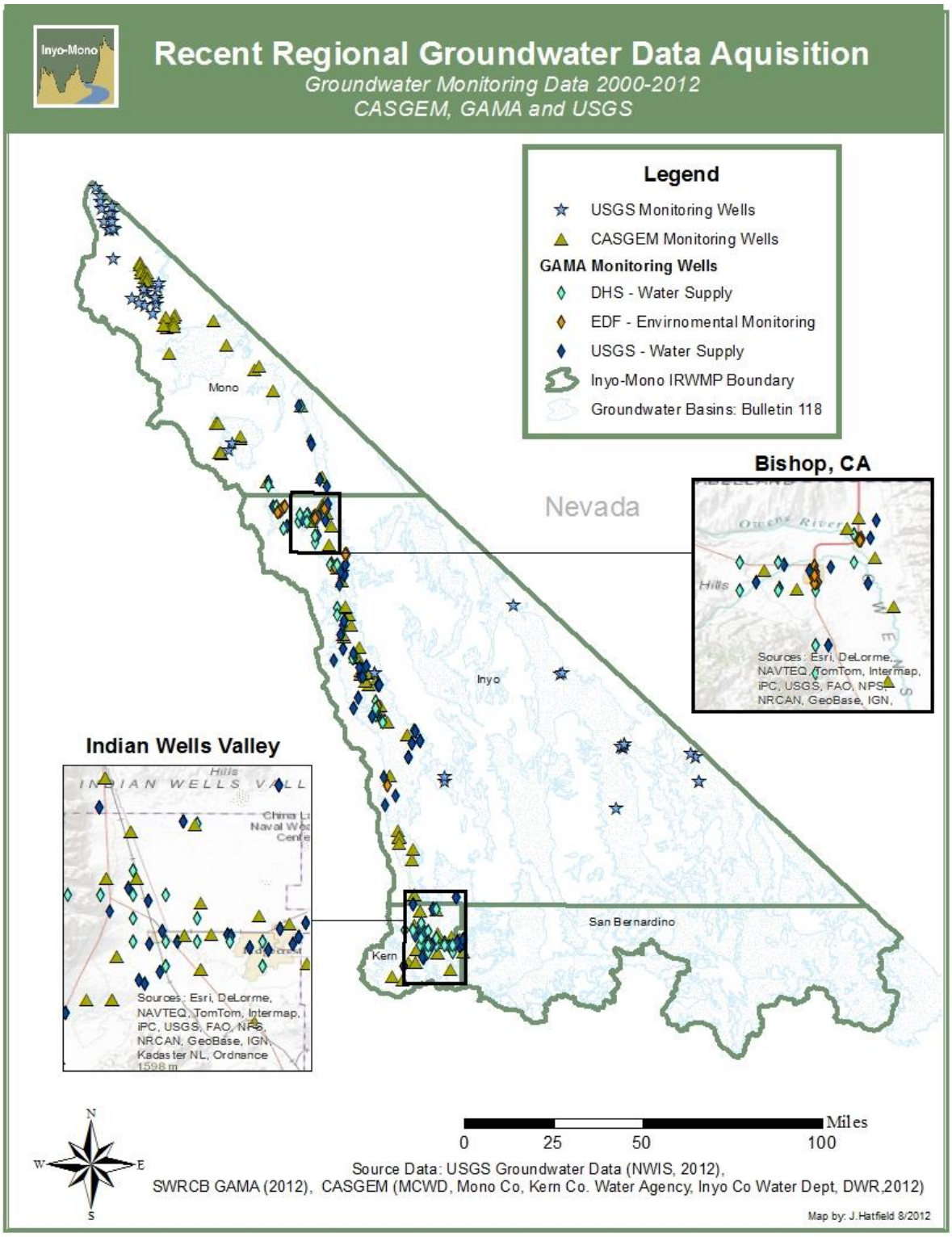
Over the past 100 years, the USGS has explored groundwater resources throughout the region, leaving behind a network of monitoring wells that provided various levels of groundwater elevation data. Historically, this network has contributed valuable groundwater data from 387 well locations in Inyo County and 133 in Mono County (Figure 4-3 USGS, NWIS, 2012). Currently, the majority of these wells sit idle due to a loss of monitoring funding, as well as aging infrastructure, and thus, no longer provide current groundwater data to the region.

For specific USGS wells, monitoring may have been discontinued for a number of reasons. In some cases, monitoring responsibilities were transferred to other entities. Other monitoring efforts ceased due to decreases in funding, transfer of monitoring responsibility to other entities, or completion of specific projects of limited time and duration.

National Water Information System (NWIS) databases include all past monitoring locations. Upon initial discovery, the data are deceiving with regards to current data availability within the region. Of the total USGS-owned wells given in the database for Inyo and Mono Counties (520 wells), only a small percentage (30 wells or 5%) have continued to serve as monitoring wells within the region (USGS, 2012). The comparative maps that follow (Figures 4-2 and 4-3) aim to illustrate the loss of data collection capacity as well as infrastructure particularly associated with the USGS efforts.

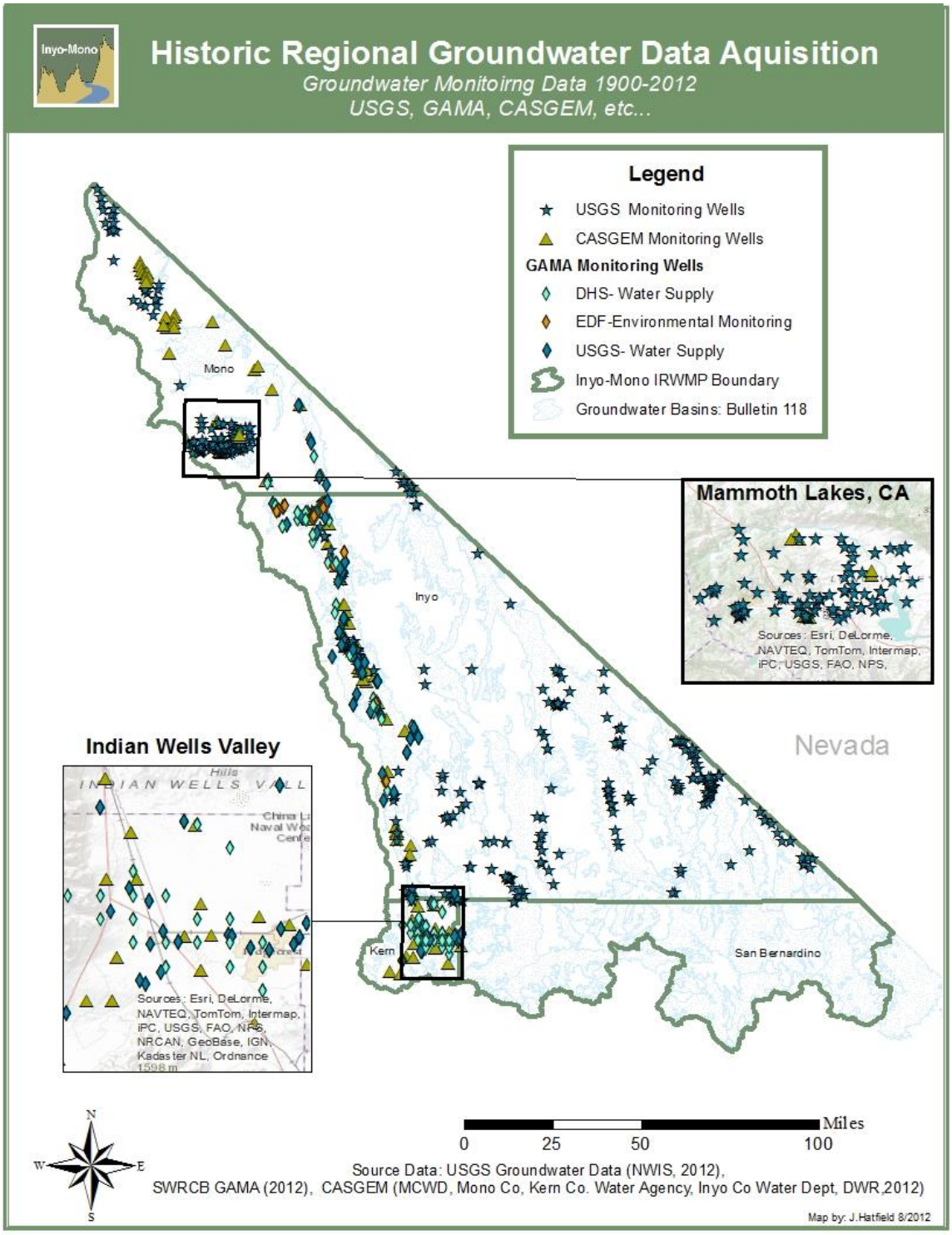
During the past decade fewer USGS monitoring data have been collected. At present, only two USGS monitoring locations are providing consistent groundwater data within the region (Long Valley Caldera study area: USGS Well # LV19, 4S28E1F1M and USGS Core Hole #CH10B, 3S29E30E2M; USGS, Personal Communication, 2012).

Figure 4-2. Recent Regional Groundwater Data Acquisition: 2000-2012



The above map depicts the monitoring data collected over the past 12 years within the Inyo-Mono IRWM Region. Loss of funding is the primary reason behind the reduction of many of the Groundwater Monitoring efforts.

Figure 4-3. Historical Regional Groundwater Data Acquisition: 1900-2012



The above map illustrates the history of groundwater monitoring and exploration throughout the vast Inyo-Mono Region by a variety of different programs. The majority of many of these wells are no longer in use within the region, particularly those owned and operated by the United States Geological Survey (USGS).

The extent of USGS surface water gauging stations is also reduced from past efforts. In the past, there existed 47 USGS stream gaging stations in Inyo County and 36 in Mono County, which contributed surface water data to the region. Due to downscaled funding within the USGS, those surface water gauges currently collecting data have been drastically reduced, leaving only two in Inyo County (both on the Amargosa River) and less than a dozen in Mono County, all of which are concentrated in a few locations; Bridgeport Valley, East and West Walker Rivers, and the critical streams near Mammoth Lakes (Figure 4-4). Some historical USGS gauges in Owens Valley have been transferred to LADWP. Although the USGS stations yield predominantly flow data, on rare occasions some sites have water quality data available in varying degrees (USGS, 2012).

City of Los Angeles- Department of Water and Power

The City of Los Angeles maintains a much larger groundwater monitoring network than is portrayed in the CASGEM data and previous maps. During the process of updating the Inyo-Mono IRWM Plan, LADWP was contacted with a request to be involved with not only the plan review process but also to furnish additional data relevant to the current water monitoring efforts within the region. At the time of the request, The City was not ready to make its groundwater data publicly available, and thus the more comprehensive data set is not reflected in the regional maps (Figures 4-2 and 4-3).

The RWMG acknowledges the concerns of LADWP regarding potential use of its data but also recognizes the unavailability of these data as a significant gap in the knowledge base of regional groundwater resources. The RWMG will continue to work collaboratively whenever possible with the City in an effort to increase the body of publicly available knowledge about water resources within the region.

The City also has a network of surface water gauging stations that monitor lake and reservoir elevations as well as real-time flow data from the Mono Lake headwaters to the entire Los Angeles Aqueduct system. This system is comprised of approximately 12 lake/reservoir elevation gauges and another several dozen flow gauges, coupled with a few temperature sensors. Real-time data for the network, illustrated in Figure 4-4 can be found at the following URL:

http://wsoweb.ladwp.com/Aqueduct/realtime/realtimeindex.htm.

Mono Basin

In addition to an established body of research specific to Mono Lake, there are ongoing monitoring efforts in the Mono Basin addressing a range of topics including the condition of Mono Lake and its tributary streams, nesting and migratory bird populations, air quality, and seismic activity. The majority of water-related monitoring in the Mono Basin is conducted by LADWP for the purposes of compliance with the State Water Resources Control Board's Decision 1631 and subsequent Orders WR 98-05 and WR 98-07. In 1994, the State Water Board established instream flow requirements below LADWP's points of

diversion on four affected Mono Basin streams. Decision 1631 also established conditions to protect public trust resources at Mono Lake. As part of the State Water Board determinations, LADWP is required to undertake restoration and monitoring activities to be in compliance with the terms and conditions of its licenses. Each May, LADWP submits an annual compliance report to the State Water Resources Control Board. This report contains not only compliance reporting, but also the reports from the previous year's lake and stream monitoring. This information is made available to the public at: http://www.waterboards.ca.gov/waterrights/water_issues/programs/mono_lake/.

DWR CASGEM Program

DWR's California Statewide Groundwater Elevation Monitoring (CASGEM) was initiated by the State legislature's SBX7-6 in 2009 to track seasonal and long-term trends in groundwater elevations in California's groundwater basins. Groundwater elevation monitoring was scheduled to begin in 2012 and is to be done by local entities that are approved as Designated Monitoring Entities by DWR. The CASGEM program has already begun to generate valuable groundwater data within the region. Currently local entities are strategizing as to how to fund such programs under already restricted budgets, while fully realizing the value of the potential data generated within the CASGEM program. CASGEM groundwater data being collected both within the region and throughout the State are available through DWR's Water Data Library: http://www.water.ca.gov/waterdatalibrary/.

CASGEM's approved Designated Monitoring Entities within the Region include Inyo County, Los Angeles Department of Water and Power, Indian Wells Valley Cooperative Groundwater Management Group, Tri-Valley Groundwater Management District and Mono County (as a conditionally approved Monitoring Entity as of January 2012). Continued efforts are being made to prioritize expanded CASGEM efforts within the region. http://www.water.ca.gov/groundwater/casgem/designated_entities.cfm

Mono County

The land above most groundwater basins within Mono County is largely undeveloped, sparsely populated, and is mostly public (Slinkard Valley, Little Antelope, Sweetwater Flat, Adobe Valley, Fish Lake Valley). Predominant jurisdictional agencies in these basins include the CA Department of Fish and Game, USFS (Humboldt-Toiyabe and Inyo National Forests) and the BLM. Within these agencies, only a handful of monitoring wells are available to contribute to CASGEM efforts. In these basins, Mono County has pledged a passive groundwater monitoring approach and will continue to monitor development within each of the basins while continuing to explore opportunities related to the installation of dedicated monitoring wells, should funding become available (Mono County**,** 2011).

More developed Mono County basins (Antelope Valley, Bridgeport Valley, Mono Basin, Long Valley, and Owens Valley) have some infrastructure allowing them to participate in CASGEM, and in these basins monitoring efforts are currently underway. Additionally a few smaller entities provide CASGEM monitoring for more remote sections of the County where small populations with groundwater concerns have historically been active within the water community.

The USGS has been conducting groundwater monitoring by special permissions with private well owners since 2010 for both the Bridgeport Valley and Antelope Valley groundwater basins as part of a larger effort focused on Walker Lake in Nevada. Funding for this project will expire in 2014, at which time the County hopes to continue agreements with private well owners for the continuation of the monitoring

effort. USGS groundwater data are available through the USGS National Water Information System web interface: http://nwis.waterdata.usgs.gov/ca/nwis/gwlevel

With the passing of Proposition 13, the Costa-Machado Water Act provided significant funding by the State of California for localized watershed planning activities. Mono County responded to several Requests for Proposals through the SWRCB, recognizing that watersheds provide the ideal boundary in which to study water-related issues. Initially, three watershed assessments in Mono County were funded in response to SWRCB solicitations, covering the Upper Owens River or Long Hydrologic Area (380 square miles), the Mono Basin (800 square miles), and the West Walker River (410 square miles). Seeing firsthand the value these watershed assessments provided the County and other interested parties, further funding was sought through other avenues to complete an additional assessment on the East Walker River Watershed (401 square miles). Chapter 11 and Appendix D contain more information on these watershed documents.

These watershed assessments thoroughly describe each watershed and clearly describe issues concerning each associated watershed. Additionally, the assessments provide synopses of water quality data including summary information on research and findings previously completed within the watershed boundary. The information provided in each of the watershed assessments can be used as a valuable planning tool for entities in the Regional Water Management Group and are presently available publicly in digital format in the Inyo-Mono IRWM Program website's Library (http://inyo-monowater.org/library/). Currently, such watershed-level assessments are only available for Mono County.

Inyo County

Inyo County comprises over half of the land are within the Inyo-Mono region with vast undeveloped roadless areas covering large expanses of desert. Extensive groundwater monitoring has been conducted in Inyo County as far back as the 1920s by the USGS as well as the City of Los Angeles, who had a vested interest in keeping track on groundwater levels as they began to export water from the region.

In an effort to comply with CASGEM mandates, the City of Los Angeles Department of Water and Power has jointly developed a Monitoring Plan with Inyo County Water Department for CASGEM groundwater monitoring within the Inyo County portion of the Owens Valley (LADWP, 2011b). Currently, 33 LADWP-owned wells have been submitted to DWR to supply groundwater data to the CASGEM program for the 663,457-acre Owens Valley groundwater basin by the City of Los Angeles.

Inyo County is charged with the monitoring of ten wells in the Rose Valley groundwater basin. The Rose Valley monitoring component is in response to concern over local groundwater pumping that provides water to the Coso Geothermal Plant at the nearby China Lake Naval Weapons Station.

Kern County

The Indian Wells Valley Cooperative Groundwater Management Group (IWVCGMG) is the Designated Monitoring Entity responsible for monitoring and reporting groundwater levels for the CASGEM program in northeastern Kern and northwestern San Bernardino Counties. The program set up by the IWVCGMG includes semi-annual groundwater monitoring (April and October) from a select 37 wells within the Indian Wells Valley (IWV) groundwater basin (Figure 4-3). The Kern County Water Agency (Agency) has been

designated by the IWVCGMG to be the independent monitoring and data archival entity for the IWV groundwater data for the CASGEM program as it is already the designated groundwater data repository for the County of Kern. The Agency maintains a robust relational database that can store data relating to groundwater, surface water, hydrologic conditions and well production, and well construction. The Agency also maintains GIS applications that are provided to IWVCGMG in the form of groundwater elevation maps, watershed conditions, geological information, cadastral, population, and assessors' data.

The Agency has monitored groundwater conditions in the IWV since 1989 and has also archived a limited amount of data from the USGS prior to 1989. The majority of the wells used in this dataset are multiple completion wells funded and constructed under a cooperative program between the U.S. Bureau of Reclamation, United States Navy (Naval Air Weapons Station, China Lake), Indian Wells Valley Water District and the Kern County Water Agency. A few of the wells are former domestic or livestock wells and dedicated monitoring wells on the China Lake Naval Air Weapons Station. The Inyo-Mono IRWM Program Office recently has obtained valuable groundwater data for the Indian Wells Valley groundwater basin and will continue to foster a positive working relationship with the Kern County Water Agency through their contacts with the IWVCGMG.

San Bernardino County

The portion of San Bernardino County that lies within the Inyo-Mono Region is by far the least populated and developed portion of that County as well as the Inyo-Mono Region. This desolate portion of the Mojave Desert has limited data available in comparison to its surroundings. Further efforts need be employed to seek out available data for this sector of the planning area.

State Water Resources Control Board

Major data collection and monitoring programs spearheaded by the State Water Resources Control Board (SWRCB) include the Surface Water Ambient Monitoring Program (SWAMP) and Groundwater Ambient Monitoring and Assessment Program (GAMA). "The GAMA Program was created by the State Water Board in 2000. It was later expanded by Assembly Bill 599 – the Groundwater Quality Monitoring Act of 2001. The main goals of GAMA are 1) to improve statewide groundwater monitoring, and 2) to increase the availability of groundwater quality information to the public" (SWRCB, 2012a): http://www.swrcb.ca.gov/water_issues/programs/gama/.

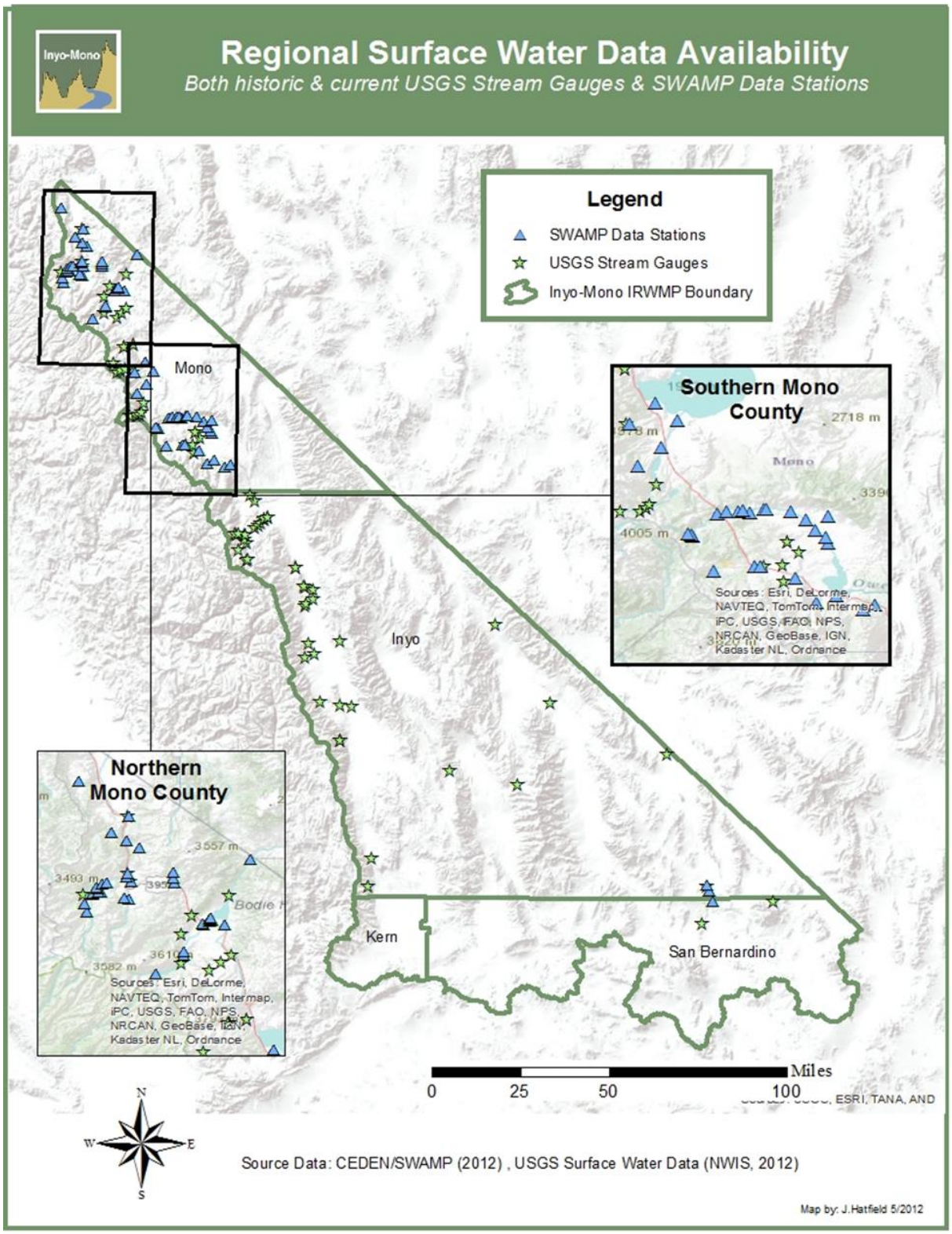
Data collection for the GAMA program in many instances began before the program's "official" start in 2000, with data from as far back as 1984 for the Inyo-Mono Region (SWRCB, 2012b). Live, online data resulting from the GAMA Program can be retrieved for only a handful monitoring wells located within the region through the SWRCB geotracker link below, although downloadable data appear to be more complete: http://geotracker.waterboards.ca.gov/gama/.

Also available through the GAMA website mentioned above are groundwater basin water quality assessments per the CA Groundwater Bulletin 118 updates for all California counties. Of interest to the Inyo-Mono Region are data for Inyo, Mono, Kern, and San Bernadino Counties: http://geotracker.waterboards.ca.gov/gama/gamamap/public/gama_reports.asp?county=INYO.

In addition to groundwater data provided through the GAMA program, the SWRCB leads an extensive surface water quality (SWAMP) data collection effort that can be accessed through the California Environmental Data Exchange Network (SWRCB 2012c; CEDEN, http://ceden.org/). Within the Inyo-Mono Region, there are approximately 67 stations that collect or have collected SWAMP data, the majority of which were studies conducted by the University of California Sierra Nevada Aquatic Research Laboratory from 1999-2007. Station locations are concentrated mainly on the Walker River and Mammoth Creek/Hot Creek with additional outlying stations dispersed throughout the region.

Figure 4-5 below details surface water quality data (SWAMP), and Figure 4-2 details groundwater data (GAMA) currently available from within the regional boundaries from the SWRCB.

Figure 4-4. Regional Surface Water Data Availability



Surface water gauging stations for both USGS and SWAMP established in the Inyo-Mono Region.

United States Forest Service

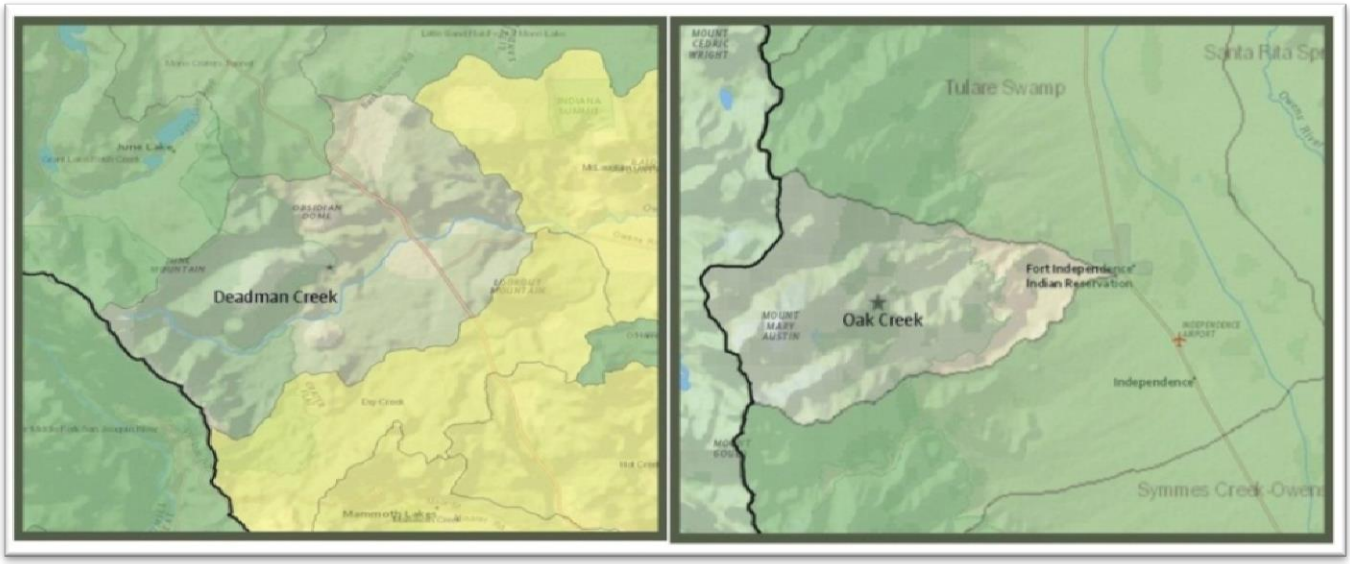
Watershed Condition Framework

The Watershed Condition Framework leverages work done by the USFS to evaluate watersheds managed in full or part by the USFS. The USFS analysis utilized basins described by their 12-digit hydrologic code, which is a nationally standardized naming convention designed by the USGS to identify watersheds at various levels. "The Watershed Condition Framework (WCF) is a comprehensive approach for proactively implementing integrated restoration on priority watersheds on national forests and grasslands" (USDA, 2011a). The report recognizes the watershed as a fundamental component of broader ecosystem health and was designed for the USFS as a first step in a larger 6-step watershed restoration process. As a first step, each watershed was evaluated against the Watershed Condition Framework using the Watershed Condition Class assessment, and one of three classes were assigned: Class 1=Functioning Properly, Class 2=Functioning at Risk, or Class 3=Impaired Function: (http://www.fs.fed.us/publications/watershed/Watershed_Condition_Framework.pdf http://www.fs.fed.us/publications/watershed/watershed_classification_guide.pdf)/

An ArcGIS Online map has been provided by the USFS to promote integration with this effort. The Inyo-Mono Program Office has utilized that map to create a version specific to the Inyo-Mono Region in an effort to bring the relevance of the USFS work down to an IRWM-region level in recognition of the profound effect USFS planning actions have on the region: http://inyo-monowater.org/wcf-map/.

Of local significance, the Oak Creek and Deadman Creek watersheds were selected as priority watersheds by the Inyo National Forest as a result of its collaborative work on the Watershed Condition Framework. Consequently, the USFS, in partnership with the Fort Independence Indian Reservation, will be receiving a Prop. 84 planning grant award in the amount of $75,000 to begin a Stream Rehabilitation and Stabilization Study for the Oak Creek Watershed (Figure 4-6).

Figure 4-5. Inyo-Mono Priority Watersheds as determined by the USFS Watershed Condition Framework



Forests to Faucets

The USDA Forests to Faucets project "uses GIS to model and map the continental United States land areas most important to surface drinking water, the role forests play in protecting these areas, and the extent to which these forests are threatened by development, insects and disease, and wildland fire. The results of this assessment provide information that can identify areas of interest for protecting surface drinking water quality. The spatial dataset can be incorporated into broad-scale planning and can help identify areas for further local analysis. In addition it can be incorporated into existing decision support tools that currently lack spatial data on important areas for surface drinking water" (USDA, 2011c): (http://www.fs.fed.us/ecosystemservices/FS_Efforts/forests2faucets.shtml.

Again, capitalizing on work already performed by the USFS, the Program Office has provided an ArcGIS Online version of the USDA Forests to Faucets online map to bring regional relevance to the work done by the USFS in the region. Key scores to high ranking watersheds are also provided in summary beneath the map on the provided web page: http://inyo-monowater.org/forest-to-faucets/.

The Surface Water Drinking Index specific map gives particular weight to the mountain/headwater regions in recognition of their role in providing high-quality drinking water to distant urban regions, giving considerable weight to a number of HUC-12 watersheds in the Inyo-Mono region:

Table 4-1. USDA Forest to Faucets: Surface Drinking Water Importance Index

USDA Forest to Faucets: Surface Drinking Water Importance Index	
Watershed (HUC-12)	**Score**
Goodale Creek-Owens Valley	97
Grant Lake	97
Mammoth Creek	96
Rush Creek	95
Convict Creek	93
South Fork of Bishop Creek	93
Hot Creek	92
Dry Creek	91
Lake Crowley-Owens River	91
Oak Creek	91

Available Technical and Analytical Tools

To date a number of improved technical and analytical tools have been developed for use by the Inyo-Mono RWMG. Each tool is discussed under its associated heading below.

Online Project Upload Form

The new online project submission form uses Google Forms to provide a user-friendly interface that was easily embedded into the Inyo-Mono website. When filled out properly, this form auto-populates the Inyo-Mono Regional Project Needs Assessment database. The project submission form gathers baseline data for each project and its relevance to Inyo-Mono IRWM Program Objectives and Resource Management Strategies (Chapter 7); DWR program preferences; CA Water Plan strategic objectives and resource management strategies; activity category; and IRWM benefits. Provided by Google, this

database has a built-in statistics package that delivers summary data for all projects in the database. This data summary can be shared publicly or kept private, by choice of the administrator. This database can also be easily exported into Microsoft Excel or Access, or other preferred database program, which can allow for advanced queries and spatial analysis where appropriate.

The content of the online form is easily edited, should the need arise, and provides an automatic cloud-based backup of the data file. Program Office staff saves additional versions of the database to the network drive on a weekly basis to reduce the probability of data loss. Feedback on the usability of the Online Project Upload Form will be sought after Round 2 Implementation projects have been uploaded, as an integral step in the adaptive management process. Results from the first round of use of the Online Project Upload Form, including a list and analysis of the projects that were uploaded, can be found in Chapter 15.

Online Plan Review Process

A collaborative online commenting process was configured and placed on the Inyo-Mono website to facilitate the review of this Plan. All interested parties were given commenting capabilities though Google Documents. In a document of this size with the potential to have a significant number of people reviewing and suggesting changes to the text, this system provided the most efficient process for Program Office staff to incorporate abundant comments into the Plan. As will be done with the Online Project Upload Form, comments and criticisms will be sought as to the functionality of the current system, once the Phase II Plan revision process is completed, and suggested changes will be considered for future Plan revisions.

Interactive Web Maps

GIS mapping technologies have experienced exponential growth in recent years. New developments by the Environmental Systems Research Institute (ESRI) have enabled GIS users with an average knowledge base the ability to create interactive web maps through free accounts (2GB max.) using the ESRI cloud. Spatial data files that retain valuable attribute data can be imported using conventional zipped shapefiles or a variety of other compatible file formats (.csv, .kml, gpx.), it is now relatively easy to load custom data into online maps. Once imported to the web map, configurable pop-ups allow the user to specify which attributes can be viewed by the map audience. Combined with any choice of ESRI basemaps, easily selected by the user, these intelligent web maps have the ability to convey immense amounts of information about a spatial feature, be it point, line, or polygon.

Three different web maps are currently featured tools on the Inyo-Mono website: a Round 1 Project Implementation map and two USFS maps that include data generated through the Forests to Faucets and Watershed Condition Framework initiatives. The project implementation map, created by Inyo-Mono Program Office staff, provides information on the first seven projects funded by a Prop. 84 Implementation Grant: http://inyo-monowater.org/interactive-project-map/.

When selected (by clicking on each point), pop-ups yielding detailed project information are displayed. This information includes the project title, sponsor, funding amount, and RWMG ranking as well as a linked PDF document that provides a narrative summary about each project. The two online Forest Service interactive maps and available data are discussed under the Data Collection Monitoring Efforts USFS section above.

Generation of New IRWM Program Data

The Round 1 Implementation project proponents began work on their respective projects in the summer and fall of 2012. The overall Implementation Grant of $1.1 million is being used to support seven water projects identified by the RWMG as high priority through its internal ranking process (Chapter 9). Collection of data relevant to monitoring these projects and how they contribute to the goal of meeting IRWM Plan Objectives and Resource Management Strategies, as well as to the body of growing water knowledge aggregated by the IRWM Program Office, has yet to commence. Specific plans to begin Plan Performance and Monitoring are discussed at length in Chapter 13.

Once the flow of original data is incoming, those newly acquired datasets will adhere to the protocols and policies outlined in Inyo-Mono Data Management Plan (Appendix A).

Available Online Data Networks

The Inyo-Mono RWMG recognizes and endorse databases and networks such as the California Environmental Data Exchange Network (CEDEN), California Data Exchange Center (CDEC), Surface Ambient Water Monitoring Program (SWAMP), Integrated Regional Water Information Systems (IRWIS), DWR's Water Data Library (WDL), California Statewide Groundwater Elevation Monitoring Database (CASGEM), and USGS's National Water Information System (NWIS). These databases and networks provide a host of data pertinent to the Inyo-Mono Region. The unfortunate problem with these data sources is the general lack of knowledge about the availability of the data as well as the time commitment required for smaller entities deficient in technical expertise to learn how to find and use available data. When fitting, the Inyo-Mono Program Office will encourage and facilitate, to the extent possible, the contribution of acquired data through IRWM funded projects to be submitted to a nationally recognized database for the benefit of all interested water entities.

Inyo-Mono IRWM Water Data Portal

To date, no centralized water data portal has been created for the Inyo-Mono website. The need to do so has not been discussed nor requested by the RWMG. Should the need arise, the Program Office would willingly compile the relevant data sources listed above into a Regional Water Data Web Portal. This effort would aim to provide the most convenient access plausible to these data sources, as well as to locally available data, for RWMG stakeholders and interested members of the public. Scoping sessions with a Data/Technology working committee from the RWMG may be the best method to identifying key data needs as a way to prioritize services to be offered via the website to the RWMG.

Improved Online Mapping Resources

With the recent release of the Environmental Systems Research Institute's (ESRI) online spatial mapping cloud-based software, spatial analysis opportunities for IRWM Programs are vast. The impetus of this online mapping tool was born from the need for collaboration and integration among entities or organizations interested in managing shared resources. The Inyo-Mono Program Office staff plans to continue providing need-based online mapping tools in response to a growing IRWM Program using Program Office staff's personal ArcGIS Online accounts.

The pursuit of additional grant funding specific to the attainment of an ArcGIS Online subscription and the subsequent development of ArcGIS Online mapping resources is a high priority among the RWMG, and work is planned to further develop this tool as a task in the Round 2 Planning Grant. By seeking

funding outside of Prop. 84 for this project, the RWMG hopes to acquire needed resources not only to develop the tool for the Inyo-Mono Region but for IRWM regions Statewide. By assuming a leadership role in this facet of water planning, the Inyo-Mono RWMG intends to strengthen its voice at a statewide level and become an authoritative source for innovative online water mapping needs for practitioners, managers, planners and legislators alike.

Static Map Library Development

In addition, Inyo-Mono Program Office plans to include an improved downloadable static map library on the program website. This library will be prioritized using RWMG input with the most sought after maps generated first, and then defaulting to the agreed upon hierarchy for remaining static maps to be completed. By anticipating RWMG mapping needs and interests, efficiencies will be gained by providing information to RWMG Members well in advance of the perceived need.

Data Management Plan

With the building of the new Inyo-Mono Regional Project Needs Assessment Database, the need for data management will invariably increase on an iterative basis (Appendix A). It is foreseeable that the growth of this database may lead to the utilization of spatial analysis for collaborative project development, prioritization, and integration. Further, as surface and groundwater quality data improve, they can be incorporated into the spatial analysis process where prudent.

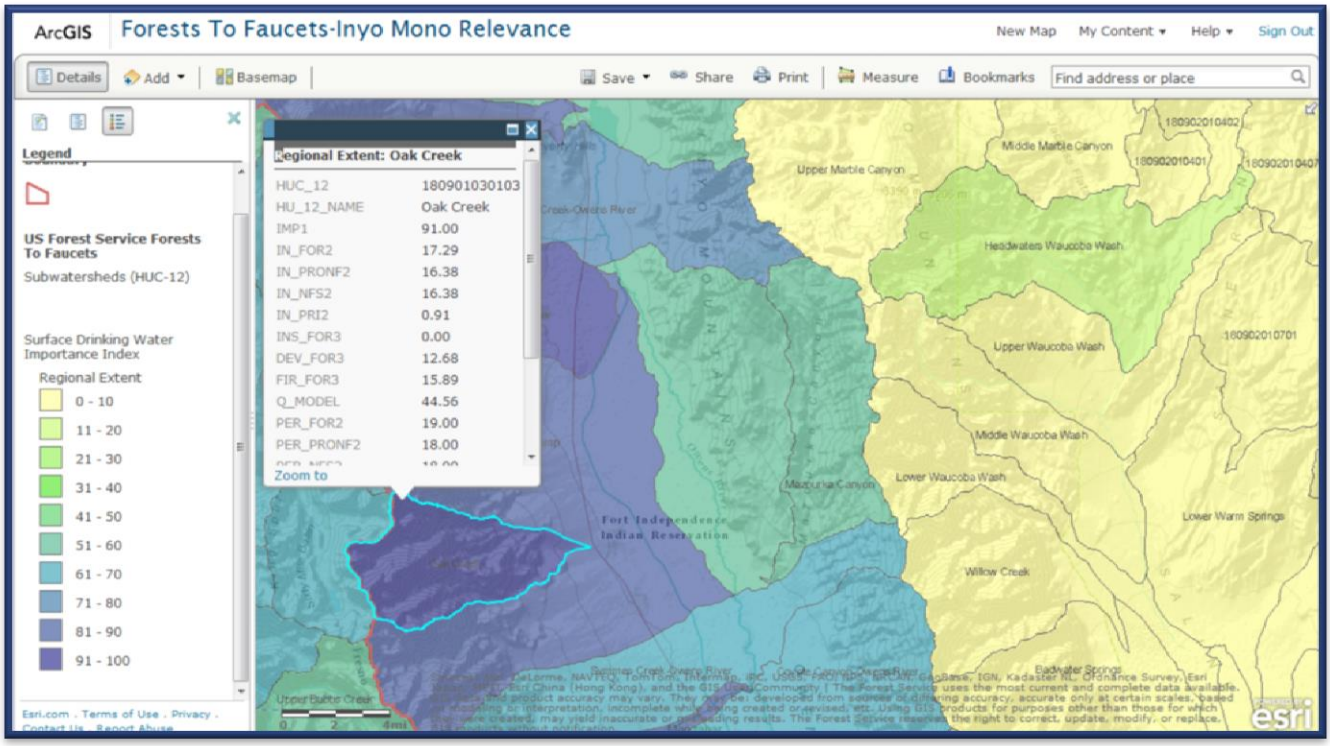
Tech Tools Training Workshops

As technology advances, the Inyo-Mono Program Office understands that trainings and orientations applicable to new tools and resources will be necessary to bring regional stakeholders up to date. In concert with our mission to continue to build internal capacity throughout the Region, Program Office staff will facilitate trainings in an effort to increase our user-base knowledge of the tools provided. Focused efforts will be made toward including both tribes and DACs and creating tools that will assist these disadvantaged groups in communicating and addressing their water related needs.

Climate Change Analysis and Data Management

The growing concern over global and local climatic changes has necessitated the management of massive amounts of data and technical information. This need includes not only past weather observations but output from climate models projecting future climate and hydrological patterns. The Inyo-Mono RWMG has only just begun to participate in climate change analysis processes, but already a great deal of information has been generated for the region (see Chapter 3, Climate Change). To date, the analysis has focused on a vulnerability assessment and a climate impacts analysis for the region (utilizing the bias-corrected and downscaled WCRP CMIP3 climate and hydrology projections: http://gdo-dcp.ucllnl.org/downscaled_cmip3_projections/dcpInterface.html#Welcome. Future analysis may include hydrologic impacts. There are several options available for this type of analysis. Two that have been considered by the Program Office are the World Climate Research Programme's (WCRP) Coupled Model Intercomparison Project Phase 3 (CMIP3) and the Water Evaluation and Planning (WEAP) system (http://www.weap21.org/). The advantage of the CMIP3 projections is that they are the same projections as those used for the climate impacts analysis for the Inyo-Mono Region, and they are available to the user at no cost. However, the WEAP system allows the user to specifically model Inyo-Mono watersheds and perhaps gain a more realistic view of those systems. Use of the WEAP model is expensive and therefore may not be feasible within the current resources available through the Inyo-

Mono IRWM Program. If prioritized by the RWMG, alternative funding may be pursued to support such modeling efforts.



Conclusion

The Inyo-Mono IRWM Program will continue its pursuit of available and ever-changing technologies to continually keep the Inyo-Mono Region current with available technologies and tools. The Program Office will look strongly at the development of additional intelligent web maps to provide RWMG members and stakeholders tools to support project development and submission as well as resources for general water resources data and information. Key to our focus will be implementation of the adaptive management process wherein we continually focus our new developments based on stakeholder feedback and strive to maximize utility and relevance for all IRWM Program-related collaborative planning efforts. By implementing the most current technology available, the Inyo-Mono aspires to become a leader among IRWM Regions in hopes of elevating the voice of an otherwise underserved region of California.

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Chapter 5: Governance

Introduction

The Inyo-Mono Regional Water Management Group (RWMG) has operated successfully for more than four years as a collaborative, consensus-based organization. The initial governance structure, described below, was put into place with the first Memorandum of Understanding (MOU) in 2008 and still exists today. The Inyo-Mono RWMG continues to be committed to transparent, open, and collaborative regional water planning for eastern California and wants to see continued financial and technical resources brought to the region.

Governance Structure

A MOU sets out the governance structure of the Inyo-Mono IRWM Program. The RWMG acts as the primary forum for MOU signatories (also known as RWMG "Members") and other participants to meet and discuss issues relevant to IRWM Plan development and implementation. All decisions about the Inyo-Mono IRWM Program are made by the RWMG. The RWMG is the final approval body for the IRWM Plan components, including, but not limited to, goals and objectives, project prioritization, funding proposals to finance and implement the Plan, hiring and overseeing management of consultants and staff, and approving any revisions to the MOU or the Plan itself. RWMG Members that have signed the MOU are affirming their commitment to the success of the Inyo-Mono IRWM Program, including: ensuring long-term ecosystem health of the area watersheds; protecting water supply and water quality; involvement of local communities, especially disadvantaged communities; building institutional and human capacity; protection, preservation, and restoration of natural resources of the Inyo-Mono region; and open communication and collaboration. There is no financial requirement to participate in the RWMG either as a Member or an interested party.

The Inyo-Mono RWMG meets about once per month, usually in Bishop or Mammoth Lakes, which are the two most geographically central communities in the region. RWMG meetings are always open to the public and are posted in local media outlets, on the Inyo-Mono website, and through County Board agendas, in compliance with the Ralph M. Brown Act. Throughout much of the pre-planning phase, RWMG meetings were facilitated by a qualified contracted facilitator from the Center for Collaborative Policy. Due to the State budget freeze in December, 2008, the Inyo-Mono RWMG was no longer able to employ the services of the facilitator, and Program Office staff began facilitating RWMG and Administrative Committee meetings.

Under the November 15, 2010, MOU (described in next section), an Administrative Committee replaced what was the Coordinating Committee during the pre-planning governance structure. The Administrative Committee is made up of six RWMG Members. The primary roles of the Administrative Committee are to provide advice and guidance to the Program Office and to help guide the decisions and process of the

RWMG. The Administrative Committee helps to review materials to be presented at RWMG meetings, including agendas and other documents. A new role of the Administrative Committee is to help resolve conflict within the RWMG – for example, when consensus cannot be reached on a particular decision item. The Administrative Committee may also play a role in developing substantive proposals, policies, and recommendations at the request and subject to approval of the RWMG, but the Administrative Committee has no decision-making authority. All RWMG Members will have the opportunity to serve on the Administrative Committee on a rotating basis. Three Administrative Committee seats will rotate each year to new members, and three will remain for another year to provide consistency between years. At the time of the writing of this Plan, the members of the Administrative Committee were: Bishop Paiute Tribe, Central Sierra Resource Conservation & Development, Indian Wells Valley Water District, Mammoth Community Water District, Mono County, and Owens Valley Indian Water Commission. All Administrative Committee members must represent MOU signatories.

The Administrative Committee also appoints a new Chair and Vice-Chair every six months. These positions are used as primary contacts for the Program Office to review agendas and provide general guidance and advice on a more day-to-day basis. The Chair and/or Vice-Chair also call to order and adjourn Administrative Committee and RWMG meetings.

Ad-hoc working committees are formed and directed as needed by the RWMG to undertake work on specific topics or issues and provide input and recommendations to the Administrative Committee and/or RWMG. All results from working committees are reviewed by the RWMG. Ad-hoc working committees have no decision-making authority and are intended to undertake focused work on particular topics and to develop databases, recommendations, and/or queries for the Group to consider. Topics or issues for ad-hoc work groups include, but are not limited to, budget development and review, fundraising, community outreach, developing Plan objectives and resource management strategies, project development and proposal assistance, project ranking process, Plan implementation, and issue-specific research and analysis.

The Inyo-Mono IRWM Program Office handles day-to-day IRWM Program operations and also represents the RWMG in meetings with other local, state and regional organizations and agencies, other RWMGs, and the general public. Program Office staff oversees consulting contracts approved by the RWMG to assure appropriate and timely results and is responsible for project documentation and timely and accurate reporting to the RWMG, DWR, and other agencies as appropriate. Program Office staff also works closely with the fiscal agent of each grant to ensure accurate and timely payment and documentation of IRWM budget expenditures.

MOU and Decision-making

The Inyo-Mono IRWM process has been divided into phases, and these phases have corresponded to different MOUs. The initial, or pre-planning, phase of the Inyo-Mono IRWM Program utilized an initial MOU. This MOU laid out the general organizational structure and decision-making powers that have been used throughout the duration of the Inyo-Mono IRWM Program. It was agreed through this MOU that only MOU signatories could participate in the decision-making process, though all interested entities were welcome to attend and participate in RWMG meetings. Entities were invited to sign this MOU at any time; there was no deadline. Indeed, groups signed the pre-planning MOU up until the time that the next iteration of the MOU was being developed. The pre-planning MOU also provided background on

the Inyo-Mono IRWM Program and described the consensus decision-making process. Eventually, 29 entities had signed the pre-planning MOU.

As the RWMG moved forward into the planning phase, several participants thought it important to revisit and make changes to the MOU. What resulted was an entirely new MOU that sets forth the purpose of the RWMG, the structure of the RWMG and its decision-making processes, and other items related to staffing, fiscal agent, budget, meetings, and reporting (Appendix B). One major change was the implementation of a quorum requirement for meetings. At least 50% of the Members must be present at an RWMG meeting to convene the meeting and conduct business. The planning/implementation MOU became effective November 15, 2010, and will govern the planning and implementation phases of the Inyo-Mono IRWM Program. This MOU has subsequently been revised once, with the effective date of those revisions as September 1, 2011. Additional revisions or amendments will be made as they become necessary. Currently, there are 32 signatories to the planning/implementation MOU (Table 5-1).

Inyo-Mono RWMG decisions on policies and actions are made *by consensus* (meaning all must agree with the proposed decision item) at publicly-noticed meetings held in compliance with the Brown Act. RWMG Members must be present at a publicly-noticed meeting (either in person or via conference call) to participate in the decision-making process for an agendized decision item. Meeting agendas are developed well in advance to allow time for RWMG Member representatives to consult with their governing boards regarding agenda topics, action items, and decision items. In reaching a consensus decision, some Members may strongly endorse a particular proposal while others may accept it as "workable". Others may only be able to "live with it". Still others may choose to "stand aside" by verbally noting a disagreement, yet allowing the group to reach a consensus without them. Any of these actions constitutes consensus. If any RWMG Member opposes an action, the proposed action fails. It is expected that Members in opposition to a particular action will verbally state their concerns during the meeting at which the decision is being made. If no consensus is reached, the matter is turned over to the Administrative Committee so that it can work with the opposing entity(ies) in addressing their concerns and ideally, work to craft an acceptable decision item for the RWMG's consideration.

Since neither the Administrative Committee nor the RWMG has any regulatory authority, any decisions they make cannot regulate or force another entity against its will to take an action not in its interest or against its own regulations or policies. All decisions will be made and developed under the consensus rule. If consensus cannot be reached during the second consideration by the RWMG, "avoided decisions" will be archived and may be reviewed at a later time in order to continue seeking solutions for difficult and important issues. This consensus process is designed to achieve the development of a single, collaborative water management portfolio that is prioritized based on the adopted objectives and resource management strategies of the Inyo-Mono RWMG. To date, the consensus process has been employed successfully by the RWMG. Decisions are considered carefully by the RWMG and worded such that they are agreeable to all Members. Some topics may require several meetings of discussion before they can be formed into a decision item. It is this careful consideration of decision items by the RWMG that has allowed the consensus process to succeed thus far.

Group Responsible for Development of Phase II Plan

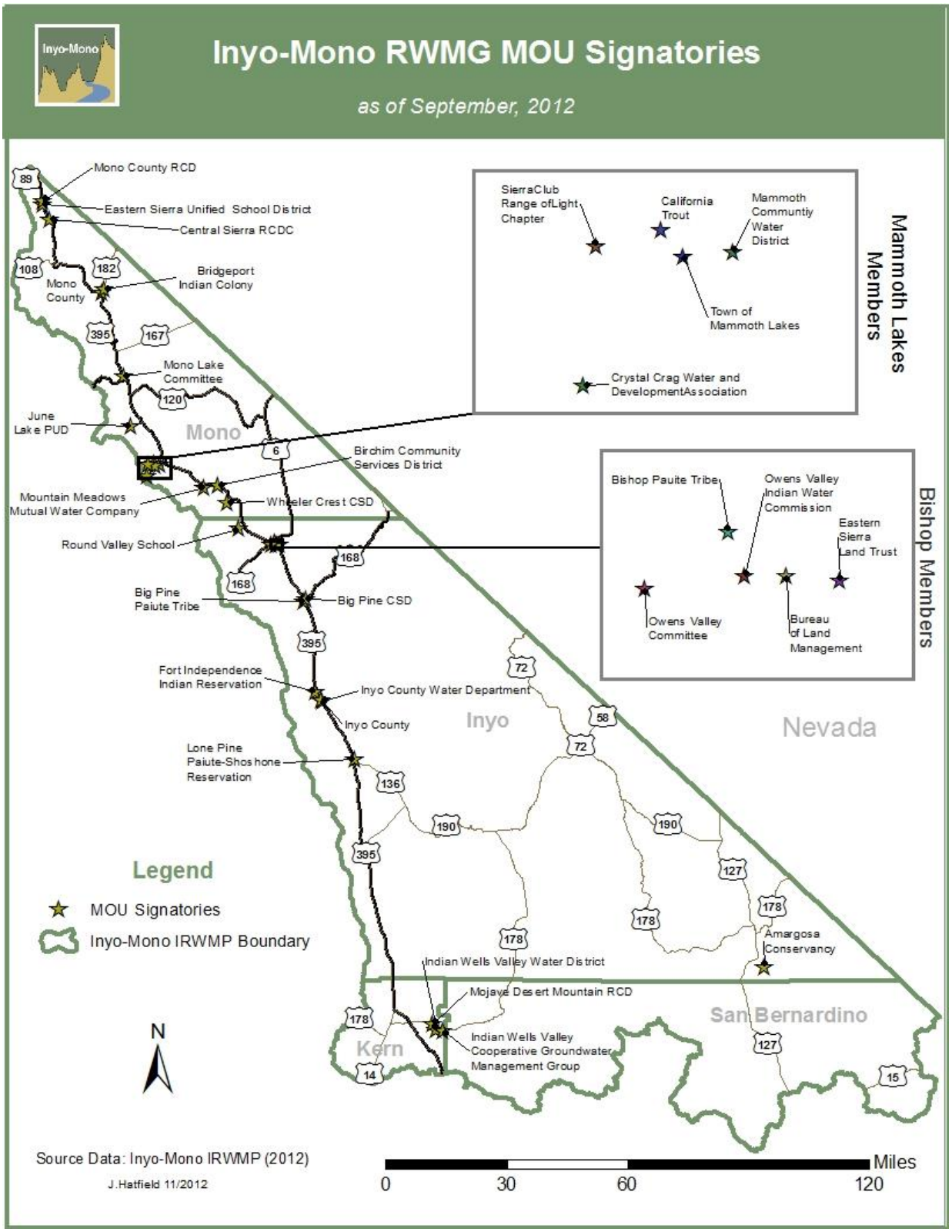
The Inyo-Mono RWMG is the entity responsible for the development of the Phase II Inyo-Mono IRWM Plan. Membership in the RWMG is defined by signing the planning/implementation Memorandum of

Understanding, Revised Version #1. Below,Table 5-1 lists the membership of the Inyo-Mono RWMG, current as of June 30, 2012, including those entities with statutory authority over water. A map is provided in Figure 5-1.

Table 5-1. Inyo-Mono Regional Water Management Group Members (i.e., MOU signatories) as of June 30, 2012.

RWMG Member Organization	Statutory Authority over Water
Amargosa Conservancy	
Big Pine Community Services District	X
Big Pine Paiute Tribe of the Owens Valley	X
Birchim Community Services District	X
Bishop Paiute Tribe	X
Bureau of Land Management – Bishop Office	X
Bridgeport Indian Colony	X
California Trout	
Central Sierra Resources Conservation & Development	
Crystal Crag Water & Development Association	X
Eastern Sierra Audubon	
Eastern Sierra Land Trust	
Eastern Sierra Unified School District	
Fort Independence Indian Reservation	X
Indian Wells Valley Cooperative Groundwater Management Group	
Indian Wells Valley Water District	X
Inyo County	X
June Lake Public Utilities District	X
Lone Pine Paiute-Shoshone Reservation	X
Mammoth Community Water District	X
Mojave Desert Mountain Resources Conservation & Development	
Mono County	X
Mono County Resource Conservation District	
Mono Lake Committee	
Mountain Meadows Mutual Water Company	X
Owens Valley Committee	
Owens Valley Indian Water Commission	
Round Valley Joint Elementary School District	X
Sierra Club Range of Light Group	
Town of Mammoth Lakes	X
U.S. Forest Service/Inyo National Forest	X
Wheeler Crest Community Services District	X

Figure 5-1: Map of Inyo-Mono MOU Signatories



Inyo-Mono MOU signatories as of September, 2012 in relation to the region's main road system.

The IRWM Program Office staff, along with a few RWMG Members, was responsible for the majority of the writing and revising of the Phase II Plan. Other RWMG participants provided specific information for inclusion in the Plan and also helped to review drafts.

Public Noticing of Phase II Plan Development

Inyo-Mono Program Office staff developed the following public notice statement for publication in area newspapers to provide notification of the development and adoption of the Phase II Plan, in accordance with §6066 of the Government Code.

> NOTICE OF PREPARATION OF Inyo-Mono INTEGRATED REGIONAL WATER MANAGEMENT PLAN, PHASE II
>
> July 24, 2012
>
> The Inyo-Mono Regional Water Management Group (RWMG) intends to prepare a Phase II Integrated Regional Water Management Plan to be completed in September, 2012 and adopted by the RWMG in October, 2012. Any member of the public who wishes to provide input to the document may do so by contacting Holly Alpert, Program Manager, at holly@Inyo-Monowater.org by August 17, 2012. The Regional Water Management Group intends to adopt the Plan at its October, 2012, regular meeting. This meeting is open to the public. The date for this meeting will be posted at the Inyo-Mono IRWMP website, listed below. A draft of the complete Plan will be made available electronically at the website www.Inyo-Monowater.org and in hardcopy at the California Trout office in Mammoth Lakes (3399 Main St., Suite W5). Contact Holly Alpert with questions.

This public notice was published for two consecutive weeks in late July and early August, 2012, in the *Mammoth Times* and *The Sheet* (serving Mammoth Lakes and Mono County), and the *Inyo Register* (serving Bishop and Inyo County). These three newspapers are papers of public record for Mono County and Inyo County respectively. This public notice provided an opportunity for the public to provide input into the Phase II Plan as well as to be present during the adoption of the Plan (during which a public comment period was available).

Plan Adoption Process

RWMG Members and participants were provided opportunity to review and comment on individual Plan chapters as they were being written in the spring and summer of 2012. Once a complete draft of the Plan was available in late September, 2012, RWMG Members were asked to take the Plan to their governing boards for approval. An RWMG meeting was scheduled for November, 2012, at which Plan adoption was agendized as a decision item, pending any final discussion by Members. Because of the consensus decision-making process of the Group, a decision to adopt the Plan means that all RWMG Members have signed on.

Since, at this time, entities presenting projects for funding through Prop. 84 Implementation grants must be MOU signatories, by default all project proponents have adopted the Inyo-Mono IRWM Plan.

Public Involvement in Inyo-Mono RWMG

The governance structure and processes of the Inyo-Mono RWMG ensure opportunity for public

participation and involvement in the development of the IRWM Plan and in other RWMG activities. All meetings are open to the public, and members of the public may find information about the IRWM Program at any time by visiting the Inyo-Mono website, or by request. The inclusive nature of the RWMG, along with consensus-based decision-making and extensive outreach efforts on behalf of the RWMG, help to ensure that the Inyo-Mono IRWM Program will remain an open and transparent process into the future.

Through more than two years of meetings and discussions, the RWMG has developed a process to ensure that RWMG Members' governing boards are provided with consistent and timely information about Inyo-Mono IRWM Program efforts and activities. RWMG meetings are scheduled so that governing boards with strict agenda requirements have opportunity to meet and discuss the upcoming meeting topics and provide guidance to representatives. Draft agendas are sent out via email for comment and additions by the RWMG, and final agendas, along with meeting location and call-in information, are provided to the RWMG at least one week ahead of the meeting. For most items that will require a decision on the part of the RWMG Members, the action item is put on the agenda for discussion at one RWMG meeting with the goal of recommending a decision item for the next meeting. This process provides RWMG Members opportunity to discuss the decision with their respective governing boards and receive guidance for decision-making at the next meeting.

The Program Office staff requests Members to RSVP for a meeting when the final agenda is sent out. This helps to ensure that the quorum requirement (50% of Members) will be reached on the day of the meeting, particularly since many Members travel long distances to attend meetings, and it is difficult to reschedule meetings.

Although RWMG's operating under the IRWM Program are not technically subject to the Ralph M. Brown Act for ensuring opportunity for public participation in meetings, the Inyo-Mono RWMG decided by consensus in October, 2010, to adopt a policy requiring the RWMG to abide by Brown Act rules. This includes publicly noticing meetings, holding meetings at locations compliant with the Americans with Disabilities Act (ADA), and posting locations of those Members calling into the meetings via the conference call option, who must post the agenda at their call-in locations and whose locations must also be ADA-accessible.

Access and Opportunity for Participation in Inyo-Mono IRWM Program

Inyo-Mono RWMG Members are involved in a variety of ways. At the most basic level, RWMG Members attend and participate in RWMG meetings. A subset of the RWMG sits on the Administrative Committee, which provides guidance to Program Office and helps to resolve disagreement within the RWMG. Staff relies on the members of the Administrative Committee, as well as other RWMG participants, to provide feedback and advice on day-to-day decisions and operations. RWMG participants also have opportunities to participate in working committees that perform specific tasks or functions, such as developing budgets for grant proposals, creating project review criteria, or assisting with writing assignments. Because of the large and remote nature of the Inyo-Mono region, many stakeholders mostly participate in RWMG meetings by phone, or if they cannot participate at all, they stay informed about Inyo-Mono IRWM Program activities through the website, emails, or through contact with staff. Stakeholder involvement is actively sought and welcome at all levels.

For stakeholders that are not yet a part of the IRWM process, any member of the public is welcome to attend RWMG, Administrative Committee, and work group meetings. As discussed above, in 2010 the Inyo-Mono RWMG decided by consensus that it would abide by the Brown Act in convening and noticing its standing committee meetings. Stakeholders and other members of the public can find meeting information on the Inyo-Mono IRWM Program website as well as at several posted locations throughout the region. Furthermore, each RWMG meeting agenda is presented to the Board of Supervisors of both Inyo and Mono Counties and is part of the public record. Call-in locations are available and open to the public.

Internal and External Communication

Communication between the Program Office and the RWMG, and among RWMG representatives, primarily occurs via email. Program Office staff uses email to send out meeting notices and agendas, documents, announcements, and other relevant material. The program website (www.inyo-monowater.org) is used as another primary tool for outreach and communication throughout the Inyo-Mono IRWM planning region. The website was overhauled in late 2011 and now provides more access to information than before. On this website, visitors can find topics such as introductory information about the Inyo-Mono IRWM Program, Member organizations, meeting summaries, a library of planning documents, and links to other IRWM Program websites. Documents that are sent to the RWMG through email are usually also posted to the website. It has become evident, however, that email and the website are not always the best communication or outreach tools in this expansive and largely rural region. Many people in the Inyo-Mono IRWM planning region do not have adequate internet access; thus, notices of upcoming events are often circulated through conventional mail, and the staff ensures that meeting agendas are posted in several physical locations throughout the region.

External communication of IRWM Program matters takes place primarily through the website and through local media sources. The Inyo-Mono IRWM Program has been visible within local media outlets. The three most widely-read local newspapers have each run several articles about various aspects of the Inyo-Mono IRWM Program, including interviews with Program Office staff and RWMG participants. There are several documented cases of these articles contributing to the involvement of new RWMG participants. One local newspaper in particular posts notices of upcoming meetings and other IRWM Program events in its calendar. All public notices regarding IRWM Program activities – the public notice for development of this Plan, for example – are published in the three regional newspapers.

Long-term Implementation of IRWM Plan

It is the intention of the Inyo-Mono RWMG to create an IRWM Plan with a time horizon that goes beyond DWR's current Proposition 84 IRWM Program. Indeed, language in the MOU was selected for the purpose of creating a body to address the region's water resources in a long-term, collaborative manner, whether funding is acquired from DWR or from some other source. The collaborative, diverse, consensus-based governance structure is designed not only to develop a Plan, but to create a robust and adaptable RWMG that will create a single management portfolio to address regional water issues consistent with the objectives of the Inyo-Mono IRWM Plan.

Coordination with Other IRWM Regions, State Agencies, and Federal Agencies

Through the 2009 Region Acceptance Process, the Inyo-Mono RWMG made contact with and met regularly with all neighboring and adjacent IRWM planning regions. These meetings were held to ensure

consistency in IRWM planning region boundary designations and to set the stage for potential future interregional planning and implementation efforts (see Chapter 13). In addition, the Inyo-Mono RWMG sought guidance from established IRWM groups in the development of its Round 1 Planning Grant application and Phase I Plan. Since that time, the Inyo-Mono Program Office has continued to collaborate with other IRWM regions on specific topics such as responding to preliminary grant recommendations and disadvantaged communities. The firm commitment on the part of the RWMG to supporting multi-benefit projects and processes will ensure that these relationships with other IRWM groups will continue.

Another way in which the Inyo-Mono RWMG has collaborated with other IRWM regions is through the Sierra Water Workgroup (SWWG). This informal alliance of IRWM regions in the Sierra Nevada began in 2009 and developed a formal charter in 2011. The group meets periodically to discuss issues of regional importance or concern and to help raise the profile of issues specific to the Sierra Nevada in Sacramento. Inyo-Mono IRWM Program Office staff has participated in the SWWG since its inception and usually participate in the meetings via conference call. Similar to the SWWG, the Roundtable of Regions is a consortium of all IRWM regions in the State. This group meets via conference call regularly to discuss issues of interest or concern to all IRWM regions and to provide input to DWR regarding the State's IRWM Program.

The Inyo-Mono RWMG has been regularly participating in meetings of the Central Nevada Regional Water Authority, a collaborative group comprised of stakeholders from central and northern Nevada, as well as Utah and three counties within California (including Inyo and Mono Counties), that meets regularly to discuss water issues of concern in Nevada and bordering states. Because the Inyo-Mono region shares a border with Nevada and includes common watersheds and groundwater basins, it is important to conduct outreach to Nevada stakeholders and understand their water concerns.

Both State and federal agencies are involved in the RWMG and regularly attend meetings. This includes California Department of Fish and Game, U.S. Forest Service, U.S. Bureau of Land Management, U.S. Fish and Wildlife Service, U.S. National Park Service, and U.S. Bureau of Reclamation. Each federal or State entity provides a unique perspective on managing land and water resources. Given that more than 90% of the Inyo-Mono region is comprised of public land, these government agencies are important partners in land and water planning.

The relationship between the Inyo-Mono RWMG and DWR has been vitally important in the development of the Inyo-Mono governance structure and planning process. DWR is able to provide useful information from other IRWM groups, along with its own perspective, to help guide the activities of the Inyo-Mono RWMG.

Integration of Stakeholders and Institutions

One of the most tangible, yet unquantifiable, benefits of the Inyo-Mono IRWM process to date has been the practice of gathering water-related stakeholders at meetings on an almost-monthly basis to discuss the structure and governance of the Group, the activities of its Members, and water issues of local or regional importance. Many of the organizations sitting at the table have historically been at odds over water issues. While it is not expected, nor intended, that the RWMG will solve all water-related conflicts in the region, many RWMG participants have acknowledged the advantages of increased communication and cooperation among adversaries and allies alike. The process has helped to educate stakeholders about each other's activities, priorities, and concerns. Smaller water districts have sought advice from larger water districts on technical issues. Less experienced communities benefit by learning from groups with more experience in water management, and in turn, RWMG stakeholders have begun to understand the difficulties of maintaining high-quality water resources and ensuring ecosystem protection in small, rural, and/or economically disadvantaged communities. During the RWMG's visioning exercise in early 2010, several RWMG participants expressed the desire that the IRWM planning process should help individual stakeholders overcome conflict and should allow the group to speak with one voice and from common objectives.

Process Used to Establish Plan Objectives

See Chapter 7 for a discussion of the process used to establish Phase II Plan objectives.

Process for Updating or Amending the Inyo-Mono IRWM Plan

As with the Memorandum of Understanding, the Inyo-Mono RWMG will periodically review the Inyo-Mono IRWM Plan and provide opportunity to change and/or amend the Plan. For minor changes, including corrections and small wording changes, the Plan will be reviewed once every six months. During this semi-annual review period, there will also be opportunity to add, modify, or remove projects to/within/from the Plan. Proposed changes to Plan text or projects will be requested by a certain date. These changes will be discussed at a subsequent RWMG meeting. The Group Members will then make a recommendation to incorporate approved changes into the Plan, which will go before governing boards and come back to the RWMG for a consensus decision at a subsequent meeting. A similar process will be used for making amendments to the Plan, which will be considered on an as-needed basis.

The Inyo-Mono IRWM Plan will be reviewed for substantive changes and updates every two years. Expected substantive changes include updates regarding regional description details, water-related policies and plans in the region, climate change impacts and responses, changes to the project list and prioritization, and measuring progress of the Plan implementation, among others. All changes to the Plan, whether they be major or minor, will follow the same process of discussion and decision by the RWMG Members.

Chapter 6: Outreach and Engagement

Overview of Community and Stakeholder Involvement

Since its inception in early 2008, the Inyo-Mono RWMG has undertaken extensive outreach to inform, educate, and engage constituents, stakeholders, and interested parties. The RWMG recognized early in the process that because of the large geographic size of the planning region and the breadth of water-related issues within the area, community involvement was critical in order to facilitate meaningful input, foster collaboration, ensure an inclusive and well-managed process, engender trust, and establish credibility. The RWMG sees broad stakeholder involvement as absolutely integral to the success of the IRWM Program, and the involved parties are proud of what has been achieved through outreach so far.

As a result, the RWMG has maintained its commitment to frequent public meetings, timely outreach to interested stakeholders, and focused efforts to build interest and involvement of Native American tribes and disadvantaged communities. From the beginning, effort was made on the part of Program Office and early RWMG participants to involve stakeholders from many different types of organizations that focus on water: government agencies, non-profit organizations, businesses, water suppliers, academic institutions, and Native American tribes. Currently, all of these sectors are represented in the RWMG by at least one organization, and in many cases, several organizations. The specific composition of the RWMG is presented in Chapter 5.

Process Used to Identify and Encourage Broad Participation

The original stakeholders of the Inyo-Mono RWMG consisted of the Sierra Nevada Alliance, California Trout, and California Department of Water Resources, with facilitation provided by the Center for Collaborative Policy. One of the primary tasks of this initial group was to identify water-related stakeholders in the planning region and to encourage attendance and participation at RWMG meetings. Within the first few months of the initiation of the IRWM planning process, meeting attendance grew to 35-40 people. Throughout the first two years, effort was continually made to identify new stakeholders and invite their participation in the process. This was mostly done through word-of-mouth from existing RWMG participants and through outreach to various media sources.

Program Office staff and Members of the Inyo-Mono RWMG have conducted outreach on a continual basis to encourage further participation from all groups and individuals within the planning boundaries having interests in water resources management. Such outreach efforts continue to this day, which

includes, but is not limited to, attending meetings of various entities throughout the planning region. Either Program Office staff or RWMG participants attend such meetings to provide an overview of the IRWM Program, to answer questions, and to hear what water issues are of concern in the community. These meetings may be ongoing public meetings, such as Mono County Regional Planning Advisory Committee (RPAC) meetings, County Board of Supervisors meetings, individual meetings with stakeholders, or special IRWM Program outreach meetings (described below). Outreach has also been conducted and is ongoing with other Sierra IRWM planning groups such as CABY, Upper Feather, Tahoe-Sierra, Southern Sierra, Mojave, Antelope Valley, Mariposa, Kern County and Madera County. This outreach builds rapport with other regional efforts and contributes to collaboration among other mountain-region and headwater RWMGs. In addition, the knowledge gained from discussions with other IRWM groups has provided valuable information for the Inyo-Mono RWMG.

Starting in mid-2010, the RWMG undertook an intensive and targeted outreach campaign throughout the planning region to identify and engage new stakeholders. Sub-regions were identified that were previously under-represented at RWMG meetings, and Program Office staff found local hosts to assist with outreach in these areas. Evening meetings were scheduled in each of the sub-regions, and local groups and individuals were identified and invited to participate (each meeting was also open to the public). At least one or two RWMG Members were present at each meeting, as well as Program Office staff. Meeting announcements were distributed to the RWMG via e-mail, using the RWMG database of approximately 200 contacts. Both e-mail and hardcopy letters were sent to new stakeholders identified by the RWMG, encouraging them to attend an outreach meeting. Flyers were posted in various public locations. Notices were also posted on the IRWM Program website and distributed to local newspapers well in advance of the scheduled meeting time. As Table 6-1 and Figure 6-1 below show, over 20 meetings were held across the planning region over a two-year period at which IRWM Program-related information and materials were presented and discussed. For many of these meetings, the primary objective was to listen and learn about high-priority water issues from the perspective of those living and dealing with them every day. These meetings were instrumental in identifying local water concerns, soliciting input and suggestions for how best to revise the Plan's overall objectives and resource management strategies (ORMS), and encouraging additional stakeholders to become involved in the IRWM planning process.

Table 6-1. Outreach Meetings Conducted June, 2010 – June, 2012

Inyo-Mono IRWM Program Outreach Summary Table			
Date	**Town**	**Meeting Type**	**Venue**
6/23/2010	Walker	ORMS	Member Residence
6/24/2010	Bridgeport	ORMS	Bridgeport Memorial Hall
7/12/2010	Big Pine	ORMS	Unknown
7/13/2010	Round Valley	ORMS	Round Valley School
7/14/2010	Crowley Lake	ORMS	Crowley Lake Community Center
7/14/2010	Tecopa	ORMS	Tecopa Senior Center
7/28/2010	Bishop	ORMS	Tri County Fairgrounds

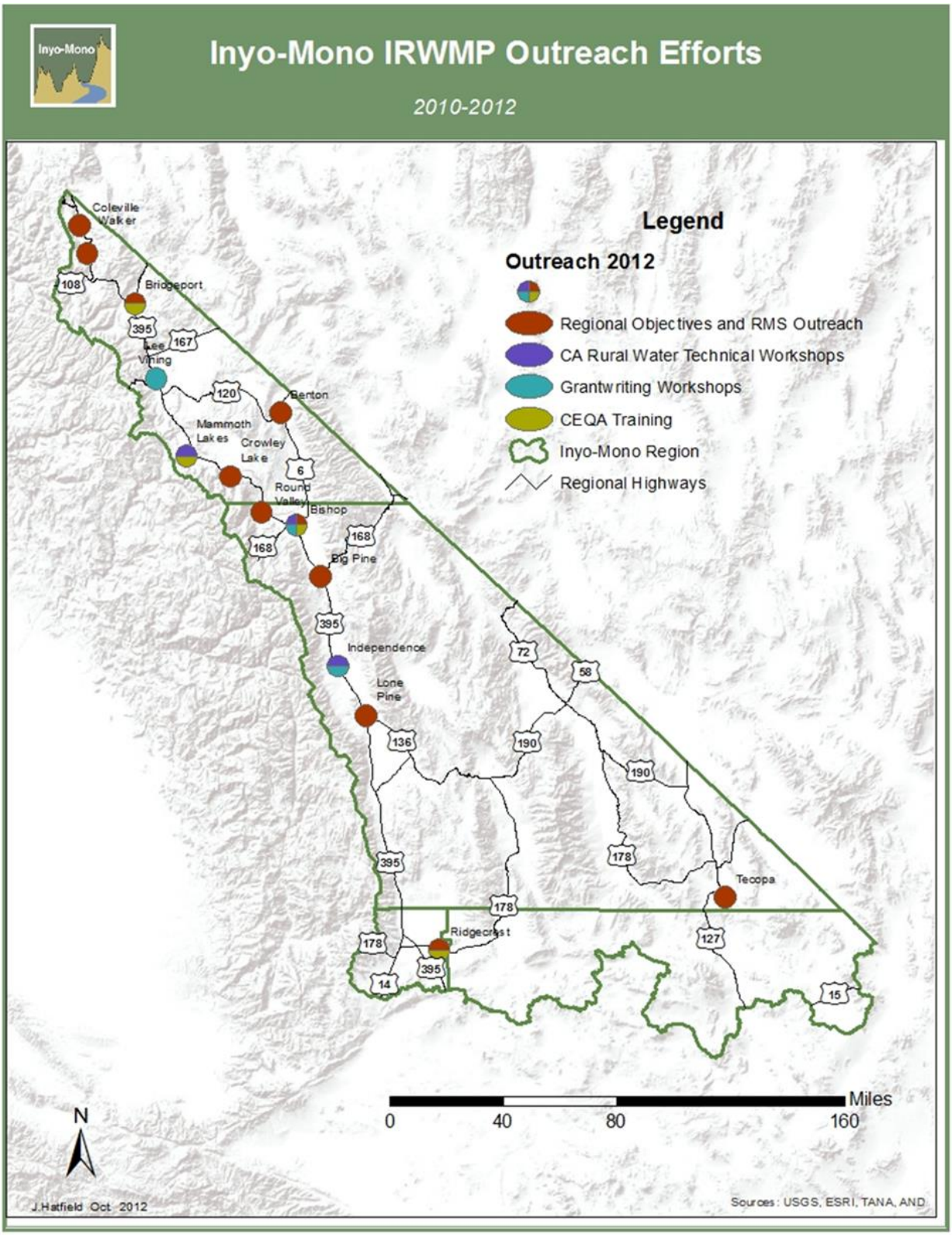
Inyo-Mono IRWM Program Outreach Summary Table			
Date	**Town**	**Meeting Type**	**Venue**
7/29/2010	Lone Pine	ORMS	Statham Hall
10/13/2010	Tecopa	ORMS	Tecopa Senior Center
10/17/2010	Ridgecrest	ORMS	Indian Wells Valley Water District
10/19/2010	Benton	ORMS	Benton Community Center
10/20/2010	Coleville	ORMS	Coleville High School
12/8/2011	Bridgeport	CEQA	Bridgeport Memorial Hall
12/9/2011	Mammoth	CEQA	Mammoth Lakes Community Center
12/14/2011	Bishop	CEQA	USFS/BLM Office
12/15/2011	Ridgecrest	CEQA	USO
11/28/2011	Mammoth	CRWA	Mammoth Community Water District
11/30/2011	Bishop	CRWA	USFS/BLM Office
12/1/2011	Independence	CRWA	Fort Independence Tribe
6/20/2012	Independence	Grant Writing	Fort Independence Tribe
6/25/2012	Lee Vining	Grant Writing	Lee Vining Community Center
6/27/2012	Bishop	Grant Writing	USFS/BLM Office

The meetings attracted a wide variety of stakeholders, including individuals already involved as well as new parties and, in total, 22 new participants/stakeholders were added to the RWMG contact list. Simple handouts were provided to participants with the request that they help spread the word to others who may be interested in participating.

In addition to the stakeholders who regularly attend meetings or otherwise participate in the IRWM planning process, the Program Office maintains a list of stakeholders who receive communications about the Inyo-Mono IRWM Program but who do not actively participate. As time permits, staff and RWMG participants attempt to make contact with these entities and encourage increased participation (see Chapter 1 for a listing of these entities). All told, since the completion of the Phase I Plan, the project mailing list has grown to include over 200 contacts.

Given the very large area of the Inyo-Mono planning region, it is not possible to reach out to and include every stakeholder that has water-related interests. However, considerable effort has been put into ensuring that all communities and areas of the region are represented by at least one stakeholder group. A further challenge is maintaining levels of stakeholder involvement through staffing changes, budget cuts, and shifting priorities. If Program Office staff observes that a previously engaged stakeholder has not been participating at the same level, they contact the organization and work to facilitate that entity's continued involvement. Having broad and consistent representation in the RWMG is key as the representatives bring many different opinions and points of view to discussions. The Inyo-Mono RWMG is truly a grassroots, member-driven organization.

Figure 6-1: Two years of outreach in the Inyo-Mono Region



Outreach efforts by category within the Inyo-Mono Region

Involving Disadvantaged Communities and Native American Tribes

Throughout implementation of Proposition 84, DWR has placed emphasis on reaching out to and supporting disadvantaged communities (DACs) in the IRWM Program. The initial RWMG recognized that the Inyo-Mono IRWM planning region contains many DACs, as defined by 2000 census median income data. In addition, several unincorporated communities within the region were too small to be counted in the census data and thus were not considered DACs, even though they might have fallen into that category. Inyo-Mono Program Office staff has updated the region's list of DACs using 5-year median household income data from the American Community Survey (ACS; household income data were not collected as part of the 2010 Census). A new online mapping tool for DACs provided by DWR is based on 2006-2010 ACS data, but it does not cover every community in the Inyo-Mono region (http://www.water.ca.gov/irwm/integregio_resourceslinks.cfm). ACS data for the communities missing from the DWR map were accessed directly from the U.S. Census website (http://www.census.gov/acs/www/). Additional information regarding the process of determining which communities in the region are DACs, as well as a list and a map of the identified DACs, is discussed in Chapter 1.

Utilizing funding from another Prop. 84 grant, the Inyo-Mono RWMG is currently investigating alternative ways of defining and identifying disadvantaged communities. Because the availability of income data is limited, particularly for small and/or rural communities, the RWMG is trying to find other metrics that could be used to define DACs in California – either data-based metrics, such as high school dropout rate or unemployment rate, or observation-based metrics, such as house size, type of car, nature of landscaping, etc. The goal of this effort is to more effectively identify DACs so that resources can be provided to those communities that need them most.

A subset of the DAC outreach efforts has focused on Native American tribes within the region. The Program Office has conducted targeted outreach to all of the tribes based in the region (vs. tribes with headquarters outside the region and only limited representation in the region). The results from this outreach have been excellent; all of the major tribes except two are involved in the IRWM planning process and are signatories to the MOU (see Chapter 5).

The RWMG continues to refine its outreach and engagement methods, especially targeting DACs and populations of low representation or few resources. A key goal of the outreach to DACs, tribes, and small water districts has been to assess their water-related and institutional needs and assist in bringing resources to those entities to address their needs. The RWMG has been working with the California Rural Water Association to undertake needs assessments for individual water systems and provide the technical, financial, and/or managerial expertise needed by small water purveyors. Staff relies heavily on the knowledge and contacts of current RWMG Members and other stakeholders in determining which potential new stakeholders to contact. The Program Office has developed written materials, including maps and graphics, to aid in providing information to new stakeholders. New stakeholders have expressed that they find it difficult to learn about the history, process, and current activities of the Inyo-

Mono IRWM Program, and written materials help to distill this information. These documents are available on the website or from Program Office staff and are updated as needed.

Governance, Decision-making Process, and Communication

Since the inception of the Inyo-Mono IRWM Program in 2008, the group has been governed by a Memorandum of Understanding. The first MOU, which governed the pre-planning phase of the Inyo-Mono IRWM Program, was adopted in November, 2008, and was subsequently signed by 28 organizations (see Chapter 5). It was later agreed among RWMG Members that the MOU should be updated and revised to reflect the Group's progression into the planning and implementation phases. A working committee made up of a subset of RWMG participants developed a new MOU that took effect November 15, 2010, with 22 signatories. A slightly revised version (Appendix B) was adopted by the RWMG with an effective date of September 1, 2012. Additional organizations may sign the MOU at any time, and a continually updated list of signatories is available on the website. As of June 30, 2012, there were 31 signatories to the planning/implementation MOU (see Chapter 5 for more information).

Decision-making in the RWMG has always occurred through consensus. The Inyo-Mono RWMG's operational definition of consensus is that all entities either approve or can live with the item being decided upon. If one or more entities disapprove, then no decision is made and it goes to a "parking lot" to be revisited at later time or further discussion ensues and an alternative decision is put forth for consideration. Only MOU signatories can participate in this decision-making process. Every group has one "vote" and thus equal power, regardless of the size or influence of any given entity. Certain decisions that are not approved by the group are placed into a "parking lot" for consideration at a later date. More information about the governance and decision-making processes of the Inyo-Mono RWMG can be found in Chapter 5.

Any member of the public is welcome to attend and contribute to RWMG, Administrative Committee, and working committee meetings. In the summer of 2010, the Inyo-Mono RWMG decided by consensus that it would conduct all its activities under the provisions of the Ralph M. Brown Act. Stakeholders and other members of the public can find meeting information on the Inyo-Mono IRWM Program website (www.inyo-monowater.org), in local newspapers, and at several posted locations throughout the region. Furthermore, each RWMG meeting agenda is presented to both the Inyo County and Mono County Boards of Supervisors and thus becomes part of the public record. Call-in locations are available and open to the public (see Chapter 5 for more details).

Communication between the Program Office and the RWMG, and among RWMG participants, primarily occurs via email and or phone communication. Program Office staff uses email to send out meeting notices and agendas, documents, announcements, and other relevant material. The project website is used as another primary tool for outreach and communication throughout the Inyo-Mono IRWM planning region. On this website, visitors can find topics such as introductory information about the Inyo-Mono IRWM Program, member organizations, meeting summaries, and links to other IRWM Program websites. Documents that are sent to the RWMG through email are usually also posted to the website. It has become evident, however, that email and the website are not always the best communication or outreach tools in this expansive, largely rural, and economically disadvantaged region. Many people in the Inyo-Mono IRWM planning region do not have adequate internet access; thus, the Program Office is working

to identify the best means to keep everyone informed in the region, such as hardcopy meeting announcements and newsletters sent via U.S. mail.

The Inyo-Mono IRWM Program has also been visible within local media outlets. The three most widely-read local newspapers have each run several articles about various aspects of the Inyo-Mono IRWM Program, including interviews with Program Office staff and RWMG participants. There are several documented cases of these articles contributing to the involvement of new RWMG participants. More recently, a staff member from one of the local newspapers has been regularly attending RWMG meetings and has been posting meeting announcements and agendas on the newspaper's website.

Integration of Stakeholders and Government Institutions

One of the most tangible, yet unquantifiable, benefits of the Inyo-Mono IRWM process to date has been the practice of gathering water-related stakeholders at meetings on an almost-monthly basis to discuss the group, its activities, and water issues. Many of the organizations sitting at the table have historically been at odds over water issues. While it is not expected, (nor intended) that the RWMG will solve water-related conflicts in the region, many participants have acknowledged the advantages of increased communication and cooperation among adversaries and allies alike. In addition, during the RWMG's visioning exercise in early 2010, several RWMG participants expressed the desire that the IRWM planning process should help individual stakeholders overcome conflict and should allow the group to speak with one voice and from common objectives.

The Inyo-Mono IRWM process has helped to educate stakeholders about each other's activities and priorities. Smaller water districts have sought advice from larger water districts on technical issues. Disadvantaged communities benefit by learning from groups with more experience in water management, and in turn, RWMG stakeholders have begun to understand the difficulties of maintaining high-quality water resources and ecosystem protection in small, rural communities. Representatives from the various participating government institutions are sitting at the table with various individuals from within the region, and through discussions a stronger sense of the region's needs are being explored and understood.

Stakeholders Involvement in Plan Implementation

Inyo-Mono RWMG Members are involved in a variety of ways. At the most basic level, RWMG members attend and participate in work group meetings. A subset of six RWMG members sits on the Administrative Committee, which provides guidance to the Program Office and helps to resolve conflict within the RWMG. Staff relies on the Administrative Committee, as well as other RWMG participants, to provide feedback and advice on day-to-day activities and operations. RWMG participants also have opportunities to participate in work groups that perform specific tasks or functions, such as developing budgets for grant proposals, researching issues as they arise, creating project review criteria, or assisting with writing assignments. Because of the large and remote nature of the Inyo-Mono region, many stakeholders only participate in RWMG meetings by phone, or if they cannot participate at all, they can stay informed about Inyo-Mono RWMG activities through the website or through contact with staff. Stakeholder involvement is welcome at any level.

Stakeholders that wish to put forward projects for funding consideration under the IRWM program are strongly encouraged to attend RWMG meetings and are required to sign the MOU. However, regardless

of any party's ability to contribute financially to the IRWM Plan's development or implementation, the RWMG encourages participation from all interested individuals and organizations.

The Inyo-Mono RWMG continues to believe that outreach to and engagement of additional stakeholders, and an open, transparent process are foundational to the IRWM planning process and are necessary for the program's ultimate success. This bottom-up model helps to ensure that all voices are heard, regardless of community size, economic status, or type of interest group, and that water-related concerns are addressed in an equitable manner. It is only by continuing to progress using this collaborative process that the RWMG will succeed.

Chapter 7: Objectives and Resource Management Strategies

Development of Inyo-Mono IRWM Plan Objectives and Resource Management Strategies

In the IRWM planning process, development of goals and objectives is a key step as they provide a basis for decision-making, guide work efforts, and can be used to evaluate project benefits. Understanding this, the Inyo-Mono RWMG started this discussion by reviewing relevant existing plans and undertaking extensive outreach within the region. With a better understanding of the water-related issues facing the diverse communities of the region, in 2010 the RWMG developed and adopted both mission and vision statements to guide the overall effort. Utilizing a consensus-based approach, the RWMG adopted the following mission statement to guide the overall planning effort:

> *To research, identify, prioritize, and act on regional water issues, and related social and economic issues, so as to protect and enhance our environment and economy. Working together, we create and implement a regional water management plan that complies with applicable policies and regulations and promotes innovative solutions for our region's needs.*

To help the diverse communities living within the planning region understand their role in implementing and undertaking this mission, the RWMG adopted the following vision statement:

> *Our vision is a landscape that is ecologically, socially, and economically resilient. As diverse stakeholders, we identify and work toward our common goals. We achieve a broad-based perspective that benefits our regional ecosystems and human communities by combining our interests, knowledge, expertise and approaches. We strive to have every voice heard within our region and our collective voice heard in the state and nation.*

History

True to this vision, the RWMG has diligently solicited input from the varied residents and organizations within the extremely large planning region. To begin the process of soliciting stakeholder participation and input into the development of goals and objectives, Program Office staff collected and reviewed all relevant water supply plans, general plans, resource management plans, and existing watershed planning efforts, and an initial list of goals and objectives was drafted in August, 2008. A working committee was formed to further refine this list, and a revised draft was presented to the RWMG in 2009.

The written product of this effort presented water resource objectives and management strategies organized under three strategic goal areas: Watershed Ecosystem Health, Water Resources, and Water and Community. Each goal had a number of specific objectives and management strategies identified. With this initial work in hand, the RWMG undertook an extensive outreach campaign in 2009 and 2010 across the planning region to meet with interested parties and identify and discuss their water related issues and concerns. (Figure 7-1) Based on meetings with interested landowners and representatives

from various tribes, non-profits, and rural communities, including disadvantaged communities, the initial strategic goal areas were confirmed to be appropriate and the objectives and resource management strategies were clarified and refined. During this time, the RWMG also decided to simplify the presentation of the goals and objectives in order to better align with the identified regional concerns and with the California Water Plan, Proposition 84 requirements, and the Lahontan Basin Plan. After much discussion and review of feedback received from the extensive outreach within the region, the RWMG agreed to drop the goal area statements and simplify the objectives and corresponding resource management strategies (RMS). A draft of the revised objectives and strategies was widely distributed to interested parties, including the Board of Supervisors of both Inyo and Mono Counties, as well as to all parties that had contributed during the outreach campaign. Incorporating the input received from this round of review, in late 2010, the RWMG adopted the following six co-equal regional objectives:

1) Protect, conserve, optimize, and/or augment water supply;
2) Protect, restore, and/or enhance water quality;
3) Provide stewardship of our natural resources;
4) Maintain and/or enhance water, wastewater, and power generation infrastructure efficiency and reliability;
5) Address climate variability and/or reduce greenhouse gas emissions; and
6) Increase participation of small and disadvantaged communities in the IRWM process.

These objectives and corresponding resource management strategies (RMS) were used to screen and select projects as part of the effort's Phase I IRWM Plan and subsequent Round 1 Implementation Grant application.

Current Objectives and Resource Management Strategies

With Phase I projects under implementation, the Inyo-Mono RWMG undertook another extensive outreach campaign (described in Chapter 6) to further understand the water-related issues facing the region and what resources the RWMG might be able to provide to address those issues. In addition, a broadly-distributed survey was undertaken to solicit specific input on the objectives and RMS.

As a result, the Program Office reviewed the mission, vision, objectives, and RMS in order to reconcile the feedback received from various RWMG Members, input gathered at public meetings held in Ridgecrest, Benton, and Coleville in late 2011, and suggestions from the public survey. Program Office staff developed an expanded set of objectives and RMSs in early 2012, and the Administrative Committee reviewed the recommended version at its March 21, 2012, meeting. The revised document was available for further review by the Administrative Committee until March 29, 2012, but no substantive comments were provided. The Administrative Committee reviewed the document again at its April 11, 2012, meeting, clarified the language in a few RMS and unanimously approved recommending the version presented below for final consideration by the RWMG at its April 25, 2012, meeting. While the mission and vision statements remained unchanged, the objectives and their corresponding RMS were modified and adopted by the full RWMG in April, 2012. Two new regional objectives were added and a number of RMS were modified to respond to issues identified during the outreach efforts and through ongoing contact with RWMG Members. The revised and adopted objectives and RMS are presented below.

Overview of the IRWM Plan Objectives and Resource Management Strategies and the Issues they Address

The planning objectives are targeted outcomes that benefit the region. When implementing regional projects, project partners will strive to meet as many objectives as possible while also recognizing that some objectives may not be fully achieved. The following describe the objectives, their rationale, and corresponding resource management strategies to achieve the objectives that have been developed for the Inyo-Mono IRWM Plan.

Objective 1: Protect, Conserve, Optimize, and Augment Water Supply While Maintaining Ecosystem Health

Water is a highly valued resource in the Inyo-Mono IRWM region. Rivers, streams, lakes, and aquifers supply water for domestic, agricultural, and recreational uses, support abundant wildlife and fisheries, and are an important aesthetic component of the local landscape. Water resources in the region have been heavily impacted over the years by the export of large volumes of water for use outside the planning region, a practice that has been detrimental to local water users and the natural environment within the region. The potential for future exports, particularly of groundwater, is a continuing concern.

Water for future development is a concern. While some communities have community water systems, other areas are served by a variety of mutual water companies, small private systems, and wells. Existing water rights are in some cases inadequate for future expansion, and additional surface water is becoming more difficult to obtain due to concerns about in-stream and water-dependent resources. Inadequate and insufficient data about many groundwater resources hinder projections on meeting future demand from those sources. Potential off-site impacts on natural resources as a result of groundwater extraction are also a concern. In addition, wells for existing development are running dry in some areas;

pumping new and deeper wells is expensive. At this time, many communities do not know how much groundwater is available, nor can they assume a constant supply of groundwater in the future. A further complication to managing water resources is the impact of climate change to the region's hydrology. The uncertainty around climate change projections and lack of region-specific information make it difficult to adequately prepare for, and respond to, impacts.

The availability of water for future development is also affected by new requirements concerning water quality. Existing community water systems that do not meet the standards set by the Lahontan Regional Water Quality Control Board (RWQCB) will have to update their systems. The cost of doing so may inhibit the ability of those systems to provide additional water for future development. In areas that do not currently have community systems, the Lahontan RWQCB will require a community system when a certain level of development is reached. The cost of installing and maintaining a system may preclude additional development in areas which are currently served by wells or small private systems.

To address these water supply concerns, the following resource management strategies have been adopted by the RWMG in order to identify projects aimed at developing a more reliable and diverse water supply portfolio:

1.1. Improve water supply reliability.
1.2. Improve system flexibility and efficiency.
1.3. Support compliance with current and future state and federal water supply standards.
1.4. Address local water supply issues through various techniques, including, but not limited to: groundwater recharge projects, conjunctive use of water supplies, water recycling, water conservation, water transfers, and precipitation enhancement.
1.5. Optimize existing storage capacity.
1.6. Conserve and adapt water uses to future conditions.
1.7. Capture and manage runoff where feasible.
1.8. Incorporate and implement low-impact development design features, techniques, and practices.
1.9. Promote public education about water supply issues and needs.
1.10. Promote planning efforts to provide emergency drinking water to communities in the region in the event of a disaster.
1.11. Promote water efficiency in fish hatcheries.
1.12. Protect water supplies that support public recreational opportunities.

Objective 2: Protect, Restore, and Enhance Water Quality

A primary goal of the IRWM Plan is to provide high quality drinking water that meets current and future federal and state drinking water standards throughout the region. Clean, reliable, and safe drinking water is essential to public health and the economic well-being of the region. The region's IRWM water quality objective and corresponding RMS are consistent with the intent of *Safe Drinking Water Act* goals to protect drinking water "from source to tap" and broader *Clean Water Act* goals for clean, fishable, and swimmable waters.

The region's water quality related issues vary, and certain areas are affected by outdated and aging water related infrastructure, land management practices, sewage disposal, construction practices, solid waste disposal, road maintenance techniques, naturally occurring minerals and ores, etc. There is a concern in some areas about the potential impacts of increased stormwater runoff resulting from

increased development and inadequate or failing infrastructure. Potential unmitigated stormwater impacts in some areas include increased streamflows, siltation, erosion, loss of aquatic habitat, flooding, and impacts to roads and agricultural areas. In other areas, particularly in the Indian Wells Valley, salt accumulation creates issues for both human water consumption and agricultural concerns.

At present, the water quality of the snowmelt runoff in the region is generally excellent, but degraded in some reaches and threatened throughout the entire unit due to non-point source loading from increased recreational use, grazing, development, and on-site septic systems. The Owens hydrologic unit (Mammoth Creek, Crowley Lake, and Pleasant Valley Reservoir) is an impaired waterbody identified in Table 3 of the 2010 CWA 319(h) NPS Grant Program Guidelines. Although Total Mean Daily Loads (TMDLs) have not been established for the Owens hydrologic unit, constituents of concern include: mercury, manganese, dissolved oxygen, ammonia, and organic enrichment (see Chapter 2 for more information on water quality).

In other areas, aquifers of poor-quality water underlie the high-quality aquifer currently being pumped. As groundwater levels continue to decline, underlying poorer-quality water may begin to mix with high-quality water, resulting in deterioration of the quality of the water supply. In many locations, portions of the aquifer have levels of arsenic and uranium higher than the current primary drinking water maximum contaminant limit (MCL) due to the granitic bedrock, requiring treatment prior to domestic use. In other areas, nitrogen and phosphate levels are elevated.

In response to these identified issues, the following resource management strategies were established toward meeting the goal of improving water quality:

2.1. Support achieving compliance with current and future state and federal water quality standards.
2.2. Improve the quality of urban, agricultural, and wildland runoff and/or mitigate their effects in surface waters and groundwater.
2.3. Support monitoring to better understand major sources of erosion and causes and, where feasible, reduce erosion and sedimentation.
2.4. Protect public health and aquatic ecosystem sustainability.
2.5. Match water quality to water use.
2.6. Support appropriate recreational programs that minimize and/or mitigate impacts to water quality.

Objective 3: Provide Stewardship of Water Dependent Natural Resources

Many cross-cutting issues overlap with and link to the objectives for water quality and water supply. These cross-cutting issues serve as a reminder that the availability of high-quality water is not only critical to the success of the human population, but also to the ultimate survival of plant and wildlife populations dependent upon healthy ecosystems.

The protection and enhancement of natural habitats is a critical element in preserving and restoring the long-term existence of regional flora and fauna. Riparian woodlands, wetlands, migration corridors, and wintering and summering grounds are recognized as critical, highly localized wildlife habitat. Increased recreational use in the region and localized development, particularly in areas outside of existing community areas, create potential impacts to the long-term sustainability of fish and wildlife populations and plant communities through degradation of habitat and resources and increased conflicts between

wildlife and humans. Although not extremely prevalent in the Inyo-Mono region, invasive species can alter natural ecosystems by replacing native plant and animal communities. As an example, introduced trout have displaced native Lahontan cutthroat trout and amphibians in many parts of the northern watersheds of the region.

Across the region, interested parties stressed the value and importance of the natural environment for a variety of reasons, including, but not limited to, the health of native flora and fauna, providing a wide variety of recreation and tourism interests, and supporting a number of agricultural and grazing operations. The region is home to a variety of unique species of fish, wildlife and aquatic invertebrates, including a number of threatened and endangered plants and animals – for example, endangered Owens tui chub. Hot Creek and the Upper Owens River are two of the most productive and popular trout fisheries in California and, as a result, provide for world-class fishing which supports the local economy.

The following resource management strategies were established toward meeting the objective of increasing the understanding of the natural resources in order to provide increased and appropriate stewardship within the planning region:

3.1. Protect, restore, and enhance natural processes, habitats, and threatened and endangered species.
3.2. Protect, enhance, and restore ecosystems.
3.3. Support science-based projects to protect, improve, assess, and/or restore the region's ecological resources, while providing opportunities for public access, education, and recreation where appropriate.
3.4. Support research and monitoring to better understand the impacts of water-related projects on environmental resources.
3.5. Identify, develop, and enhance efforts to control invasive species

Objective 4: Maintain and Enhance Water, Wastewater, Emergency Response and Power Generation Infrastructure Efficiency and Reliability

Throughout the region, and in disadvantaged communities in particular, outdated water storage and conveyance equipment, lack of back-up generators, and/or antiquated piping present significant challenges to providing safe and reliable water supplies for both human consumption and fire protection. Compounding this situation is the fact that many of the antiquated water systems are in areas that experience extremely cold winters with significant snowfall and, thus, the period of time during the year within which any construction and/or maintenance can occur is extremely limited. Moreover, many of these same areas are rural and do not have the institutional capacity to effectively manage their water-related infrastructure and regulatory compliance matters.

Since many of the areas within the region rely on old and/or inefficient equipment and motors to drive their groundwater pumping and water conveyance, a significant amount of energy is currently being

wasted. Additionally, a limited number of energy intensive power generating facilities (e.g., geothermal) as well as significant water conveyance structures exist within the region that could be retrofitted to improve their efficiency and reduce greenhouse gas emissions while also improving reliability. As such, the following resource management strategies were established toward meeting the objective of maintaining and enhancing water related treatment and power generation efficiency and reliability:

4.1. Promote rehabilitation and replacement of aging water and wastewater delivery and treatment facilities in rural communities, including tribal lands.
4.2. Ensure adequate water for fire protection and emergency response.
4.3. Promote and improve energy efficiency of water systems and uses.
4.4. Support water use efficiency in power generating facilities.
4.5. Provide for development and improvement of emergency response plans.

Objective 5: Address Climate Variability and Reduce Greenhouse Gas Emissions

As stated in the *California Water Plan Update 2009*, climate change models suggest that the North Lahontan region will generally receive less annual precipitation, with more precipitation falling as rain. Scenarios indicate a higher reliance on groundwater to maintain current levels of agricultural development and to accommodate population growth. In the South Lahontan Region, reliance on groundwater may also increase due to reductions in local surface flows and snowpack quantity. Regardless of precipitation trends, it is recognized that average temperature will increase, timing of snowmelt and streamflow will change, and summers will become longer. Drier-than-average conditions may result in an increase in the frequency of fires and area consumed as well. Primary and secondary impacts caused by fires include damage to an existing watershed, changes in surface runoff and percolation, and economic impacts to the area (see Chapter 3 for a more in-depth discussion). Additionally, forthcoming climate change legislation may spur increased local development of alternative energy production facilities, which may have their own water demands.

In order to prepare the region for increasing climate variability and to help reduce greenhouse gas emissions from local water systems and projects, the following resource management strategies have been established:

5.1. Increase understanding of the greenhouse gas emissions resulting from water operations and management.
5.2. Increase understanding of impacts of climate change on water supplies and water quality.
5.3. Manage and modify water systems to respond to increasing climate variability.
5.4. Support efforts to research and implement alternative energy projects and diversify energy sources to move and treat water within the region.
5.5. Support efforts to reduce greenhouse gas emissions in the region.
5.6. Support assessment and mitigation of water-related impacts of renewable and non-renewable energy projects.
5.7. Promote public education about impacts of climate change, particularly as it relates to water resource management in the region.

Objective 6: Promote Participation of Small and Disadvantaged Communities, Including Tribes, in IRWM Process to Identify and Work towards Meeting Their Needs

The RWMG's mission statement emphasizes the need for a consensus approach in water resources management within the region, and the vision statement emphasizes the need for a stakeholder-driven process. Maximizing stakeholder and community involvement and stewardship is essential to the success of the IRWM Plan.

Stakeholder involvement is a vital part of the IRWM planning process as a means to identify and address public interests and perceptions, address stakeholder questions and issues, ensure that the Plan and any proposed solutions are in keeping with public interests, and provide for public ownership and support of the proposed solutions. The Inyo-Mono RWMG has maintained its commitment to developing a bottom-up, stakeholder-driven process as its model to ensure successful and widely-supported projects and programs. Stakeholder involvement may assist in identifying areas where increased public education and outreach is required and may help focus the Plan toward the public's key water management issues and potential solutions. Public education and outreach at community events, workshops, and school-based educational programs are required to promote the identification and understanding of the region's resources. Public education also increases:

- awareness of water management opportunities,
- stakeholder input to water management ideas and opportunities,
- public activism, and
- public and community ownership of both problems and solutions.

As discussed previously, the Inyo-Mono IRWM Program has been developed in an interactive, open and transparent process in which the concerns and interests of different stakeholders have been taken into consideration. Continued and increased stakeholder interaction during subsequent phases of the IRWM Program, including implementation of projects, has been established as an integral component of the overall vision with the following specific resource management strategies:

6.1. Engage regional communities and tribes in collaborative water and natural resource management related efforts.
6.2. Provide assistance for tribal and DAC consultation, collaboration, and access to funding for development, implementation, monitoring, and long-term maintenance of water resource management projects.
6.3. Promote public education and training programs in disadvantaged communities and tribal areas about water resource protection, pollution prevention, conservation, water quality, watershed health, and climate change.
6.4. Promote social resilience in disadvantaged communities and tribes to more effectively respond to social, economic or environmental disturbances impacting water-related resources.

Objective 7: Promote Sustainable Stormwater and Floodplain Management that Enhances Flood Protection

The outreach conducted since completion of the Phase I Plan highlighted the flood related management challenges faced by a few communities in the region, including Ridgecrest, Mammoth Lakes, Coleville, and Fort Independence Indian Reservation. As is common in many areas, development in upper

elevations and steep hillside areas exacerbates problems of stream instability, erosion, and flooding. A challenge somewhat unique to the Inyo-Mono area is the erosion and subsequent flooding experienced after wildfires, which in turn can impact the amount and quality of water supplies for human communities. Additionally, many areas are ill equipped to handle and direct high flows that result occasionally after intensive rain storms. In a few isolated situations, extensive damage to commercial businesses has resulted from extensive rain storms. In other areas, sediment management is needed to both increase channel carrying capacity while also increasing habitat values. Addressing these challenging issues is made increasingly difficult by the fact that ownership of the various streams is mixed among private parties, public easements and assorted government agencies.

In response to these issues, the RWMG decided to add this new objective to the Phase II Plan and has created the following specific resource management strategies:

7.1 Characterize current stormwater and flood management situations and challenges.
7.2 Promote region-wide integrated stormwater and flood management planning.
7.3 Improve existing stormwater and flood management infrastructure and operational techniques/strategies.
7.4 Promote projects and practices to protect infrastructure and property from flood damage.
7.5 Integrate ecosystem enhancement, drainage control, and natural recharge into construction projects.
7.6 Develop and implement public education, outreach, and advocacy on stormwater and flood management matters

Objective 8: Promote Sound Groundwater Monitoring, Management and Mitigation in Cooperation with all Affected Parties

Similar to the concern with potential flooding, many interested parties have expressed serious concerns with both the quantity and quality of the groundwater on which they rely. Many parties expressed a growing desire to protect groundwater resources from pollution, degradation, and overdrafting as an important step towards improving water quality, water supply reliability, and habitat quality within the region. Furthermore, there is a need to better understand the current status and recent trends in groundwater quality and quantity, which will help regional entities respond to recent groundwater regulations. In response, the RWMG decided to add this new objective to the Phase II Plan with the following specific resource management strategies:

8.1 Support and implement state-mandated groundwater and surface water monitoring requirements, and other groundwater monitoring efforts.
8.2 Promote efforts to monitor, manage, and mitigate effects of groundwater-dependent projects.
8.3 Develop and support projects that mitigate for the effects of groundwater extraction.
8.4 Protect and improve the quality and quantity of stored groundwater supplies and recharge areas.
8.5 Promote conjunctive use projects.
8.6 Identify existing gaps in groundwater and surface water quantity data and undertake appropriate assessments/characterization studies.
8.7 Collect data and monitor groundwater and surface water supply variability.

8.8 Promote efforts to manage/design groundwater projects so that future impacts requiring mitigation are avoided.

Prioritization of the IRWM Plan Objectives and Resource Management Strategies

The RWMG has agreed that all objectives and corresponding resource management strategies are to be "co-equal" in terms of prioritization. However, the RWMG has also stated that there is explicit support for planning and implementing projects that benefit disadvantaged communities and tribes. The RWMG recognizes that by pursuing a wide range of projects that support the eight independent objectives, synergies among the various objectives will be enhanced and the end result will be in pursuit of the overarching mission. Since this updated Plan represents the region's evolving IRWM efforts, the RWMG supports projects that advance any of the stated objectives. When implementing regional projects, project proponents will strive to meet and integrate as many objectives as possible while also recognizing that some objectives may not be fully achieved. Furthermore, additional objectives may be considered in future revisions of the IRWM Plan.

Measurable Metrics for Evaluating Objective Achievements

Developing objectives and associated resource management strategies is critical to establishing direction for a given effort. In the case of the Inyo-Mono IRWM Plan, there are eight co-equal regional objectives and a total of 53 resource management strategies. As important is an ability to monitor and evaluate successes in meeting agreed-upon objectives via the implementation of resource management strategies. Table 7-1 presents objectives and resource management strategies along with metrics that will be used in evaluating progress implementing the Phase II Inyo-Mono IRWM Plan. More information about Plan implementation and how performance will be monitored can be found in Chapters 12 and 13, respectively.

Table 7-1. Inyo-Mono IRWM Plan objectives and resource management strategies and evaluation metrics

Objective / Resource Management Strategy	Evaluation Metric
Objective 1: Protect, conserve, optimize, and augment water supply while maintaining ecosystem health	
1.1 Improve water supply reliability	Reduce the number of water distribution systems that are unable to attain or distribute a reliable potable water supply
1.2 Improve system flexibility and efficiency	Reduce the amount of water lost and/or increase in the number of uses resulting from specific water sources
1.3 Support compliance with current and future state and/or federal water supply standards	Reduce the number of water supply standards compliance violations
1.4 Address local water supply issues through	Number of water supply projects

Objective / Resource Management Strategy	Evaluation Metric
various techniques, including, but not limited to: groundwater recharge projects, conjunctive use of water supplies, water recycling, water conservation, water transfers, and precipitation enhancement.	successfully implemented
1.5 Optimize existing storage capacity	Increase in volume of water stored
1.6 Conserve and adapt water uses to future conditions	Reduce amount of water used
1.7 Capture and manage runoff where feasible	Reduce amount of unmanaged runoff entering natural waterways
1.8 Incorporate and implement low-impact development design features, techniques, and practices	Reduce amount of water used
1.9 Promote public education about water supply issues and needs	Survey responses indicating additional understanding of issue and needs
1.10 Promote planning efforts to provide emergency drinking water to communities in the region in the event of a disaster	Number of emergency preparedness/ response plans developed or revised
1.11 Promote water efficiency in fish hatcheries	Reduce amount of water used in hatcheries
1.12 Protect water supplies that support public recreational opportunities.	Number of impaired water bodies supporting recreational activities
Objective 2: Protect, restore, and enhance water quality	
2.1 Support achieving compliance with current and future state and federal water quality standards	Reduction in number of violations of various standards
2.2 Improve the quality of urban, agricultural, and wildland runoff and/or mitigate their effects in surface waters and groundwater	Improvements in water quality sampling from project site
2.3 Support monitoring to better understand major sources of erosion and causes and, where feasible, reduce erosion and sedimentation	Number of monitoring studies and programs undertaken
2.4 Protect public health and aquatic ecosystem sustainability	Improvements in water quality sampling
2.5 Match water quality to water use	Identification and maintenance of appropriate water quality for specific use

Objective / Resource Management Strategy	Evaluation Metric
2.6 Support appropriate recreational programs that minimize and/or mitigate impacts to water quality	Reduction in number of days where recreational activity is curtailed or diminished
Objective 3: Provide stewardship of water dependent natural resources	
3.1 Protect, restore, and enhance natural processes, habitats, and threatened and endangered species	Number of acres of project site and/or habitat being protected, restored, or enhanced
3.2 Protect, restore, and enhance ecosystems	Number of acres of project site and/or habitat being protected, restored, or enhanced
3.3 Support science-based projects to protect, improve, assess, and/or restore the region's ecological resources, while providing opportunities for public access, education, and recreation where appropriate.	Number of research and monitoring studies undertaken and made publically available
3.4 Support research and monitoring to better understand the impacts of water-related projects on environmental resources.	Number of research and monitoring studies undertaken
3.5 Identify, develop, and enhance efforts to control invasive species.	Number of acres or sites where invasive species are removed
Objective 4: Maintain and enhance water, wastewater, emergency response and power generation infrastructure efficiency and reliability	
4.1 Promote rehabilitation and replacement of aging water and wastewater delivery and treatment facilities in rural communities, including tribal lands.	Number of facilities, including linear length of pipes, replaced and/or repaired
4.2 Ensure adequate water for fire protection and emergency response	Volume of additional water provided
4.3 Promote and improve energy efficiency of water systems and uses	Reduction in energy demand necessary for water systems
4.4 Support water efficiency in power generating facilities	Reduction in energy demand of facilities
4.5 Provide for development and improvement of emergency response plans	Number of emergency response plans developed and implemented
Objective 5: Address climate variability and reduce greenhouse gas emissions	
5.1 Increase understanding of the greenhouse gas emissions resulting from water operations	Number of studies or analyses completed and reviewed to increase understanding of

Objective / Resource Management Strategy	Evaluation Metric
and management	greenhouse emissions
5.2 Increase understanding of impacts of climate change on water supplies and water quality	Number of research and monitoring studies and analyses undertaken and reviewed
5.3 Manage and modify water systems to respond to increasing climate variability	Number of projects completed
5.4 Support efforts to research and implement alternative energy projects and diversify energy sources to move and treat water within the region	Number of research and development projects developed and/or implemented
5.5 Support efforts to reduce greenhouse gas emissions in the region	Regional greenhouse gas emissions over time
5.6 Support assessment and mitigation of water-related impacts of renewable and non-renewable energy projects	Number of projects developed and/or implemented
5.7 Promote public education about impacts of climate change, particularly as it relates to water resource management in the region	Number of survey responses indicating gained understanding about potential climate change impacts
Objective 6: Promote participation of small and disadvantaged communities, including tribes, in IRWM process to identify and work towards meeting their needs	
6.1 Engage regional communities and tribes in collaborative water and natural resource related efforts	Number of participants attending public meetings; number of media communications
6.2 Provide assistance for tribal and DAC consultation, collaboration, and access to funding development, implementation, monitoring, and long-term maintenance of water resource management projects.	Number of requests for assistance; number of consultations undertaken
6.3 Promote public education and training programs in disadvantaged communities and tribal areas about water resource protection, pollution prevention, conservation, water quality, watershed health, and climate change	Number of lectures and/or materials developed and distributed; number of survey responses indicating gained understanding about water resources
6.4 Promote social resilience in disadvantaged communities and tribes to more effectively respond to social, economic or environmental disturbances impacting water-related resources	Number of lectures and/or materials developed and distributed; change in number and impact of social, economic, and environmental disturbances
Objective 7: Promote sustainable stormwater and floodplain management that enhances	

Objective / Resource Management Strategy	Evaluation Metric
flood protection	
7.1 Characterize current stormwater and flood management situations and challenges	Number of studies undertaken and reviewed
7.2 Promote region-wide integrated stormwater and flood management planning	Number of planning efforts undertaken and/or implemented
7.3 Improve existing stormwater and flood management infrastructure and operational techniques/strategies	Number of relevant stormwater and flood techniques/strategies implemented or facilities improved
7.4 Promote projects and practices to protect infrastructure and property from flood damage	Number of acres, buildings, or system elements protected as a result of projects
7.5 Integrate ecosystem enhancement, drainage control, and natural recharge into construction projects	Number of relevant projects constructed
7.6 Develop and implement public education, outreach, and advocacy on stormwater and flood management matters	Number of lectures and/or materials developed and distributed
Objective 8: Promote sound groundwater monitoring, management and mitigation in cooperation with all affected parties	
8.1 Support and implement state-mandated groundwater and surface water monitoring requirements, and other groundwater monitoring efforts.	Number and scale of monitoring efforts undertaken
8.2 Promote efforts to monitor, manage, and mitigate effects of groundwater-dependent projects.	Number of and scale monitoring efforts undertaken; reduction in adverse effects
8.3 Develop and support projects that mitigate for the effects of groundwater extraction.	Number of mitigation efforts undertaken; reduction in adverse effects from extraction
8.4 Protect and improve the quality and quantity of stored groundwater supplies and recharge areas.	Number of projects undertaken; improved water quality; variability in groundwater elevations
8.5 Promote conjunctive use projects.	Number of projects developed and/or implemented
8.6 Identify existing gaps in groundwater and surface water quantity data and undertake appropriate assessments/characterization studies.	Number of studies initiated and/or completed

Objective / Resource Management Strategy	Evaluation Metric
8.7 Collect data and monitor groundwater and surface water supply variability.	Number of research and monitoring studies undertaken; amount of data contributed to State and federal databases
8.8 Promote efforts to manage/design groundwater projects so that future impacts requiring mitigation are avoided.	Number of projects designed and/or changes in mitigation requirements

Relationship to Proposition 84 Guidelines and California Water Plan Update 2009

The Inyo-Mono IRWM Plan process has been developed and implemented, taking into consideration from the onset the Proposition 84 Plan Guidelines. The Inyo-Mono IRWM Plan is consistent with the intent of the Proposition 84 IRWM Grant Program: to encourage integrated regional strategies for management of water resources and to provide funding for projects that protect communities from drought, protect and improve water quality, and improve local water security by reducing dependency on imported water.

Furthermore, the Inyo-Mono IRWM Plan objectives and resource management strategies are consistent with the Proposition 84 Grant Program Preferences for proposals that:

- Include integrated projects with multiple benefits
- Support and improve local and regional water supply reliability, conservation, and efficiency
- Contribute expeditiously and measurably to the long-term attainment and maintenance of water quality standards, including the reduction of non-point source pollution
- Eliminate or significantly reduce pollution in impaired waters and sensitive habitat area
- Develop increased understanding of groundwater conditions and availability
- Undertake watershed protection and management activities, including ecosystem and fisheries restoration and protection
- Include safe drinking water and water quality projects that serve disadvantaged communities.

The Inyo-Mono IRWM Plan objectives and resource management strategies described above are also in line with statewide priorities set forth by the *California Water Plan* (2009 Update) and the Proposition 84 Guidelines.

The California Water Plan lays out a roadmap for water management through the year 2030. Where appropriate, these California Water Plan objectives have been applied in the Inyo-Mono IRWM planning process. The RWMG recognizes that various strategies are often connected to one another, as well as to other activities. As such, the IRWM Plan looks to find projects that help diversify the water management portfolio for the region as well as create positive synergistic effects that aid in improving the overall water and environmental condition of the region and State. An analysis of the relationship between California Water Plan Update 2009 Resource Management Strategies and Inyo-Mono IRWM Plan RMS is shown in Table 7-2.

Table 7-2. Relationship between CA Water Plan 2009 and Inyo-Mono IRWM Resource Management Strategies

Resource Management Strategies		
CA Water Plan Update 2009		**Inyo-Mono IRWM Plan**
Pillars	Resource Management Strategies	Resource Management Strategies addressed *Yes, No, Not Applicable* *(Identified from Table 7-1)*
Reduce water demand	1. Agriculture Water Use Efficiency	1. Yes
	2. Urban Water Use Efficiency	2. Yes
Improve Operational Efficiency and Transfers	1. Conveyance-Delta	1. Not Applicable
	2. Conveyance-Regional/local	2. Yes
	3. System Reoperation	3. Yes
	4. Water Transfers	4. Yes
Increase Water Supply	1. Conjunctive Management and Groundwater Storage	1. Yes
	2. Desalination	2. Yes
	3. Precipitation Enhancement	3. Yes
	4. Recycled Municipal Water	4. Yes
	5. Surface Storage-CALFED	5. Not Applicable
	6. Surface Storage-Regional/Local	6. Yes
Improved Water Quality	1. Drinking Water-Treatment and Distribution	1. Yes
	2. Groundwater Remediation/Aquifer Remediation	2. Yes
	3. Matching Quality to Use	3. Yes
	4. Pollution Prevention	4. Yes

Resource Management Strategies		
CA Water Plan Update 2009		**Inyo-Mono IRWM Plan**
Pillars	Resource Management Strategies	Resource Management Strategies addressed *Yes, No, Not Applicable* *(Identified from Table 7-1)*
	5. Salt and Salinity Management	5. Yes
	6. Urban Runoff Management	6. Yes
Improved Flood Management	1. Flood Risk Management	1. Yes
Practice Resources Stewardship	1. Agricultural Lands Stewardship	1. Yes
	2. Economic Incentive	2. Yes
	3. Ecosystem Restoration	3. Yes
	4. Forest Management	4. Yes
	5. Recharge Area Protection	5. Yes
	6. Water-Dependent Recreation	6. Yes
	7. Watershed Management	7. Yes
Other Strategies	1. Crop Idling for Water Transfers	1. Yes
	2. Dewvaporation or Atmospheric Pressure Desalination	2. No/Not Applicable
	3. Fog Collection	3. No
	4. Irrigated Land Retirement	4. Yes
	5. Rainfed Agriculture	5. Yes
	6. Waterbag Transport/ Storage Technology	6. No

Chapter 8: Coordination

Intent of Coordination

The intent of coordination in the context of IRWM planning is to ensure the following:

- That a RWMG coordinates and integrates its activities with local agencies and stakeholders to avoid conflict within the region and to best utilize resources;
- That RWMGs are aware of adjacent planning efforts and are coordinating with adjacent RWMGs; and
- That the RWMGs are aware of State, federal and local agency resources and roles in the implementation of their plans and projects.

The Inyo-Mono RWMG has made a concerted effort to identify and involve all relevant local agencies and stakeholders since the inception of the IRWM Program. Indeed, outreach to regional stakeholders, be they public agencies, private business, NGOs, or tribes has been always been a central activity aimed at both engagement and coordination. The RWMG believes strongly that through coordination among local agencies, interested stakeholders, and adjacent IRWM regions, efficient use of resources can be achieved, redundant actions can be reduced, and opportunities for cooperative projects can be identified. The RWMG has worked hard to build an understanding of neighboring IRWM planning endeavors and to learn how their management issues are similar or different to those in the Inyo-Mono region.

Coordination of Activities within Region

The strength of any IRWM planning effort lies in the degree to which involved parties engage and coordinate with one another. Understanding this, the Inyo-Mono RWMG has worked hard to create a forum for local project proponents and stakeholders to coordinate with one another on relevant water-related activities and efforts. The result is a broad and encompassing stakeholder group that meets regularly and works together to avoid conflicts and maximize efficiencies. Those entities involved represent interests ranging from federal, state, and local government; resource and water agencies; non-profit and conservation organizations; American Indian tribal organizations; educational organizations; business interests; agriculture and ranching groups; and individuals having vested interests in how water is managed in eastern California. In addition to those entities that are RWMG Members and/or regularly participate in the planning process, there is a large number of organizations and individuals who are on the Inyo-Mono RWMG contact list and regularly receive updates and notices of meetings. Some of these entities have been regular participants in the past but do not currently participate at a high level. In total,

more than 200 people are included in the Inyo-Mono contact list, representing 106 organizations (Chapter 1).

To keep all interested parties informed of the effort and recent developments, a variety of communication tools are used. Notices and agendas for upcoming RWMG meetings are sent to all people on the email contact list, as are meeting summaries and any other relevant information about the Inyo-Mono IRWM process or issues related to water planning and management in the region. In addition, Program Office staff is available by phone and by email for questions and information requests. When warranted, staff will travel within the region, or to Sacramento, to meet with stakeholders, members of the public, and DWR officials. The program website (www.inyo-monowater.org) has become an increasingly visible and important tool for sharing information with current Members and reaching out to new stakeholders. On this website, visitors can find topics such as introductory information about the Inyo-Mono IRWM Program, member organizations, meeting summaries and other important documents, and links to other IRWM Program websites. Because of the rural nature of the Inyo-Mono region, not all stakeholders have adequate access to the Internet, and it has been necessary at times to reach people through other means (such as phone, U.S. mail, in person, etc.).

One of the most tangible, yet unquantifiable, benefits of the Inyo-Mono IRWM process to date has been the practice of gathering water-related stakeholders at meetings on an almost-monthly basis to discuss the group, its activities, and water issues. Many of the organizations sitting at the table have historically been at odds over water issues. While it is not expected, nor intended, that the RWMG will solve all water-related conflicts in the region, many RWMG participants have acknowledged the advantages of increased communication and cooperation among adversaries and allies alike. The process has helped to educate stakeholders about each other's activities, priorities and challenges. For instance, smaller water districts have sought advice from larger water districts on technical issues. Less experienced communities benefit by learning from groups with more experience in water management, and in turn, RWMG stakeholders have begun to understand the difficulties of maintaining high-quality water resources and ensuring ecosystem protection in small, rural communities. During the RWMG's visioning exercise in early 2010, several RWMG participants expressed the desire that the IRWM planning process should help individual stakeholders overcome conflict and should allow the group to speak with one voice and from common objectives.

Identification and Coordination with Neighboring IRWM Regions

Understanding and appreciating the importance of coordination between the Inyo-Mono RWMG and neighboring RWMGs, the Inyo-Mono RWMG began reaching out to other efforts early on. Specifically, through the 2009 Region Acceptance Process, the Inyo-Mono RWMG identified all eastern California IRWM planning regions (see Figure 1-1 in Chapter 1) and held a series of meetings to ensure consistency in IRWM planning region boundary designations and to set the stage for potential coordination at the interregional scale. For example, the Inyo-Mono region overlaps with the Mojave IRWM planning region due to differences between the watershed boundary and a water agency jurisdictional boundary. As a result of this overlap, the two efforts have communicated during development and refinement of the respective IRWM Plans. In addition, the Inyo-Mono RWMG sought guidance from established IRWM groups in the development of its first planning grant application and the Phase I Plan.

Although not a neighbor to the Greater Los Angeles IRWM Program by geographic standards, the Inyo-Mono planning region provides critical source water for the City of Los Angeles. As such, maintaining stewardship of water resources within the Inyo-Mono region has direct implications for the water quality and supply to millions of people in Los Angeles; stewardship of water resources should be of interest to both regions. Recognizing this, Inyo-Mono Program Office staff has met with members of the Leadership Committee of the Greater Los Angeles IRWM Program in the hopes of developing inter-regional collaborations benefitting members and the resources of both regions. As with the Greater Los Angeles Program, the Inyo-Mono RWMG looks forward to furthering collaborative opportunities with neighboring IRWM planning regions.

Coordination and Involvement with Other Planning Efforts

Recognizing the importance of engaging with other water planning efforts within California, Program Office staff has participated in several efforts outside of specific IRWM Programs. More specifically, these efforts include the following:

Sierra Water Work Group

The Sierra Water Workgroup's (SWWG) mission is to assist regional efforts to protect and enhance water quality, water supply, and watershed health; to develop cooperative regional response; and to facilitate reinvestment in our watersheds and water resources by all beneficiaries. The SWWG is a coalition of 11 Sierra Nevada RWMGs and seeks to raise the profile of the importance of Sierra Nevada snowpack to California's water resources. The Inyo-Mono IRWM Program was a founding member of the SWWG and has remained engaged as a member since its inception. As a member, the Inyo-Mono RWMG has contributed to the efforts to address water-related needs of communities throughout the Sierra Nevada and has benefitted from coordinating with like-minded groups.

Roundtable of Regions

The Roundtable of Regions (RoR) is an ad-hoc group comprised of representatives from IRWM Programs throughout California. As with the SWWG, the RoR provides an opportunity for dialogue amongst IRWM Programs. However, unlike the SWWG, the geographic scope of the RoR is significantly broader, providing a greater opportunity to give input to, and gain knowledge from, other IRWM planning efforts. This group is a good source of information and input for both participating RWMGs and DWR, particularly when specific statewide initiatives, programs, or funding opportunities are launched. The Inyo-Mono Program Office is an active participant in the RoR and has been since its inception.

California Water Plan Update 2013

The California Water Plan serves as an umbrella water planning document for the State. The Plan is revised every five years to reflect current trends, needs, and priorities related to water planning and provide the framework for policy development and funding priorities. Included in this planning is an emphasis on DWR's IRWM Program. Since the onset of the Water Plan Update 2013, Program Office staff has been actively involved in the planning process, serving on the Public Advisory Committee and several topical caucuses (Finance, DAC, and Climate Change), as well as playing a leadership role in the development of the North and South Lahontan regional description chapters. Through its involvement, Program Office staff has been able to provide a voice for high-priority water needs of the Inyo-Mono region, and, in turn, bring information back to the RWMG regarding state water-planning efforts and serve as a liaison between state-wide planning efforts and those of the Inyo-Mono RWMG.

Central Nevada Regional Water Authority

Inyo-Mono Program Office staff participates in annual Great Basin Water Forum meetings convened by the Central Nevada Regional Water Authority, a collaborative group comprised of stakeholders from central and northern Nevada, as well as Utah and three counties within California (including Inyo and Mono Counties), that meets regularly to discuss water issues of concern in Nevada and bordering states. Because the Inyo-Mono region shares a border with Nevada and includes common watersheds, it is important to conduct outreach to Nevada stakeholders and understand their water concerns.

Coordination with Agencies and Agency Support

Recognizing the important role that both federal and State government agencies play in water resources management in the Inyo-Mono region, the RWMG has worked diligently to involve relevant agencies in the overall effort. A number of agencies, including California Department of Fish and Game, U.S. Forest Service, U.S. Bureau of Land Management, U.S. Fish and Wildlife Service, U.S. National Park Service, and U.S. Bureau of Reclamation, regularly attend meetings. Given that more than 90% of the Inyo-Mono region's land area is comprised of public land, these government agencies are important partners in coordinating land and water planning for the region. Similarly, the Inyo-Mono RWMG has spent considerable time and effort cultivating its relationship with DWR. Staff at DWR provided helpful guidance and information during the development of the Inyo-Mono governance structure and planning process. DWR continues to be an essential partner in the Inyo-Mono IRWM process.

Given the rural nature of the Inyo-Mono region and the numerous disadvantaged communities, there is a preponderance of small yet critical water needs. These needs span the water supply, water quality and ecosystem stewardship scope, and many of these needs occur in small water systems supplying between 10 and 100 households. In addition to direct water-related needs, there is a paucity of technical, managerial and financial resources necessary to manage the small water systems that occur throughout the region. Funding is often difficult to come by as a result of challenging proposal requirements, high administrative costs, and prohibitive match funding requirements. The Inyo-Mono RWMG has attempted to address these needs at the State level by providing feedback to DWR about its grant requirements. The RWMG encourages more flexibility within the State's IRWM Program to be more responsive to the needs of small, rural communities. At the regional level, the Inyo-Mono RWMG has developed a collaborative relationship with the California Rural Water Association (CRWA), which has the capacity and expertise to address the needs of small, rural, and/or disadvantaged communities. Yet real challenges remain.

Local, state, and federal agencies can and should do more to help the needs of small, rural, and disadvantaged communities. Such assistance would require a more coordinated approach among granting agencies and regulatory agencies to achieve better alignment between grant requirements and the actual needs and abilities of communities. Improved coordination of this type would provide greater opportunity to leverage multiple funding opportunities to meet match requirements and increase the scope of funding available to support local and regional needs. Similarly, state and federal grant programs could increase their outreach to stakeholders to improve awareness regarding what funding opportunities exist. For example, the California Financing Coordinating Committee conducts annual funding fairs that are open to the public, yet stakeholders living in small, rural areas often are not aware of these fairs or of the opportunities they provide. Moreover, the fairs are almost always convened in

more densely populated areas, requiring many hours of travel and often an overnight stay in order to attend. The Inyo-Mono RWMG encourages innovative solutions, such as a “finance extension” program where representatives from funding agencies travel throughout the state, engaging with communities to increase awareness of funding opportunities and building capacity to respond to such programs.

The Inyo-Mono RWMG has always strived to maximize the opportunity to work and coordinate with stakeholders throughout the region, throughout the state, and even into neighboring Nevada. Although primarily focused on the Inyo-Mono region, the RWMG seeks to learn from and support other planning efforts in order to leverage one another’s experiences and positively impact a greater number of communities throughout the state of California. Fundamental to the success of the Inyo-Mono Program is a continued recognition of the importance to reach out to local, regional, and state-wide stakeholders representing public, private, tribal, and non-profit sectors. The Inyo-Mono IRWM Program will continue to reach out and coordinate with neighboring as well as other water-related planning efforts moving forward.

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Chapter 9: Finance

Introduction

The Inyo-Mono IRWM Program has, from its inception, been challenged with funding constraints emanating from the very limited number of large, well-funded water-related entities in the region, the preponderance of disadvantaged communities, and the rural nature of the region itself.

Prior to receiving Round I Planning Grant funding, financial support for the Inyo-Mono IRWM effort primarily comprised of financial support from California Trout and a pre-planning grant awarded by the Sierra Nevada Conservancy. In addition, several small monetary contributions have been provided by RWMG participants. However, since that time, significant progress has been made to secure financial resources for the region, falling broadly under three categories: planning, building capacity for economically disadvantaged communities, and project implementation. The implementation of the Inyo-Mono IRWM Plan involves addressing all three of these categories.

Although securing significant short- to medium-term funding for the Inyo-Mono region has been achieved, the financing needed to support broader regional goals and objectives is both critical and significant. A key component of the Inyo-Mono IRWM Round 2 Planning Grant is to develop a comprehensive and long-term financial management plan for the region. Achieving, and more importantly implementing, such a plan will build on existing funding and establish the long-term trajectory for meeting the financial needs of the Inyo-Mono IRWM Program and regional priorities. What follows in this chapter are descriptions of:

1. Funding sources that have supported, or currently are, supporting the Inyo-Mono IRWM Program (broader funding needs for the region)
2. Known and possible funding sources, programs, and grant opportunities
3. Various funding mechanisms, including water enterprise funds, rate structures, and private financing options, for projects that implement the IRWM Plan
4. Certainty and longevity of known or potential funding
5. How operation and maintenance costs for projects that implement the Inyo-Mono IRWM Plan will be covered guaranteed long-term

Current Funding Sources

The Inyo-Mono IRWM Program has successfully secured funding to begin addressing regional needs. These funds currently support planning, capacity building for disadvantaged communities (DACs), and project implementation needs.

Planning Round 1

In 2010, the Inyo-Mono IRWM Program received its first CA Department of Water Resources (DWR) Planning Grant in the amount of $237,615, with California Trout serving as grantee. This funding was matched by local contributions (primarily in-kind), bringing the total of the Round 1 Planning Grant to $331,653. The primary tasks and associated expenses per task are presented in Table 9-1. The Round 1 Planning Grant concluded in the fall of 2012.

Table 9-1. Round 1 Planning Grant tasks and associated budgets

Task	Description	DWR Grant	Total
1	Enhance and Maintain Inyo-Mono IRWMP Collaborative Process & Stakeholder Involvement	$75,000	$90,578
2	Update all relevant planning documents and processes in the Inyo-Mono Region	$7,500	$10,000
3	Re-evaluate governance and organizational structure for Inyo-Mono IRWMP	$9,000	$10,000
4	Incorporate Climate Change into the Inyo-Mono IRWM Plan and Develop Climate Change Adaptation Strategies	$10,000	$11,000
5	Conduct Region-Wide Outreach to Refine Phase I Issues, Goals, Objectives, and Strategies	$40,000	$46,000
6	Solicit & Evaluate Phase II Projects from Inyo-Mono Planning Region	$36,419	$80,879
7	Develop Draft Inyo-Mono IRWMP Phase II, including prioritized projects	$26,000	$40,000
8	Review and evaluate draft Inyo-Mono IRWMP Phase II with RWMG	$21,000	$26,000
9	Develop and Submit Final Inyo-Mono IRWMP, Phase II	$11,000	$13,000
10	Maintain and Enhance Inyo-Mono IRWMP Website, GIS, and Communication Tools	$1,696	$4,196
	Grant Total	**$237,615**	**$331,653**

Planning Round 2

In March, 2012, the Inyo-Mono IRWM Program submitted a Round 2 Planning Grant proposal requesting a total of $683,651, with an additional $361,349 being provided as match contributions. As with the Round 1 Planning Grant proposal, California Trout was the grantee. In July, 2012, DWR presented preliminary recommendations for Round 2 Planning Grant funding. The Inyo-Mono region was recommended to receive $480,270, representing 70% of the total funding requested. The amount awarded will provide necessary funding for the RWMG to revise the Phase II Plan and update it to the 2012 Plan Standards, expand and implement planning projects, and realize general programmatic needs through 2014. More specific details regarding tasks and budgets for the Round 2 Planning Grant are presented in Table 9-2, below. Relative to Round 1 funding, Round 2 funding will allow more than just programmatic operations and Plan revisions to occur. For the Inyo-Mono Region, these funds will support more sophisticated climate change analyses, a significant expansion of GIS and data management, and the completion of a long-term sustainable financing plan. Additionally, at least three planning studies will be completed, supporting river restoration needs in the Walker Basin, streambank stabilization in the Independence area, and a storm water management plan for the Town of Mammoth Lakes.

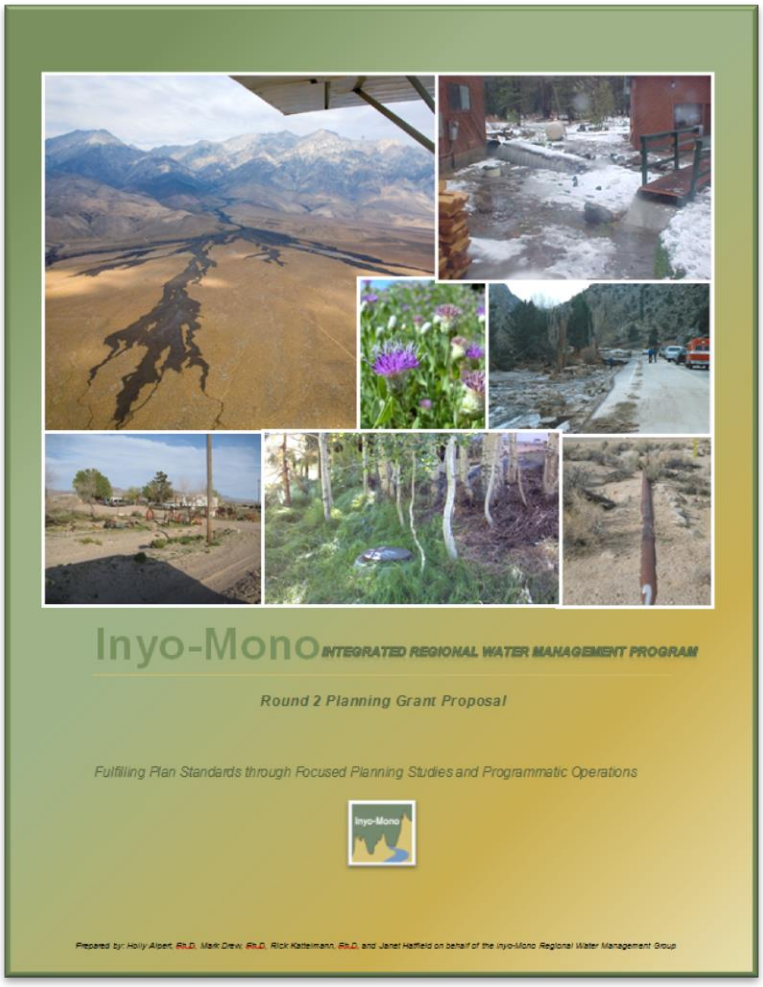


Table 9-2. Round 2 Planning Grant tasks and associated budgets

INYO-MONO ROUND 2 PLANNING GRANT BUDGET

FUFILLING PLAN STANDARDS THROUGH FOCUSED PLANNING STUDIES AND PROGRAMMATIC OPERATIONS

Chapter	Planning Study	Task	Non-State Share (Funding Match)	Requested Grant Funding	Total	Match %
1. Sustain and build upon Inyo-Mono IRWM Program operations			$ 52,000	$ 102,136	$ 154,136	34%
2. Planning Studies						
CHAPTER 2: PLANNING STUDIES	2.A Oak Creek Stream Stabilization Technical Study	2.A.1. Coordination and stakeholder meetings	$ 20,000	$ 10,000	$ 30,000	
		2.A.2. Data collection and inventory	$ 150,000	$ 50,000	$ 200,000	
		2.A.3. Develop report with alternatives, and IRWM Plan update	$ -	$ 10,000	$ 10,000	
		2.A.4. Presentation of results and findings	$ 5,000	$ 5,000	$ 10,000	
		2.A. TOTAL	$ 175,000	$ 75,000	$ 250,000	70%
	2.B West Walker River Restoration Planning Study	2.B.1. Project administration	$ 8,000	$ 5,500	$ 13,500	
		2.B.2. Outreach/information gathering and analysis	$ 10,000	$ 32,000	$ 42,000	
		2.B.3. Drafting and dissemination of West Walker River Restoration plan	$ 5,000	$ 30,000	$ 35,000	
		2.B. TOTAL	$ 23,000	$ 67,500	$ 90,500	25%
	2.C Town of Mammoth Lakes Stormwater Management Master Plan	2.C.1. Project administration	$ 2,500	$ 7,500	$ 10,000	
		2.C.2. Develop Town of Mammoth Lakes Stormwater Management Plan	$ 26,875	$ 80,625	$ 107,500	
		2.C.3. Implement strategic aspects of the Stormwater Management Plan	$ 23,750	$ 71,250	$ 95,000	
		2.C.4. Planning study quality control and review	$ 1,250	$ 3,750	$ 5,000	
		2.C.5. California Environmental Quality Act	$ 3,000	$ 9,000	$ 12,000	
		2.C. TOTAL	$ 59,250	$ 170,250	$ 229,500	26%
	2.D Inyo/Mono Watersheds Invasive Plant Inventory	2.D.1. Project organization and administration	$ 15,192	$ -	$ 15,192	
		2.D.2. Data collection	$ -	$ 73,788	$ 73,788	
		2.D.3. Data assessment	$ 15,192	$ -	$ 15,192	
		2.D.4. Data dissemination and publication	$ 1,215	$ -	$ 1,215	
		2.D. TOTAL	$ 31,599	$ 73,788	$ 105,387	30%
3. Enhance integration of climate change information into the Inyo-Mono IRWM planning process			$ 6,000	$ 38,298	$ 44,298	14%
4. Information/data management, Geographic Information Systems (GIS), and the Inyo-Mono IRWMP website			$ 5,000	$ 14,400	$ 19,400	26%
5. Sustainable funding plan for the Inyo-Mono IRWM Program			$ 4,500	$ 22,718	$ 27,218	17%
6. Integration and updating the Inyo-Mono IRWM Plan to meet Plan standards			$ 5,000	$ 29,013	$ 34,013	15%
Other Costs			$ -	$ 17,300	$ 17,300	0%
		Sub-Grand Total	$ 361,349	$ 610,403	$ 971,752	37%
		O&A (12% of Grant Funding Request):		$ 73,248		
		GRAND TOTAL		$ 683,651	$ 1,045,000	35%

Capacity Building for Disadvantaged Communities

Pilot Project Grant 1

The Inyo-Mono IRWM Program submitted a proposal to DWR to secure funding aimed at engaging and involving DACs in regional water planning efforts and building water resources-related capacity specifically for disadvantaged communities in the rural headwater communities of the eastern Sierra. In August, 2011, the Inyo-Mono IRWM Program was awarded $371,000 for this work. Tasks and associated budgets are provided in Table 9-3. This grant will be completed in September, 2013. As with the two Planning Grants, California Trout is serving as the grantee for this grant.

Table 9-3. DAC Grant1 Tasks and Budgets.

Task	Description	DWR funding
1	Identify under-represented stakeholders in the planning region and develop and implement an outreach strategy to engage them in at least 10 critical planning meetings.	$ 31,575
2	Conduct stakeholder meetings to gather feedback on (1) priority local water issues (2) goals and objectives (3) strategies for addressing water issues.	$ 52,996
3	Needs Assessments	$ 57,360
4	Capacity Building	$ 77,533
5	Final synthesis and report drafting	$ 15,800
6	Project findings dissemination	$ 69,861
*	Supplies/travel	$ 38,800
*	O & A (8%)	$ 27,514
	Grant total	**$ 371,439**

Pilot Project Grant 2

Based on an opportunity to address additional needs in Inyo-Mono DACs, the Inyo-Mono IRWM Program submitted a budget amendment request to address two distinct tasks, shown along with their associated budgets in Table 9-4. California Trout is the grantee for the Pilot Project Grant 2.

Table 9-4. DAC Grant 2 Tasks and Budget.

Task	Description	DWR funding
1	Developing alternative metrics to identify and designate economically disadvantaged communities.	*$ 65,000*
2	Development of a 25-30 minute video showcasing importance of water, DWR IRWM Program, Inyo-Mono IRWM Program and opportunities for DAC's engagement in water planning.	*$ 50,000*
*	*O & A (12%)*	*$ 14,000*
	Grant total	**$ 129,000**

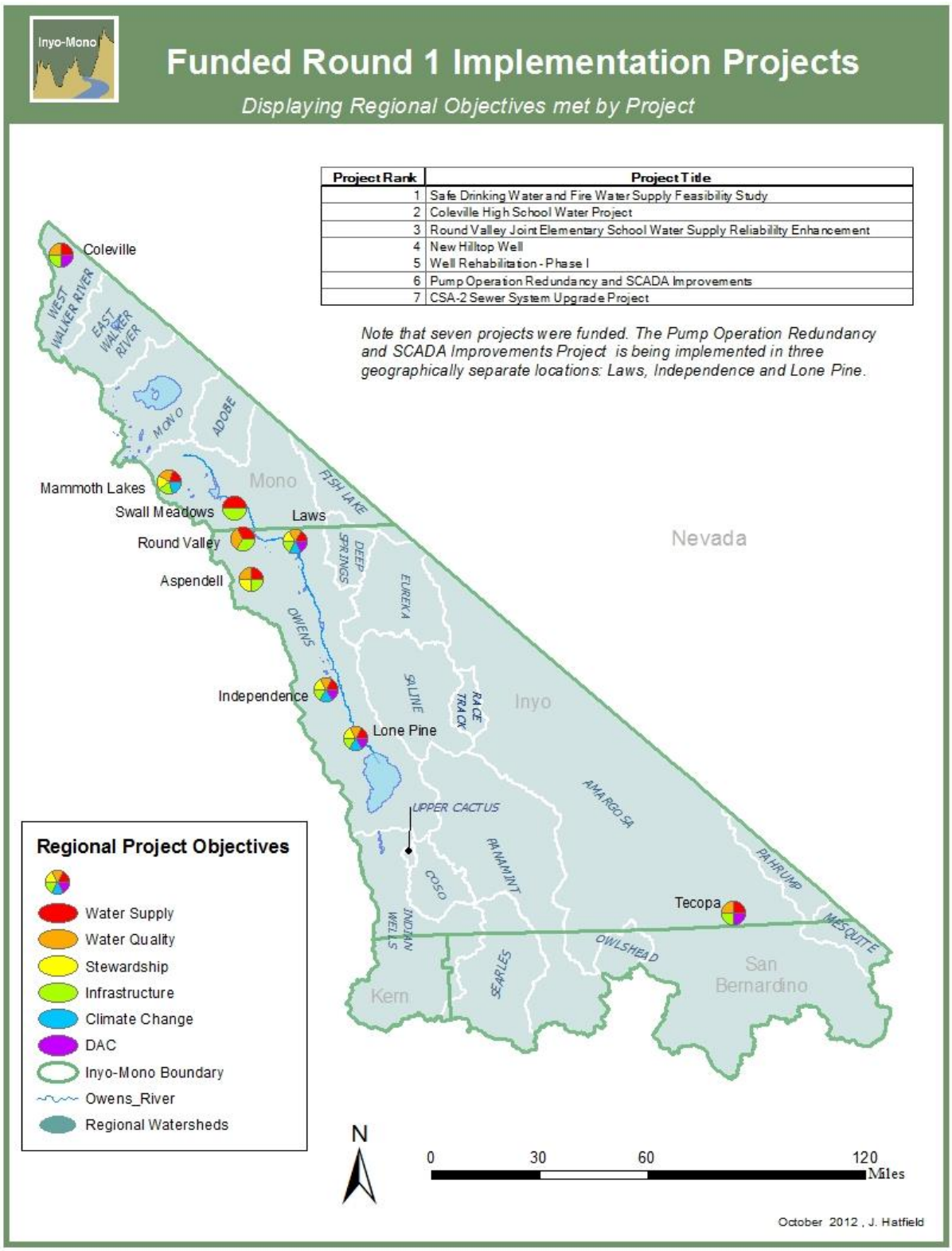
Project Implementation

In January, 2011, the Inyo-Mono IRWM Program submitted a proposal for Round 1 Prop. 84 Implementation funding in the amount of $4,299,858, with a match commitment of $1,400,409. Central Sierra Resources Conservation and Development was the grantee. In August, 2011, DWR presented the Inyo-Mono IRWM Program an award of $1,075,000, supporting seven distinct projects (see Table 9-5 and Figure 9-1 below).

Table 9-5. Funded Round 1 Implementation Projects

Project sponsor	Project title	Non-State Share (Funding Match)	Requested Grant Funding	Total
Armargosa Conservancy	Safe Drinking Water and Fire Water Supply Feasibility Study for Tecopa, California	$1,000	$65,172	$66,172
Inyo County	Pump Operation Redundancy and SCADA Improvement Project	$20,391	$62,708	$83,099
Round Valley Joint Elementary School District	Round Valley Joint Elementary School District Water Project	$30,300	$80,400	$110,700
Wheeler Crest Community Services District	New Hilltop Well	$62,100	$55,300	$117,400
Eastern Sierra Unified School District	Coleville High School Water Project	$88,667	$266,000	$354,667
Inyo County	CSA-2 Sewer System Improvements Project	$110,626	$310,895	$421,521
Mammoth Community Water District	Well Rehabilitation (Phase 1)	$37,000	$98,000	$135,000
Central Sierra RC&D	Central Sierra Grant Administration	$ -	$136,525	$136,525
Grant Total		**$350,084**	**$1,075,000**	**$1,425,084**

Figure 9-1: Funded Round 1 Implementation Projects

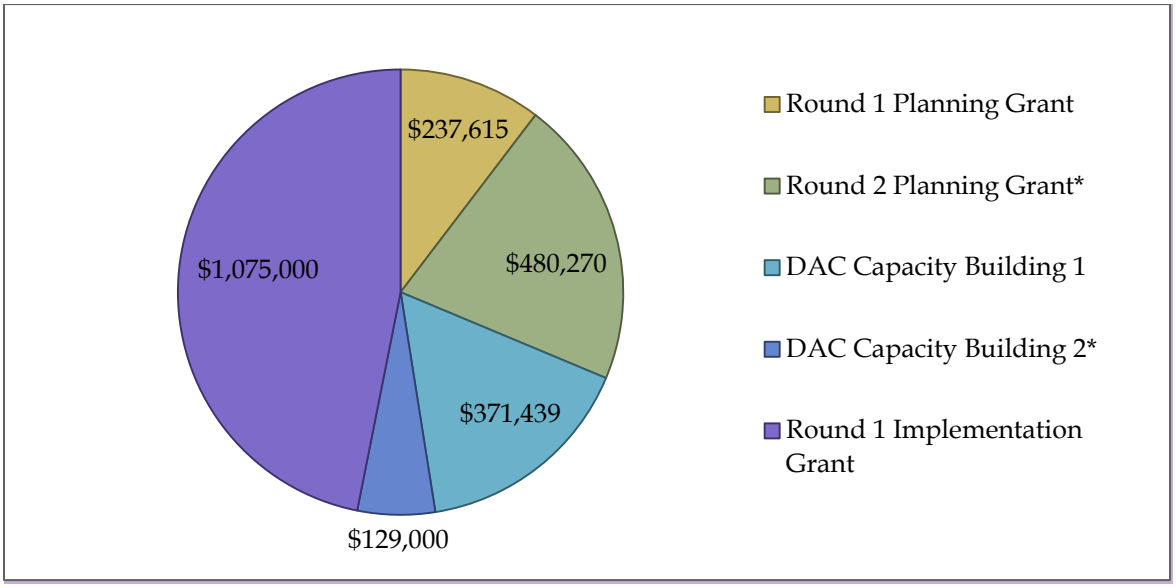


Funded Implementation projects shown within their respective watersheds

Summary of Funding to Date

Figure 9-2 summarizes Prop. 84 IRWM Program funding secured for the Inyo-Mono Program 2010-2012. Although modest for some regions, funding secured thus far represents a significant step forward in beginning to address regional needs. Important to note is that more than 50% of the funding secured thus far has, or will be, allocated to planning and capacity building needs as opposed to specific "implementation" projects. This is the case for two reasons: (1) planning funds are essential for the overall development and implementation of the Inyo-Mono IRWM Program, and (2) an overarching principle guiding the Inyo-Mono IRWM Program is the need and concerted effort to build regional capacity in order to more effectively respond to regional needs over the long-term. As regional capacity grows, it is anticipated that the ratio of planning to implementation funds will shift dramatically toward project implementation. In total, the Inyo-Mono IRWM Program has received almost $2.3 million in grant funding, the large majority of which has directly benefitted, and has remained in, the region. This money has created jobs, has supported the participation of DACs and tribes in the regional water management planning process, and has gone directly to regional entities to implement projects that improve water supply and water quality.

Figure 9-2. Prop. 84 IRWM Program funding secured for the Inyo-Mono region (2010-2012).



*As of the date of completion of this Plan, these grant awards are pending final notification from DWR.

Regional Funding Needs

Since the inception of the Inyo-Mono IRWM Program, there has been one round of Prop. 84 Implementation funding made available. The Inyo-Mono region submitted a proposal for Round 1 Implementation funding and received $1,075,000 (total funding request was for $4.3 million). These funds are supporting completion of seven projects in the region (see Chapter 12).

During the spring of 2012, the Inyo-Mono Program Office conducted a project needs assessment for the planning region. The objective of the assessment was to gain a broader understanding of the types of projects needing funding as well as the amount of funding that would be necessary to complete them (see Chapter 15 for additional information regarding the assessment and findings). Many entities with

known significant water-related issues did not provide information regarding project needs for one reason or another during this assessment, and therefore the findings are thought to be conservative. Regardless, the findings suggest that the total amount of funding needs for the region far exceeds $120 million, only slightly more than $1 million of which has been secured thus far. Moving forward, a concerted effort will need to be made to secure additional financial resources for the region.

Known and Possible Funding Sources, Programs, and Grant Opportunities

The California Financing Coordinating Committee

The California Financing Coordinating Committee (CFCC) was formed in 1998 and is made up of seven funding agencies: six state, and one federal. CFCC members facilitate and expedite the completion of various types of infrastructure projects by helping customers combine the resources of different agencies. Project information is shared among CFCC members so that additional resources can be identified. CFCC members conduct free Funding Fairs in several California communities each year to educate the public and potential customers about the different member agencies and the financial and technical resources available. Appendix C contains specific funding mechanisms and opportunities sponsored by members of the CFCC. Information about funding opportunities made available or publicized through the CFCC can be found at the following websites:

- California Financing Programs: http://cfcc.ca.gov/ca_financing.htm
- California Grant Programs: http://cfcc.ca.gov/ca_grant.htm
- Federal Financing Programs: http://cfcc.ca.gov/fed_financing.htm
- Federal Grant Programs: http://cfcc.ca.gov/fed_grant.htm

Other Online Funding Sources and Grant Opportunities

Federal grant opportunities and application information can be found at www.grants.gov.

The Foundation Center provides a resource for finding philanthropic funding for project needs: www.foundationcenter.org.

The Sierra Nevada Conservancy maintains a list of funding opportunities on its website: http://www.sierranevada.ca.gov/other-assistance/current-funding-opportunities.

Many other IRWM Programs have developed websites containing grant opportunity-related information. One such example is the North Coast IRWM Program funding opportunities webpage: www.northcoastirwmp.net/Content/103423/preview.html. A list of additional websites for selected IRWM regions can be found at: http://Inyo-Monowater.org/other-irwmp-regions/.

There are myriad funding resources available to support Native American tribal lands and resources:

Resources and References for Native Land and Trusts & Conservancies

- Indian Country Conservancy: http://www.indiancountryconservancy.org/
- Maidu Summit Consortium: http://www.maidusummit.org/
- Native American Land Conservancy: www.nalc4all.org/

Potential Funding Sources for Eco-Cultural Land Conservation

- Administration for Native Americans: www.acf.hhs.gov/programs/ana/programs/program_information.html
- California State Parks OHMVR Program: www.ohv.parks.ca.gov
- Council on Foundations: www.cof.org
- Environmental Grantmakers Association: www.ega.org
- First Nations Development Institute: www.firstnations.org
- Funding Exchange: www.fex.org
- Indian Land Tenure Fund: www.iltf.org
- International Funders for Indigenous Peoples: www.internationalfunders.org
- Lannan Foundation-Indigenous Communities Program: www.lannan.org/programs/indigenous-communities/
- National Park Service-Historic Preservation Grants: www.nps.ogv.hps/hpg/index.htm
- Seventh Generation Fund for Indian Development: www.7genfund.org
- The Christensen Fund: www.christensenfund.org
- U.S Fish and Wildlife Service -Tribal Grants : www.fsw.gov/grants/tribal.html

Alternative Funding Mechanisms for Projects that Implement the IRWM Plan

Below is a brief presentation of certain types of funding mechanisms other than grants that may be relevant to project needs in the region and to the implementation of the Phase II Inyo-Mono IRWM Plan.

Water Enterprise Fund

Water enterprise funds are generally used to account for operations that are financed and operated in a manner similar to private enterprises, with the intent being that the costs of providing goods or services to the general public on a continuing basis are financed or recovered primarily through user charges. The fund commonly includes:

1) Water Enterprise Utility Fund - accounts for activities relating to the operation of a community's water system, including water distribution and treatment.
2) Water Capital Projects - used to account for costs associated with large capital projects.
3) Water Impact Fees - accounts for connection charges paid by new users of a water system. Fees collected are to be used for future Water System Capital Improvements.

Financial Capacity: Rate Structure

Financial resources of a water system include, but are not limited to, revenue sufficiency, credit worthiness, and fiscal controls. It is necessary for a water system to have a budget and enough revenue coming in to cover costs, repairs, and replacements. Financial capacity recommendations related to rate structures include the following:

1) Revenues from drinking water sales should cover all public/private water system costs, including operating costs, maintenance costs, debt service costs, operating reserves, debt reserves, emergency equipment replacement reserves, and revenue collection costs.
2) Capital improvement funding for facilities needed for upgrading the existing system should come from revenue from water sales or other sources of capital. Rates should be set accordingly.

3) New connection fees, development fees, and other funding sources should cover all public water supply capital improvement costs for facilities needed for expanding the system for new customers. Fees should be set accordingly.
4) All drinking water-generated revenues should be used for drinking water purposes. For public water systems owned by entities that provide other services in addition to drinking water, drinking water purposes should include equitable share of administrative costs for the entire entity.

Bridge Loans: Revolving Loan Fund

The National Rural Water Association Revolving Loan Fund (RLF) was established under a grant from United States Department of Agriculture and Rural Utilities Services to provide financing to eligible utilities for pre-project costs associated with proposed water and wastewater projects. RLF funds can also be used with existing water/wastewater systems and the short-term costs incurred for replacement equipment, small-scale extension of services, or other small capital projects that are not a part of regular operations and maintenance. Systems applying must be public entities. This includes municipalities, counties, special purpose districts, Native American tribes and corporations not operated for profit, including cooperatives, with populations up to 10,000. For more information, interested parties can go to: http//www.nrwa.org/revolvingloan.htm.

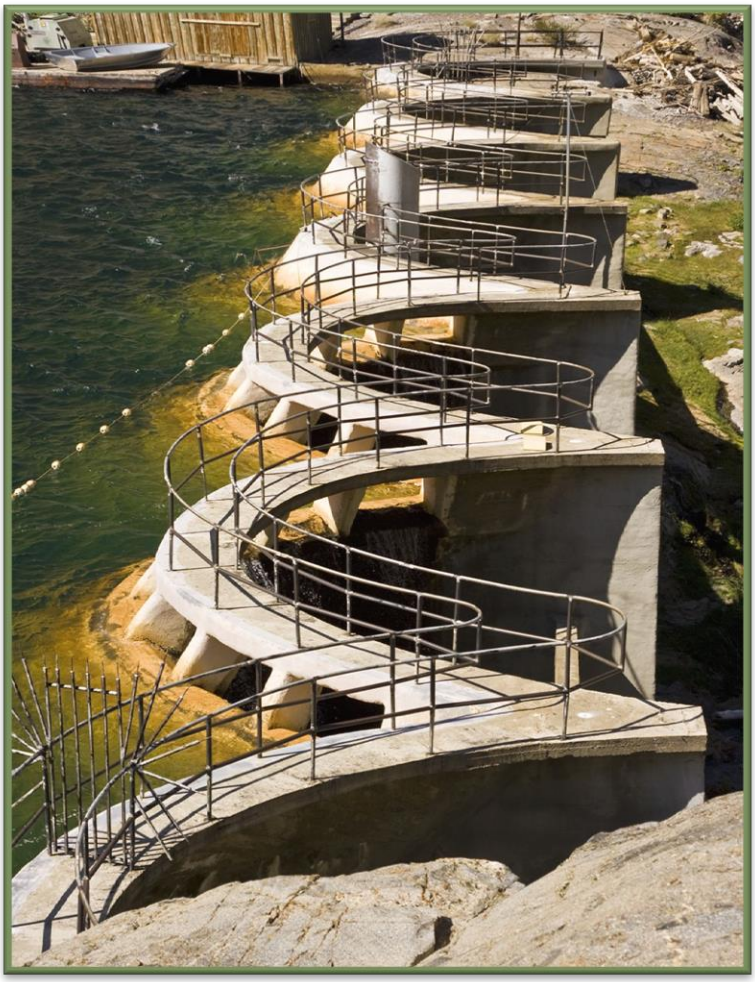
Certainty and Longevity of Known or Potential Funding

As described above, significant funding has been secured in support of the Inyo-Mono IRWM Program. This funding will provide resources to the Program through at least 2014. However, funding secured thus far is not sufficient to address all of our regional needs. Between now and the termination of existing funding, the Inyo-Mono IRWM Program will be pursuing a suite of funding opportunities, some currently identified, and some yet to be identified. In particular, the Inyo-Mono Program will be submitting applications for both Round 2 and Round 3 DWR Prop. 84 Implementation funding. Other funding sources such as the Proposition 1E stormwater and flood management funding may be pursued depending on project needs and the ability of project proponents to respond to funding match requirements. What is certain about these funding opportunities is the amount and approximate timeframe in which the funds will be made available. Less certain is the amount that the Inyo-Mono region may ultimately need or may ultimately secure. The reality is that, even with existing certainty of some funding sources, match requirements and the technical capacity to develop, implement, and administer certain grants is a challenge for the Inyo-Mono region.

Beyond the issue of technical capacity to pursue existing funding sources, the state of California's economy and that of the nation as a whole creates uncertainty with respect to future funding opportunities. The termination of Propositions 84 and 1E pose a significant challenge to IRWM regions, particularly since no additional bond funding is slated to become available in the near future. DWR is challenged with finding ways to help continue funding IRWM planning in California. Nonetheless, it has always been and will continue to be a regional priority to build capacity to secure and administer local, state, and federal funding in support of the Inyo-Mono IRWM Program and associated projects. Continued fundraising, capacity building, and the development of a long-term sustainable finance plan will help to create more funding certainties in the years ahead.

Operation and Maintenance Costs and Certainty of Funding

As part of the project review process for specific grant solicitations, project proponents are required to provide information specific to how long-term management of a given project will be ensured (Chapter 14). Included in this request are the expected means to address operation and maintenance expenses. Given the diversity of project proponents and the scope of their respective projects, there is not one single source, strategy, or plan to address operation and maintenance costs for all projects that implement the Inyo-Mono IRWM Plan. Instead, coordination of the various projects will involve financial monitoring and evaluation of progress being made (see Chapter 13). Monitoring and evaluation of projects will include identifying the status of necessary operation and maintenance expenses throughout the duration of the projects themselves and, when necessary, developing the means to ensure adequate resources are made available.



The Inyo-Mono RWMG recognizes, however, that securing adequate funding for operation and maintenance costs is challenging. Granting agencies often would rather fund capital improvement projects than operation and maintenance. Therefore, as a part of the long-term sustainable finance plan being developed by the RWMG, operation and maintenance will be a topic of particular focus.

The Inyo-Mono planning region has made significant strides towards addressing financial resource needs to develop and implement the Inyo-Mono IRWM planning program as well as to support on-the-ground implementation projects. At the same time, it is recognized that there is an enormous disparity between the financial resources that have already been secured relative to the needs of the region, and also between the financial needs of the region and the resources potentially available to the Inyo-Mono IRWM Program through Prop. 84, which are limited and only available via a competitive process. As noted above, the Inyo-Mono RWMG, with support from Round 2 Planning Grant funds, will develop and implement a long-term sustainable finance plan for 2013 and beyond. This plan is expected to result in the development of a diverse portfolio of funding strategies and opportunities responding to the scale and types of financial needs of the region.

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Chapter 10: Needs Assessment and Capacity Building

Introduction

Although a primary objective of the Integrated Regional Water Management Program is to bring funding to high-priority water resources projects within a region, the Inyo-Mono RWMG envisions a larger purpose. Throughout four years of conducting outreach in the Inyo-Mono region, we have come to realize that the resource needs of the region are not always financial. Many small water districts and DACs require resources in the form of time, technical expertise, or additional staff. The operating philosophy of the Inyo-Mono RWMG is that it is better to provide training on specific topics (grantwriting, CEQA, etc.) than to contract expensive consultants to do the work for us. Thus, another main objective of the Inyo-Mono IRWM Program is to assess the needs of stakeholders in the region and to bring resources to address those needs and to build capacity within stakeholder groups.

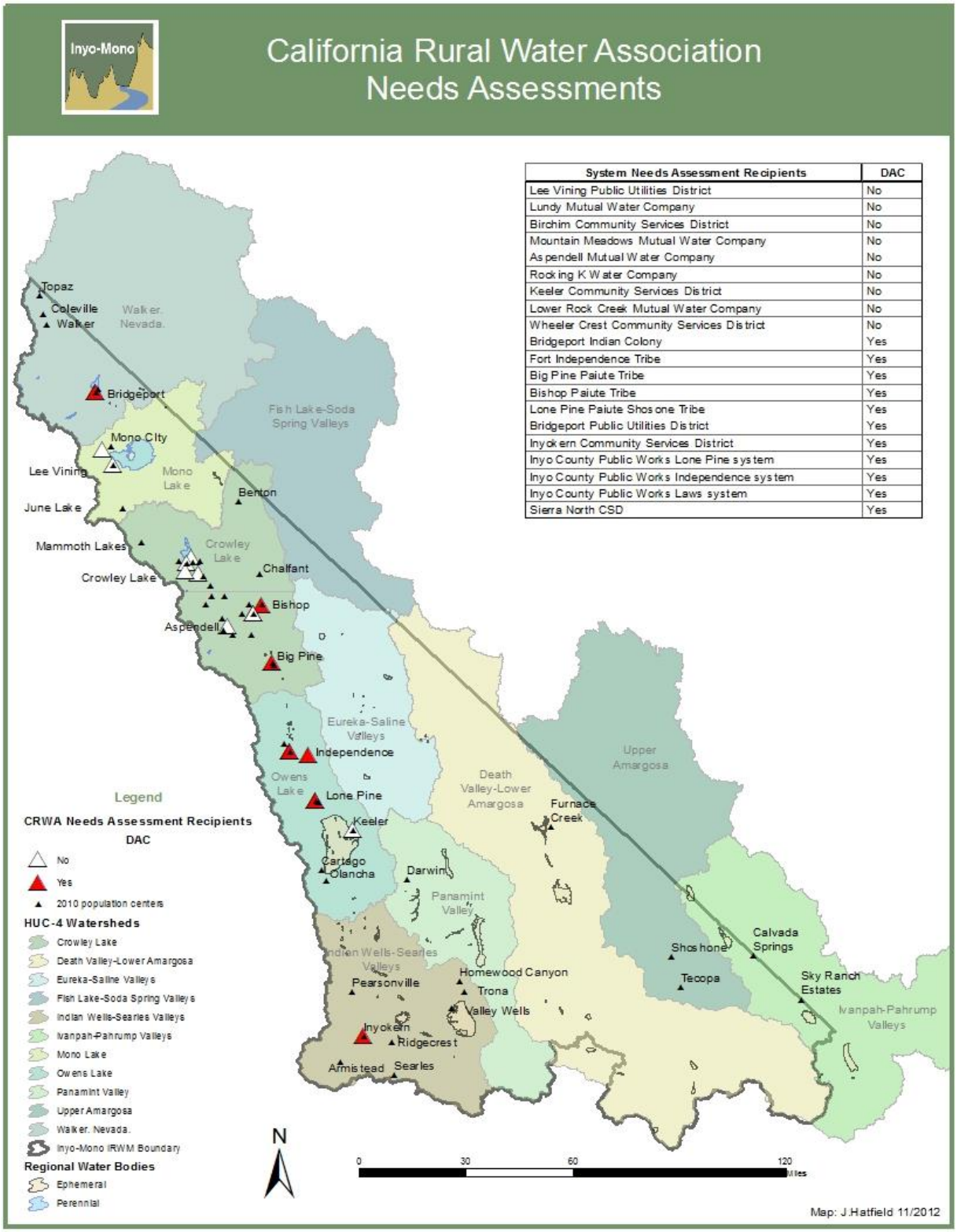
Needs Assessments

During preparation of the initial IRWM Plan, the group recognized that many of the small water systems and DACs of the region could benefit from independent evaluation and assistance toward improving operations. Early on, a relationship with the California Rural Water Association was forged. This organization is "dedicated to meeting the needs of water and wastewater systems by providing quality information, training and technical assistance in maintaining a high level of service to their communities" (California Rural Water Association, 2011). One of CRWA's services is to assess the needs of rural water systems with respect to each system's Technical, Managerial, and Financial (TMF) capacity for meeting applicable laws and regulations regarding drinking water and sustainability over the long term (California Rural Water Association, 2011).

During the autumn of 2011, the CRWA conducted needs assessments of 22 water systems in Inyo, Mono, and Kern Counties (Figure 10-1). These assessments were funded through a DWR Planning Grant and were conducted at 6 tribes, 10 public entities, and 6 private mutual water systems. Operators or board members of each system provided information to the CRWA representative, and they discussed the organizational capacity to provide safe drinking water and to comply with laws and regulations over the foreseeable future. These independent and standardized evaluations provided an opportunity to remind and/or educate each system operator about any outstanding needs for improving the TMF capacity of the system in a non-regulatory context.

A report that summarized problems identified in the needs assessments identified some common issues faced by small water systems in the Inyo-Mono Region (Reger, 2012). Five of the 22 systems had water quality issues because of either arsenic or uranium contamination in their water supply. Only one of these five is currently at the point where they are capable of moving to another source and therefore eliminating the concern. The other four still require additional funding or technical assistance to be able to address their contamination. As another fundamental problem, three of the 22 systems had managerial difficulties with day-to-day operations and inadequate information about the system infrastructure (Reger, 2012).

Figure 10-1: Needs Assessments conducted within the Inyo-Mono region in 2011.



System Needs Assessment Recipients	DAC
Lee Vining Public Utilities District	No
Lundy Mutual Water Company	No
Birchim Community Services District	No
Mountain Meadows Mutual Water Company	No
Aspendell Mutual Water Company	No
Rocking K Water Company	No
Keeler Community Services District	No
Lower Rock Creek Mutual Water Company	No
Wheeler Crest Community Services District	No
Bridgeport Indian Colony	Yes
Fort Independence Tribe	Yes
Big Pine Paiute Tribe	Yes
Bishop Paiute Tribe	Yes
Lone Pine Paiute Shoshone Tribe	Yes
Bridgeport Public Utilities District	Yes
Inyokern Community Services District	Yes
Inyo County Public Works Lone Pine system	Yes
Inyo County Public Works Independence system	Yes
Inyo County Public Works Laws system	Yes
Sierra North CSD	Yes

The map above shows recipients of CRWA Needs Assessments relative to the entities DAC status.

Aging infrastructure and an inability to replace and/or expand it in a timely manner were common problems in most of the systems. Very few systems had replaced any or all of their water mains and pipes in the last ten to twenty years, primarily because of anticipated high costs. Other needs identified by the study were installation of additional storage capacity for fire flow or other emergency situations and automated control of the system (Reger, 2012).

The compilation of technical, managerial, and financial (TMF) information gathered from each system showed a number of commonalities. Most water suppliers had operating plans, general and financial policies, ownership records, water rights, records of their current water capacity and usage, and emergency notification plans. Items that were commonly lacking were written operator instructions and job responsibilities, water conservation plans, five-year budgets, meters, and capital improvement plans (Reger, 2012)

Building Capacity

The results of the 22 needs assessments directly informed several subsequent RWMG efforts aimed at building capacity of stakeholder organizations in the region. These efforts mostly took the form of targeted workshops on a particular topic but also include the overall Inyo-Mono IRWM process.

Topical Workshops

A variety of training needs within the region became evident as the RWMG developed its organizational structure, assembled the initial IRWM Plan, and worked on the proposal for the first round of implementation funding.

Water Supplier Training by CRWA

The California Rural Water Association conducted three water-related workshops within the Inyo-Mono region during the autumn of 2011. Topics included Regulatory Review, Capital Improvements, and Water Shortage. In each of two workshops held in Mammoth Lakes and Bishop, 15 water system operators participated. A third workshop held in Independence benefitted another eight water systems. Water operators attending these workshops received six California Department of Public Health Water Contact Hours.

California Environmental Quality Act Compliance

During the process of preparing the proposal for the first round of implementation grants, many RWMG Members expressed a lack of knowledge about details of the state and federal environmental review laws (California Environmental Quality Act [CEQA] and National Environmental Policy Act [NEPA]). The RWMG attempted to build capacity among its Members and participants by organizing a series of workshops about CEQA. Although several participants in the Inyo-Mono RWMG are federal agencies (two National Forests, Bureau of Land Management, National Park Service, and federally-recognized tribes) or occasionally have projects in

which they partner with a federal agency, a NEPA-specific workshop has yet to be developed for our region.

Four CEQA workshops were held during December of 2011 in Ridgecrest, Bishop, Mammoth Lakes, and Bridgeport. Three workshops provided an introduction to preparing CEQA documentation as a project proponent. These were titled "Water Resources and the California Environmental Quality Act" and were generously provided in-kind by the Law Firm of Chatten-Brown and Carstens of southern California. The fourth workshop was more general in scope and was organized from the perspective of reviewing and commenting on an environmental review. This workshop was conducted by the Planning and Conservation League of Sacramento and roughly followed their standard outline for such sessions. Details may be found at http://www.pclfoundation.org/events/aboutceqaworkshops.html.

Grant Writing Skills

An obvious disparity between a rural region such as the Inyo-Mono Region and many of the large urban or irrigation-district based RWMGs elsewhere in California is the lack of technical and managerial capacity to prepare thoroughly competent and competitive proposals for funding. RWMGs that include large urban water utilities and/or large well-funded irrigation districts have significant advantages with technical staff, consultants, and internal funding over rural RWMGs with respect to proposal development. There is a strong need to greatly improve the capacity of small rural water entities to prepare adequate proposals. Similarly, economically-disadvantaged communities and their water suppliers need significant help in improving their grant-writing capabilities to be better prepared to respond to the funding opportunities of the IRWM Program and others.

The Inyo-Mono RWMG took an initial step to build capacity for grant writing with a series of workshops offered in June, 2012. Three workshops were held – one each in Independence, Bishop, and Lee Vining. Each workshop covered the fundamentals of responding to requests for proposals. The sessions were interactive, and the participants informed their peers about many useful experiences. Although overall attendance was rather limited, the participants gave favorable reviews of the workshops and encouraged the RWMG to offer additional workshops. The Group plans to do so with funding from its Disadvantaged Communities grant.

Process-based Capacity Building

The IRWM planning process in the Inyo-Mono region has contributed to increased knowledge, abilities, contacts, referral resources, and funding opportunities -- often collectively called "building capacity" -- among the groups, agencies, and individuals participating in the RWMG. Capacity of Inyo-Mono RWMG Members and affiliates has been enhanced simply by participating in the routine meetings of the RWMG. The regular meetings as well as work on the Plan and various proposals have increased knowledge and understanding of technical and policy matters relating to water in the region and the state. Through collaboration within the RWMG, we have improved our understanding of local issues, problems, and solutions that our neighbors have employed. Through involvement with the IRWM planning process, we have improved our understanding of statewide priorities and program preferences and solutions adopted by other regions. The creation, development, review, and revision of suitable projects for potential IRWM Program funding have certainly improved the ability of many RWMG participants to consider and craft quality proposals and projects.

The RWMG meetings have provided avenues for networking among attendees and secondary

associates such as contractors, advisors, and colleagues who have been recommended by a RWMG attendee as a means of advising on or solving a particular problem. These contacts have greatly increased the flow of information among people involved in the full range of water resources activities within the Inyo-Mono Region. Such networking activity has also provided an opportunity for technical assistance between peers.

As an example of building capacity among IRWM regions, the Inyo-Mono RWMG continues to participate in interregional groups and events. A Sierra IRWMP Summit in October, 2009, and a Sierra Water Workgroup Summit in July, 2012, both sponsored by the Sierra Nevada Conservancy and Sierra Nevada Alliance, provided excellent opportunities to learn from other IRWM groups in the Sierra Nevada. Both formal presentations and informal conversations allowed participants to exchange information, resources, and ideas with peer IRWM groups elsewhere in the Sierra Nevada. (See also Chapter 8, Coordination, for more information on interregional collaborations.)

Lastly, the Inyo-Mono RWMG website has been instrumental in local capacity building. Besides providing timely news about RWMG activities, meetings of other organizations, funding opportunities, and training possibilities, the website is an excellent resource and library for research papers, technical studies, maps, planning reports, and other useful documents concerning water in the region.

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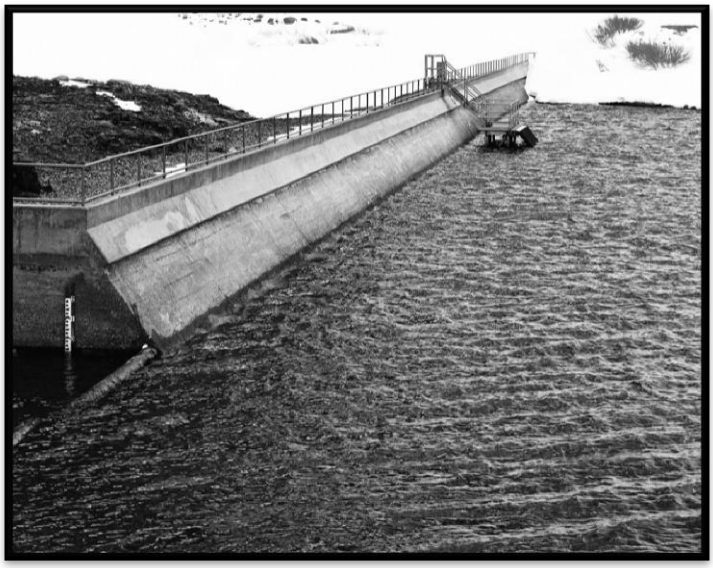
Chapter 11: Land Use and Water Planning Documents Integration

Introduction



As described thoroughly in the Regional Description (Chapter 2), the Inyo Mono region is unique, particularly given its rural nature and extensive public land holdings. Geographically speaking, the Inyo-Mono region is vast, remote, and relatively undeveloped, resembling its neighbor Nevada much more closely than the more urban and developed areas characteristic of much of California. Although the assumption may be that Inyo-Mono regional water management issues are simplistic, in fact, they are surprisingly complex and unique to the region. Matters regarding water rights and exports remain contentious within the region. Other regional issues trend toward watershed stewardship, particularly relative to federal lands, along with addressing the fundamental community water needs one would expect from largely an economically disadvantaged region.

A contentious, complex and often colorful history with respect to water acquisition and rights began to paint the backdrop in the region early in the 1900s (Chapter 2). For over 100 years, water disputes have continued between the City of Los Angeles and some agencies and residents of Inyo and Mono Counties. Although outstanding issues persist, past events have resulted in a plethora of legal agreements, monitoring mandates, and environmental checks and balances put in place as resolution strategies among the various parties as well as to provide environmental monitoring standards to which all parties agree.

Outside of the Los Angeles specific planning documents, the Inyo-Mono region encompasses multiple other vital planning efforts of various types, including environmental mandates in support of public sector planning needs. The planning efforts discussed herein are the assemblage of a variety of land management agencies ranging from the Federal and State levels to tribal and municipal levels.

The Inyo-Mono IRWM Planning effort relies on stakeholder involvement to encapsulate the goals and objectives of the numerous water-related entities within the Region, thus fundamentally incorporating those goals and objectives into the foundation of the IRWM Planning effort. A by-product of the gap analysis of both the spatial and topical deficiencies of our planning efforts is the collation of new planning documents that build upon preexisting documents identified in the Phase I IRWM Plan. The identification and organization of available planning documents assists stakeholders to recognize established planning efforts, identify persistent planning gaps, as well as provide a useful resource that will help enable the

region to integrate such planning actions with that of the Inyo-Mono IRWM Plan. Ideally this strategy reduces redundant planning efforts, provides a centralized clearinghouse for water-related planning documents, and promotes integration by bringing awareness of past, current and, in some cases, future planning efforts throughout the Region.

In an effort to facilitate integration of proposed planning actions into pre-existing planning efforts on a level previously unattainable by the membership, the Inyo-Mono Program Office has created a digital library with electronic versions of the known planning documents. Hosted on the Inyo-Mono IRWM website, (http://inyo-monowater.org/library/), the organization of these planning efforts enable members to familiarize themselves with past and current planning efforts in the region.

Important to the planning needs of the Inyo-Mono region is functionally linking identified goals, objectives and resource management strategies not only theoretically but practically to the individual planning efforts in the region. In doing so, the IRWM Program can build upon sound regionally accepted goals and objectives. With a concrete foundation, the Inyo-Mono IRWM Program can improve on its desire to bridge the gap between disparate planning efforts and in doing so realize landscape-scale collaboration and resource management planning that leads to responsible land management stewardship as well as beneficial economies of scale.

Methods

A six-step process was undertaken to complete the documents analysis for the Inyo-Mono region. Step one of the analysis was performed concurrent with the Phase I planning effort and resulted in the creation of a Mandatory Documents Table. This table led to the assembly of water related planning documents within the Inyo-Mono region. A cumulative 50 documents were identified in Phase I and were organized alphabetically into table format identifying the document title, the portion of the planning region to which the document pertained, whether or not the Program Office had physically acquired said planning document(s), the source location where the document was obtained, a brief narrative summary of the document's contents and what it aimed to achieve, as well as the year the document was completed or revised (Appendix D).

For the Phase II Plan, based on the Mandatory Documents Table, step two involved an initial website investigation with the goal of determining how many documents had been developed since the time of the Phase I planning effort. The next step in the search effort was to delve further into the existing table and find source location information for the documents that were initially mentioned but not obtained by the Inyo-Mono Program Office.

The Inyo-Mono region has a history of attracting research entities, presumably due to the unique nature and diversity of the landscape. To the region's benefit, many natural and social scientists have migrated to live and work in the eastern Sierra and have become involved in the Inyo-Mono IRWM planning process. As a third step to the process, these experts were extensively utilized for their knowledge in the many specialized fields pertaining to land and resource management planning within the region. Conversations with these individuals opened new doors and filled in many ambiguous holes in the documents table.

The fourth step centered on communicating with neighboring IRWM planning regions regarding intra-regionally relevant documents. Multiple regional websites and plans were consulted in an effort to generate ideas for new planning document procurement and integration into the Inyo-Mono Phase II planning process.

In a region as large as the Inyo-Mono, it is quite evident where spatial gaps exist within planning documents. A spatial approach was implemented as a fifth phase in the analysis and yielded numerous new planning efforts for addition to our growing list. Primarily, planning documents relevant to large expanses of scarcely populated desert regions were obtained. These documents cover large expanses of the Mojave Desert as well as Death Valley National Park/Preserve that were not previously accounted for or incorporated into the IRWM effort.

The final step in evaluation of planning efforts across the region began by revisiting initial Goals, Objectives, and Resource Management Strategies from the Phase I Plan. In doing so, thought processes were exposed to a multi-angled resource management approach. Plans were sought out that featured intrinsic ecosystem approaches to land management planning and their effects on watersheds. These unique efforts are acknowledged through the inclusion process of multiple plans into this chapter and the associated documents table (Appendix D).

Relevant Planning Documents to Inyo-Mono IRWM Program

Planning documents are extensive in a region of our magnitude and therefore have been categorized in an effort to make a concise summary for the reader. More detailed summaries for each document can be found in Appendix D.

Federal

Legislation at the national level that drives water quality protection and management and are pertinent to the Inyo-Mono region include the:

1) Federal Water Pollution Control Act [AKA: The Clean Water Act (1972)]
2) Safe Drinking Water Act (1974)
3) Endangered Species Act (1973)
4) Clean Air Act (1970)

5) Bioterrorism Act (2002)
6) EPA Water Quality Standards Handbook: Second Edition (2007)
7) Code of Federal Regulations, Title 40: Protection of the Environment Chapter 1: EPA, Subchapter D: Water Programs Part 131: Water Quality Standards

The U.S. Environmental Protection Agency houses most of this legislation on its website for convenient reference. These laws drive protection of all environmental resources within the Region on a fundamental level. For organizational purposes, the planning documents and reports resultant of one of the aforementioned legislative acts will be accounted for within one of the categorical sections described below.

Most recently, the Interagency Climate Change Adaptation Task Force has drafted a *National Action Plan: Priorities for Managing Freshwater Resources in a Changing Climate (2011).* This plan defines a national goal for water resources management: "*Government agencies and citizens collaboratively manage freshwater resources in response to a changing climate in order to assure adequate water supplies, to protect human life, health and property, and to protect water quality and aquatic ecosystems"* (National Action Plan, 2011). The plan further provides six recommended strategies to federal agencies in an effort to assist them with achievement of this goal.

State

The following legislation and planning reports provide further direction specific to water quality, quantity, and supply reliability requirements at the State level. The majority of these documents are ushered in by the California Department of Water Resources (DWR) and the State Water Resources Control Board (SWRCB). Efforts initiated outside these two entities are largely resultant of private interest groups with specific water quality, quantity or supply reliability concerns driving legislation and water resources management planning forward.

State Legislation

1) Local Groundwater Management Assistance Act: AB 303 (2000)
2) California Fish and Game Code Section 5937 (1937)
3) California State Senate Bill 1307: Chapter 734, Public Water Systems (1997)

DWR

1) California State Water Conservation Act: SBX7-7 Local (2009)
2) California Groundwater Bulletin 118 Update (2003)
3) California State- Urban Water Management Planning Act: CWC §§ 10610 -10656 (2010)
4) California Water Plan Update (2009)
5) Climate Change Handbook: Regional Water Management Planning with Climate Change Adaptation and Mitigation (2011)
6) Managing an Uncertain Future: Climate Change Adaptation strategies for California's Water Resources (2008)

SWRCB

1) California Pesticide Management Plan for Water Quality (1997)
2) California State Porter-Cologne Water Quality Control Act (1969) (Update 2011)

3) California State Rangeland Water Quality Management Plan (1995)
4) Plan for California's Nonpoint Source Pollution Control Program (2000)
5) California State Assembly Bill 739: Chapters 610, Stormwater Management (2007)

State Environmental Plans/Programs/Publications

1) Drops of Energy: Conserving Urban Water in California to Reduce Greenhouse Gas Emissions (2011)

Region-Wide Multi-Watershed Management Areas

Federal land ownership dominates the region, comprising 92% and 84% of Inyo and Mono Counties, respectively. The Los Angeles Department of Water and Power by comparison owns 3-4% in each of the two counties (http://www.inyomonoagriculture.com/). The Inyo-Mono IRWM Program acknowledges these enormous percentages of land ownership by the various federal agencies, and in turn has sought active participation with representative resource managers. Both parties acknowledge that establishment of a cooperative relationship between various agencies and the local IRWM Program is paramount to the success of integrated water resources and land management planning throughout the Inyo-Mono region. The following planning efforts have been instrumental in the Phase II planning efforts.

SWRCB

1) Water Quality Control Plan for the Lahontan Region: Basin Plan (1995)
2) Watershed Management Initiative: Lahontan Region (2006)

United States Forest Service

1) A Summary of current trends and probable future trends in climate change and climate driven processes in the Inyo National Forest and adjacent lands (2011)
2) Humboldt National Forest Land and Resource Management Plan (1986)
3) Humboldt-Toiyabe National Forest Climate Change Vulnerability Report (2011)
4) Inyo National Forest Land and Resource Management Plan (1988)
5) Inyo National Forest Wilderness Management Plan and EIS (2001)
6) Kern Wild and Scenic River Management Plan (1994)
7) Sierra Nevada Forest Plan Amendment (1994)
8) Sierra Nevada Forest Plan Amendment: Draft SEIS (2010)
9) South Sierra Wilderness Management Plan: Environmental Assessment (1991)
10) Toiyabe National Forest Land and Resource Management Plan (1986)
11) Watershed Condition Framework (2011)

Bureau of Land Management

1) BLM Bishop Field Office Resource Management Plan Record of Decision (1993)
2) BLM California Desert Conservation Area Plan (1980-1999)
3) BLM-Northern and Eastern Mojave Desert Management Plan (NEMO) and EIR (2002)
4) BLM-Northern and Eastern Mojave Desert (NEMO) ROD (2002)

National Park Service

1) Death Valley, General Management Plan (2002)

2) Death Valley, Furnace Creek Springs Restoration and Adaptive Management Plan (2012)
3) Death Valley, Water Resources Stewardship Monitoring Report (Expected, 2012)
4) Death Valley, Water Resources Stewardship Monitoring Plan (Expected 2012)
5) Death Valley, Saline Warm Springs Management Plan and EIS (Expected 2014)
6) Death Valley, Wilderness Plan (TBA)
7) Death Valley, Fire Management Plan (2007)
8) Devils Postpile General Management Plan (Expected 2013)

Inyo/Mono Agricultural Commissioner's Office

1) Annual Reports: Invasive Weed Control and Eradication Activities in Inyo and Mono Counties (2008-2010)
2) Eastern Sierra Weed Management Area MOU (2010)
3) Eastern Sierra Weed Management Area Strategic Plan (Date Unknown)

Regional Plans

The size and diversity of the planning region yield abundant planning efforts at the regional level. They have been categorically divided below in order to simplify summarizing the scope of the documents. Due to the unique role of the Los Angeles Department of Water and Power within the region, a separate subheading has been designated to house documents relating to the complex interrelationship between the City and the two Counties. While some of these documents could easily be organized under more general subheadings, we have elected to apportion these documents to the Los-Angeles-Inyo-Mono County Plans/Reports section in an effort to best describe the current climate and working relationships between involved entities.

Watershed/Groundwater Management Plans/ Reports

Watershed and groundwater management plans are the backbone of the IRWM planning process. Without these documents, a successful IRWM planning process is not plausible. These plans create linkages between water quality and water quantity problems and conditions, processes, and activities occurring within the respective watersheds. Defined in these Plans are goals, objectives, and best management practices (where applicable) as well as historical, current, and desired future conditions of the watershed.

1) Amargosa Water Report: Draft (2007)
2) Bishop Creek Watershed Management Plan (Expected, 2013)
3) East Walker River Watershed Management Plan (2012)
4) East Walker River Watershed Assessment (2012)
5) Fish Slough Management Plan (USFWS, Update Expected, 2012)
6) Groundwater Management Plan for the Mammoth Basin Watershed (2005)
7) Mammoth Creek Environmental Impact Report – Final (2011)
8) Mono Basin Watershed Management Plan (2007)
9) Mono Basin Watershed Assessment (2007)
10) North Mono Basin Watershed Analysis (2001)
11) Upper Owens River Watershed Assessment (2007)
12) Upper Owens River Watershed Management Plan (2007)
13) Walker River Geographic Response Plan:Draft (2006)

14) West Walker River Watershed Management Plan (2007)
15) West Walker River Watershed Assessment (2007)

City of Los-Angeles-Inyo-Mono County Plans/Reports

Water management and export activities by the City of Los Angeles over the past century and associated legal and administrative decisions in recent decades have generated various documents that guide and report about many aspects of current water management by the Los Angeles Department of Water and Power within the region.

1) Agreement Between the County of Inyo and the City of Los Angeles DWP on a Long Term Groundwater Management Plan for Owens Valley and Inyo County: Long Term Water Agreement (1991)
2) Annual Reports: LADWP, Owens Valley Report (2006-2011)
3) Annual Reports: Inyo County, Owens Valley Monitor (1998-2011)
4) Annual Compliance Report to SWRCB: Mono Basin (2003-2011)
5) City of Los Angeles Water Supply Plan: Securing LA's Water Supply (2008)
6) Conservation Strategy for the Southwestern Willow Flycatcher (2005)
7) Final Ad Hoc Yellow Billed Cuckoo Habitat Enhancement Plan (2005)
8) Green Book for the Long-term Groundwater Management Plan for the Owens Valley and Inyo County (1990)
9) Habitat Conservation Plan for the Owens Valley (Expected, Spring 2013)
10) Habitat Management Plan: Owens Lake (2010)
11) Initial Study and Mitigated Negative Declaration for Owens Dry Lake Phase 8 Dust Control Measures (2010)
12) Initial Study and Mitigated Negative Declaration for Additional Mitigation Projects developed by the MOU Ad Hoc Group (2010)
13) Lower Owens River Project (LORP) Action Plan (Appendix to the MOU between Inyo County, LADWP, et al. re: Implementation of the LORP; 1997)
14) LORP- Annual Operations Plan (2009-2010)
15) LORP- Ecosystem Management Plan (2002)
16) LORP- Monitoring, Adaptive Management , and Reporting Plan (2008)
17) LORP- Recreational Use Plan- Existing conditions memo (2011)
18) LORP-Annual Report (2010)
19) LORP- Final EIR (2004)
20) Mono Basin Environmental Impact Report (1993)
21) Mono Basin: Grant Lake Operations and Management Plan (1996)
22) Mono Basin: Rush and Lee Vining Creek Instream Flow Study (2008)
23) Mono Basin: State Water Resources Control Board Restoration Order 98-05 (1998)
24) Mono Basin: State Water Resources Control Board Restoration Order 98-07 (1998)
25) Mono Basin Stream and Stream Channel Restoration Plan (1996)
26) Mono Basin Waterfowl Habitat Restoration Plan (1996)
27) Mono Lake Basin Water Right Decision 1631 (1994)
28) MOU between Inyo County, City of Los Angeles, Sierra Club, Owens Valley Committee, CA Dept. of Fish and Game and California State Lands Commission (1997)

29) Owens Lake Master Plan: Draft (2011)
30) Owens Valley Land Management Plan (2011)
31) Owens Valley PM10 Planning Area Demonstration of Attainment State Implementation Plan (2008)
32) Owens Valley PM10 Planning Area Demonstration of Attainment State Implementation Plan Final Subsequent Environmental Impact Report (2008)

Relevant Reports (Research/Advocacy/Conservation/Compliance)

While not technically considered planning documents, the following reports were recognized by the Inyo-Mono IRWM Program Office to be valuable supporting documents to the Region's planning efforts. A newer component of these reports include climate change, although limited data are available regarding effects of changing climate within the region.

As required by Section 4(f) of the *Endangered Species Act* (1973), recovery plans are required to ensure the adequate protection and monitoring of said species. The resulting documents support the monitoring and management of those unique resources. Also included under this heading are conservation plans for several of the resource conservation organizations that operate within the regional boundaries.

Section 305(b) of the *Clean Water Act* mandates biennial assessments of the nation's water resources. From these assessments an impaired water bodies list is formulated. Sixteen water bodies within the region have been listed as impaired according to the CWA 303(d) list (see also Chapter 2): Amargosa River, Bodie Creek, Bridgeport Reservoir, Buckeye Creek, Crowley Lake, East Walker River, Haiwee Reservoir, Hilton Creek, Mammoth Creek, Mesquite Springs, Mono Lake, Pleasant Valley Reservoir, Robinson Creek, Rock Creek, Searles Lake and Swauger Creek. The associated reports are listed here.

1) Bodie Creek Project Report: Total Maximum Daily Loads for Metals (2003)
2) Bridgeport Reservoir: Report on Beneficial Use Impairment: Limnology in the Summer-Fall 2000 and comparisons with 1989 (2003)
3) Crowley Lake: Assessment of internal nutrient loading to Crowley Lake (2003)
4) Crowley Lake: Environmental Assessment for Crowley Lake Watershed Grazing Allotment Analysis (2009)
5) Crowley Lake: Recommendations to delist Crowley Lake for Nitrogen and Phosphorus (2005)
6) Crowley Lake: Restoration of riparian habitat and assessment of riparian corridor fencing and other watershed best management practices on nutrient loading and eutrophication of Crowley Lake, CA (2003)
7) Dry Creek: Hydrologic Assessment of the Dry Creek Drainage for Mammoth Mountain Ski Area (2007)
8) Fish Slough Milk Vetch: 5 Year Review and Summary (2009)
9) Haiwee Reservoir: Total Maximum Daily Loads for Copper (2001)
10) Kern River: Restoration of the California Golden Trout in the South Fork Kern River, Kern Plateau (2008)
11) Lahontan Cutthroat Trout Recovery Plan (1995)
12) Mill Creek Settlement Agreement (FERC relicensing) P-1390-040 (2007)
13) Owens Basin Wetland and Aquatic Species Recovery Plan- Inyo and Mono Counties (1998)
14) Owens Pupfish- 5 Year Review Summary and Evaluation (2009)
15) Owens TuiChub-5 year Review Summary and Evaluation (2009)

16) Proposition 13 - Southwest Wellfield Recharge Feasibility Study (2005)
17) Proposition 50 - Testing of Zero-Liquid Discharge Technologies Using Brackish Groundwater for Inland Desert Communities (2010)
18) Prospects for Wetland Conservation in Mono County (2007)
19) Short-Term Action Plan for Lahontan Cutthroat Trout in the Walker River Basin (2003)
20) West Walker River Lahontan Cutthroat Trout Recovery Plan (2003)

Local Government Plans

The documents below reflect current planning requirements applicable to various tiers of government with the Inyo-Mono region.

County Plans

Per California State regulations, "Each planning agency shall prepare and the legislative body of each county and city shall adopt a comprehensive, long-term general plan for the physical development of the county or city, and of any land outside its boundaries which in the planning agency's judgment bears relation to its planning" (Cal. Gov. Code §65300).

1) Inyo County General Plan Update (2001)
2) Inyo County Groundwater Ordinance (1998)
3) Inyo County Resolution No. 99-43 (1997)
4) Kern County General Plan (2009)
5) Kern County Groundwater Ordinance (1998)
6) Mono County General Plan (1997) and Update (2001)
7) Mono County Master Environmental Assessment (2001) and Update (2010)
8) San Bernardino County General Plan (2007) Amended (2011)

Urban Water Management Plans

As required by the California State- Urban Water Management Planning Act of 1983 (CWC §10610, §10656), "all water suppliers which provide water to 3,000 or more connections, or provide over 3,000 acre-feet of water annually, take action to ensure reliability in its water service sufficient to meet customer needs during normal, dry, and multiple dry years" (Urban Water Management Planning Act, 1983). The plans below are efforts to remain compliant with current State regulations:

1) City of Los Angeles DWP Urban Water Management Plan (2010)
2) Indian Wells Valley Urban Water Management Plan (2010)
3) Mammoth Community Water District Urban Water Management Plan (2011)

City/Town Plans

Per California State regulations, "Each planning agency shall prepare and the legislative body of each county and city shall adopt a comprehensive, long-term general plan for the physical development of the county or city, and of any land outside its boundaries which in the planning agency's judgment bears relation to its planning" (Cal. Gov. Code §65300). Below illustrates the planning efforts of the few incorporated towns and cities within the region.

1) City of Bishop General Plan and Update (2011)

2) City of Bishop Wastewater Master Plan (2008)
3) City of Bishop Water Master Plan (2008)
4) City of Bishop Parks and Recreation Master Plan (2008)
5) City of Ridgecrest General Plan (2009)
6) June Lake 2010 Area Plan (2010)
7) Town of Mammoth Lakes General Plan Update (2007)
8) Town of Mammoth Lakes – General Plan-Final EIR (2007)
9) Town of Mammoth Lakes - Parks and Recreation Master Plan: Draft (2008)
10) Town of Mammoth Lakes – Storm Drain Master Plan (1984*)
11) Town of Mammoth Lakes - Storm Drain Master Plan Update (2005)
12) Mammoth Mountain Ski Area Master Development Plan (Expected, 2012)
13) Town of Mammoth Lakes-Downtown Neighborhood District Plan (2010)

* Indicates baseline plan needed in tandem with updated or revised plan.

Tribal Plans

"Where Tribes qualify to be treated as States for the purposes of water quality standards, EPA has the responsibility to assist the Tribe in establishing standards that are appropriate for the reservation and consistent with the Clean Water Act. EPA recognizes that Tribes have limited resources for development of water quality standards" (40 CFR 131.3-1.8.6). The following plans are products of area tribes eligible to be included in the Water Quality Standards Program as outlined in the EPA Water Quality Handbook.

http://water.epa.gov/scitech/swguidance/standards/handbook/chapter01.cfm#section8

1) Bishop Paiute Tribe Water Quality Control Plan (2007)
2) Water Quality Standards, Big Pine Reservation (2005)

Small Water Company Plans

There are vast numbers of small water purveyors that operate within the Inyo-Mono Region. Planning efforts required by these entities are a product of the larger Federal Safe Water Drinking Act. Unfortunately, most lack necessary resources to comply with required/desired planning efforts as is clearly illustrated by the meager list below. Under the current Planning Grant, needs assessments are underway in an effort to identify deficiencies in at least some of these small water systems throughout the region, and provide assistance to these entities in an attempt to improve compliance standards.

1) June Lake PUD Master Water Plan Update (2007)

Analysis Findings

It is predictable that a region of our size and rural nature retains a multitude of deficiencies in its planning efforts. The majority of the Inyo-Mono region is categorically included under the definition of a Disadvantaged Community. The lack of resources to assist with needed planning efforts reveals itself rapidly when comparing our planning efforts to that of more advantaged regions. Glaring deficiencies are most prominent when considering tribes and small water districts regardless of DAC status. The remote nature of the region also contributes to significant planning gaps. Where human inhabitance and visitation populations are low, planning by default remains a low priority.

The exercise identifying planning documents available within the Inyo-Mono region has yielded significant benefits to the Inyo-Mono IRWM Program. Through this process, planning voids have revealed themselves through familiarization with governing legislation, as well as through similarity comparisons of planning efforts between entities. By acknowledging these deficiencies, the Inyo-Mono IRWM Program has gained a heightened awareness of the planning needs within the Region.

The Inyo-Mono Program Office has made the documents discussed above readily available in digital format on the program website (http://inyo-monowater.org/library/) in dual user-friendly searchable formats. Further, each document has been collected into a table (Appendix D) that remains congruent with the organization of this chapter. Within this table, detailed information is offered for each document, including but not limited to, source location information and a brief summary of the purpose and scope of each entry.

The aforementioned documents will be updated on an as-needed basis when brought to the attention to the Program Office by its membership. In addition, an annual reminder will be issued at the first Regional Water Management Group regular meeting of the year to prompt Members to revisit the relevant documents library and provide the Program Office with updated or new planning documents as the need arises.

It is the aim of the Inyo-Mono IRWM Program to utilize this newly organized information to capture planning needs, identify how we can better meet those needs, and emphasize integration of future projects within the region.

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Chapter 12: Plan Implementation

Introduction

Creating and implementing an effective IRWM Plan requires an understanding of the regional geography, water resources, demographics, economy, and current issues regarding water use and management. The planning process also must take into consideration ongoing concurrent planning efforts, data, and planning gaps, and must combine all the information into a coherent and comprehensive planning tool. With such an understanding, an effective IRWM Plan then develops objectives and strategies for management of and planning for water resources (as described in Chapter 7). These strategies, in turn, led to the selection (Chapter 14) of an array of projects (Chapter 15) that contribute toward meeting the Plan's objectives. As importantly, to effectively implement an IRWM Plan, each region must create a willingness and desire on the part of community stakeholders and regional decision-makers to work together in a collaborative manner (Chapter 8).

Actions and Projects to Implement the Plan

The initial (or Phase I) version of the Inyo-Mono IRWM Plan was created during the summer and autumn of 2010. It was formally adopted by the Inyo-Mono RWMG on December 15, 2010. Since that time, virtually all activities of the Inyo-Mono RWMG have been contributing towards implementation of the Plan. The routine meetings of the RWMG, advanced outreach and needs assessment meetings (Chapter 6 and 10), start-up of the initial implementation projects (see below), the project focused on disadvantaged communities (Chapter 1), capacity-building activities (Chapter 10), preparation of a proposal for a Round 2 planning grant (Chapter 9), and the collaborative process of this current revision of the Plan all effectively implement the Plan. The next round of implementation projects (anticipated in 2013) will continue to implement the Plan.

In August, 2011, Central Sierra Resource Conservation and Development, acting on behalf of the Inyo-Mono RWMG, was awarded $1,075,000 through the first round of Prop. 84 Implementation funding. Although the initial proposal to DWR contained 15 projects and requested just over $4 million, the final award funded seven of the initial 15 projects (those projects ranked 1 through 7 by the RWMG). As a whole, these projects begin to implement key features of the Inyo-Mono IRWM Plan, especially the Inyo-Mono objectives relating to water supply, water quality, water infrastructure, and involvement of disadvantaged communities. These projects are a direct result of the extensive outreach done throughout the region and the effective governance and decision-making structure employed by the RWMG. A brief synopsis of each project is provided below. Figure X shows the location of each of the seven projects.

Project #1: Safe Drinking Water and Fire Water Supply Feasibility Study for Tecopa, California

This project will conduct a feasibility study to determine whether safe drinking water and fire flow storage facilities can be provided in the two communities. Instead of focusing on the delivery of potable water to every household, the study will analyze the feasibility of constructing a public drinking water station in each community which would provide treated, potable water where residents could fill drinking water containers. The study will also identify a location in each community where an above ground water storage tank for fire flow could be located and will identify the type of storage tank that should be used.

Phase I Plan Objectives addressed: 1) Protect, conserve, optimize and/or augment water supply; 2) Protect, restore and/or enhance water quality; 4) Maintain and enhance water, wastewater, and/or power generation infrastructure efficiency and reliability; 6) Increase participation of small and disadvantaged communities in IRWM process

Project #2: Coleville High School Water Project

The purpose of this proposal is to eliminate the current public health hazard at the Coleville School Campus resulting from high levels of uranium found in the groundwater used for the school's water supply. The levels currently exceed the California maximum contaminant level of 20pCi/L. In order to meet this standard, the Eastern Sierra Unified School District needs to employ some form of treatment. The treated water needs to be available at all potential points of use at the various school buildings on the site. Successful implementation will improve the site's water quality to a level that will meet the California Safe Drinking water Act Maximum Allowable Value.

Phase I Plan Objectives addressed: 1) Protect, conserve, optimize and/or augment water supply; 2) Protect, restore and/or enhance water quality; 4) Maintain and enhance water, wastewater, and/or power generation infrastructure efficiency and reliability; 6) Increase participation of small and disadvantaged communities in IRWM process

Project #3: Round Valley Joint Elementary School District Water Project

Round Valley Elementary School is presently served by one shallow well with deteriorating steel casing. Over the last two years the water system has failed three times forcing the school to bring in portable bathrooms and bottle water, and consider the need for potentially closing the school. Current state water standards require new systems have redundant sources. A new well will be drilled, providing a second water source and line the existing well with new casing. This project will provide a reliable water supply for Round Valley School, incorporating simplicity and redundancy within the proposed design. In addition

this project will provide water for structural fire protection by providing access to an irrigation ditch on the neighboring property.

Phase I Plan Objectives addressed: 1) Protect, conserve, optimize and/or augment water supply; 4) Maintain and enhance water, wastewater, and/or power generation infrastructure efficiency and reliability

Project #4: New Hilltop Well

The goal of this project is to drill a new well and install a small pressure system to service the Hilltop subdivision of Swall Meadows. The new system will augment and eventually replace an aging artesian well source that is located 2500 feet from the community, has become erratic in its reliability, and is prone to increasing supply line maintenance needs. The new well will be located within the Hilltop subdivision.

Phase I Plan Objectives addressed: 1) Protect, conserve, optimize and/or augment water supply; 4) Maintain and enhance water, wastewater, and/or power generation infrastructure efficiency and reliability

Project #5: Well Rehabilitation – Phase I

The Mammoth Community Water District (MCWD) operates two wells which have been shown to have issues with contaminants. This project will provide profiling studies of both wells. By profiling the wells, MCWD will be able to determine if water quality can be improved by sealing off sections that contribute the highest contaminant loading. The testing will also verify the most efficient pumping rates while minimizing contaminant loading and maximizing yield.

Phase I Plan Objectives addressed: 1) Protect, conserve, optimize and/or augment water supply; 2) Protect, restore and/or enhance water quality; 4) Maintain and enhance water, wastewater, and/or power generation infrastructure efficiency and reliability

Project #6: Pump Operation Redundancy and SCADA Improvements

Inyo County owns and operates three community water systems serving the unincorporated towns of Laws, Independence and Lone Pine. The combined population served by the water systems is approximately 2,000. The Lone Pine and Independence water systems are supplied by water from a well and gravity head storage tanks. A well and hydro pneumatic storage tank supplies the Laws community water system. Transducers located at the tanks send high /low signals to the Supervisory Control and Data Acquisition System (SCADA) system to operate the pumps. Currently, there is no redundancy to activate the pumps should the transducers or SCADA system fail. The goals of this project are to increase the overall reliability of the water systems' ability to start the pumps when necessary, provide redundancy to operator notification in the event of an emergency, increase the variables monitored by the SCADA system, install a communications line to increase the variables monitored, and achieve a degree of energy savings and efficiency by shifting the pump-on times to the lo peak or base peak periods from the hi peak period. This project will install secondary pressure sensor switches on each water system as a backup to energize and operate the well pumps and maintain system pressure in case of transducer or SCADA system failures. The project also will upgrade the SCADA systems to include capability to program off-peak pumping capability to save energy.

Phase I Plan Objectives addressed: 1) Protect, conserve, optimize and/or augment water supply; 4) Maintain and enhance water, wastewater, and/or power generation infrastructure efficiency and reliability; 5) Address climate variability and/or reduce greenhouse gas emissions; 6) Increase participation of small and disadvantaged communities in IRWM process

Project #7: CSA-2 Sewer Improvements Project

The sewer system in Aspendell, a small community to the west of Bishop, CA, was installed in the late 1960s and consisted of a gravity sewer collector that discharged to a communal septic tank, force main, and leach field. By the early 1970s the system began to exhibit various problems. In the mid-1970s an engineering study found that the leach field was poorly designed and the collector system had problems related to poor construction, hydraulics, and inflow and infiltration (I&I). By replacing approximately 3000 feet of main, Inyo County will eliminate the source of blockages and I&I that has resulted in overflow and spillage. The project will also eliminate the inconsistency in pipe diameters that currently exists.

Phase I Plan Objectives addressed: 2) Protect, restore and/or enhance water quality; 3) Provide stewardship of our natural resources; 4) Maintain and enhance water, wastewater, and/or power generation infrastructure efficiency and reliability

Responsible Parties and Institutional Structure

The fundamental responsibility for Plan implementation lies with the entire Inyo-Mono RWMG. The Administrative Committee oversees operations between RWMG meetings. The Program Office carries out the day-to-day work of the RWMG. Further details about governance and administration may be found in Chapter 5, and linkages and coordination are described in Chapter 8. At the project level, each project proponent is fully responsible for the execution of their particular project.

Relation of Inyo-Mono IRWM Plan to Local Water and Land Use Planning

IRWM Plans are by nature long-term planning efforts. Fundamental to creating an effective IRWM Plan is identifying and consulting existing plans within the region to leverage ongoing efforts, minimize redundancies, and create synergies amongst and between relevant stakeholders. Moreover, in order to maximize the potential opportunity to address water-related needs in a region, an IRWM planning effort needs to be keenly aware of and integrate other planning efforts, as well as legally binding agreements that currently are in place.

Since early in the Inyo-Mono planning process, the Program Office has strived to reach out to relevant stakeholders throughout the planning region with the primary goal of engaging as many interested community members in the Inyo-Mono planning process as possible. The Inyo-Mono RWMG was aware of the extensive planning efforts that were completed and implemented or that were in the development process within the planning region. Thus, a second goal of broad stakeholder engagement was to acquire, first-hand, knowledge of past, existing, or future planning efforts in the region. With such information, the RWMG ensured that the development and implementation of the Inyo-Mono IRWM Plan *will integrate, complement, and support such planning efforts.*

Working together, Program Office staff, consultants, members of the Inyo-Mono RWMG, and involved participants have endeavored to collect as many documents relevant to the Inyo-Mono planning region as possible (Chapter 11). In doing so, this effort has resulted in more than 120 planning documents

being acquired, reviewed and summarized (Appendix D). These documents include a wide array of planning efforts, legally binding agreements, regulations, and mandatory requirements. They also address issues pertinent to both land and water resources planning. *Fundamental to the Inyo-Mono planning effort is the opportunity to more effectively integrate water and land-use planning.* The process of reviewing existing planning efforts, combined with extensive discussions amongst all involved in the Inyo-Mono planning effort, has facilitated a process of integrating information from such efforts into the development of objectives and resource management strategies relevant to the Inyo-Mono planning region (Chapter 7).

The Inyo-Mono IRWM Plan does not knowingly conflict with any existing plan or legal agreement. Moreover, to ensure that the Plan does not conflict with plans that may be developed in the future, Program Office staff will seek out and review newly developed plans on a regular basis. Doing so will ensure the Inyo-Mono IRWM Plan integrates and remains complementary to new plans well into the future.

One significant outcome of the planning effort thus far has been the opportunity to generate collaboration between a wide range of agencies and groups that had little reason to associate in the past. This collaboration has occurred primarily as a result of regularly convened meetings of the IM-RWMG. Such meetings facilitate discussions about existing planning efforts (water- and/or land-specific) as well as how the Inyo-Mono IRWM planning effort can support identified needs. Additionally, the Inyo-Mono planning effort has provided an opportunity to bring together an array of stakeholders having diverse expertise and mandates. This integration has proven to be very productive in terms of coordinating planning needs and developing strategies to address ongoing planning as an element of the Inyo-Mono IRWM Plan. This collaborative process has also resulted in resources and expertise being shared among participants.

Analysis of Impacts and Benefits of Plan Implementation

The Inyo-Mono RWMG is committed to ensuring that the IRWM Plan is consistent and compatible with existing planning documents, and in particular, established agreements and legal obligations. Rather than confounding the present legal and regulatory environment, the IRWM Plan is intended to streamline and improve stakeholders' ability to operate and succeed within the current (and proposed future) regulatory environment. Moreover, participants in the Inyo-Mono RWMG recognize the value in the Inyo-Mono IRWM planning effort in that it affords an opportunity for regional coordination and collaboration throughout the planning region itself. Indeed, the wide array of RWMG Members (Chapter 5) has committed to participating in the Inyo-Mono IRWM process as a means to leverage collaborative opportunities and realize multi-agency efficiencies and topical benefits. Table 12-1 provides a summary of the expected impacts and benefits derived from the development and implementation of the Inyo-Mono IRWM Plan.

Table 12-1. Impacts and Benefits of Plan Implementation

Inyo-Mono IRWM Plan Objectives	Inyo-Mono Region	
	Potential Impacts	**Potential Benefits**
Protect, conserve, optimize, and/or augment water supply	• Habitat degradation • Construction related delays or impacts to water supply or quality • Financial liability for long-term project management	• New water supply systems • Increased reliability of water supply systems • Additional water supply via water conservation measures
Protect, restore, and/or enhance water quality	• Habitat degradation • Construction related delays or impacts to water supply or quality • Financial liability for long-term project management	• Improved water quality • Improved aquatic and wetland habitats • Improved recreational opportunities • Improved human health within region • Improved health of regional flora and fauna
Provide stewardship of our natural resources	• Human and financial resource burden(s) • Limits on water diversions and groundwater pumping	• Restoration of ecosystem processes • Increased ecological resilience • Improved long-term services provided by regional resources • Improved health and viability of regional habitats • Improved health of regional flora and fauna • Improved recreational opportunities • Improved regional socio-economic conditions
Maintain and/or enhance water, wastewater, and power generation infrastructure efficiency and reliability	• Financial liability for long-term project management • Environmental impacts of infrastructure projects	• Increased reliability of water supply systems • Improved energy efficiency • Reduced potential for wastewater contamination • Reduced operational costs

Inyo-Mono IRWM Plan Objectives	Inyo-Mono Region	
	Potential Impacts	Potential Benefits
Address climate variability and/or reduce greenhouse gas emissions	• Financial liability for long-term project management • Construction related delays or impacts to regional resources due to new, more efficient infrastructure and energy sources • Increased demand for water to support "green" technology/renewable energy sources	• Improved climate change adaptability • Reduction of greenhouse gas emissions
Increase participation of small and disadvantaged communities in IRWM process	• Time burden	• More comprehensive understanding of the needs of DAC and tribal entities • Improved ability to address water needs of DACs and tribal entities • Improved of human and resource capacity
Promote sustainable stormwater and floodplain management that enhances flood protection	• Environmental impacts of stormwater and flood management infrastructure • Effects to surface water diversions • Unforeseen impacts as flood regimes revert to natural flood patterns	• Reduced adverse impacts of flooding in communities • Reduced erosion • Improved water quality • Improved habitat quality
Promote sound groundwater monitoring, management, and mitigation in cooperation with all affected parties	• Difficulty of obtaining information due to unwillingness to share data or infrastructure • Increased conflict among agencies/organizations	• Responding to and complying with mandates to monitor groundwater • Improved understanding of groundwater trends, quality, and quantity • Increased cooperation among entities • Improved water availability to parties using or desiring to use groundwater

The above-mentioned impacts and benefits will be reviewed throughout the Plan's duration. Based the progress of the implementation of the Inyo-Mono IRWM Plan, the impacts and benefits may be revised to reflect lessons learned, achieved milestones, and to document any unforeseen impacts or benefits to date.

Economic and Technical Feasibility

Financial aspects of the overall Plan, including economic feasibility, are described in Chapter 9. The technical feasibility for implementation of the Plan itself appears to be straightforward and without obvious difficulties. Each individual implementation project authorized in the 2011 round of funding conducted its own evaluations of economic and technical feasibility. Those evaluations were judged for adequacy during the project selection process (Chapter 14). In the event that technical expertise is needed, the Inyo-Mono RWMG continues to be committed to bringing technical resources to the region in order to build the capacity of regional stakeholders. Among those resources available are DWR's technical services. Furthermore, various agencies and organizations within the region have been able to provide various kinds of technical expertise with respect to implementation of the Plan when needed.

Current Status of Each Element of the Plan

The Inyo-Mono RWMG is just at the beginning stages of implementing the elements of the Inyo-Mono IRWM Plan. The Phase I Plan was completed and submitted to DWR at the end of 2010. The first round of implementation projects was authorized by DWR in mid-2011, and work has just begun on these projects. Fortunately, pre-existing planning and implementation work outside of the IRWM planning process has been successfully addressing many of the water resources issues and needs within the region.

After a few years of progress, assessment of the initial achievements and remaining work of the Inyo-Mono RWMG will be appropriate and useful. An assessment of the contributions of the IRWM Program should include, but not be limited to the following issues:

1) Water supply reliability, water conservation and water use efficiency.
2) Storm water capture, storage, clean-up, treatment, and management.
3) Removal of invasive non-native species, the creation and enhancement of wetlands, and the acquisition, protection, and restoration of open space and watershed lands.
4) Non-point source pollution reduction, management and monitoring.
5) Groundwater recharge and management projects.
6) Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution to users.
7) Water banking, exchange, reclamation and improvement of water quality.
8) Planning and implementation of multipurpose flood management programs.
9) Watershed protection and management.
10) Drinking water treatment and distribution.
11) Ecosystem and fisheries restoration and protection.

Timelines for Active and Planned Projects

The Inyo-Mono RWMG was awarded a Round 1 Prop. 84 Implementation Grant in August, 2011. The $1,075,000 awarded funded seven implementation projects throughout the Inyo-Mono region. Work on

these projects started in summer of 2012, and it is expected that all projects will be completed within 18 months of the project start date.

A subset of the projects listed in this Phase II Plan (Chapter 15) will be submitted for funding through the Round 2 Implementation grant process, which is expected to take place in early 2013. Some of these projects and/or newly developed projects will then be put forward for Round 3 Implementation funding. Recognizing that Prop. 84 funding is finite, the Inyo-Mono RWMG is committed to helping to secure financial and technical resources to continue implementing high priority regional projects well into the future.

Next Steps in Plan Implementation

In March, 2012, the Inyo-Mono RWMG submitted a proposal for a Round 2 Planning Grant. The requested funds would continue the early momentum of the RWMG and enhance the implementation of the Plan. The Inyo-Mono RWMG intends that the updated Plan will serve as the basis for the next 3-5 years of water-resources planning and management for the Inyo-Mono IRWM Region. Furthermore, we expect that, through regular updates that reflect new information and changing conditions, the Inyo-Mono IRWM Plan will continue to be useful in the long term.

The Round 2 Inyo-Mono Planning Grant proposal is broken down into six main categories of activities deemed critical to the long-term success of the Inyo-Mono RWMG:

1) enhance operations associated with the Inyo-Mono IRWM Program
2) planning studies that respond directly to issues and priority needs of the region based on continued dialogue within the Inyo-Mono RWMG and recent public outreach activities
3) study the uncertainties of climate change and likely impacts to the hydrology of the region
4) improve the technological capacity of the RWMG
5) identify long-term financial needs to sustain the Inyo-Mono IRWM Program
6) synthesize results from categories 1-5 to update the Inyo-Mono IRWM Plan to more fully meet Prop. 84 IRWM Plan Standards.

As noted above, the Inyo-Mono RWMG is awaiting the opportunity provided by the Round 2 and Round 3 Implementation funding cycles.

It is recognized that future funding to support Integrated Regional Water Management efforts in California is uncertain. Moreover, based on work completed thus far by the Inyo-Mono RWMG, it is understood that there are significant funding needs to support high-priority implementation projects, regional capacity building, and programmatic activities necessary to ensure the long-term viability of the Inyo-Mono RWMG. Thus, it is imperative that a sustainable financial plan be developed to address short and long-term funding needs of the region. To address future uncertainty and critical funding needs, the RWMG intends to develop and begin to implement a short and long-term financial plan that responds to regional needs (Chapter 9).

Chapter 13: Plan Performance and Monitoring

Introduction

Fundamental to successfully implementing the Inyo-Mono IRWM Plan is the means to monitor and evaluate progress. Doing so allows the Inyo-Mono RWMG an opportunity to determine whether the short and long-term objectives are being achieved. Additionally, the needs within the Inyo-Mono region are expected to change as implemented projects begin addressing needs and as new and possibly unexpected situations arise. The implementation approach therefore needs to be flexible and iterative and provide for the opportunity to introduce changes as needed to accomplish the various resource management strategies identified for each planning objective. Thus, developing and implementing a monitoring and evaluation protocol system is critical in order to provide an opportunity to modify elements of the Plan based on an adaptive management approach. In this chapter, elements of developing performance measures along with who will be involved are presented. This is followed by a description of a process for developing and implementing an Inyo-Mono Monitoring & Adaptive Management Program.

Ensuring Plan Performance

The Inyo-Mono IRWM Plan implementation will be evaluated based on the use of performance measures, quality assurance procedures, and periodic assessments (to be conducted on at least a semi-annual basis). These evaluation approaches are to be based primarily on performance measures (performance monitoring). Performance monitoring will be employed with the intent of monitoring progress of project implementation as well as overall programmatic implementation. In particular, performance measures will be established to enable an objective evaluation of the Inyo-Mono IRWM Plan relative to established objectives and resource management strategies agreed upon by Members of the RWMG.

In the initial process of implementing the Inyo-Mono IRWM Phase II Plan, a series of indicators will be developed that is linked to the agreed-upon objectives of the Inyo-Mono IRWM Plan. Additionally, indicators will be developed to ensure that deliverables associated with Round 2 Planning Grant funds are being met, which in turn will help to ensure that the Inyo-Mono IRWM Program as a whole is achieving its intended goals. Performance indicators, at a minimum, will include three types: 1) administrative; 2) output; and 3) outcome. A description of the three types of performance indicators is provided below.

1) Administrative indicators will be used to evaluate progress being made by the Inyo- Mono IRWM Program Office, grantees, project proponents, and others that may be responsible for supporting the implementation of the Phase II Plan. Indicators may include, but will not be limited to, such metrics as the number of RWMG and Administrative Committee meetings convened, the number of targeted outreach meetings convened, and timeliness of project reporting and other administrative obligations.
2) Output indicators will be used to measure the overall progress associated with implementing the Phase II Inyo-Mono IRWM Plan. Output indicators will closely correspond to how projects are achieving their intended goals. Specific indicators may include the number of replaced wells, the number of infrastructure improvements targeted to improving water quality, the number of water conservation initiatives implemented, the number of acres reclaimed from invasive species, and the progress of projects in relation to their schedules.
3) Outcome indicators will include indicators that evaluate either in a quantitative or qualitative manner the effects of projects that implement the Phase II Inyo-Mono IRWM Plan. For example, outcome indicators may include such metrics as the quantity of reclaimed water, the acre feet of water conserved via a water conservation initiative, the degree to which water quality was improved, and the area of native vegetation restored.

Each of the proposed performance indicators will be used to more broadly evaluate progress being made by the Inyo-Mono RWMG, provide information necessary to facilitate an adaptive management strategy, and provide relevant information to keep the general public and policy makers informed as to the success, challenges, and shortfalls of the Inyo-Mono IRWM Program.

Entities Involved in Developing Performance Indicators

Specific indicators relevant to evaluating the Phase II Inyo-Mono IRWM Plan will be developed during the first quarter of the Plan's implementation. Four entities will be responsible for developing specific indicators as well as evaluating the overall effectiveness of the Phase II Inyo-Mono IRWM Plan:

1) The Inyo-Mono Program Office will be responsible for developing administrative indicators specifically for the Round 2 Planning Grant and will support the development of output and outcome indicators for Planning and Implementation Grants. Program Office staff will also be directly involved in performance evaluations.

2) Round 1 Implementation Grantee will be responsible for developing appropriate administrative indicators for the Round 1 Implementation Grant. Additionally, Grantee will contribute to the evaluation of appropriate project performance indicators throughout the duration of the Round 1 Implementation Grant[2].

3) Project proponents, in accordance with Prop. 84 grant requirements, have already proposed elements for monitoring the progress of their projects. Project proponents will finalize, within the first quarter of implementing their projects, a plan that includes administrative, output, and outcome indicators for their respective projects as well as a schedule to monitor progress. This

[2] It is anticipated that should the Inyo-Mono RWMG receive Round 2 Implementation Grant funding, the Grantee for this grant would assume the same responsibilities as the Round 1 Implementation Grantee.

will also be done with any project proponents receiving Round 2 and/or Round 3 Implementation grant funding.

4) Administrative Committee members have oversight of financial aspects related to the Inyo-Mono Program. Members of the Administrative Committee will contribute to finalizing performance indicators and evaluating overall performance of both the Program and project implementation.

Together, the four entities described above will serve as members of an Evaluation Working Committee to be established at the onset of the Plan's implementation.

Development of an Inyo-Mono Monitoring & Adaptive Management Program

To meet the requirements of DWRs Proposition 84 Implementation Proposal Solicitation Package (PSP), each project proponent must include in its proposal submission information specific to monitoring, assessment, and measuring performance. For each of the projects that are awarded funding, the monitoring, assessment, and performance indicators will provide the basis for a monitoring plan necessary to evaluate progress being made towards the Plan's implementation. Such evaluations will be conducted by the Evaluation Working Committee described above.

Frequency of Evaluating RWMG Performance in Plan Implementation

The frequency for evaluating the Inyo-Mono RWMG performance in implementing the Phase II Plan and projects funded with the Round 1 Implementation grant will be dictated primarily by reporting requirements set forth within contracts established among funding sources and grantees. Such grant agreements will describe performance monitoring requirements on the part of the grantee and individual project proponents. It is anticipated that evaluations will be initiated approximately six months after the Plan's implementation.

Data Management System for Tracking Implementation Performance

Based on the various performance indicators agreed upon by the RWMG in approved monitoring plans, a database will be created to house all Plan and project implementation monitoring and evaluation information. This database will allow for tracking implementation performance and will be developed in a manner consistent with the information provided in Chapter 12 (Data Management and Technical Analysis).

Process for Lessons Learned to be Implemented in Future Plans

The Inyo-Mono RWMG firmly believes in an active adaptive management approach to developing and implementing future plan(s). As such, it is the intent of Program Office and others involved with the Evaluation Working Committee to utilize the information derived from monitoring and evaluation of the Phase II Inyo-Mono IRWM Plan and Round 1 implementation projects in a manner that facilitates modifications necessary to ensure projects achieve their intended objectives[3]. In addition to monitoring and evaluation of specific projects, the Program Office will coordinate with members of the Evaluation Working Committee on a quarterly basis to assess progress relative to the Plan's implementation, including progress made towards revisions to the Inyo-Mono Phase II IRWM Plan. Doing so on an

[3] A similar process will be implemented if and when Round 2 and/or Round 3 Implementation projects are funded.

iterative basis and at regular intervals will enable the Program Office an opportunity to modify strategies and approaches as needed.

Timing of Development of Project-specific Monitoring Plan

Project proponents are required to provide information in their project proposals specific to monitoring, assessment, and indicators enabling evaluations of projects to be conducted. Working collaboratively with the Evaluation Working Committee, project proponents will finalize and implement necessary monitoring plans based on the prescriptions within each monitoring plan and on regularly established schedules.

Chapter 14: Project Review Process

Introduction

Projects are one of the ways in which the Inyo-Mono IRWM Plan is implemented within the planning region (see Chapter 12 for a full discussion). The Round 1 Implementation Grant funded seven projects that focus on improving water quality, increasing water supply reliability, and/or upgrading antiquated infrastructure. More recently, the Round 2 Planning Grant will fund several projects that help to meet planning gaps in the region. The Inyo-Mono RWMG will continue to seek out projects that meet the most pressing needs in the region, as reflected in this Plan's Objectives and Resource Management Strategies (RMS; Chapter 7), and that also help to meet the Objectives, RMS, and Program Preferences of DWR and the California Water Plan (Chapter 1).

Each project that aims to be considered for funding will go through a two-step process. First, the project must be submitted to the general pool of projects using a newly-developed online upload form. Second, projects from the general pool that are ready to move forward for funding are put through a carefully-designed process of evaluation and ranking by the RWMG. Each of these steps is described below.

Projects Included in the IRWM Plan

The Inyo-Mono RWMG has an "open door" policy with respect to submitting and including projects in its IRWM Plan. This means that, other than requiring certain information to be provided along with each project submitted, projects are not filtered before including them in the Plan. The RWMG strongly feels that this policy allows a better assessment of the overall needs of the region with respect to water issues and funding and also provides more opportunity to combine and integrate similar projects. Filtering occurs when projects are being selected and ranked for funding.

Procedures for Submitting a Project to the IRWM Plan

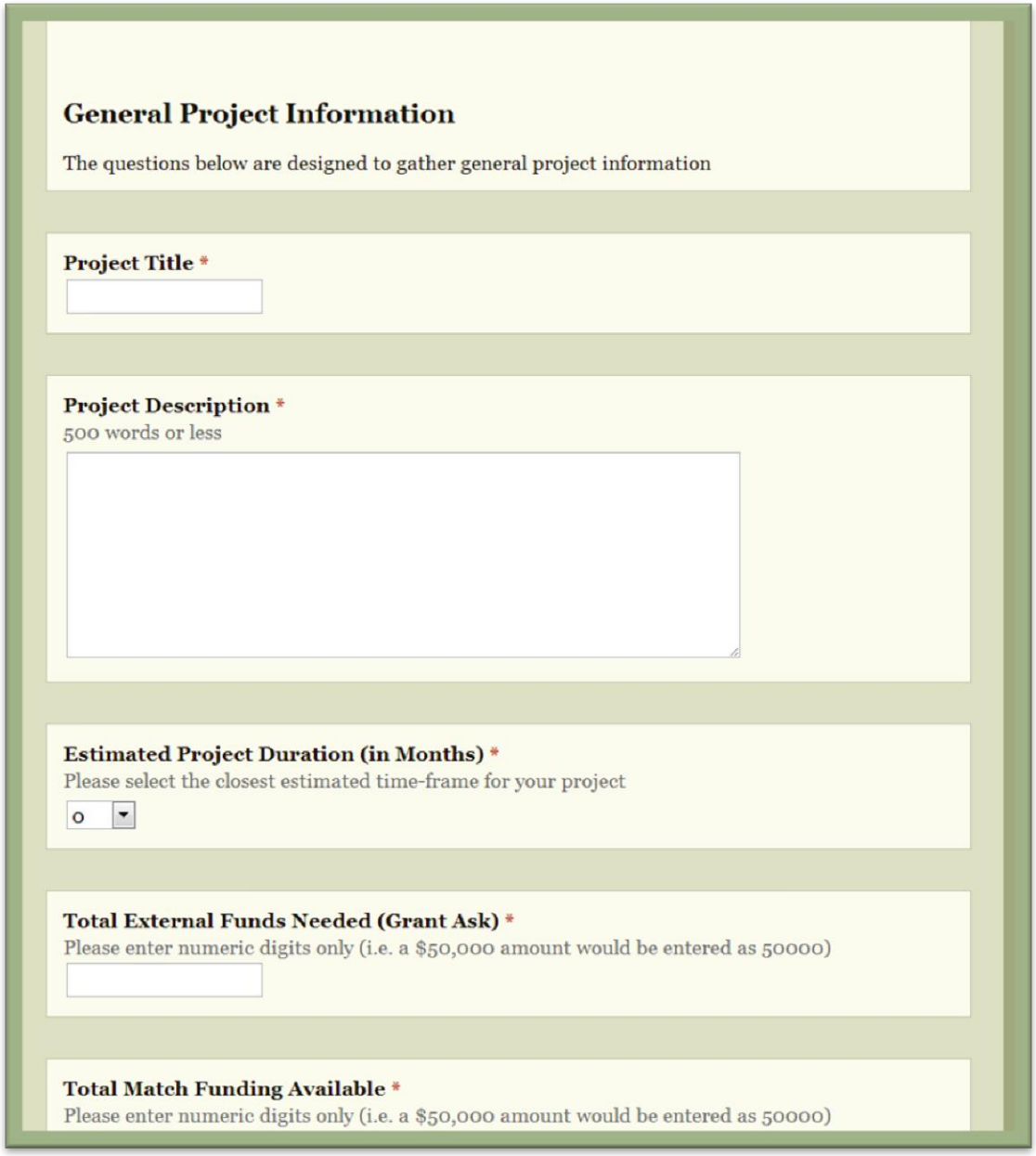
Based on feedback received regarding the process used to submit projects for inclusion in the Inyo-Mono IRWM Phase I Plan, the process was substantially changed to better meet the needs of project proponents as well as the larger planning objectives of the region. In the Phase I Plan, project proponents simply emailed project descriptions and other basic information to Program Office staff. In working with other IRWM regions, staff learned that online project submittal forms are used with success in several regions, and staff endeavored to create a similarly useful process for the Inyo-Mono region.

The new online upload form was created in early 2012 to meet the needs of the Phase II Plan and upcoming rounds of Implementation funding. The form is housed on the Inyo-Mono IRWM Program website and is password-protected to help ensure that fraudulent information is not submitted. Users who wish to submit a project using this form simply contact the Program Office for the password. Although any stakeholder with an interest in water management may submit a project using this form, only projects submitted or sponsored by RWMG Members will move forward for funding.

As mentioned above, this new online upload form is designed to meet several purposes. First, it provides relevant information concerning the project itself, including organizational contact information, project title and description, length of project, cost of project (including amount of funding needed and amount of funding already available), type of project (conceptual, planning, implementation), project location, communities and watersheds benefitted (including DACs), and relation to Inyo-Mono Objectives and RMSs. Secondly, the upload form aims to collect information that helps to determine how the Inyo-Mono projects meet State water planning objectives such as DWR Program Preferences and California Water Plan Strategic Objectives, RMS, and Integrated Water Management Benefits. This information may be provided to the State in summary form to better describe the project and finance needs of the Inyo-Mono region, as well as how the projects proposed to meet those needs also address State water planning priorities.

Not all fields in the project upload form are mandatory. Those that are required are marked with a red asterisk. The extensive information requested in the upload form requires that the project proponent has carefully considered the need for and design of the project and can relate the project to larger regional and Statewide planning objectives. Thus, the amount of time required to fill out the online form provides a first filter on the number of projects submitted. Extensive instructions are included at the top of the online form (http://inyo-monowater.org/members/project-upload/), and Program Office staff is available to answer questions and provide assistance. Furthermore, additional tips for successful project upload are provided on the website, along with a study guide (http://inyo-monowater.org/members/). A downloadable Word document that contains all of the questions in the upload form is also available on the website at the previous link. Alternatively, for stakeholders in the region that may not have access to the Internet, the Word document version of the submission form can be made available (and then be submitted) in hardcopy. An example of the appearance of the online upload form is shown in Figure 14-1.

Figure 14-1. Screenshot of online project upload form on Inyo-Mono IRWM website.



General Project Information

The questions below are designed to gather general project information

Project Title *

Project Description *
500 words or less

Estimated Project Duration (in Months) *
Please select the closest estimated time-frame for your project
0

Total External Funds Needed (Grant Ask) *
Please enter numeric digits only (i.e. a $50,000 amount would be entered as 50000)

Total Match Funding Available *
Please enter numeric digits only (i.e. a $50,000 amount would be entered as 50000)

Procedures for Review of Projects for Inclusion in the IRWM Plan

All projects that meet the basic requirements of the project upload/submittal process described above are automatically included in the Inyo-Mono IRWM Plan. No filter is placed on this part of the process because the RWMG desires to assess and consider the full range of water-related needs in the planning region. Thus, potential project proponents are invited to submit projects that are (1) concept-only, (2) in the planning phase, or (3) shovel-ready (relevant for both planning and implementation projects). The RWMG has determined that it is important to maintain this "open-door" policy with respect to project submission so that there is a larger pool from which to pull projects for any given funding opportunity. Again, because project proponents need to be able to relate their projects not only to Inyo-Mono

Objectives and RMS, but also to Statewide planning priorities, projects are not submitted that do not have relevance to the Inyo-Mono planning process.

The more in-depth project review occurs when projects are considered for inclusion in a particular funding application. That process will be discussed later in this chapter.

Procedure for Communicating List of Projects

The Phase I Plan project list was completely re-created for the Phase II Plan. Program Office staff communicated with project proponents to request that they re-submit projects using the new project upload form, or if the project has already been completed or is no longer relevant, to communicate that with the staff. The project upload form was made available to potential project proponents in April, 2012. Projects that were submitted prior to June 22, 2012, are included in the Phase II Plan. This process resulted in 36 projects. The project list and accompanying analysis are described in Chapter 15. The online upload form will remain open for project submissions indefinitely; however, any additional projects that are submitted will not be added to the IRWM Plan until there is a formal amendment process initiated or a revision of the Plan takes place (see Chapter 5 for information on adding projects to the Plan).

Evaluation of Projects for Inclusion in Funding Applications

Project proponents who wish to put forward projects for a particular funding opportunity are subjected to rigorous evaluation and ranking processes. Combined, these processes help to determine which projects are ready to be submitted for funding and allow the RWMG to express its preferences and priorities with respect to implementing the IRWM Plan.

An extensive evaluation/ranking process and request for proposals was utilized for the Round 1 Implementation Grant in 2010/early 2011. Although the outcome of this process was a ranked list of projects that reflected the greatest needs in the region, there were many flaws in the implementation of the process. After the Round 1 Implementation Grant application was submitted in early 2011, Program Office staff collected feedback about the project evaluation/ranking process with the intention of improving the process in future funding rounds.

In early 2012, a working committee began meeting to address potential revisions to the project evaluation/ranking process. The committee started by reviewing the Round 1 process as well as the feedback collected from RWMG Members after the Round 1 Implementation Grant submission. Much of the original document was preserved in the new process. One major changed that occurred early on was the development of project “bins” or categories. The RWMG was concerned that projects addressing ecosystem stewardship had difficulty competing with projects addressing basic water supply and quality needs. One way to alleviate this direct competition is by separating projects out into subject-based bins. The working committee recommended the creation of five project bins: Water Supply, Water Quality, Ecosystem Stewardship, Stormwater and Flood Management, and Groundwater.

The working committee also suggested developing Technical Advisory Committees (TACs) for each project bin. This group of people would have expertise in the subject of that bin and would review, score, and rank only those projects in that bin. With the development of the final Round 2 evaluation/ranking process, it was decided that the bins would only be used for the first round of review by the TACs. After the TACs develop their recommended scoring of projects, RWMG Members will complete their own

review and scoring of projects (or may accept the TAC's score for that project), and all of the projects will be considered together, regardless of bin. The overall process for scoring and ranking, as well as the pre-proposal template, can be found in Appendix E.

DWR prescribes several review factors that should be included in a RWMG's project evaluation and ranking process (see below). These review factors were included in both the Round 1 and Round 2 evaluation/ranking processes (see Appendix E for the Round 2 process document). These factors will continue to be considered in future evaluation/ranking processes:

1) How the project contributes to the IRWM Plan objectives
2) How the project is related to resource management strategies
3) Technical feasibility of the project
4) Specific benefits to critical DAC water issues
5) Specific benefits to critical water issues for Native American tribal communities
6) Environmental Justice considerations
7) Project costs and financing
8) Economic feasibility
9) Project status
10) Strategic considerations for IRWM Plan implementation
11) Contribution of the project in adapting to the effects of climate change
12) Contribution of the project in reducing greenhouse gas emissions as compared to project alternatives

Project proponents are asked to provide information related to the review factors in a formal request by the RWMG and are given a deadline by which material needs to be submitted. Once all project information has been submitted, the RWMG Members then review the project information and score and rank the projects. Project rankings are submitted to the Program Office, which combines the rankings and develops an overall aggregate ranking to be approved by the RWMG during a regularly-scheduled (and public) meeting. The approved aggregate ranking is then used to shape the funding application.

Although the project evaluation/ranking process touches on all of the review elements listed above, the last three review factors will be the subjects of particular focus in the development of future evaluation/ranking processes. As described in Chapter 1, the RWMG will be undertaking an analysis and evaluation of how to best apply the "integration" concept in the Inyo-Mono planning region. It is hoped that one of the outcomes of this effort will be a better understanding of how to integrate project needs, either geographically or by subject, in future funding applications. Similarly, although climate change adaptation and mitigation were addressed in the Round 1 Implementation evaluation/ranking process, they received minimal attention and emphasis during the RWMG's ranking of projects. This Plan contains a more thorough analysis of climate change-related issues specific to the Inyo-Mono region; therefore, it will be possible to more thoroughly address climate change in future evaluation/ranking processes.

Project review and ranking is a dynamic process, as regional and Statewide priorities shift, and as RWMG Members and Member representatives change, but this process should always reflect the most current thinking about water planning and management in the region. This will ensure that funding applications accurately and appropriately communicate the region's values.

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Chapter 15: Inyo-Mono Phase II Projects

Phase I Projects

A list of projects was developed for the Phase I Inyo-Mono IRWM Plan based on submissions from Inyo-Mono RWMG Members and other regional stakeholders. The Phase I call for proposals was relatively straightforward and simply asked for project proponent name and contact information, project title, project description, and estimated project cost (if known). The process of soliciting project ideas began in the summer of 2009 and continued through most of the Phase I Plan writing process in 2010. Eventually, descriptions of 101 projects were collected, including the 15 that were submitted for Round 1 Implementation funding. Twenty-five of the projects underwent ranking by the RWMG to be included in the Implementation application, though only 15 were included in the final application due to various kinds of constraints. No other kind of analysis was performed on the information contained in the 101 project descriptions. The full list of projects can be found in the Phase I Plan.

Phase II Projects

Online Project Upload Form

For the Phase II IRWM Plan, the RWMG agreed that the project solicitation and project evaluation processes could be streamlined and made more efficient for project proponents. One way to do this could be through reducing the amount of redundant information being asked of project proponents in different steps of the process. Examples from other IRWM regions of online project upload forms were researched, and exemplary characteristics were noted. The goals of building an online project upload form for the Inyo-Mono region were three-fold: (1) to collect the necessary information from project proponents to assess regional water-related project needs and how they related to the Inyo-Mono regional Objectives and Resource Management Strategies; and (2) to determine how the regional project needs fit into the larger DWR State Water Plan strategies, priorities, and benefits; and (3) to provide a big-picture analysis of the financial needs of the region with respect to various categories of water resources projects.

The online upload form is password protected to provide basic quality control on the information being submitted. Potential users simply contact the Inyo-Mono Program Office for the password. The upload form will be available on an ongoing basis for project proponents to upload projects, and they can submit information for projects that are conceptual, in the planning phases, or shovel-ready. A partial screen shot of the upload form is shown in Figure 14-1 of Chapter 14. The complete upload form can be found at http://Inyo-Monowater.org/members/project-upload/.

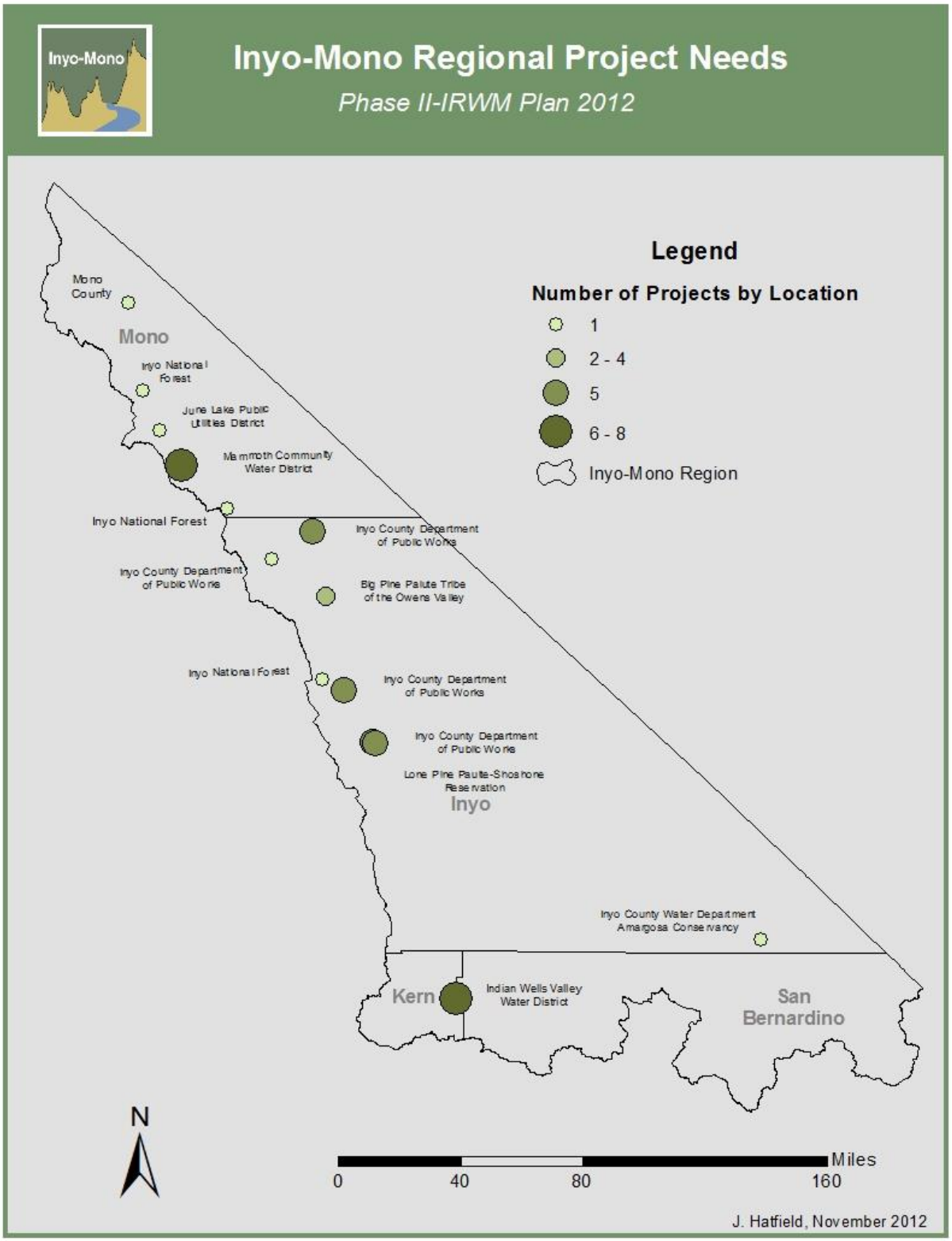
Phase II Project List

The online project upload form was made available for entities to upload projects in April, 2012. Written and oral instruction was provided by the Program Office on several occasions and in several different venues. Although the upload form is always available, a cutoff date for Phase II projects of June 22, 2012, was arbitrarily decided. At that point, 36 projects had been uploaded into the system, which is a substantial decrease from the 101 projects included in the Phase I Plan. It is suspected that the longer and more involved upload form used for the Phase II projects may have presented a challenge or barrier to some. The Program Office will continue working with project proponents in determining the best way to gather project-related information.

The Phase II Project List will be amended as necessary to include additional project needs that are gathered using the online upload form. Plan amendments will be considered and decided upon by the Inyo-Mono RWMG according to the process outlined in Chapter 1.

Figure 15-1 and Table 15-1, below, shows the list of the 36 projects gathered between April and June, 2012. This list will be updated as needed in the form of an approved amendment, following the RWMG decision-making process, to the Inyo-Mono IRWM Plan.

Figure 15-1: Round 2 Implementation proposed projects



Map showing regional project needs at the time of Round 2 Implementation by organization sposoring the project.

Table 15-1. Phase II Plan projects

Organization Name	Organization Type	Project Title	Project Description
Big Pine Paiute Tribe	Native American Tribe	Wellfield Radius of Influence Study	The Big Pine Indian Reservation is located in LADWP's Big Pine Wellfield, and, annually, approximately one-third of LADWP's groundwater pumping is from Big Pine. The Taboose-Thibault Wellfield is adjacent to the Big Pine wellfield and is annually pumped an almost equal amount. The Tribe would like to develop a model depicting a radius of influence of each DWP well in the Big Pine and Taboose-Aberdeen wellfields to better understand the impacts of pumping on the region. This study will assist in the management of groundwater resources in the Big Pine and Taboose-Aberdeen wellfields.
Big Pine Paiute Tribe of the Owens Valley	Native American Tribe	Hydrant Replacement	An analysis of the Tribe's water distribution system revealed that there are 62 hydrants throughout the system and the average hydrant age is 33 years old. Hydrants have a typical life expectancy of 40-60 years so hydrant replacement is of a high priority. In fact, 27 of the 62 hydrants have reached the end of their life expectancy or parts are no longer available if repairs are needed. This project will replace hydrants for the protection of the community and surrounding environment.
Big Pine Paiute Tribe of the Owens Valley	Native American Tribe	Irrigation Mainline Replacement	LADWP is required to annually deliver surface water to the Big Pine Indian Reservation. The surface water is diverted from Big Pine Creek and flows through an unlined ditch on LADWP land into an intake pond which ultimately feeds the tribal irrigation system. Unfortunately, the irrigation mainline, located on LADWP property, has numerous leaks resulting in abundant water losses which are credited to the Tribe's uses but which the Tribe never actually receives. This project will replace the mainline from the irrigation holding pond to the standpipe located at Watson Street. The pipe will be 15" diameter and run 1,400 feet. Natural Resource Conservation Service has indicated interest in assisting with the funding of this task. This task may trigger the California

Organization Name	Organization Type	Project Title	Project Description
			Environmental Quality Act since the construction will take place off Reservation.
Big Pine Paiute Tribe of the Owens Valley	Native American Tribe	Watermain Replacement Project	This project will replace approximately 9400 feet of old 4 inch PVC main which has had numerous repairs and has been proven to be undersized for the growing community of the Big Pine Paiute Tribe. The tribal utility operator found 7 leaks during the 2008 comprehensive study survey along the 4 inch portion of the water distribution system that he repaired, thus saving approximately 1 million gallons per month in water losses. Due to the historically high numbers of line breaks and lack of sufficient fire flows, all sections of 4 inch pipe need to be replaced with 6 inch or 8 inch pipe. There are no SDWA violations involved with the proposed project. However, without the needed fire protection, the safety risk to the community has been catastrophic household fires as well as potential for more catastrophic fires as long as the water mains remain undersized for proper fire flows. These areas identified as having undersized water mains have already experienced seven catastrophic household fires in the last nine years with the most recent one on March 31, 2012, one in December 2009, one in the summer of 2005, one in 2004, two in 2003, and one in the summer of 2002. Reasons for the catastrophic nature of these household fires have been noted as either due to a lack of fire hydrants within the proximity of the home or due to a lack of sufficient fire flow provided by the undersized 4 inch water mains required to suppress the fire.

Organization Name	Organization Type	Project Title	Project Description
Indian Wells Valley Water District	Public Utilities District	Aquifer Testing Program	This project involves a series of aquifer tests in areas where the groundwater flow model is lacking real data. Some of the aquifer data used in the model used geologic logs and driller reports. Actual aquifer tests will add certainty to the model and refine its use as a groundwater management tool.
Indian Wells Valley Water District	Public Utilities District	Brackish Water Resource Study	Groundwater is the sole source of potable water for the communities of Ridgecrest, Inyokern, Trona, the Naval Air Weapons Station at China Lake, and numerous private well owner living in unincorporated areas. Recharge of the aquifer is primarily from the Sierra Nevada range on the valley's west side. While scientists believe there is a great deal of groundwater in the aquifer, not all is potable. Although Indian Wells Valley Water District (IWVWD) actively promotes conservation, groundwater levels continue to decline. The need for alternative sources of potable water is inevitable. This project will identify source areas for brackish water that could be treated and provide a new source of potable water for the valley. By utilizing local brackish water supplies, the IWVWD could significantly delay the need to import water.
Indian Wells Valley Water District	Public Utilities District	Brackish Water Treatment Plant	Construction of a brackish water treatment facility to utilize local non-potable water supplies as a supplemental source for the valley's water supply thereby delaying the need to consider importing water.
Indian Wells Valley Water District	Public Utilities District	Main Line Replacement	Main line replacement enables the District to replace old or under-sized main line pipelines to improve operating efficiency, improve water quality, and improve fire flow.

Organization Name	Organization Type	Project Title	Project Description
Indian Wells Valley Water District	Public Utilities District	Southwest Area Hydrogeologic Study	A follow-up study to the recent AB303 project that provided 8 new wells and sampling of over 75 sites. The 8 wells drilled generally showed fairly good water quality characteristics and could be a potential area for future production. Additional data are needed in the area south and west of existing monitor wells. Funding would also provide additional water sampling, future aquifer testing using AB303 project wells, and some shallow geophysical surveys.
Indian Wells Valley Water District	Public Utilities District	Storm Infiltration System	Study the feasibility of capturing surface water during significant rain events and percolating that water into the acquifer. Groundwater depths in the recharge areas of the valley are deep, and percolation ponds may not be feasible due to vertical migration rates, evaporation rates, etc. Storm runoff could possibly be captured and percolated in the eastern part of the valley where groundwater levels are relatively shallow, but the water is of lower quality. This project could shed light on possibilities of water capture, retention, detention, infiltration, re-injection, treatment, and re-use of surface water flowing through the valley and not currently being utilized.
Indian Wells Valley Water District	Public Utilities District	Water Collection Galleries	A study to provide the feasibility of installing water collection systems along the Sierra Nevada front. Information could provide insight to the potential of recharging water migrating from the canyons to aquifer systems along the Sierra. Water collection systems at some key locations could supplement the existing supply with water that would otherwide be lost to evaporation or migration into the Sierra Nevada fault, etc. Key locations include Indian Wells Canyon, Grapevine Canyon, Sand Canyon, NoName Canyon, and Nine-Mile Canyon.
Indian Wells Valley Water District	Public Utilities District	Water Quality Treatment Plant	Construction of a water treatment facility to be used by both the Indian Wells Valley Water District and the Navy's facilities at China Lake Naval Air Weapons Station (NAWS) to handle future water quality issues.

Organization Name	Organization Type	Project Title	Project Description
Inyo County	County Agency	CSA-2 Sewer System Upgrade Project	The proposed project is located in Aspendell, served by County Service Area #2 (CSA-2), west of Bishop, bordering Inyo National Forest and USFS campgrounds. The County manages the system on behalf of the Aspendell residents. The project will replace 3,000 ft. of existing sewer main. The system was installed in the late 1960s and consisted of a gravity sewer collector that discharged to a communal septic tank and leachfield. By the early 1970s the system began to exhibit various problems. In the mid 1970s an engineering study found that the leach field was poorly designed and the collector system had problems related to poor construction, hydraulics and inflow and infiltration (I&I). In 1977 the USFS was ordered by the RWQCB to remove pit toilets located in nearby campgrounds to eliminate impacts to water quality. In 1978 the USFS constructed a treatment facility to serve the campgrounds. At that time, CSA-2 abandoned the community septic and leach field system and connected the existing sewer collection system to the USFS system. The sewer collection system is now more than 40 years old, near the end of its useful life. Several hundred feet of the main need replacement due to recurring blockages and continuing I&I. Blockages occur from inconsistency of pipe diameters, uneven grade and root intrusion, and have resulted in overflow and spillage. Bishop Creek is downgrade from the sewer system, and runoff from a spill has the potential to contaminate the creek. Seeping mains also may affect groundwater in wetland areas near the creek and likely produce non-point source pollution. I&I are increasing as the system degrades and are impacting the treatment plant and increasing energy costs for treatment and reducing plant capacity, thereby resulting in rising costs charged to CSA-2. The

Organization Name	Organization Type	Project Title	Project Description
			USFS has complained about flow generated by the CSA-2 system. The County intends to replace mains that have documented root intrusion or I&I first and then replace other portions of the system. Phase 1 will include approximately 3,000 feet of 6" mains, and manholes.
Inyo County	County Agency	Groundwater monitoring network for southeast Inyo County	This project will construct a network of six monitoring wells in southeastern Inyo County for the purpose of (1) complying with CASGEM monitoring requirements, (2) monitoring effects of groundwater development and use on groundwater users and groundwater dependent resources, (3) help determine interbasin flow paths in the Pahrump-Middle Amargosa-California Valley region, and (4) help determine sources of water to regional groundwater discharge features such as springs that provide water to the Amargosa River. The project involves siting and constructing six wells in Pahrump Valley, California Valley, Middle Amargosa Valley, and Mesquite Valley, sampling these wells for general water quality, equipping the wells with data loggers, initiating a data collection program, and submitting a monitoring program to DWR to comply with CASGEM monitoring requirements. The project will be conducted in cooperation with the Amargosa Conservancy, USBLM, and USGS.
Inyo County	County Agency	Laws, Independence, and Lone Pine Water Systems Master Plan	Laws, Independence, and Lone Pine are disadvantaged communities. The Laws, Independence, and Lone Pine Town water systems are in need of a Master Plan / Needs Assessment which could answer basic questions about how to operate the systems effectively and economically but yet set aside enough reserves to meet both anticipated and unforeseen needs. The assessment would include a hydraulic analysis of the systems addressing fire flow needs and maximum day demand needs. The assessment may also include a staffing plan identifying the number of office and field staff necessary to carry out operations of the system and identify specific tasks to each staff member. The assessment

Organization Name	Organization Type	Project Title	Project Description
			should also identify all current and anticipated future regulatory requirements a water purveyor must meet. These regulations encompass California Occupational Safety and Health Administration requirements to Certified Unified Program Agency regulations to Air Quality regulations and Public Health Department regulations. Capital improvements could be identified over a five, ten and twenty year horizon. The estimated cost for the project is based upon cost estimates received for a hydraulic analysis and water rate study and the estimated costs of County personnel providing requested data to the successful contractor.
Inyo County	County Agency	Laws, Independence, and Lone Pine Rate Study	Laws, Independence, and Lone Pine are disadvantaged communities. The Laws, Independence, and Lone Pine Rate Study shall build upon the Water Master Plan / Needs Assessment Project and the Condition Assessment Project by preparing a Water Rate Study to investigate identified funding needs and how to fund them. The estimated costs for this project, keeping in mind the previously completed studies, may be about $50,000 which also includes Administration costs. The Water Master Plan, Conditions Assessment, and Rate Study Projects may be completed within one round of funding.
Inyo County	County Agency	Laws, Independence, and Lone Pine high efficiency toilet replacement project	Laws, Independence, and Lone Pine are disadvantaged communities. The Laws, Independence, and Lone Pine high efficiency toilet (HET) replacement project shall provide a rebate to customers who purchase and install HETs in their homes as a water conservation measure. The program may be administered as follows: the customer would purchase a toilet from a pre-defined list of appliances with a rebate amount determined by the particular model chosen. After an inspection of installation by the County, a rebate would be applied to their water bill and carried forward until the rebate amount was exhausted. The estimated number of toilets replaced would be 1.25 toilets per service

Organization Name	Organization Type	Project Title	Project Description
			with a maximum rebate of $100 per replaced toilet applied to their water bill. Some residents may replace all their toilets while others may not replace any toilets. The estimated cost for the project could be $119,000 for 1.25 toilets for every 952 services and approximately $30,000 for project administration for a total project estimate of $149,000. Alternatively, rather than applying the rebate to the water bill, a rebate card valued at $100 may be issued.
Inyo County Public Works	County Agency	Laws, Independence, and Lone Pine Condition Assessment and Leak Detection Survey	Laws, Independence, and Lone Pine are disadvantaged communities. The Laws, Independence, and Lone Pine Condition Assessment and Leak Detection Survey shall provide a condition assessment of pipeline integrity and leak detection of all mains in the three town water systems. The project shall also provide funds to excavate and repair leaks and unmetered services discovered by this Project. The project may help to conserve water lost by leaks and un-metered services while the condition assessment may help to prioritize capital improvements. The estimated cost for the Condition Assessment and Leak Detection Survey may be $200,000 over the total of approximately 20 miles of mains in all three water systems. An additional $50,000 could be included to remedy the defects discovered. Administration of the project may cost approximately $50,000.
Inyo County Public Works	County Agency	Lone Pine, Independence and Laws Water Meter Project	Inyo County owns and operates three community water systems serving the unincorporated towns of Laws, Independence, and Lone Pine. The combined population served by the water systems is approximately 2,000 people. The proposed project will replace residential analog meters with automatic electronic read meters and renovate the Town Demand Meters. Laws, Independence, and Lone Pine are Disadvantaged

Organization Name	Organization Type	Project Title	Project Description
			Communities. Ratepayer revenues for Lone Pine and Independence cover operations and maintenance but are insufficient to build capital reserves for upgrades. The county has had limited success raising the rates. The Laws water system supplies water for only 14 ratepayers. Monthly revenues are too small to operate the system in the black. Inyo County subsidizes the system operation and maintenance costs. The aging analog meters were installed in the 1970s and are no longer accurate and produce unreliable readings for billing. The Town Demand meters have not been certified in ten years. The Independence Town demand meter is not turning freely and under reporting flows. The proposed project will replace the residential analog meters with automatic electronic read meters and renovate the Town Demand Meters. The project will provide for accurate measurement of individual water usage and efficient monitoring of the town's gross water demand. The improvements will provide better accounting and billing information and promote water conservation. Converting to automatic electronic read meters will reduce meter reading time from 10 days to 3 days, providing for more efficient operations and reduced costs.
June Lake Public Utility District	Public Utilities District	Wastewater Treatment Plant Upgrades	Our wastewater treatment plant has been in service for over 35 years and is in need of the upgrades identified below to enhance the treatment process. Currently we do not have a screening device at the head works. Screens are used in wastewater treatment to strain larger particles from the water stream and are usually the first components in the treatment system. The main objective of using a screen is to remove materials and large objects that could damage or cause blockage to downstream equipment, reduce the overall effectiveness and reliability of the treatment processes and ultimately contaminates the final discharge waterway.

Organization Name	Organization Type	Project Title	Project Description
			The objectives of this project are to protect and restore surface water and groundwater quality into the Mono Basin to safeguard public and environmental health and to secure water supplies for beneficial uses.
Lone Pine Paiute-Shoshone Tribe	Native American Tribe	Hydrant Replacement on Zucco Road	The fire hydrants located throughout the reservation are in need of replacement. In a report created by SCS Engineers in June of 1999 titled "Water Resources Management Plan and Irrigation Analysis: Lone Pine Paiute-Shoshone Indian Reservation, Lone Pine, California", it was noted that the majority of hydrants on LPPSR were nearing the end of their service life (based on a 40-60 year service life). Since 1999, none of the hydrants have been replaced; therefore, they are in need of replacement. The main objective of this project is to replace the existing fire hydrants on Zucco Road with newer, properly functioning, efficient models. Other subsequent objectives are safer conditions on Zucco Road due to improved operational efficiency of hydrants, lower leak potential due to replaced hydrants, fire suppression, and employment of tribal Members from the LPPSR for completion of the project. The beneficiaries of this project are both tribal and non-tribal residents living on the reservation. The new hydrants on Zucco Road would create a safer area less prone to fire damage, which helps protect homes in and around the surrounding community of Lone Pine. Since the hired help will come from LPPSR, the tribal Members are given an opportunity for work that otherwise would not have existed.
Lone Pine Paiute-	Native American	Irrigation system	The irrigation system was installed in the 1940s by the Bureau of Indian Affairs as part of the 1934 Land Exchange. The system, well over 25

Organization Name	Organization Type	Project Title	Project Description
Shoshone Tribe	Tribe	replacement	years old, is in serious need of rehabilitation and/or replacement. Pipe failures and cracking has been seen and affects the operation of the system. The overall project goal is system replacement. Currently, LPPSR's irrigation mainline runs approximately 5,200 feet from east to west and consists of many different pipe sizes. A replacement of the system would allow it to flow properly and provide the necessary amounts of water for assigned and tribal lands. The main objective is to replace the old system with newer parts to guarantee effective operation for meeting future demands.
Lone Pine Paiute-Shoshone Tribe	Native American Tribe	Main Line Replacement	The original distribution system was put in by the Bureau of Indian Affairs in the 1940s and consisted of various pipe widths: 5", 4", 3", 2" and ½" pipes, which ultimately failed after certain periods of time. In 1990, approximately 5 miles of the mainline were replaced with 4", 6" and 8" pipes to replace failing sections and to expand the system. According to a 1999 investigation, many of the main lines were reaching the end of their service life and were recommended for replacement. Today, it is very evident that the mainline needs to be replaced to not only adequately supply water to homes and tribal operations, but to also ensure the system does not fail if and when fire hydrants are used to suppress fires. Project goal is to repair or replace damaged mainlines to ensure their continued use and operation of the system to maintain its capacity to supply homes and tribal operations. Overall project objective is to meet the demands of a growing population and to allow access for new home construction and future economic development. 2012 update: mainline replacement has occurred on the western side of the reservation, but work remains to be completed. Funds needed are probably lower than the "grant ask" since a lot of the work has been completed.

Organization Name	Organization Type	Project Title	Project Description
Lone Pine Paiute-Shoshone Tribe	Native American Tribe	Water Storage Tank	Initial construction of water storage tanks for LPPSR took place at various stages. There are currently three (3) storage tanks that supply water for domestic use. These storage tanks are located within reservation boundaries and operate on a gravity flow and pressurized system. The pressurized system mainly feeds the western half of the reservation, which has resulted in expensive utility bills to keep the system operational. The main goal of the project is to move the water storage tanks 3000 feet west of their current location to the base of the Alabama Hills to enable the whole system to completely operate by gravity flow, thus reducing the costs to operate. An end result of relocating the water storage tanks is to ensure that LPPSR will/can meet the needs/demand of a growing population and allow for easier access when new homes are built.
Lone Pine Paiute-Shoshone Tribe	Native American Tribe	Well Rehabilitation	The construction of domestic wells took place more than 25 years ago. In 1999, an inventory and inspection of the wells was conducted and noted that all wells are either in need of being updated and/or replaced. Despite the repairs that have occurred throughout the years, they continue to be problematic. During the initial inspection of the wells in 1999, it was noted that no rehabilitation work or diagnostic testing has ever been done. The goal of the project is to improve the function and operation of the wells to improve water quality conditions. An overall objective of the project is to sustain an adequate supply of water that can meet the capacity of future demands and reduce the costs needed for untimely repairs.

Organization Name	Organization Type	Project Title	Project Description
Mammoth Community Water District	Community Services District	Expansion of Mammoth Basin Groundwater Monitoring Array	MCWD relies on groundwater for up to 60% of its annual potable supply, and has a network of nine production wells and 14 monitoring wells. MCWD completed a groundwater model and report in 2009 (Wildermuth environmental Inc. 2009), to simulate the groundwater basin under existing and potential future groundwater use levels. This report identified geographic areas that lack adequate groundwater data and thus constrain the understanding of the hydrogeologic system and limit the accuracy of the groundwater model. To address these data gaps, MCWD proposes installation of new monitoring wells in the areas identified in the 2009 report, and a targeted set of pumping-induced short term "stress tests" to confirm key aquifer parameters, such as groundwater/surface water interactions. The proposed new well locations are: 1) four wells in the vicinity of Laurel Pond for water quality and shallow groundwater monitoring; 2) two wells between the Town of Mammoth Lakes and Hwy 395, adjacent to Mammoth Creek, to improve groundwater monitoring in the central-eastern areas of the aquifer; 3) one well near the crossing of Mammoth Creek and Hwy 395 to monitor areas of potential creek interactions with groundwater; and 4) one well in the vicinity of the Convict Creek watershed divide to confirm key boundary condition assumptions for the aquifer. The collection of new groundwater data would be used to improve the Mammoth Basin Groundwater model and increase the understanding of the characteristics of the hydrogeological system.
Mammoth Community Water District	Community Services District	Mammoth Creek Data Collection Improvements	MCWD's water right licenses and permit require the District to refrain from diverting water when Mammoth Creek flows fall below specified monthly flow levels. These specified flows protect the creek's fish habitat and downstream ranching operations. This project would improve the accuracy of two key gages for low flow conditions, and provide improved real-time monitoring at a third gage, for improved tracking and response to low flow conditions. This project would improve Mammoth Creek flow

Organization Name	Organization Type	Project Title	Project Description
			monitoring at three locations: • the Old 395 Gage downstream of the Mammoth Creek crossing of Hwy 395 bridge by installing a live link with MCWD's Supervisory control and Data Acquisition (SCADA) system • the Old Mammoth Road gage, by redesigning the placement of the gauge to improve flow hydraulics • the Twin Lakes Outlet Weir to measure low flows by installing a sharp crested weir plate
Mammoth Community Water District	Community Services District	MCWD Energy Efficiency and Self-Sufficiency	MCWD is keenly interested in reducing its carbon footprint and reducing energy costs by pursuing options for reducing its operational energy demands and producing renewable clean energy. The cost for energy is the District's second largest operations expense. With the completion in 2011 of a 1 MW solar array that provides 30% of the District's current annual electrical power supply, the District has demonstrated its determination to pursue sound energy generation and reduce its greenhouse gas emissions into the future. The District proposes implementing further renewable energy production and energy efficiency using the most appropriate technology available. This project would include two elements supporting expanded renewable energy production and maximum system efficiency; installation of variable frequency drives (VFD's) on all major power loads such as well pumps and wastewater plant blowers, and a technical/financial feasibility study for installation of micro-turbines at existing pressure reducing stations in the water distribution system. The VFDs have a secondary benefit of improved management of groundwater quality, when installed on wells. The micro-turbine concept is gaining rapid support within the energy sector as one of the largest potential sources of small, distributed generation sources. This project will confirm the feasibility of retrofitting the 3 largest pressure reducing stations with micro-turbines to generate power for feed in to the local SCE grid.

Organization Name	Organization Type	Project Title	Project Description
Mammoth Community Water District	Community Services District	MCWD Recycled Water Master Plan	MCWD's recycled water distribution is limited to one current and one future customer, both golf courses with large irrigation demands. To optimize the future use of the recycled water, the District proposes the development of a recycled water master plan. The plan would include consideration the economic and supply aspects of expanding recycled water distribution to parks, schools, large commercial properties, and public landscape medians. For example, the plan will examine the current and future production and storage capacity for recycled water, areas of the service area that could best utilize reclaimed water, and the associated costs to expand the recycled water distribution infrastructure. In addition, the plan would inform planning efforts to meet future water supply demands. The plan will also assist MCWD in applying for future federal USBR Title XVI program funds for construction of new recycled water distribution and treatment improvements.
Mammoth Community Water District	Community Services District	MCWD Water Treatment Plant Corrosion Control	The properties of MCWD's water supply contribute to conditions that cause an exceedence of the Safe Drinking Water Act (SDWA) Lead and Copper Rule. California Department of Public Health (DPH) has mandated that MCWD implement the results and recommendations of a recent Corrosion Control Study to achieve compliance for the Lead and Copper Rule. The District has one surface water treatment plant and two groundwater treatment plants. The study recommended and the DPH has approved the installation of aeration systems to adjust the pH of the groundwater treatment plant (GWTP) effluents. The surface water treatment plant pH control is completed (2011-2012), and used caustic soda chemical feed to adjust the raw water pH. This project will implement the corrosion control improvements at groundwater treatment plant #2.

Organization Name	Organization Type	Project Title	Project Description
Mammoth Community Water District	Community Services District	MCWD Well Rehabilitation Phases 1 and 2	MCWD's groundwater production wells have varying levels of naturally occurring contaminants, which are regulated by state and federal drinking water standards. To produce safe water for the community, groundwater supplies from some wells must be reduced and diluted with other supplies. This need to reduce the amount of groundwater produced is a significant concern when surface water supplies are limited by environmental concerns or low water availability. Recent advances in well profiling have demonstrated that contaminants can be limited to specific layers within an aquifer and that the identification of the location of these layers and the rate of water produced from these layers can be used to develop actions that would reduce or eliminate contaminants from the well. Phase 1 of this proposal would conduct well profiling in four wells and develop recommendations to reduce contaminants. Phase 2 would consist of implementing recommended actions to reduce contaminants into the raw water system.
Mammoth Community Water District	Community Services District	Meridian Blvd. Sewer Main Replacement Project	MCWD has aging sewer lines made of substandard materials and designed for lower flows than they are currently carrying; therefore, completion of this project will eliminate the potential overflow of sewage onto the streets. The project consists of replacing about 1,000 feet of aging sewer main pipeline and installing 6,500 feet of new sewer main pipeline along portions of Meridian Boulevard in the Town of Mammoth Lakes. The pipeline replacement targets existing asbestos cement pipe threatened by structural failure due to hydrogen sulfide corrosion exasperated by low slopes and high flows. The proposed new pipeline alignment and installation would extend the existing sewer main along Meridian Boulevard and divert flows around old asbestos pipe currently in use.

Organization Name	Organization Type	Project Title	Project Description
Mono County	County Agency	Mono Well Sampling and Solution	Many wells in Mono County do not meet safe drinking water standards. This known problem is exacerbated by the lack of a suitable testing laboratory that private landowners can utilize to conduct the regular testing that is justified by these conditions. This project would be carried out in 2 phases--the first would provide a mobile laboratory to conduct testing in the outlying communities at a reduced cost to the consumer. The second phase of this project would be to provide appropriate treatment infrastructure (reverse osmosis, etc.) for systems that have established problems.
US Forest Service	Other Federal Agency	Hilton Trails/Watershed Restoration	This project proposes to repair identified trail/watershed interaction problem areas within the Hilton Lakes Watershed. Specific actions include: repairing headcuts, re-routing system trails out of sensitive montane and subalpine meadow systems, restoring abandoned trails. In addition, this project proposes to maintain existing erosion control structures on the system trails, placement of additional erosion control structures and enhancing stream crossing. This project will assist in restoring meadow hydrologic function and provide a sustainable trail system that is compatible with watershed processes. This project will also provide ecosystem resiliency for the restored meadows by enhancing water capture, storage and summer base flows.
US Forest Service	Other Federal Agency	Lee Vining Campground Watershed Evaluation	This project proposes to inventory campgrounds and associated roads for maintenance, improvement or removal in Lee Vining Canyon where they contribute to negative watershed effect, degraded water quality and impaired meadow hydrologic function. Priority campgrounds include Lower Lee Vining, Moraine, and Aspen campgrounds. There is an opportunity to take a broader look at issues within this watershed incorporating stakeholders such as Southern California Edison, Los Angeles Department of Water and Power, California State

Organization Name	Organization Type	Project Title	Project Description
			Parks, Mono Lake Committee and local citizens in Lee Vining and surrounding communities among others. The Forest in collaboration with stakeholders would develop a preliminary proposed action to address identified issues, such as water quality and meadow hydrologic function, within the watershed.
US Forest Service	Other Federal Agency	Oak creek Gully restoration Implementation	This project would implement restoration recommendations from the collaborative planning effort. The collaborative planning effort is being conducted jointly with the Ft. Independence Tribe and the Inyo National Forest. At this point, it is uncertain exactly of what the restoration effort will consist. Potential projects include: engineering of up to three flood diversions, two reservoirs, three miles of creek restoration (tribal, private, and National Forest lands) and up to 500 acres of irrigation systems. Creek restoration could consist of reshaping the channel and improving bank stability, placing riprap in the channel to retard bank erosion and/or riparian plantings among other treatments. The collaborative planning effort contains a detailed account of history of the fire/flood sequence and consequences in the Oak Creek Watershed. This project would benefit the Tribe, Oak Creek Stakeholders (Private landowners), Mt. Whitney Fish Hatchery, Inyo National Forest, as well as local flora and fauna.

Phase II Project Needs Analysis

The information collected in the online project upload form allowed for more extensive analysis of the types of projects currently needed within the Inyo-Mono IRWM region than was possible in the Phase I Plan. Again, 36 projects are part of this analysis.

Fifteen of the 36 projects were input by urban water suppliers (Figure 15-1). There are only two urban water suppliers in the Inyo-Mono IRWM region: Mammoth Community Water District and Indian Wells Valley Water District. The next two largest categories of project proponents are County Agency and Native American Tribe. Public Utilities Districts and Resource Agencies round out the 36 projects.

Figure 15-2. The 36 Phase II projects split out by Project Proponent organization type.

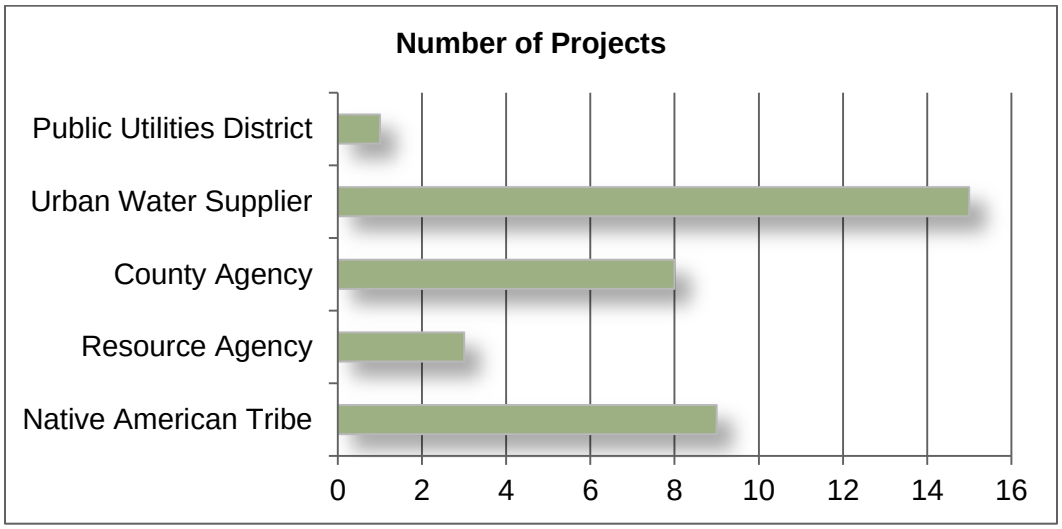
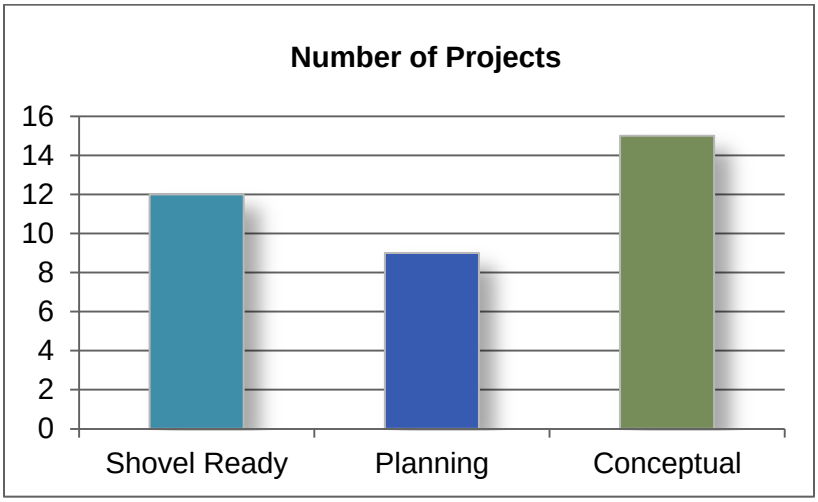


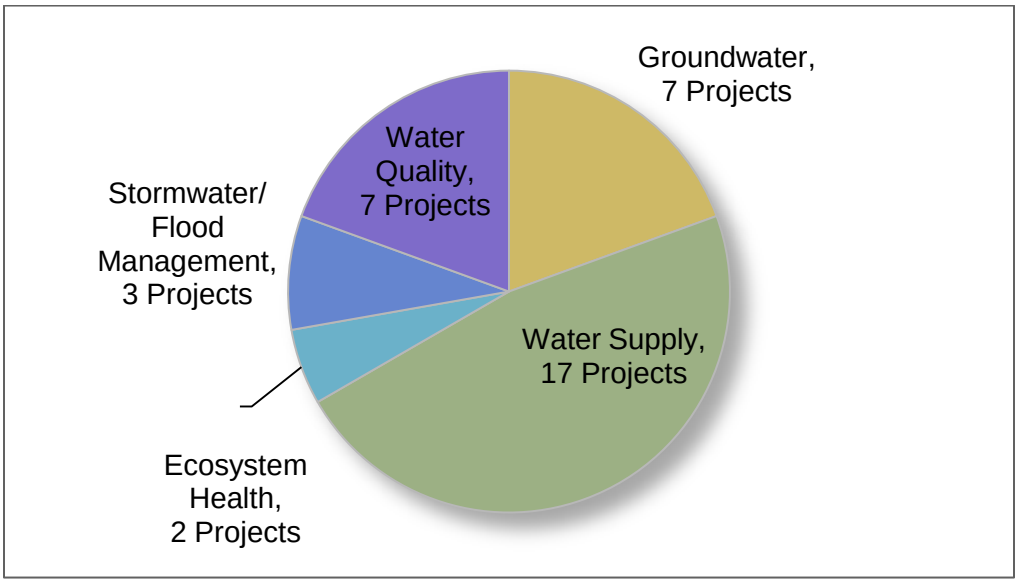
Figure 15-3. Phase II project status.



Of the 36 Phase II projects, 12 are shovel-ready, nine are in the planning phase, and 15 are conceptual (Figure 15-2).

As part of the online project upload process, potential project proponents were asked to self-identify a primary project evaluation bin. These evaluation bins will be used in the revised project evaluation and ranking process for future rounds of Proposition 84 Implementation funding (Chapter 14), and also perhaps for other types of project funding. For the purposes of this analysis, the self-selection of evaluation bins was used to determine the primary type of project. Not surprisingly given the overriding water-related concerns in the region, almost half of the projects were identified as Water Supply projects (Figure 15-3). The other two significant categories of projects were Water Quality and Groundwater. Ecosystem Health and Stormwater/Flood Management represented the smallest two categories. These five categories were modified from the eight regional Objectives as discussed in Chapter 7. In the Phase I Plan, there was no Objective focused on groundwater management, and it became apparent that this was a major planning gap within the region, as is evident by the use of the Groundwater evaluation bin in the online upload form and discussions with various RWMG Members about groundwater concerns.

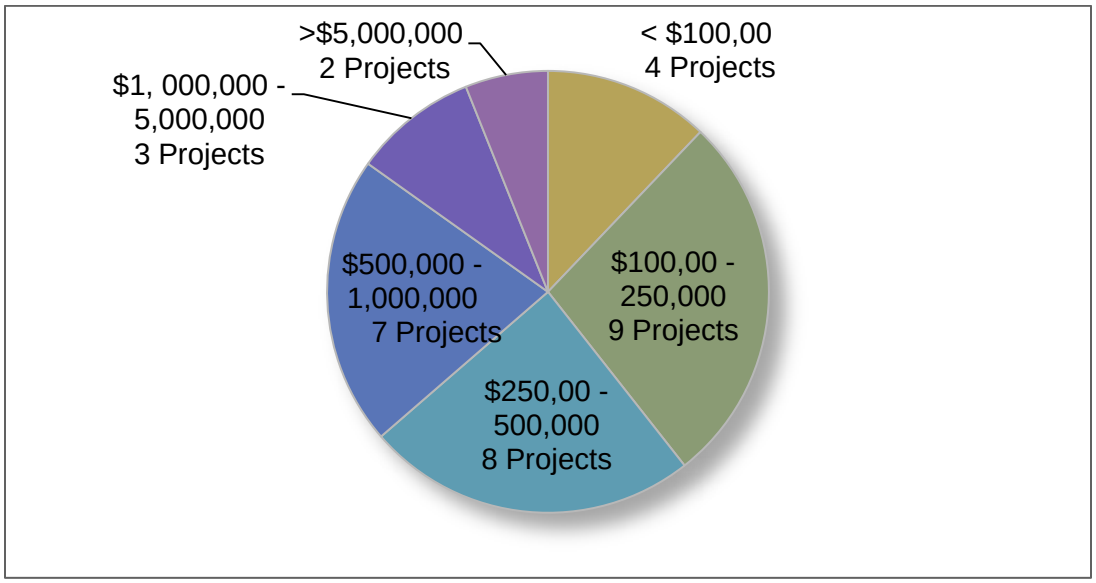
Figure 15-4. Phase II project type as modified from self-selected evaluation bins in the online project upload form.



Another important factor to consider in the analysis of regional project needs is cost. Thirty-three of the 36 projects were able to provide some estimate of project cost, including many of the concept-only projects. Given this, an estimate of the total cost of project needs in the region is $121,825,000. This includes a $24,000,000 project and an $80,000,000 project, both in the Indian Wells Valley Water District. Removing those two projects from the calculations, the average project cost is approximately $580,000. The individual project costs range from $42,000 to $80,000,000. Separating out projects submitted by disadvantaged communities (DACs), the average project cost is $380,000, and projects range from $43,000 to $994,000. A total of $6,032,000 in matching funds are available from project proponents to count towards the

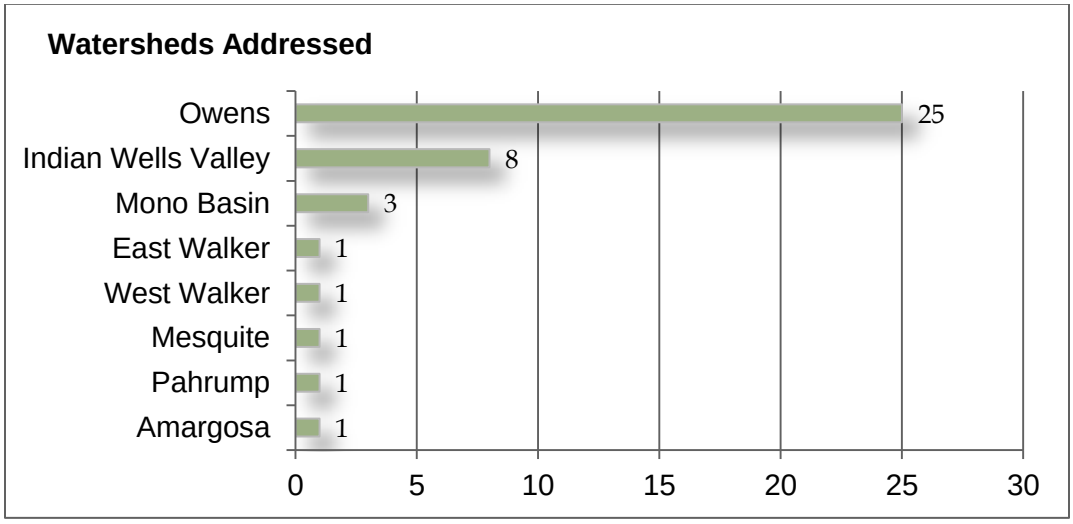
total $121,825,000 in project needs. As many of the projects are being sponsored by DACs, however, the RWMG will be seeking waivers to matching fund requirements. Figure 15-4 shows a further breakdown of this information by cost category:

Figure 15-5. Phase II project cost by category.



Another aspect of the analysis was to examine the geographical distribution of the benefits of the 36 Phase II projects. Through the online upload form, the project proponents were asked to identify which area watershed(s) their project(s) would address. The most projects focused on the Owens watershed. This is where the majority of the population in the Inyo-Mono region resides. It is also the area from which water is exported to Los Angeles, so this area receives a great deal of attention. The overall results from this analysis can be seen in the Figure 15-5.

Figure 15-6. Number of Phase II projects benefitting individual Inyo-Mono watersheds.



The final part of the analysis is an examination of projects addressing water-related needs in DACs. Bringing financial and technical resources to Inyo-Mono DACs has been and continues

to be a top priority for the RWMG. Understanding their needs will better allow the RWMG to seek out the appropriate resources. Only by building long-term relationships with DACs and working with them on a continual basis can we ensure that their needs are addressed in a timely manner. Furthermore, it is not enough to simply understand that there are project needs in these communities. In the Phase I Plan and subsequent Implementation application process, numerous DAC project needs were identified, and several DAC projects even went through the ranking process, but many DAC project proponents did not have the capacity to complete the long and complex DWR grant application. Particularly difficult for DACs was the economic analysis required within the application.

Table 15-2. Inyo-Mono DACs included in Phase II projects.

DACs in Phase II Projects
Benton
Big Pine
Big Pine Paiute Tribe
Coleville
Fort Independence Indian Reservation
Independence
Inyokern
Laws
Lone Pine
Lone Pine Paiute-Shoshone Reservation
Tecopa
Topaz
Trona
Walker

Therefore, having an initial list of Phase II projects from DACs will allow the RWMG to work with them in the Implementation application process and provide them the resources necessary to submit competitive funding applications.

Of the 36 Phase II projects submitted, 20 were submitted on behalf of, or will benefit, DACs. Table 15-1 provides a list of the DACs that are included in the 20 projects.

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Summary/Conclusion

The Phase II Inyo-Mono IRWM Plan contains the most up-to-date information about the Inyo-Mono region, its water resources, and the RWMG's vision for water planning now and into the future. The IRWM Program has already showed substantial progress and great promise through the grants received and the projects implemented. Yet the true success of the Program is not measured by grant money received or numbers of meetings held, but by the people helped, the water quality improved, the water supplies enhanced, and the ecosystems protected.

At the start of the Inyo-Mono IRWM Program, the RWMG persevered in its development of the Phase I IRWM Plan despite funding challenges. The Phase I Plan guided the IRWM Program through its "adolescence" and through the implementation of the first projects. This Phase II Plan is a substantially improved document that will continue to guide the RWMG for the next several years. Certain sections will be expanded and improved upon through the work of the Round 2 Planning Grant, and other updates and amendments will be made as needed. But the foundation for long-term water planning in the Inyo-Mono region has been laid, and we will continue to build upon our ever-increasing knowledge and understanding of the region, of each other, and of the area's ecosystems to better manage the water resources for both human and natural communities. Efforts to date have significantly improved collaboration among many organizations, DACs, and Native American tribes. These relationships will serve the Inyo-Mono Regional Water Management Group well into the future.

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References

Aitken S., S. Yeaman, J. Holliday, T. Wang, and S. Curtis-McLane. 2008. Adaptation, migration or extirpation: climate change outcomes for tree populations. Evolutionary Applications 1: 95-111.

Babb, D.E. 1992. History of early water diversions and their impact on Owens Lake. In: The History of Water in the Eastern Sierra Nevada, Owens Valley and White Mountains, C.A. Hall, V. Doyle-Jones, and B. Widawski (eds.). Los Angeles: University of California Press, pp. 263-267.

Bailey, R.A., G.B. Dalrymple, and M.A. Lanphere. 1976. Volcanism, structure, and geochronology of Long Valley caldera, Mono County, California. Journal of Geophysical Research 81(5): 725-744.

Bauer Environmental Services. 1998. Draft environmental impact report and environmental assessment: Mammoth Community Water District proposed reclaimed water project. State Clearinghouse number 95121029. Mammoth Lakes, CA: Mammoth Community Water District.

Bean, R.T. 1989. Hydrogeologic Conditions in Indian Wells Valley and Vicinity. Prepared for California Department of Water Resources. Contract No. DWR B- 56783. 51 pgs.

Boyle Engineering Corporation. 2004. June Lake Public Utility District 2004 master water plan update. Bakersfield, CA: Boyle Engineering Corporation.

Boyle Engineering Corporation. 2005. June Lake Public Utility District wastewater system evaluation. Bakersfield, CA: Boyle Engineering Corporation.

Brown, R.L. 1979. Water quality study -- June Lake loop. Sacramento: California Department of Water Resources.

Brown and Caldwell and Triad Engineering. 1984. Mammoth Lakes storm drainage master plan. Prepared for Mono County Public Works Department.

Buckmelter, N. 2000. Gasoline spill at MMSA -- fuel spill remediation might take years. Mammoth Times, June 1, 2000.

Burton, J.F., and M.M. Farrell. 1992. Cultural resources of the Arcularius Ranch, Long Valley, California. Contributions to Trans-Sierran Archaeology No. 29. Tucson, AZ: Trans-Sierran Archaeological Research.

California Air Resources Board, the California Climate Action Registry, ICLEI-Local Governments for Sustainability, and The Climate Registry. 2010. Local Government Operation Protocol for the quantification and reporting of greenhouse gas emissions inventories Version 1.1. http://www.arb.ca.gov/cc/protocols/localgov/pubs/lgo_protocol_v1_1_2010-05-03.pdf; accessed 5/13/2012.

California Climate Action Team. 2008. Water-Energy Sector Write-up for Public Distribution. http://www.climatechange.ca.gov/climate_action_team/reports/CAT_subgroup_reports/Water Sector_Summary_and_Analyses.pdf; accessed 5/31/2012.

California Department of Fish and Game. 1990. Interim management plan, Pickel Meadow and Little Walker River. Bishop, CA: DFG fisheries files.

California Rural Water Association. 2011. IRWMP needs assessments and technical assistance support outline for Inyo/Mono Region. Sacramento, CA.

Carson River Basin Council of Governments. 1974. Regional storm drainage plan, Walker River phase I inventory. Carson City, NV.

Casazza, M.L., C.T. Overton, M.A. Farinha, Alicia Torregrosa, J.P. Fleskes, M.R. Miller, J.S. Sedinger, and Eric Kolada. 2009. Ecology of greater sage-grouse in the Bi-State Planning Area Final Report, September 2007: U.S. Geological Survey Open-File Report 2009-1113, 50 pgs.

Cayan D.R., E.P. Maurer, M.D. Dettinger, M. Tyree, and K. Hayhoe. 2008. Climate change scenarios for the California region. Climatic Change 87: (Suppl 1):S21-S42.

Chalfant, W.A. 1933. Story of Inyo. Bishop, CA: Chalfant Press.

Chen, Y., S. Parmenter, and B. May. 2007. Introgression between Lahontan and endangered Owens tui chubs, and apparent discovery of a new tui chub in the Owens Valley, California. Conservation Genetics, v. 8(1): 221-238.

Collopy, M.W. and J.M. Thomas. 2010. Restoration of a desert lake in a agriculturally dominated watershed: The Walker Lake Basin. Reno, NV: University of Nevada and Desert Research Institute.

Couch, R.F., K. Monks, and R. Knapp. 2003. Groundwater management in the Indian Wells Valley Basin, Tetra Tech EM Inc., 104 pgs.

Curry, R.R. 1996. Delineation report: Development of specific plans and policies to avoid or mitigate the impacts of future development in certain Mono County wetlands. South Lake Tahoe, CA: California Regional Water Quality Control Board--Lahontan Region.

Danskin, W.R. 1998. Evaluation of the Hydrologic System and Selected Water-Management Alternatives in the Owens Valley, California. U.S. Geological Survey Water-Supply Paper 2370-H. 175 pgs.

DeDecker, M. 1966. Mines of the eastern Sierra. Glendale, CA: LaSiesta Press.

Deinstadt, J.M., G.F. Sibbald, J.D. Knarr, and D.M. Wong. 1986. Survey of fish populations in streams of the Owens River drainage: 1985. Inland Fisheries Administrative Report 86-3. Rancho Cordova, CA: California Department of Fish and Game.

DWR. 1964. West Walker River investigation. Bulletin 64. Sacramento, CA.

DWR. 1973. Mammoth basin water resources environmental study (final report). Sacramento, CA.

DWR. 1981. June Lake area water assessment study. Sacramento, CA: Department of Water Resources.

DWR. 1992. Walker River Atlas. Sacramento, CA.

DWR. 2004. California's groundwater: Update 2003. Bulletin 118. Sacramento, CA

DWR. 2008. Managing an uncertain future: Climate change adaptation strategies for California's water. Sacramento, CA: California Department of Water Resources.

DWR. 2009. California Water Plan Update 2009. Sacramento, CA: California Department of Water Resources.

DWR. 2010. Climate change characterization and analysis in California water resources planning studies. Sacramento, CA: Natural Resources Agency.

Ebasco Environmental, Water Engineering and Technology, and W. Davis and Associates. 1993. Instream flow and habitat restoration investigations for the upper Owens River, Mono County, California. Stream Evaluation Report 93-1. Sacramento, CA: California Department of Fish and Game.

ECO:LOGIC Consulting Engineers and Wagner & Bonsignore Consulting Civil Engineers. 2006. June Lake Public Utility District water resource assessment. Reno, NV: ECO:LOGIC Consulting Engineers.

EDAW. 2005. Initial study / notice of preparation for the State Water Resources Control Board's on-site wastewater treatment system regulations. Sacramento, CA: EDAW.

Elkins, K.A. 2002. Spatial and temporal variability of nutrient and fecal coliform export from East Walker River watershed: Implications for pollutant source areas. M.S. thesis, Civil and Environmental Engineering, University of California, Berkeley.

Environmental Sciences Associates. 1984. Draft environmental impact report: Mammoth Lakes general plan update. Novato, CA: Environmental Sciences Associates.

EPA, DWR. 2011. Climate Change Handbook for Regional Water Planning. Sacramento, CA.

Federal Energy Regulatory Commission. 1986. Owens River basin: Seven hydroelectric projects, California. Final environmental impact statement. Washington, DC: Federal Energy Regulatory Commission, Office of Hydropower Licensing.

Fletcher, T.C. 1987. Paiute, Prospector, Pioneer: The Bodie-Mono Lake Area in the Nineteenth Century. Lee Vining, CA: Artemisia Press.

Gaines, D. 1989. Mono Lake Guidebook. Lee Vining, CA: Kutsavi Press.

GBUAPCD. 2008. Great Basin Unified Air Pollution Control District, Owens Valley PM_{10} Planning Area Demonstration of Attainment State Implementation Plan - 2008 Revision, GBUAPCD, Bishop, California, January, 2008.

Gerstung, E. 1988. Status, life history, and management of the Lahontan cutthroat trout. American Fisheries Society Symposium 4: 93-106.

Gilbert, C.M. 1938. Welded tuff in eastern California. Geologic Society of America Bulletin 49: 1829-1862.

Glancy, P.A. 1971. Water resource appraisal of Antelope Valley and East Walker area, Nevada and California. Nevada Department of Conservation and Natural Resources, Water Resources Reconnaissance Series, Report 53. Carson City, NV: U.S. Geological Survey.

Gram/Phillips Associates, Inc. 1977. Final environmental impact report: Proposed sewerage system for the community of Hilton Creek Community Services District, Mono County, California. State Clearing House #77050933. Pasadena, CA: Gram/Phillips Associates, Inc.

Gram/Phillips Associates, Inc. 1980. Draft environmental impact report for a proposed 80 acre Crowley Lake subdivision (tentative tract map 37-26), Mono County, California. State Clearing House #80041404. Pasadena, CA: Gram/Phillips Associates, Inc.

Gregory, G. 2011. Re-watering Walker Lake. High Country News 43(13): 7, 21. August 8, 2011.

Gregory, S.V., F.J. Swanson, W.A. McKee, and K.W. Cummings. 1991. An ecosystem perspective of riparian zones. BioScience 41(8): 540-51.

Hall, M.C. 1984. Obsidian, paleoeconomy, and volcanism in the eastern Sierra Nevada. Paper presented at the Great Basin Anthropological Conference, 19th biennial meeting, Boise. Cited by Burton and Farrell, 1992.

Hansford, Catherine. 2006. June Lake Public Utility District Water Resource Assessment, Technical Memorandum No. 2, Rodeo Grounds Water Demands. http://monocounty.ca.gov/cdd%20site/Planning/Documents/JuneLakeWaterStudy_TechnicalMemorandum2.pdf; accessed 6/1/2012.

Harrington, B. 2009. Comments on Public Review Draft of the California Water Plan Update 2009. Independence, CA: County of Inyo Water Department.

Hart, J. 1996. Storm over Mono: The Mono Lake battle and the California water future. Berkeley, CA: University of California Press.

Hashimoto, H.S. and I. Qazi. 1981. Water action plan for the Owens-Mono area. Department of Water Resources, Southern District, Los Angeles.

Hayhoe K., et al. 2004. Emissions pathways, climate change, and impacts on California. Proceedings of the National Academy of Sciences of the United States of America 101: 12422-12427.

Hereford, R., R.H. Webb, and C.I. Longpre. 2003. Precipitation history of the Mojave Desert region, 1893-2001. USGS Fact Sheet 117-03. Carson City, NV: U.S. Geological Survey, Nevada Water Science Center.

Herbst, D.B., and J.M. Kane. 2004. Responses of stream channels, riparian habitat, and aquatic invertebrate community structure to varied livestock grazing exposure and management in the West Walker River watershed (Mono County, California). Final report to Lahontan RWQCB, South Lake Tahoe, CA.

Hill, M. 1975. Geology of the Sierra Nevada. California Natural History Guide 37. Berkeley, CA: University of California Press.

Hoffmann, A. 1981. Vision or villainy: Origins of the Owens Valley – Los Angeles water controversy. College Station: Texas A&M Press. 308 pgs.

Hollett, K.J., W.R. Danskin, W.F. McCaffrey, and C.L. Walti. 1991. Geology and Water Resources of Owens Valley, California. U.S. Geological Survey Water-Supply Paper 2370-B. 77 pgs.

Horne, A.J., J.C. Roth, M. Beutel, R. Barth, K. Elkins, S. Stoller, R. Muneepeerakul, J. Berlin, J. Truitt, S. Huang, and J. Kane. 2003. Report on Bridgeport Reservoir beneficial use impairment: Limnology in the summer-fall 2000 and comparisons with 1989. Department of Civil and Environmental Engineering, University of California, Berkeley.

Horton, G. 1996. Walker River chronology: A chronological history of the Walker River and related water issues. A publication in the Nevada Division of Water Planning's Nevada Water Basin Information and Chronology Series, available on the Nevada Division of Water Planning's website: www.water.nv.gov. Carson City, NV: Department of Conservation and Natural Resources.

Howald, A. 2000a. Valentine Camp. Part 1 of A flora of Valentine Eastern Sierra Reserve. MSE Environmental Report 16. Santa Barbara, CA: University of California, Museum of Systematics and Ecology.

Howald, A. 2000b. Plant communities. in Sierra East: Edge of the Great Basin, G. Smith, ed. California Natural History Guide 60. Berkeley, CA: University of California Press. 94-207.

Hubbs, C.L., and R.R. Miller. 1948. The zoological evidence: correlation between fish distribution and hydrographic history in the desert basins of western United States. Bull. Univ. Utah 38:17-166.

Humberstone, J.A. 1999. Walker River basin water quality modeling. M.S. thesis. Reno, University of Nevada.

Indian Wells Valley Cooperative Groundwater Management Group. 2006. Cooperative groundwater management plan for the Indian Wells Valley. Ridgecrest, CA.

Indian Wells Valley Water District. 2002. Indian Wells Valley Water District 2000 Urban Water Management Plan. Cited by Couch, et al. 2003.

Ingram, S. 2008. Cacti, Agaves, and Yuccas of California and Nevada. Los Olivos, CA: Cachuma Press.

Inyo County and City of Los Angeles. 1991. Agreement Between the County of Inyo and the City of Los Angeles and Its Department of Water and Power on a Long Term Groundwater Management Plan for Owens Valley and Inyo County. http://www.inyowater.org/Water_Resources/water_agreement/default.html

Inyo National Forest. 1987. Land and resource management plan. Bishop. CA: USDA Forest Service.

Inyo National Forest. 1988. Draft environmental impact statement for the Sherwin Ski Area, Mono County, California. Bishop, CA: USDA-Forest Service, Inyo National Forest.

IPCC. 2007. Summary for Policymakers in Solomon S, D. Qin, M. Manning, Z. Chen, M. Marquis, D.B. Averyt, M. Tignor, and H.L. Miller, ed. Climate Change 2007: The Physical Science Basis. Contribution of Working Group 1 to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.

Irwin, S. 1991. California's Eastern Sierra: A visitor's guide. Los Olivos, CA: Cachuma Press.

IWVWD. 2011. The Water Line. http://www.iwvwd.com/Newsletter/Water-Summer-11%20Web%20Version.pdf; accessed 5/28/2012.

Jellison, R., and D.R. Dawson. 2003. Restoration of riparian habitat and assessment of riparian corridor fencing and other watershed best management practices on nutrient loading and eutrophication of Crowley Lake, California. Final report, SWRCB # 9-175-256-0. Sacramento, CA: State Water Resources Control Board.

Jellison, R.J., D.R. Dawson, and J.O. Sickman. 2003. Arsenic sources and the feasibility of using nitrogen isotopes to determine nitrogen sources to Crowley Lake, California. Final Report, Sacramento, CA: State Water Resources Control Board, September 1, 2003.

Jennings, M.R. 1996. Status of amphibians. In Sierra Nevada Ecosystem Project: Final Report to Congress, vol. II, chapter 31, 921-944. Davis, CA: University of California, Centers for Water and Wildland Resources.

Johnson, M.J., C.J. Mayers, C.A. Garcia, and B.J. Andraski. 2007. Selected micrometeorological, soil-moisture, and evapotranspiration data at Amargosa Desert Research Site in Nye County near Beatty, Nevada 2001-5. U.S. Geological Survey Data Series 284, 29 pgs.

Jones and Stokes Associates. 1993a. Draft Mono Basin environmental impact report. Sacramento, CA: Jones and Stokes Associates.

Jones and Stokes Associates. 1993b. Mono Lake basin and Owens River valley water quality data report. Mono Basin EIR auxiliary report 17. Sacramento, CA: Jones and Stokes Associates.

JRP Historical Consulting Services and California Dept. of Transportation. 2000. Water conveyance systems in California: Historic context development and evaluation procedures. Davis and Sacramento, CA.

Kahrl, W. 1982. Water and power. Berkeley and Los Angeles: University of California Press.

Kattelmann, R. 1992. Historical floods in the eastern Sierra Nevada. In: The History of Water in the Eastern Sierra Nevada, Owens Valley and White Mountains, C.A. Hall, V. Doyle-Jones, and B. Widawski (eds.). Los Angeles, CA: University of California Press, pp. 74-86.

Kattelmann, R. 1996. Hydrology and water resources. In: Sierra Nevada Ecosystem Project: Final report to Congress. Volume 2, chapter 30. Davis, CA: University of California, Centers for Water and Wildland Resources. pp. 855-920.

Kattelmann, R. 2007a. Mono basin watershed assessment. Mammoth Lakes, CA: Community Development Department, County of Mono.

Kattelmann, R. 2007b. Upper Owens River basin watershed assessment. Mammoth Lakes, CA: Community Development Department, County of Mono.

Kattelmann, R. 2007c. West Walker River basin watershed assessment. Mammoth Lakes, CA: Community Development Department, County of Mono.

Kattelmann, R. and A. Johnson. 2012. East Walker River basin watershed assessment. Bishop, CA: Eastern Sierra Land Trust.

Kattelmann, R., and D. Dawson. 1994. Water diversions and withdrawal for municipal supply in the eastern Sierra Nevada. In: Effects of Human-Induced Changes on Hydrologic Systems, R.A. Marston and V.R. Hasfurther (eds.). Bethesda, MD: American Water Resources Association, pp. 475-483.

Kattelmann, R. and M. Embury. 1996. Riparian areas and wetlands. In: Sierra Nevada Ecosystem Project: Final report to Congress. Volume 3, chapter 5. Davis, CA: University of California, Centers for Water and Wildland Resources. pp. 201-273.

Kenny, J.F., N.L. Barber, S.S. Hutson, K.S. Linsey, J.K. Lovelace, M.A. and Maupin. 2009. Estimated use of water in the United States in 2005: U.S. Geological Survey Circular 1344, 52 pgs.

King, M.J. and J.D. Bredehoeft. 1999. Death Valley Springs Geochemical Investigation. Prepared for Inyo County Planning Department, Independence, CA.

Knapp, R.A. 1996. Non-native trout in natural lakes of the Sierra Nevada: An analysis of their distribution and impacts on native aquatic biota. In: Sierra Nevada Ecosystem Project: Final report to Congress, vol. 3, pp. 363-407. Davis, CA: University of California, Centers for Water and Wildland Resources.

Knapp, R.A., and K.R. Matthews. 2000. Nonnative fish introductions and the decline of the mountain yellow-legged frog from within protected areas. Conservation Biology 14:428-438.

Krieger & Stewart, Inc. 1998. Domestic Water System 1997 General Plan. Prepared for the IWVWD. Cited by Couch, et al., 2003.

Krieger & Stewart, Inc. 2011. Indian Wells Valley Water District 2010 Urban Water Management Plan. Ridgecrest, CA.

Kurtak, J.M. 1998. Mine in the Sky. Publication Consultants.

LADWP. 1987. Mono Basin geology and hydrology. Aqueduct Division, Hydrology Section. Los Angeles, CA.

LADWP. 2010. Urban Water Management Plan. Los Angeles, CA: Los Angeles Department of Water and Power.

LADWP. 2011a. Annual Owens Valley Report. Los Angeles, CA.

LADWP. 2011b. California Statewide Groundwater Elevation Monitoring (CASGEM) - Monitoring Plan for the Inyo County Portion of the Owens Valley Groundwater Basin (DWR Groundwater Basin 6-12).

Lahontan Regional Water Quality Control Board. 1975. California Regional Water Quality Control Board--Lahontan Region, 1995. Water Quality Control Plan for the Lahontan Region. South Lake Tahoe, CA.

Lahontan Regional Water Quality Control Board. 1994. Water body fact sheets for Crowley Lake and Hot Creek. South Lake Tahoe, CA: Lahontan Regional Water Quality Control Board.

Lahontan Regional Water Quality Control Board. 1998. Watershed management initiative, draft chapter. South Lake Tahoe, CA: Lahontan Regional Water Quality Control Board.

Lawton, H. W., P.J. Wilke, and W. M. Mason. 1976. Agriculture among the Paiute of Owens Valley. Journal of California Anthropology 3: 13–50.

Lee, W.T. 1906. Geology and water resources of Owens Valley, California. Water Supply Paper 181. Washington, D.C.: U.S. Geological Survey.

Lee, C.H. 1912. An intensive study of the water resources of a part of Owens Valley, California. Water Supply Paper 294. Washington, D.C.: USGS.

Lee, C.H. 1915. Report on hydrology of Owens Lake Basin and the natural soda industry as

affected by the Los Angeles Aqueduct Diversion. Berkeley: University of California, Water Resources Center Archives. 105 pgs.

Lee, K. 1969. Infrared exploration for shoreline springs at Mono Lake, California test site. Stanford Remote Sensing Laboratory, Technical Report 69-7.

Lenihan J.M., R. Drapek, D. Bachelet, R.P. Neilson. 2003. Climate change effects on vegetation distribution, carbon, and fire in California. Ecological Applications 13: 1667-1681.

Libecap. G.D. 2007. Owens Valley Revisited: A Reassessment of the West's First Great Water Transfer. Stanford: Stanford University Press.

Lipshie, S.R. 1979. Geology overview. In: An environmental overview of geothermal development: The Mono-Long Valley KGRA, edited by C.L. Strojan and E.M. Romney, 29-92. Los Angeles, CA: Laboratory of Nuclear Medicine and Radiation Biology, University of California.

Lipshie, S.R. 2001. Geologic guidebook to the Long Valley - Mono Craters region of eastern California. Santa Ana, CA: South Coast Geological Society.

Lopes, T.J. and K.K. Allander. 2009. Water budgets of the Walker River basin and Walker Lake, California and Nevada. Scientific Investigations Report 2009-5157. Carson City, NV: U.S. Geological Survey.

Lucich, K. 2004. Scoping letter regarding Mill Creek habitat improvement project. Bridgeport, CA: USDA-Forest Service.

Mammoth Community Water District. 2005. Mammoth Community Water District water assessment amendment Town of Mammoth Lakes general plan update. September 27, 2005.

Mammoth Community Water District. 2011a. 2010 Urban Water Management Plan. Mammoth Lakes, CA.

Mammoth Community Water District. 2011b. Final EIR Mammoth Creek fishery bypass flow requirements, watershed operations constraints, point of measurement, and place of use, SCH # 1977032082. Mammoth Lakes, CA.

Mammoth County Water District. 1981. Draft water plan. Mammoth Lakes, CA.

Mammoth Times. 2002. Contamination found in Crowley water. Mammoth Times, November 28, 2002.

Martin, E. 1992. Water's role in early history of Inyo National Forest. In: The History of Water in the Eastern Sierra Nevada, Owens Valley and White Mountains, C.A. Hall, V. Doyle-Jones, and B. Widawski (eds.). Los Angeles, CA: University of California Press, pp. 285-293.

Melack, J.M., and L. Lesack. 1982. Long Valley reservoir research program, progress report 1. Prepared for Los Angeles Department of Water and Power (cited by Jellison and Dawson, 2003).

Melack, J.M., J.O. Sickman, F.V. Setaro, and D. Engel. 1992. Long-term studies of lakes and watersheds in the Sierra Nevada, patterns and processes of surface-water acidification. Final report to the California Air Resources Board, contract A932-060. Santa Barbara, CA: University of California.

Millar, C.I., et al. 1996. The Mammoth-June ecosystem management project, Inyo National Forest. In Sierra Nevada Ecosystem Project: Final Report to Congress, vol. II, chapter 50. Davis, CA: University of California, Centers for Water and Wildland Resources, pp. 1273-1346.

Miller, R.R. 1973. Two new fishes, *Gila bicolor snyderi* and *Catostomus fumeieventris,* from the Owens River Basin, California. Occasional Paper of the Museum of Zoology, University of Michigan 667: 1-19.

Milliron, C. 1997. A Fisheries Management Plan for Crowley Lake and Tributaries, Mono County, California. Sacramento, CA: California Department of Fish and Game.

Milliron, C., P. Kiddoo, M. Lockhart, and R. Ziegler. 2004. Aquatic biodiversity management plan for lakes in the West Walker basin of the Sierra Nevada, Mono County, California, 2004-2014. Bishop, CA: Department of Fish and Game, Eastern Sierra and Inland Deserts Region.

Minnich, R.A. 2007. Climate, paleoclimate, and paleovegetation. in: M.G. Barbour, T. Keeler-Wolf, and A.A. Schoenherr (eds.), Terrestrial Vegetation of California. Chapter 2, pp. 43-70. Berkeley, CA: University of California Press.

Mono County. 1992. Master environmental assessment. Bridgeport, CA.

Mono County. 2011. Water Level Monitoring Plan for the Groundwater Basins of Mono County. Mono County. Bridgeport, CA.

Mono County LAFCO. 2009. Municipal Service Review and Sphere of Influence Recommendation, June Lake Public Utility District, Mono County, California. http://www.monocounty.ca.gov/cdd%20site/Planning/Documents/JuneLakePublicUtilityDistrict_02.2009.pdf; accessed 6/7/2012.

Mono County Planning Department. 2004. Supplement to the Mono County general plan land use amendments, final environmental impact report, prepared for the Benton Crossing landfill. SCH #98122016 and #2004082091. Bridgeport, CA: Mono County Planning Department.

Mono County Resource Conservation District. 1990. Long range program. Bridgeport., CA.

Mote P.W., A.F. Hamlet, M.P. Clark, and D.P. Lettenmaier. 2005. Declining mountain snowpack in western north America. Bulletin of the American Meteorological Society 86: 39.

Mulvihill, Tom. 2008. July GM Column, Aquifer Storage Recovery. IWVWD Press Release. http://www.iwvwd.com/Articles/07-08%20GM%20Column%20Aquifer%20Storage%20Recovery.pdf; accessed 5/28/2012.

Mulvihill, Tom. 2010. General Manager Column, The Water District is a BIG Operation. IWVWD Press Release. http://www.iwvwd.com/Articles/10-18-10%20GM%20Column%20Water%20District%20Big%20Operation.pdf; accessed 5/28/2012.

National Research Council. 1992. Restoration of Aquatic Ecosystems: Science, Technology, and Public Policy. Washington, DC: National Academy Press.

National Research Council. 1995. Wetlands: Characteristics and Boundaries. Washington, DC: National Academy Press.

Nolte Associates, Inc. 2008a. City of Bishop Water Master Plan. Prepared for The City of Bishop Department of Public Works.

Nolte Associates, Inc. 2008b. City of Bishop Wastewater Master Plan. Prepared for The City of Bishop Department of Public Works.

Perrault, J.R. 1995. Mill Creek report. in Mono Basin Waterfowl Habitat Restoration Plan, Los Angeles Department of Water and Power. Appendix E to Appendix 1 (Drewien, Reid, and Radcliff), 20 pgs.

Perrine, R.L., et al. 1973. Water quality and recreation in the Mammoth Lakes Sierra. Los Angeles, CA: University of California, Environmental Science and Engineering.

Pister. P. 1995. Fish. In: Deepest Valley: Guide to Owens Valley. J. Putnam and G. Smith, eds. Mammoth Lakes, CA: Genny Smith Books. pp. 213-224.

Powell, D. and H. Klieforth. 2000. Weather and climate. In: Sierra East: Edge of the Great Basin, Genny Smith, editor. California Natural History Guides 60. Berkeley, CA: University of California Press. pp. 70-93.

Quad Knopf, Inc. 2004. Crystal Geyser Roxane: Beverage bottling plant, light industrial project. Draft environmental impact report SCH #2002121051. Submitted to Inyo County Planning Department.

R2 Resource Consultants. 2000. Feasibility study for sediment bypass on Lee Vining, Walker, and Parker Creeks, Mono Basin, California. Redmond, Washington.

Rachowitz, L.J., R.A. Knapp, J.A.T. Morgan, M.J. Stice, V.T. Vredenburg, J.M. Parker, and C.J. Briggs. 2006. Emerging infectious disease as a proximate cause of amphibian mass mortality. Ecology 87: 1671-1683.

Reger, K. 2012. Inyo Mono regional water management group needs assessment report. California Rural Water Association, Sacramento, CA.

Reisner, M. 1986. Cadillac Desert: The West and Its Disappearing Water. New York: Viking Penguin, Inc.

Rinehart, D. 2003. Geologic story, in Mammoth Lakes Sierra (G. Smith, ed.), pp. 117-132. Mammoth Lakes, CA: Genny Smith Books.

Rowlands, P.G. 1995. Regional bioclimatology of the California Desert, in, Latting, J., and Rowlands, P.G., eds., The California Desert—An Introduction to Natural Resources and Man's Impact. Riverside, CA: University of California Press, pp. 95-134.

Sada, D.W. and D.B. Herbst. 2001. Macroinvertebrates and Environmental Characteristics of Owens Valley Springs, Inyo County, California. Prepared for Los Angeles Department of Water and Power, Bishop, CA.

Setmire, J.G. 1984. Water-quality appraisal of Mammoth Creek and Hot Creek, Mono County, California. Water Resources Investigations Report 84-4060. Sacramento, CA: U.S. Geological Survey. 50 pgs.

Seiler, R.L., M.S. Lico, S.N. Wiemeyer, and D.C. Evers. 2004. Mercury in the Walker River basin, Nevada and California--Sources, distribution, and potential effects on the ecosystem. Scientific Investigations Report 2004-5147. Carson City, NV: U.S. Geological Survey.

SGI. 2011. 2011 State of the Basin Report: Amargosa River Basin. Prepared for the Amargosa Conservancy.

Sharpe, S., M.E. Cablk, and J.M. Thomas. 2008. The Walker Basin, Nevada and California: Physical environment, hydrology, and biology. Desert Research Institute Technical Report #41231, Rev. 01. Reno, NV: Desert Research Institute, 63 pgs.

Shumway, M. 1985. An inventory of recorded water diversions in the Owens and Mono basins. Report on file in Bishop office of California Department of Fish and Game.

Smeltzer, M.W., and G.M. Kondolf. 1999. Historical geomorphic and hydrologic analysis of the Owens River gorge. CEDR-01-99. Berkeley, CA: Center for Environmental Design Research, University of California.

Smith, G.E. and M.E. Aceituno. 1987. Habitat preference criteria for brown, brook, and rainbow trout in eastern Sierra Nevada streams. Stream Evaluation Report 87-2, California Department of Fish and Game, Sacramento, CA.

Smith, G. and G. James. 1995. History. In: Deepest Valley: Guide to Owens Valley. J. Putnam and G. Smith, eds. Mammoth Lakes, CA: Genny Smith Books, pp. 231-268.

Snyder M.A., L.C. Sloan, J.L. Bell. 2004. Modeled regional climate change in the hydrologic regions of California: A CO_2 sensitivity study. Journal of the American Water Resources Association 40: 591-601.

Steinkampf, W.C. and W.L. Werrell. 1998. Groundwater Flow to Death Valley, as inferred from chemistry and geohydrology of selected springs in Death Valley, California and Nevada. USGS WRI 98-4114, U.S. Geological Survey. Denver, CO.

Steward, J. 1934. Ethnography of the Owens Valley Paiute. American Archaeology and Ethnology 33: 233–324.

Stewart I.T., D.R. Cayan, and M.D. Dettinger. 2004. Changes in snowmelt runoff timing in western North America under a 'business as usual' climate change scenario. Climatic Change 62: 217-232.

Stine, S. 1994. Extreme and persistent drought in California and Patagonia during mediaeval time. Nature 369: 546-549.

Stine, S. 1995. Restoration of degraded riparian, wetland, and deltaic environments on Mill Creek, Mono County, California. In: Mono Basin Waterfowl Habitat Restoration Plan, Los Angeles Department of Water and Power. Appendix E to Appendix 1 (Drewien, Reid, and Radcliff), 23 pgs.

Swanson, F.J., S.V. Gregory, J.R. Sedell, and A.G. Campbell. 1982. Land-water interactions: The riparian zone. In: Analysis of Coniferous Forest Ecosystems in the Western United States, edited by R.L. Edmunds. Stroudsburg, PA: Hutchinson Ross Publishing Company, pp. 267-291.

SWRCB. 2012a. Groundwater Ambient Monitoring and Assessment. Retrieved May 24, 2011 from http://www.swrcb.ca.gov/water_issues/programs/gama/.

SWRCB. 2012b. Groundwater Ambient Monitoring and Assessment, GeoTracker, water data retrieval tool: http://geotracker.waterboards.ca.gov/gama/.

SWRCB. 2012c. California Environmental Data Exchange Network. http://ceden.org/.

Thomas, R. 1984. The West Walker deer herd management plan. Bishop, CA: California Department of Fish and Game.

Town of Mammoth Lakes. 2007. General Plan Update: 4.9 Population, Housing, and Employment. http://www.ci.mammoth-lakes.ca.us/documents/10/45/53/72/4.09%20Population%20Housing%20and%20Employment.PDF; accessed July 17, 2012.

Triad Engineering. 1987. Drainage and flood hydrology study, Conway Ranch.

Triad Engineering. 1994. Engineer's report for Mountain Meadows Mutual Water Company. Mammoth Lakes, CA.

Triad/Holmes Associates. 2004. Rodeo Grounds water and sewer system improvement project. Prepared for Intrawest and June Lake Public Utility District. Mammoth Lakes, CA: Triad/Holmes Associates.

Tweed, W.C. and L. Davis. 2003. Death Valley and the northern Mojave: A visitor's guide. Los Olivos, CA: Cachuma Press.

United States Census. 2010. http://2010.census.gov/2010census; accessed July 17, 2012.

U.S. Census Bureau. 2010. American FactFinder. http://factfinder2.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t; accessed 6/1/2012.

USDA. 2011a. Watershed Condition Framework. http://www.fs.fed.us/publications/watershed/Watershed_Condition_Framework.pdf.

USDA. 2011b. Watershed Condition Classification Technical Guide. http://www.fs.fed.us/publications/watershed/watershed_classification_guide.pdf.

USDA. 2011c. E. Weidner, A. Todd. From the Forest to the Faucet. Drinking Water and Forests in the US. Methods paper. Ecosystem Services & Markets Program Area, State and Private Forestry. http://www.fs.fed.us/ecosystemservices/pdf/forests2faucets/F2F_Methods_Final.pdf.

USDA - Forest Service. 1988. Draft environmental impact statement for the land and resource management plan. Bishop, CA: Inyo National Forest.

USDA - Forest Service. 1989. Environmental Assessment, Lahontan cutthroat trout restoration project, Silver Creek and Wolf Creek, Mono County. Sparks, NV: Toiyabe National Forest.

USDA - Forest Service, 1992. Old growth management strategy. Bishop, CA: Inyo National Forest.

USDA - Forest Service. 1994. Dry Creek well and pipeline project environmental assessment. Mammoth Lakes, CA: Inyo National Forest.

USDA - Forest Service. 2003. North Mono Basin report. Bishop, CA: Inyo National Forest.

USDA - Forest Service. 2004. Draft West Walker landscape strategy. Bridgeport, CA: Humboldt -Toiyabe National Forest.

USDA - Forest Service. 2011. Humboldt -Toiyabe National Forest climate change vulnerability report. Bridgeport, CA: Humboldt -Toiyabe National Forest. [accessed at http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5294901.pdf]

USDA Nevada River Basin Survey Staff, 1969/1975. Water and related land resources - central Lahontan basin - Walker River subbasin - Nevada - California. U.S. Deparment of Agriculture.

U.S. EPA. 2012. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2010. http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2012-Main-Text.pdf; accessed 5/31/2012.

U.S. Fish and Wildlife Service. 2011. Revised recovery plan for the Mojave population of the desert tortoise (*Gopherus agassizii*). U.S. Fish and Wildlife Service, Pacific Southwest Region, Sacramento, California. 222 pp.

USGS. 2012. National Water Information System. Retrieved May 22, 2012, from http://waterdata.usgs.gov/nwis.

Vannote, R.L., G.W. Minshall, K.W. Cummins, J.R. Sedell, and C.E. Cushing. 1980. The river continuum concept. Canadian Journal of Fisheries and Aquatic Sciences 37: 130-37.

von Geldren, Jr., C.E. 1989. A fisheries management plan for the Mammoth Lakes basin and certain adjacent waters, Mono and Madera counties, California. Administrative Report 89. CA Dept of Fish and Game, Sacramento, CA.

Vorster, P. 1985. A water balance forecast model for Mono Lake, California. Master's thesis, California State University, Hayward.

Vorster, P. 1992. The development and decline of agriculture in the Owens Valley. In: The History of Water in the Eastern Sierra Nevada, Owens Valley and White Mountains, C.A. Hall, V. Doyle-Jones, and B. Widawski (eds.). Los Angeles, CA: University of California Press, pp. 268-284.

Whitney, S. 1979. A Sierra Club naturalist's guide to the Sierra Nevada. San Francisco, CA: Sierra Club Books.

Wildermuth Environmental, Inc. 2003. Investigation of groundwater production impacts on surface water discharge and spring flow. Report to Mammoth Community Water District.

Wood, S.H. 1977. Distribution, correlation, and radiocarbon dating of late Holocene tephra, Mono and Inyo Craters, eastern California. Geological Society of America Bulletin 88: 89-95.

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Appendix A: Inyo-Mono IRWM Program Data Management Plan

Types of data

Original data generated by the Inyo-Mono Program Office and RWMG will primarily be stakeholder driven. The majority of data will be in association with IWRM Projects submitted into the Inyo-Mono Regional Needs database using the online upload form. Once projects are ranked, and awarded funding they move to the implementation phase. There, routine monitoring and evaluation is required by DWR to ensure projects are relating as specified to the Inyo-Mono IRWM plan and are being implemented in such a way that they respond to the RWMG's Objectives and Resource Management strategies.

Other original data housed by the Inyo-Mono Program Office will be as directed by the RWMG on an as-needed basis and may range from a variety of relevant spatial data analyses outputs or as a result of advance climatological modeling in an effort to better comprehend the impacts of Climate Change on our region.

Third party data is of relevance to the Inyo-Mono IRWM Program. County officials, non-profit groups and government agencies all have provided invaluable spatial data to the RWMG at the inception of the program. To date, this data has served as the backbone to the RWMG spatial data acquisition and has largely made possible the compilation of preliminary and fundamental RWMG maps.

Data and metadata standards

All data acquired will comply with Federal Geographic Data Committee (FGDC) guidelines so as to make all in-house data compatible with State and National databases. http://www.fgdc.gov/ Detailed guidance from the California Environmental Resources Evaluation System (CERES) further outlines how using the FGDC standard also qualifies data for automatic compatibility with CERES and the California Environmental Information Catalog (CEIC): http://www.ceres.ca.gov/prog_info/standards.htm. The FGDC Standards guidance from CERES provided above will be followed for all original IRWM Program data.

Relevant water databases that may be utilized for data acquisition or submission include but are not limited to; the aforementioned CERES California Environmental Information Catalog (CEIC), Environmental Data Exchange Network (CEDEN), California Data Exchange Center (CDEC), Surface Ambient Water Monitoring Program (SWAMP), Integrated Regional Water Information Systems (IRWIS), DWRs Water Data Library (WDL), California Statewide Groundwater Elevation Monitoring Database (CASGEM), and USGS National Water Information System (NWIS).

Policies for access and sharing

The IRWM Program promotes collaboration and integration on many levels, including and especially data. Additionally, it is recognized that the IRWM Program is funded with State dollars through Proposition 84. Thus, all original data generated by the Inyo-Mono RWMG,

once finalized by the Program Office, will be made available for public use, via the Inyo-Mono website or the appropriate State or National database. Prior to finalization, data distribution may take place only once metadata standards are met to ensure the Inyo-Mono region maintains a reputable data source to other organizations and IRWM regions.

The recent release of ArcGIS Online http://www.arcgis.com/home/index.html has opened up a brand new arena for collaborative data transfer and lease in the Geospatial realm. To the extent possible online web maps published by the Inyo-Mono GIS Analyst/Data Management Coordinator will be published to "*share with everyone*" so that local water-related data can be made available to the broadest interested audience available. When prudent, these public web maps will be embedded into the Inyo-Mono Website to facilitate RWMG member usage. The map publisher will follow advised sharing practices from ESRI available at the following link: http://resources.arcgis.com/en/help/arcgisonline/#/Best_practices_for_sharing/010q00000011000000/

In some instances web maps may be published and made available only to specific user groups within the IRWM Program when draft or proprietary data are involved, but should be limited so specific instances or short-term projects.

Policies and provisions for re-use, re-distribution

All data requests will be directed to the Inyo-Mono GIS Analyst/Data Management Coordinator. Program Office staff will make every effort to disperse data requests in a timely manner and of professional quality. The Inyo-Mono IRWM Program assumes no liability for accuracy of data once it is transferred to a third party user. All users who utilize Inyo-Mono IRWM data should reference the data used in the Source Data section of the published map documents as follows.

Source Data: Inyo-Mono IRWM Program, 2012 (or whatever year is appropriate for the data being used)

At present, the Inyo-Mono IRWM Program does not serve data up to its users; therefore it is the responsibility of the third party user to ensure the most current version of the data is being used for analysis purposes.

Plans for archiving and preservation of access

Due to the immense time investment of data acquisition, archiving Inyo-Mono IRWM data will occur on a quarterly basis. Working documents will be housed on the GIS Analyst/Data Management Coordinator's computer, with backups hosted on the Inyo-Mono Program Office network, and triplicate copies to the ESRI or Google Cloud when appropriate. RWMG and Public access to the data will be maintained on the Inyo-Mono Website (www.inyo-monowater.org) on a page dedicated to data management, and will be further defined according to the needs of the Inyo-Mono RWMG.

Appendix B: Planning/Implementation MOU

Inyo-Mono REGIONAL WATER MANAGEMENT GROUP
PLANNING AND IMPLEMENTATION MEMORANDUM OF UNDERSTANDING
Revised Version #1
Effective Date: September 1, 2011

WHEREAS, on November 21, 2008, a Memorandum of Understanding was entered into for the Pre-Planning Phase of the Inyo-Mono Integrated Regional Water Management Plan; and

WHEREAS, this Memorandum of Understanding reflects the further development of the Plan by establishing the basis for governance and consensus; and

WHEREAS, the parties to this Memorandum of Understanding seek to provide stability and consistency in the planning, management, and coordination of water resources within the watershed of the Inyo-Mono Region pursuant to the Integrated Regional Water Management Planning Act (California Water Code section 10530 et seq.); and

WHEREAS, the parties to this Memorandum of Understanding will identify projects, establish the priority of such projects and seek funding to implement such water-related projects in the Inyo-Mono Region as part of the development of an Inyo-Mono Regional Water Management Plan; and

WHEREAS, the parties to this Memorandum of Understanding are not limited in seeking other funding for water-related projects, nor does this Memorandum of Understanding impose legally binding requirements on the parties;

NOW, THEREFORE, the parties agree as set forth below to work together in the Inyo-Mono Regional Water Management Group for the Inyo-Mono Region to carry out the purposes of this Memorandum of Understanding and develop and advance the Inyo-Mono Regional Water Management Plan.

ARTICLE I

DEFINITIONS

Section 1.01 Definitions. Unless the context requires otherwise, the words and terms defined in this Article shall have the meanings specified.

"IRWM Planning Act" or **"Planning Act"** means the Integrated Regional Water Management Planning Act, Part 2.2 of Division 6 of the California Water Code commencing with section 10530.

"IRWM Plan" or **"Plan"** has the meaning set forth in Water Code section 10534, which is a comprehensive plan for a defined geographic area, the specific development, content and adoption of which shall satisfy requirements of the Planning Act.

"Regional Water Management Group" has the meaning set forth in California Water Code section 10539, which is a group of three or more local agencies, at least two of which have statutory authority over water supply or water management, as well as those other persons who may be necessary for the development and implementation of a Plan.

"Inyo-Mono Region" or "Region" generally includes Inyo and Mono Counties, northern portions of San Bernardino County and the northeastern portion of Kern County as depicted in the Map attached as Exhibit "A".

"Inyo-Mono Regional Water Management Group" or "Group" means the Regional Water Management Group for the Inyo-Mono Region.

"Member of the Inyo-Mono Regional Water Management Group" or "Member" means an entity identified in California Water Code §10541 (g) that is based in the Region, has members or chapters in the Region, or has water management authority in the Region, and is a signatory to this Memorandum of Understanding. Member Representative refers to the person or persons representing the Member at meetings of the Group.

"Admin Committee" means the Administrative Working Committee as defined in Section 2.05.

"Consensus" means approval of the Member Representatives to move forward with a particular action. "Consensus" does not mean that all Member Representatives support an action, but rather that no Member Representative has voted to oppose an action. A Member Representative may abstain or not vote and that will be considered as no opposition to the action. A Member Representative may verbally note disagreement with an action but still allow consensus without the Member Representative's support. To vote, a Member Representative must be present in person or by telephone or other electronic device that enables the Member Representative to participate in the discussion. It is understood by the Group that some actions will require a decision by the governing body of one or more Members.

"Chair and Vice-Chair" means the Chairperson and Vice-Chairperson of the Administrative Working Committee.

"Cooperating Entity" means a business, organization, individual or agency that is not a Member of the Inyo-Mono Regional Water Management Group but is selected to carry out a specific project.

"Disadvantaged Community" or **"DAC"** means any community within the Region qualifying as a Disadvantaged Community under California law using then-current U.S. Census data.

"Fiscal Year" means the period from July 1st to and including the following June 30th.

"MOU" means this Memorandum of Understanding, as existing or as subsequently amended.

"Program Office" means Staff - personnel directed by the Group to manage daily operations and other needs. The Program Office shall preside over Group Meetings unless recused in which case the Chair or Vice-Chair of the Admin Committee shall preside.

ARTICLE II

PURPOSE AND ORGANIZATION

Section 2.01 Purpose. This MOU is entered into in accordance with the Planning Act for the purpose of forming the Group that will (1) develop, implement and periodically update the Plan, and (2) coordinate planning and actions with connected Regions. The Group shall work to:

(a) Support regional objectives and the objectives of the California Water Plan.
(b) Promote communication and cooperation within the Region in support of these objectives.
(c) Facilitate investment in projects that can minimize costs and maximize regional benefits through cooperation between Members and Cooperating Entities, through economies of scale, through projects with multiple resource benefits, or through DAC projects.
(d) Endeavor to assure an element of geographic fairness in the ranking of projects.

This MOU does not impose legally binding requirements on its Members and is not an enforceable contract or agreement. It is a statement of principles for how the Group will conduct business.

Section 2.02 Term of MOU. This MOU shall replace the MOU dated November 15, 2010. This MOU shall continue in effect until terminated by all then-current Members. Inclusion of additional Members, and/or withdrawal of Members shall not terminate this MOU.

Section 2.03 Member Representatives. Each member shall designate a Member Representative to the Group. More than one Member Representative may be appointed, but each Member shall have only one vote. A Member may appoint someone as their Member Representative notwithstanding the fact that such person is also the Member Representative for another Member. In such instances, such person shall have one vote on behalf of each Member represented.

Section 2.04 Decision Making. Decision making by the Group is based upon consensus of those Member Representatives present in person, by phone, or electronically. Where action by the governing body of one or more Members whose representative is present is required, or desirable, the matter shall not be considered approved by the Group until a decision by those governing bodies has been obtained. A Member's governing body may, in its discretion, elect to note disagreement with but "not oppose" an action, rather than disapprove it, thereby allowing the action to move forward without its endorsement.

If the Group cannot reach consensus, the matter may be referred to the Admin Committee for further work and consideration. The Group or the Admin Committee may appoint a working committee for this task. The Admin Committee or the working committee shall then report back to the Group. If consensus by the Group cannot be reached at this point, the matter is taken off the agenda. At a later point, the matter may be placed on the agenda for further consideration.

Section 2.05 Administrative Working Committee. The Admin Committee and the Program Office shall be jointly responsible for the on-going administrative work of the Group. The Admin Committee shall consist of six (6) Members who shall serve a term of two years. Three Members of the first Admin Committee shall serve a term of one year, so that there will be an orderly transition of administrative business. Members of the Admin Committee shall serve on a rotating basis so that every Member has the opportunity to serve, notwithstanding that a

Member may decline to serve. Members may serve consecutive terms with approval of the Group.

Membership of the Admin Committee shall be appointed by the Group. The Admin Committee shall select a Chair and Vice Chair. Decisions by the Admin Committee shall be by consensus. Decisions by the Admin Committee are always subservient to those of the Group.

Section 2.06 Other Working Committees. Other working committees shall be appointed by the Group, or by the Admin Committee as needed.

Section 2.07 Quorum. The presence of fifty percent of the Members of the Group shall constitute a quorum for the transaction of business, except that less than a quorum may adjourn a meeting from time to time.

Section 2.08 Meetings. The various meetings of the organization shall be as follows:

(a) Members shall meet at least quarterly in a regularly scheduled meeting.
(b) The Admin Committee shall meet at least twice a year.
(c) All Member and Admin Committee meetings are open to the public and shall be publicly noticed.
(d) Other working committees shall meet as needed at a location of their own choosing and shall select their own chair as needed**.**
(e) Attendance at all meetings may be in person or by electronic connection.
(f) Location of meetings shall rotate throughout the planning region whenever feasible.

Section 2.09 Minutes and Agenda. The Program Office shall be responsible for maintaining a record of the activities of the Group and the Admin Committee, noticing all Group meetings, Admin Committee meetings and working committee meetings. Minutes of Group and Admin Committee meetings, and any special reports or documents, shall be distributed to the Group. Group and Admin Committee agendas shall be prepared by the Program Office in collaboration with the Admin Committee Chair or her/his designee. Any Member may request an item to be placed on the Group Agenda.

Section 2.10 Organization, Bylaws and Policies and Procedures. The Group may take another organizational form necessary to support the Inyo-Mono RWMG. The Group may amend the MOU and establish Bylaws and/or Policies and Procedures as necessary.

Section 2.11 Fiscal Agent. The Admin Committee, with approval by the Group, is responsible for establishing a Fiscal Agent with appropriate qualifications to receive, disburse and account for funds related to this MOU. Funding received by the Fiscal Agent to carry out projects shall be disbursed to Members or to Cooperating Entities only after the Fiscal Agent enters a funding agreement with the Member or Cooperating Entity as may be appropriate or required. The Fiscal Agent shall be responsible for any necessary financial reporting, including reports needed to comply with the terms of any grant agreement. The Fiscal Agent shall report annually to the Group and monthly to the Admin Committee. All fiscal reports shall be distributed to the Group.

Section 2.12 Program Office. The Group may employ professional staff or consultants as needed and within prudent fiscal constraints. The Group may accept staffing funded by members of the Group or others.

Section 2.13 Annual Budget. The Admin Committee shall develop an annual budget for each fiscal year for administrative expenses. The budget shall be based upon funds available or

pledged as of May 31st of the previous year. The budget may be modified during the fiscal year as necessary with approval by the Group. Each annual budget shall be approved by the Group.

Section 2.14 Annual Operational and Fiscal Report. The Admin Committee is responsible for preparing an annual operation and fiscal report for presentation to the Group at the end of each fiscal year. The annual report of the Fiscal Agent is part of this report.

Section 2.15 Member Withdrawal. A Member may withdraw from the Group and MOU at any time. A letter, resolution, or similar document signed by the Member's designated representative or other appropriate authority within the Member's organization shall be provided to the Group to complete the withdrawal.

Section 2.16 Member Financial Responsibility. A Member shall have no financial obligation to the Group or the Plan unless otherwise agreed to by the Member in writing. Each Member is responsible for individually contracting with the Fiscal Agent for its own project grant funding. The Group will contract separately for any grants or monies it receives.

Date: _____

_____
Organization

_____
Name and position (print)

_____
Name (signature)

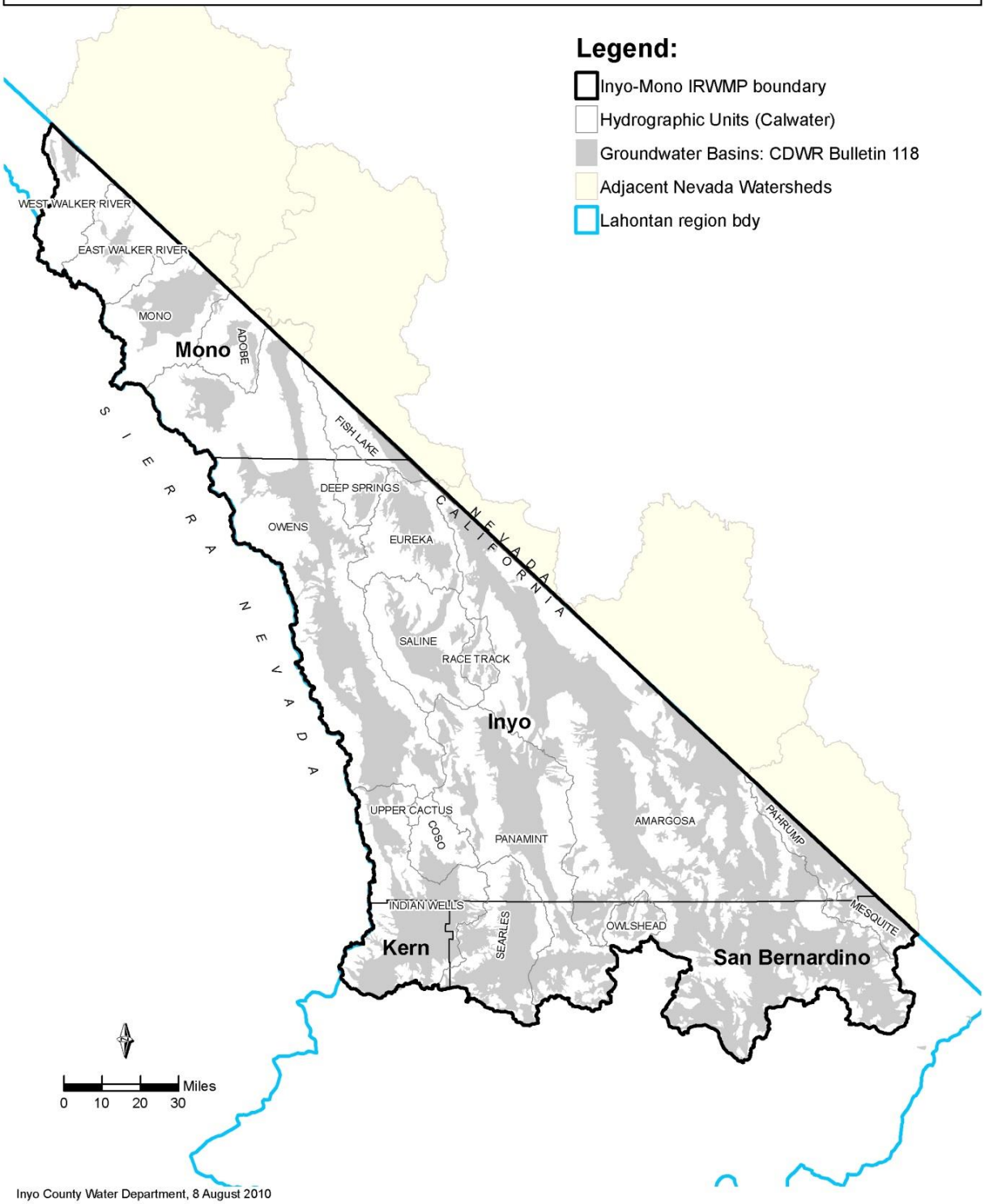
Primary Representative:

Email: _____
Telephone: _____
Address: _____

Alternative Representative:

Email: _____
Telephone: _____
Address: _____

Exhibit A: Inyo-Mono IRWMP boundaries



Appendix C: CFCC Water Programs Funding Mechanisms

Program	Department	Type	Purpose	Eligibility Requirements	CEQA/ NEPA	Eligible Uses	Ineligible Uses	Funding Limits	Terms/Dates	Contact
Infrastructure State Revolving Fund (ISRF) Program http://ibank.ca.gov/infrastructure_loans.htm	California Infrastructure and Economic Development Bank (I-Bank)	Loan	Provide financing for construction and/or repair of publicly owned water supply, treatment and distribution systems, and drainage, and flood control facilities	Applicant must be a local municipal entity. Project must meet tax-exempt financing criteria. Project must promote economic development and attracts, creates, and sustains long-term employment opportunities.	CEQA	Acquire land, construct and/or repair water collection and treatment systems, including equipment	Privately owned infrastructure Debt refinancing	$10 million maximum per project per fiscal year $20 million annual maximum per jurisdiction per fiscal year	Interest rate is 67% of Thompson's Municipal Market Index for 'A' rated security Maximum 30 year term Open application process Preliminary Application available at ibank.ca.gov	Diane Cummings (916) 324-4805
Proposition 84Chapter 2Public Resources Code Section 75022	California Department of Public Health	Grants	Grants for small community drinking water system infrastructure improvements and related actions to meet chemical and nitrate drinking water standards.	Must be a small community water system with a population less than 10,000 or a public school; priority given to disadvantaged communities; must be in noncompliance with a primary standard or treat surface water and be under a boil water order	CEQA	Please call or check CDPH website for more information. http://www.cdph.ca.gov/certlic/drinkingwater/ Pages/DWPfunding.aspx		$5 million per project $500,000 for feasibility study	Pre-application Invited annually	Jose Alarcon (916) 449-5685

Program	Department	Type	Purpose	Eligibility Requirements	CEQA/ NEPA	Eligible Uses	Ineligible Uses	Funding Limits	Terms/Dates	Contact
Safe Drinking Water State Revolving Fund (SDWSRF)	California Department of Public Health	Loans Grants	Provide low interest loans or grants to assist public water systems in achieving or maintaining compliance with the Safe Drinking Water Act (SDWA)	Must be a public water system Project must be needed to comply with the SDWA Project must be on CDPH's project priority list System must meet technical, managerial, and financial requirements All applications are for loans; financial review determines if grant funds apply	CEQA Some projects CEQA/ NEPA	Water treatment facilities, replace aging infrastructure, planning studies, consolidation of water systems, source water protection, etc	Dams or rehab of dams, O&M costs, lab fees for monitoring, projects mainly for fire protection or future growth, etc	$500,000 per planning study $20 million per project and $30 million per entity per cap grant Call program for grant limitations	Pre-application Invited annually Loan: Interest rate is ½ the general obligation rate 2009 program rate is 2.5017%, paid back over 20 years. The rate changes every January Disadvantaged system can obtain a zero interest loan Disadvantaged public and mutual systems may receive partial grant funding	Kelvin Yamada (916) 449-5624

Program	Department	Type	Purpose	Eligibility Requirements	CEQA/ NEPA	Eligible Uses	Ineligible Uses	Funding Limits	Terms/Dates	Contact
Community Development Block Grant (CDBG) Program	State Department of Housing and Community Development	Grants toCity and CountyJurisdictions	Project must principally benefit low income persons/households . For example: do water system upgrades for residents of communities with over half of its residents being low income or extend water service to a site for a business that creates jobs for low income persons	Cities or counties that are not under HUD's CDBG entitlement program Jurisdictions can pay for improvements to their own system or give the funds to private or public water providers	NEPA/ CEQA	Pay for project feasibility study, final plans and specs, site acquisition and construction, and grant administration costs Pay for one time assessment fees for low income families Pay for installation of private laterals and hook up fees for low income families	Maintenance costs Refinancing of existing debt	Each CDBG Allocation sets funding award limits In their annual NOFA (Typically $500,000) Six Allocations: 1-General,2-Native American, 3-Colonia, 4-Economic Development Enterprise Fund, 5-Economic Development Over The Counter, and 6-Planning and Technical Assistance	Notices of Funding Availability (NOFAs) released each year Jurisdiction sets type of financing and terms (grants vs. loans)	Patrick Talbott (916) 552-9361
Water and Waste Disposal program	USDA Rural Development	Loan/Grant	Provide loans and grants to develop and rehabilitate community water systems	Public bodies, Tribes, Nonprofits ,Cities, Towns and census designated places with populations less than 10,000	NEPA/ CEQA	Funds may be used for costs associated with planning,design,and construction of new or existing systems Eligible projects include storage, distribution, source development	Facilities not modest in size, design, and cost For profit systems	None, but average project size is $3-5 million	Loans: 4% - 5% fixed, 40 years Grant funding available to reduce user costs Continuous filing	Dave Hartwell USDA State Office (530) 792-5817
Water and Waste Disposal	USDA Rural Development	USDA guarantees loans made by banks	Provide additional security for commercial lenders that finance community water, systems	Banks and other commercial lenders are eligible applicants Cities, Towns, Public bodies ,census designated place, with populations less than 10,000	NEPA/ CEQA	Funds may be for costs associated with Planning, design, and construction of new or existing systems Eligible projects include water, storage, distribution, and source development	Facilities not modest in size, design, and cost Privately owned infrastructure	None	Negotiated between business and lender Fixed and variable rates allowed Continuous filing	Dave Hartwell USDA State Office (530) 792-5817

Program	Department	Type	Purpose	Eligibility Requirements	CEQA/ NEPA	Eligible Uses	Ineligible Uses	Funding Limits	Terms/Dates	Contact
Proposition 82 New Local Water Supply	Department of Water Resources	Loan	Water supply development projects and feasibility studies	Local public agencies	CEQA	Construction or study of canals, dams, reservoirs, desalination facilities, groundwater extraction project where more than 50% of expected benefits result from hydroelectric power generation facilities, or other construction or improvements	A	$5 million per eligible construction project $500,000 per eligible feasibility study	Interest rate is the State's rate on General Obligation bonds Repayment up to 20 years for construction projects or 5 years for feasibility studies Continuous filing Check website (www.grantsloans.water.ca.gov) for updates	Jerry Snow (916) 651-9264
Proposition 204 Drainage Reuse Program	Department of Water Resources	Grant	Drainage reuse studies	Public agencies	CEQA	Research and technical study projects to develop methods to reuse subsurface agricultural drainage water		$200,000 per project	**This program has been suspended** Check website (www.grantsloans.water.ca.gov) for updated status	Jose Faria (559) 230-3339

Program	Department	Type	Purpose	Eligibility Requirements	CEQA/ NEPA	Eligible Uses	Ineligible Uses	Funding Limits	Terms/Dates	Contact
Proposition 13 Agricultural Water Conservation Program	Department of Water Resources	Loan	To finance feasible, cost effective agricultural water conservation projects or agricultural programs to improve water use efficiency and to finance feasibility studies for such projects	Local public agencies or incorporated mutual water companies	CEQA	Construction or other capital outlays, including but not limited to canal or ditch piping or lining projects, automating canal structures, water distribution system control improvements, tailwater recovery projects, purchasing and installing water measurement devices, and replacement of leaking distribution system components	General purpose equipment, equipment or materials for operations and maintenance, wellhead rehabilitation, expanded tank storage, water supply, water treatment, water recycling, wastewater treatment, flood control, conjunctive use, and groundwater banking projects	$5 million cap per eligible project	Interest rate is ½ the State's rate on the most recent sale of general obligation bonds Repayment up to 20 years Continuous filing Check website (www.owue.water.ca.gov/finance/index.cfm) for updates	Baryohay Davidoff (916) 651-9666
Proposition 50 (Chapter 7(g)) Water Use Efficiency Program	CALFED / Department of Water Resources	Grant	Projects to improve agricultural water use efficiency (WUE)	Local agencies; nonprofits; tribes; State educational institutions; cities, counties, or other political subdivisions of the State	CEQA	Agricultural water use efficiency implementation projects or studies that carry out the CALFED Water Use Efficiency Program	Wellhead rehabilitation, new storage tanks providing expanded capacity, water supply development, water treatment, wastewater treatment, flood control, conjunctive use, recycled water, groundwater banking projects, among others	Up to $3 million for Section A projects and up to $200,000 for Section B projects Section A – non-State cost share required; disadvantaged communities may qualify for a cost share reduction or waiver Section B – a local cost share is not required	2009/10 Proposal Solicitation Package is under development The total amount available for this funding cycle is $19 million Check website (http://www.owue.water.ca.gov/finance/index.cfm) for updated information on the next funding cycle	Baryohay Davidoff (916) 651-9666

Program	Department	Type	Purpose	Eligibility Requirements	CEQA/ NEPA	Eligible Uses	Ineligible Uses	Funding Limits	Terms/Dates	Contact
Proposition 84 (Chapter 2, §75026) Integrated Regional Water Management (IRWM)	Department of Water Resources	Grant	For projects that assist local public agencies to meet long-term water management needs of the State, including the delivery of safe drinking water, flood risk reduction, and protection of water quality and the environment Grant funds for development and revisions of IRWM Plans and implementation projects of IRWM Plans	A local public agency or nonprofit **representing an IRWM effort must be the applicant or grantee** Other IRWM partners may access funds through their own agreements with the applicant/grantee	CEQA	Development or revision of IRWM Plans. Projects that implement IRWM Plans	Operation and maintenance activities	Bond funding allocation for entire program is $1billion Prop 84 allots grant funding to 11 funding areas. Approximately 20 million in Funds for inter-regional efforts Guidelines contain information on how potential funding of multiple IRWM efforts within a funding area will occur and maximum grant amount per funding area. Guidelines have also been combined with Prop 1E SWFM funding Each Proposal Solicitation Package will have predetermined amount of funds available.	$100 million of implementation will be available in the first Proposal Solicitation Package. Additional $250 million for reducing dependence on delta water may be added to the first round solicitation. Anticipate draft guidelines and application Feb/Mar 2010 25% minimum cost share with waivers for DACs Check website (www.grantsloans.water.ca.gov/grants/irwm/integregio.cfm) for updated status	Joe Yun (916) 653-9222

Program	Department	Type	Purpose	Eligibility Requirements	CEQA/ NEPA	Eligible Uses	Ineligible Uses	Funding Limits	Terms/Dates	Contact
Proposition 84 Delta and San Joaquin and Sacramento Rivers Water Quality Grant Program	Department of Water Resources	Grant	Water quality improvement projects	Local agencies	CEQA	Projects which result in improvements to water quality in the Delta and San Joaquin and Sacramento River Basins that protect drinking water supplies	Projects that do not show direct protection of drinking water supplies	$4 million to $30 million, depending on geographic location and project type	**This program has been suspended** Check website (http://baydeltaoffice.water.ca.gov/sdb/prop84/index_prop84.cfm) for updated status	Genevieve Schrader (916) 653-2118
Proposition 84 Local Levee Assistance Program	Department of Water Resources	Grant	Local Levee Evaluation Projects (LOLE) - Evaluate levee stability and levee seepage and underseepage; Local Levee Urgent Repair Projects (LLUR) - Repair and improve critically damaged local levees.	Local public agencies Levees located outside of the Delta Levees that are not part of the State Plan of Flood Control.	CEQA	LOLE - Evaluation of levee stability, seepage, or underseepage for local levees (levees not part of the State Plan of Flood Control) not located within the Sacramento-San Joaquin Delta; LLUR - Repair and improvement of critically damaged local levees (levees not part of the State Plan of Flood Control) located within the Sacramento-San Joaquin Delta	LOLE - Evaluation of levees that are part of the State Plan of Flood Control or that are located within the Sacramento-San Joaquin Delta; LLUR - Repair or improvement of levees that are part of the State Plan of Flood Control for the Central Valley or are located within the Sacramento-San Joaquin Delta	LOLE - $1 million per applicant; LLUR - $5 million per applicant	Program guidelines and solicitation package expected to be released by Spring 2010 Check website (www.water.ca.gov/floodSAFE) for updates	David Wright (916) 574-2644
Proposition 84 Flood Protection Corridor Program	Department of Water Resources	Grant	Flood risk reduction through non-structural projects that include wildlife habitat enhancement and/or agricultural land preservation components	Local government agencies or nonprofit organizations	CEQA	Funding acquisition of real property or easements in a floodplain from willing sellers; preserving or enhancing flood-compatible agricultural use; restoration of habitat compatible with seasonal flooding; and related activities	Flood protection projects that do not include wildlife habitat enhancement or agricultural land preservation benefits	$5 million per eligible project	Next funding cycle expected in 2010 Check website (www.water.ca.gov/floodSAFE) for updates	Earl Nelson (916) 574-1244

Program	Department	Type	Purpose	Eligibility Requirements	CEQA/ NEPA	Eligible Uses	Ineligible Uses	Funding Limits	Terms/Dates	Contact
Proposition 84 Flood Control Subventions Program	Department of Water Resources	Grant (Claims Reimbursement).	Implementation of federally-authorized flood control projects (minor or major) and Watershed Protection Flood Prevention Projects	Local public agencies	CEQA/ NEPA	Major flood control projects authorized by Congress; small flood control projects authorized by PL 80-858 and the U.S. Army Chief of Engineers; and watershed protection projects, which include projects authorized by the Administrator of the Natural Resources Conservation Service	Flood control projects without federal authorization	Variable state cost-share percentage based on multi-purpose objectives for projects, ranging from a minimum of 50% to a maximum of 70%	Claim submittals accepted on continuous basis Claims paid based on available State funding Check website (www.water.ca.gov/floodSAFE) for updates	Varda Disho (916) 574-2745
Proposition 84 Urban Streams Restoration Program	Department of Water Resources	Grant	Reduce urban flooding and erosion, restore environmental values, and promote stewardship of urban streams	Local government agencies and citizens groups/nonprofits (together)	CEQA	Examples include creek cleanups; eradication of exotic or invasive plants; revegetation efforts; bioengineering bank stabilization projects; channel reconfiguration to improve stream geomorphology and aquatic habitat functions; acquisition of parcels critical for flood management; and coordination of community involvement in projects		$1 million per eligible project	**This program has been suspended** Check website (www.grantsloans.water.ca.gov) for updates on the next funding cycle	Sara Denzler (916) 651-9625

Program	Department	Type	Purpose	Eligibility Requirements	CEQA/ NEPA	Eligible Uses	Ineligible Uses	Funding Limits	Terms/Dates	Contact
Proposition 84 Local Groundwater Assistance	Department of Water Resources	Grant	Assistance for local public agencies to conduct groundwater studies or carry out groundwater monitoring or management activities	Local public agencies	CEQA	Groundwater data collection, modeling, monitoring, and management studies; monitoring programs; installation of monitoring wells and equipment; basin management; development of information systems; groundwater planning; and other groundwater management related activities	Projects without a clear nexus to groundwater management, projects which solely benefit private landowners or water users, research not directly related to groundwater management, and most production wells	$250,000 per eligible project or study	$4.68 million appropriated for FY 2009-10 funding cycles Check website (http://www.water.ca.gov/lgagrant/) for updates	Jerry Snow (916) 651-9264
Proposition 1E Floodway Corridor Program	Department of Water Resources	Grant	Similar to the Flood Protection Corridor Program—flood risk reduction through primarily non-structural projects, but focus will likely be on protecting urban areas	Local public agencies or nonprofit/citizens groups	CEQA	Funding acquisition of property rights from willing sellers and related activities for floodway corridor projects, particularly those that will reduce flood risk for urban areas	Flood protection projects that do not include wildlife habitat enhancement or agricultural land preservation benefits	$5 million per eligible project.	Next funding cycle expected in 2010 Check website (www.water.ca.gov/floodSAFE) for updates	Earl Nelson 916 574-1244
Proposition 84 Early Implementation Projects (State-federal Flood Control System Modification Program)	Department of Water Resources	Grant	Rehabilitate, reconstruct, or replace levees, weirs, bypasses, and facilities of the State Plan of Flood Control; or improve or add to facilities of the State Plan of Flood Control to increase flood protection levels for urban areas	Local public agencies and Federal agencies Projects are or would become facilities of the State Plan of Flood Control Projects are consistent with objectives of Propositions 1E and 84	CEQA/ NEPA	Rehabilitation, reconstruction, or replacement of levees, weirs, bypasses, or other facilities of the State Plan of Flood Control and improvement or addition of facilities to the State Plan of Flood Control to increase flood protection levels for urban areas	Flood control projects involving facilities outside the State Plan of Flood Control	To be determined under program guidelines, which are being developed	Solicitation for project proposals to be announced upon release of final program guidelines—expected by December 2010 Check website (www.water.ca.gov/floodSAFE) for updates	Darryl Brown (916) 574-2646

Program	Department	Type	Purpose	Eligibility Requirements	CEQA/ NEPA	Eligible Uses	Ineligible Uses	Funding Limits	Terms/Dates	Contact
Proposition 1E CVFPB Capital Outlay Projects and Studies	Department of Water Resources	Grant	Evaluate, rehabilitate, reconstruct, or replace levees, weirs, bypasses, and facilities of the State Plan of Flood Control; to increase flood protection levels for urban areas	Local public agencies and Federal agencies Projects are facilities of the State Plan of Flood Control Projects are consistent with objectives of Propositions 1E and 84	CEQA/ NEPA	Evaluate, rehabilitation, reconstruction, or replacement of levees, weirs, bypasses, or other facilities of the State Plan of Flood Control.	Flood control projects involving facilities outside the State Plan of Flood Control – Must meet Federal Interest Requirements	In accordance with Corps, State and Local Agreements	Next Federal and State funding cycle expected in 2010	Kent Zenobia (916) 574-2639
Proposition 1E (Article 4, §5096.827) Stormwater Flood Management Program	Department of Water Resources	Grant	Stormwater management projects that reduce flood damage	Local agency or nonprofit representing an IRWM effort Project is located outside the State Plan of Flood Control Project must be part of an existing IRWM Plan and be consistent with applicable Water Quality Basin Plan	CEQA	Projects designed to manage stormwater runoff to reduce flood damage	Operations and maintenance activities	$30 million per eligible project See SBxx1 (Perata) for additional information on funding allocations	$300 million available Anticipate draft guidelines and application Feb/Mar 2010 Each Proposal Solicitation Package will have predetermined amount of funds available. 50% cost share (no ability to waive or reduce for DAC) Check website (www.grantsloans.water.ca.gov/grants/irwm/integregio.cfm) for updates	Joe Yun (916) 651-9222

Program	Department	Type	Purpose	Eligibility Requirements	CEQA/ NEPA	Eligible Uses	Ineligible Uses	Funding Limits	Terms/Dates	Contact
Agricultural Drainage Management Loan Program	State Water Resources Control Board	Loan	Loans to address treatment, storage, conveyance, or disposal of agricultural drainage water	Cities, counties, districts, joint powers Authority, or other political subdivisions of the State	CEQA	Acquisition and construction, tailwater recovery, filter, drainage, recirculation, and high efficiency irrigation equipment	Land	$5 million per project $100,000 for feasibility studies	Interest rate is ½ of the general obligation bond Repayment term of 20 years	Ahmad Kashkoli (916) 341-5855
319(h) Nonpoint Source Implementation Program	State Water Resources Control Board	Grant	Provide grants to projects that implement watershed based plans to restore impaired water bodies through the control of nonpoint source pollution consistent with completed Total Maximum Daily Loads (TMDLs)	Local Public Agencies, Public Agencies, Public Colleges, 501(c)(3) Non-Profit Organizations, Federally Recognized Indian Tribes, State Agencies*, Federal Agencies* (*If collaborating w/local entities involved in watershed mgmt or if proposing a statewide project)	CEQA/ NEPA	Development of watershed based plans and implementation of management measures to control nonpoint source pollution		Implementation Minimum: $250,000 Implementation Maximum: $1 million Planning Minimum: $125,000 Planning Maximum: $750,000	Approximately $4.5 - 5.5 million per year Next funding cycle possibly Fall 2009 for FFY '09-10 funds	Patricia Leary (916) 341-5167
Non-Point Source Program (through the Clean Water State Revolving Fund [CWSRF] Expanded Use Program)	State Water Resources Control Board	Financing	Financing to protect water quality	Public agencies, nonprofits, and private parties (through special arrangement)	CEQA or CEQA +	Land acquisition to protect habitat/water quality; stormwater management; irrigation/drainage management; hydromodification; forestry; marinas; abandoned mines; animal feeding operations; estuary enhancement; and others	Actions required by National Pollutant Discharge Elimination System (NPDES) permits	$50 million per project per year	Interest is ½ of the latest general obligation bond (interest rate reductions may be available in the future) Repayment term of up to 20 years	Julé Rizzardo (916) 341-5822

Program	Department	Type	Purpose	Eligibility Requirements	CEQA/ NEPA	Eligible Uses	Ineligible Uses	Funding Limits	Terms/Dates	Contact
Proposition 84 Storm Water Grant Program	State Water Resources Control Board	Grant	Provide grants for projects designed to reduce and prevent storm water contamination of rivers, lakes, and streams	Local public agencies	CEQA	Implementing low-impact development and other onsite and regional practices, on public and private lands Complying with stormwater-related total maximum daily load (TMDL) requirements established pursuant to section 303(d) of the Clean Water Act (33 U.S.C. § 1313(d)) and Division 43 of the California Public Resources Code (PRC)	Operations and maintenance activities	$3 million per project	Suspended due to bond freeze. Next funding cycle possibly 2010. Applications through FAAST	Erin Ragazzi (916) 341-5733
Energy Partnership Program	California Energy Commission	Technical Assistance (No cost to the applicants)	To identify energy efficiency and cost effectiveness measures at the W&WW facilities	Water and wastewater treatment facilities owned and/or operated by the cities, counties, special districts, or other non-profit entities.	None	A number of services can be provided. For details, please refer to the website: http://www.energy.ca.gov/efficiency/partnership/index.html	State of California/Federal Government Departments; or profit systems	Technical services of up to $20,000 (consultants costs depending on the facility size, type and scope of the study; No cost to the applicants)	Not applicable	Shahid Chaudhry (916) 654-4858

Program	Department	Type	Purpose	Eligibility Requirements	CEQA/ NEPA	Eligible Uses	Ineligible Uses	Funding Limits	Terms/Dates	Contact
Energy Financing Program	California Energy Commission	Loan	Provides financing for water & wastewater facilities through low-interest loans for feasibility studies and implementing energy-saving measures.	Water and wastewater treatment facilities owned and/or operated by the cities, counties, special districts, or other non-profit entities.	None	Partial list includes: Lighting, motors or variable frequency drives and pumps, building insulation, HVAC modifications, automated energy management systems/controls, energy generation including renewable energy projects and cogeneration etc. For details, please refer to the website: http://www.energy.ca.gov/efficiency/financing/index.html	State of California/Federal Government Departments; or profit systems	Finance up to 100% of the cost of energy efficiency projects. The maximum loan amount is $3 million per application. There is no minimum loan amount.	Projects must have a simple payback of 10 years or less based on energy costs savings.	Shahid Chaudhry (916) 654-4858

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Appendix D: Relevant Planning Documents

	Document	Date	Affected Area	Location Information	Source	Document Summary
FEDERAL	**FEDERAL**					
	Clean Water Act: Federal Water Pollution Control Act	1972 (2002)*	Nation	http://cfpub.epa.gov/npdes/cwa.cfm?program_id=45	EPA	Section 303(d) of the federal Clean Water Act requires that all states in the U.S. identify waterbodies that do not meet specified water quality standards and that do not support intended beneficial uses. Identified waters are placed on the Section 303(d) list of impaired waterbodies. Once placed on this list, states are required to develop a water quality control plan - called a Total Maximum Daily Load (TMDL) - for each waterbody and each associated pollutant/stressor.
	Safe Water Drinking Act	1974	Nation	http://water.epa.gov/lawsregs/rulesregs/sdwa/index.cfm	EPA	The Safe Drinking Water Act was originally passed by Congress in 1974 to protect public health by regulating the nation's public drinking water supply. The law was amended in 1986 and 1996 and requires m any actions to protect drinking water and its sources—rivers, lakes, reservoirs, springs, and ground water wells.
	Endangered Species Act 16 U.S.C. §1531 et seq.	1973	Nation	http://www.epa.gov/regulations/laws/esa.html	EPA	The Endangered Species Act (ESA) provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found. Species include birds, insects, fish, reptiles, mammals, crustaceans, flowers, grasses, and trees. The law requires federal agencies, in consultation with the U.S. Fish and Wildlife Service and/or the NOAA Fisheries Service, to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species. The law also prohibits any action that causes a "taking" of any listed species of endangered fish or wildlife. Likewise, import, export, interstate, and foreign commerce of listed species are all generally prohibited.
	Clean Air Act	1970 (2008)*	Nation	http://www.epa.gov/air/caa/	EPA	The Clean Air Act is the law that defines EPA's responsibilities for protecting and improving the nation's air quality and the stratospheric ozone layer. The last major change in the law, the Clean Air Act Amendments of 1990, was enacted by Congress in 1990. Legislation passed since then has made several minor changes
	Bioterrism Act: Requirements of the Public Health Security and Bioterrorism Preparedness and Response Act of 2002	2002	Nation	http://water.epa.gov/infrastructure/watersecurity/lawsregs/bioterrorismact.cfm	EPA	The Bioterrorism Act requires community drinking water systems serving populations of more than 3,300 persons to conduct assessments of their vulnerabilities to terrorist attack or other intentional acts and to defend against adversarial actions that might substantially disrupt the ability of a system to provide a safe and reliable supply of drinking water. The requirements of the Act assign EPA and water utilities responsibilities to enhance water sector security and to develop response measures for potential threats to the nation's water supplies and systems, as outlined below.

EPA Water Quality Handbook	2007	State of CA, Nation	http://water.epa.gov/scitech/swguidance/standards/handbook/chapter01.cfm#section8	EPA	The Water Quality Standards Regulation (40 CFR 131) describes State requirements and procedures for developing, reviewing, revising, and adopting water quality standards (WQS), and EPA requirements and procedures for reviewing, approving, disapproving, and promulgating water quality standards as authorized by section 303(c) of the Clean Water Act. This Handbook serves as guidance for implementing the Water Quality Standards Regulation and its provisions.
National Action Plan-Priorities for Managing Freshwater Resources in a Changing Climate	2011	Nation	http://www.whitehouse.gov/sites/default/files/microsites/ceq/napdraft6_2_11_final.pdf	DWR	The Draft National Action Plan for Managing Freshwater Resources in a Changing Climate recommends Federal agency actions to aid freshwater resource managers in managing and protecting the Nation's water resources. It also outlines ways in which Federal agencies can support state, local and tribal governments in their water resources planning by improving access to quality data and information and best practices. The draft Action Plan responds to a 2010 report from the Obama Administration's interagency Climate Change Adaptation Task Force that identified freshwater resources planning as a priority.
Code of Federal Regulations Title 40: Protection of the Environment Chapter 1: EPA, Subchapter D: Water Programs Part 131: Water Quality Standards	2011	Nation, State of California	http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/Title40/40cfr131_main_02.tpl	EPA	Part 131 describes the requirements and procedures for developing, reviewing, revising, and approving water quality standards by the States as authorized by section 303(c) of the Clean Water Act. A water quality standard defines the water quality goals of a water body, or portion thereof, by designating the use or uses to be made of the water and by setting criteria necessary to protect the uses. States adopt water quality standards to protect public health or welfare, enhance the quality of water and serve the purposes of the Clean Water Act (the Act).
STATE of CALIFORNIA					
Local Groundwater Management Assistance Act : AB303	2000	State of CA	http://www.leginfo.ca.gov/pub/99-00/bill/asm/ab_0301-0350/ab_303_bill_20000927_chaptered.pdf	CA State Govt.	The goal of the Local Groundwater Management Assistance Act of 2000 (Assembly Bill 303) is to help local agencies better understand how to manage groundwater resources effectively to ensure the safe production, quality, and storage of groundwater in the State. Eligible projects include groundwater studies, groundwater monitoring, and groundwater basin management. The program began in 2000, and as of 2009, six(6) rounds of AB 303 grants have been awarded to support local groundwater assistance projects.
California Fish And Game Code Section 5937	1937	State of CA	http://www.leginfo.ca.gov/cgi-bin/displaycode?section=fgc&group=05001-06000&file=5930-5948	State of CA	Provides guidelines and requirements for fishways in and around water retaining infrastructure in waterways throughout California.
Senate Bill 1307	1997	State of CA	http://www.leginfo.ca.gov/pub/97-98/bill/sen/sb_1301-1350/sb_1307_bill_19971007_chaptered.html	State of CA	Existing law sets forth definitions governing the California Safe Drinking Water Act. This bill would revise some of those definitions and would also require those definitions to govern a provision of law relating to certification of persons to supervise and operate water treatment plants.
State of California					
Department of Water Resources					
California State Water Conservation Act (SBX7-7)	2009	State of CA	http://Inyo-Monowater.org/wp-content/uploads/2011/09/SBX7_7_-Water_Conservation_Act_2009.pdf	DWR	Requires the state to achieve a 20% reduction in urban per capita water use by the year 2020.

California Groundwater Bulletin 118 Update	2003	State of CA	http://www.water.ca.gov/groundwater/bulletin118/update2003.cfm	DWR	California's Groundwater includes guidance and tools that will assist local agencies in effectively managing groundwater as a sustainable part of their water supplies. California's Groundwater includes a description of current groundwater management efforts by local water agencies, required and recommended components of effective groundwater management plans, and a model ordinance that can be used by local governments. In addition, the bulletin describes the roles of state and federal agencies in protecting groundwater quantity and quality. Online technical descriptions and GIS compatible maps of 515 groundwater basins and subbasins were part of the effort to publish the bulletin. The basin/subbasin descriptions include information about the geology, groundwater quantity and quality, and current groundwater management practices in the basins. This supplemental material will be updated as new information becomes available.
California State Urban Water Management Planning Act (CWC §§ 10610 -10656)	1983	State of CA	www.water.ca.gov/urbanwatermanagement/.../ ...	DWR	The Urban Water Management Planning Act requires that every urban water supplier that provides water to 3,000 or more customers, or provides over 3,000 acre-feet of water annually, take action to ensure reliability in its water service sufficient to meet customer needs during normal, dry, and multiple dry years. To this end, urban water suppliers who meet the above criteria must complete an Urban Water Management Plan. The Act specifies the contents of Urban Water North Coast Integrated Regional Water Management Plan.
California Water Plan Update (Next Update: 2013)	2009	State of CA	http://www.waterplan.water.ca.gov/cwpu2009/index.cfm	DWR	The *California Water Plan* provides a framework for water managers, legislators, and the public to consider options and make decisions regarding California's water future. The Plan, which is updated every five years, presents basic data and information on California's water resources including water supply evaluations and assessments of agricultural, urban, and environmental water uses to quantify the gap between water supplies and uses. The Plan also identifies and evaluates existing and proposed statewide demand management and water supply augmentation programs and projects to address the State's water needs.
Climate Change Handbook: Regional Water Management Planning with Climate Change Adaptation and Mitigation- Handbook	2011	State of CA	http://www.water.ca.gov/climatechange/CCHandbook.cfm	DWR	The purpose of this handbook is to provide a roadmap for water resources planners describing: 1) The steps that many water planning entities are taking to include climate change impacts and adaptation in planning strategies; 2) The steps that many water planning entities are taking to assess system-wide and project-associated greenhouse gas (GHG) emissions and identify potential mitigation measures; and 3) A strategy for incorporating the steps identified in (1) and (2) into the IRWM process or other similar watershed-level planning. The handbook discusses methods to quantify climate change impacts on water resources, and mitigation and adaptation measures that can be taken to reduce impacts. The handbook introduces a decision-support framework for including climate change in the process of developing an IRWM Plan or similar watershed plan.
Managing an Uncertain Future: Climate Change Adaptation Strategies for California's Water Resources	2008	State of CA	http://www.water.ca.gov/climatechange/docs/ClimateChangeWhitePaper.pdf	DWR	Climate change is already affecting California's water resources. Bold steps must be taken to reduce greenhouse gas emissions. However, even if emissions ended today, the accumulation of existing greenhouse gases will continue to impact climate for years to come. Warmer temperatures, altered patterns of precipitation and runoff, and rising sea levels are increasingly compromising the ability to effectively manage water supplies, floods and other natural resources. Adapting California's water management systems in response to climate change presents one of the most significant challenges of this century

State of California

State Water Resources Control Board

STATE of CALIFORNIA (SWRCB)	California Pesticide Management Plan for Water Quality	1997	State of CA	www.cdpr.ca.gov/docs/emon/surfwtr/process/150wtr_qlty_pm_plan.pdf	SWRCB	The Department of Pesticide Regulation (DPR) and the SWRCB cooperatively developed the California Pesticide Management Plan. The Plan aims to protect water quality from the potential negative effects of pesticides. The Plan explicitly recognizes the importance of water quality throughout the state and the importance of pesticides to a strong economy and potential impacts to public health. The Plan provides for outreach programs (education, training, and public information), water quality standards compliance, ground and surface water protection programs, regulatory compliance, interagency communication, and dispute/conflict resolution (CEPA 1997).
	California State Porter-Cologne Water Quality Control Act	1969 (2011)*	State of CA	www.swrcb.ca.gov/laws_regulations/docs/portercologne.pdf	SWRCB	Under the Porter-Cologne Water Quality Control Act (Porter-Cologne), the State Water Resources Control Board (State Board) has the ultimate authority over State water rights and water quality policy. However, Porter-Cologne also establishes nine Regional Water Quality Control Boards (Regional Boards) to oversee water quality on a day-to-day basis at the local/regional level. Regional Boards engage in a number of water quality functions in their respective regions. One of the most important is preparing and periodically updating Basin Plans,(water quality control plans). Each Basin Plan establishes:1) beneficial uses of water designated for each water body to be protected;2) water quality standards, known as water quality objectives, for both surface water and groundwater; and 3) actions necessary to maintain these standards in order to control non-point and point sources of pollution to the State's waters.
	California State Rangeland Water Quality Management Plan	1995	State of CA	www.swrcb.ca.gov/...forms/.../ca_rangeland_wqmgmt_plan_july1995.pdf	SWRCB	The primary goal of this Plan is to maintain and improve the quality and associated beneficial uses of surface water as it passes through and out of rangeland resources in the state. Approved by the SWRCB in July of 1995, the plan was developed cooperatively by industry, conservation organizations, and state and federal agencies. It is a “Tier 1” voluntary effort at the local level for compliance with the Plan for California’s Nonpoint Source Pollution Control Program. The plan also describes voluntary compliance with the Clean Water Act, the Coastal Zone Management Act, and the Porter-Cologne Act (SWRCB 1995b). The RWQMP could serve as an example of bringing stakeholders to the table for development of plans to address TMDL implementation prior to regulatory action. Where appropriate, efforts such as this could be incorporated by the Regional Board as a Certification of Compliance.
	Plan for California’s Nonpoint Source Pollution Control Program	2000	State of CA	http://www.swrcb.ca.gov/water_issues/programs/nps/docs/planvol1.pdf	SWRCB	The purpose of the NPS Program Plan is to improve the State’s ability to effectively manage NPS pollution and conform to the requirements of the Federal Clean Water Act and the Federal Coastal Zone Act Reauthorization Amendments of 1990. These documents were developed by staff of the State Water Resources Control Board's Division of Water Quality and the California Coastal Commission (CCC), in coordination with the Regional Water Quality Control Boards and staff from over twenty other State agencies
	California State Senate Bill 739: Chapter 610 Stormwater Management	2007	State of CA	http://Inyo-Monowater.org/wp-content/uploads/2011/09/ab_739_bill_20071013_chaptered.pdf	SWRCB	Under existing law, the State Water Resources Control Board and the California regional water quality control boards prescribe waste discharge requirements for the discharge of stormwater in accordance with the national pollutant discharge elimination system (NPDES) permit program established by the federal Clean Water Act and the Porter-Cologne Water Quality Control Act (state act).
	Drops of Energy: Conserving Urban Water in California to Reduce Greenhouse Gas Emissions	2011	State of CA	www.law.berkeley.edu/files/Drops_of_Energy_May_2011_v1.pdf	DWR/EPA	Water use means energy use. The state pumps and treats water and consumers use water in energy-intensive ways, such as through water heating and pressurizing. Consequently, the consumption of water in California requires approximately 20 percent of the state’s electricity, 30 percent of its non-power plant natural gas, and 88 million gallons of diesel fuel annually. The greenhouse gas emissions associated with water related energy consumption total more than 100 million metric tons of carbon dioxide equivalent gases, while the burning of carbon-based fuels to power the state’s water infrastructure releases particulate matter that can cause asthma and other health effects. Conserving water therefore means conserving energy and limiting pollution.

Region-Wide Multi-Watershed Management Areas

State Water Resources Control Board (SWRCB)

Water Quality Control Plan for the Lahontan Region (Basin Plan)	1995	Lahontan Region	http://www.swrcb.ca.gov/lahontan/water_issues/programs/basin_plan/references.shtml	SWRCB	The California Regional Water Quality Control Board adopts and implements this Basin Plan for the Lahontan Region, which extends from the Oregon border to the northern Mojave Desert and includes all of California east of the Sierra Nevada crest. This plan sets forth water quality standards for the surface and ground waters in the region, identifies general types of water quality problems, identifies required or recommended control measures for these problems, and summarizes applicable provisions of separate State/Regional Board planning and policy documents and other water quality management plans. This Plan also summarizes past and present water quality monitoring programs and identifies monitoring activities to provide the basis for future Basin Plan updates.
State Water Resources Control Board: Watershed Management Initiative	2006	Lahontan Region/ Upper Owens River	http://www.swrcb.ca.gov/lahontan/water_issues/programs/watershed_management/index.shtml	SWRCB	A five-year Strategic Plan guides the water resource protection efforts of the State and Regional Water Boards. A key component of the Strategic Plan is the Watershed Management Initiative (WMI.) The WMI promotes a watershed management approach for water quality protection. It is intended to help meet our goal of providing water resources enhancement and restoration while balancing economic and environmental impacts. Each of the nine Regional Water Boards prepares its individual Chapter of the WMI, which is used both as an outreach and planning tool to identify the Region's priorities and programs. The WMI Chapter is not a commitment to complete work but rather provides a framework to focus and integrate resources to more efficiently restore degraded waterways, encourage regional resource-based planning, and promote the use of urban and rural management practices for pollution control. The Upper Owens is called out specifically within the Inyo-Mono Region.

Region-Wide Multi-Watershed Management Areas (Continued)

USFS

United States Forest Service (USFS)

A summary of current trends and probable future trends in climate and climate driven processes on the Inyo National Forest and adjacent lands	2011	Inyo National Forest, Inyo & Mono Counties	http://Inyo-Monowater.org/wp-content/uploads/2011/09/InyoNF_ClimateChangeTrendSummary_1-27-11.pdf	USFS- Inyo N.F.	Several types of data are presented to illustrate climatic patterns within the Inyo National Forest and adjacent lands. First, spatially explicit weather records are presented as maps. These are derived using data from the PRISM climate dataset, which interpolates records from weather stations to all areas of the landscape for all years beginning in the late 19th century (Daly et al. 1994, PRISM 2010). Second, weather data are shown for the greater Mojave region http://www.wrcc.dri.edu/monitor/cal-mon/frames_version.html; (Abatzoglou et al. 2009) as a whole, which includes the Inyo Mountains in the southeastern INF. This dataset is obtained by averaging PRISM data across the Mojave region for each year beginning in the late 19th century. Finally, data are also presented from three weather stations within the INF with long-term meteorological records. Records from these sites provide an indication of local-scale variation in climate patterns, and how patterns at individual stations differ in the extent to which they reflect those seen at broader, regional scales.
Humboldt National Forest Land and Resource Management Plan	1986	North Mono County	Humboldt-Toiyabe National Forest- Planning	USFS-Inyo N.F.	Work on Forest Plan revision has been suspended as resources and personnel are devoted to travel management, environmental analysis of grazing, fire and fuels management, and implementation of the American Recovery and Reinvestment Act. The Humboldt-Toiyabe National Forest will make a public announcement when Forest Plan revision is re-initiated.

USFS	Humboldt-Toiyabe National Forest Climate Change Vulnerability Report	2011	Mono County	http://www.fs.usda.gov/wps/portal/fsinternet/!ut/p/c4/04_SB8K8xLLM9MSSzPy8xBz9CP0os3gDfxMDT8MwRydLA1cj72BTS2MTAwjQL8h2VAQA61IWbA!!/?ss=110417&navtype=BROWSEBYSUBJECT&cid=FSE_003771&navid=130000000000000&pnavid=null&position=BROWSEBYSUBJECT&ttype=land&pname=Humboldt-Toiyabe%20National%20Forest-%20Land%20&%20Resources%20Management	USFS	Through research on woodrat middens and pollen deposition records, scientists have been able to examine changes in vegetation from the late Pleistocene (the last epoch of glacial activity) through the Holocene (11,000 years ago to present time – a period of post-glacial climate stabilization and warming). Past vegetation changes associated with climate variation provide a basis for predicting future risks associated with current climate change and a growing human interaction with natural processes. The following is a short summary of climate changes and associated biological adjustments that have occurred.
	Inyo National Forest Land and Resource Management Plan	1988	Inyo National Forest, Inyo & Mono Counties	INF General Management Plan	USFS- Inyo N.F.	This Plan provides direction for the management of all lands and resources administered by the Inyo National Forest and documents the environmental analyses conducted as part of the planning process. Describes current conditions and need for management actions. The plan lists alternatives and proposed actions, describes affected environment and environmental consequences. In 2009 an update was given explaining the planning moratorium the Inyo National Forest is subjected to under Federal Law.
	Inyo National Forest Wilderness Management Plan and EIS	2001	Inyo National Forest, Inyo & Mono Counties	http://www.fs.usda.gov/wps/portal/fsinternet/!ut/p/c4/04_SB8K8xLLM9MSSzPy8xBz9CP0os3gDfxMDT8MwRydLA1cj72DTUE8TAwjQL8h2VAQAMtzFUw!!/?ss=110504&navtype=BROWSEBYSUBJECT&cid=FSBDEV3_003888&navid=130100000000000&pnavid=130000000000000&position=Feature*&ttype=detailfull&pname=Inyo National Forest- Planning	USFS-Inyo N.F.	This document is the Final Environmental Impact Statement (FEIS) that analyzes the effects of proposed amendments to the Land and Resource Management Plans (LRMP) for the Sierra and Inyo National Forests with respect to management direction for the Ansel Adams, John Muir, and Dinkey Lakes Wildernesses and replacement of the existing wilderness management plans.
	Kern Wild and Scenic River Management Plan (North & South Forks)	1994	Kern River Watershed	*http://www.fs.usda.gov/wps/portal/fsinternet/!ut/p/c4/04_SB8K8xLLM9MSSzPy8xBz9CP0os3gjAwhwtDDw9_AI8zPwhQoY6BdkOyoCAPkATlA!/?ss=110504&navtype=BROWSEBYSUBJECT&cid=FSE_003756&navid=130100000000000&pnavid=130000000000000&ttype=main&pname=Inyo%2520National%2520Forest%2520-%2520Planning*	USFS-Inyo N.F.	This document presents reasons for selecting Alternative 3 to implement the management plan for the North and South Forks of the Kern Wild and Scenic River for the next 10 to 15 years. Long-term estimates of the Alternatives' environmental and economic attributes, contained in the environmental impact statement were considered in the decision. The Comprehensive Management Plan will be an amendment to the Inyo and Sequoia Forest Land and Resource Management Plans.
	Sierra Nevada Forest Plan Amendment	1994	Sierra Nevada forests	http://www.fs.fed.us/r5/snfpa/final-seis/	USFS	Amendment to the January 2001 Sierra Nevada Forest Plan. Plan adopts integrated strategy for vegetation management to reduce risk of wildfire to communities and to protect old forests, wildlife habitats and watersheds. Includes specific management strategies, actions and requirements to manage forest lands.

USFS	Sierra Nevada Forest Plan Amendment: Draft Supplemental EIS	2010	Sierra Nevada forests	http://www.fs.fed.us/r5/snfpa/final-seis/	USFS	This supplemental environmental impact statement (SEIS) to the 2004 Sierra Nevada Forest Plan Amendment (SNFPA or Framework) Final SEIS is being prepared to comply with two orders issued by the Eastern District Court of California on November 4, 2009. These court orders, issued in *Sierra Forest Legacy v. Rey*, No. 2:05-cv-00205-MCE-GGH (E.D. Cal. Nov. 4, 2009) and *People of the State of California v. USDA*, No. 2:05-cv-00211-MCE-GGH (E.D. Cal. Nov. 4, 2009), require the Forest Service to remedy a violation of NEPA relative to the analysis of alternatives presented in the 2004 Framework FSEIS by completing a narrowly focused SEIS by May 1, 2010.
	South Sierra Wilderness Management Plan: Environmental Assessment	1991	Southern Sierra Forests	gjAwhwtDDw9_AI8zPwhQoY6BdkOyoCAPkATIA!/?ss=110504&navtype=BROWSEBYSUBJECT&cid=FSE_003756&navid=130100000000000&pnavid=130000000000000&ttype=main&pname=Inyo%2520National%2520Forest%2520-%2520Planning	USFS	The need for a Forest Plan amendment is due to the fact that not all the programmatic direction referenced in the South Sierra Wilderness Implementation Plan (SSWIP) was contained in the Forest Plan. The two-staged decision making process used by the USFS requires that programmatic directions be located at eh Forest Plan level. Therefore, the purpose of the proposed amendment is to incorporate into the Inyo Forest Plan the specific programmatic direction that is presently unique to the SSWIP.
	Toiyabe National Forest Land and Resource Management Plan	1986	North Mono County	Humboldt-Toiyabe National Forest- Planning	USFS-HTNF	Work on Forest Plan revision has been suspended as resources and personnel are devoted to travel management, environmental analysis of grazing, fire and fuels management, and implementation of the American Recovery and Reinvestment Act. The Humboldt-Toiyabe National Forest will make a public announcement when Forest Plan revision is re-initiated
	USDA- Watershed Condition Framework	2011	Nation	http://www.fs.fed.us/publications/watershed/Watershed_Condition_Framework.pdf	USDA-Forest Service	The Watershed Condition Framework (WCF) is a comprehensive approach for proactively implementing integrated restoration on priority watersheds on national forests and grasslands. The WCF proposes to improve the way the Forest Service approaches watershed restoration by targeting the implementation of integrated suites of activities in those watersheds that have been identified as priorities for restoration. The WCF also establishes a nationally consistent reconnaissance-level approach for classifying watershed condition, using a comprehensive set of 12 indicators that are surrogate variables representing the underlying ecological, hydrological, and geomorphic functions and processes that affect watershed condition. Primary emphasis is on aquatic and terrestrial processes and conditions that Forest Service management activities can influence. The approach is designed to foster integrated ecosystem-based watershed assessments; target programs of work in watersheds that have been identified for restoration; enhance communication and coordination with external agencies and partners; and improve national-scale reporting and monitoring of program accomplishments. The WCF provides the Forest Service with an outcome-based performance measure for documenting improvement to watershed condition at forest, regional, and national scales.
Region-Wide Multi-Watershed Management Areas (Continued)						
Bureau of Land Management						
BLM	Bishop Field Office Resource Management Plan Record of Decision	1993	BLM Lands, Inyo-Mono Counties	IRWM Program Digital Library	BLM	Decision of the Bureau of Land Management for managing federal mineral leases and BLM public lands within the Bishop Resource Area. Decisions and strategies are presented for recreation use, wildlife management, mineral uses and land ownership and authorizations.

	California Desert Conservation Area Plan	1980-1999	Southern Inyo County	http://www.blm.gov/ca/st/en/prog/planning.html	BLM	This report is the compilation of all the changes to the Desert plan from 1980-1999 including the 147 amendments and the changes from the California Desert Protection Act. The BLM intends to update the CDCA plan following completion of the four ongoing bio-regional management plans, which cover a substantial portion of the California Desert.
	Northern and Easter Mojave Desert (NEMO) ROD	2002	Mojave Desert	http://www.blm.gov/ca/st/en/fo/cdd/nemo.html	BLM	This Record of Decision (ROD) approves, with minor modifications, the Proposed Northern and Eastern Mojave Desert Management Plan (NEMO), an amendment of the 1980 Bureau of Land Management California Desert Conservation Area (CDCA) Plan. The minor modifications from the Proposed Plan include changes in format, wording, and other minor corrections to improve clarity.
	Northern and Eastern Mojave Desert Management Plan and EIR	2002	Mojave Desert	http://www.blm.gov/ca/st/en/fo/cdd/nemo.html	BLM	The Draft 2000 California Desert Conservation Area Plan Amendments for the Northern and Eastern Mojave (NEMO) Planning Area address: (1) the adoption of standards of public land health with specific guidelines for livestock grazing; (2) the protection of threatened and endangered species, as well as species that may be considered for listing in the reasonably foreseeable future by evaluating the habitat requirements and necessary management actions for each such species; (3) multiple-use class of lands released from wilderness consideration and the changes necessary to conform the California Desert Conservation Area Plan to the California Desert Protection Act passed by Congress in 1994; (4) the adoption of an appropriate long-term strategy for motorized competitive speed events outside of Off-Highway-Vehicle open areas in the planning area; (5) the designation of routes of travel within the planning area; (6) elimination of permitted solid waste landfills from public lands in the planning area; and (7) the identification of rivers eligible for the National Wild and Scenic Rivers System in the planning area . The preparation of this document was coordinated with numerous individuals, Federal and State agencies, special interest groups and County
Region-Wide Multi-Watershed Management Areas (Continued)						
National Park Service-NPS						
NPS	Death Valley General Management Plan	2002	Death Valley National Park	http://www.nps.gov/deva/parkmgmt/planning.htm	NPS	This General Management Plan is Death Valley National Park's overall management strategy for a ten to fifteen year period. This document summarizes the selected alternative from the Final General Management Plan / Environmental Impact Statement (July 2001).The Record of Decision (ROD), signed on September 27, 2001, is included in this document as an appendix. The ROD includes a summary of public and interagency involvement.
NPS	Death Valley: Furnace Creek Spring Restoration and Adaptive Management Plan	2012	Death Valley National Park	http://Inyo-Monowater.org/wp-content/uploads/2011/09/FCSprings_Restoration_Final.pdf	NPS	This plan compiles information from this work and integrates it to guide restoration and justify its goals and identify indicators to assess restoration progress. Accomplishing restoration requires adaptive management that incorporates information provided by monitoring to assess program efficacy and inform management decisions that are necessary to successfully achieve restoration. This plan provides guidance to achieve restoration. However, engineering and construction complexities that may be required to fully achieve restoration (primarily spring source restoration) are beyond the scope of this restoration plan.
NPS	Death Valley Fire Management Plan	2007	Death Valley National Park	http://Inyo-Monowater.org/wp-content/uploads/2011/09/DEVA_FMP_2007.pdf	NPS	The 2007 Fire Management Plan for Death Valley National Park will guide management of Wildland fire over the next ten years. This plan fulfills responsibilities under several directives including the Federal Wildland Fire Management Policy, the National 10-year Comprehensive Strategy Implementation Plan for Reducing Wildland Fire Risks to Communities and the Environment, the Interagency Fire Management Plan Template, and NPS Director's Order #18: Wildland Fire Management. This plan also incorporates the most current fire science.

Region-Wide Multi-Watershed Management Areas (Continued)

Inyo-Mono Agriculture Commissioners Office

Inyo- Mono Ag.

Annual Report- Invasive Weed Control and Eradication Activities in Inyo and Mono Counties	2008-2010	Inyo and Mono Counties	http://www.inyomonoagriculture.com/eswma.html	Inyo-Mono Ag Commissioner Office	The Inyo/Mono Counties' Agricultural Commissioner's office operates a noxious weed program as well as administering the Eastern Sierra Weed Management Area. The ESWMA includes public and private entities that aid in local weed issues. These reports summarize work performed as well as successes and challenges within the region directly related to noxious weeds.
Eastern Sierra Weed Management Area Strategic Plan	2008	Inyo and Mono Counties	Digital Library	Inyo-Mono Ag Commissioner Office	This strategic plan outlines actions designed to control the spread of noxious weeds utilizing integrated pest management practices. To accomplish this, the ESWMA members will integrate resources, priorities, and strategies into a unified action. The plan will be updated and revised on a continual basis to reflect program successes and new challenges. Unified action is the best method for reducing the extensive economic, ecological and social impacts of noxious weeds on Inyo and Mono Counties' resources and people.
Eastern Sierra Weed Management Area MOU	2010	Inyo and Mono Counties	Digital Library	Inyo-Mono Ag Commissioner Office	This Memorandum of Understanding is made and entered into by the California Department of Food and Agriculture (CDFA), Inyo/Mono Counties Agricultural Commissioner's Office, Los Angeles Department of Water and Power (LADWP), Inyo County Water Department, Bureau of Land Management (BLM) Bishop Field Office, Barstow Field Office, Needles Field Office, USDA, Forest Service, Inyo National Forest (USFS), Toiyabe National Forest (USFS), CalFire, Natural Resource Conservation Service, Inyo/Mono Resource Conservation District, Inyo/Mono Counties Cattlemen's Association, California Department of Transportation District 9 (CalTrans), Bishop Paiute Tribe Environmental Management Office, and California State Parks.

REGIONAL PLANS

Watershed/Groundwater Management Plans/Reports

Amargosa River Report (Draft)	2007	Amargosa River	http://www.amargosaconservancy.org/index.php/water	Amargosa Conservancy	This report details the significance of and threats to the Amargosa River, describes the current legal environment surrounding the issue, outlines activities and actions in progress aiming to protect the water resources, and addresses what means there are to improving conservation efforts.
Bodie Creek, Mono County: Total Maximum Daily Loads for Metals (Project Report)	2003	Bodie Creek, Mono County	http://www.waterboards.ca.gov/lahontan/water_issues/programs/tmdl/bodie_creek/docs/bodie_creek_project_report_12_04.pdf	Lahontan RWQCB	Bodie Creek is currently 303(d)-listed for non-specific "metals." Analytical results from this limited sampling effort indicate exceedances of water quality criteria for total aluminum, iron, manganese, arsenic, mercury, and dissolved zinc. Beneficial uses of Bodie Creek include cold freshwater habitat (COLD), and domestic and municipal supply (MUN). The water quality criteria used for the comparisons in this report were selected to be protective of these beneficial uses.

Watershed/Groundwater	East Walker River Watershed Assessment and Plan	2012	East Walker River	No digital copy available	ESLT	This report describes how the 400 square mile watershed of the East Walker River above the California/Nevada border influences the quantity and quality of the water flowing into the East Walker River.
	Groundwater Management Plan for the Mammoth Basin Watershed	2005	Mammoth Lakes	http://www.mcwd.dst.ca.us/ProjectsReports/GWMP/GWMP.htm	MCWD	This plan presents a management strategy to guide management decisions and evaluate water resources within the Mammoth Basin watershed. The objectives of this report are to protect the environment, establish sustainable yields and meet the needs of the community. The plan outlines current basin conditions and groundwater monitoring programs based on existing reports and data. The plan presents specific action recommendations for groundwater protection and management.
	Indian Wells Valley Cooperative Groundwater Management Plan	2006	Indian Wells Valley Basin	http://www.iwvgroundwater.org/administrative_documents.html	IWVWD	The Cooperative Groundwater Management Plan was signed and approved in 1995, as the first step towards determining best management practices of groundwater resources in Indian Wells Valley. Funding was used to monitor wells used for groundwater; develop a GIS management system to archive, track and present data; develop a conceptual groundwater model; and to develop a website to allow public access to information. Based on above report, data gaps were identified. This plan proposes additional tasks: environmental documentation, construct monitoring wells, water sampling, continuous water level monitoring and geohydrologic data review.
	Mammoth Creek: Final Environmental Impact Report	2011	Mammoth Creek	http://www.mcwd.dst.ca.us/	MCWD	The Mammoth Community Water District, as the Lead Agency under the California Environmental Quality Act (CEQA), has prepared this Final Environmental Impact Report (Final EIR) for the Mammoth Creek fishery bypass flow requirements, watershed operation constraints, point of measurement, and place of use. The project is located in the Mammoth Lakes Basin, on the eastern slope of the Sierra Nevada, encompassing Lake Mary and the Mammoth Creek watercourse, downstream to the United States Geological Survey flume gage on Hot Creek, the length of Bodle Ditch from Lake Mary to the head of Mammoth Meadows.
	Mono Basin Watershed Management Plan	2007	Mono Basin	http://www.monocounty.ca.gov/cdd%20site/Planning/Projects/Documents/MonoBasinWatershedManagmentPlan307_000.pdf	Mono County	This plan creates linkages between water quality and water quantity problems and conditions, processes, and activities occurring in the Mono Basin watershed. The study area includes 800 square miles of the Mono Basin watershed; the plan pertains only to lands in the Basin and not Mono Lake. It contains goals and objectives, describes desired future conditions and potential actions, and identifies data gaps. Issues described include water supply (for the June Lake area) and water quality. The guiding principle is to minimize disturbance to stream systems and riparian areas. The plan has no authority itself, and must be adopted by the Mono County Collaborative Planning Team and its member agencies in order to achieve the projects/actions proposed.
	Mono Basin Watershed Assessment	2007	Mono Basin	http://Inyo-Monowater.org/wp-content/uploads/2011/09/Assessments_MonoBasin.pdf	Mono County	This report describes how the 800-square mile (677 square miles within California) watershed influences the quantity and quality of water that flows into Mono Lake. It will largely ignore the lake itself except as an end point for the water contributed from the lands surrounding the lake. The Mono Basin is watershed #601 in the Calwater system of watershed delineation
	North Mono Basin Watershed Analysis	2007	Mono Basin	http://www.monobasinresearch.org/onlinereports/ Look under" Other" at bottom of web page also in RWMG Digital Library	Mono Basin Clearinghouse	Analysis conducted during 2001 as part of the Sierra Nevada Forest Plan amendment "…to maintain or restore ecological sustainability to provide a sustainable flow of uses, values, products and services from these lands". Document provides a framework to guide landscape management. Contains a characterization of the watershed, identifies issues and key questions, assesses current conditions, historical and "natural" conditions, interprets data, and suggests management opportunities and recommendations. Issues identified: 1) Human use to the aquatic environment, 2) Human use of the terrestrial environment, 3) Erosion and water quality, 4) Habitat composition (upland, wetland, riparian), 5) Fisheries and fish habitat condition, and 6) wildlife (terrestrial and avian).

Upper Owens River Watershed Assessment	2007	Owens River	www.monocounty.ca.gov/.../Planning/.../Assessment_UpperOwensRiverBasin .pdf	Mono County	This report describes how the 380-square mile watershed influences the quantity and quality of water that flows into the upper Owens River above the Crowley Lake dam. The study area has been called the Long Hydrologic Area (and Subarea) and is watershed #603.1 in the Calwater system of watershed delineation (http://www.ca.nrcs.usda.gov/features/calwater/ and http://cwp.resources.ca.gov).
Upper Owens River Watershed Management Plan	2007	Owens River	http://www.monocounty.ca.gov/cdd%20site/Planning/Projects/Documents/UpperOwensWatershedManagementPlan307draft_000.pdf	Mono County	This plan creates linkages between water quality and water quantity problems and conditions, processes, and activities occurring in the Upper Owens River watershed. The study area is the 380 square mile Long Hydrologic Area. It contains goals and objectives, and describes desired future conditions and potential actions. Issues include water supply and water quality. It identifies data gaps including water quality data, sediment budgets of Mammoth and Hot creeks, and groundwater systems. The guiding principle is to minimize disturbance to stream systems and riparian areas. The plan has no authority itself, and must be adopted by the Mono County Collaborative Planning Team and its member agencies in order to achieve the projects/actions proposed.
Upper Owens River Watershed Management Plan	2007	Owens River	http://www.monocounty.ca.gov/cdd%20site/Planning/Projects/Documents/UpperOwensWatershedManagementPlan307draft_000.pdf	Mono County	This plan creates linkages between water quality and water quantity problems and conditions, processes, and activities occurring in the Upper Owens River watershed. The study area is the 380 square mile Long Hydrologic Area. It contains goals and objectives, and describes desired future conditions and potential actions. Issues include water supply and water quality. It identifies data gaps including water quality data, sediment budgets of Mammoth and Hot creeks, and groundwater systems. The guiding principle is to minimize disturbance to stream systems and riparian areas. The plan has no authority itself, and must be adopted by the Mono County Collaborative Planning Team and its member agencies in order to achieve the projects/actions proposed.
Walker River Geographic Response Plan (Draft)	2006	Walker River	http://ndep.nv.gov/bca/emergency/walker_river_plan06.pdf	CWRAC	The Walker River Geographic Response Plan (WRGRP) establishes the policies, responsibilities, and procedures required to protect the health and safety of the populace, the environment, and public and private property from the effects of hazardous materials incidents.
West Walker River Watershed Management Plan	2007	West Walker River Watershed	http://www.monocounty.ca.gov/cdd%20site/Planning/Projects/Documents/WestWalkerWatershedManagementPlan30_000.pdf	Mono County	This plan creates linkages between water quality and water quantity problems and conditions, processes, and activities occurring in the West Walker River watershed. The study area is the 410 square mile watershed that includes the area above Topaz Reservoir at the California/Nevada border. It contains goals and objectives, describes desired future conditions and potential actions, and identifies data gaps. Issues described include water supply/water allocation and water quality. The guiding principle is to minimize disturbance to stream systems and riparian areas. The plan has no authority itself, and must be adopted by the Mono County Collaborative Planning Team and its member agencies in order to achieve the projects/actions proposed.

REGIONAL PLANS (Continued)

Los Angeles-Inyo/Mono County Plans/Reports

Los Angeles/ Inyo-Mono County Plans/ Reports	Agreement Between the County of Inyo and the City of Los Angeles and Its Department of Water and Power on a Long Term Groundwater Management Plan for Owens Valley and Inyo County:Water Agreement	1991	Inyo County	http://www.inyowater.org/Water_Resources/water_agreement/default.html	Inyo County Water Dept.	The overall goal of the Agreement is to manage water resources in the Owens Valley to avoid causing certain described decreases in vegetation and to avoid significant effects on the environment which cannot be mitigated while providing a reliable supply for use in Inyo County and for export to Los Angeles. Conditions documented during a vegetation inventory conducted from 1984-87 serve as the basis for determining whether significant decreases and changes in vegetation have occurred. Inyo County and Los Angeles jointly prepared an EIR analyzing impacts of management according to the Agreement on the Owens Valley environment and water supply for Los Angeles. The Agreement established detailed procedures contained in the Green Book to manage groundwater pumping, to monitor environmental conditions, and to assess and mitigate impacts of increased water export to Los Angeles. A detailed summary of the history leading to adoption of the Agreement is contained in the EIR (pp. 2-10 to 2-19).
	Annual Reports: Owens Valley Monitor	1998-2011	Owens Valley	http://www.inyowater.org/Annual_Reports/Default.htm	Inyo county Water Dept.	The *Owens Valley Monitor* is Inyo County Water Department's (ICWD) annual report. The Monitor is an account of monitoring and other work performed by ICWD and the Los Angeles Department of Water and Power (LADWP). In accordance with the Inyo/Los Angeles Water Agreement, ICWD and LADWP monitor water-related activities in the valley and their effects on groundwater levels and vegetation. The two agencies also conduct scientific research to improve water management methods.
	Annual Reports: Owens Valley	2006-2011	Owens Valley	http://www.ladwp.com/ladwp/cms/ladwp014332.jsp	LADWP	These document are intended to satisfy the Los Angeles Department of Water and Power's(LADWP) annual reporting obligations pursuant to the *Agreement between the Countyof Inyo and the City of Los Angeles and its Department of Water and Power on a LongTerm Groundwater Management Plan for Owens Valley and Inyo County* (Water Agreement); *the 1991 Environmental Impact Report Water from the Owens Valley to Supply the Second Los Angeles Aqueduct, 1970 to 1990, 1990 Onward, Pursuant to a Long Term Groundwater Management Plan* (1991 EIR); the Laws Type E transfer; the*1997 Memorandum of Understanding between the City of Los Angeles Department of Water and Power, County of Inyo, the California Department of Fish and Game, the California State Lands Commission, the Sierra Club, and the Owens Valley Committee*(1997 MOU); and the *August 2004 Amended Stipulation and Order in CaseNo. S1CVCV01-29768* (Stip/Order).
	Annual Compliance Report to SWRCB (Re:Mono Basin)	2003-2010	Mono Basin	http://www.monobasinresearch.org/onlinereports/#HYDROLOGY	Mono Basin Clearinghouse	Pursuant to the SWRCB Decision 1631and Orders No. 98-5 and 98-7 and in accordance with the terms and conditions of the Los Angeles Department of Water and Power Mono Basin Water Right License No. 10191 and 10192, the following compliance reports fulfill legal reporting requirements under Orders 98-5 and 98-7.
	Conservation Strategy for the Southwestern Willow Flycatcher	2005	Owens River/ Rock Creek	http://Inyo-Monowater.org/wp-content/uploads/2011/09/LADWP-willow-flycatcher-conservation-strategy.pdf	LADWP	Includes conservation strategies for the Southwestern Willow Flycatcher in proposed critical habitat, which includes riparian habitat along a 69-mile reach of the Owens River and a 0.9 mile long reach of Rock Creek in Inyo and Mono counties.
	City of Los Angeles Water Supply Plan: Securing LA's Water Supply	2008	Inyo-Mono IRWM Region	http://www.monobasinresearch.org/onlinereports/index.html#LEGAL	Mono Basin Clearinghouse	In 2007, we reached a boiling point as several factors converged to create water shortages from all major sources, sparking the need to rethink existing and future water supplies to meet the demand of more than 4 million people in Los Angeles. This City of Los Angeles Water Supply Plan, "Securing L.A.'s Water Supply," provides a blueprint for ensuring a reliable water supply for Los Angeles residents and businesses and for future generations of Angelenos.

Los Angeles-Inyo/Mono County	Final Ad Hoc Yellow Billed Cuckoo Habitat Enhancement Plan	2005	Hogback Creek, Baker Creek	http://www.inyowater.org/Mitigation/ybcu/index.html	Inyo County Water Dept.	The 1997 MOU between LADWP and Inyo County and others required that habitat be evaluated in the riparian woodland areas of Hogback and Baker creeks so that enhancement plans could be developed. These plans identify reasonable and feasible actions or projects to maintain and improve the habitat of the Yellow-billed Cuckoo.
	Grant Lake Operations and Management Plan	1996	Grant Lake, Mono Basin	http://www.monobasinresearch.org/onlinereports/index.html#LEGAL	Mono Basin Clearinghouse	The Grant Lake Operations and Management Plan addresses four separate but interrelated components: Grant Lake operation, Lee Vining Conduit diversions, exports, and stream flows. In addressing these components, the plan also meets the Decision 1631requirements regarding the upper Owens River. In providing the streamflows that are required by Decision 1631, both base flows as well as channel maintenance flows, the Grant Lake Operations and Management Plan provides the necessary flows for stream and stream channel restoration. Further, by adhering to the Decision's export criteria, the Plan allows the elevation of Mono Lake to rise to the target elevation, thus providing the most significant element of waterfowl habitat restoration.
	Green Book for the Long-term Groundwater Management Plan for the Owens Valley and Inyo County	1990	Inyo County	http://www.inyowater.org/Water_Resources/Green%20Book%202000.PDF	Inyo County Water Dept.	This Green Book was created in agreement between the County of Inyo and LADWP for the Long-term Groundwater Management Plan for the Owens Valley and to accompany the environmental impact report (EIR). The Green book describes goals of the Agreement that pertain to vegetation management and sets forth procedures and methods to achieve those goals. It describes techniques, procedures and criteria to compile vegetation inventories, create vegetation management maps and monitor vegetation data. Further studies and supporting technical vegetation information are presented.
	Habitat Management Plan- Owens Lake	2010	Owens Dry Lake	http://www.ladwp.com/ladwp/cms/ladwp013227.pdf	LADWP	This document describes the Owens Lake Habitat Management Plan (OLHMP) for the Owens Lake Dust Mitigation Project (Project). This plan is a requirement of Mitigation Measure Biology-14 of the 2008 State Implementation Plan Final Subsequent Environmental Impact Report (2008 SIP FSEIR). The overall goal of the plan, as stated in the 2008 SIP FSEIR is to avoid direct and cumulative impacts to native wildlife communities that may result from the Project. As noted in Mitigation Measure Biology-14, the plan will apply to all emissive areas subject to dust control measure on lands owned by either the City of Los Angeles (City) or the California State Lands Commission (CSLC). The OLHMP was developed by staff of LADWP.
	Inyo County Resolutions No. 99-43: Extraction and Use of Inyo County's Water Resources	1999	Inyo County	http://www.inyowater.org/water_resources/icwaterpolicy9943.html	Inyo County Water Dept.	A resolution of the Inyo County Board of Supervisors which affirms the extraction and use of Inyo County's water resources for the Lower Owens River Project in order to meet the obligations under the Inyo/Los Angeles Long Term Water Agreement, Final EIR, and Memorandum of Understanding, while protecting the County's environment, citizens and economy from adverse effects. This document establishes policies and procedures to implement the obligations of the County and evaluate results.
	LORP: Action Plan (Appendix to MOU between Inyo County, LADWP and others. Re: Implementation of the LORP	1997	Lower Owens River	http://www.inyowater.org/LORP/LORP_Implementation_Plan_Detailed_Oct19_05.pdf	Inyo County Water Dept.	This plan describes the tasks and objectives for preparing an ecosystem management plan, which will guide the implementation of the Lower Owens River Project (LORP), as part of Inyo/Los Angeles Long Term Water Agreement to restore wetland and riparian habitats and to re-water the full 60-mile reach of the Lower Owens River.
	LORP: Annual Operations Plan	2009-2010	Lower Owens River	http://www.inyowater.org/dwp_annual_operations_plan/2009_2010/default.htm	Inyo County Water Dept.	This document is intended to satisfy LADWP's annual reporting obligations pursuant to the Water Agreement; the 1991 EIR; the Laws Type E transfer; the 1997 MOU between LADWP, Inyo County, the California Department of Fish and Game, the California State Lands Commission, the Sierra Club, and the Owens Valley Committee; and the August 2004 Amended Stipulation and Order in Case No. S1CVCV01-29768.

Los Angeles/ Inyo-Mono	LORP: Annual Report	2010	Lower Owens River	http://www.inyowater.org/LORP/default.htm	Inyo County Water Dept.	The Lower Owens River Project (LORP) is a large-scale habitat restoration project in Inyo County, California being implemented through a joint effort by the Los Angeles Department of Water and Power (LADWP) and Inyo County (County). The LORP was identified in a 1991 Environmental Impact Report (EIR) as mitigation for impacts related to groundwater pumping by LADWP from 1970 to 1990. The description of the project was augmented in a 1997 Memorandum of Understanding (MOU), signed by LADWP, County, California Department of Fish and Game (CDFG), California State Lands Commission (SLC), Sierra Club, and the Owens Valley Committee. As described in the *Lower Owens River Monitoring Adaptive Management and Reporting Plan* (Ecosystem Sciences, 2008), copies of the annual monitoring report will be distributed to the other MOU parties (CDFG, SLC, Sierra Club, and the Owens Valley Committee) and made available to the public. This document represents the reporting requirements for the LORP Annual Report for 2010.
	LORP: Ecosystem Management Plan	2002	Lower Owens River	http://www.inyowater.org/LORP/default.htm	Inyo County Water Dept.	The Ecosystem Management Plan describes Management Concepts for the LORP and includes a River Management Plan, Wetland Management Plan, Land Management Plan, LORP Conservation Plan, Recreation Management Plan, and Monitoring and Adaptive Management Plan.
	LORP: Final EIR	2004	Lower Owens River	http://www.ladwp.com/ladwp/cms/ladwp005749.jsp	Inyo County Water Dept.	This final EIR was prepared by the LADWP as part of the agreement to restore various wetland and riparian habitats along the Owens River, known as the Lower Owens River Project (LORP). The objective of the EIR is to evaluate the impacts of the proposed LORP in order to allow LADWP and the County to make informed decisions about the final design and implementation of the Project and to implement the LORP in the most environmentally sound manner. A description of the project, current environmental conditions, potential impacts of the project, and alternatives are presented.
	LORP: Monitoring, Adaptive Management, and Reporting Plan	2008	Lower Owens River	http://www.inyowater.org/LORP/DOCUMENTS/LORP_MonitoringAdaptiveManagmentPlan_042808.pdf	Inyo County Water Dept.	Describes the long-term monitoring plan for collecting and analyzing data on the progress toward meeting LORP goals. Using this data, the LORP will be adaptively managed and project management will be modified if data from ongoing monitoring and analysis reveal that such modification is necessary to ensure the attainment of the LORP goals.
	LORP: Recreation Use Plan (Existing Conditions Memo)	2011	Lower Owens River	http://www.inyowater.org/LORP/default.htm	Inyo County Water Dept.	This memorandum is a summary of existing conditions, opportunities and constraints with respect to developing and managing recreation within the Lower Owens River Project Area (LORP). Inyo County is partnering with the Los Angeles Department of Water and Power (LADWP) to create a long-range Recreational Use Plan for the Lower Owens River. The goal of the Plan is to enhance and better manage community and visitor recreation experiences in the LORP area. This plan will create a foundation for the continued investment and collaboration needed to establish the Lower Owens River area as a destination for local and regional outdoor enthusiasts. Resource conservation and recovery, improved recreational access and local economic development are fundamental goals of this plan
	Mono Basin EIR (Draft)	1993	Mono Basin	http://www.monobasinresearch.org/onlinereports/index.html#LEGAL	Mono Basin Clearinghouse	The California State Water Resources Control Board (SWRCB) has prepared a draft environmental impact report (EIR) for the review and modification of certain Mono Basin water rights held by the City of Los Angeles. The draft EIR was prepared in accordance with the provisions of the California Environmental Quality Act (CEQA). The project evaluated in the draft EIR consists of: 1) The establishment and maintenance of instream flow requirements in the Mono Lake tributaries from which the City of Los Angeles diverts water; 2)The establishment and maintenance of water elevation requirements in Mono Lake to provide appropriate protection for public trust resources and beneficial uses of Mono Lake. The SWRCB will incorporate the appropriate instream flow requirements, lake level requirements, and mitigation measures into the City of Los Angeles' water right licenses for diversion from Mono Basin.

Los Angeles-Inyo/Mono	Mono Basin: Rush and Lee Vining Creek Instream Flow Study	2008	Mono Basin	www.waterboards.ca.gov/.../water_issues/programs/mono_lake/docs/instreamflowstudy_rushleevining.pdf - 2009-08-19 - Text Version	SWRCB	The SWRCB Order 98-05, Section 1 b.(2)(a), directed the Mono Basin Stream Scientists to "evaluate and make recommendations based on the results of the monitoring program, regarding the magnitude, duration and frequency of the SRF flows necessary for the restoration of Rush Creek". The Rush Creek and Lee Vining Creek Instream Flow Study (IFS) was designed to quantify adult trout holding (primarily winter) and foraging (spring, summer, fall) microhabitat areas over a range of test flows, then assess trout microhabitat area in conjunction with water temperature, fish passage, and riffle hydraulics where trout food resources (benthic macroinvertebrates) are concentrated. The IFS results and flow needs are presented in this Report.
	Mono Basin: Stream and Stream Channel Restoration Plan	1996	Mono Basin	http://www.monobasinresearch.org/legal/1996streamplan.pdf	Mono Lake Committee	The restoration plan prepared by LADWP has the overall goal to 'develop functional and self-sustaining stream systems with healthy riparian ecosystem components'. This complies with the order of the SWRCB which defined the objective for the Stream and Stream Channel Restoration Plan to be " ... to restore, preserve and protect the streams and fisheries in Rush, Lee Vining, Walker and Parker creeks."
	Mono Basin: Waterfowl Habitat Restoration Plan	1996	Mono Basin	http://www.monobasinresearch.org/legal/1996waterfowlplan.pdf	Mono Lake Committee	The Mono Lake Basin Water Right Decision 1631 was adopted by the State Water Resources Control Board (SWRCB) on September 28, 1994. This Decision amended Water Right Licenses 10191 and 10192, held by the City of Los Angeles, to meet the public trust needs of the Mono Basin environment, and to comply with Fish and Game Code Sections 5937 and 5946. The Decision defined instream flow requirements in the four streams from which the Los Angeles Department of Water and Power (LADWP) diverts water, and established water diversion criteria to protect wildlife and other environmental resources (air quality, scenic value, water quality standards) in the Mono Basin. Decision 1631 requires LADWP to prepare a Waterfowl Habitat Restoration Plan, to help mitigate the loss of waterfowl habitat due to the diversion of water. This document is the plan required by the SWRCB.
	Mono Lake Basin Water Right Decision 1631	1994	Mono Basin	http://www.monobasinresearch.org/images/legal/d1631text.htm	Mono Basin Clearinghouse	In Decision 1631, the State Water Board modified Licenses 10191 and 10192 for the purpose of establishing instream flow requirements below Los Angeles Department of Water and Power's points of diversion on four affected streams, which are tributaries to Mono Lake. The decision also established conditions to protect public trust resources at Mono Lake. Subsequent Orders WR 98-05 and WR 98-07 amended Decision 1631. Pursuant to the State Water Board determinations, the Licensee is required to undertake restoration and monitoring activities to be in compliance with the terms and conditions of its licenses.
	MOU: Inyo County, City of Los Angeles, Sierra Club, Owens Valley Committee, CA Dept of Fish and Game and CA State Lands Commission	1997	Inyo County	IRWM Program Digital Library	LADWP	The MOU resolved disagreements on the scope and details of several environmental projects and studies described in the Agreement, and required additional land and habitat management plans be developed. The majority of the MOU provisions pertain to the implementation of the Lower Owens River Project (LORP) to re-water 53 62 miles of the original channel below the LAA intake dam. This project will establish a viable warm water fishery and healthy functioning ecosystem and wetlands associated with the river. This It is the single largest mitigation project in required by the Agreement. The MOU also establishes a commitment for frequent communication among representatives of the parties to discuss issues that arise during implementation of the MOU and sets out dispute resolution procedures to settle future disagreements.
	Owens Lake Master Plan (Working Draft)	2011	Owens Dry Lake	https://owenslakebed.pubspsvr.com/Master%20Plan/Forms/AllItems.aspx	Owens Lake Master Planning Committee	The purpose of the plan is to promote/protect the resources of the lakebed, while achieving water-efficient dust control and maintaining or improving the lakebed's overall public trust value. The core elements of the plan are water-efficient dust control and wildlife habitat. The Master Plan includes consideration of other public trust resources associated with the playa, including public access and recreation, and other lakebed resources such as cultural resources, renewable energy, grazing, and mining. The Master Plan reflects the outcome of collaborative planning among local, state, and federal stakeholders and it represents the collective vision for the future of the lakebed

	Owens Valley Land Management Plan (Draft)	2008	Owens Valley	Digital Library	LADWP	Provides management direction for water supply, habitat, recreation, and land use on all City of Los Angeles-owned lands in Inyo County, excluding the Lower Owens River Project area. This plan provides a framework for implementing management prescriptions through time, monitoring resources, and adaptively managing changed land and water conditions.
	Owens Valley PM10 Planning Area Demonstration of Attainment State Implementation Plan	2008	Owens Dry Lake	http://www.gbuapcd.org/ovpm10sip.htm	GBAPCD	Calls for an addition of 13.2 square miles of dust control on Owens Lake by April 2010, bringing a total of 42.1 square miles of dust control measures into operation on Owens Lake. Dust control measures used under this plan include managed vegetation, shallow flood, and gravel cover.
	Owens Valley PM10 Planning Area Demonstration of Attainment State Implementation Plan: Final SEIS	2008	Owens Dry Lake	http://www.gbuapcd.org/ovpm10sip.htm	GBAPCD	This Subsequent Environmental Impact Report (EIR) analyzes the potential for significant environmental impacts in association with the 2008 Owens Valley PM10 Planning Area Demonstration of Attainment State Implementation Plan (SIP)1 (proposed project). This Subsequent EIR incorporates the 1998 EIR and 2003 EIR by reference and provides broad program-level and project-specific environmental analyses for the 2008 SIP revision.
	Mono Basin: State Water Resources Control Board Restoration Orders: WR98-07	1998	Mono Basin	http://www.waterrights.ca.gov/hearings/WaterRightOrders/WRO98-07.pdf	Mono Basin Clearinghouse	Order amending provisions of order WR 98-05 applicable to stream restoration measures and dismissing petitions for reconsideration. November 19, 1998. State of California Water Resources Control Board. In the Matter of Stream and Waterfowl Habitat Restoration Plans and Grant Lake Operations and Management Plan Submitted by the Los Angeles Department of Water and Power Pursuant to the Requirements of Water Right Decision 1631 (Water Right Licenses 10191 and 10192, Applications 8042 and 8043).
	Mono Basin: State Water Resources Control Board Restoration Orders: WR 98-05	1998	Mono Basin	http://www.waterboards.ca.gov/waterrights/board_decisions/adopted_orders/orders/1998/wro98-05.pdf	Mono Basin Clearinghouse	Decision 1631 substantially resolved the long-standing debate over imposing restrictions on water diversions from the Mono Basin in order to protect environmental and public trust resources. In recent years, attention has shifted to examining other actions that could be taken to help restore various resources damaged through years of water diversions and in-basin development. The focus of this order is on the still narrower issue of determining the stream and waterfowl habitat restoration measures that Los Angeles should be required to implement or participate in under the provisions of Decision 163 I which amended the conditions governing Los Angeles' diversion of water under Licenses 10191 and 10192.
REGIONAL PLANS (continued)						
RELEVANT REPORTS (Research, Advocacy, Conservation, Compliance)						
Relevant Reports	Bodie Creek Project Report: Total Maximum Daily Loads for Metals	2003	Bodie Creek Watershed	http://www.waterboards.ca.gov/lahontan/water_issues/programs/tmdl/bodie_creek/docs/bodie_creek_project_report_12_04.pdf	SWRCB	Bodie Creek is included on the Clean Water Act Section 303(d) list for metals Impairment. In April, May and June of 2004, staff of the Lahontan Regional Water Quality Control Board (RWQCB) collected surface water samples from the creek to determine if metals detected in sediment during previous investigations (Dynamac, 2002) were present in surface water of Bodie Creek. Water samples from Bodie Creek were analyzed for dissolved and total metals and cyanide (see Bodie Creek Sampling and Analysis Plan, Lahontan RWQCB, April 2004). This report explains the initial findings.

Bridgeport Reservoir: Report on Beneficial Use Impairment: Limnology in the Summer-Fall 2000 and comparisons with 1989	2003	Bridgeport Reservoir	http://www.waterboards.ca.gov/lahontan/water_issues/programs/tmdl/bridgeport/docs/bridgeport_reservoir_year_2000_final_report_figures.pdf	SWRCB	A comprehensive study of the reservoir's limnology was carried out in summer-fall 2000 and compared with a smaller study conducted in 1989. The specific purpose of the 2000 study was to understand the physical, chemical and biological processes in the reservoir in relation to impairment of beneficial uses. The information will be used as part of the Total Maximum Daily Load (TMDL) process to determine numerical and/or narrative water quality standards to attain designated beneficial use.
Crowley Lake: Assessment of internal nutrient loading to Crowley Lake	2003	Crowley Lake	www.waterboards.ca.gov/.../programs/tmdl/crowley_lake/docs/final_00-196-160-0_int_loading_crowley_1.pdf - 2008-02-16 - Text Version	SWRCB	Crowley Lake (Long Valley Reservoir) is avaluable aquatic resource identified as impaired by nutrients by the CA Water ResourcesControl Board. The lake is eutrophic and is characterized by an ample supply of nutrients and significant summer algal blooms (EPA 1978, Melack and Lesack 1982). Adverse impacts of increased eutrophication at Crowley Lake have included de-oxygenation of the hypolimnion and downstream fish kills (Milliron 1997), and decreased water quality as indicated by taste, odor, and large areas of floating algal mats.
Crowley Lake: Environmental Assessment for Crowley Lake Watershed Grazing Allotment Analysis	2009	Crowley Lake	http://www.fs.fed.us/nepa/nepa_project_exp.php?project=17526	USFS	Today, there are 15 grazing allotments in the Crowley Lake Basin ranging in size from 500 to 50,500 acres. Twelve of the allotments are subject to this environmental analysis. Grazing in the allotments is authorized by Term Grazing Permits that specify the terms and conditions for grazing on the allotment, including the type and timing of livestock as well as any management actions necessary o meet desired rangeland conditions.
Crowley Lake: Recommendation to delist Crowley Lake for Nitrogen and Phosphorus	2005	Crowley Lake	www.swrcb.ca.gov/lahontan/water_issues/programs/.../staffreport.pdf	SWRCB	In 1994, Crowley Lake (also known as Long Valley Reservoir) was listed as an impaired water body in accordance with Section 303(d) of the Clean Water Act (CWA) based on information and listing criteria available at that time. The most current 303(d) list, updated in 2002 by Lahontan Regional Water Quality Control Board (Regional Board), shows Crowley Lake to be impaired by nitrogen and phosphorous, with grazing, atmospheric deposition, internal nutrient cycling, erosion/siltation, and undifferentiated non-point and natural sources listed as the potential sources of nitrogen and/or phosphorous loading (LRWQCB, 2002). A November 1994 Water Body Fact Sheet prepared by the State Water Resources Control Board (SWRCB, 1994) described the impairment of Crowley Lake as eutrophication, "…with the hypolimnion anoxic in1991."
Crowley Lake: Restoration of riparian habitat and assessment of riparian corridor fencing and other watershed best management practices on nutrient loading and eutrophication of Crowley Lake, CA	2003	Crowley Lake, Mono County	http://www.waterboards.ca.gov/lahontan/water_issues/programs/tmdl/crowley_lake/docs/final_9-175-256-0_crowley_restoration_monitoring_1.pdf	SWRCB	Crowley Lake (Long Valley Reservoir), Mono County is a valuable aquatic resource. The lake and its tributaries are the premier trout fishery in the Eastern Sierra and the reservoir constitutes 60% of the storage capacity of the Los Angeles Aqueduct system. The watershed is approximately 380 sq. miles and is predominately public lands administered by Inyo National Forest (INF), Bureau of Land Management (BLM), and the City of Los Angeles. Crowley Lake was first classified as eutrophic by EPA's National Eutrophication Survey (1975), is 'listed' for nutrients per Section 303(d) of the federal Clean Water Act, and is a TMDL priority for the Lahontan Regional Water Quality Control Board. The purpose of the work covered by this contract was to restore a substantial length of the main tributary (Owens River) immediately upstream of Crowley Lake by implementing grazingBMPs including riparian fencing (Chapter 2), to develop an annual nutrient loading budget for Crowley Lake (Chapter 3), to determine the major sources of nutrients (Chapter 4), and monitor continuing eutrophication via transparency, nutrient concentrations, and characterization of the plankton communities (Chapter 5).
Dry Creek: Hydrologic Assessment of the Dry Creek Drainage for Mammoth Mountain Ski Area	2007	MMSA, Town of Mammoth Lakes	TBA	MCWD	Not available for public review at this time.

Relevant Reports	Fish Slough Milk Vetch: 5 Year Review and Summary	2009	Fish Slough	http://Inyo-Monowater.org/wp-content/uploads/2011/09/Fish-Slough_Milk-vetch_5yrReview_2009.pdf	USFWS	The U.S. Fish and Wildlife Service (Service) is required by section 4(c)(2) of the Endangered Species Act of 1973 (Act) to conduct a status review of each listed species at least once every 5 years. The purpose of a 5-year review is to evaluate whether or not the species' status has changed since it was listed (or since the most recent 5-year review). Based on the 5-year review, we recommend whether the species should be removed from the list of endangered and threatened species, be changed in status from endangered to threatened, or be changed in status from threatened to endangered. Our original listing of a species as endangered or threatened is based on the existence of threats attributable to one or more of the five threat factors described in section 4(a)(1) of the Act, and we must consider these same five factors in any subsequent consideration of reclassification or delisting of a species. In the 5-year review, we consider the best available scientific and commercial data on the species, and focus on new information available since the species was listed or last reviewed. If we recommend a change in listing status based on the results of the 5-year review, we must propose to do so through a separate rule-making process defined in the Act that includes public review and comment.
	Haiwee Reservoir: Total Maximum Daily Loads for Copper	2001	Haiwee Reservoir	http://www.waterboards.ca.gov/lahontan/water_issues/programs/tmdl/haiwee/docs/haiwee_tmdl_all.pdf	Lahontan RWQCB	The California Regional Water Quality Control Board, Lahontan Region (Regional Board) has developed this Progress Report to present the technical and scientific background for the forthcoming Total Maximum Daily Load (TMDL) for copper in Haiwee Reservoir, Inyo County. This Progress Report contains the draft TMDL technical support elements as recommended by United States Environmental Protection Agency (USEPA) Region IX staff to restore the water in Haiwee Reservoir to meet State water quality standards.
	Kern River: Restoration of the California Golden Trout in the South Fork Kern River, Kern Plateau	2008	South Fork Kern River	http://nrm.dfg.ca.gov/documents/DocViewer.aspx	CA Dept. of Fish and Game	This paper describes a major recovery effort for California golden trout, *Oncorhynchus mykiss aguabonita*, started in 1966 and still in progress, to remove an invasion of brown trout and hybrid golden x rainbow that had invaded and spread throughout the South Fork Kern River drainage and nearly caused extinction of the California State Fish and namesake of Inyo National Forest's Golden Trout Wilderness. The paper condenses and presents an historic and joint effort by the California Department of Fish and Game and Inyo National Forest involving construction of major fish barriers, application of pesticides to more than 100 miles of stream to remove invading fishes, restocking of native fishes, habitat restoration, and reduction of grazing levels and resting of grazing allotments to allow physical recovery of trout habitat. Continuing research by geneticists will allow us to better understand the golden trout resource and its future. The recovery effort almost certainly represents the most extensive such project ever undertaken for a fish, either freshwater or marine.
	Lahontan Cutthroat Trout Recovery Plan	1995	Walker River Watershed	http://ecos.fws.gov/docs/recovery_plan/950130.pdf	USFWS	Lahontan cutthroat trout currently exist in about 155 streams and 6 lakes and reservoirs in Nevada, California, Oregon, and Utah. The species has been introduced outside its native range, primarily for recreational fishing purposes. Currently LCT occupy approximately 0.4 percent of former lake habitat and 10.7 percent of former stream habitat within native range. This plan outlines recovery strategies and aims to eventually delist the species.
	Owens Basin Wetland and Aquatic Species Recovery Plan: Inyo and Mono Counties	2005 2007	Mill Creek	http://Inyo-Monowater.org/wp-content/uploads/2011/09/Mill-Creek-Settlement-Agreement_FERC_P-1390-040.pdf	FERC	FERC issued a new license to Southern California Edison Company for continued operation and maintenance of its 3-megawatt Lundy Hydroelectric Project. The project is located on Mill Creek in Mono County, California. Portions of the project occupy lands managed by the USDA Forest Service and the Bureau of Land Management.

RELEVANT REPORTS						
		1998	Inyo & Mono Counties	http://ecos.fws.gov/docs/recovery_plan/980930b.pdf	USFWS	Establishes recovery objectives for the Owens pupfish, Owens tui chub, and Astragalus lentiginosus var. piscinensis and identifies actions needed to protect species of concern in the Owens Basin. The goal is to restore target species to viable and interacting populations within their ecosystems. Includes an implementation schedule to achieve these recovery objectives.
	Owens Pupfish: 5 Year Review and Summary Evaluation	2009	Owens River	http://Inyo-Monowater.org/wp-content/uploads/2011/09/Owens_Pupfish_5yrReview_2009.pdf	USFWS	See summary for Fish Slough Milk Vetch above
	Owens Tui Chub: 5 Year Review and Summary Evaluation	2009	Owens River	http://Inyo-Monowater.org/wp-content/uploads/2011/09/Owens_Tui-Chub_5yrReview_2009.pdf	USFWS	See summary for Fish Slough Milk Vetch above
	Proposition 13: Southwest Wellfield Recharge Feasibility Study	2005	Indian Wells Valley Basin	Inyo-Mono IRWM Program Digital Library http://www.inyo-monowater.org	IWVWD	The Indian Wells Valley Water District constructed two one-acre percolation/recharge ponds, two 6-inch monitoring wells, and assembled a weather station. 527 acre-feet of water were pumped into the recharge ponds while transducers in the monitoring wells tracked water levels. The weather station recorded wind speed, atmospheric temperature, and rainfall. An evaporation pan was used to estimate the on-site evaporation rate.
	Proposition 50: Testing of Zero-Liquid Discharge Technologies Using Brackish Groundwater for Inland Desert Communities	2010	Indian Wells Valley Basin	Inyo-Mono IRWM Program Digital Library http://www.Inyo-Monowater.org	IWVWD	The Indian Wells Valley Water District completed a comprehensive feasibility investigation to desalt water from the Water District's Northwest Well Field (NWWF). The Water District then applied for a Proposition 50 Grant and was selected to proceed with pilot testing of the major components of the selected treatment train. When fully-implemented, the NWWF brackish water treatment project creates a new source of potable water, furthers the use of economically and environmentally acceptable desalination, advances the desalination technology and evaluates a novel reversible reverse-osmosis treatment plant configuration.
	Prospects for Wetland Conservation in Mono County	2007	Mono County	Unknown if digital copy is available at this time	Mono County/ ESLT	Defines and describes wetlands of Mono County and provides a discussion on wetlands mitigation banking.
	Short-Term Action Plan for Lahontan Cutthroat Trout in the Walker River Basin	2003	Walker River	http://www.fws.gov/lahontannfhc/fish/lahontan_cutthroat_trout/documents/final_writ.pdf	USFWS	The Action Plan identifies short-term activities or research that will further our understanding of the conservation needs of LCT specific to the Walker River basin and utilizes adaptive management to refine the longterm recovery strategy.
	West Walker River Lahontan Cutthroat Trout Recovery Plan	2003	West Walker River	http://Inyo-Monowater.org/wp-content/uploads/2011/09/WWalker_LahontanRecoveryPlan_2003.pdf	USFWS	This Action Plan and the tasks identified herein are intended to eliminate or minimize the threats that impacted Lahontan Cutthroat Trout and through continued implementation of this process ensure the long-term persistence of the species.

Local Government Plans

County Plans

Inyo County General Plan (Update)	2001	Inyo County	http://inyoplanning.org/general_plan/index.htm	Inyo County	The Inyo County General Plan sets out the goals and policies of the County and provides for implementation measures to ensure the policies are carried out. Policies have been established to support the implementation of the Agreement and MOU and to manage groundwater resources in the County to provide for a viable economy, enhance the natural environment, and protect water quality and quantity through ordinance, project approvals, and agreements with other agencies.
Inyo County Groundwater Ordinance	1998	Inyo County	http://www.inyowater.org/water_resources/Inyo_County_Ordinance_1004.pdf	Inyo County Water Dept.	Establishes policy for the County of Inyo to manage the transport, transfer, acquisition and sale of surface and groundwater to protect the overall economy and environment of the County.
Kern County General Plan	2009	Southwest Inyo-Mono Region	http://www.co.kern.ca.us/planning/gpe.asp	Kern County	The General Plan is a policy document with planned land use maps and related information that are designed to give long-range guidance to those County officials making decisions affecting the growth and resources of the unincorporated Kern County jurisdiction, excluding the metropolitan Bakersfield planning area. This document helps to ensure that day-to-day decisions are in conformance with the long-range program designed to protect and further the public interest related to Kern County's growth and development. The General Plan also serves as a guide to the private sector of the economy in relating its development initiatives to the public plans, objectives, and policies of the County.
Kern County Groundwater Ordinance	1998	South-west corner of Region	http://www.co.kern.ca.us/planning/pdfs/waterord.pdf	Kern County	Establishes county policy regarding transfers or transport of native groundwater to areas outside Kern County and the watershed of the aquifer.
Mono County General Plan (Update)	1997 (2001)*	Mono County	http://www.monocounty.ca.gov/online_services/general_plan.html	Mono County	A long-term comprehensive general plan to guide decisions on future growth, development, and conservation of natural resources for Mono County until 2010. This Plan has authority and established policies are upheld by law. The Plan has a section for land use, circulation, housing, conservation, safety, noise, and hazardous waste management. The County's Regional Planning Advisory Committees (RPACs) and community planning groups reviewed drafts of the general plan; their comments were incorporated into a revised draft.
Mono County Master Environmental Assessment (Update)	2001	Mono County	http://www.monocounty.ca.gov/cdd%20site/Planning/MEA.htm	Mono County	The Mono Country MEA was originally prepared to provide the background environmental information for the update of the Mono County General Plan in 2003. The Mono Country MEA contains information on existing conditions in the county and analyzes the effects those conditions will have on future development. The plan describes in detail existing land use, socioeconomics, community services, demographics, housing, transportation, outdoor recreation, visual resources, cultural resources, climate, air quality, geology, hydrology, biological resources, energy resources, noise, natural hazards, and public health and safety within Mono County.

San Bernadino County General Plan	2007 (2011)*	San Bernadino County	http://cms.sbcounty.gov/lus/Planning/GeneralPlan.aspx	San Bernadino County	The policies and programs of the General Plan are intended to underlie most land use decisions. Preparing, adopting, implementing, and maintaining a general plan serves to: 1) Identify the community's land use, transportation, environmental, economic, and social goals and policies as they relate to land use and development. 2) Form the basis for local government decision-making, including decisions on proposed development. 3) Provide residents with opportunities to participate in the planning and decision-making processes of their community. 4) Inform residents, developers, decision makers, and other cities and counties of the ground rules that guide development within the community.
Local Government Plans (Continued)					
Urban Water Management Plans					
City of Los Angeles Urban Water Management Plan	2010	Inyo-Mono Region/ City of Los Angeles	http://www.ladwp.com/ladwp/cms/ladwp013956.pdf	LADWP	The LADWP's 2010 Urban Water Management Plan (UWMP) serves two purposes: (1) compliance with the requirements of California's Urban Water Management Planning Act (Act), and (2) as a master plan for water supply and resources management consistent with the City's goals and policy objectives.
Indian Wells Valley Urban Water Management Plan	2010	Ridgecrest	http://www.iwvwd.com/	IWVWD	The 2010 UWMP, as presented here, supersedes the 2005 UWMP and fulfills the requirements of Part 2.6 (the Urban Water Management Planning Act) and Part 2.55 (applicable sections of the Water Conservation Act of 2009, also known as SBX7-7) of Division 6 of the California Water Code, as amended.
Mammoth Community Water District Urban Water Management Plan	2010	Mammoth Lakes	http://www.mcwd.dst.ca.us/2010%20Final%20UWMP%20reduced.pdf	MCWD	The 2010 UMWP is an important long term planning document for the District and the community it serves, which is primarily the incorporated area of the Town of Mammoth Lakes (Town). The conclusions and recommendations from the 2010 UWMP will determine key aspects of long term capital investment by the District for water supply and treatment, and influence future land use planning and development levels within the Town, to the extent these are influenced by the practical and regulatory requirements linking water supply reliability and land use decisions.
Local Government Plans (Continued)					
City/Town Plans					
City of Bishop General Plan and Update	2011	Bishop	http://www.ca-bishop.us/PublicWorks/Planning/GeneralPlan/GeneralPlan.html	City of Bishop	The General Plan has been prepared pursuant to CA Government Code Section 65300 eq set. which requires all general service local governments to prepare and adopt a general plan.

City /Town Plans	City of Bishop Wastewater Master Plan	2008	Bishop	http://www.ca-bishop.us/PublicWorks/CityofBishopPublicWorks.html	City of Bishop	The primary goals of this Master Plan are to guide the development and operation of the City's water system, and to develop a Capital Improvements Plan that is responsible, realistic, and appropriate for the City. From this, the City will have a solid foundation to continue providing water service to the City and to proceed with projects to improve and maintain that service.
	City of Bishop Water Master Plan	2008	Bishop	http://www.ca-bishop.us/PublicWorks/CityofBishopPublicWorks.html	City of Bishop	The primary goals of this Master Plan are to guide the development and operation of the City's water system, and to develop a Capital Improvements Plan that is responsible, realistic, and appropriate for the City. From this, the City will have a solid foundation to continue providing water service to the City and to proceed with projects to improve and maintain that service.
	City of Bishop Parks and Recreation Master Plan	2008	Bishop	http://www.ca-bishop.us/CommunityServices/CommunityServices.html	City of Bishop	The master plan has arisen from the conviction that parks and recreational services are a fundamental service of the City of Bishop California. It represents a comprehensive planning process to determine ways recreational and leisure services can be efficiently and effectively delivered to the citizens of Bishop and Inyo County. It is a plan of action for the next several years that addresses management, parks, facilities, and programming.
	City of Ridgecrest General Plan	1991-2010	Ridgecrest	http://www.westplanning.com/ridgecrest/index.htm	City of Ridgecrest	This General Plan is a policy document designed to guide the future growth and development of Ridgecrest in a manner consistent with it's physical, social, economic, and environmental goals. The plan provides a framework of policies and programs with which local decision makers may direct the growth of the community. At the same time, it constitutes a vehicle for citizen involvement both during the plan's development and throughout its implementation.
	June Lake Area Plan	2010	June Lake	June Lake Area Plan 2010 See IRWM Program Digital Library	Mono County	The June Lake 2010 Area Plan summarizes existing conditions in the June Lake area, identifies community issues and potentials, and specifies goals, objectives and policies to guide community development over the next 20 years. This Area Plan supplements the Mono County General Plan by providing area-specific directives.
	Town of Mammoth Lakes: General Plan Update	2007	Mammoth Lakes	http://www.ci.mammoth-lakes.ca.us/index.aspx?NID=162	Town of Mammoth Lakes	Strategic plan that establishes guidelines and priorities for the community of Mammoth Lakes. It addresses: land use, circulation, housing, conservation, open space, noise, and safety.
	Town of Mammoth Lakes: General Plan-Final EIR	2007	Mammoth Lakes	http://www.ci.mammoth-lakes.ca.us/index.aspx?NID=163	Town of Mammoth Lakes	EIR in support of the General Plan for the Town of Mammoth Lakes.

City / Town Plans	Town of Mammoth Lakes: Parks and Recreation Master Plan (Draft)	2008	Mammoth Lakes	http://www.ci.mammoth-lakes.ca.us/index.aspx?nid=259	Town of Mammoth Lakes	The recommendations for parks and recreation elements outlined in this Master Plan are based on the results of field analysis, inventories, demand analysis, workshop planning sessions, and survey results from residents and second households. The Plan outlines the vision for developing parks and recreation within Mammoth Lakes for the next 18 years. It anticipates future conceptual designs for parks and lands in the Town inventory. These lands may be subject to further study and coordination with public and private participants, which may modify the outcome of some aspects of the Plan. When implemented, this Plan will enable the Town to provide accessible parks and recreation facilities for its residents and visitors, and foster a sense of community through its facilities and programs.
	Town of Mammoth Lakes: Storm Drain Master Plan	1984*	Mammoth Lakes	http://www.ci.mammoth-lakes.ca.us/index.aspx?nid=222	Town of Mammoth Lakes	By the early 1980's, development in the Community of Mammoth Lakes had reached a point where peak flows from Spring snowmelt and thunderstorms caused increased erosion and localized flooding in many area of the community. Uncontrolled runoff accelerates erosion and increases sediment loads and attendant water quality problems in Mammoth Creek. These problems are also aggravated by discharges directly to Mammoth Creek of surface water runoff from heavily developed commercial areas containing sediment, oil, grease and nutrients. According to the USFS and CA Dept. of Fish and Game, declining water quality has resulted in decreased fish populations downstream of Mammoth Lakes. This plan was developed in response to those findings.
	Town of Mammoth Lakes: Storm Drain Master Plan Update	2005	Mammoth Lakes	http://www.ci.mammoth-lakes.ca.us/index.aspx?nid=222	Town of Mammoth Lakes	This 2005 Storm Drain Master Plan for the Town of Mammoth Lakes (Town) updates the existing 1984 study for Mono County. This Master Plan sets forth to attain the following objectives: 1) Assess the adequacy of the existing conveyance structures of the storm drain system in the Town.2) Make specific recommendations for future improvements to the storm drain system. 3) Recommend and assess the impact of specific detention facilities as specified by the Town. The intent of these facilities is to reduce the drainage burden on downstream storm drain system. 4) Provide a basis for the cost estimates and financing necessary to make the storm drain and detention improvements recommended in (2) and (3) above. 5) Review the area's hydrology for both winter rain and snow and summer rain events. 6) Provide a concise and simple hydrologic methodology necessary for developers to plan and design specific design improvements and assess the impact of development on downstream constituents.This methodology will be designed so that it will be compatible with methods adopted in the 1984 study.
	Town of Mammoth Lakes: Downtown Neighborhood District Plan	2010	Mammoth Lakes	http://www.ci.mammoth-lakes.ca.us/index.aspx?NID=133	Town of Mammoth Lakes	This Study Report summarizes the outcomes of the Neighborhood District Planning (NDP) process for districts within Mammoth Lakes' Downtown area, encompassing the Main Street/Highway 203 corridor from the Town entry to Minaret Road, the North Old Mammoth Road area, and the 25-acre Shady Rest Site. Successful planning through the NDP process is critical to redefining the character, form and function of Main Street and the entire downtown as the town's major gateway and commercial district, providing a catalyst for reinvestment and change.
Local Government Plans (Continued)						
Tribal Plans						
	Bishop Paiute Tribe Water Quality Control Plan	2007	Bishop	http://water.epa.gov/scitech/swguidance/standards/upload/2008_11_12_standards_wqslibrary_tribes_bishop.pdf	EPA	The Bishop Paiute Tribe Water Quality Plan contains a characterization of the Reservation, its climate, geology, surface and ground waters. The plan identifies water quality and quantity issues and describes water quality standards. Includes a discussion of general control actions and recommendations to protect water resources for municipal, industrial and cultural uses as well as to protect wildlife and aquatic habitat.

Water Quality Standards, Big Pine Reservation	2005	Big Pine	http://www.epa.gov/waterscience/standards/wqslibrary/tribes/bigpine-200601.pdf	EPA	Plan outlines water quality standards within the boundaries of the Big Pine Paiute Reservation to protect public health and welfare and to maintain or enhance water quality in relation to existing and/or potential beneficial uses of the water. Water quality standards are presented in numerical and narrative form. Describes current water uses and policies for implementation.
Local Government Plans (Continued)					
Small Water Companies/ CSD Plans					
June Lake PUD Master Water Plan (Update)	2007	June Lake	IRWM Program digital Library.	June Lake PUD	The document describes present/projected land and water use in the June Lake District and proposes future improvements needed to meet future demands along with estimated capital costs. Estimates of future water usage are based on the land use projections.

Appendix E: Round 2 Ranking Process

Round 2 Prop. 84 IRWM Implementation

Proposal Process, Scoring/Ranking Process, & Pre-Proposal Application

Project Review Process

General Information and Preparation of Pre-proposals

- You are *strongly* encouraged to review all relevant documents including the *draft* Round II Implementation Proposal Solicitation Package (PSP), Draft IRWM Plan Guidelines, and the guidance included in this Request For Proposals (RFP).
- Please pay particular attention to required procedures and deadlines. Refer to the attached timeline for more information about the review and ranking process, fiscal agent selection, and proposal development. The timeline is also available at the following link: http://www.tiki-toki.com/timeline/entry/22016/INYO-MONO-IRWM-PROGRAM/#!date=2012-09-10_13:15:05!
- If you intend to submit a project for Round 2 Implementation funding, **you *must* attend the September 26, 2012, PSP and ranking workshop in Independence, CA** (see www.inyo-monowater.org for details). There will be a conference call/webinar option if you cannot attend in person. If you are not able to attend at all, you must send someone to attend in your place. Those not attending will not be eligible to submit pre-proposals.
- All project proponents who wish to have their projects considered for Round 2 Implementation funding must submit their project(s) using the online upload form first (unless you have already done so): http://inyo-monowater.org/members/project-upload/. **All projects must be uploaded by September 30, 2012.**
- **Round 2 Implementation pre-proposals** (those proposals used for internal ranking) **are due to the Program Office by 11:59 pm, October 16, 2012.** Also become familiar with the Implementation PSP before starting your pre-proposal so that you understand what is expected of projects and project proponents. **Please submit pre-proposals as Word documents. We suggest using the attached application worksheet (starting on p. 5) as a template for your pre-proposal.**
- With regards to the Implementation PSP section in the pre-proposal, a fully-developed proposal is not necessary. Reviewers will be looking for the minimal amount of information necessary to respond to the questions in the Implementation PSP Table starting on Page 4. However, providing responses to all of the scoring criteria/questions is highly recommended.
- **All project proponents *are required* to give a brief presentation of their project(s) to the Regional Water Management Group on October 17, 2012. *All entities wishing to review and rank projects must attend this project presentation workshop***, including all technical advisory committee (TAC) members. A conference call/webinar option will be available for those not able to attend in person.

Scoring of Proposals and Allocation of Funding

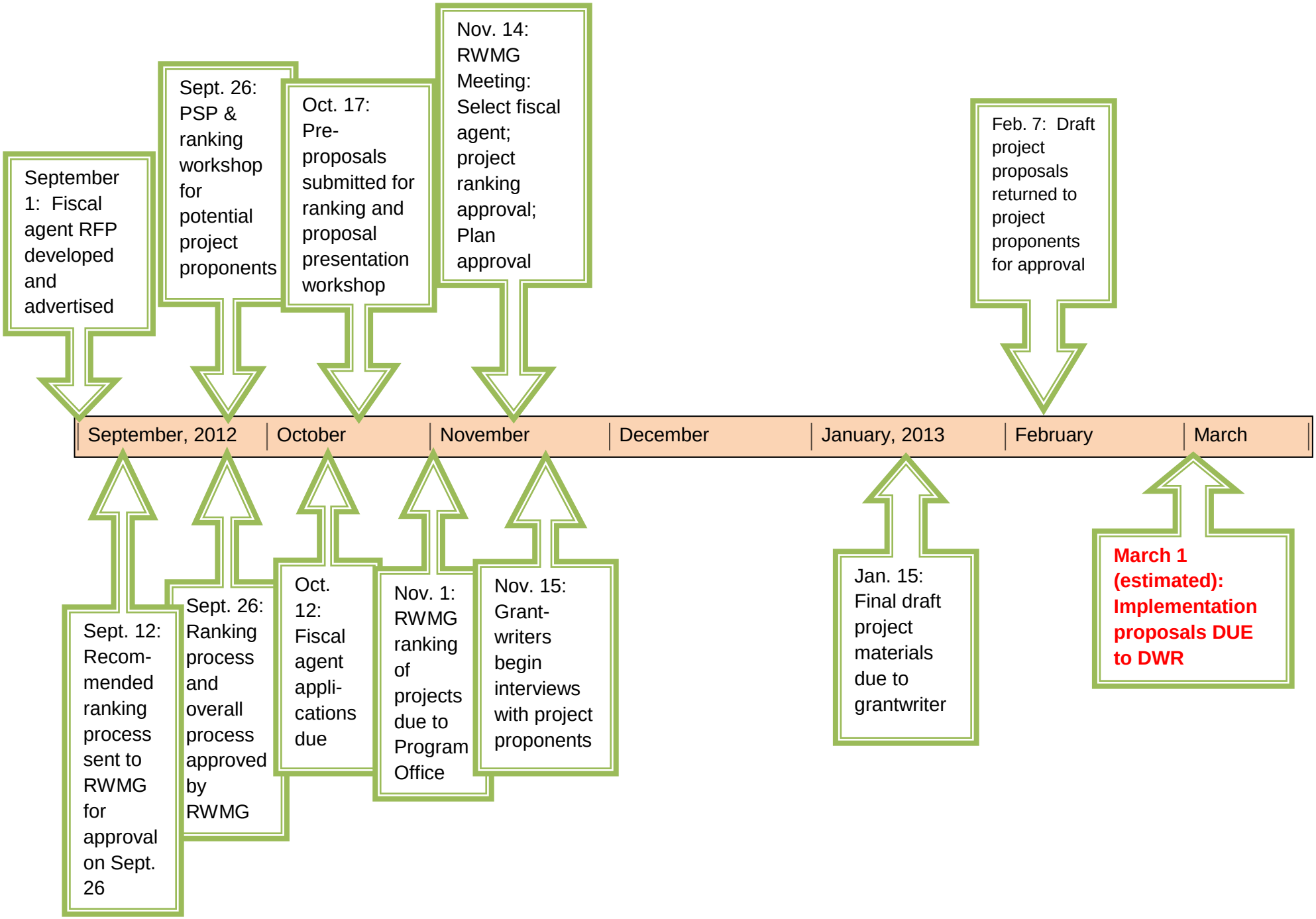
- **Category-specific TACs will meet and evaluate proposals for that category only before October 24, 2012.** *TACs will evaluate the entire Implementation PSP section of each pre-proposal up to 80 points.* TACs are encouraged, in addition to providing the scores of each project evaluated, to provide a narrative explanation of its scoring/ranking of the proposals. TAC members do not necessarily need to be RWMG Members.
- **TACs will provide their scoring and rankings to the Program Office by October 24, 2012.** Program Office will then provide this information to project proponents and the RWMG. If project proponents wish to respond to the TAC rankings, they may do so any time before November 1, 2012, and those responses will be made available to the group of project reviewers.
- Expenses required by fiscal agent to implement and administer the Grant Agreement with DWR will be subtracted from the total grant award with remaining funds going directly to support implementation projects.

- Funding will be allocated among projects in the following way: Implementation projects will be prioritized for funding based on the project's evaluation score, regardless of bins. Projects will be ranked from the highest score to the lowest score, and funding will be allocated accordingly. When there is insufficient grant money to fully fund the next project, the Program Office will discuss with funded project proponents how best to maximize the remainder amount so as to fund as many projects as possible. If needed to help resolve conflict, the Program Office will consult the Administrative Committee.
- Only RWMG Members are eligible to review and rank projects. Members wishing to review and rank projects must commit to reviewing and ranking ALL projects. RWMG reviewers may accept the TAC scoring for those specific sections for a particular project, or they may do their own scoring. If you accept the TAC scores, you must also review and score the other sections of the proposal not scored by the TAC.
- **RWMG Members who wish to review and rank projects must submit their rankings by 9:00 am, November 1, 2012, to the Program Office. Project ranking results will be circulated to the RWMG as soon as possible for Members to take to their governing boards for approval by November 14, 2012.**
- Contact the Program Office with any questions or for more information:
    - Mark Drew, Program Director

      mdrew@caltrout.org; 760-924-1008
    - Holly Alpert, Program Manager

      holly@inyo-monowater.org; 760-709-2212
    - Janet Hatfield, Program Assistant

      janet@inyo-monowater.org; 760-387-2747


September 1: Fiscal agent RFP developed and advertised
Sept. 26: PSP & ranking workshop for potential project proponents
Oct. 17: Pre-proposals submitted for ranking and proposal presentation workshop
Nov. 14: RWMG Meeting: Select fiscal agent; project ranking approval; Plan approval
Feb. 7: Draft project proposals returned to project proponents for approval
September, 2012
October
November
December
January, 2013
February
March
Sept. 12: Recom-mended ranking process sent to RWMG for approval on Sept. 26
Sept. 26: Ranking process and overall process approved by RWMG
Oct. 12: Fiscal agent appli-cations due
Nov. 1: RWMG ranking of projects due to Program Office
Nov. 15: Grant-writers begin interviews with project proponents
Jan. 15: Final draft project materials due to grantwriter
March 1 (estimated): Implementation proposals DUE to DWR

Round 2 Implementation Pre-Proposal Application

General Project Information

Project proponent:

❏Yes ❏No Is the project proponent a signatory of the planning/implementation MOU? If not, are there plans in place to become an MOU signatory on or before October 17, 2012 (deadline for pre-proposal submission), or is the project proponent partnering with an MOU signatory? If project proponent is partnering with an MOU signatory, please list the name of the signatory.

MOU Signatory Partner:

Contact person:

Phone:

E-mail:

Name of project:

County(ies) where the project will be implemented:

Watershed(s) where the project will be completed:

This project best fits into the following category (choose one, based on the Inyo-Mono regional Objectives [see p. 10 below for a list of Objectives]):

❏ Water Quality

❏ Water Supply

❏ Ecosystem Health

❏ Flood Management

❏ Groundwater

Project Abstract:
Provide a 300-word (or less) abstract summarizing the project

Scoring

The maximum amount of points available per proposal is 115. Pay particular attention to the allocated scoring for each section below and instructions pertinent to that section.

Implementation PSP (80 points for entire section; see individual scoring criteria for scoring guidance)

If you have difficulty reading the Scoring Criteria text, you can refer directly to Table 5 in the Implementation PSP: http://www.water.ca.gov/irwm/integregio_implementation.cfm

Table 5 – Supplemental Scoring Criteria and Scoring Standards				
Scoring Criteria	**Weighting Factor**	**Range of Points Possible**	**Score**	**Scoring Standards**
Work Plan *Scoring will be based on whether the applicant has presented a detailed and specific Work Plan that adequately documents the Proposal (i.e., suite of projects).* Does the Work Plan contain an introduction that includes: a) goals and objectives of the Proposal and how the Proposal helps achieve the goals and objectives of the adopted IRWM Plan? c) a map showing relative project locations; and Are tasks for each project of adequate detail and completeness so that it is clear that the project can be implemented? Do the tasks include appropriate deliverables and reporting submittals (i.e., quarterly and final reports)? Is the proposal consistent with the applicable Basin Plan? Is this a study or part of a larger – multi-phased project effort? If so, will the proposed project(s) be operational as a standalone project(s) without the completion of the end project(s)? Does the Work Plan include a listing of required permits and their status including CEQA compliance? Does the Work Plan include Data Management and Monitoring Deliverables consistent with the IRWM Plan Standards and Guidance - Data Management Standard?	3	0–15	0–5	Standard Scoring Criteria See 2012 Guidelines, Section V.G
Budget *Scoring will be based on whether the applicant has presented a detailed and specific budget that adequately documents the Proposal.*	1	0–5	5	A score of 5 points will be awarded where the Budgets for all the projects in the Proposal have detailed cost information as described in Attachment 4; the costs are reasonable, and all the Budget categories of Exhibit B are thoroughly supported.

Table 5 – Supplemental Scoring Criteria and Scoring Standards				
Scoring Criteria	**Weighting Factor**	**Range of Points Possible**	**Score**	**Scoring Standards**
Are the tasks shown in the Budget consistent with the work items shown in the Work Plan and Schedule? Are the detailed costs shown for each project reasonable? Does the budget attachment contain an explanation of how the project costs were estimated?			4	A score of 4 points will be awarded where the Budgets for all the projects in the Proposal have detailed cost information as described in Attachment 4 and the costs are considered reasonable but the supporting documentation for some of the Budget categories of Exhibit B are not fully supported or lack detail.
			3	A score of 3 points will be awarded where the Budgets for most of the projects in the Proposal have detailed cost information as described in Attachment 4, but not all costs appear reasonable or supporting documentation is lacking for a majority of the items shown in the Budget categories described in Exhibit B.
			2	A score of 2 points will be awarded where the Budgets for less than half the projects in the Proposal have detailed cost information as described in Attachment 4, many of the costs cannot be verified as reasonable, or supporting documentation is lacking for all of the Budget categories described in Exhibit B.
			1	A score of 1 will be awarded where there is no detailed Budget information provided for any of the proposed projects.
			0	A score of 0 will be awarded where there is no Budget information provided.
Schedule *Scoring will be based on whether the applicant has presented a detailed and specific schedule that adequately documents the Proposal and on the readiness to proceed with the Proposal. Readiness will be measured by construction cycles following the anticipated award date of September 2013. It is assumed in the Scoring Standards that the first construction cycle will begin April 2014, the second cycle will begin April 2015, and the third cycle will begin April 2016.* Are the tasks in the schedule consistent with the tasks described in the Work Plan? Given the task descriptions in the Work Plan, does the schedule seem reasonable? How many construction cycles occur between the assumed agreement execution date and the start of construction or implementation for the	1	0–5	5	A score of 5 points will be awarded if the schedule is consistent with the Work Plan and Budget, reasonable, and demonstrates a readiness to begin construction or implementation of at least one project of the Proposal no later than May 2014.
			4	A score of 4 points will be awarded if the schedule is consistent with the Work Plan and Budget, demonstrates a readiness to begin construction or implementation of at least one project of the Proposal no later than May 2015.
			3	A score of 3 points will be awarded if the schedule is consistent with the Work Plan and Budget, reasonable, and demonstrates a readiness to begin construction or implementation of at least one project of the Proposal no later than May 2016.
			2	A score of 2 points will be awarded if the schedule is consistent with the Work Plan and Budget, demonstrates a readiness to begin construction or implementation of no project of the Proposal earlier than May 2016.

Table 5 – Supplemental Scoring Criteria and Scoring Standards				
Scoring Criteria	**Weighting Factor**	**Range of Points Possible**	**Score**	**Scoring Standards**
earliest of the Proposal's projects?			1	A score of 1 point will be awarded if the Schedule is not consistent with the tasks presented in the Work Plan and Budget, is clearly not reasonable. Readiness to begin construction or implementation will be disregarded.
			0	A score of 0 will be awarded if the schedule was not included in the application.
Monitoring, Assessment, and Performance Measures *Scoring will be based on whether the applicant has presented an adequate monitoring and assessment program including performance measures that will allow a determination of whether the objectives are met.* Do the output indicators effectively track project output? Are the outcome indicators adequate to evaluate change resulting from the project's implementation? Is it feasible to meet the targets within the life of the project(s)?	1	0–5	0-5	Standard Scoring Criteria See 2012 Guidelines, Section V.G
Technical Justifications of Projects *Scoring will be based solely on the technical justifications of project(s) with respect to claimed physical benefits. Magnitude of physical benefits will not be scored under this criterion. However, physical benefits must be clearly described and quantified (if applicable) as points will be allocated based on the quality of the technical analysis and supporting documentation in consideration of the type of benefit claimed. Scoring is designed to not bias types or sizes of projects with respect to each other.* Did the applicant provide information that clearly identifies and describes the physical benefits of each project included in the Proposal? Is the technical analysis appropriate and justified considering the size of the project and the type of benefit claimed?	2	0–10	4-5	A proposal that includes clearly identified and well described physical benefits and supporting documentation that demonstrates the project(s) is technically justified to achieve the claimed benefits will be awarded a score of 4 or 5 points based on the adequacy of the technical justification of the project(s).
			3-4	A proposal that includes clearly identified and well described physical benefits, but lacks sufficient supporting documentation to demonstrate the project(s) is technically justified to achieve the claimed benefits will be awarded a score of 3 or 4 points based on the adequacy of the technical justification of the project(s).
			2-3	A proposal that includes physical benefits that are not clearly identified and/or well described and lacks sufficient supporting documentation to demonstrate the project(s) is technically justified to achieve the claimed benefits will be awarded a score of 2 or 3 points based on the adequacy of the technical justification of the project(s).
			1-2	A proposal that includes physical benefits that are not clearly identified and/or well described and little to no supporting documentation to demonstrate the project(s) is technically justified to achieve the claimed benefits will be awarded a score of 1 or 2 points based on the adequacy of the technical justification of the project(s).

Table 5 – Supplemental Scoring Criteria and Scoring Standards				
Scoring Criteria	**Weighting Factor**	**Range of Points Possible**	**Score**	**Scoring Standards**
			0	A score of zero will be awarded to proposals that do not include supporting documentation to demonstrate the project(s) is technically justified to achieve the claimed benefits.
Benefits and Costs Analysis *Scoring will be based on the magnitude of benefits and quality of analysis. Magnitude will be evaluated relative to total proposal costs. For proposals where a cost effectiveness evaluation is provided, these evaluations will also be scored based on the quality and completeness of the evaluation. Scoring is designed to not bias types of projects with respect to each other.* Points will be allocated based on: 1) the benefits realized through implementation of the Proposal relative to proposal costs and 2) the quality of the analysis and supporting documentation demonstrating those benefits. [redacted] Are the costs and benefits claimed supported with clear and complete documentation? Is the benefit analysis appropriate considering the size of the project and the type of benefit claimed? [redacted] Note the following: • Applicants may not split a single project into multiple smaller components or phases in order to be eligible for the Cost Effectiveness Analysis Option (Section D1). • Points may be reduced if DWR determines that the benefits described in the Non-Monetized Benefit Analysis (Section D2) could readily be quantified in dollar terms. This judgment may involve the type of benefit, the size of the project, and the availability of information. • If DWR determines that FDR project benefits can be monetized, but the applicant did not present the benefits, the applicant risks losing points.	3	0-30	8-10	Collectively the proposal is likely to provide a high level of benefits in relationship to cost and this finding is supported by detailed, high quality analysis and clear and complete documentation.
			7-8	Collectively the proposal is likely to provide a high level of benefits in relationship to cost, but the quality of the analysis or clear and complete documentation is lacking.
			5-7	Collectively the proposal is likely to provide a medium level of benefits in relationship to cost and this finding is supported by detailed, high quality analysis and clear and complete documentation.
			4-5	Collectively the proposal is likely to provide a medium level of benefits in relationship to cost, but the quality of the analysis or clear and complete documentation is lacking.
			1-4	Collectively the proposal is likely to provide a low level of benefits in relationship to cost. Varying degree of quality of the analysis and supporting documentation.
			0	A score of zero will be awarded to proposals that do not demonstrate any level of benefit.

Table 5 – Supplemental Scoring Criteria and Scoring Standards				
Scoring Criteria	**Weighting Factor**	**Range of Points Possible**	**Score**	**Scoring Standards**
Program Preferences *Scoring will be based on whether the Proposal will implement one or more of the specified IRWM Grant Program Preferences (See Section II.F). Proposals that demonstrate significant, dedicated, and well-defined projects that meet multiple Program Preferences will be considered more favorably than Proposals that demonstrate a significant potential to meet a single Program Preference or demonstrate a low degree of commitment or certainty to meeting Program Preferences.* Did the applicant demonstrate a high degree of certainty that the Proposal will implement the Program Preferences claimed? Did the applicant document the magnitude and breadth of Program Preferences that the Proposal will achieve? Did the applicant include a project(s) that will address critical water supply or water quality needs of disadvantaged communities within the IRWM region?	2	0–10	0-5	One half point will be awarded for each Program Preference (including the Statewide Priorities listed in Table 1 of the 2012 Guidelines) that will be met through the implementation of the Proposal, with one exception. One full point will be awarded if the Proposal includes a project(s) that will meet the Preference: "Address critical water supply or water quality needs of disadvantaged communities within the IRWM region" (DAC Program Preference). The maximum score of 5 points will be awarded only if the Proposal, upon implementation, will meet at least 8 non-DAC Program Preferences AND includes a project(s) that will meet the DAC Program Preference. If the Proposal does not include a project that will meet the DAC Program Preference, the maximum score that may be awarded is 4 points. Program Preference points will be granted if it is clear that the preference will be met upon implementation of the Proposal.
Total Range of Points Possible Without Tie Breaker Points =		**0 – 80**		

Statewide Priorities (3 points for entire section)

State Water Plan Strategic Objectives

Please indicate which of the following objectives from the Water Plan Update 2009 this project addresses (check all that apply).

- ❑ Reduce Water Demand
- ❑ Improve operational efficiency and transfers
- ❑ Increase water supply
- ❑ Improve water quality
- ❑ Practice resource stewardship
- ❑ Improve flood management

Inyo-Mono Regional Priorities and Preferences (32 points for entire section)

Inyo-Mono IRWM Planning Priorities (20 points for entire section)

1. In the table below, put an "X" by each Inyo-Mono IRWM Plan Objective and Resource Management Strategy that the project supports. Include a one-sentence description justifying your answer for each. (5 points)

Regional Objective	Resource Management Strategies
☐ Protect, conserve, optimize, and augment water supply while maintaining ecosystem health	☐ Improve water supply reliability. ☐ Improve system flexibility and efficiency. ☐ Support compliance with current and future state and federal water supply standards. ☐ Address local water supply issues through various techniques, including, but not limited to: groundwater recharge projects, conjunctive use of water supplies, water recycling, water conservation, water transfers, and precipitation enhancement. ☐ Optimize existing storage capacity. ☐ Conserve and adapt water uses to future conditions. ☐ Capture and manage runoff where feasible. ☐ Incorporate and implement low-impact development design features, techniques, and practices. ☐ Promote public education about water supply issues and needs. ☐ Promote planning efforts to provide emergency drinking water to communities in the region in the event of a disaster. ☐ Promote water efficiency in fish hatcheries. ☐ Protect water supplies that support public recreational opportunities.

Regional Objective	Resource Management Strategies
☐ Protect, restore, and enhance water quality	☐ Support achieving compliance with current and future state and federal water quality standards. ☐ Improve the quality of urban, agricultural, and wildland runoff and/or mitigate their effects in surface waters and groundwater. ☐ Support monitoring to better understand major sources of erosion and causes and, where feasible, reduce erosion and sedimentation. ☐ Protect public and aquatic ecosystem sustainability. ☐ Match water quality to water use. ☐ Support appropriate recreational programs that minimize and/or mitigate impacts to water quality.
☐ Provide stewardship of water dependent natural resources	☐ Protect, restore, and enhance natural processes, habitats, and threatened and endangered species. ☐ Protect, enhance, and restore ecosystems. ☐ Support science-based projects to protect, improve, assess, and/or restore the region's ecological resources, while providing opportunities for public access, education, and recreation where appropriate. ☐ Support research and monitoring to better understand the impacts of water-related projects on environmental resources. ☐ Identify, develop , and enhance efforts to control invasive species.
☐ Maintain and enhance water, wastewater, emergency response, and power generation infrastructure efficiency and reliability	☐ Promote rehabilitation and replacement of aging water and wastewater delivery and treatment facilities in rural communities, including tribal lands. ☐ Ensure adequate water for fire protection and emergency response. ☐ Promote and improve energy efficiency of water systems and uses. ☐ Promote water efficiency in power generating facilities. ☐ Provide for development and improvement of emergency response plans.

Regional Objective	Resource Management Strategies
☐ Address climate variability and reduce greenhouse gas emissions	☐ Increase understanding of water related greenhouse gas emissions. ☐ Increase understanding of impacts of climate change on water supplies and water quality. ☐ Manage and modify water systems to respond to increasing climate variability. ☐ Support efforts to research and implement alternative energy projects and diversify energy sources to move and treat water within the region. ☐ Support efforts to reduce greenhouse gas emissions in the region. ☐ Promote public education about impacts of climate change, particularly as it relates to water resource management in the region.
☐ Enhance participation of disadvantaged communities and tribal entities in IRWM process	☐ Engage regional communities and tribes in collaborative water and natural resource management related efforts. ☐ Provide assistance for tribal and DAC consultation, collaboration, and access to funding for development, implementation, monitoring, and long-term maintenance of water resource management projects. ☐ Promote public education and training programs in disadvantaged communities and tribal areas about water resource protection, pollution prevention, conservation, water quality, watershed health, and climate change. ☐ Promote social resilience in disadvantaged communities and tribes to more effectively respond to social, economic or environmental disturbances impacting water-related resources.

Regional Objective	Resource Management Strategies
☐ Promote sustainable stormwater and floodplain management that enhances flood protection	☐ Characterize current stormwater and flood management situations and challenges. ☐ Promote region-wide integrated stormwater and flood management planning. ☐ Improve stormwater and flood management infrastructure and operational techniques/strategies. ☐ Promote projects and practices to protect infrastructure and property from flood damage. ☐ Integrate ecosystem enhancement, drainage control, and natural recharge into construction projects. ☐ Develop and implement public education, outreach, and advocacy on stormwater and flood management matters.
☐ Promote sound groundwater and surface water monitoring, management, and mitigation in cooperation with all affected parties	☐ Support and implement state-mandated groundwater and surface water monitoring requirements, and other groundwater monitoring efforts. ☐ Promote efforts to monitor, manage, and mitigate effects of groundwater-dependent projects. ☐ Develop and support projects that mitigate for the effects of groundwater extraction. ☐ Protect and improve the quality and quantity of stored groundwater supplies and recharge areas. ☐ Promote conjunctive use projects. ☐ Identify existing gaps in groundwater and surface water quantity data and undertake appropriate assessments/characterization studies. ☐ Collect data and monitor groundwater and surface water supply variability. ☐ Promote efforts to manage/design groundwater projects so that future impacts requiring mitigation are avoided.

2. Will this project benefit disadvantaged communities? If yes, list DACs that will benefit. Will the project benefit *only* DACs? If not, please give an estimated proportion of funding that would be used to benefit DACs. (If uncertain which communities quality as DACs, contact Program Office staff.) (10 points)
3. Will this project involve or benefit Native American Indian tribes? If yes, list which tribes. Will the project benefit *only* tribal communities? If not, please give an estimated proportion of funding that would be used to benefit tribes. (5 points)

Project Status/Project Readiness (6 points for entire section, scored as a whole)

1. Is this a project under CEQA?
    a. ❑Yes ❑No
    b. If yes, what level of CEQA is required?
    c. What is the proposed schedule for completing CEQA?
2. Is this a project under NEPA?
    a. ❑Yes ❑No
    b. If yes, what level of NEPA is required?
    c. What is the proposed schedule for completing NEPA?
3. Is the project proponent able to commit a 25% funding match as required by the PSP, or will the proponent be seeking a DAC match waiver?
4. What are the local and regional permitting requirements (if any), and have they been met? If not, what is the current status of compliance and/or plan for complying with the requirements? If permits are required, when do they expire?
5. Will there be staff available for project implementation, or will they need to be hired?
6. What kinds of planning documents, outside of permitting, are necessary for the project, and are they complete? For example, engineering designs or blueprints, work plan, etc.
7. What other financial resources (internal and/or external) will be available to undertake the project and sustain it beyond the IRWM grant?
8. Does the project proponent have the authority or approval to implement the project (such as landowner approval; approval from governing board; or fee, easement, or license rights)?
9. What will be the status of achieving the appropriate approvals by September 1, 2013 (anticipated final award date)?
10. If approvals have not been granted by September 1, 2013, what is the proposed schedule for achieving such approvals?
11. Is there a labor compliance program in place?

Subjective Evaluation Narratives (limit responses to 100 words or fewer) (6 points for entire section, scored as a whole)

1. Will this project result in reduced greenhouse gas emissions? If yes, explain how.
2. Will this project contribute to developing or implementing adaptation strategies to respond to climate variability impacts on water resources? If yes, explain how.
3. Are there any expected negative economic or environmental impacts of the project? Please describe.
4. Does the project address public health and safety concerns? Please describe.
5. Will this project contribute to achieving compliance with regulatory requirements?
6. Does the project mitigate existing negative environmental conditions? Please explain.

Addendum to Chapter 15

Approved by Inyo-Mono RWMG January 23, 2013.

The initial deadline for stakeholders to input projects into the online project upload system was late May, 2012. When it came time to start reviewing specific projects in preparation for the Prop. 84 Round 2 Implementation grant, several stakeholders expressed that they would still like an opportunity to submit projects for Round 2 funding. Thus, the deadline for submitting projects was extended to September 30, 2012. However, any additional projects submitted between June and September, 2012, were not included in the analysis of 36 projects in Chapter 15 of the Phase II Plan. Eleven additional projects were submitted during that time, and those projects are summarized in the table below. These projects have not been incorporated into the analyses contained in Chapter 15. Two of these projects are being submitted for Round 2 Implementation grant funding. We are including the other nine projects so that they become part of the Inyo-Mono IRWM Phase II Plan and can be eligible for Proposition 84 and other funding.

Organization Name	Organization Type	Project Title	Project Description
Crystal Crag Water and Development Association	Mutual Water Company	Crystal Crag Water Quality Compliance	When our present water system was installed, it made use of a pre-existing 3000-gallon tank. They also installed a 7440-gallon tank in order to have a little over 10,000 gallons of storage—supposedly enough to have enough contact time to meet our CT requirement. A weakness in our system is our old 3000-gallon tank. Seven years ago it was rusting on the inside. We put in a liner which has kept the tank from leaking. However it has not kept the tank from rusting more between the liner and the inner surface. We have judged that that tank should not be part of our solution because it would only mean that we would face a large expenditure in a few years when the liner wears out. It would be cheaper in the long run to get a new tank and keep up the maintenance on it as we have done with the larger tank. We have hired an engineer recommended by the California Rural Water Association to come up with a solution. He has come up with the following recommendations: Additional Recommendations: 1. Install a data recorder for the master flow meter for the system. This will allow the capture of peak flow data for the system, which is not currently captured. Peak flow

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			data is needed for appropriate CT calculations. Install a data recorder for the tank levels. This is a required factor in CT calculations and should be recorded and documented for future calculations. 2. Install a flow meter in the piping to the new tank. This will allow the setting of an appropriate flow split between the two tanks using a throttling valve. By documenting an appropriate flow split, more accurate (and less conservative) CT calculations can be performed. 3. Modify the current CT spreadsheet so that the full flow is applied to the pipe volume. This will have the effect of reducing the CT calculation.
Inyo County	County Agency	CSA-2 Sewer System Needs Assessment	Sewer system has not been evaluated for 35 years, and there were significant infiltration/inflow problems then.
Inyo County Public Works	County Agency	Lone Pine Transmission Main Project	Lone Pine is a disadvantaged community. This project would install about 4,300 lineal feet of 16 inch ductile iron pipe. Approximately 800 lineal feet of the current transmission main are above ground paralleling the creek within 2 feet of the creek, cross under the creek bed or are adjacent to tributaries to Lone Pine Creek. The existing main has a joint in the pipe crossing a gully where the main is above ground and the joint is sagging in mid-air. The steel pipe is very thin- about 1/8 inch thick. The new main would primarily be within public rights-of-way and as far from th creek as possible; while the existing main is entirely on public lands or LADWP land. The new main would also cross the LADWP aqueduct.
Inyo County Public Works	County Agency	Independence Transmission Main Project	Independence is a disadvantaged community. This project would replace the transmission main from the tanks to the old chlorination vault, a distance of about 2,600 lineal feet. The current main has 2,135 feet of old steel main that was used material when it was installed in 1928. A leak in the main in 1991 started as a pin-hole diameter sized leak which grew eventually to 210 lineal feet replaced as none of the adjacent pipe was of sufficient integrity to permit attachment without causing more leaks. This project would also add a 12 inch meter providing more fire flow to the town than the existing 8 inch meter. The current transmission main is of 10", and 12" construction. This project would replace all 10"-12" pipe with 16 inch ductile iron pipe. The main crosses through a boulder field about 1000 feet wide with boulders maybe as large as 2 feet to 3 feet in diameter.

Organization Name	Organization Type	Project Title	Project Description
Inyo County Public Works	County Agency	Independence Transmission Main Project #2	Independence is a disadvantaged community. If the Independence transmission main project is not approved for round 2 funding, this project would survey the existing Independence Transmission Main for elevation and at the high points and points of inflection on the main install double 2" air release valves. There is one known and several suspected high points trapping air within the transmission system. These defects impede the delivery of large volumes of water during times of high demand such as a fire. There is air in the distribution system potentially causing an air lock affecting a portion of the upper end of the distribution system. This project also adds a 12" meter to the existing 8" town demand meter which may provide more fire flow to the town.
Inyo County Public Works	County Agency	Alternative Lone Pine Transmission Main Project	Lone Pine is a disadvantaged community. If the 4,300 lineal foot Lone Pine Transmission Main Project is not approved, this project may install about 2,000 lineal feet of 16" ductile iron pipe bypassing the tributaries of Lone Pine creek, pass along public rights-of-way and pass into LADWP land and reconnect with the existing transmission main west of the aqueduct preventing the need for a new aqueduct crossing. Approximately 800 lineal feet of the current transmission main abandoned by this project are above ground paralleling the creek nearby, cross under the creek, or are adjacent to creek tributaries. It also has a sagging joint in mid-air. The main is about 1/8" thick.
Inyo County Public Works	County Agency	Owens Valley Safe Water Project	This project tests and replaces, if necessary, about 50 backflow preventers to county facilities thereby protecting the public health; replaces leaking check valves at Laws, Independence, and Lone Pine which protects the groundwater; replaces disintegrating infrastructure in Laws protecting the water supply; installs a backflow preventer and a meter at the Laws Museum protecting the public supply; installs a bypass line in Independence protecting the creek, and installs about 800 lineal feet of pipe in Lone Pine benefitting three schools and the hospital.
Amargosa Conservancy	Non-profit organization	Amargosa Basin Groundwater Studies	Perennial flow in the Wild and Scenic (W&S) Amargosa River is almost wholly groundwater dependent, but the sources and future sustainability of that flow are largely unknown. BLM's comprehensive W&S management plan is in preparation, will require a system water balance and federal reserved water right determination, which necessitates the collection and analysis of extensive hydrological and other information to protect the river and its unique and rich ecological resources. Collaborative studies, whose participants include the Amargosa Conservancy, the US Geological Survey,

Organization Name	Organization Type	Project Title	Project Description
			BLM, The Nature Conservancy and Inyo County, have resulted in a partial understanding of this geologically and hydrologically-complex system, but much work remains to be done in the face of new demands on regional groundwater from utility scale solar plants. This grant would critically supplement and extend existing studies, provide essential information to the BLM W&S planning, and develop a greater understanding of the effects of climate change and proposed groundwater pumping in this over-allocated interstate groundwater system. The work would be completed by the USGS and additional field work by Johnson Wright, Inc., (JWI) a hydrogeological consulting firm that has done substantial monitoring and analysis focused on the area. The USGS study would install monitors and complete the first two years of an evapotranspiration study. The JWI work would continue river and spring sampling and monitoring, including geochemical analysis, install and monitor several additional wells in key locations, and install a weather station to determine precipitation levels. Extensive partner matching funds are anticipated to be available. The grant request could be segmented or somewhat reduced in scale if needed and still achieve important goals.
US Forest Service	Other Federal Agency	Hilton Trail/Watershed Rehabilitation	This project proposes to repair and restore system trails impacting watershed health within the Hilton Lakes Watershed. Specific activities include: rerouting trails out of sensitive wet meadow areas then rehabilitating the old trail tread restoring meadow function; repairing meadow headcuts causing by trails and trail runoff; repair and/or enhance existing trail crossing of perennial streams and improving existing erosion control structures on the trail. The Forest proposes to restore up to six (6) meadow headcuts and re-route up to one (1) mile of trail. In addition, at least one (1) mile of trail would be restored.
U.S. Forest Service	Other Federal Agency	Bishop Creek Sewage Treatment Plan	The Bishop Creek Wastewater Treatment Plant (WWTP) will be brought up to standard by streamlining effluent flow, increase energy efficiency and decommission unused assets. The sewage disposal ponds will be repaired to comply with the terms of the State Water Resources Control Board order, which governs the operation of the facility. The plant services 97 connectors including seven (7) campgrounds, an RV dump station and the community of Aspendell. The current operating condition of the plant does not comply with the State issued discharge permit.

Organization Name	Organization Type	Project Title	Project Description
Town of Mammoth Lakes	Local Agency	Mammoth Lakes Stormwater Management Plan Phase 2	Much of the infrastructure in the Town of Mammoth Lakes (hereafter referred to as "Town"), including roads and drainage facilities, were built by Mono County prior to the incorporation of the Town in 1984. During this time, there was minimal emphasis placed on erosion control, water quality or facility design. As a result, the Town is now dealing with serious erosion issues, inadequate drainage facilities, numerous flood prone areas and a lack of water quality improvements. Several large storm events in 2006 and 2007 highlighted the existing problems in the Town and caused excessive erosion of slopes and ditches, flooding of Town facilities and private property, and discharged sediment and other pollutants to Hot Creek and Mammoth Creek. The project is located within the Town of Mammoth Lakes municipal boundary, which is the only incorporated city in Mono County, California. All stormwater from the Town drains into Mammoth Creek and Hot Creek, which are impaired streams. This project will develop policies and methods to control nutrient and sediment loads from entering nearby Mammoth Creek and Hot Creek. In addition a measurement and monitoring plan will be developed to evaluate the long term implementation of the plan and policies. The project will adopt measures that can be modified and used from other local best management practices. The Town is signatory to the Inyo-Mono Regional Water Management Group, and this project will be developed and completed in cooperation with this planning group. In addition, the Town will conduct outreach and meetings with the Town Council, Planning Commission, and other members of the public to solicit input and provide information and education regarding the importance of stormwater pollution to the community and the environment. Goal: Move the Town of Mammoth Lakes towards a more proactive approach to managing stormwater, improving water quality and minimizing the risk of flooding through the development and implementation of a Stormwater Management Plan. Objectives: 1. Develop a Stormwater Management Plan that includes provisions for improved management and policy; Capital Improvement Program (CIP); maintenance and operations; and education and outreach. 2. Build upon the work previously completed by the Town, including the integration of

Organization Name	Organization Type	Project Title	Project Description
			the findings and recommendations included in the Erosion, Drainage and Flooding Project Final Recommendations Report dated April 11, 2008. 3. Identify, delineate and prepare to implement CIP projects identified within the Stormwater Management Plan.

Correction 1

Date of Correction: March 11, 2013

Table 2-4 in the Inyo-Mono IRWM Phase II Plan lists the Bulletin 118 groundwater basins located in the Inyo-Mono IRWM region.

The first correction is that the table is partially and mistakenly duplicated on p. 28 and 29. Approximately the first half of the table is shown on p. 28, and then the complete table is located on p. 29. The p. 28 table is a partial duplicate and will be deleted in future versions of the Plan.

After further investigation into the Inyo-Mono IRWM region boundaries and their relation to the Bulletin 118 groundwater basins, it was discovered that two basins had been included in Table 2-4 that are not actually located within the Inyo-Mono IRWM boundaries, and four basins had not been included in Table 2-4 that are located within the boundaries. These corrections are summarized below:

<u>Basins included in Table 2-4 NOT located in Inyo-Mono IRWM region</u>

Basin 6-46: Fremont Valley

Basin 6-69: Kelso Lander Valley

<u>Basins NOT included in Table 2-4 that do occur in Inyo-Mono region</u>

Basin 6-26: Avawatz Valley

Basin 6-27: Leach Valley

Basin 6-77: Grass Valley

Basin 6-78: Denning Spring Valley

The revised Table 2-4 is included below and will be incorporated into the next update of the IRWM Plan.

Basin Number	Basin Name	Basin Number	Basin Name
6-7	Antelope Valley	6-55	Coso Valley
6-8	Bridgeport Valley	6-56	Rose Valley
6-9	Mono Valley	6-57	Darwin Valley
6-10	Adobe Lake Valley	6-58	Panamint Valley
6-11	Long Valley	6-61	Cameo Area
6-12	Owens Valley	6-62	Race Track Valley
6-13	Black Springs Valley	6-63	Hidden Valley
6-14	Fish Lake Valley	6-64	Marble Canyon Area

6-15	Deep Springs Valley	6-65	Cottonwood Spring Area
6-16	Eureka Valley	6-66	Lee Flat
6-17	Saline Valley	6-68	Santa Rosa Flat
6-18	Death Valley	6-70	Cactus Flat
6-19	Wingate Valley	6-71	Lost Lake Valley
6-20	Middle Amargosa Valley	6-72	Coles Flat
6-21	Lower Kingston Valley	6-73	Wild Horse Mesa Area
6-22	Upper Kingston Valley	6-74	Harrisburg Flats
6-23	Riggs Valley	6-75	Wildrose Canyon
6-24	Red Pass Valley	6-76	Brown Mountain Valley
6-25	Bicycle Valley	6-77	Grass Valley
6-26	Avawatz Valley	6-78	Denning Spring Valley
6-27	Leach Valley	6-79	California Valley
6-28	Pahrump Valley	6-80	Middle Park Canyon
6-29	Mesquite Valley	6-81	Butte Valley
6-30	Ivanpah Valley	6-82	Spring Canyon Valley
6-34	Silver Lake Valley	6-84	Greenwater Valley
6-35	Cronise Valley	6-85	Gold Valley
6-49	Superior Valley	6-86	Rhodes Hill Area
6-50	Cuddeback Valley	6-88	Owl Lake Valley
6-51	Pilot Knob Valley	6-105	Slinkard Valley
6-52	Searles Valley	6-106	Little Antelope Valley
6-53	Salt Wells Valley	6-107	Sweetwater Flat
6-54	Indian Wells Valley		

Promoting Sustainability in the Inyo-Mono Region: Understanding Regional Groundwater Resources and Upgrading Infrastructure in Disadvantaged Community Water Systems

Attachment 2: Adopted Plan and Proof of Formal Adoption

The Inyo-Mono IRWM Phase II Plan was adopted November 14, 2012. The Plan, along with proof of formal adoption, the Chapter 15 amendment, and a correction to Chapter 2, is provided in the first file of this attachment. Below is proof of approval of the Chapter 15 amendment, which took place January 23, 2013.

Meeting Summary
Inyo-Mono Regional Water Management Group
Regular Meeting

Wednesday, January 23, 2013
Mammoth Community Water District
1315 Meridian Boulevard
Mammoth Lakes, CA93546
9:30 am – 12:30 pm

Call-in option:
1-866-862-2138
passcode: 1678718

Decision Items:

- Mark Drew moves to approve the following composition of the Admin. Committee (New Members: Justin Nalder, Malcolm Clark, and Alan Bacock; and Existing Members: Leroy Corlett, Irene Yamashita, and Heather deBethizy). Wesley Hawks seconds the motion. All approve.
- Wesley moves to approve the Phase II Plan amendment as presented. Darla Heil seconds the motion. All approve.
- Mark moves to approve both sets of RWMG meeting notes as amended. Wesley seconds the motion. All approve.
- Bob Harrington moves to approve the revised process for the Program Office Generic Letter of Support. Malcolm Clark seconds the motion. All approve.

Action Items:

- Program Staff is looking to put together a Data/Technology working committee to brainstorm a way to provide more helpful data to the Group. If you're interested in being a part of this committee, email janet@inyo-monowater.org. A more formal solicitation will occur regarding this committee at a later date.
- Program Staff will work with other Stakeholders to begin brainstorming on next steps regarding the Phase II Plan in an effort to address some of the suggestions regarding Plan Implementation in today's discussion. Program Staff will also provide regular updates to the rest of the RWMG on progress on this endeavor.
- The Program Staff is putting together a grant writing and proposal development workshop on February 6. It will be geared towards applying for DWR funds specifically for disadvantaged communities and Native American tribes. It will be held at the Big Pine Paiute Tribe Council Room. Please RSVP by emailing Holly at holly@inyo-monowater.org.
- Program Staff will post a request for applications on the website in regards to looking for a film crew to make a local water documentary.
- Maya Weinhart and Janet Hatfield have updated the online match forms. If you have a match form to submit please do so by February 15, 2013, to Maya at maya@inyo-monowater.org. The form is available online: http://inyo-monowater.org/documents/downloadable-forms/