

# Chapter 19 *Technical Analysis and Data Management*

## 19.0 Introduction

Technical analysis of water management information, and organizing and cataloging that information to support current and future analyses and decision-making, are essential for watershed management by a variety of stakeholders.

This chapter documents the background sources used to prepare this Plan and describes methodologies employed for analysis of relevant information. It presents the data gaps identified during the planning process to support efforts toward filling those gaps over time. Further, the system for current data management is described along with a system for proposed future data management by stakeholders and the Regional Water Management Group (RWMG). Finally, the processes for providing relevant technical data to state databases are explained.

A variety of entities contributed to data collection and analysis: NGOs and local and state agencies provided regionally specific information and contributed to data analyses and, subsequently, to future scenario development. Stakeholders also served on the Core Team and RWMG to supplement, refine, and approve presentation of information. A compendium of new data and information related to changes in the region since the 2008 IRWMP was prepared and is included in the Data Catalog posted under the Library tab on the Yuba County IRWMP website ([yubairwmp.org/](http://yubairwmp.org/)).

For preparation of the climate chapter, the project team conducted initial data gathering and then refined analyses with stakeholders and the Stockholm Environmental Institute (SEI) team. SEI conducted a parallel planning and modeling effort to encourage robust decision-making and, in doing so, generated not only a first-level analysis of data, but brought back an array of planning scenarios to inform stakeholder planning and decision-making.

**Table 19-1** displays the primary sources of data used to prepare Plan sections, how the data/documents were relevant to Plan preparation, and specific notes that might help current or future stakeholders use or update a data source. When possible, information for at least a 20-year planning horizon was provided to help stakeholders plan for longer-term needs, such as infrastructure. Please see the IRWMP bibliography for an all-inclusive list of documents used during Plan preparation.

Further guidance on data management is provided in Chapter 17 *Plan Performance and Monitoring* that sets forth the process and intervals by which Plan-related data and analyses will be monitored, modified, and shared over time.

## 19.1 Technical Analysis

### 19.1.1 Background

The 2013 Yuba County IRWMP Update benefitted from a unique alliance: a project team that prepared a Department of Water Resources (DWR) guideline-compliant document and a parallel endeavor headed

by SEI that developed a scenario-based computer hydrologic model, aided by a science-based decision strategy called Robust Decision Support (RDS). The blended efforts were supported by the California Water Foundation to advance sustainable water management in the Yuba County IRWM region and to use this opportunity as a testing ground to potentially improve future IRWM planning processes throughout California. The RDS team's scope of work will be fulfilled beyond the timeframe of this Plan; future outcomes of that work are anticipated to be incorporated into this IRWMP during Plan revisions.

### **19.1.2 Analyses by the Project Team**

The project team approached preparation of this Plan by conducting initial research and data collection through literature reviews; provision of information from stakeholders; and in some cases from the SEI team, stakeholder interviews, and Core Group and RWMG meetings. Sources included maps; data sets; research papers and texts; adopted policies, plans, and laws; climate and water modeling; and interviews with those having technical expertise in the region. The project team analyzed these sources and subsequently prepared Plan sections for review by the Core Group and/or RWMG. In this way, project team analyses were corroborated or refined by regional stakeholders.

To aid the reader who desires specific documentation of facts contained in this Plan, footnotes are provided. In the case of climate analyses, substantial technical data was used and/or generated for preparation of the chapter. Methodology for modeling and analyses to support the climate change chapter is provided below.

#### **19.1.2.1 Modeling and Analyses to Support the Climate Change Chapter**

**Vegetation modeling:** Vegetation modeling prepared for the CABY IRWMP (February 2014) included the Yuba County IRWMP region and was excerpted for the purpose of understanding climate impacts on vegetation in the context of this Plan. Methodology from the Draft CABY IRWMP is described below:

“The California Climate Change Center’s ‘Climate Scenarios’ project, initiated in 2005 in response to then Governor Schwarzenegger’s Executive Order S-3-05, analyzes potential climate change impacts on vegetation changes throughout the state, using the US Forest Service’s MC1 model forced with lower (B1) and medium-high (A2) emissions scenarios. MC1 is a dynamic vegetation model with three components: 1) a simulation of plant type mixtures and vegetation types; 2) a description of the movement of carbon, nitrogen, and water through ecosystems; and 3) fire disturbance. The scenarios used for this work (B1 and A2) and the models feeding the climate forcing (GFDL and PCM1) are the same as those used in the state’s Cal Adapt modeling scenarios. (Lenihan 2008).”

**Greenhouse Gas Emission Calculations:** Greenhouse gas (GHG) analyses were calculated for projects in this Plan that currently have sufficient data for analysis, to compare project alternatives and mitigate emissions under project design (see **Appendix 14-4**). To determine the average annual total GHG emissions, short-term construction emissions were divided over the life of the project. The total construction activity emissions are the sum of the emissions from construction equipment, transportation of construction workforce, transportation of construction materials, and construction electricity emissions.

Emissions from construction equipment were calculated by evaluating each equipment type. The maximum number of a specific equipment type per day was multiplied by the total operation days of that equipment to find the total operation hours. The fuel consumption per hour was determined either

by a table from the California Air Resource Board, or by the sponsor of the project if he or she was familiar with the equipment. The total fuel consumption was calculated by the product of the total operation hours and fuel consumption per hour. Finally, the total CO<sub>2</sub> equivalent emissions were determined in metric tons by multiplying the total fuel consumption by the CO<sub>2</sub> emissions per diesel gallon, which is 0.010 (from the World Resources Institute-Mobile combustion CO<sub>2</sub> emissions tool<sup>1</sup>). This process is repeated for each equipment type. The sum of these numbers is the total CO<sub>2</sub> equivalent emissions for the construction equipment.

The emissions from transportation of construction workforce were calculated next. The total miles traveled were determined by the product of the average number of workers per day, the total number of workdays, and average distance traveled (round trip). The total fuel consumption in gallons of gasoline was determined by dividing the total miles traveled by the average passenger vehicle fuel efficiency (which is provided by the US Environmental Protection Agency). This number was multiplied by the CO<sub>2</sub> emissions per gallon gasoline (0.009) to obtain the total CO<sub>2</sub> equivalent emissions in metric tons for the transportation of construction workforce.

The emissions from transportation of construction materials were subsequently calculated. There are two 'trip types': delivery and spoils. The total emissions were calculated the same way for both. The total miles traveled are determined by the product of the total number of trips and average trip distance. This number is then divided by the average semi-truck fuel efficiency to find the total fuel consumption, and then multiplied by the CO<sub>2</sub> emissions per gallon diesel to find the total CO<sub>2</sub> equivalent emissions in metric tons. The sum of this number for the two trip types equals the total emissions from the transportation of construction materials.

The construction electricity emissions were calculated simply by multiplying the amount of electricity needed in mega-watt hours by the amount of CO<sub>2</sub> per mega-watt hour, which is 0.310 (provided by eGRID2010<sup>2</sup>).

The total construction activity emissions are the sum of the total of emissions from construction equipment, transportation of construction workers and materials, and construction electricity. The average annual total GHG emissions are finally determined by the quotient of the total construction activity emissions and estimated project useful life in years.

#### 19.1.2.2 SEI's Modeling and Decision Support

The Yuba County IRWMP Update involves a parallel process being conducted by a consulting team from SEI. While the project team prepared the DWR guideline-compliant IRWMP, the SEI team populated a sophisticated, scenario-based water model with regionally specific information to help determine the region's greatest water-related vulnerabilities and solutions to address them. This model is called the Water Evaluation and Planning model, or WEAP. Stakeholders were involved in a unique Robust Decision Support process during model development that, in turn, both enhanced their understanding of the model and improved the region's water-management decision-making. In effect, the Yuba County IRWMP process will serve as a test case for determining the utility of the WEAP and RDS applications in other IRWM processes across California. Please see **Appendix 11-2** for a description of RDS for this Plan.

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<sup>1</sup> World Resources Institute, The Greenhouse Gas Protocol: Designing a Customized Greenhouse Gas Calculation Tool (June 2006). Available from: <http://pdf.wri.org/GHGProtocol-Tools.pdf>

<sup>2</sup> US Environmental Protection Agency, The Emissions & Generation Resource Integrated Database for 2010: (Egrid2010) Technical Support Document. Prepared by: E.H. Pechan & Associates, Inc. (December 2010).

## 19.2 Data Management

A standardized data management system is supported by the Yuba County RWMG because it provides both the underpinning for the preparation of the 2008 Plan and this Plan Update, and because it will aid water managers in finding and using reference and monitoring materials for future water management and planning. It will allow stakeholders to become informed and to share information they find valuable or relevant, and to upload and store IRWM-related materials on shared state databases. Further, project sponsors need data to plan, design, implement, monitor, and fund their respective projects.

### ***19.2.1 Data Collection Techniques, Policies, and Procedures***

The purpose of the Yuba County IRWM region's data collection policies and procedures is to clarify *who* will be responsible for data collection and posting, *where* that data will be stored, and *how* stakeholders can access the data.

The RWMG will be responsible for posting current events and documents related to the Plan and its updates, meetings related to the IRWM process, and materials relevant to projects and their funding. Project sponsors will be responsible for posting data related to their projects and for all project monitoring (interim and final). It will be the responsibility of the RWMG to post individual studies or non-project monitoring, or both, by working with the project authors and researchers. Monitoring data may be collected, stored, and disseminated on both the Yuba data management system (DMS) or on state databases, or both, as appropriate.

The RWMG will not dictate data collection protocols for projects; rather the entities with whom project managers are interacting will have their respective required data-collection techniques. Data necessary to update the Plan will be identified as part of the annual Plan review and will be refreshed and collected accordingly.

### ***19.2.2 Data Collection, Management, and Contributions to State Data Systems***

**Data collection:** Data collected during preparation of this Plan has been posted on the Yuba County IRWMP website ([yubairwmp.org](http://yubairwmp.org)) under the library tab. Key documents related to IRWM planning have been downloaded, and links to the most commonly used state data systems and sites posted (e.g., State Water Resources Control Board [SWRCB], DWR/Division of IRWM). Future studies, maps, data sets, non-project-related monitoring results, research studies, relevant state guidelines and policies, agency plans, and other stakeholder contributions will be posted to the DMS by the RWMG on at least an annual basis. Plan revisions and updates and the materials used in the preparation of those updates will be uploaded by the RWMG.

Project sponsors will be responsible for collecting interim and final project monitoring data and outcomes and posting them to the DMS. The development of baseline assessment of indicator metrics, and methodologies for monitoring and tracking outcomes are discussed in Chapter 17 *Plan Performance and Monitoring*. These monitoring outcomes will be used to inform adaptive management and improve future project performance.

The functionality of the Yuba County IRWMP website was designed to serve as a data and communications portal for all IRWM processes. The site supports a library tab that will access technical documents and a searchable database linked to key words and phrases. The utility of this site will be enhanced by regular updates of current events, and by at least annual update of data and information by the RWMG.

The Yuba County IRWMP DMS system may provide data to many state data-sharing sites, where relevant and as required. These sites include the following at a minimum: California Environmental Resource Evaluation System (CERES), DWR's Water Data Library (WDL), California Environmental Data Exchange Network (CEDEN), California Data Exchange Center (CDEC), Surface Ambient Water Monitoring Program (SWAMP), Integrated Regional Water Information Systems (IRWIS), California Statewide Groundwater Elevation Monitoring Database (CASGEM), and USGS's National Water Information System (NWIS), and California Environmental Information Clearinghouse (CEIC).

Yuba County IRWM region stakeholders currently contribute data compatible with relevant statewide databases, including programs administered by the SWRCB and DWR. Stakeholders voluntarily participate in the SWRCB's Groundwater Ambient Monitoring Assessment (GAMA) program and CASGEM. Data collection will continue to be coordinated and shared with CERES, SWAMP, and other statewide efforts when appropriate and feasible. However, there is a lack of capacity and technical expertise for smaller and underfunded entities to access, use, and contribute to the myriad state databases, and this is unlikely to change given funding available for such capacity. Particular attention will be paid by the RWMG in aiding under-represented communities in data sharing.

The localized effects of climate change will manifest in coming decades and additional relevant information and data will be generated to supplement this Plan. Therefore, the RWMG will revisit climate projections and data in this Plan and supplement it at appropriate intervals to be determined by the RWMG. Revisions to the Plan will accommodate these new data and studies accordingly. IRWM Guidelines encourage RWMGs to stay involved with the California Natural Resource Agency's California Adaptation Strategy process and to consider joining the California Climate Action Registry at <http://www.climateregistry.org>. New information and climate-related revisions to the Plan will be shared during RWMG meetings, project development processes, and on the Yuba County IRWMP website.

### ***19.2.3 How Stakeholders Contribute and Share Data***

Sharing and contributing data is facilitated in a variety of ways: via uploading information to the [Yubairwmp.org](http://Yubairwmp.org) website (with RWMG permission), uploading data to the appropriate state data system, participating in RWMG and work group/committee meetings, and attending non-IRWM-sponsored meetings, conferences, or workshops about water management, such as Feather River Flood Management team meetings. Federal data is generally accessed via the respective agency's website and personal contacts. Linkage to most commonly used state data-sharing sites also facilitates data sharing.

An annual 'call for information' will go out from the RWMG to ensure that the website is updated during annual Plan review. This prompt is included in the implementation table at the end of this document.

### **19.2.4 DMS Support**

During preparation of the Plan Update, the project team improved the functionality of the website and designed a DMS. After the Plan is adopted, support of the DMS will become the responsibility of the RWMG and will be funded by mechanisms discussed in Chapter 15 *Finance* of this Plan.

It is assumed that a consultant will need to be retained to troubleshoot any problems with the website and provide improved functionality and improved and repaired linkages over time.

### **19.2.5 Responsibility for Maintaining Data**

The RWMG will be responsible for ensuring that new studies relevant to regional water management, as well as Plan revisions and/or updates and Plan performance evaluations are uploaded to the Yuba County IRWM website. It is expected that the RWMG will keep the website current for matters pertaining to events and planning, and all project sponsors will add the information relevant to their respective projects and project monitoring. Support for uploading project-related information will be provided to project sponsors by the RWMG.

## **19.3 Data Needs and Gaps**

The following data gaps for better serving water managers in the region were identified during the planning process both by the project team's review of existing documents, and by stakeholders during meetings and project development interviews.

### **19.3.1 200-Year Floodplain Mapping for the Region**

The 200-year floodplain is used for assessing flood protection. New 200-year floodplains were supposed to be derived by Central Valley Floodplain Evaluation and Delineation (CVFED) Program as a product of the FloodSAFE initiative. However, these have only been developed for selected urban areas to date. Outside these areas, this floodplain data still defaults to the 2001 Comprehensive Study delineation of the 200-year floodplain. The latest data set is known as "SB 1278-200-year floodplain data" and is incomplete for most of Yuba County.

### **19.3.2 Groundwater**

While YCWA is carrying out a Measurement and Monitoring Program for the region's valley component, need exists for further monitoring and groundwater data to address the gap in knowledge necessary to fully and efficiently manage this resource. YCWA's Groundwater Management Plan (2012) identifies several data gaps that would aid water managers in a better understanding of regional volume, movement, quality, and resiliency of groundwater resources in the North and South subbasins. These informational needs include:

- information to help in the prevention of land subsidence;
- construction of monitoring wells where critical data gaps exist, including a better understanding of surface water and groundwater relationship and groundwater recharge, in the Yuba Gold Fields;

- stream-aquifer interaction studies;
- better understanding of how changing land use (e.g., conversion from agricultural to residential) could impact groundwater resources; and
- a determination of ‘safe-yield’ of the basin for groundwater pumping from refinements to the Groundwater Adaptive Management Tool (GAMT) that shows modeled drawdown and recovery.

Obtaining additional information on the foothills’ fractured-bedrock aquifers would also benefit county planners and rural residents who rely on groundwater for domestic or irrigation use. Fractured bedrock is known to be an unpredictable and sometimes unreliable water source. Extended drought, that may be further exacerbated by climate drying, has the potential to further affect fractured-bedrock-associated groundwater.

Conservation interests have identified potential habitat impacts associated with likely changes in water management practices in response to climate change. They advocate development of a program-specific network of shallow monitoring wells to detect changes in water levels over the shallowest portion of the aquifer. They believe that in evaluating impacts to certain wetlands species, it is important to discern both the rate of groundwater level change, as well as the cumulative change over the entire year. They suggest that data collection and monitoring frequency should be appropriately selected to support the temporal and long-term evaluations.

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- information to help in the prevention of land subsidence;
- better understanding of surface water and groundwater relationship, including groundwater recharge, in the Yuba Gold Fields;
- better understanding of how changing land use (e.g., conversion from agricultural to residential) could impact groundwater resources; and
- a determination of ‘safe-yield’ of the basin for groundwater pumping from refinements to the Groundwater Adaptive Management Tool (GAMT) that shows modeled drawdown and recovery.

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### **19.3.3 Agricultural Water Efficiency**

A set of findings and recommendations published by the Ag Innovations Network<sup>3</sup> emphasizes the regional watershed management approach to agricultural water efficiency and conservation. It mentions the use of RWMGs and the IRWM process as the preeminent venue for meaningfully engaging agricultural stakeholders and recognizes past under-representation from this sector. Its recommendations can be used as a checklist during the planning process to assess whether ag-related water issues have been adequately addressed and whether the agricultural community has been sufficiently engaged. The findings say that, “Nearly a quarter of farmers surveyed by the Agricultural Water Management Council said that lack of technical assistance limited their ability to implement water conservation practices.” This is particularly relevant in the time of agency budget cuts and when considering potential limitations to project development.

## **19.4 Quality Assurance of Datasets and Information**

Referenced materials used to prepare this Plan originated from sources that were peer reviewed, created within academia or the scientific community, prepared by public agencies, or reviewed for individual veracity during public review processes. Technical data sets generally came from trusted sources, such as population data from the US Census, flow data from the USGS, or monitoring datasets from water management agencies.

Methodologies for preparing and analyzing data that contributed to this Plan are discussed in previous sections of this chapter. In the future, if it is brought to the attention of the RWMG that an information source(s) is suspect, or a disagreement over facts arises, the RWMG will set up a process for hearing a defense of the material, or will evaluate materials from both sides of a factual disagreement before determining how and whether to accept those data into the IRWM process.

Part of the adaptive management process of the Plan will be to encourage feedback about information and to incorporate better technologies for information-sharing as they arise.

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<sup>3</sup> Ag Innovations Network, Agricultural Water Stewardship: Recommendations to Optimize Outcomes for Specialty Crop Growers and the Public in California. California Roundtable on Water and Food Supply (June 2011). Convener: Ag Innovations Network, Sebastopol, CA. Available from: [http://aginnovations.org/articles/view/stewardship\\_recs/](http://aginnovations.org/articles/view/stewardship_recs/)



**Table 19-1. A Summary of Primary Studies and Data Sets Used in Preparing the Yuba County IRWMP**

Name of Study/Data Set	Use in the IRWMP	Other (e.g., status of data, certainty of data/analysis, relevance to other sections)
<b>Water Quality</b>		
Alpers, C.N., M.P. Hunerlach, J.T. May, and R.L. Hothem, Mercury Contamination from Historical Gold Mining in California, Fact Sheet #: 2005-3014 Version 1.1. US Geological Society (Sacramento, CA, 2005): <a href="http://pubs.usgs.gov/fs/2005/3014/fs2005_3014_v1.1.pdf">http://pubs.usgs.gov/fs/2005/3014/fs2005_3014_v1.1.pdf</a> .	Used to describe how fish from reservoirs and streams in the Bear-Yuba watersheds have bioaccumulated sufficient mercury to pose a risk to human health.	
Black & Veatch Corporation and Standish-Lee Consultants, Watershed sanitary survey update and source water assessment (2002).	Used to describe possible sources of various pollutants.	
California EPA, Central Valley RWQCB, The Integrated Report - 303(d) List of Water Quality Limited Segments and 305(b) Surface Water Quality Assessment, Sacramento, CA; State of California (2011). <a href="http://www.swrcb.ca.gov/centralvalley/water_issues/tmdl/impaired_waters_list/index.shtml">http://www.swrcb.ca.gov/centralvalley/water_issues/tmdl/impaired_waters_list/index.shtml</a> .	These analyses were used to characterize the nature and status of water quality impairment for stream reaches.	These data are updated, so should be consulted periodically.
CDFW, California Aquatic Invasive Species Management Plan (2008).	Used to describe problems with AIS species throughout California.	
Central Valley RWQCB, Water Quality Control Plan (Basin Plan). 4 <sup>th</sup> ed. (2007).	The State of California identified the Bear River and South Fork Yuba River as Priority 1 Impaired Watersheds requiring restoration to improve water quality as a result of the large amounts of mercury.	Also used in Land Use chapter.
Curtis, J.A., L.E. Flint, C.N. Alpers, S.A. Wright, and N.P. Snyder 2001-03, Sediment transport in the Upper Yuba River Watershed, California U.S. Geological Survey Scientific Investigations Report 2005-5246 (2006): <a href="http://pubs.usgs.gov/sir/2005/5246/">http://pubs.usgs.gov/sir/2005/5246/</a> .	This report summarizes various studies of the Yuba River and adjacent watersheds which suggest that smaller tributaries are asymptotically incising toward pre-mining channel-bed elevations. This causes remobilization of hydraulic mining sediment and continues to affect sediment yields from impacted basins. It also contributes to lost water storage space in reservoirs.	
DWR, 2013 website search. Watershed Management Initiative.	Used to compare the Yuba County IRWM region's water quality issues with the issues addressed in the Central Valley RWQCB's 2003 Watershed Management Initiative, Central Valley Reports.	Also used in Land Use chapter.

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DWR, California Water Plan Update (2009).	Used to describe water transfers.	Also used in Water Supply chapter.
DWR, Upper Yuba River Watershed Chinook Salmon and Steelhead Habitat Assessment (June 2006).	Used to describe low flows, high water temperatures, and sediment on the South and Middle Yuba Rivers which have contributed to problems for the cold-water adapted aquatic communities.	
Placer County Water Agency, Middle Fork American River Hydroelectric Project FERC relicensing website. FERC data and studies (2013).	Important water quality information, especially used to enhance understanding of mercury methylation in the Upper Yuba watershed.	Includes a variety of statistical, biological/scientific, economic, hydrological modeling, and physical monitoring species.
Sacramento Valley Water Quality Coalition, Monitoring and Reporting Program: Annual Monitoring Report 2013.	Used to describe salts in the Yuba County IRWM region which were found to be low-threat with zero exceedances found since 2003.	
Schilling, F. (n.d.), State of the Yuba: an assessment of the Yuba River watershed (Nevada City: University of California).	Describes how the high concentrations of suspended sediment in the Humbug Creek watershed can be attributed to abandoned mines in the Malakoff Diggings Historical State Park and clear-cuts on private lands.	
Schmitt, J. and A. Michael, Rainfall infiltration under urban soil surface conditions – experiment and model results, 13 <sup>th</sup> Annual Soil Conservation Organization Conference: Conserving Soil and Water for Society: Sharing Solutions (Brisbane) (July 2004).	Used to describe how increasing development and the conversion of lands to impervious surfaces can also result in pollutant spikes during storm events.	
USGS, Bear-Yuba Watersheds Interagency Abandoned Mine Lands Project (2000). <a href="http://ca.water.usgs.gov/mercury/bear-yuba/">http://ca.water.usgs.gov/mercury/bear-yuba/</a> .	Provided data concerning mercury and methylmercury in water, sediment, and biota from sites in the Bear River watershed. These data are available online.	
USGS and SWRCB, Groundwater Quality in the Middle Sacramento Valley, California. A fact Sheet by George L. Bennett, V. Miranda, S. Fram, and Kenneth Belitz. (2011).	Used to describe the geochemical conditions in the sediments which favor arsenic solubility. These trace and minor elements naturally occur in the Yuba County region.	
Wiener, J.G., C.C. Gilmore, and D.P. Krabbenhoft, Mercury strategy for the Bay-Delta Ecosystem: a unifying framework for science, adaptive management, and ecological restoration. La Crosse, Wisconsin: University of Wisconsin (2003).	Provided data concerning mercury and methylmercury in water, sediment, and biota from sites in the Bear River watershed. These data are available online.	

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YCWA, Federal Energy Regulatory Commission (FERC) #2246, Yuba/Bullard Bar Project: Relicensing website data. (Accessed September-December 2013 online).	Temperature modeling maps of the Yuba River were prepared for YCWA as part of FERC relicensing. These maps were used to help describe temperature issues in the Yuba River.	
YCWA, Yuba County Water Agency Groundwater Management Plan (2010).	Used to describe elevated levels of TDS and deep groundwater pumping which can negatively impact irrigated agriculture and the taste of domestic drinking water. Also used to summarize the percent of irrigation water that comes from groundwater, groundwater elevations, and wells.	Also used in the Climate Change and Water Supply chapters.
YCWA, Groundwater Management Plan, Update to Board (September 12, 2006).	Describes how groundwater levels have largely recovered from historical overdraft, except in the Wheatland area, because of YCWA's surface water project.	
<b>Water Supply and Demand</b>		
2030 Yuba County General Plan Update (Adopted June 7, 2011).	The Plan and 2008 background reports were used to support population and land use growth and development trends as background for water supply and demand analyses.	This document was also used in the Land Use, Climate Change, and Region Description chapters.
California Department of Finance, Population Projections by Race/Ethnicity for California and Its Counties 2000–2050. Sacramento, CA (May 2012). <a href="http://www.dof.ca.gov/research/demographic/reports/projections/p-1/">http://www.dof.ca.gov/research/demographic/reports/projections/p-1/</a> .	Used to support supply and demand analyses.	
California Water Service Company. 2010 Urban Water Management Plan – Marysville District (Adopted June 2011).	Assesses the state of supply for the Marysville District. Used as background for the water supply and demand analyses.	
DWR, California Water Plan Update (2009).	Used to describe the Sacramento Area (which Yuba County is a part of), as defined by the California Water Plan Update, acres of agriculture land converted to urban or nonagricultural purposes.	Also used in Water Quality chapter.
DWR et al., 20x2020 Water Conservation Plan (2010).	Used to describe water conservation targets and potential statewide savings.	
DWR, 2013 (draft). Water plan data for the Water Plan	These data were used to calculate the environmental water	

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Information Exchange is currently being updated. Therefore previous data as cited below was used. Website reviewed on June 17, 2014, from <a href="http://www.waterplan.water.ca.gov/waterpie/index.cfm">http://www.waterplan.water.ca.gov/waterpie/index.cfm</a> DWR. 2002. Water plan data, wild and scenic rivers water use. Originally retrieved August 21, 2006, from <a href="http://www.waterplan.water.ca.gov/docs/waterpie/wpdata/WildandScenic.98.00.01.xls">http://www.waterplan.water.ca.gov/docs/waterpie/wpdata/WildandScenic.98.00.01.xls</a> .	demand for the South Yuba River.	
DWR, 2013 (draft), Water plan data for the Water Plan Information Exchange is currently being updated. Therefore previous data as cited below was used. Website reviewed on June 17, 2014, from <a href="http://www.waterplan.water.ca.gov/waterpie/index.cfm">http://www.waterplan.water.ca.gov/waterpie/index.cfm</a> DWR, Water plan data, wild and scenic rivers water use (2002). Originally retrieved August 21, 2006, from <a href="http://www.waterplan.water.ca.gov/docs/waterpie/wpdata/WildandScenic.98.00.01.xls">http://www.waterplan.water.ca.gov/docs/waterpie/wpdata/WildandScenic.98.00.01.xls</a> .	The Yuba County IRWM region contains approximately 39 miles of the Wild and Scenic South Yuba from Spaulding Dam to the upper limit of Englebright Reservoir.	
DWR, California Water Plan Update Bulletin, v.2:160-98 (1998).	This Plan provides an overview of flows in Wild and Scenic Rivers throughout California which constitute the largest environmental water use. This Plan was also used to define environmental flows.	
DWR, Initial Information Package, Relicensing of the Oroville Facilities. FERC License Project No. 2100 (2001).	The Initial Information Package was used for the discussion on environmental flow data and data supporting the Yuba Accord.	
DWR, Groundwater Information Center, <a href="http://www.water.ca.gov/groundwater/">http://www.water.ca.gov/groundwater/</a>	This website was used extensively to describe the relationship between ground and surface water. Various graphics were reviewed to help illustrate groundwater and surface water interactions.	
Groves, D.G., S. Matyac, and T. Hawkins, Quantified scenarios of 2030 California water demand. In California Water Plan Update 2005. Sacramento, CA: California Department of Water Resources (2005).	This reference defines environmental water demand and uncertainties in calculations. Used in water supply section.	

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Linda County Water District, 2010 Urban Water Management Plan.	Assesses the state of supply for Linda County Water District. Used as background for the water supply and demand analyses.	Used by urban water agencies in the region; monitor for updates.
Olivehurst Public Utilities District, Final 2010 Urban Water Management Plan. Prepared by Atkins. Adopted November 17, 2011.	Assesses the state of supply for Olivehurst PUD. Used as background for the water supply and demand analyses.	
US Census Bureau, quickfacts.census.gov	Used to support supply and demand analyses.	
YCWA, Yuba County Water Agency Groundwater Management Plan (2010).	The Plan illustrated groundwater levels, flows, transfers, locational extent, and planning to inform the water supply and demand discussion extensively.	Also used in the Climate Change and Water Quality chapters.
Yuba County Department of Agriculture, Agricultural Crop Report (2012).	Describes the dominant agricultural crops in Yuba County. Used in water supply and region description sections.	
Flooding		
California Department of Water Resources, Sacramento and San Joaquin River Basin Comprehensive Study (2013).	Three selected studies were reviewed to identify the percent of Yuba County IRWM region that falls in the 200-year flood plain.	
City of Wheatland, External Source Flood Protection Plan (2005).	Stakeholders recommended we review this document. This proposed project would include the development of 14,329 residential lots on approximately 4,069 acres located within Yuba County. Although data was not cited directly in the IRWMP, the plan was reviewed and taken into consideration as part of preparation of this IRWMP Update.	
Coalition Members of the Feather River Regional Flood Management Team, Draft Feather River Regional Flood Management Plan (October 2013). Coalition Members of the Feather River Regional Flood Management Team, Revised Final Draft Feather River Regional Flood Management Plan (May 22, 2014).	This draft Plan was used extensively to inform the entire Flood Management chapter including background and history, infrastructure, and interface with water quality concerns. The response to comments table was issued in May 2014 and was reviewed to determine if any changes to the final draft FRRFMP resulted in edits to the sections that were used in the IRWMP. No edits were noted as the comments either requested additional information or addressed	Chapter 9 Flood Management needs to be updated to add a citation for the Final Draft FRRFMP.

<b>Table 19-1. A Summary of Primary Studies and Data Sets Used in Preparing the Yuba County IRWMP</b>		
<b>Name of Study/Data Set</b>	<b>Use in the IRWMP</b>	<b>Other (e.g., status of data, certainty of data/analysis, relevance to other sections)</b>
	sections not used in the draft Flood Chapter.	
DWR, Central Valley Flood Protection Plan (2011).	Lists several flood projects to be evaluated in Yuba, Sutter, and Butte Counties.	
FEMA, Zone A – Areas subject to inundation maps (2005). Available from: <a href="https://msc.fema.gov/webapp/wcs/stores/servlet/FemaWelcomeView?storeId=10001&amp;catalogId=10001&amp;langId=-1">https://msc.fema.gov/webapp/wcs/stores/servlet/FemaWelcomeView?storeId=10001&amp;catalogId=10001&amp;langId=-1</a> .	These data were used to understand both infrastructure and climate vulnerabilities and to determine data gaps for flooding.	Also used in Climate Change chapter.
Summary Report on Investigations for the Yuba-Feather Supplemental Flood Control Project (Feather River West Levee Project EIS/EIR) (2012).	Stakeholders recommended we review this document. The Sutter Butte Flood Control Agency (SBFCA) is proposing the Feather River West Project (FRWP) to reduce flood risk in the Sutter Basin, which includes a portion of Sutter and Butte Counties. Although data was not cited directly in the IRWMP, the plan was reviewed and taken into consideration as part of preparation of this IRWMP Update.	
YCWA, Flood Management Strategic Plan (2012).	This draft Plan was used to inform the entire Flood Management chapter including background and history, infrastructure, and flood concerns.	
Yuba County Region - Integrated Regional Water Management Plan (2008).	Where appropriate, background information was used from the 2008 IRWMP to inform the Flood Management chapter.	
<b>Natural Resources</b>		
CDFW, Biogeographic Data Branch. California Natural Diversity Database. Sacramento, CA (July 2011). Available from: <a href="http://www.dfg.ca.gov/biogeodata/cnddb/">http://www.dfg.ca.gov/biogeodata/cnddb/</a> .	These data were used to identify sightings and potential habitat for species of special concern as identified by the state and federal governments.	These data are updated, so should be consulted periodically.
SWRCB, Lower Yuba River Accord (2008).	The Yuba Accord was used extensively to inform the entire natural resources discussion and especially fisheries and environmental water demand.	
<b>Population</b>		
California Department of Finance, Population Projections by Race/Ethnicity for California and Its Counties 2000–2050. Sacramento, CA (May 2012).	These statistical analyses were used to project future population and demographics and, subsequently, water demand and potential land use changes in the Region	These data are updated, so should be consulted periodically.

**Table 19-1. A Summary of Primary Studies and Data Sets Used in Preparing the Yuba County IRWMP**

Name of Study/Data Set	Use in the IRWMP	Other (e.g., status of data, certainty of data/analysis, relevance to other sections)
<a href="http://www.dof.ca.gov/research/demographic/reports/projections/p-1/">http://www.dof.ca.gov/research/demographic/reports/projections/p-1/</a> .	Description chapter.	
US Census Bureau, Census 2010. Washington, D.C. (2011). Available from: <a href="http://2010.census.gov/2010census/index.php">http://2010.census.gov/2010census/index.php</a> .	Statistical analyses were used to project population and demographics and, subsequently, water demand and potential land use changes.	These data are updated, so should be consulted periodically.
Land Use and Region Description		
Beale Air Force Base, Air Combat Command: Installation Sustainability Assessment Report, 2012.	Identifies water usage and potential savings areas. Used in the Land Use chapter.	
City of Marysville, City of Marysville General Plan (August 1985).	This is a policy document designed to guide the future growth and development of Marysville in a manner consistent with its physical, social, economic, and environmental goals. These documents were reviewed for IRWMP consistency with the city's goals and policies in the Land Use chapter.	
City of Wheatland, General Plan Update Master Water Plan (2006).	Estimates water demands needed to serve the General Plan Update's proposed land uses and identifies the available water sources to serve the GPU demands. Information from this document was incorporated into the Land Use chapter.	
City of Wheatland, Wheatland General Plan: Draft and Final Environmental Impact Report (2006). City of Wheatland, General Plan Background Report (2006). City of Wheatland, Wheatland General Plan Update (2006).	Used for development projections, goals and objectives review, and planning priorities. These city plan updates are policy documents designed to guide the future growth and development of Wheatland in a manner consistent with its physical, social, economic, and environmental goals. These documents were reviewed for IRWMP consistency.	City plans are periodically updated.

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Name of Study/Data Set	Use in the IRWMP	Other (e.g., status of data, certainty of data/analysis, relevance to other sections)
<p>City of Wheatland, Hop Farm Water Supply Assessment (2008).                      City of Wheatland, Johnson Rancho Water Supply Assessment (2008).                      Olivehurst Public Utility District, Bear River Project Water Supply Assessment (2006).                      Olivehurst Public Utility District, Country Club Estates Water Supply Assessment (2007).                      Olivehurst Public Utility District, Magnolia Ranch Water Supply Assessment (2013).</p>	<p>SB 610 requires certain development projects, including those with more than 500 proposed dwelling units, and projects that will increase residential service connections by more than 10 percent, to prepare a water supply assessment (WSA). The WSA is used by the lead planning agency to determine if a project’s water demands will be met by the water purveyor’s supplies. Information on area WSAs was incorporated into the Land Use chapter.</p>	
<p>National Marine Fisheries Service, Recovery Plan for the Sacramento River winter-run Chinook salmon, the Central Valley spring-run Chinook salmon, and the California Central Valley steelhead (2014).</p>	<p>The goal of the Recovery Plan is to restore and safeguard the special-status species in the document title to the point where Endangered Species Act (ESA) protections are no longer warranted. The foothills region of the Plan area is listed as a primary reintroduction area in the plan. Information from this document is incorporated into the Land Use chapter.</p>	
<p>Sierra Nevada Forest Plan Amendment (2004).</p>	<p>This plan was reviewed for IRWMP consistency with the goals and objectives. The Sierra Nevada and the Modoc Plateau encompass dozens of complex ecosystems each with numerous, interconnected social, economic, and ecological components. The Sierra Nevada Forest Plan Amendment lays out broad management goals and strategies for addressing five problem areas identified during the planning process: old forest ecosystems and associated species; aquatic, riparian, and meadow ecosystems and associated species; fire and fuels management; noxious weeds; and lower westside hardwood ecosystems.</p>	<p>Forest plans are periodically updated.</p>



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SNEP Science Team and Special Consultants, Summary of the Sierra Nevada ecosystem project report. Centers for Water and Wildland Resources, Davis, CA: University of California (1996).	This report was used to describe how growth in the Yuba County IRWM region will affect the extent of open spaces and cause significant impacts on natural resources.	
SWRCB, Development of Flow Criteria for the Sacramento-San Joaquin Delta (2010).	The purpose of the Flow Criteria is to identify new flow criteria necessary for fish protection in the Sacramento-San Joaquin Delta ecosystem in accordance with the Delta Reform Act of 2009, Water Code Section 85000 et seq. The Flow Criteria do not have any regulatory or adjudicative effect but are used to inform planning decisions for the Delta Plan being prepared by the Delta Stewardship Council and through the collaborative Bay-Delta Conservation Plan effort. Flow Criteria consider and balance all competing uses of water. This document is incorporated into the Land Use chapter.	
USDA, Natural Agricultural Statistics Service, 2007 Census of Agriculture: Yuba County, California.	Used to inform acres of agriculture lost to urbanization.	
US Forest Service, Land and Resource Management Plans for the Plumas and Tahoe National Forests (1990).	These plans describe the current management direction, supply or production capability, existing and projected demands for forest goods and services, and the need or opportunity for changes in current management direction. Applicable resource areas discussed include recreation, fish, wildlife, and sensitive plants, diversity, riparian areas, water, ownership, land uses, and the urban/rural/wildland interface. The plans also discuss how each issue, concern, or opportunity is resolved or addressed during the planning process. The Management Direction chapter presents both forest-wide and area-specific management direction for the TNF. The forest-wide management direction consists of forest goals and desired future conditions, objectives, standards, and guidelines. Information from these plans was presented in the Land Use chapter.	Forest plans are periodically updated.

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Name of Study/Data Set	Use in the IRWMP	Other (e.g., status of data, certainty of data/analysis, relevance to other sections)
YCWA, Dobbins Fire Protection District, and Yuba County Multi-Hazard Mitigation Plans (2007).	Local government agencies and special districts are required to develop and adopt Multi-Hazard Mitigation Plans to be eligible for federal disaster assistance and hazard mitigation grant funds. The goals and strategies of the three area hazard plans are consistent across the documents, with the main purpose being to create a framework for the procedures and projects that will reduce risk and losses in an emergency situation such as wildfire, flooding, or earthquake.	
Yuba County, General Plan Update (2009).	The General Plan was used to identify goals and relevant public policy relative to the distribution of future public and private land use. Planning and land use play a vital role in water use and distribution, and as such will influence infrastructure needs, water demand and supply, and impacts on natural systems addressed in the Plan. Used to inform the percent of land in Yuba County that is now planned for development. Used extensively to describe major land uses in Yuba County and development in various parts of the county.	
Yuba County General Plan Update Background Report: Agriculture (January 2008).	Used to describe percent of various crops in Yuba County.	
Yuba County LAFCO Municipal Services Review and Sphere of Influence Options reports	The Municipal Service Review for Yuba County evaluates services provided by municipal agencies and independent special districts within the county. The districts included in this review are striving to maintain service levels within the changing dynamics of population growth, escalating costs, limited funding, and increasing water demands. Used in the Land Use chapter.	
Yuba County, Draft Parks Master Plan (2008).	Stakeholders recommended we review this reference. Used for recreation development projections, goals and objectives review, and planning priorities. The plan was reviewed and taken into consideration as part of	County plans are periodically updated.

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	preparation of this IRWMP Update, and information from the Parks Master Plan was used in the Land Use chapter.	
Yuba City, Yuba City General Plan (2004).	Used for development projections, goals and objectives review and planning priorities.	City plans are periodically updated.
Yuba County and City of Marysville, Storm Water Management Plan (2004).	The Storm Water Management Plan fulfills the requirements of the National Pollutant Discharge Elimination System (NPDES) Phase II requirements for Small Municipal Separate Storm Sewer Systems. Identifies BMPs, measurable goals, and timetables for the implementation of six minimum control measures required by the US EPA and the State Water Resources Control Board.	
Climate		
AECOM, Final Yuba County General Plan, Environmental Impact Report, Sacramento, CA (May 2011). Available from: <a href="http://www.yubavision.org/EIR.aspx">http://www.yubavision.org/EIR.aspx</a>	Population trend data, policies addressing GHG emissions and other climate mitigations, and impact assessment from this document were used in the preparation of the climate vulnerability assessment.	Census data and trend projections will change over time. These data were used in the Region Description and Water Supply chapters as well.
California Climate Change Center, Water management adaptation with climate change (paper). Prepared by: Josué Medellín-Azuara, Christina R. Connell, Kaveh Madani, Jay R. Lund, and Richard E. Howitt. Final paper August 2009.	Explores water management adaptation in California using two scenarios: a warm-dry and a warm-only. Modeled findings project consequences that allow separation of precipitation and temperature effects for hydrological adaptation. Specific reference to changes in water supply for the Sacramento basin are relevant to the Yuba County IRWMP, as are segregated analyses of supply for urban vs agricultural use. Used in assessing regional vulnerabilities for urban and agricultural water use and effects on hydropower generation.	The California Energy Commission's PIER Program established the California Climate Change Center in 2003 to document climate research to inform the public and expand climate change information. Likelihood of updated information over time.

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Name of Study/Data Set	Use in the IRWMP	Other (e.g., status of data, certainty of data/analysis, relevance to other sections)
California Department of Water Resources, Managing An Uncertain Future: Climate change adaptation strategies for California's water, Sacramento, CA, State of California (October 2008). Available from: <a href="http://www.water.ca.gov/climatechange/docs/ClimateChangeWhitePaper.pdf">http://www.water.ca.gov/climatechange/docs/ClimateChangeWhitePaper.pdf</a> .	Provided a profile of the observed climate phenomena at the state level that have bearing on the region.	
California Energy Commission, Cal-Adapt – Exploring California's Climate Change Research, State of California. Website: <a href="http://cal-adapt.org/tools/">http://cal-adapt.org/tools/</a>	Modeled climate trend graphs were accessed for temperature degrees of change, precipitation decadal averages, and wildfire risk, with GIS imaging of all parameters. This information served as another source of comparison with other modeling of the watershed for high and low GHG scenarios.	Less certain because this is modeled data.
California Natural Resources Agency, 2009 California Climate Adaptation Strategy (2009). Retrieved from CAKE: <a href="http://www.cakex.org/virtual-library/1959">http://www.cakex.org/virtual-library/1959</a> .	Proposes a set of recommendations for policy development to protect the state from the effects of climate change and generally focuses on GHG reduction strategies that were used in the Climate chapter.	
Climate Change Scoping Plan: A framework for change, Prepared by the California Air Resources Board for the State of California, Sacramento, CA (December 2008). Available from: <a href="http://www.arb.ca.gov/cc/scopingplan/document/adopted_scoping_plan.pdf">http://www.arb.ca.gov/cc/scopingplan/document/adopted_scoping_plan.pdf</a> .	Was most relevant when considering adaptive resource management strategies and GHG reduction associated with project development.	
Freeman, G. J., Climate change and California's diminishing low elevation snowpack - a hydroelectric scheduling perspective. Western Snow Conference 71:39-47 (2003). Available from: <a href="http://www.westernsnowconference.org/proceedings/pdf_Proceedings/2003%20WEB/Freeman,%20G._Climate%20Change%20and%20CA's%20Diminishing%20Low-Elevatio.pdf">http://www.westernsnowconference.org/proceedings/pdf_Proceedings/2003%20WEB/Freeman,%20G._Climate%20Change%20and%20CA's%20Diminishing%20Low-Elevatio.pdf</a>	Displays PG&E's early findings on possible impacts to hydropower generation from observed increases in runoff from winter rainfall and concomitant decrease in spring snowmelt. Figures 1-5 in this paper illustrate changes in snow water equivalent, flow ratios, and comparisons of flow for the Yuba drainage. This paper helped with climate trend analyses and vulnerability assessment.	
Freeman, G. J., Runoff impacts of climate change on northern California's watersheds as influenced by geology and elevation—a mountain hydroelectric system perspective. Western Snow Conference 76:23-34 (2008). Available from: <a href="http://www.westernsnowconference.org/proceedings/pdf_Proc">http://www.westernsnowconference.org/proceedings/pdf_Proc</a>	Characterizes the relationship of geology and elevation to groundwater flows in the region, the relationship of groundwater and runoff from reduced snowmelt and their combined effects on runoff trends. It is forecast that climate change will have a relatively large (in comparison	

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eedings/2008/Freeman.RunoffImpactsOfClimateChangeOnNorthernCalifornia'sWatersheds.pdf	to more northerly California rivers) timing and quantity change on the Yuba basin because it has a relatively large proportion of exposed granite in its headwaters that limits absorption and recharge. This paper helped with climate trend analyses and vulnerability assessment.	
Freeman, G. J., Tracking the impact of climate change on central and northern California's spring snowmelt subbasin runoff. Western Snow Conference 78:107:118 (2010). Available from: <a href="http://www.sierrainstitute.us/ALMANOR/Freeman_Climate_Change_and_Snowmelt.pdf">http://www.sierrainstitute.us/ALMANOR/Freeman_Climate_Change_and_Snowmelt.pdf</a> .	Used to examine the influences of and correlation between topography and rain shadow effect on climate impacts to reduced snowmelt, spring runoff, and sometimes total runoff for the water year.	
Freeman, G. J., Analyzing the impact of climate change on monthly river flows in California's Sierra Nevada and Southern Cascade Mountain ranges. Paper presented at Western Snow Conference (2012).	Trend analyses for runoff in the Yuba basin, and related hydrogenation forecasts are offered in this paper. This paper helped with climate trend analyses and vulnerability assessment.	
Lenihan, J.M., et al., The response of vegetation distribution, ecosystem productivity, and fire in California to future climate scenarios simulated by the MC1 dynamic vegetation model. Climate Change 87 (Suppl 1): S215-S230. Output of potential natural vegetation for California (model simulations) (2008). Available from: <a href="http://www.enerty.ca.gov/pier/project_reports/500-03-58cf.html">http://www.enerty.ca.gov/pier/project_reports/500-03-58cf.html</a> .	Analysis of vegetation and effects on vegetation from climate change using modeled data. Used to help inform the climate vulnerability analysis about changing vegetation patterns and related habitat.	Less certain because modeled data were used.
Mehta, V.K., D. E. Rheinheimer, D.Y. Yates, D.R. Purkey, J.H. Viers, C.A. Young, and J.F. Mount, Potential impacts on hydrology and hydropower production under climate warming of the Sierra Nevada. Journal of Water and Climate Change (2011).	The Water Evaluation and Planning (WEAP) model was applied to the Cosumnes, American, Bear, and Yuba (CABY) region to simulate climate impacts on hydropower generation. The authors found that all four watersheds responded to climate warming with corresponding increases in wet season flows, decreases in dry season flows, and a net annual decrease in flow overall. This paper helped with climate trend analyses and vulnerability assessment.	

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<p>Natural Resources Agency, Department of Water Resources, Division of Integrated Regional Water Management, Proposition 84 &amp; Proposition 1E Integrated Regional Water Management Guidelines, Sacramento, CA; State of California. (November 2012). Available from:  <a href="http://www.water.ca.gov/irwm/guidelines.cfm">http://www.water.ca.gov/irwm/guidelines.cfm</a>.</p>	<p>Guidance for the Plan on aspects of climate to be discussed, strategies to be considered, and assessment of GHG emissions.</p>	<p>Guidance for all Plan sections.</p>
<p>Office of Emergency Services, Yuba County Multi-Jurisdictional Multi-Hazard Mitigation Plan, Yuba County, CA (2009). Available from:  <a href="http://www.co.yuba.ca.us/departments/OES/PDM/Multi-hazard%20mitigation%20plan/Plan%20Documents/Section%204%20-%20Risk%20Assessment.pdf">http://www.co.yuba.ca.us/departments/OES/PDM/Multi-hazard%20mitigation%20plan/Plan%20Documents/Section%204%20-%20Risk%20Assessment.pdf</a></p>	<p>This Plan, developed with stakeholder and community assistance, makes a risk assessment of both natural and human-caused hazards within Yuba County. It includes discussion of probability, a vulnerability assessment, loss estimates, and the impact of future county development. Climate change is one of the hazards discussed, both directly and indirectly (e.g., it is discussed indirectly via severity of winter storms and flood hazard). This helped with climate trends analyses and vulnerability assessment.</p>	<p>Also used in Land Use chapter.</p>
<p>Safford, H.D., M. North, and M.D. Meyer, Chapter 3: Climate Change and the Relevance of Historical Forest Conditions, Managing Sierra Nevada Forests, Albany, CA: US Department of Agriculture, Forest Service, Pacific Southwest Research Stations. No date. Available from:  <a href="http://www.fs.fed.us/psw/publications/documents/psw_gtr237/psw_gtr237_023.pdf">http://www.fs.fed.us/psw/publications/documents/psw_gtr237/psw_gtr237_023.pdf</a></p>	<p>Broad application of data from this study helped define regional climate trends and vulnerabilities/strategies</p>	
<p>US Environmental Protection Agency, CA Department of Water Resources, US Army Corps of Engineers, and the Resource Legacy Fund, Climate Change Handbook for Regional Water Planning (December 2011). Available from:  <a href="http://www.water.ca.gov/climatechange/docs/Climate_Change_Handbook_Regional_Water_Planning.pdf">http://www.water.ca.gov/climatechange/docs/Climate_Change_Handbook_Regional_Water_Planning.pdf</a></p>	<p>The climate checklist was populated where relevant, was applied to and populated with localized data by the project team and the Core Group to inform the climate vulnerabilities and adaptations section.</p>	
<p>World Resources Institute, The Greenhouse Gas Protocol: Designing a Customized Greenhouse Gas Calculation Tool (June 2006). Available from:  <a href="http://pdf.wri.org/GHGProtocol-Tools.pdf">http://pdf.wri.org/GHGProtocol-Tools.pdf</a></p>	<p>Provided the formulae used to calculate GHG emissions from Tier 1 projects.</p>	

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Yuba County Water Agency, Groundwater Management Plan (December 2010).	The Groundwater Management Plan addresses groundwater basin conditions through spring 2010. It provides the status of management activities in the basin and presents a list of groundwater management actions to implement Plan goals. This Plan helped array adaptive strategies for groundwater management in the face of climate stressors, and data gaps for water management.	This is an update of the 2005 GWMP. Also used in the Land Use chapter.
US Environmental Protection Agency, The Emissions & Generation Resource Integrated Database for 2010: (Egrid2010) Technical Support Document. Prepared by: E.H. Pechan & Associates, Inc., (December 2010). Available from: <a href="http://www.epa.gov/cleanenergy/documents/egridzips/eGRID2010TechnicalSupportDocument.pdf">http://www.epa.gov/cleanenergy/documents/egridzips/eGRID2010TechnicalSupportDocument.pdf</a>	Used to calculate construction-related electric energy use emissions.	