Appendix 1
Literature Review

Prepared for

County Drought Advisory Group Process as Partial Fulfillment of Assembly Bill 1668

By

California Department of Water Resources

Water Use Efficiency Branch

March 2021

Part 1: Appendix 1
Literature Review

The content in this appendix was prepared in February 2019, under the supervision of the California Department of Water Resources with the assistance of Greg Young of Tully & Young.

Appendix 1. Literature Review

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Introduction

In May 2018, Governor Brown signed into law several new statutes intended to help make water conservation a California way of life. These statutes, developed and approved through Assembly Bill 1668 and Senate Bill 606, added Section 10609.42 to the California Water Code (CWC). The added section instructs the California Department of Water Resources (DWR) to:

a) "[U]se available data to identify small water suppliers and rural communities that may be at risk of drought and water shortage vulnerability." [CWC 10609.42(a)], and

b) Develop for the Governor and Legislature "recommendations and guidance relating to the development and implementation of countywide drought and water shortage contingency plans to address the planning needs of small water suppliers and rural communities." [CWC 10609.42(b)]

Specifically, CWC 10609.42(b) directs DWR to include, but not be limited to, recommendations that address the following components:

1) Assessment of drought vulnerability

2) Actions to reduce drought vulnerability

3) Response, financing, and local communications and outreach planning efforts that may be implemented in times of drought

4) Data needs and reporting

5) Roles and responsibilities of interested parties and coordination with other relevant water management planning efforts

To assist DWR with its required tasks, a literature review was conducted of several documents that may provide insight into small water supplier and rural community drought vulnerability. This report documents the findings of the literature review.

Selected Literature for Review

The selected literature reviewed is listed in Table 1, along with an indication as to its relevance or value for the two aforementioned DWR directives. The County Drought Advisory Group (CDAG), organized to assist DWR in this task, contributed to the compilation of this list and represent some of the agencies or authors that appear in this literature review. The selected literature represents a number of readily available documents that were topically relevant and reflective of recent drought circumstances experienced in California. Many of these sources focused on the availability and reliability of safe drinking water for disadvantaged communities, using the recent drought as a platform to highlight longer-trending concerns regarding clean drinking water. It should be noted that because there are many interrelations between water shortage contingency planning and the issue of safe drinking water availability under all conditions, these literature sources provide conclusions and findings from a broader scope than the project with which DWR is tasked.

Methods

Each of the literature sources listed in Table 1 was reviewed. Various primary points, conclusions, data sources, and findings were identified during the review process for later assessment and revisiting. Primary information was copied from the electronic versions of the sources into a spreadsheet, for use in preparing this summary report.

Table 1. Literature Sources Reviewed for this Report

Ref #	Report Title	Report Source	Relevancy to CWC Section 10609.42 Subsections					
			(a)	(b)(1)	(b)(2)	(b)(3)	(b)(4)	(b)(5)
1	Californians Without Safe Water and Sanitation: California Water Plan Update 2013	DWR (2013)	X	X		X		X
2	Measuring Progress Toward Universal Access to Water and Sanitation in California: Defining Goals, Indicators, and Performance Measures	Pacific Institute (2018)		X		X	X	X
3	Managing Drought in a Changing Climate: Four Essential Reforms	PPIC (2018)	X		X			X
4	The Struggle for Water Justice in California's San Joaquin Valley: A Focus on Disadvantaged Unincorporated Communities	UCD (2018)	X	X	X		X	
5	Drought Management and Climate Adaptation of Small, Self-Sufficient Drinking Water Systems in California	UCD (2018)	X	X	X	X	X	X
6	Bringing Water and Land Use Together: Final Report to the Community Foundation Water Initiative on the Equitable Integration of Water and Land Use	Local Gov Comm (2018)			X			X
7	Broadening understandings of drought: The climate vulnerability of farmworkers and rural communities in California	Univ of Arizona (2018)	X	X		X		

Table 1. Literature Sources Reviewed for this Report (contd.)

Ref #	Report Title	Report Source	Relevancy to CWC Section 10609.42 Subsections					
			(a)	(b)(1)	(b)(2)	(b)(3)	(b)(4)	(b)(5)
8	Making Water Conservation a California Way of Life: Implementing Executive Order B-37-16	DWR/SWRCB (2017)		X	X	X	X	X
9	Water Equity Science Shop (WESS) presentation on the domestic well community layer	CWC (2018)	X					
10	Water/Wastewater Utilities and Extreme Climate and Weather Events: Case Studies on Community Response, Lessons Learned, Adaptation, and Planning Needs for the Future (Project CC7C11)	WERF (2014)				X		X
11	Drought and Equity in California	Pacific Institute (2017)	X	X	X	X	X	X
12	Drought and Water Supply Vulnerability Contingency Planning	Comm. Water Center (2018)						
13	A Framework and Tool for Evaluating California's Progress in Achieving the Human Right to Water	OEHHA (2019)	X					
14	Drought Contingency Plan Template	HIS (2014)			X	X	X	
15	Basic & Urgent: Realizing the Human Right to Water & Sanitation for Californians Experiencing Homelessness	ELC/EJCW (2018)						

Findings

Many of the reviewed literature sources included foundational data derived from common state and federal data sources, though they were often from different points of time, used differently in analytical work, or simply presented in different formats. These same literature sources often had overlapping or similar conclusions and findings. The findings extracted from each source were reviewed to create a synthesized set of findings to give background information for CDAG breakout group discussions.

The synthesized findings were categorized by subject and included a set of related study findings (as detailed in the DWR Action 2 section, beginning on page 9). Those synthesized findings are:

> SF1 **Funding and Financing:** Improve access to funding sources for drought planning and drought mitigation project implementation. Priorities should include streamlining the application processes to reduce the level of effort; modifying the threshold requirements to target disadvantaged communities, especially disadvantaged unincorporated communities (DUC)[1] with at-risk drinking water sources or systems; defining "drought" as a qualifying emergency; and making funds available during non-drought periods to support advanced and proactive planning and solutions. Consider modifying the determination of "income" to assure at-risk DUCs are appropriately meeting qualification thresholds.
> *Study Findings: 1d, 1g, 2a, 3d, 4b, 5a, 5b, 5c, 11g, 12e, 12g*
>
> SF2 **Data and Tools:** Need for coordination among local, regional, state, and federal agencies to collaborate on a consistent set of indicators to help counties monitoring rural communities and small water systems vulnerable to droughts and water shortages. Improve state managed and financed data collection, data management, and data storage, along with routine development, reporting, and dissemination of vulnerability mapping.

[1] A Disadvantaged Unincorporated Community (DUC) "means a fringe, island, or legacy community in which the median household income is 80 percent or less than the statewide median household income." California Government Code Section 65302.10(a)(2).

Study Findings: 1a, 1b, 2b, 2c, 2d, 2e, 4d, 4e, 5b, 6d, 7b, 8a, 8b, 11a, 11d, 11e, 12b

SF3 **Outreach and Education:** Need for financed creation and distribution of drought planning tools and templates, including educational outreach materials for use by small water systems and within rural communities. Education materials should target specific audiences of water users such as renters, multi-unit housing occupants, and users with language barriers. Increase research for DUC-oriented safe water solutions.
Study Findings: 4f, 5d, 5e, 5i, 11g, 12b

SF4 **Technical Assistance and Capacity Building:** Provide state-financed personnel and management resources to high-risk DUCs to facilitate planning, prevention, and mitigation for drought and water shortage vulnerabilities. Provide venues for local coordination and knowledge transfer. Include diverse expertise and representation (e.g., community advocates, local system operators, disadvantaged self-supplied or small water system users and large system operators).
Study Findings: 1f, 5f, 5h, 5i, 6e, 6f, 6g, 7a, 12a

SF5 **Regional Planning and Coordinated Communication:** Require responsible regional parties to demonstrate drought preparedness for all water users within defined boundaries (e.g., through Hazard Mitigation Plan, General Plan Updates, or stand-alone programs). Encourage development of drought plans when not in the midst of a drought and perform monitoring and plan-updates on a routine basis—including communications with state, regional, and local agencies to assure data sharing.
Study Findings: 3a, 7b, 7c, 8b, 8c, 8d, 8e, 10a, 10b, 11b, 12a, 12d, 12f, 14a

SF6 **Land-Use Plans:** Require land-use planning to address conditions of ongoing water shortage vulnerability (e.g., because of water quality or other factors), especially for disadvantaged communities. Encourage land-use planning to limit the creation of, or worsening of, water shortage conditions for small water systems and rural communities. Include emphasis on water system infrastructure investments prior to new developments (e.g., consolidation, water system upgrades, or water system

interties prior to land-use modifications). Improve county well-permitting processes to recognize water limitations and vulnerabilities.
Study Findings: 3b, 3c, 4c, 5i, 6a, 6b, 6c, 6d, 6h, 11c

SF7 **Consolidation:** Emphasize consolidation of small water systems, especially those at risk of, or already facing safe water concerns. When this is impractical, facilitate support from local urban water suppliers to provide technical expertise, emergency response, mutual aid, and service interties.
Study Findings: 1e, 4a, 5g, 11f

SF8 **Rate Restructuring:** Refine small water system billing to reduce financial impact of drought surcharges on low-income customers, while helping small water system operators obtain adequate revenues to assure stable operations during droughts (e.g., state funding sources or disadvantaged community rate-assistance funding).
Study Findings: 5i, 11g

SF9 **Human Right to Water:** Assure state, regional, and local land-planning and water supply and management entities continue to focus on implementing actions to achieve the policy goals within California Water Code Section 106.3 (AB 685).
Study Findings: 1c, 15a, 15b, 15c, 15d, 15e, 15f

DWR Action 1

Identify Small Water Suppliers and Rural Communities Vulnerable to Droughts

As directed by CWC 10609.42(a), DWR shall identify small water suppliers and rural communities at risk of drought, using available data. The literature sources each include a variety of data obtained from several federal, state, regional, and local resources. Some of the cited literature references data sources or demonstrates data combinations and analyses that can aid this DWR directive. Data in the literature generally falls within five categories:

1) Water supply source — surface water or groundwater, or both

2) Water provider — public water system or self-supplied domestic well

3) Demographics

4) Economics

5) Source water quality

While DWR will likely need to develop its own combination of these data categories, the data references cited in the literature provide a starting place. Data used to prepare graphics, tables, and maps presented in the various literature were copied into a master spreadsheet, referencing the dataset name and providing a link to the source data (as presented in the literature, though links were not validated), and indicating the dataset's primary owner. This information is summarized in Table 2.

Table 2. Referenced Data Sources from Cited Literature

Dataset Name	Data Source (Report)	Organization (Data Owner)	Type of Data	Coverage (Statewide or Specific Region)
Communities that Rely on a Contaminated Groundwater Source for Drinking Water, 2013	https://www.waterboards.ca.gov/water_issues/programs/gama/ab2222/docs/ab2222.pdf	State Water Resources Control Board (SWRCB)	census data	statewide
Population Estimates for Community Water Systems	June 2012 database (reported by each community water system)	California Department of Public Health (CDPH): Permits, Inspection, Compliance, Monitoring and Enforcement (PICME)	census data	statewide
Small Water Program Plan	http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Smallwatersystems.shtml.	California Department of Public Health (CDPH)	water use data	statewide
Groundwater Ambient Monitoring & Assessment Program – Private Domestic Well Project	http://www.waterboards.ca.gov/gama/domestic_well.shtml	SWRCB	water use data	select private wells, various counties
Groundwater Assessment and Protection Program – Salinas and Pajaro Valley Domestic Well Project 2012/2013 (Preliminary Results)	http://www.waterboards.ca.gov/centralcoast/water_issues/programs/gap/index.shtml#special_projects	Central Coast Regional Water Quality Control Board	water use data	Salinas and Pajaro Valley
Onsite Wastewater Treatment System	2012 policy	SWRCB	water use data	statewide
Sanitation Deficiency Construction Program	2012 program	Indian Health Services (IHS)	water use data	statewide
Addressing Nitrate in California's Drinking Water with a Focus on Tulare Lake Basin and Salinas Valley Groundwater	2012 Report to the Legislature	UC Davis	water use data	Tulare Lake Basin and Salinas Valley
Recommendations Addressing Nitrate in Groundwater	2013 Report to the Legislature	SWRCB	water use data	statewide
Report on New and Expanded Funding Sources to Address the Needs of Disadvantaged Communities in Unincorporated Areas that Do Not Have Safe Drinking Water	2013 Final Report to the Governor's Office http://www.waterboards.ca.gov/water_issues/programs/groundwater/docs/stakeholders/8132013_2_final_rep_new_expanded_funding.pdf	Governor's Drinking Water Stakeholder Group	economic data	statewide
Small Community Wastewater Strategy	2008 Report and Annual Updates	SWRCB	water use data	statewide
2013 Office of Federal Acknowledgement, Number of Petitioners by State. [Website].	http://www.bia.gov/cs/groups/xofa/documents/text/idc1-024416.pdf	Bureau of Indian Affairs (BIA)	census data	statewide
Technical, Managerial, and Financial (TMF) Criteria for Public Water Systems [Website]	http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/tmfcapacitydevelopment/2013/TMF%20Criteria%20May%202013.doc.	CDPH	water use data, economic data	statewide
Small Water System Program Goal, Implementation Plan.	http://www.cdph.ca.gov/certlic/drinkingwater/Documents/SWS/2013/Small%20Water%20System%20Implementation%20Plan.pdf	CDPH	water use data	statewide

Table 2. Referenced Data Sources from Cited Literature (contd.)

Dataset Name	Data Source (Report)	Organization (Data Owner)	Type of Data	Coverage (statewide or Specific Region)
2014 California Water Action Plan	http://resources.ca.gov/docs/california_water_action_plan/Final_California_Water_Action_Plan.pdf	California Natural Resources Agency, California Department of Food and Agriculture, California Environmental Protection Agency.	water use data	statewide
2014. Safeguarding California: Reducing Climate Risk - An update to the 2009 California Climate Adaptation Strategy.	http://resources.ca.gov/docs/climate/Final_Safeguarding_CA_Plan_July_31_2014.pdf.	California Natural Resources Agency	water use data	statewide
2013. Indian Entities Recognized and Eligible to Receive Services from the United States Bureau of Indian Affairs	http://www.gpo.gov/fdsys/pkg/FR-2013-05-06/pdf/2013-10649.pdf	Federal Register / Vol. 78, No. 87 / Monday, May 6, 2013 / Notices. Pages 26384 – 26389.	census data	statewide
2012. Agreements and Legislative Recommendations, Final Report to the Governor's Office.	http://www.waterboards.ca.gov/water_issues/programs/groundwater/docs/stakeholders/08202012_1_final_rep_to_gov.pdf.	Governor's Drinking Water Stakeholder Group	water use data, census data, economic data	statewide
2014. Data Collection and Management for Local and State Small Water Systems	http://www.waterboards.ca.gov/water_issues/programs/groundwater/docs/stakeholders/1142014_3_data_management_rep.pdf	Governor's Drinking Water Stakeholder Group	water use data	statewide
2012. Our Changing Climate 2012: Vulnerability & Adaptation to the Increasing Risks from Climate Change in California. A Summary Report on the Third Assessment from the California Climate Change Center. Support from California Energy Commission and California Natural Resources Agency.	http://www.energy.ca.gov/2012publications/CEC-500-2012-007/CEC-500-2012-007.pdf	California Climate Change Center, with support from California Energy Commission and California Natural Resources Agency.	water and economic data	statewide
2013c. Fifth Annual Update on Efforts to Assist Small and/or Disadvantaged Communities in Meeting Their Wastewater Needs.	http://www.waterboards.ca.gov/board_info/agendas/2013/oct/102213_4.pdf.	SWRCB	water and economic data	statewide
2012a. National Water Program 2012 Strategy: Response to Climate Change. EPA-850-K-12-004.	http://water.epa.gov/scitech/climatechange/upload/epa_2012_climate_water_strategy_full_report_final.pdf	United States Environmental Protection Agency (EPA), Office of Water.	water use data	nationwide
2012b. 2010 National Public Water Systems Compliance Report.	http://www2.epa.gov/sites/production/files/2014-04/documents/sdwacom2010.pdf	EPA	water use data	nationwide
2013. RTOC Strategic Plan 2012-2014 (Draft).	http://www.epa.gov/region9/tribal/rtoc/win13/pdf/2013-02-14-attach-c-rtocstrategic-plan-2012-2014-v01082013.pdf	EPA Region 9 Tribal Operations Committee	census data, economic data	EPA Region 9

Table 2. Referenced Data Sources from Cited Literature (contd.)

Dataset Name	Data Source (Report)	Organization (Data Owner)	Type of Data	Coverage (statewide or Specific Region)
2014. Indian Tribal Approvals. [Website].	http://water.epa.gov/scitech/swguidance/standards/wqslibrary/approvtable.cfm	EPA	census data, economic data	statewide
2012 Report. Place Matters for Health in the San Joaquin Valley: Ensuring Opportunities for Good Health for All.	https://www.fresnostate.edu/chhs/cvhpi/documents/cvhpi-jointcenter-sanjoaquin.pdf	Joint Center for Political and Economic Studies	census data, economic data	San Joaquin Valley
Social Vulnerability Analysis: A Comparison of Tools. February 2013.	http://www.iwr.usace.army.mil/Portals/70/docs/iwrreports/Social_Vulnerability_Analysis_Tools.pdf	Alexandria, Virginia: Institute for Water Resources	economic data	nationwide
2015. Los Angeles County Community Water Systems: Atlas and Policy Guide. Supply Vulnerabilities, At-Risk Populations, Conservation Opportunities, Pricing Policies, and Customer Assistance Programs	http://innovation.luskin.ucla.edu/sites/default/files/Water_Atlas_0.pdf	Los Angeles: UCLA Luskin Center for Innovation	water and economic data	Los Angeles County
2010 Census: Households and Families	https://www.census.gov/programs-surveys/decennial-census/data/datasets.2010.html	United States Census Bureau	census data	nationwide

DWR Action 2

Develop Guidance and Recommendations for the Legislature

A summary of each reviewed document that CDAG found was relevant to DWR's second directive [under CWC 10609.42(b)] is provided below. These summaries are not intended to capture the full range of a particular source's objectives and findings; rather, the summaries provide the source's context (usually directly quoting a stated goal/purpose of the relevant study or report), and a list of findings reflecting the host of issues that need to be addressed for reducing drought vulnerability and impacts on small water systems and rural communities. Again, the breadth of findings was broader than the scope of the project with which DWR is tasked.

Study 1

Californians Without Safe Water and Sanitation: California Water Plan Update 2013
Jose Alarcon, Senior Engineer; Department of Water Resources (2013)

Context of the study:

"This report was prepared as part of the *California Water Plan Update 2013* process and is an update to the 2005 *Californians without Safe Water* report. It continues the dialogue regarding Californians without safe drinking water and/or adequate sanitation facilities and includes 14 recommendations toward ensuring that all Californians have safe drinking water and adequate sanitation facilities." (p. 1)

Relevant findings reported:

1a: State, regional, and local governments should coordinate to estimate the statewide total population without safe water, including those residing in areas served by a state small water system, local small water system, or private domestic well. [SF2]

1b: State, regional, and local governments, along with interested stakeholders, should coordinate to develop performance metrics and track the progress of achieving safe drinking water and sanitation for all Californians. Periodic progress reports should be prepared that show what improvements have been made and what additional actions are needed. [SF2]

1c: Ensure implementation of the policy goals within California Water Code Section 106.3 (AB 685), which states that every human being has the right to safe, clean, affordable, and accessible water that is adequate for human consumption, cooking, and sanitary purposes. [SF9]

1d: State government should remove barriers to local and regional funding for water projects conducted, to support disadvantaged and environmental justice communities. [SF1]

1e: State government should provide incentives for the consolidation, acquisition, or improved management of small water systems. [SF7]

1f: State Water Resources Control Board (State Water Board) and other state agencies that provide funding to third-party technical assistance providers to assist small water and wastewater systems should allow tribal water and wastewater systems to be eligible to receive this technical assistance. [SF4]

1g: State Water Board and other state agencies should submit an endorsement letter to the U.S. Environmental Protection Agency and Congress supporting an increase in the funding allocation (currently at 2 percent) for the Safe Drinking Water Act Drinking Water Infrastructure Tribal Set-Aside and Clean Water Act Indian Set-Aside Programs. [SF1]

Study 2

Measuring Progress Toward Universal Access to Water and Sanitation in California: Defining Goals, Indicators, and Performance Measures
Laura Feinstein; Pacific Institute (September 2018)

Context/goals/assumptions of the study:

"This report offers a unified framework on how to measure progress toward universal access to water and sanitation in California." (p. IV) "This report focuses on water and sanitation service in homes, including standard housing types, such as single-family and multi-family units; unconventional housing, such as RVs, vans, and boats; group residences, such as dormitories, Single Resident Occupancies (SROs), and homeless shelters." (p. 5)

Relevant findings reported:

2a: Use the Eligibility for Customer Assistance Program (ECAP) metric described in "Ancillary Performance Indicators for Affordable Water and Sanitation" to qualify households for a water affordability assistance program. [SF1]

2b: Collect information on service disconnections that distinguishes between occupied and unoccupied residences. [SF2]

2c: Identify public water systems that persistently fail to deliver water that meets Safe Drinking Water Act standards. [SF2]

2d: Adopt a single, consistent set of indicators and performance measures, and designate a single entity entrusted with regularly assessing those metrics. [SF2]

2e: Investigate quality of water delivered by very small [water] systems, i.e., domestic wells. [SF2]

Study 3
Managing Drought in a Changing Climate: Four Essential Reforms
Jeffrey Mount (et al.); Public Policy Institute of California (September 2018)

Context/goals/assumptions of the study:

"This report employs new and recently published climate change simulations, along with lessons learned from the latest drought, to examine California's capacity for adaptation to greater climate extremes and growing water scarcity.[2] We conclude that California will need new policies and strategic investments to reduce the social, economic, and environmental costs of dealing with droughts of the future.

We begin by examining the challenges of managing scarce water supplies in four key sectors during the drought: cities and suburbs, irrigated agriculture, rural communities, and freshwater ecosystems. Based on climate model projections, we then examine additional pressures that are likely to challenge water management in these sectors over the next several decades. We next recommend a suite of policy and management reforms in four areas: drought planning, water infrastructure and

operations, water rights administration, and funding. Finally, we examine where California appears to be on the right path in preparing for future droughts and where difficult course corrections may be needed." (p. 5)

Relevant findings reported:

3a: Plan ahead. Stronger drought planning is critically important for urban water management, groundwater sustainability, safe drinking water in rural communities, and freshwater ecosystems. [SF5]

3b: Upgrade the water grid. California needs a comprehensive program to address above- and below-ground storage, conveyance, and operational challenges by mid-century; including repairing facilities that are broken, expanding conveyance and storage capacity, and modernizing and integrating operations. [SF6]

3c: Update water allocation rules. California should comprehensively update its water allocation governance. The goals should be to find equitable and efficient ways to allocate limited supplies among competing demands during dry times, while promoting efforts to capture and store water during wet times. [SF6]

3d: Find the money. Reliable funding is crucial for adapting to climate change. New sources are needed to pay for necessary water-management investments and to fill funding gaps in the state's water system. [SF1]

Study 4

The Struggle for Water Justice in California's San Joaquin Valley: A Focus on Disadvantaged Unincorporated Communities

Jonathan London (et al.); UC Davis: Center for Regional Change (February 2018)

Context/goals/assumptions of the study:

"Our report analyzes this situation in detail, and offers several recommendations to inform policy and advocacy on how to improve water access to these communities. To do so, we have

used maps of DUCs, CWSs, and State Small Water Systems (SSWSs), as well as water quality reports, demographic data, and expert interviews. Together, these sources have helped us highlight gaps in the provision of safe and affordable drinking water.

Our main conclusion is that California's legislature, regulatory agencies, and water suppliers need to undertake more concerted and well-resourced efforts to ensure that the HRTW is ensured for all of the San Joaquin Valley's residents." (p. 9)

Relevant findings reported:

4a: Develop and strengthen consolidation and service extension mandates and incentives. [SF7]

4b: Create larger, more stable, more equitably distributed and coordinated sources of funding that focus on addressing historical patterns of inequitable access to resources. [SF1]

4c: Ensure that local governments comply with land use and annexation laws to address the legacies of discriminatory local planning practices. [SF6]

4d: Improve public access to data and planning tools, enhance existing data systems, and coordinate monitoring systems efforts. [SF2]

4e: Develop new publicly accessible data and mapping tools to improve local and regional planning. [SF2]

4f: Address outstanding research needs. [SF3]

Study 5

Ekstrom, Julia A., Meghan R. Klasic, Amanda Fencl, Mark Lubell, Ezekiel Baker, Frances Einterz. (University of California, Davis). 2018. Drought Management and Climate Adaptation among Small, Self-Sufficient Water Systems in California.

California's Fourth Climate Change Assessment, California Natural Resources Agency. Publication number: CCCA4-CNRA-2018-004.

Context/goals/assumptions of the study:

"The overarching goal of this project was to document small, self-sufficient system managers' perspectives, experiences, and needs for future drought resilience in the face of climate change and uncertainty. Small [Water] systems are those that serve fewer than 10,000 people, and self-sufficient system are those that do not receive any water from either of the major California water projects (State Water Project, Central Valley Project)." (p. 1)

Relevant findings reported:

5a: Small water systems need assistance, and this likely requires different approaches than what is provided to larger systems. [SF1]

5b: Need better income surveys in rural areas to more accurately capture demographics of water system customers. [SF1] [SF2]

5c: Defining disadvantaged communities should be specific for the drinking water sector (for purposes of financial assistance qualifications). [SF1]

5d: Need continued and improved outreach to and education of consumers about the value of water, the importance of conservation, and the potential repercussions of not conserving. [SF3]

5e: Need unified messaging (via templates) to save staff time and resources and create a consistent message. [SF3]

5f: Need state financial support to increase staff capacity for small water systems. [SF4]

5g: Agreements between larger and smaller [water] systems to create more equitable distribution of financial and technical assistance. [SF7]

5h: Work with other smaller [water] systems to plan for extreme events. [SF4]

5i: Need ongoing water conservation outreach programs, rate restructuring, infrastructure updates, and maintaining working relationships among and between systems, non-governmental organizations, and the state government. [SF3] [SF4] [SF6] [SF8]

Study 6

Bringing Water and Land Use Together: Final Report to the Community Foundation Water Initiative on the Equitable Integration of Water and Land Use

Local Government Commission (October 2018)

Context/goals/assumptions of the study:

"Integrating water management and land-use planning emerged as a shared interest area among the Community Foundation Water Initiative members. The cohort commissioned this report to help identify and pursue opportunities at the intersection of integrated water management and land-use planning that advance equity, regional economic development, climate adaptation, housing and transportation planning.

Through this effort, the Community Foundation Water Initiative and its members are gaining a robust understanding of water management needs and opportunities for improved integration with land-use planning at local, regional and statewide levels. By advocating for and investing in efforts that effectively integrate water management and land-use planning, local community foundations will help make all of California's communities more equitable and resilient.

This report identifies strategies for community foundations and other local leaders to leverage the multiple benefits of an integrated, collaborative planning approach. These results benefit the project's community and agency stakeholders, and will have a "scaling up" effect to influence regional and statewide practices." (pp. 3–4)

Relevant findings reported:

State Actions:

6a: Prioritize infrastructure investments that support existing communities, especially underserved communities, before new development. [SF6]

6b: Ensure state and local investments are directed toward multi-solving through green infrastructure projects developed at local scales with robust community engagement. [SF6]

6c: Incentivize or require cross-sector, coordinated planning and management of land use, water, flood mitigation, and climate adaptation. [SF6]

6d: Require additional sophistication (better data and analytics) in growth projections and coordinated regional planning for both land-use planning and water-management agencies. [SF2] [SF6]

Regional Actions:

6e: Advocate for water access and affordability for community members facing disadvantages. [SF4]

6f: Provide venues for local leaders in both the water and land-use sectors to interact with one another (to build relationships, share ideas, and eventually collaborate). [SF4]

6g: Develop regional leaders in both the water and land-use sectors and provide opportunities for them to interact with one another. [SF4]

6h: Build local political will and understanding around water and land-use integration by convening and educating local leaders. [SF6]

Study 7
Broadening Understandings of Drought: The climate vulnerability of farmworkers and rural communities in California
Christina Green; University of Arizona (August 2018)

Context/goals/assumptions of the study:

"This paper is organized as follows. Section 2 connects the literature on socioeconomic drought in agricultural systems in developed countries with the scholarship on climate vulnerability. Section 3 describes the study area and the case study of the 2012–2016 drought. Section 4 summarizes the methods for data collection, including semi-structured interviews and a household survey. In Section 5, data results on the impact of the drought on agricultural employment and well-being are presented. Section 6 discusses these results in the context of socio-economic drought and differential vulnerability. Finally, Section 7 concludes the paper with policy recommendations." (p. 1)

Relevant findings reported:

7a: Planning for future droughts improves with the coordination and participation of diverse experts with knowledge of local communities and different dimensions and scales of well-being. The response to the human impact of the drought in California required the coordination and engagement of government officials, community leaders, farmworker activists, and nonprofits involved in water security, food security, health, and employment training. [SF4]

7b: Drought vulnerability is dynamic and changes with adaptation decisions made during a drought. Drought relief and planning needs continual assessments to consider the redistribution of drought risk, given different adaptation decisions. [SF2] [SF5]

7c: Greater inclusion and representation of vulnerable groups in drought and water resource planning and management is needed. [SF5]

Study 8

Making Water Conservation a California Way of Life: Implementing Executive Order B-37-16

California Department of Water Resources (DWR), State Water Resources Control Board (State Water Board), California Department of Food and Agriculture (CDFA), California Public Utilities Commission (CPUC), and California Energy Commission (CEC); (April 2017)

Context/goals/assumptions of the study:

"The EO directs the California Department of Water Resources (DWR), State Water Resources Control Board (Water Board), California Department of Food and Agriculture (CDFA), California Public Utilities Commission (CPUC), and California Energy Commission (CEC) – collectively referred to as the 'EO Agencies'– to summarize in a report a framework for implementing the EO and incorporating water conservation as a way of life for all Californians.

The framework described herein promotes efficient use of the State's water resources in all communities, whether conditions are wet or dry, and prepares the State for longer and more severe drought cycles that will mark our future. The EO directs DWR, the Water Board, and CPUC to develop methods to ensure compliance with the provisions of the EO, including technical and financial assistance, agency oversight, and enforcement action by the Water Board to address non-compliant water suppliers, if necessary." (p. 1-1)

Relevant findings reported:

8a: Reporting and Data Recording — Improved data collection, management, analysis, sharing, and transparency at all levels is foundational to the ability to plan. Data analysis will allow for better coordination among stakeholders and improve on both long-term actions as well as immediate responses to drought risks, especially in rural communities. [SF2]

8b: Communications Planning — Improved monitoring and communications among stakeholders, from the state, through the counties, and to the water suppliers and citizens. [SF2] [SF5]

8c: County Demonstration of Drought Planning — While some portion of a county's residents may be covered by an urban supplier's Water Shortage Contingency Plan (WSCP) or a small supplier's drought plan (not required), there is nothing currently available to demonstrate that drought risk is being addressed for all county residents. To address this need, counties may submit

drought planning information to the EO Agencies through documents such as: [SF5]

1) Drought-specific protocols defined in a county (or multi-jurisdictional) hazard mitigation plan.

2) A county drought plan.

8d: Roles and Responsibilities — Defined state agency and county roles, responsibilities, and funding mechanisms. [SF5]

8e: Coordination — The EO agencies and the county, working with stakeholders, should coordinate with Sustainable Groundwater Management Act (SGMA) efforts to assure drought planning and responses are reflected in groundwater sustainability plans, where applicable. [SF5]

Study 9

Presentation on the Domestic Well Community Layer

Community Water Center and Water Equity Science Shop (WESS); (September 2018)

Context/goals/assumptions of the study:

Presentation at workshop during technical advisory meeting for development of the Drinking Water Tool

Relevant findings reported:

Note: this presentation is about data for understanding and defining vulnerability and does not report specific, written findings.

Study 10

Water/Wastewater Utilities and Extreme Climate and Weather Events: Case Studies on Community Response, Lessons Learned, Adaptation, and Planning Needs for the Future (Project CC7C11)

Lauren Fillmore (et al.); Water Environment Research Foundation (2014)

Context/goals/assumptions of the study:

"Collaboratively with NOAA, U.S. EPA, and partner organizations, research was conducted at six local workshops, organized to

include participants that experienced different types of extreme events throughout a river basin or watershed. The localities included: Apalachicola-Chattahoochee-Flint River Basin, Georgia; Central Texas; Lower Missouri River Basin, Kansas and Missouri; National Capital Area; Russian River Basin, California; Tidewater Area, Virginia." (Executive Summary)

Relevant findings reported:

10a: To build resilience, communities must embrace both emergency response and long-term preparedness. [SF5]

10b: The complex array of decisions needed to support resilience within a basin requires coordination across water service areas and jurisdictional boundaries. [SF5]

Study 11

Drought and Equity in California

Laura Feinstein, Rapichan Phurisamban, Amanda Ford, Christine Tyler, Ayana Crawford; Pacific Institute (January 2017)

Context/goals/assumptions of the study:

"In this report, we examine three major impacts of the drought. The first two—shortages and price hikes—affected people's access to safe, affordable, adequate water in their homes. The third arena we investigate is salmon fishery performance during the drought, and how it affected commercial and tribal fishermen reliant on salmon for income, food, and cultural traditions. We selected these topics based on input from a diverse set of stakeholders. While we were unable to explore them in-depth in this report, the impact of drought on farmworkers, water quality, and subsistence fishermen (beyond the tribes we discuss in Section 3), are also critical issue areas that deserve further analysis.

Our goals were to synthesize available information from the state, media outlets, and non-governmental organizations (NGOs) and develop recommendations on how to mitigate the impacts of future droughts. This report is intended to provide information to community groups to advocate for their own interests, as well as to inform policymakers and other decision-

makers interested in crafting more effective drought response strategies, particularly to address the needs of the state's most vulnerable communities." (p. 6)

Relevant findings reported:

11a: Establish a statewide, quantitative metric for measuring water supply reliability for public water systems. [SF2]

11b: Require water shortage contingency plans for all public water systems and establish regional plans for non-public systems. [SF5]

11c: Increase oversight of new private wells. [SF6]

11d: Systematically collect information on water shortages for public and non-public water systems. [SF2]

11e: Identify areas where private wells and other non-public water systems are likely to run dry in future droughts. [SF2]

11f: Identify areas where water system consolidation can resolve supply problems. [SF7]

11g: To reduce the inequitable impact of drought charges on low-income households, we recommend the following:

1) Ensure drought surcharges are not applied to basic water use, preferably by calculating household water budgets based on the number of people in a residence. [SF8]

2) Provide technical and financial assistance to water utilities, especially the smallest ones, to implement drought charges that do not unfairly burden low-income households. [SF1] [SF3]

3) Target water conservation and efficiency programs to low-income households by offering, for example, point-of-sale coupons, targeted education and outreach, and direct-install programs. [SF3] [SF8]

a) Develop low-income rate-assistance programs within current legal constraints, and reform Proposition 218 to allow greater latitude in funding such programs. [SF8]

b) Wherever possible, require meters and submeters to allow for more equitable drought charges based on volumetric water use. [SF8]

c) Develop approaches that effectively target specific customers, such as renters and residents of multi-unit buildings, for rate assistance and conservation programs. [SF3] [SF8]

Study 12

Drought and Water Supply Vulnerability Contingency Planning
Maria Martinez (et al.); Community Water Center, prepared by Yale University (March 2018)

Context/goals/assumptions of the study:

"This report offers recommendations to state and local water decision-makers to improve drought contingency and water supply vulnerability planning for small water systems and in rural, disadvantaged, and unincorporated communities across California. By examining drought contingency, preparedness, and response plans, this report highlights the need to shift drought management away from a reactionary model of responding to drought, and toward a proactive paradigm of drought preparedness that integrates an awareness of water supply vulnerability into all phases of water management. A selection of 16 drought contingency and water management plans were assessed for equity and inclusion based on five primary criteria that target DAC-specific needs and vulnerabilities (Figure 1)." (p. 6)

"This report examines and develops recommendations for drought contingency and water supply vulnerability planning in small water systems and for rural, disadvantaged, and unincorporated communities across California. We developed the recommendations by evaluating 16 local and regional drought contingency plans, conducting 45 interviews with agency and

community representatives, and reviewing California's relevant drought and water- related policies." (p. 18)

Relevant findings reported:

12a: Move away from a "one-size-fits-all" drought management strategy to a strategy prioritizing community needs—particularly in the state's disadvantaged communities. Identify and prioritize communities that have the highest water supply and drought vulnerability, when allocating water resources and throughout the planning process. [SF5]

12b: Develop mapping and decision-support tools to empower state and local water policymakers with the information they need to support proactive drought and water supply vulnerability contingency planning and inform sound policymaking. [SF2] [SF3]

12c: Integrate and coordinate drought management systems in order to preserve institutional memory and build collaborative partnerships with stakeholders. [SF4]

12d: Improve and require drought contingency plans for disadvantaged communities by following best practices. [SF5]

12e: Include drought provisions in disaster fund measures, such as California Disaster Assistance Act, to include drought as a covered disaster under the statute's definition of disaster, and to lift strict constraints to ensure funding can be used for multi-benefit drought solutions. [SF1]

12f: Account for the impacts of climate change in drought and groundwater management, and use drought mitigation and adaptation as a strategy to make communities resilient to changes in water supplies. Drought and other water supply crises should be viewed as an opportunity to improve the effectiveness of response plans and to enact permanent changes in water policy and water management. [SF5]

12g: Provide adequate funding to support drought and water supply contingency planning processes to ensure vulnerable

communities have adequate resources to manage and respond to drought and water supply vulnerability. [SF1]

Study 13

A Framework and Tool for Evaluating California's Progress in Achieving the Human Right to Water

Carolina Balazs (et al.); Office of Environmental Health Hazard Assessment (January 2019)

Context/goals/assumptions of the study:

"Recently, the Board enlisted the expertise of the Office of Environmental Health Hazard Assessment (OEHHA) to develop a framework for evaluating the quality, accessibility, and affordability of the state's domestic water supply. Once populated with data, the framework described in this report can be used as a tool to track changes and needs across the state's community water systems and across the framework's three principal analytic components – water quality, accessibility, and affordability. This marks the first state-led effort to develop a conceptual framework and method for assessing the status of the state's water systems in the context of AB 685 and tracking progress in achieving the statute's broad policy goals. Other related efforts focus on one aspect of water service, or present results at a single point in time. This framework and tool will uniquely offer information that can be viewed over time, at the state or system-level, across all three principal components of the State's human right to water." (p. 2)

Relevant findings reported:

This report provides a data framework for evaluating and tracking potentially vulnerable small water systems and rural communities. It is useful for DWR's first directive, but it does not provide findings useful for the second directive.

Study 14

Drought Contingency Plan Template 03-24-2014-Final

Indian Health Service, California Area, Office of Environmental Health and Engineering (March 2014)

Context/goals/assumptions of the study:

"The Drought Contingency Plan (Plan) is a framework of forward-leaning planning for scenarios and objectives, managerial and technical actions, and potential response systems in order to prevent, or better respond to, a drought-related emergency or critical situation. The overall goal of the Plan, and the contingency planning process, is to facilitate rapid emergency response. The intention of the Plan is to be functional, flexible, and easy to implement, and also serve as a tool for maintaining control over the events or limiting the risk of loss of control. The Plan should be periodically updated." (p. 1)

Relevant findings reported:

14a: Document presents a template for use in developing a localized, small water system drought contingency plan, including triggering stages and response actions. [SF5]

Study 15

Basic & Urgent: Realizing the Human Right to Water & Sanitation for Californians Experiencing Homelessness

Environmental Law Clinic at University of California Berkeley and Environmental Justice Coalition for Water (August 2018)

Context/goals/assumptions of the study:

"This report, prepared by the University of California Berkeley Environmental Law Clinic (ELC) for use in advocacy efforts by the Environmental Justice Coalition for Water (EJCW): (1) examines the lack of access to water and toilets faced by California's unsheltered residents; (2) explores existing efforts towards, barriers to, and opportunities for ensuring such access; and (3) recommends minimum standards for access to water and sanitation by homeless Californians. It also proposes policy and programmatic interventions for achieving those standards." (Executive Summary, p. i)

Relevant findings reported:

15a: Establish minimum state standards for access to water and sanitation, and incentivize compliance. [SF9]

15b: Create municipal incentives for new developments to include publicly accessible drinking fountains and toilets. [SF9]

15c: Identify and pursue partnerships to expand non-encampment-tied services. [SF9]

15d: Ensure all public drinking fountains are operational, accessible, and remain in good repair. [SF9]

15e: Ensure all public toilets are operational, accessible, clean, safe, and in good repair. [SF9]

15f: Provide ongoing basic services (potable water, toilets, hand washing stations, and showers) at all established encampments. [SF9]

Summary of the List of Findings

The findings extracted from each literature source were evaluated and synthesized to develop a set of common findings (see *Findings* section of this review). The relationship between each literature source and the synthesized findings are presented in Table 3. This can help CDAG return to specific literature sources and/or authors to quickly reference relevant ideas and detailed findings.

The synthesized findings can be useful when CDAG discusses elements to be considered when developing guidance relating to the development and implementation of countywide drought and water shortage contingency plans. These plans intend to address the planning needs of small water suppliers and rural communities.

Table 3. Relationship of Literature Sources and Synthesized Findings

		Findings								
		SF1	**SF2**	**SF3**	**SF4**	**SF5**	**SF6**	**SF7**	**SF8**	**SF9**
Literature Reviewed										
1	Californians w/o Safe Water (CA Water Plan 2013)	X	X		X		X	X		X
2	Measuring Progress (Pacific Institute 2018)	X	X							
3	Managing Drought (PPIC 2018)	X				X	X			
4	The Struggle for Water Justice (UCD 2018)	X	X	X			X	X		
5	Drought Management (UCD 2018)	X		X	X		X	X	X	
6	Bringing Water/Land Use Together (Local Gov Com 2018)				X		X			
7	Broadening Understanding of Drought (Univ of Ariz 2018)		X		X	X				
8	Making Water Conservation a Way of Life (DWR 2017)		X			X				
9	Drinking Water Vulnerability Tool PPT (WESS 2018)									
10	Enhancing Resiliency (WERF 2014)					X				
11	Drought and Equity in CA (Pacific Institute 2017)	X	X	X		X	X	X	X	
12	Drought and Water Supply Vulnerability (CWC 2018)	X	X	X	X	X				

Table 3. Relationship of Literature Sources and Synthesized Findings (contd.)

		Findings								
		SF1	**SF2**	**SF3**	**SF4**	**SF5**	**SF6**	**SF7**	**SF8**	**SF9**
13	A Framework/Tool for Evaluating Progress (OEHHA 2019)									
14	Drought Contingency Plan Template (IHS 2014)									
15	Basic & Urgent (ELC/EJCW 2018)					X				X

	Summary of Findings
SF1	Funding and Financing: Improve access to funding sources for drought planning and drought mitigation project implementation. Priorities should include streamlining the application processes to reduce the level of effort, modifying the threshold requirements to target disadvantaged communities, especially disadvantaged unincorporated communities (DUCs) with at-risk drinking water sources or systems, defining "drought" as a qualifying emergency, and making funds available during non-drought periods to support advanced and proactive planning and solutions. Consider modifying the determination of "income" to assure at-risk DUCs are appropriately meeting qualification thresholds.
SF2	Data and Tools: Need for coordination among local, regional, state and federal agencies to collaborate on a consistent set of indicators to help counties monitoring rural communities and small water systems vulnerable to droughts and water shortages. State-managed and financed data collection, data management, and data storage, along with routine development, reporting, and dissemination of vulnerability mapping.
SF3	Outreach and Education: Need for financed creation and distribution of drought planning tools and templates, including educational outreach materials for use by small water systems and within rural communities. Education materials should target hard-to-reach water users such as renters, multi-unit housing occupants, and users with language barriers. Increase research for DUC oriented safe water solutions.

Table 3. Relationship of Literature Sources and Synthesized Findings (contd.)

Summary of Findings (contd.)	
SF4	Technical Assistance and Capacity Building: Provide state-financed personnel and management resources to high-risk DUCs to facilitate planning, prevention and mitigation for drought and water shortage vulnerabilities. Provide venues for local coordination and knowledge transfer. Include diverse expertise and representation (e.g. community advocates, local system operators, disadvantaged self-supplied or small water system users, large system operators.)
SF5	Regional Planning and Coordinated Communication: Require responsible regional parties to demonstrate drought preparedness for all water users within defined boundaries (e.g. through Hazard Mitigation Plan, General Plan Updates, or stand-alone programs). Encourage development of drought plans when not in the midst of a drought, and to perform monitoring and plan-updates on a routine basis – including communications with State, regional and local agencies to assure data sharing.
SF6	Land-use Plans: Require land-use planning to address conditions of on-going water shortage vulnerability (e.g. due to water quality or other factor), especially for disadvantaged communities. Encourage land use planning to limit the creation or worsening of water shortage conditions for small water systems and rural communities. Include emphasis on water system infrastructure investments prior to new developments (e.g. consolidation, water system upgrades, or water system interties prior to land-use modifications). Improve county well permitting processes to recognize water limitations and vulnerabilities.
SF7	Consolidation: Emphasize consolidation of small water systems, especially those at risk to or already facing safe water concerns. When impractical, facilitate support from local urban water suppliers to provide technical expertise, emergency response, mutual aid, and service interties.
SF8	Rate Restructuring: Refine small water system billing to reduce financial impact of drought surcharges on low-income customers, while helping small water system operators obtain adequate revenues to assure stable operations during droughts (e.g., state funding sources, disadvantaged community rate-assistance funding).
SF9	Human Right to Water: Assure state, regional, and local land-planning and water supply and management entities continue to focus on implementing actions to achieve the policy goals within California Water Code Section 106.3 (AB 685).

Exhibit 1

SF1 **Funding and Financing**: Improve access to funding sources for drought planning and drought mitigation project implementation. Priorities should include streamlining the application processes to reduce the level of effort, modifying the threshold requirements to target disadvantaged communities, especially disadvantaged unincorporated communities (DUC)[2] with at-risk drinking water sources or systems, defining "drought" as a qualifying emergency, and making funds available during non-drought periods to support advanced and proactive planning and solutions. Consider modifying the determination of "income" to assure at-risk DUCs are appropriately meeting qualification thresholds.

Study Findings:

	Short Term
1d	State government should remove barriers to local and regional funding for water projects conducted to support disadvantaged and environmental justice communities.
1g	State Water Board and other state agencies should submit an endorsement letter to the U.S. Environmental Protection Agency and Congress supporting an increase in the funding allocation (currently at 2 percent) for the Safe Drinking Water Act Drinking Water Infrastructure Tribal Set-Aside and Clean Water Act Indian Set-Aside Programs.
2a	Use the Eligibility for Customer Assistance Program (ECAP) metric described in "Ancillary Performance Indicators for Affordable Water and Sanitation" to qualify households for a water affordability assistance program.
11g	(2) Provide technical and financial assistance to water utilities, especially the smallest ones, to implement drought charges that do not unfairly burden low-income households
12e	Include drought provisions in disaster fund measures, such as California Disaster Assistance Act, to include drought as a covered disaster under the statute's definition of "disaster," and lift strict constraints to ensure funding can be used for multi-benefit drought solutions.

[2] A Disadvantaged Unincorporated Community (DUC) "means a fringe, island, or legacy community in which the median household income is 80 percent or less than the statewide median household income. California Government Code Section 65302.10(a)(2).

	Long Term
3d	Find the money. Reliable funding is crucial for adapting to climate change. New sources are needed to pay for necessary water-management investments and to fill funding gaps in the state's water system.
4b	Create larger, more stable, more equitably distributed and coordinated sources of funding that focus on addressing historic patterns of inequitable access to resources.
5a	Small water systems need assistance...and this likely requires different approaches than what is provided to larger systems.
5b	Need better income surveys in rural areas to more accurately capture demographics of water system customers.
5c	Defining disadvantaged communities should be specific for drinking water sector (for purposes of financial assistance qualifications).
12g	Provide adequate funding to support drought and water supply contingency planning processes to ensure vulnerable communities have adequate resources to manage and respond to drought and water supply vulnerability.

SF2 **Data and Tools**: Need for coordination among local, regional, state, and federal agencies to collaborate on a consistent set of indicators to help counties monitoring rural communities and small water systems vulnerable to droughts and water shortages. Improve state managed and financed data collection, data management, and data storage, along with routine development, reporting, and dissemination of vulnerability mapping.

Study Findings:

	Data
1a	State, regional, and local governments should coordinate to estimate the statewide total population without safe water including those residing in areas served by a State small water system, local small water system, or private domestic well.
1b	State, regional, and local governments, along with interested stakeholders, should coordinate to develop performance metrics and track the progress of achieving safe drinking water and sanitation for all Californians. Periodic progress reports should be prepared that show what improvements have been made and what additional actions are needed.
2b	Collect information on service disconnections that distinguishes between occupied and unoccupied residences.

	Data
2c	Identify Public Water Systems that persistently fail to deliver water that meets Safe Drinking Water Act standards.
2d	Adopt a single, consistent set of indicators and performance measures, and designate a single entity entrusted with regularly assessing those metrics.
2e	Investigate quality of water delivered by Very Small [Water] Systems, i.e., domestic wells.
5b	Need better income surveys in rural areas to more accurately capture demographics of water system customers.
6d	Require additional sophistication (better data and analytics) in growth projections and coordinated regional planning for both land-use planning and water-management agencies.
7b	Drought vulnerability is dynamic and changes with adaptation decisions made during a drought. Drought relief and planning needs continual assessments to consider the redistribution of drought risk given different adaptation decisions.
8a	Reporting and Data Recording – Improved data collection, management, analysis, sharing, and transparency at all levels is foundational to the ability to plan. Data analysis will allow for better coordination among stakeholders and improve on both long-term actions as well as immediate responses to drought risks, especially in rural communities.
11d	Systematically collect information on water shortages for public and non-public water systems.
11e	Identify areas where private wells and other non-public water systems are likely to run dry in future droughts.
	Tools
4d	Improve public access to data and planning tools, enhance existing data systems, and coordinate monitoring systems efforts.
4e	Develop new publicly accessible data and mapping tools to improve local and regional planning.
8b	Communications Planning – Improved monitoring and communications among stakeholders, from the State, through the counties, and to the water suppliers and citizens.
11a	Establish a statewide, quantitative metric for measuring water supply reliability for public water systems.
12b	Develop mapping and decision-support tools to empower State and local water policymakers with the information they need in order to support proactive contingency Drought and Water Supply Vulnerability Contingency planning and inform sound policymaking.

SF3 **Outreach and Education:** Need for financed creation and distribution of drought planning tools and templates, including educational outreach materials for use by small water systems and within rural communities. Education materials should target specific audiences of water users such as renters, multi-unit housing occupants, and users with language barriers. Increase research for DUC-oriented safe water solutions.

Study Findings:

4f	Address Outstanding Research Needs.
5d	Need continued and improved outreach to and education of consumers about the value of water, the importance of conservation, and the potential repercussions of not conserving.
5e	Need unified messaging (templates) to save staff time and resources and create a consistent message.
5i	Need ongoing water conservation outreach programs, rate restructuring, infrastructure updates, and maintaining working relationships among and between systems, non-governmental organizations, and the State government.
11g	To reduce the inequitable impact of drought charges on low-income households, we recommend the following: (2) Provide technical and financial assistance to water utilities, especially the smallest ones, to implement drought charges that do not unfairly burden low-income households; (3) Target water conservation and efficiency programs to low-income households by offering, for example, point-of-sale coupons, targeted education and outreach, and direct-install programs; (6) Develop approaches that effectively target hard-to-reach customers, such as renters and residents of multi-unit buildings, for rate assistance and conservation programs.
12b	Develop mapping and decision-support tools to empower State and local water policymakers with the information they need in order to support proactive contingency Drought and Water Supply Vulnerability Contingency planning and inform sound policymaking.

SF4 **Technical Assistance and Capacity Building**: Provide state-financed personnel and management resources to high-risk DUCs to facilitate planning, prevention, and mitigation for drought and water shortage vulnerabilities. Provide venues for local coordination and knowledge transfer. Include diverse expertise and representation (e.g., community advocates, local system operators, disadvantaged self-supplied or small water system users and large system operators).

Study Findings:

Technical Assistance	
1f	State Water Board and other State agencies that provide funding to third-party technical assistance providers to assist small water and wastewater systems should allow tribal water and wastewater systems to be eligible to receive this technical assistance.
7a	Planning for future droughts improves with the coordination and participation of diverse experts with knowledge of local communities and different dimensions and scales of well-being. The response to the human impact of the drought in California required the coordination and engagement of government officials, community leaders, farmworker activists, and non-profits involved in water security, food security, health, and employment training.
5i	Need ongoing water conservation outreach programs, rate restructuring, infrastructure updates, and maintaining working relationships among and between systems, non-governmental organizations, and the State government.
6e	Advocate for water access and affordability for community members facing disadvantages.
Capacity Building	
5f	Need State financial support to increase staff capacity for small [water] systems.
5h	Work with other smaller [water] systems to plan for extreme events.
6f	Provide venues for local leaders in both the water and land-use sectors to interact with one another (to build relationship, share ideas, and eventually collaborate).
6g	Develop regional leaders in both the water and land-use sectors and provide opportunities for them to interact with one another.
12a	Move away from a "one size fits all" drought management strategy to a strategy prioritizing community needs, particularly in the State's disadvantaged communities. Identify and prioritize communities that have the highest water supply and drought vulnerability when allocating water resources and throughout the planning process.

SF5 **Regional Planning and Coordinated Communication**: Require responsible regional parties to demonstrate drought preparedness for all water users within defined boundaries (e.g., through Hazard Mitigation Plan, General Plan Updates, or stand-alone programs). Encourage development of drought plans when not in the midst of a drought and perform monitoring and plan-updates on a routine basis—including communications with state, regional, and local agencies to assure data sharing.

Study Findings:

Regional Planning	
3a	Plan ahead. Stronger drought planning is critically important for urban water management, groundwater sustainability, safe drinking water in rural communities, and freshwater ecosystems.
7b	Drought vulnerability is dynamic and changes with adaptation decisions made during a drought. Drought relief and planning needs continual assessments to consider the redistribution of drought risk given different adaptation decisions.
7c	Greater inclusion and representation of vulnerable groups in drought and water resource planning and management is needed.
8c	County Demonstration of Drought Planning — While some portion of a county's citizenry may be covered by an urban supplier's WSCP or a small suppliers' drought plan (not required), there is nothing currently available to demonstrate that drought risk is being addressed for all county citizens. To address this need, counties may submit drought planning information to the EO Agencies through documents such as: Drought-specific protocols defined in a county (or multi-jurisdictional) Hazard Mitigation Plan. A County Drought Plan.
10a	To build resilience, communities must embrace both emergency response and long-term preparedness.
11b	Require water shortage contingency plans for all public water systems and establish regional plans for non-public systems.
12a	Move away from a "one size fits all" drought management strategy to a strategy prioritizing community needs, particularly in the state's disadvantaged communities. Identify and prioritize communities that have the highest water supply and drought vulnerability when allocating water resources and throughout the planning process.
14a	Document presents a template for use in developing a localized, small water system drought contingency plan, including triggering stages and response actions.

Coordinated Communications	
8b	Communications Planning — Improved monitoring and communications among stakeholders, from the State, through the counties, and to the water suppliers and citizens.
8d	Roles and Responsibilities — Defined State Agency and county roles, responsibilities, and funding mechanisms.
8e	Coordination — The EO Agencies and the county, working with stakeholders, should coordinate with SGMA efforts to assure drought planning and responses are reflected in Groundwater Sustainability Plans (where applicable).
10b	The complex array of decisions needed to support resilience within a basin requires coordination across water service areas and jurisdictional boundaries.
12d	Improve and require drought contingency plans for disadvantaged communities by following the best practices detailed in section 4.
12f	Account for the impacts of climate change in drought and groundwater management and use drought mitigation and adaptation as a strategy to make communities resilient to changes in water supplies. Drought and other water supply crises should be viewed as an opportunity to improve the effectiveness of response plans and to enact permanent changes in water policy and water management.

SF6 **Land-Use Plans**: Require land-use planning to address conditions of ongoing water shortage vulnerability (e.g., because of water quality or other factors), especially for disadvantaged communities. Encourage land-use planning to limit the creation of, or worsening of, water shortage conditions for small water systems and rural communities. Include emphasis on water system infrastructure investments prior to new developments (e.g., consolidation, water system upgrades, or water system interties prior to land-use modifications). Improve county well-permitting processes to recognize water limitations and vulnerabilities.

Study Findings:

Land-Use Plans	
3c	Update water allocation rules. California should comprehensively update its water allocation governance. The goals should be to find equitable and efficient ways to allocate limited supplies among competing demands during dry times while promoting efforts to capture and store water during wet times.
4c	Ensure that local governments comply with land use and annexation laws to address the legacies of discriminatory local planning practices.
6a	Prioritize infrastructure investments that support existing communities, especially underserved communities, before new development.
6b	Ensure State and local investments are directed toward multi-solving through green infrastructure projects developed at local scales with robust community engagement.
6c	Incentivize or require cross-sector, coordinated planning and management of land use, water, flood mitigation and climate adaptation.
6d	Require additional sophistication (better data and analytics) in growth projections and coordinated regional planning for both land-use planning and water-management agencies.
6h	Build local political will and understanding around water and land-use integration by convening and educating local leaders.
Infrastructure	
3b	Upgrade the water grid. California needs a comprehensive program to address above- and below-ground storage, conveyance, and operational challenges by mid-century, including repairing facilities that are broken, expanding conveyance and storage capacity, and modernizing and integrating operations.
5i	Need ongoing water conservation outreach programs, rate restructuring, infrastructure updates, and maintaining working relationships among and between systems, non-governmental organizations, and the State government.
6a	Prioritize infrastructure investments that support existing communities, especially underserved communities, before new development.
11c	Increase oversight of new private wells.

SF7 **Consolidation**: Emphasize consolidation of small water systems, especially those at risk of, or already facing safe water concerns. When this is impractical, facilitate support from local urban water suppliers to

provide technical expertise, emergency response, mutual aid, and service interties.

Study Findings:

1e	State government should provide incentives for the consolidation, acquisition, or improved management of small water systems.
4a	Develop and strengthen consolidation and service extension mandates and incentives.
5g	Agreements between larger and smaller [water] systems to create more equitable distribution of financial and technical assistance.
11f	Identify areas where water system consolidation can resolve supply problems.

SF8 **Rate Restructuring**: Refine small water system billing to reduce financial impact of drought surcharges on low-income customers, while helping small water system operators obtain adequate revenues to assure stable operations during droughts (e.g., state funding sources or disadvantaged community rate-assistance funding).

Study Findings:

5i	Need ongoing water conservation outreach programs, rate restructuring, infrastructure updates, and maintaining working relationships among and between systems, non-governmental organizations, and the State government.
11g	To reduce the inequitable impact of drought charges on low-income households, we recommend the following: (1) Ensure drought surcharges are not applied to basic water use, preferably by calculating household water budgets based on the number of people in a residence; (3) Target water conservation and efficiency programs to low-income households by offering, for example, point-of-sale coupons, targeted education and outreach, and direct-install programs; (4) Develop low-income rate assistance programs within current legal constraints and reform Proposition 218 to allow greater latitude in funding such programs; (5) Wherever possible, require meters and submeters to allow for more equitable drought charges based on volumetric water use; (6) Develop approaches that effectively target hard-to-reach customers, such as renters and residents of multi-unit buildings, for rate assistance and conservation programs.

SF9 **Human Right to Water**: Assure state, regional, and local land-planning and water supply and management entities continue to focus on implementing actions to achieve the policy goals within California Water Code Section 106.3 (AB 685).

Study Findings:

1c	Ensure implementation of the policy goals within California Water Code Section 106.3 (AB 685), which states that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes.
15a:	Establish minimum State standards for access to water and sanitation and incentivize compliance.
15b:	Create municipal incentives for new developments to include publicly accessible drinking fountains and toilets.
15c:	Identify and pursue partnerships to expand non-encampment-tied services.
15d:	Ensure all public drinking fountains are operational, accessible, and remain in good repair.
15e:	Ensure all public toilets are operational, accessible, clean, safe, and in good repair.
15f:	Provide ongoing basic services (potable water, toilets, hand washing stations, showers) at all established encampments.