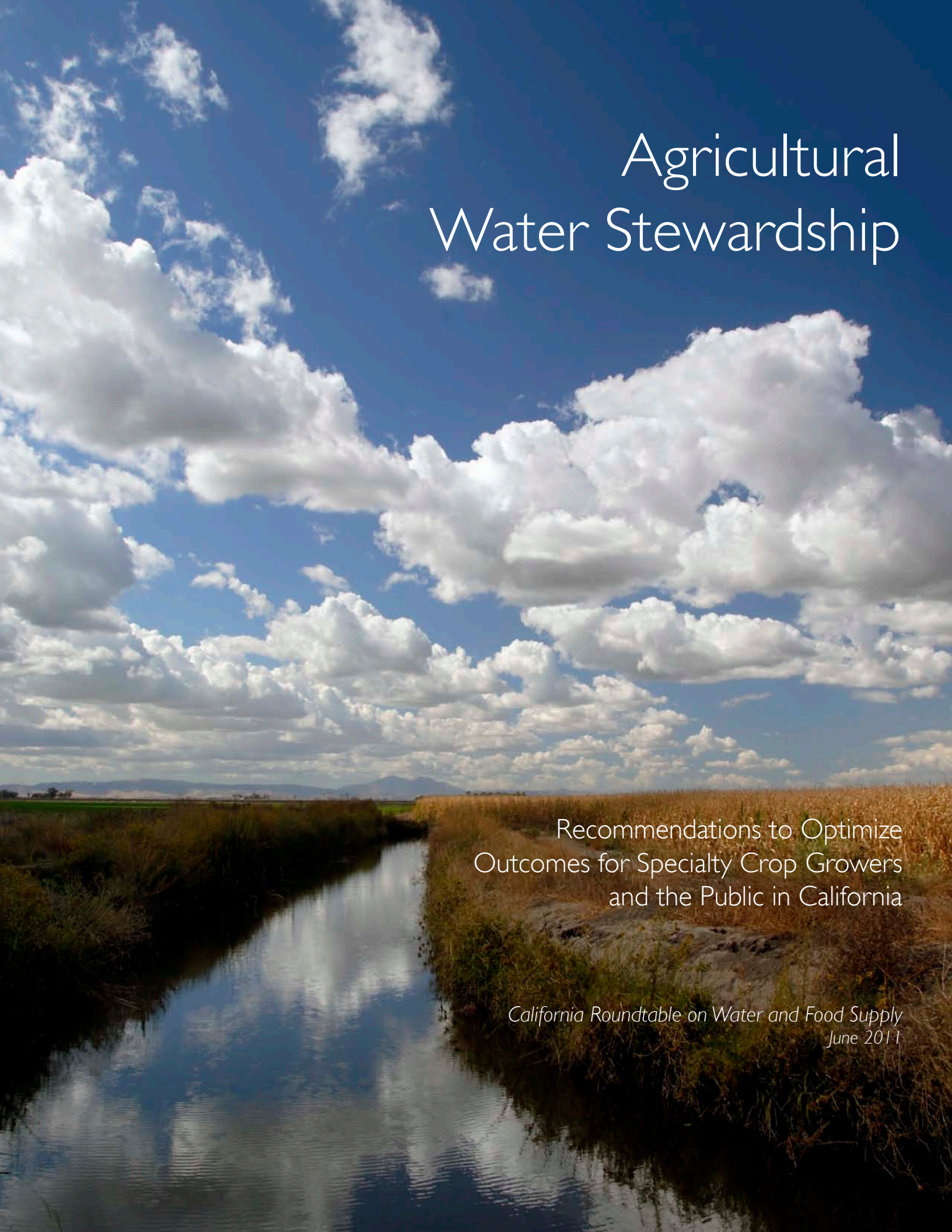

Agricultural Water Stewardship

Recommendations to Optimize Outcomes for Specialty Crop Growers and the Public in California

California Roundtable on Water and Food Supply
June 2011

About the California Roundtable on Water and Food Supply

The California Roundtable on Water and Food Supply is a consensus-based forum to uncover obstacles, identify solutions, and take action to enhance water security for agriculture,[i] the public and the environment. Participants share a dedication to a healthy and balanced future for California and each bring deep experience on issues at the intersection of water supply and agriculture to the table. The Roundtable membership represents a broad and balanced cross-section of stakeholders including, but not limited to, representatives from specialty crop agriculture, water supply management, government, fish and wildlife, natural resources, stewardship, environmental justice, rural economic development, and academia. Recognizing that polarized debates on water in California often end at impasse, the Roundtable first came together in the summer of 2010 with the conviction that a creative and frank "off-the-record" dialogue could help draw out the wisdom and ideas needed to develop strong new pathways forward for water management in California. Roundtable members have found significant common ground even amidst ongoing water debates.

Roundtable members identified agricultural water stewardship as a key area of importance for sound long-term water management. The group held a series of meetings to build a common understanding of agricultural water use, develop a unified set of principles that underlie long-term solutions, and create recommendations for decision-makers and the public on balanced solutions to tough agricultural water issues. This report is the product of those efforts.

The following individuals participated in the California Roundtable on Water and Food Supply dialogue on agricultural water stewardship and contributed to this report:

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***The opinions and recommendations made by CRWFS do not necessarily reflect those of the organizations with which members are affiliated.**

[i] Throughout this report, the term "agriculture" refers exclusively to production of specialty crops in California.

Water Stewardship

A Lens for Sound Water Policy and Management

"Moving water is the most complex and artful thing we do as farmers."

–Danny Merkley

The challenges associated with water supply, distribution, and use are the subject of substantial conflict and widely divergent perspectives. Yet there is broad agreement that demands on water supply in many regions of California increasingly exceed availability, particularly given the constraints of current water infrastructure and use patterns. Clearly, a broad set of solutions will be needed to address the growing problems associated with water management. In addition, the inherently regional nature of these problems mandates different approaches in different contexts.

One common call has been for the agricultural sector to improve water management and reduce overall consumption of water. Practices that reduce applied water to agricultural lands represent a powerful and broadly supported solution set. For example, water conservation can help to protect the quality of groundwater and surface water, save farmers money, augment stream flows, reduce tailwater runoff, conserve energy, and store water for subsequent drought periods.

But these outcomes are not universal. Reducing applied water may have undesirable outcomes. In some cases, the benefits of water applied over and above a crop's needs include availability for on-farm re-use, groundwater recharge, the provision of wildlife habitat, or supply of runoff for possible use downstream. Eliminating farm runoff may be beneficial or detrimental to other water users, depending on several factors, such as water quality, water source, crop rotation, location of the farm within the watershed, and farm inputs. There is added concern in some cases that water conservation will reduce flexibility in the system, decrease yields, and increase economic risks for growers. Simply reducing agricultural water applications does not necessarily result in a net benefit at the farm or watershed levels.

Furthermore, agricultural water conservation has varying definitions,[1] which can impede collaboration on appropriate and effective solutions. For example, conservation may be interpreted to refer to reductions in applied water, a decrease in consumptive water use, a decline in the amount of freshwater flowing to salt sinks and polluted water bodies, or the elimination of wasted water through greater water use efficiency by agricultural crops. While each of these objectives has a role to play in good water management and policy, the California Roundtable on Water and Food Supply recommends "agricultural water stewardship" as a more useful concept to guide thinking and decision-making for agricultural water use within California.

Agricultural water stewardship can be defined as the use of water in a manner that optimizes agricultural water use while addressing the co-benefits of water for food production, the environment, and human health.

Agricultural Water Stewardship Builds Agricultural and Ecological Resilience

Agricultural water stewardship can be defined as the use of water in a manner that optimizes agricultural water use while addressing the co-benefits of water for food production, the environment, and human health. Agricultural

[1] See Glossary on page 9 for the definitions of key terms used in this report.

Beneficial Management Practices

Many practices that could enhance performance on a wide range of water stewardship indicators are already known, but their application should be expanded. Examples* of beneficial practices include:

On-farm stewardship practices

- Use of irrigation systems that are designed for optimum "distribution uniformity," with appropriate management to also achieve a high efficiency for each irrigation and location
- Improvement of relative timing of water applications and chemical and nutrient inputs to minimize aquifer pollution
- Tailwater ponds and return systems
- Vegetated filter strips
- Efforts to reinstate natural flows and hydrograph cycles
- Restoration of riparian corridors and other waterways for multiple ecosystem services (e.g., infiltration, soil and water quality, wildlife habitat, etc.)
- Soil management regimes to enhance infiltration and retention of water in soils, including cover crops, amendments, minimum tillage
- Soil moisture and crop water status monitoring
- Wind turbines for frost control
- Dry farming

Supply management

- Off-stream storage ponds for irrigation and frost protection
- Managed groundwater recharge using surplus irrigation water when chemical or nutrient (e.g., nitrate) runoff is low
- Wetlands for improving water quality and wildlife habitat
- Recycling of municipal water for agricultural use, with proper attention to water quality
- Measures to better match quality of water with intended use, including drinking water for rural communities
- Modification of conveyance capabilities to move flows to recharge areas

*This list is intended to illustrate the range of possible practices and is not an exhaustive or prioritized list.

water stewardship is premised on the notion that water management decisions cannot be made independent of ecological, social, and economic contexts. It takes into account local biogeographical considerations such as soil type, soil ecology, topography, agronomic inputs, and terrestrial and aquatic ecology. Agricultural water stewardship emphasizes whole-farm approaches that acknowledge the role of agriculture in the local watershed and community. Effective stewardship results in the provision of multiple types of ecosystem services—the human benefits garnered from well-functioning ecosystems, including agro-ecosystems. In summary, the local and regional context in which a farm operates will determine the best water management approaches to maximize water use efficiency, minimize adverse environmental impacts, and balance trade-offs for society as a whole.

Agricultural water stewardship takes into account a broad range of variables in identifying balanced solutions. Importantly, it embraces the full spectrum of solutions, from cutting-edge technology to the cultural and agro-ecological practices that enhance the ecological integration of farming and lead to improved water quality and supply management. Agricultural water stewardship should guide dialogue and decision-making for agricultural water management in California.

Recommendations

The members of the California Roundtable on Water and Food Supply have identified three key solution sets in the effort to improve and promote agricultural water stewardship:

1. Improve our knowledge base;
2. Build stronger support for growers; and
3. Foster smarter regulations.

Specific recommendations for each of these themes are provided below.

Create a Stronger Knowledge Base

A clear picture of the factors affecting water distribution and use in California is important to decision-making at the policy and farm levels, but is currently lacking. There is a need for better data collection and demonstration of water supply and distribution at basin scale, and better baseline data on water use to guide decision-making. However, in keeping with stewardship principles, a one-size-fits-all approach is impracticable and insufficient to address today's challenges; a watershed-by-watershed approach is required to identify appropriate and effective management solutions. We recognize that "good water management" is a moving target: knowledge and technologies are constantly evolving, as is the biophysical and socio-economic environment within which agricultural systems operate. Furthermore, because of the complexity of water supply issues in California, a concerted effort is needed to facilitate data interpretation and decision-making. The following activities support and address these needs.

A. Research Priorities

We recommend that the research, academic, and water information and management communities collaborate to address the following needs:

i. Collect better data for understanding basin-scale water balances, particularly empirical measurements of water use, return flows, and groundwater percolation. These data are necessary to comprehend the risks and benefits of management practices and determine the most appropriate and efficient means for enhancing groundwater recharge and water quality. This effort should include building a better understanding of the conditions under which agricultural water use efficiency and water conservation approaches (that may cause overall reductions in applied water) are beneficial to overall watershed health, and where they are detrimental.

ii. Design and generate an effective system of data dissemination regarding water use, delivery, and quality to support effective policy decision-making. Ensure that data collection does not unduly burden farm operators.

"Good water management" is a moving target: knowledge and technologies are constantly evolving.

iii. Develop clear and broadly supported indicators of success for agricultural water stewardship that increase the resilience of agriculture to fluctuating water supplies while maintaining or improving watershed health. These indicators are needed to help guide grower decision-making, direct funding and technical support, measure the effectiveness of relevant activities, policies and regulations, and ultimately influence widespread adoption of agricultural water stewardship practices.

iv. Undertake regional-scale research efforts to assist the agricultural community in solving or minimizing the magnitude of local water supply and quality challenges. Research should involve regional stakeholders in developing their own set of meaningful protocols, questions, and performance measures.

v. Enact a more efficient and effective information exchange system, including place-based guidance tools to provide agricultural producers with information about water management practices that work toward solving or mitigating identified problems at the farm and watershed levels.
vi. Develop empirical data and models to better quantify beneficial on-farm water stewardship management practices by region, basin, and, where possible, farm type.
vii. Evaluate the extent of conversion of irrigated lands from flood and furrow irrigation to drip and micro-sprinkler irrigation and how this has influenced demand for, or reliance on, surface water and groundwater for irrigation. In turn, assess how this has affected, or may potentially affect, groundwater depletion and recharge of specific groundwater basins or sub-basins in California. Identify potential implications this may have on future conjunctive water management efforts.
viii. Determine and clearly communicate the in-stream flows required to sustain aquatic ecosystems to inform and guide agricultural practices that may provide clear contributions to adequate in-stream flows.

B. Research and Data Communications Improvements

We recommend that research initiatives, whenever possible, involve agricultural and local communities early on to help identify research questions and priorities. We also encourage the research and education community to clearly communicate emerging research findings on practices and technologies to practitioners and the public. A targeted effort is needed to more effectively bridge new research findings on sound irrigation management, technology, and cultural practices with policy and practice. Furthermore, given the highly complex and fragmented nature of agricultural water use and management

Agricultural Water Stewardship: Guiding Principles

In an effort to achieve sound solutions to agricultural water management, decision-makers at all levels should consider the following guiding principles to maximize co-benefits of agricultural water use. Effective agricultural water stewardship approaches:

1. Sustain an efficient and competitive agricultural industry in California;
2. Contribute positively to the protection of farmland, local communities, and the environment;
3. Are cost-effective for growers to implement, and incentivized where appropriate;
4. Result in shared costs of implementing agricultural water stewardship practices, on the basis that everyone benefits from such practices (e.g., through maintenance of open space, improvement of water quality, increasing water quantity) and the water embodied in California specialty crops;
5. Do not undermine growers' water rights;
6. Are selected and applied based on local watershed conditions and needs, including protection of public trust resources and the needs of the broader societal system; and
7. Integrate into existing and ongoing planning processes and frameworks, including state and regional water quality control board planning (e.g., CV-SALTS) and Integrated Regional Water Management Planning, as suited to local conditions.

data, we recommend that steps be taken to improve coordination among all entities conducting research pertaining to agricultural water use and management (including public, private, federal, tribes, state, and irrigation districts, among others). This may also include an inventory of the places relevant knowledge resides (e.g., academic institutions, government bodies, individual researchers, etc.), in order to create a more unified and publicly available body of knowledge to inform decision-making at all levels.

2 Improve Support Mechanisms for Growers

Agricultural water stewardship approaches represent a key element of drought mitigation, climate adaptation, and flood management. Moreover, federal and state budget cutbacks have severely eroded the system of technical and financial support that is necessary to support improvements in on-farm water management practices. For example, funds for mobile irrigation labs that evaluate the performance of irrigation systems have been cut, Farm Bill conservation programs such as Environmental Quality Incentives Program, including the Ag Water Enhancement Program, are suffering further dramatic cutbacks, and technical support agencies including UC Cooperative Extension, USDA Natural Resources Conservation Service, local Resource Conservation Districts, and the two State University systems have all suffered substantial cuts in recent years, with additional cuts anticipated in the future. More support staff educated in irrigation and water stewardship practices are needed. They should be trained to conduct outreach and technical assistance, as even the programs that do exist are hampered by a lack of skilled staff.

Specialty crop producers generally recognize that agricultural water stewardship is important for both farm water security and environmental health. Growers are willing to implement sound on-farm practices, yet require assistance in responding to challenges resulting from the changing environmental and social context.

Of particular importance are mechanisms that disseminate information about regionally appropriate beneficial practices[2] and financing mechanisms that offset the cost and risks of implementing new practices and technologies. This is especially significant as securing annual operating capital through loans becomes more difficult due to mounting water and economic challenges.

A robust and renewed technical and financial investment in agricultural water stewardship is critical for the health of our farms and watersheds, and must be made a statewide priority. While we would like to see technical support programs strengthened, the recommendations below should also serve to bolster the adoption of on-farm and regional stewardship practices.

The Department of Water Resources Integrated Regional Water Management (IRWM) Planning processes currently underway, which cover most of California, will play a leading role in implementing agricultural water stewardship and closing the gap between state-level policy and local practice. While some IRWM plans have been successful in engaging the agricultural community (e.g., the Upper Kings Basin IRWM Plan), agriculture has typically been represented by water agencies in these processes. However, the funding and coordination opportunities that exist demand a broader and more direct participation of the agriculture sector in the IRWM planning process.

> We recommend that research initiatives, whenever possible, involve agricultural and local communities early on to help identify research questions and priorities.

The following actions are needed to help growers adopt agricultural water stewardship practices.

[2] 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.

A. Expand technical, financial, and peer support for agricultural water stewardship practices.

i. **Agriculture organizations** should:
   - √ Be actively involved in documenting and promoting crop-specific beneficial practices; and
   - √ Foster peer-to-peer education of beneficial management practices through organized field days and other programs.

ii. **Water Districts** should:
   - √ Document growers' experiences with alternative water management strategies along with pros and cons for various stewardship options (e.g., production, water quality, water use efficiency, etc.);
   - √ Include agricultural water stewardship approaches in their agricultural water management plans; and
   - √ Explore opportunities to connect growers with practices, funding, and other resources.

iii. **Policy advocates** should review relevant emerging policy to ensure that it reflects the framing of agricultural water stewardship that includes a watershed approach, and provides adequate technical and financial support for adoption of practices at the farm and regional scale.

iv. **State and federal agencies** should:
   - √ Collaborate to identify possible cross-cutting funding programs and incentives to increase adoption of on-farm and regional agricultural water stewardship approaches that achieve multiple objectives (e.g., activities to improve winter farm water retention while also contributing to flood management, groundwater recharge, surface water storage for summer use, improved in-stream flows, and enhanced wildlife habitat);
   - √ Ensure that there are sufficient future funds for (a) data collection, monitoring, and research, and (b) technical and financial support for the agriculture sector to implement agricultural water stewardship approaches. In particular, state and federal legislators and the Executive Offices should provide adequate funding and support for technical support programs such as those administered by UC Cooperative Extension, Resource Conservation Districts, and others.
   - √ Develop mechanisms to make permitting and accounting easier for groundwater conjunctive use; and
   - √ Ensure that adequate funding levels be provided to university irrigation teaching programs – not just research.

B. Enhance the ability of Integrated Regional Water Management processes to advance agricultural water stewardship solutions as part of their place-based focus.

i. **Agencies** engaged in the state's Integrated Regional Water Management Program, including the California Department of Water Resources, the State Water Resources Control Board and its nine Regional Water Quality Control Boards, Cal/EPA, the Natural Resources Agency and the California Energy Commission, along with the California Department of Food and Agriculture, should:
   - √ Foster increased participation of the agriculture sector in IRWM processes by:
     - Partnering with the State Board of Food and Agriculture and/or the California Department of Food and Agriculture to develop a plan to raise awareness about how the IRWM processes can support the needs of production agriculture;
     - Explicitly addressing and stating the important role the production agriculture community can play in IRWM planning and implementation on the website and in outreach materials;
     - Collaborating with local growers and related local support and service providers to identify specific solutions informed by stakeholder experiences;

- Expanding IRWM guidelines to emphasize a stronger connection to agricultural stakeholders, including farmers, agricultural organizations, and commodity groups;
- Including applicant scoring criteria that encourage the participation of the agriculture sector and provide a focus on agricultural water stewardship;
- Exploring performance-based scoring criteria to enhance effectiveness of IRWM Plans; and
- Examining other potential mechanisms to engage the agriculture sector to broaden and diversify representation.

√ Collaborate with the Department of Food and Agriculture and other organizations such as the Pacific Institute and the California Institute for Rural Studies to create a database of success stories and beneficial practices of agricultural water stewardship, in particular highlighting those fostered through IRWM projects, that could be replicated elsewhere;

√ Encourage the Regional Water Quality Control Boards to participate in all IRWM planning and implementation processes;

√ Cooperate to bring all nine Regional Water Quality Control Basin Plans up to date and have them recognized within the IRWM planning process; and

√ Urge regulatory agencies to pursue incentive approaches to encourage agricultural actors to participate in IRWM Regional Water Management Groups to more efficiently achieve water quality outcomes.

ii. IRWM Regional Water Management Groups (RWMGs) that have irrigated lands within their districts should:

√ Evaluate local opportunities to reach out to, engage, and promote leadership by the agricultural community in planning and implementation processes, including farm owners, farm managers, water managers, and representative agricultural organizations including key commodity groups;

√ Examine and implement, where appropriate, agricultural water stewardship and efficiency measures at the individual farm and regional scales; and

√ Evaluate and implement mechanisms for channeling funds toward technical support and financial incentives for adopting agricultural water stewardship approaches. Water suppliers, Cooperative Extension, Resource Conservation Districts, and other technical support entities may be appropriate conduits.

iii. Agriculture organizations should:

√ Evaluate opportunities for greater involvement in IRWM processes;

√ Educate their members about IRWM plans and their potential to integrate the needs of the agricultural community; and

√ Encourage and support their members in actively participating in IRWM proposal development and implementation where appropriate.

3 Move Toward Outcome-Based Policy and Regulatory Frameworks that Foster Agricultural Water Stewardship

Regulation of agricultural water supply and quality in California is highly complex. Examples of regulations that govern agricultural water use include the Porter-Cologne Act and California Water Code (including the Irrigated Lands Regulatory Program and a suite of amendments in 2009), US Bureau of Reclamation law, the Clean Water Act and other protections for water quality and natural resources (including the federal and state Endangered Species Acts, related biological opinions, and the Central Valley Project Improvement Act), specific regulations and guidance applied by individual

irrigation districts, and recent court decisions. The many agencies and laws involved lead to substantial obstacles hindering creation of a coherent and navigable system for the agricultural community. State and federal policy must be designed to be consistent with local policy, conditions, and needs. This regulatory conundrum must be resolved in order to develop locally appropriate, incentive- and outcome-based models to support growers in adopting water stewardship approaches that do not undermine environmental and human health. These objectives require the following changes to regulatory processes.

State and federal policy must be designed to be consistent with local policy, conditions, and needs.

i. State government should:

- √ Collaborate with stakeholders to set the needed legislative and regulatory (as well as water resource management plans') goals, objectives, guidelines, and data standards to improve surface and groundwater management, and then direct the IRWM RWMGs to determine the mix of resource management strategies to be used to meet state objectives. RWMGs should then be required to submit implementation and finance plans describing how they will pursue appropriate strategies/actions and document compliance.
- √ Explore ways to foster RWMGs as a forum to achieve goals or standards required by regulatory agencies. Explore the following criteria for regulatory decision-making:
  - Regulatory processes that support "local" and "regional" solutions with consistent metrics of accountability, transparency, and performance standards;
  - Engagement of the agricultural community in collaborative development of regulations and policies to advance agricultural water stewardship; and
  - Regulatory processes that recognize and promote practices and projects that result in stewardship benefits.

ii. Engage the agriculture and water conservation communities in developing adaptive management approaches to enhance in-stream flows for the SWRCB's 132 priority rivers and streams. Encourage IRWM RWMGs to take leadership in cases where these groups overlap with priority streams.

iii. Coordinate among agencies to ensure successes and progress are both complementary and synergistic, and result in multiple types of ecosystem services for various sectors of society.

Collectively, these actions to strategically build the knowledge needed to make effective policy decisions, adequately support growers in taking action, and coordinate policy and regulations to meet local needs, represent an important and substantial step toward a sustainable water future for California. Agricultural water stewardship is a critical framework to inform policy and practice, and serves to bridge the gap between local on-the-ground realities and policy-making as we strive to balance various water needs in the state.

Glossary

Agricultural water use efficiency*

The ratio of applied water to the amount of water required to sustain agricultural productivity. Efficiency is increased through the application of less water to achieve the same beneficial productivity or by achieving more productivity while applying the same amount of water.

Applied water*

The total amount of water that is diverted from any source to meet the demands of water users without adjusting for water that is used up, returned to the developed supply or irrecoverable. It is the quantity of water delivered to the intake to a city water system or factory or a farm headgate, directly or by incidental flows to a marsh or wetland for wildlife areas. For existing instream use, applied water demand is the portion of the streamflow dedicated to instream use or reserved under the federal or State Wild and Scenic Rivers acts or the flow needed to meet salinity standards in the Sacramento-San Joaquin Delta under State Water Board standards.

Consumptive use*

A quantity of applied water that is not available for immediate or economical reuse. It includes water that evaporates, transpires, or is incorporated into products, plant tissue, or animal tissue. Consumptively used water is removed from available supplies without return to a water resource system (uses such as manufacturing, agriculture, landscaping, food preparation, and in the case of Colorado River water, water that is not returned to the river.)

Agricultural water stewardship

The agricultural use of water in a manner that optimizes agricultural water use while addressing the co-benefits of water for food production, the environment, and human health. Agricultural water stewardship is premised on the notion that water management decisions cannot be made in isolation of the ecological, social, and economic context. It emphasizes whole-farm, place-based approaches that recognize the role of agriculture in the local watershed, and of local biogeographical conditions such as soil type, soil ecology, topography, and terrestrial and aquatic ecology in water management decisions.

*Definitions drawn from: "California Water Plan Update 2009 Glossary." *California Water Plan Update 2009*. Vol. 4 Reference Guide.

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