CA State Board of Food and Agriculture

CRAIG McNAMARA, PRESIDENT

Craig McNamara
Board President
Owner, Sierra Orchards

Joshua Eddy
Executive Director

Ashley Boren
Executive Director
Sustainable Conservation

Donald Bransford, Owner
Bransford Farms

Don Cameron,
General Manager,
Terranova Ranch, Inc.

Nancy Casady
General Manager
Ocean Beach People's
Organic Food Co-Op

Helene Dillard, Dean
College of Agricultural
And Environmental
Sciences, University of
California, Davis

Ben Drake, President
Drake Enterprises

Michael Gallo, Co-owner
Joseph Gallo Farms

Eric Holst,
Senior Director,
Environmental Defense
Fund

Mary Holz-Clause, Dean
College of Agriculture
California State
Polytechnic University,
Pomona

Bryce Lundberg,
Vice President,
Lundberg Family Farms

Martha Montoya,
President,
Los Kitos Produce

Miles Reiter,
Chairman and CEO,
Driscoll Strawberry
Associates, Inc.

Joy Sterling, CEO
Iron Horse Vineyards

May 13, 2016

Ms. Jeanine Townsend
Clerk to the Board
State Water Resources Control Board
P.O. Box 100
Sacramento, CA 95814

RE: Comments to A-2239(a)-(c).

Dear Members of the State Water Resources Control Board (SWRCB):

We appreciate the opportunity to provide comments on this important issue. The California State Board of Food and Agriculture (Board) is deeply concerned about the issue of safe drinking water and the communities impacted by groundwater quality. The Board is also concerned that as proposed the order would derail the cooperation built over the last decade between the Central Valley Regional Water Quality Control Board and broad stakeholder coalitions to focus on improving water quality.

The fact that the proposed order is a statewide program and a policy precedent for other agricultural areas is especially troubling because of the complexity of groundwater nitrate issues. A statewide program must take into account regional agricultural and aquifer characteristics. The existing Eastern San Joaquin order is in the early stages of data collection about nutrient management practices and has not had the time necessary to produce the results that are the goals we all share: improved nutrient management to protect groundwater and drinking water sources.

At its March 1, 2016 meeting of our Board we heard from a number of stakeholders, including members of the Agricultural Expert Panel and the Nitrogen Tracking and Reporting Task Force (copy attached). The proposed order would alter the scope and scale of the current nitrate analysis and reporting. This approach is inconsistent with the Agricultural Expert Panel's findings and the Nitrogen Tracking and Reporting Task Force's (Task Force) recommendations. Such an increase in data collection surpasses the threshold of reasonable and necessary to achieve the desired outcomes of improved nutrient management and ground water quality protection. We believe an economic impact assessment is required and that it would show very significant costs for such extensive data collection and analysis.

The Board maintains that the third party approach (agricultural coalitions), entities reporting in aggregate to state agencies, is the best avenue for reporting

requirements associated with Irrigated Lands Regulatory Program. The Agricultural Expert Panel, the Task Force, and other experts agree that grower reporting to third-party coalitions which summarize data at township or regional level, over at least three years for analysis, can provide the appropriate data necessary for assessment. (Nitrogen Tracking and Reporting Task Force: Final Report, pg. 14)

As proposed, the Board does not accept the reporting alternatives identified in the public notice and recommends the SWRCB not adopt the changes to the general order for the Eastern San Joaquin River Watershed. Rather, the Board encourages the SWRCB to reach out to the regional boards, members of its Agricultural Expert Panel and the Task Force to take advantage of the Memorandum of Understanding with California Department of Food and Agriculture for consultation on nutrient management to better understand the significant economic impact of this proposed order and the constraints of the existing infrastructure to accommodate the overly burdensome data collection.

To reiterate, the Board is committed to groundwater quality protection. We believe that the cooperative approach laid out above will be a much more effective alternative to those proposed. We are confident you will find other, more successful alternatives to achieving the desired outcome of groundwater quality protection.

Thank you for the opportunity to provide comments.

Sincerely,

Craig McNamara
President

CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

Nitrogen Tracking and Reporting Task Force

FINAL REPORT

December, 2013

Table of Contents

Acknowledgements 2

Executive Summary 3

I. Introduction 4

II. Background 6

III. Process 7

IV. Recommendation 13

Appendices 23

A. List of Task Force Members 23

B. List of Presenters and Systems Considered 24

C. Fact Sheet on State Water Resources Control Board Recommendations Addressing Nitrate in Groundwater Report . 25

D. Glossary 27

Acknowledgements

This report is the result of the efforts of a Task Force convened by Secretary Karen Ross, California Department of Food and Agriculture (CDFA), to identify an appropriate nitrogen tracking and reporting system. The objective of the Task Force was to provide meaningful and high quality data to help CDFA, the State Water Resources Control Board (State Water Board hereinafter) and the Regional Water Quality Control Boards address groundwater quality in nitrate high-risk areas in California. The Task Force included stakeholders and experts from agricultural organizations, academia, regulating agencies, and the environmental advocacy community (Appendix A – List of Members).

Task Force members invested a significant amount of time and energy to produce this final report, which has been through several iterations based on their comments and suggestions. The members were uniformly courteous, industrious, extremely professional and dedicated to completing the charge of the Task Force. Particular thanks must be given to several of the Task Force members and other participants who took the responsibility for making presentations on various existing models (see Appendix B – List of Presenters and Systems Considered).

A deep sense of appreciation and gratitude is extended to Marcelle (Marci) DuPraw, California State University Sacramento, Center for Collaborative Policy, for facilitating the Nitrogen Tracking and Reporting Task Force meetings and assisting in drafting the final report; and CDFA acknowledges the efforts of CDFA staff Edward Hard, Erika Lewis, Maria Hicks, Dr. Amrith Gunasekara, and Dr. Asif Maan for their assistance with Task Force activities and drafting the final report.

Executive Summary

Agriculture in California is highly diverse in terms of food production, crop management, ecosystems, and climate. Nitrogen fertilizer is essential for crop food production. Nitrogen fertilizer use over several decades in California has led to nitrates in groundwater. Recognizing that nitrates from agricultural nitrogen fertilizing materials have entered some California groundwater systems used for drinking water, CDFA convened the Nitrogen Tracking and Reporting Task Force in 2013 as part of a multi-pronged administration effort to address nutrient management and water quality.

This Task Force was charged with implementing Recommendation 11 of several recommendations made to the Legislature by the State Water Board: "CDFA, in coordination with the Water Boards, should convene a Task Force to identify intended outcomes and expected benefits of a nitrogen mass balance tracking system in nitrate high-risk areas. The Task Force should identify appropriate nitrogen tracking and reporting systems, and potential alternatives, that would provide meaningful and high quality data to help better protect groundwater quality." (See Appendix C – Fact Sheet on State Water Resources Control Board Recommendations.) This charge was achieved through several measures including, among others, understanding and discussing the pros and cons of existing nitrogen tracking and reporting systems, identifying desirable components or elements of existing systems and evaluating the variability and complexity of California agriculture in relation to where existing systems have been implemented.

Through several meetings, presentations by subject matter experts and discussion, the Task Force members came to general agreement on several components of an effective nitrogen tracking and reporting system. The recommended system addresses eight key topics including: (1) System Structure; (2) Data Elements; (3) Roles, Responsibilities and Data Accessibility; (4) Benefits of Participation; (5) Verifiability; (6) Societal Benefits of the Recommended System; (7) Limitations and (8) System Phase-in. This report presents the Task Force's discussions and recommendations including intended outcome and anticipated benefits of such a tracking and reporting system for nitrogen use.

The Task Force's recommendations on a reporting system, and any resulting information from the implementation of such a system, will be utilized by CDFA and the Water Boards to further their efforts in protecting water quality and improving the efficiency of on-farm nitrogen management. The Task Force's recommendations will also be presented to a panel of experts convened by the State Water Board, in coordination with CDFA, following Recommendation 14 of the State Water Board's Legislative report. The expert panel will assess existing agricultural nitrate control programs and may propose new measures for consideration by the Water Boards for their on-going regulatory and non-regulatory efforts.

I. Introduction

Agriculture in California is highly diverse in terms of food production, crop management, ecosystems, and climate. California has a Mediterranean growing climate and five different biomes with their own sub- and micro-climates, different soil types, weather patterns and water quality that allow the state to produce more than 400 commodities, many of which are produced only in California. These traits allow for agricultural crop production that is vastly different from other U.S. states and affords a year-round diverse, reliable, and safe food supply.

Nitrogen is an essential plant nutrient required to ensure food production and essential building block (e.g., proteins and DNA) for humans. Nitrogen application and associated management varies among the diversity of crops grown in California, soil type, irrigation method, cost, and cultural practices. Nitrogen fertilizer use over several decades in California can and has led to nitrates in groundwater. It is widely acknowledged that the nitrogen cycle is complex and therefore nitrogen management in agricultural systems offers numerous challenges in a state with such high crop and environmental diversity.

Recognizing that nitrates from agricultural nitrogen fertilizing materials have entered some California groundwater systems used for drinking water, CDFA convened the Nitrogen Tracking and Reporting Task Force in 2013 as part of a multi-pronged administration effort to address nutrient management and water quality. This Task Force was charged with implementing a particular recommendation that had been made by the State Water Board in its "Recommendations Addressing Nitrate in Groundwater" report to the Legislature. Recommendation 11 calls for identifying the intended outcomes and expected benefits of a nitrogen mass balance tracking and reporting system for nitrate high-risk areas: "CDFA, in coordination with the Water Boards, should convene a Task Force to identify intended outcomes and expected benefits of a nitrogen mass balance tracking system in nitrate high-risk areas. The Task Force should identify appropriate nitrogen tracking and reporting systems, and potential alternatives, that would provide meaningful and high quality data to help better protect groundwater quality." This report presents the Task Force's discussions and recommendations.

The Task Force membership was diverse with 28 representatives from several different sectors; agricultural sector, environmental community, environmental justice community, government entities at local, regional, and state levels, and both of California's university systems (the University of California and California State University). Efforts were made to ensure that Central Valley and Central Coast interests were well-represented based on the fact that those regions are at the forefront of currently addressing nitrates in groundwater.

This diverse Task Force was successful in reaching general agreement on a set of recommendations in a relatively short amount of time (two months). Their recommendation, detailed in Section IV of this report, identifies the intended outcome of their recommended nitrogen tracking and reporting system. The system addresses eight key topics including: (1) System Structure; (2) Data Elements; (3) Roles,

Responsibilities and Data Accessibility; (4) Benefits of Participation; (5) Verifiability; (6) Societal Benefits of the Recommended System; (7) Limitations; and (8) System Phase-in.

There are several other detailed factors that must be considered in addressing nitrates from agricultural nitrogen use, but these are not the focus of this report. These factors include details related to database development, data gathering by aggregators, data transmittal, the definition and designation of high-risk areas, and groundwater quality monitoring and reporting. These factors offer numerous complexities and are all essential components to a broader comprehensive administration strategy. In recognition of this complexity, the Task Force acknowledges that nitrogen tracking and reporting will lead to an iterative process with growers and regulators. The proposed approach is for growers to track and report nitrogen management data. Interpretation and results of those data will be used to provide guidance as to how to improve nitrogen management and, ultimately, to improve protection of groundwater. The result, along with scientific and technological advances, will be a cycle of continual improvement over time with the objective of improving groundwater quality for its many beneficial uses including as a drinking water source.

II. Background

The Challenge

CDFA and the State Water Board recognize that nitrates from agricultural nitrogen fertilizing materials, both synthetic and organic, have migrated into some California groundwater systems. Because some of the aquifers are also used for drinking water, nitrate contamination presents a public health concern to several communities in the state. The State Water Board took steps to address this issue, beginning with the "SBX2 1" report to the Legislature on the extent of the problem and how to address it. Recommendation 11 in the SBX2 1 report called for the identification of intended outcomes and expected benefits of a nitrogen mass balance tracking and reporting system for nitrate high-risk areas.

The challenge that has been identified is based on two important points, both equally important. First, nitrogen fertilizer amendments are necessary and required for plant growth and are critical for food production. Second, the SBX2 1 report to the Legislature concluded that the majority of nitrates in groundwater in the Tulare and Salinas regions were from agricultural nitrogen use over many decades.

The Charge to the CDFA Nitrogen Tracking and Reporting Task Force

CDFA (in coordination with the State Water Board) convened the Task Force in the summer of 2013. As detailed in the Task Force charter, CDFA charged the Task Force members with identifying appropriate nitrogen tracking and reporting systems in consideration of the crop diversity and agronomic conditions in the state and with identifying potential alternatives that would provide meaningful and high quality data to help better protect groundwater quality in nitrate high-risk areas. (The task of defining "nitrate high-risk areas" is the responsibility of the State Water Board.) CDFA led this effort because it is the locus of several programs associated with nitrogen fertilizing materials. For example, CDFA manages the Fertilizing Materials Inspection Program, the Fertilizer Research and Education Program (FREP) and the Organic Input Materials Label Review and Registration Program. Program staff members have significant expertise and experience related to the efficient and effective management of nitrogen fertilizing materials, agronomic expertise and an understanding of environmental issues at the interface of agriculture.

III. Process

The Task Force convened on July 29, August 28 and 29, and September 12, 2013. CDFA staff and facilitator Marci DuPraw from the Center for Collaborative Policy at the California State University, Sacramento, supported the Task Force and members in reviewing existing nitrogen tracking and reporting systems and related decision support tools, identifying elements to include in a recommended system, and building consensus on a recommended system. Facilitation was particularly helpful in this situation, given the short period of time in which the Task Force needed to complete its work and the importance of the issue to numerous stakeholders from diverse sectors. The Task Force pursued their charge through a series of four intensive, facilitated meetings. Members listened to presentations by subject matter experts on existing tracking and reporting systems. They discussed the pros and cons of existing nitrogen tracking and reporting systems, and identified desirable elements of these systems. They also took into consideration the variability and complexity of California agriculture in relation to a nitrogen tracking and reporting system. See below for a more detailed description of the approach used to support the Task Force's deliberations.

Meeting 1

At the Task Force's inaugural meeting, executive leaders from CDFA and the State Water Board provided context for the Task Force's assignment – to recommend a nitrogen tracking and reporting system capable of addressing the underlying policy concerns. The leaders stressed the critical importance of protecting drinking water quality and urged the Task Force to develop clear and practical recommendations that ideally would be useful to growers as well as decision-makers. Moreover, they underscored the importance of taking diverse perspectives into account, while drawing upon the best available technical expertise and emerging technologies. It is anticipated that information generated by the system would enable farmers and ranchers to reduce costs and increase yields by helping them better target nitrogen applications for plant needs.

Members began discussions by agreeing upon two important building blocks. These two important building blocks included five driving questions and fifteen ideal characteristics of a nitrogen tracking and reporting system. Since the charge was to develop recommendations for a nitrogen tracking and reporting system that would generate information useful to decision-makers, they first discussed and agreed upon the key questions facing decision-makers. They identified these as being:

- How much nitrogen is being applied?
- At what scale (where) is nitrogen being applied?
- How much nitrogen is being taken up by the plant?
- How much nitrogen is being lost as emissions to the groundwater?
- What is the impact on groundwater quality?

Thus, Task Force members focused on recommending a nitrogen tracking and reporting system or potential alternatives that would contribute to decision-makers' ability to

answer the above questions. (Some of these questions were addressed through the scientific SBX2 1 report to the Legislature.) The members discussed and reached general agreement on 15 ideal characteristics of the nitrogen tracking and reporting system. These included the following characteristics:

- Has geographic information system (GIS) tracking capability
- Based on verifiable methodologies
- User-friendly interface with information security provisions to ensure protection of confidential business information
- Establishes the trust of agricultural producers
- Affordable
- Equitable (e.g., shared costs by beneficiaries)
- Strives to balance feasibility, accuracy, and practicality
- Produces information to address policy questions
- Balances certainty (or consistency, as in a uniform system state-wide) and adaptability
- Leverages existing knowledge and lessons learned to maximize effectiveness and efficiency
- Provides benefits to the reporting community
- Data available to local groundwater management agencies, local and regional planning agencies, and regulatory community
- Affords tiering and phasing-in timelines for manageability
- Generates information on the fate of nitrogen over time (e.g., annually)
- Includes a spatial component that is compatible with existing groundwater quality monitoring systems

These characteristics would serve as key points of reference during subsequent discussions. Members provided CDFA staff with suggestions about existing nitrogen tracking and reporting systems and related decision support tools that might be relevant to the Task Force charge. Members also made suggestions about the elements of these systems and tools about which they wished to learn more (see below).

Meeting 2

In Meeting 2, CDFA leadership reminded the Task Force members to focus on Recommendation 11 of the SBX 2 1 report to the Legislature and that there were other groups responsible for addressing the other recommendations (e.g., Recommendations 6 and 14). The Task Force was urged to focus on identifying types of data that would be most useful to decision makers and provide real-time information while being practical to collect.

State Water Board leadership addressed Task Force questions about recent decisions pertaining to the Central Coast Draft Agricultural Order and how the decisions impact the charge of the Task Force. State Water Board leadership informed the Task Force that the State Water Board decision was a draft decision that is part of an evolving

regulatory framework and therefore should not limit the work of the Task Force. It was the desire of the State Water Board leadership that the CDFA Task Force should operate as a "no constraints" process that affords members to think creatively about a range of possible approaches.

CDFA staff organized a series of presentations along with several subject matter experts to inform the members about existing systems. The presentations covered 13 nitrogen tracking and reporting systems and related decision support tools (See Appendix B). The purpose of these presentations was to give the Task Force material from which to draw in developing their own recommended system (or alternative).

Presenters and subject matter experts were asked to address the following topics with respect to the system or tool that was the focus of their respective presentations:

1. Purpose
2. Expected outcome
3. Data elements
4. Reporting mechanism (e.g., paper, electronic, voluntary, regulatory, third party)
5. Scale (e.g., field, farm, township and range, regional, state-wide etc.)
6. Cooperative nature
7. Economic costs/impact
8. Measures of success
9. Benefits and challenges

Task Force members identified five of the systems as being relevant to their charge. These included the East San Joaquin Water Quality Coalition efforts, Nebraska Groundwater Management Plan, Maryland Nutrient Reporting Program, California statewide Dairy Order, and Central Coast Ag Order. The Task Force jointly identified the qualities that were compelling about each of these systems, as well as areas that might be strengthened.

Meeting 3

Task Force members developed agreement on an initial list of the data elements that a nitrogen tracking and reporting system would need to "track" and to "report." To support the members in this task, staff provided Task Force members with a list of the data elements tracked and reported by their five preferred systems from the Meeting 2 presentations. This list was intended to stimulate further discussion. Data elements tracked by one or more of these five systems included:

- All forms and sources of nitrogen
- Where nitrogen is applied
- All data needed to track mass balance which will include yield and nitrogen removed
- Crop type

- Soil type (acquired by USDA NRCS)
- Responsible party
- Age of perennial crop
- Nitrogen application amount
- Nitrogen and irrigation management practices

Data elements included in the initial discussion of elements that a grower would report under one or more of those five systems included:

- All forms and sources of nitrogen
- Where applied
- All data needed to generate mass balance
- Mass balance calculated using nitrogen inputs and outputs
- Data needed to identify water quality impacts below the root zone

Three subgroups (with members assigned to subgroups by staff to achieve diverse, cross-sector representation in each subgroup) were established at this meeting. Each subgroup was requested to outline a potential approach to a nitrogen tracking and reporting system that would be appropriate for California's nitrate high-risk areas (or offer an alternative to such a system that would generate the high quality data needed by decision makers to protect groundwater quality). Subgroup members were encouraged to consider the following questions:

- Data requirements and availability
- Who / how data is generated and collected/managed?
- Who does data get submitted to and used by?
- Cost of development and compliance?
- Challenges?
- How well does the system meet "ideal characteristics" and provide needed data to protect groundwater and incentivize reduced use of nitrogen fertilizing material?

Members then identified together the numerous commonalities in the three system concepts developed during the subgroup discussions. Commonalities included:

- Use of third party as data-aggregator entity who pushes information "up" to the regulatory entity
- Need to understand farmers' current farm management practices
- Intended outcome of improved water quality
- Tracking all sources of nitrogen and amount by crop type
- Scale - township aggregation as for reporting to regulators with caveats (e.g., Is this scale adequate to reflect differences in cropping patterns, geology, and hydrology? Is watershed level appropriate? Appropriate in all locations to serve needed purpose?)

- Electronic reporting system (from third party to regulators)
- Responses to data received that focus on problem-solving research and outreach efforts
- Phased-in approach to tracking and reporting
- Annual reporting (with an indication if crop has not yet been harvested)
- On-farm, event-based record keeping as the foundation of nitrogen tracking and reporting

The Task Force requested that CDFA staff and the facilitation team develop a "straw" recommendation that reflected the common themes and tracking and reporting concepts identified through the subgroups for discussion at the fourth meeting. Task Force members also identified differences that suggested areas to which the Task Force might need to devote further attention.

- Preference for grower submitting electronic reporting, but recognition of need for paper reporting option
- Definitions, limitations, and implications of "net" mass balance estimates submitted to Regional Board
- The influence of irrigation management on the fate of nitrogen
- Clarify what is tracked versus what is reported to arrive at an annual calculation of nitrogen mass balance
- Data quality and verification

Meeting 4

This meeting began with an overview of nitrogen mass balance concepts presented by Dr. Mikkelsen from the International Plant Nutrition Institute. This was an effort to ensure that the Task Force had a shared understanding of nitrogen mass balance.

Task Force members focused on refining the "straw" recommendation document, reaching general agreement on it by the end of their fourth meeting. The resulting recommendations contain eight key elements:

1. System Structure;
2. Data Elements;
3. Roles, Responsibilities and Data Accessibility;
4. Benefits to participate in the Nitrogen Tracking and Reporting System;
5. Verifiability;
6. Benefits of the Recommended System;
7. Limitations;
8. System Phase-in

Members reviewed and established general agreement on the outline and structure of the Task Force final report. The staff and facilitation team revised the original "straw" recommendation to reflect the changes agreed upon by the Task Force members during

this meeting. Additional review and comments on the recommendation and final report were completed electronically (e.g., electronic mail correspondence).

It is important to note that the State Water Board will be convening a panel of experts (Expert Panel, hereinafter) to assess current nitrogen control programs, such as the Irrigated Lands Regulatory Program, and develop recommendations by the end of Summer 2014; it is anticipated that a final report will be completed by Fall 2014. The outcome of the Task Force is expected to be used in the Expert Panel discussions. All of these efforts are the result of the State Water Board SBX2 1 recommendations to the Legislature designed to address nitrates in groundwater.

IV. Recommendation

CDFA and the State Water Board recognize that nitrates from both synthetic and organic nitrogen fertilizing materials used in agriculture have, over several decades, moved to some groundwater systems in California. Many communities in California rely on those same groundwater systems for drinking water. Thus, some drinking water supplies contaminated by nitrates from nitrogen fertilizing materials pose a public health concern to several communities in California. The State Water Board addressed this issue in its SBX2 1 report to the Legislature; this report contained a series of recommendations, one of which (Recommendation 11) is to identify intended outcomes and expected benefits of a nitrogen mass balance tracking and reporting system in nitrate high risk areas. To implement Recommendation 11, CDFA (in coordination with the State Water Board) convened a Task Force in summer of 2013 to identify appropriate nitrogen tracking and reporting systems, and potential alternatives that would provide meaningful and high quality data to help better protect groundwater quality.

This document characterizes the recommendations formulated through consensus-building to reach general agreement by the Task Force as of the conclusion of its fourth and final meeting. Given more time, Task Force members would have liked to continue refining and strengthening their recommendation. General agreement in this context should be understood to mean that Task Force members viewed the recommendation contained herein as a potentially viable way of establishing a nitrogen tracking and reporting system for nitrate high- risk areas. As described in this document, there are many related scientific and methodological uncertainties. The Task Force also emphasized the importance of further scientific research to strengthen available methods of quantifying nitrogen entering groundwater under various agronomic and environmental conditions.

The Task Force was charged in part with identifying the intended outcome of establishing a nitrogen tracking and reporting system; they identified that outcome as contributing to improved groundwater quality. The Task Force affirmed the importance of nitrogen tracking and reporting in nitrate high-risk areas.[1] The information provided by a nitrogen reporting and tracking system is an essential element in improving our understanding of the fate and transport of nitrogen. At the same time, the Task Force notes that a tracking and reporting system cannot, in and of itself, improve groundwater quality; it can only be expected to provide a portion of the information and understanding necessary to guide future decision making in this area.

An effective nitrogen tracking and reporting system must be broadly applied to produce data that are comparable across the geographic area in which they are used. However, at the same time, it must recognize and accommodate regional differences, such as in

[1] The task of defining nitrate high-risk areas was assigned to the State Water Board. At the time of this final report's release, the State Water Board had initiated work on this task but has yet to start its public process.

agricultural production and hydrogeology. It also must be flexible over time to accommodate changes as we learn more about nitrogen's movement in the environment. The Task Force recognized that the application of scientific knowledge to quantitatively estimate the magnitude of field scale movement of nitrogen past the crop root zone and the amount of nitrogen that is entering groundwater from an individual field or farm is currently limited, with estimates available on a large-scale basis, but not available on a field-by-field basis (except qualitatively). This limitation is due to the extensive scientific resources and instrumentation otherwise necessary for detailed, accurate estimation of nitrogen fluxes out of the root zone and into groundwater. Application of such monitoring systems is currently non-economic for field-by-field estimation of nitrogen fluxes across entire groundwater basins.

The elements of the Task Force's recommended tracking and reporting system are described below. The Task Force acknowledged that this system reflects a significant change for growers. As discussed later in this report, it may be appropriate to implement it in phases, with periodic adjustments, while all concerned learn what works. Task Force members believe that the particular approach suggested offers a number of benefits, which are enumerated in Section 6. Highlights include the belief that such a system will contribute to a better understanding of nitrogen fertilizer application and movement throughout the hydrologic system, will focus technical assistance where it is most needed to mitigate future nitrogen loading to groundwater and improve groundwater quality, and will reassure the public that growers are using nitrogen fertilizer in a manner consistent with best management practices to produce a safe, reliable, and affordable food supply. In so doing, the Task Force believes that establishing such a system will help to sustain agricultural productivity and sustainability in California.

Moreover, while the Task Force's recommended approach uses the concept of nitrogen mass balance as a key point of reference, this concept is only "one piece of the puzzle" in determining excess nitrogen that could potentially reach groundwater and in preventing that from happening. The nitrogen mass balance should be used in the larger context of informing improved use and efficiency of nitrogen application. Its use should be reviewed as part of Recommendation 14 of the State Water Board's SBX2 1 report to the Legislature -- which calls upon the Water Boards to convene an expert panel to assess existing agricultural nitrate control programs and develop related recommendations to ensure that these programs are protecting groundwater quality. These steps must also be complemented by further research (e.g., to establish a reliable methodology by which to quantify the amount of nitrogen reaching groundwater under various cropping systems, soil types, and agricultural practices; methods of preventing excess nitrogen from reaching groundwater, etc.).

1. **System Structure:** As depicted in Figure 1, the nitrogen tracking and reporting system can be described as a pyramid with one layer for tracking and several layers of reporting. Growers collect a number of types of crop and field-specific information

on an event basis to enable calculation of nitrogen mass balance (the quantity of nitrogen applied minus the quantity of nitrogen removed). The difference represents nitrogen that is not currently accounted for, including but not limited to nitrogen available for leaching to groundwater.[2] Much of the tracking data are retained on farm; a subset is compiled by crop and field at the farm scale and annually reported upward to a data aggregator.

In turn, the data aggregator annually compiles and reports data submitted by numerous growers into a single combined report for a larger geographic area as designated by the relevant Regional Water Board.[3] The Regional Water Board provides to the State Water Board the information necessary to compile an annual report on "status and trends" with respect to management and the fate of nitrogen applied in irrigated agriculture. In accordance with current law, any information submitted to a State or Regional Water Board is available for public review, with the exception of information determined to be proprietary; this is also true in situations where a Regional Water Board serves the role of data aggregator.

Thus, the narrowing of the pyramid (Figure 1) reflects increasing consolidation of information and larger geographic units of analysis as the information moves upward through the system from grower to State Water Board. Such a system is designed to effectively maintain grower confidence in the reporting system, optimize limited state resources and ensure improvement of groundwater quality.

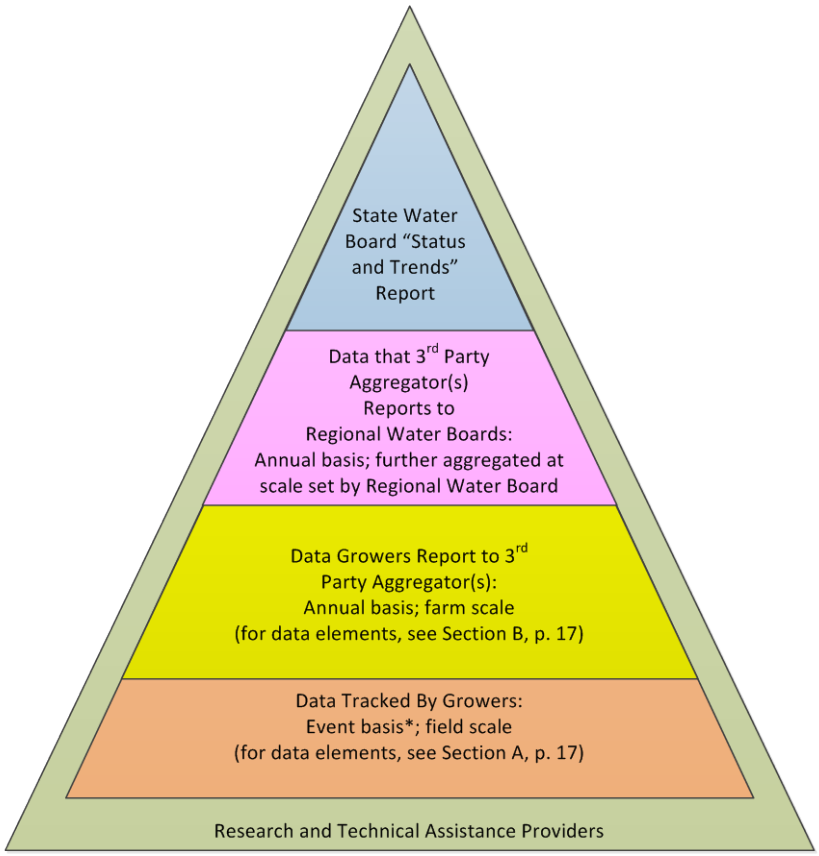
Data reporting by growers is electronic. However, aggregators should also provide the option for paper reporting where reporting electronically is a hardship, since some growers may not have ready access to electronic reporting. Resources should be available to help growers develop the capacity to report electronically, as necessary. Data aggregators should provide growers with written guidance to explain what to track, what to report, and acceptable methods for doing so; additionally, any guidance documents will define key terms, provide tracking and reporting templates, and identify the unit scale (e.g., field) for nitrogen tracking and reporting. The reporting system should be flexible enough to accommodate farm-level data management systems that may be used by growers as long as they meet the nitrogen reporting objectives.

The data aggregators' reports, which include an analysis of the data collected, are submitted electronically to the Regional Water Boards. The scale of "reporting unit" -

[2] There are many dynamics (e.g., other losses, transformations and additions) associated with the nitrogen cycle in addition to leaching. These include: denitrification, volatilization, atmospheric deposition, mineralization, immobilization, plant uptake and removal, assimilation, etc.). These processes are highly dependent on a variety of conditions (e.g., farm management, crop type, irrigation and drainage management, soil type, environmental conditions, etc.), can vary widely, and in some cases are unknown.
[3] Task Force members noted that aggregation of data can compound errors if not done appropriately.

- e.g., watershed, township, section, or other appropriate unit – is set by each Regional Water Board in collaboration with the aggregators to best reflect regional

Figure 1
CDFA Nitrogen Tracking and Reporting Task Force
Nitrogen Tracking and Reporting System for Nitrate High Risk Areas in California: Structure, Roles, and Data Elements



Notes:
- Bottom of pyramid represents data tracked by grower.
- Moving toward top of pyramid corresponds with process of reporting data up to higher levels of decision-makers.
- Research and technical assistance providers support all aspects of tracking and reporting system.

**/ "Event" to be defined by Regional Water Board, in consultation with data aggregator(s); more frequent than annual.*

agricultural and aquifer characteristics. All regions should report data with reference to acres for consistency purposes, thus enabling comparisons across the geographic area in which this system is implemented.

2. **Data Elements:** The specific data elements recognized by the Task Force as elements to track and report are provided below in Sections A, B, C, D and E and

correspond to the different levels of the graphic in Figure 1, moving from the bottom to the top. The Task Force recognized that many of the data elements proposed are listed in templates under development as part of the Central Valley Regional Water Quality Control Boards Long Term Irrigated Lands Regulatory Program.

Section A. Data tracked by growers:

- Name of owner/manager
- Assessor Parcel Number (APN)
- Field identification number
- Crop type
- Crop age
- Total acres per crop
- Expected yield (Estimated. Documented as pounds of production per acre)
- Actual yield (Measured. Documented as pounds of production per acre)
- Nitrogen needed by crop (Measured or estimated. Documented in pounds of nitrogen per acre)
- Nitrogen removed (Measured or estimated. Documented as pounds of nitrogen harvested in the crop yield per acre; also includes material removed or harvested that is not the primary product, such as wheat straw bailed and removed after wheat is harvested, orchard prunings, almond hulls, etc.)
- Total nitrogen applied to field. Includes:
  - Foliar, conventional, and organic fertilizers (Measured. Documented as pounds per acre, dry and liquid combined);
  - Nitrogen in irrigation water (Measured. Documented as pounds per acre)
  - Nitrogen in organic amendments, including manure, biosolids, compost, and non-marketable plant biomass[4] -- e.g., crop residue (Measured. Documented as pounds of nitrogen applied per acre)
- Residual soil nitrogen credits (Measured. Documented as pounds of nitrogen per acre)
- Irrigation method

Section B. Data reported by grower to data aggregator(s):*/

- Management unit (e.g., Assessor Parcel Number, field number, or other suitable management unit decided by the Regional Water Board in consultation with the aggregator in the context of determining the reporting unit)

[4] Growers will need guidance on how to capture non-marketable plant biomass in calculations of "expected yield" and "nitrogen needs" of their crops.

- Crop year
- Grower identification number
- Crop type
- Crop age
- Total acres per crop
- Nitrogen removed (as defined in Section A above)
- Total nitrogen applied (as defined in Section A above).
- Residual soil nitrogen credits (as defined in Section A above)
- Annual nitrogen ratio (calculated by total nitrogen removed divided by total nitrogen inputs)

**/ Where there is no third party data aggregator approved by the Regional Board or where the Regional Board requires reporting by individual growers, growers submit their annual reports to the pertinent Regional Water Board directly.*

Section C. Data reported by aggregator(s) to Regional Water Board: Aggregated data referenced in section "B," at the "reporting unit" determined by the Regional Water Board and in coordination with growers/data aggregators. Data aggregation should be carried out by professionals familiar with California agricultural water quality regulations and with technical backgrounds in agronomy, GIS systems, statistical analysis, and other related disciplines.

Section D. Data reported by Regional Board to State Water Boards: Status and trends of nitrogen applied and harvested in nitrate high-risk areas within pertinent Regions, as well as potential loading to groundwater under various cropping systems, soil types, and agricultural practices.

Section E. Reported by State Water Board: Status and trends of nitrogen applied and harvested in State's nitrate high-risk areas, as well as potential loading to groundwater under various cropping systems, soil types, and agricultural practices.

3. Roles, Responsibilities, and Data Accessibility:

A. Grower: Responsible for data tracking and reporting (to aggregator). The field-level, event-specific[5] data tracked by grower stays on farm, accessible only to the grower, but is subject to the data aggregator and the Water Boards' review upon request.

[5] To be defined by the Regional Water Board in consultation with aggregator(s); more frequent than annual.

B. Aggregator: Responsible for data collection from growers and reporting to Regional Water Boards; quality control regarding accuracy of grower data via outreach, technical assistance, written guidance for growers on implementing tracking and reporting requirements; and education outreach efforts to bring identified "outliers" into compliance through improved management practices. The data aggregator normally has access to farm-level data reported by growers and the data that the aggregator synthesizes at the designated reporting unit scale to report to the Regional Water Board; if the Regional Water Boards request access to more fine-grained data for quality control or problem-solving purposes, the data aggregator can reach down to access grower's original raw data at the field scale (where there is no third party data aggregator, the grower will indicate to the Regional Water Board what information, if any, in his/her annual report is confidential business information. The Water Boards will determine if this information is exempt from public access under the Public Records Act).

C. Regional Water Boards: Responsible for implementing and enforcing regulatory program and data reporting to the State Water Board and to the public on a regional scale. Aggregated reports submitted by a discharger of aggregator are maintained and used by the Regional Board for regulatory determinations and are available to the public; however, if access to more fine-grained data is needed for quality control or problem-solving purposes, the Water Boards can reach down to access growers' original raw data at field scale.

D. State Water Board: Data analysis and trends in nitrogen mass-balance on a state-wide scale. Normally has access only to reports submitted by Regional Water Boards; however, if access to more fine-grained data is needed for quality control or problem-solving purposes, the Water Boards can reach down to access growers' original raw data at field scale.

E. CDFA: Funds research (e.g., through Fertilizer Research and Education Program) and provides technical education (e.g., through Certified Crop Advisers' Nitrogen Management Training Program) and outreach.

F. USDA: USDA ARS and USDA NIFA conduct research. USDA NRCS provides grower incentive funds competitively through Environmental Quality Incentive Program.

G. Institutions and Research Professionals: Research, technical education and development of grower tools for effective nitrogen crop uptake and management. Educational opportunities will be assessed and developed as appropriate to support grower education data collection needs and reporting.

H. Professional Advisers: Certified source of continuing education on nitrogen management and methods of improving nitrogen usage and crop results.

I. Public: The public has access to status and trends related to nitrogen mass-balance reported annually by the State Water Board, using a geographic scale deemed appropriate. The data reported to the Regional Water Boards and State Water Board is available to the public (unless it is confidential business information), and will typically be posted on their website.

4. **Benefits for Growers Who Participate in this Suggested Nitrogen Tracking and Reporting System:** Growers who participate will have:

   A. Effective documentation and increased public confidence that growers are making all reasonable effort to minimize nitrate loading to groundwater and maximize water quality protection so as to be in compliance with regulatory requirements.

   B. Opportunities to learn improved nitrogen management practices that may enable growers to increase the efficiency of their nitrogen fertilizer usage. Aggregators will provide follow-up on nitrogen management for conditions where the nitrogen ratio is considered an outlier in reported values.

   C. The opportunity to demonstrate effective nitrogen regulation and influence future regulations.

   D. Assistance from the data aggregator in meeting tracking and reporting requirements (e.g., technical assistance and training).

   E. Protection of confidential business information.

   F. Increased confidence that, in most instances, they will be able to retain field-specific information on-farm.

5. **Verifiability:** The nitrogen tracking and reporting system will include mechanisms enabling the data aggregator and the Regional Water Boards to verify the accuracy of the data that the system generates (consistent with available methods), including:

   A. Growers retain their field-level data (Section 2.A.) for the term required by existing laws and regulations, and make records available to the data aggregator and the Water Board upon request.

   B. The data aggregator is responsible for ensuring the accuracy of the data it reports, and to that end, investigates apparent exceptions in reporting patterns. The aggregator assists growers in implementing appropriate nitrogen management practices to improve water quality.

C. The Regional Water Boards are responsible for ensuring the accuracy of the data they receive and may consider developing an audit mechanism.

D. Technical assistance providers, such as Certified Crop Advisors and staff from the Resource Conservation Districts, can play a valuable role in assisting growers and data aggregators to implement the nitrogen tracking and reporting system effectively (e.g., through assistance in developing nitrogen management plans for growers).

6. **Societal Benefits of the Suggested System:** There was general agreement among Task Force members that the nitrogen tracking and reporting system described herein potentially offers numerous intended benefits. It will:

A. Contribute to a better understanding of nitrogen fertilizer application and movement.

B. Focus technical assistance where it is most needed to mitigate future nitrogen loading to groundwater and improve groundwater quality.

C. Reduce methodological uncertainties and increase the precision of results over time.

D. Reassure the public that growers are using nitrogen fertilizer in a manner consistent with best management practices to produce a safe, reliable, and affordable food supply.

E. Help growers increase their efficiency by better managing nitrogen use where appropriate, with a potential for cost savings.

F. Stimulate research and technological advancements to aid in increasingly effective and efficient use of nitrogen fertilizer.

G. Better enable technical assistance providers, such as Certified Crop Advisers and Resource Conservation Districts, to help growers with well-informed recommendations.

H. Potentially generate incentives that better align water and nitrogen usage.

I. Encourage innovation in nitrogen fertilizer formulations and irrigation technology.

J. Help to sustain agricultural productivity and sustainability in California.

K. Offer a successful model for California that can also be adopted elsewhere.

7. **Limitations:** The above benefits of the recommended nitrogen tracking and reporting system are intended, but unproven. Limitations can also be anticipated. Primary among these is the fact that the scientific knowledge currently available for

understanding nitrogen's movement beyond the root zone for the many crops growing in California is limited and in some cases non-existent, particularly in terms of calculating exact amounts of nitrogen lost to air and groundwater. Additionally, it is recognized that the timing and amount of water applied can be critical to water/nitrogen moving below the root zone and is not tracked as part of these recommendations. Current and future technology adoption by growers will provide better knowledge and management in this area. There is a strong need for further scientific research to improve the existing data for nitrogen uptake and movement for California's many crops. It should also be emphasized that the Task Force was not charged with considering the costs of implementing a nitrogen tracking and reporting system, and did not consider cost in its deliberations. Clearly, costs will need to be factored into policy-makers' decisions concerning the path forward.

8. **System Phase-In**: The Task Force recognizes that implementing this system represents a significant request of growers, and that it will take time for them to adjust. All implementing parties will be learning about aspects of the proposed system that works and that need adjustment. Thus, the Task Force acknowledges that development of this program will need to proceed in phases, both to allow for ongoing, supporting scientific analysis and to help growers become accustomed to the program. The results of initial efforts should be periodically reviewed to inform subsequent phases with the system's design and implementing guidance modified adaptively as needed to ensure that it is effective in improving and protecting groundwater quality. Items discussed for possible inclusion in later phases included reporting the timing and volume of irrigation and the timing of fertilizer application. The "phase-in" approach should include a timeline and milestones to ensure consistent progress toward full implementation. The pace of implementation will be driven by trend analysis, research results, and best available science. The timeline will be structured to accommodate the collection and validation of the best available science. Over time, the Task Force envisions this system as reducing methodological uncertainties, increasing the precision of results, and establishing a successful system for tracking and reporting of nitrogen to help minimize nitrate loading and maximize protection of water quality.

Appendices

Appendix A: List of Task Force Members

CDFA wishes to thank the Nitrogen Tracking and Reporting Task Force Members for their time commitment, collective expertise, due diligence, thoughtful input and respect of divergent opinions. Their collective investment to seek general agreement to develop useful recommendations to help improve groundwater quality in the long-term has been instrumental in the Task Force success.

1. Allan Fulton, MSc., University of California Cooperative Extension
2. Danny Merkley, California Farm Bureau Federation
3. Darrin Polhemus, State Water Resources Control Board
4. Dave Duncan, California Department of Pesticide Regulation
5. Dave Orth, Kings River Conservation District
6. David Zoldoske, EdD., California State University, Fresno
7. Deanne Meyer, PhD, University of California, Davis
8. Donna Meyers, Santa Cruz Resource Conservation District
9. Gordon Burns, California Environmental Protection Agency
10. Hank Giclas, Western Growers Association
11. Jeanette Pantoja, California Rural Legal Assistance Inc.
12. J.P. Cativiela, Dairy CARES
13. Jennifer Clary, Clean Water Action
14. Joel Kimmelshue, PhD, Land IQ
15. Karen Ross, California Department of Food and Agriculture
16. Ken Harris, Central Coast Regional Water Quality Control Board
17. Luana Kiger, MSc, Natural Resources Conservation Service
18. Marc Los Huertos, PhD, California State University, Monterey Bay
19. Pamela Creedon, Central Valley Regional Water Quality Control Board
20. Parry Klassen, East San Joaquin Water Quality Coalition
21. Phoebe Seaton, California Leadership Council for Justice and Accountability
22. Rob Mikkelsen, PhD, International Plant Nutrition Institute
23. Sandra Schubert, California Department of Food and Agriculture
24. Sonja Brodt, PhD, University of California, Davis
25. Stacey Carlsen, California County Agricultural Commissioners and Sealers Association
26. Tess Dunham, Somach Simmons and Dunn
27. Thomas Harter, PhD / Minghua Zhang PhD, University of California, Davis
28. Tim Hartz, PhD, University of California, Davis

Appendices

Appendix B: List of Presenters and Systems Considered

CDFA thanks presenters, guest speakers and subject matter experts for their expertise and time sharing their valuable and unique experiences to help inform the process.

1. Doug Patteson, Central Valley Regional Water Quality Control Board
   -*Dairy Nutrient Planning*
2. Parry Klassen, East San Joaquin Water Quality Coalition
   -*Nitrogen Management Approach*
3. Angela Schroeter, Central Coast Regional Water Quality Control Board
   -*Data Management and Reporting*
4. Larry Wilhoit PhD, California Department of Pesticide Regulation
   -*Pesticide Use Reporting System*
5. Amadou Ba PhD, CDFA
   -*Fertilizing Materials Tonnage Reporting*
6. Krijn Poppe MSc, LEI Wageningen UR
   -*Dutch Mineral Accounting System Minus*
7. Thomas Harter PhD, University of California, Davis
   -*N Tracking Analysis to Estimate Groundwater Loading*
8. Doug Parker PhD, University of California Institute for Water Resources
   -*Nutrient Reporting In Maryland*
9. Edward J. Hard, CDFA / Richard Ferguson PhD, University of Nebraska, Lincoln
   -*Nebraska's Central Platte Valley Groundwater Management Program*
10. David Zoldoske EdD, California State University, Fresno
    -*Wateright Online Irrigation Scheduling*
11. Joel Kimmelshue PhD, Land IQ
    -*Consideration of a Nitrate Hazard Index for Reporting and Tracking*
12. Tim Hartz PhD, University of California, Davis
    -*CropManage Software for Irrigation and Nitrogen Management*
13. Hank Giclas, Western Growers Association
    -*Performance Metrics for Specialty Crops: A Common Yardstick*

Appendix C

Water Boards

Fact Sheet

Report Recommendations to Address Impact of Nitrates Contamination in Groundwater Require Renewed Efforts

Overview

Groundwater contamination by nitrate is a major water quality issue and can pose health risks at concentrations above health standards. A State Water Resources Control Board (State Water Board) report on nitrates, which are principally a by-product of fertilizers, makes 15 recommendations to ensure clean drinking water is accessible to communities with groundwater contamination, calls for monitoring contamination for future remediation and identifying a funding source to pay for improvements and access to drinking water in at-risk communities.

Nitrate contamination is particularly significant in the Tulare Lake Basin and Salinas Valley areas. The report titled "*Recommendations Addressing Nitrate in Groundwater in the Tulare Lake Basin and Salinas Valley*" was released and sent to the Legislature for consideration per the mandate of Chapter 1 of the Second Extraordinary Session of 2008 (SBX2 1, Perata). The Legislation required the State Water Board to develop pilot projects focusing on nitrate in groundwater in the Tulare Lake Basin and Salinas Valley and to submit a report to the Legislature on the scope and findings of the pilot projects, including recommendations.

Nitrate a Public Health Concern

Nitrate pollution in groundwater is a widespread water quality problem that can pose serious health risks to pregnant women and infants if consumed in significant concentrations. Nitrate contaminated groundwater is a particularly significant problem in the Tulare Lake Basin and Salinas Valley areas, where approximately 2.6 million people rely on groundwater for their drinking water. Other areas of the State, however, also have nitrate contaminated groundwater that is used as a source of drinking water.

Significant Academic and Multi Agency Participation

In developing this report, the State Water Board relied significantly on information and findings from: 1) the State Water Board's contracted study with the University of California, Davis resulting in a 2012 report entitled *Addressing Nitrate in California's Drinking Water* http://www.waterboards.ca.gov/water_issues/programs/nitrate_project/index.shtml 2) the Governor's Drinking Water Stakeholder Group, which was comprised of representatives from state agencies, environmental justice advocates, and agricultural representatives; and 3) an Interagency Task Force, which included representatives from the California Department of Public Health, the Department of Food and Agriculture, the Department of Pesticide Regulation, the California Environmental Protection Agency and local environmental health agencies.

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
STATE WATER RESOURCES CONTROL BOARD
1001 I Street, Sacramento, CA 95814 • 916-341-5254 • Mailing Address: P.O. Box 100, Sacramento, CA 95812-0100 • www.waterboards.ca.gov
Water Boards

Water Boards

Fact Sheet

15 Specific Recommendations

The State Water Board makes 15 specific recommendations to address water quality issues associated with nitrate contaminated groundwater. These recommendations reflect a comprehensive strategy focused on the following four key areas:

- **Providing Safe Drinking Water**. Creating a reliable, stable funding source, integrated with institutional changes, to provide long-term safe drinking water infrastructure and interim solutions for the small disadvantaged communities impacted by nitrate contamination.

- **Monitoring, Assessment and Notification.** Developing and managing the data necessary to identify and effectively manage nitrate contaminated groundwater, with particular attention focused on (1) defining nitrate high-risk areas in order to prioritize regulatory oversight and assistance efforts in these areas, (2) notifying groundwater users in nitrate high-risk areas and (3) requiring property owners to sample their well as part of a property title transfer or purchase.

- **Nitrogen Application Reporting.** Developing and implementing a statewide nitrogen fertilizer application reporting system to effectively monitor nitrate application.

- **Protecting Groundwater.** Developing an effective statewide regulatory system for minimizing discharges of nitrates to groundwater, including (1) establishing a nutrient management certification program which recognizes the importance of water quality protection, (2) convening a task force of experts to identify and evaluate components of existing agricultural nitrate control programs for managing nitrate in groundwater, and (3) evaluating the effectiveness of existing permits for food processing and wastewater treatment facilities to address nitrate contamination in high-risk areas.

Ensuring Safe Drinking Water Requires New Funding Source

A majority of the report recommendations rely on identifying a funding source for successful implementation. The regulatory, monitoring, education and research recommendations can draw from existing programs with dedicated funding. The provision of safe drinking water for disadvantaged communities will require a new funding source. Existing funding available are the Safe Drinking Water State Revolving Fund (SRF), which is capitalized with federal grants, and state bond funds. Disadvantaged community demand outweighs limited existing funding through the SRF. There is a need to identify a new funding source, which can be used in combination with existing funding sources, to design, build, operate and maintain safe drinking water systems for disadvantaged communities. This report gives recommendations to the Legislature on the issue of funding.

Additional Resources

To see the report, please visit:
http://www.waterboards.ca.gov/water_issues/programs/nitrate_project/index.shtml
(This was updated February 20, 2013)

Appendices

Appendix D

ARS	Agricultural Research Service
CDFA	California Department of Food and Agriculture
DNA	Deoxyribonucleic acid
FREP	Fertilizer Research and Education Program
NIFA	National Institute of Food and Agriculture
NRCS	Natural Resources Conservation Service
SBX2 1	Chapter 1 of the Second Extraordinary Session of 2008
USDA	United States Department of Agriculture