

Second Statewide Agricultural Expert Panel Draft Report Executive Summary



March 30, 2026

Executive Summary

Nitrogen (N) is an essential nutrient for crops and is often the most limiting nutrient in cropping systems. While insufficient N availability can reduce yield and profitability, excess N can be lost to the environment with undesirable environmental impacts, and ultimately human health.

California's agriculture is highly diverse with respect to crops grown, cropping systems and size of operations. California is a highly productive agricultural region. However, nitrate leaching from intensive crop production systems has led to increased nitrate concentrations in groundwater with a large proportion originating from fertilizer and manure applications to crops.

The First Agricultural Expert Panel, convened by the State Board in 2014, recommended adopting a simplified N budget as the primary metric for evaluating progress on source control, with eventual impact on groundwater quality.

The recommended approach was to calculate the N applied over N removed ratio (A/R). Where A includes N applied with synthetic fertilizer (A_{FER}), organic amendments ($A_{COMP} + A_{ORG}$) and irrigation water (A_{IRR}), while R includes N removed via harvest (R_{HARV}) and N sequestered in the permanent wood of perennial crops (R_{SEQ}).

In their review of the Central Coast Ag Water Quality Order, the State Water Board stated that substantial progress has been made towards implementing a long-term sustainable irrigated lands regulatory but that there is still much more work to do. In 2025, the State Water Board convened a Second Statewide Agricultural Expert Panel to review the recommendations from the First Expert Panel, to identify critical data gaps in the N budget approach used for the Irrigated Lands Regulatory Program (ILRP) and to provide expert advice to the State Water Board on the development of multi-year A/R target values and A-R values.

More specifically, the Panel was asked to answer nine questions (see Appendix B in the [Second Statewide Agricultural Expert Panel Draft Report](#) or Questions for the Second Statewide Agricultural Expert Panel on the Irrigated Lands Regulatory Program [webpage](#).) The second Expert Panel met numerous times between August 2025 and May 2026. The Panel's responses and recommendations are summarized below. The questions were condensed for the Executive Summary.

Question 1 focused on crop-specific N-related limits that are protective of groundwater quality.

- Question 1 referred to the development of limits, but in this response, the Expert Panel will also utilize the concept of targets. Limits can provide effective regulatory clout because they carry the threat of penalties in cases of non-compliance. However, targets, especially when used in conjunction with

educational efforts, can also help the agricultural industry make improvements in reducing N loading despite the lack of penalties.

- In some regions sufficient data and analytical tools are available to set long-term crop-specific targets/limits for nitrate discharge from agricultural land that is protective of water quality. Other regions need more time to collect and analyze data to assess groundwater risks from nitrate; however, this should not preclude these regions from collecting data on applied N and implementing targets/limits.
- Targets/limits should be addressed on a local/regional basis. The diversity of agricultural production systems in the state makes it impossible to impose a one-size-fits-all approach to the regulatory process.
- Targets and limits may refer to metrics that quantify potential nitrate loading to groundwater including N applied (A) minus N removed (R), or A where R data is not available. However, development of R values for commodities needs to continue to be a priority. In addition, soil-plant-water, vadose zone, and hydrogeological models can be used to evaluate potential and future impacts of nitrate discharge from agriculture on groundwater nitrate concentration while accounting for other processes not captured with A and R.
- Targets and limits may be applied to a specific crop, a specific multi-cropping system, or to a specific land area.
- The Panel agrees that there is a point at which N discharges to groundwater are excessive and Regional Boards may set initial limits that all growers should be able to meet within a reasonable timeframe (3 to 5 years). These limits should be considered by individual Regional Boards, but not as a statewide precedential requirement
- The Panel recommends that only three-year rolling averages of the selected metrics are used for regulatory enforcement to account for various disruptions and issues that occur in agricultural systems.

Question 2 focused on increasingly protective interim N-related limits can be set now to ensure that all growers make progress towards N-related limits that are protective of groundwater quality.

- The Expert Panel agrees that targets/limits for A-R (or other nitrate discharge equivalent metrics) can be made now and provides a roadmap for reducing nitrate discharges in regions where groundwater is at risk for nitrate contamination. The interim targets/limits do not necessarily need to immediately achieve the 10-ppm nitrate-N maximum contaminant level (MCL). However, an iterative process that gradually brings water quality targets closer to the

operational water quality objective in a steady and measured way that is environmentally beneficial and agronomically feasible would be the desired path forward.

- The perspective of the Panel is that it makes more sense to set limits at the higher N discharge objectives which are agronomically achievable by a high percentage of growers. Agronomically challenging A-R goals that are to be implemented in the future should be classified as targets to provide flexibility for growers to develop, experiment, and implement the necessary practices that will allow them to reach these more restrictive N discharge objectives.
- An extensive education and outreach effort should be conducted to help growers utilize best management practices to improve N use efficiency and to make rapid progress to lower the values of the selected metric and to reduce potential nitrate discharge to groundwater.

Question 3 asked whether there are any recent scientific or technical considerations or advances that future policy decisions should consider.

- The Expert Panel agrees that some scientific advances have been made to understand field-level N mass balance, N transformation rates, and nitrate leaching factors. However, additional research is needed to understand and account for N transformation processes in each region. Root zone and soil crop models can be used in accounting for N transformation processes.
- Each region should have the flexibility to determine the best metric, model, or literature value for accounting for N transformation rate factors.
- The Expert Panel recommends the use of soil nitrate testing to measure nitrate levels and applying this information to reduce fertilizer applications without jeopardizing crop yields.

Question 4 focused on scientifically appropriate metrics and methods to evaluate and quantify N discharges to groundwater.

- The Expert Panel agrees that A-R is an appropriate metric to evaluate and quantify N discharges to groundwater for regulatory purposes. A-R can be calculated for specific crops or cropping systems and allows for comparison of different fields or farms/ranches in a region.
- A/R is not an appropriate metric to assess N discharge, but A/R is an essential metric to assess grower/ranch performance.

- While A and R, as proposed by the first Expert Panel, are a simplification and may not be accurate enough for scientific studies, they rely on data that are generally readily available to growers and can be accurately determined in most cases at the field or farm scale.
- The Expert Panel supports complementing the A-R metric with soil-water-crop, vadose zone, and hydrogeological computer models for assessments at larger scales, e.g. at the township or groundwater basin scale.
- These models are also good tools to inform A-R targets and limits that would result in improved groundwater quality in future years by accounting for factors not easily provided by growers, such as groundwater recharge, N mineralization, or denitrification.

Question 5 focused on data collection and reporting practices included in the Eastern San Joaquin Water Quality Order, quality assurance procedures and potential improvements.

- The Panel finds that the summary tables required by the Eastern San Joaquin Water Quality Order are appropriate for the purpose of estimating N discharge to groundwater. However, the Panel recommends that additional data be reported to facilitate analysis by the public.
- The Expert Panel recommends the following additions:
 - Size of the individual field or parcel as a categorical characteristic.
 - Simplified information on the predominant soil series.
 - A summary table prepared by region, which lists, for each crop or cropping system on an area basis, total acres, average precipitation, irrigation, ET, runoff, and recharge, as well as the average and distribution of N applied and N removed values.
 - In regions where soil-crop models are used: The average and distribution of modeled annual values for different sources of N applied, N from atmospheric deposition and biological fixation, N removed, N in permanent, woody tissue, N in runoff and atmospheric N losses, as well as change in soil organic matter N content.
- The Expert Panel recommends the development of a standardized table of crop names, crop groups and crop group naming.
- The Panel recommends developing standardized documentation requirements on how growers arrived at the reported amount of N applied, the proportion of N

mineralized from organic fertilizer and compost and how they measured the harvested product.

- Effective verification and auditing processes should be evaluated to ensure reductions in A-R are validated and enduring.
- During the first 2-3 years of data collection, many errors and mistakes are made and need to be corrected. Audits during this period should not result in enforcement actions. After the initial phase, the level of auditing primarily depends on the quality of the data.
- A comprehensive comparison and assessment of fertilizer sales in California against ILRP-reported statewide fertilizer application rates may provide a large-scale verification of ILRP-reported fertilizer application data.
- Another important form of verification is the assessment of nitrate discharge from the landscape via measured groundwater nitrate concentrations.

Question 6 focused on N fertilizer application limits (A_{FER}), which were established in the 2021 Central Coast Ag Order.

- In addition to synthetic fertilizers (A_{FER}), N Applied (A) includes inputs from organic fertilizers (A_{ORG}), composts (A_{COMP}), and irrigation water (A_{IRR}). Targets/limits on A_{FER} do not account for contributions of these other inputs of N, as well as the relationship to N removed (R). Therefore, A_{FER} alone provides an incomplete assessment of the risk of N losses.
- The Panel finds that A_{FER} limits have questionable benefits. Therefore, the Expert Panel concludes that the focus should be on determining targets/limits for A and A-R. Instead of developing crop specific A_{FER} target/limits, resources are better used to determine crop specific removal N, crop N uptake curves, and for grower outreach on practices to improve N use efficiency.

Question 7 asked whether discount factors to A, additional components of R included in the 2021 Central Coast Ag Order, as well as excluding N in irrigation water from the calculation of total N applied are appropriate additions.

- The use of winter cover crops and high-carbon amendments prevent nitrate losses during the winter fallow when residual soil nitrate is most at risk for leaching due to uncontrolled winter rains. The Expert Panel supports N removal credits for these practices as they provide incentives for growers to implement these practices, which not only help reduce nitrate leaching, but also have a multitude of other benefits to the operation, soil health and environment.

- R_{SCAVENGE} should be expanded to include other cover crop strategies that have been shown to reduce nitrate leaching during the winter fallow, namely fall-grown cover crops, low residue cover crop practices, and cereal-legume cover crop mixes.
- The re-release of scavenged N to the subsequent crop needs further investigation to know how much it may affect the calculation of future-crop A-R values. The use of soil nitrate quick tests to guide fertilization of crops is currently the best management practice to account for N mineralized from cover crop biomass.
- Recent research has documented the amount of labile N that mineralizes from composts and organic fertilizers during the timeframe of the crop cycle. Providing a credit to the labile fraction of N from compost and organic fertilizers does not penalize growers for all N in these materials and incentivizes their use.
- The Panel supports the fundamental principle of “pump and fertilize”. Clearly, the more that synthetic or organic fertilizer can be replaced by N in irrigation water, the better. Utilizing nitrate in irrigation water to the maximum possible extent should always be encouraged, whether through education, incentives, or regulation.
- The Expert Panel recommends that A_{IRR} is calculated based on the volume equal to crop evapotranspiration or the volume of water applied by irrigation, whichever is smaller. The assumption is that the N in the evapotranspired volume is the amount that a crop takes up during the season and discounts extra water needed for soil preparation, salt leaching, and for offsetting non-uniformity of the of the irrigation system and other inefficiencies.
- For purposes of modeling and estimating potential N loading to the aquifer, growers could be required to report all the N applied from irrigation water but these values should not be used for compliance with A-R targets/limits.

Question 8 asked whether scientific data suggests that small and/or small diversified farms are operated in a fundamentally different manner that results in a reduced water quality impact compared to larger farms, on a per acre basis.

Nutrient management practices can be substantially different on small-scale diversified farms compared to larger farms. Small diversified productions in California also include container-grown nursery production, which operate in a significantly different manner than field grown crops.

Nutrient management practices also vary from one operator to the next. Small farms as a category are unlikely to demonstrate a reduced water quality impact on a per acre basis.

We recommend a category such as “reduced-risk small farms” that could be defined as meeting a number of criteria associated with lower risk for nitrate leaching.

This could be combined with alternate reporting requirements, technical assistance with monitoring soil and plant N levels, and education.

Question 9 focused on additional exceptions to, or alternative methods for complying with, the precedential nitrogen management requirements in the Eastern San Joaquin Water Quality Order.

- The Panel finds that wine-grape vineyards, alfalfa, and non-fertilized pastures are potential candidates for some form of exception or alternative compliance pathways.
- An alternative compliance approach for these cropping systems may require a strict limit for fertilizer applications, thus requiring reporting in some form.
- We recommend consideration of alternate reporting methods for nurseries, given the difficulty in accurately computing R for a large variety of ornamental species grown in containers that leave the nursery for sale.
- Some organic farms and, in the future, perhaps some farms with demonstrable regenerative farming practices may have low nitrate leaching, particularly in low N demanding crops. Since nutrient management practices vary across different approaches to organic certification, it may be useful to define specific organic and regenerative nutrient management practices associated with low nitrate leaching rather than relying on organic certification alone as a defining category.
- In regions where there is no current and no reasonably foreseeable future groundwater use for domestic, municipal, commercial, irrigation, public supply, or groundwater dependent ecosystem purposes, the Panel recommends consideration of alternative compliance pathways.
- The alternate reporting requirements in Order WQ 2023-0081 authorized small-scale diversified farms to initially report A values only but gave the regional water boards discretion to determine when or how R values should be reported. It may be more effective to develop alternate compliance pathways that effectively use A or other methods as long-term solutions.
- The reduced reporting requirements are only possible when and where such exceptions and alternative compliance methods do not increase groundwater pollution risk.

In addition, the Panel provides an extensive list of recommendations for effective irrigation and nitrogen management practices and needs for outreach, research, evaluation and implementation. The panel also provides detailed information on the use of models to assess well nitrate contamination risks from agriculture.