

Confined Animal Facility Permitting and Reporting Under the Porter-Cologne Water Quality Control Act: An Analysis of Regional Board Activities

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Glossary of Key Terms

CAF The California Code of Regulations defines a **Confined Animal Facility** as “[a]ny place where . . . animals are corralled, penned, tethered or otherwise enclosed or held and where feeding is by means other than grazing.”¹

CIWQS The **California Integrated Water Quality System** is a database used by the State Board and Regional Boards to log information about sites of environmental interest, including CAFs. CIWQS includes data on facility violations and enforcement actions taken by the state.²

Manure Conversion Factor The estimated amount of manure that a single animal excretes in a year.

NMP A **Nutrient Management Plan** is a document in which a CAF prospectively describes the management practices that the facility will undertake to ensure compliance with the WDR. It “identif[ies] the management practices used at the facility to minimize adverse impacts to surface water and groundwater,” including, for example, intended manure land applications.³

Regional Board
(or “Region”) California has nine semi-autonomous **Regional Water Quality Control Boards**. Each Regional Board is responsible for protecting water quality in its region by enforcing WDR requirements. Regional Boards interface directly with CAFs by reviewing NMPs and collecting annual reports.

State Board The **State Water Quality Resources Control Board** establishes high-level, statewide policies to effectuate the goals of the Porter-Cologne Act. These policies are implemented by Regional Boards.

WDR A **Waste Discharge Requirement** sets out limits imposed by Regional Boards on environmental discharges. WDRs incorporate both state-level and regional-level policies.

¹ 27 Cal. Code Regs. § 20164.

² *California Integrated Water Quality System Project (CIWQS)*, California Waterboards, <https://www.waterboards.ca.gov/ciwqs/>

³ Region 2 Order Attach. D 1.

Executive Summary

California is home to a significant proportion of the confined animal facilities (CAFs) in the United States, including more large commercial dairies than any other state. These facilities produce thousands of pounds of animal waste. Waste from CAFs—and the excess nutrients therein—can pollute surface water, contaminate groundwater, cause algal blooms, and ultimately lead to severe human health consequences. Communities in the Central Valley, the region that is home to the majority of California’s CAFs, have felt these effects most acutely.

California’s Porter-Cologne Water Quality Control Act has created a multi-layered regulatory regime to monitor and curb water pollution in the State. The State Water Resources Control Board (State Board) establishes high-level, state-wide policies to effectuate the Porter-Cologne Act’s goals. Nine Regional Water Resources Control Boards (Regional Boards) then operationalize these state-wide policies via Waste Discharge Requirements (WDRs), which impose various requirements on CAFs.

As part of this regulatory regime, CAFs in every region must submit annual reports documenting their waste production and waste management practices. The precise content of these self-reporting requirements differs by region.

This white paper analyzes reports containing (1) data from 2023 for the five regions with the largest numbers of CAFs in California; and (2) data from 2024 from the region with the most CAFs in the state. We identify six central problems with the self-reporting regime:

1. CAFs frequently underreport wastewater production, or fail to report it at all.

After use, the water that facilities use to clean animal pens and to process milk contains many of the same contaminants as manure. Yet some Regional Boards do not require CAFs to report how much of this wastewater they produce. In the regions that do, there is evidence that CAFs underreport wastewater production.

2. CAFs frequently underreport manure production.

Rather than weighing out how many tons of manure they produce, CAFs often estimate manure production using **manure conversion factors**, or the expected amount of manure that each cow will produce in one year. Operators employ different manure conversion factors. When compared to scientific literature, some underestimate manure production by as much as a factor of two hundred.

3. CAFs do not disclose, or inadequately document, where waste goes.

All Regional Boards require CAFs to attach documentation about where they ship their excess waste, but farms often fail to do so. Many CAFs also complete the form with information that is illegible or unlikely to be accurate.

4. Most CAFs fail to report how much waste they apply to their crops. Those that do typically report significant overapplication.

Two regions do not require CAFs to report how much waste they apply to crops. In the Central Valley, where the Regional Board does require such reporting, 397 of 546 facilities that we analyzed reported applying more nitrogen from manure and wastewater than their crops could possibly take up in 2024.

5. CAFs frequently fail to account for all nutrients in the waste they produce.

Although nutrient inputs (i.e., manure and wastewater) at CAFs should theoretically equal nutrient outputs (i.e., land application and exports),

this is often not the case. For instance, one report fails to account for more than a million pounds of nitrogen from manure and wastewater.⁴ This “missing nitrogen” raises questions as to the accuracy and comprehensiveness of reporting.

6. Regional Boards do not adequately enforce reporting requirements.

For instance, according to the online database that catalogs enforcement (the California Integrated Water Quality System Project, or **CIWQS**), two of the five regions we analyzed reported taking zero enforcement actions in the last five years, despite numerous violations in that timeframe.

To remedy these problems, we recommend four buckets of policy changes that the State Board can and should implement:

1. The State Board should **standardize reporting requirements across regions.**

Specifically, the State Board should mandate that all Regional Boards require CAFs to: (1) report their wastewater; (2) account for all the nutrients contained in manure and wastewater; (3) sample their groundwater; (4) attach corroborating documents to reports such as sampling analyses; and (5) use uniform, scientifically valid manure conversion factors.

2. The State Board should **monitor violations of reporting requirements.**

The Porter-Cologne Act grants the State Board broad authority to identify violations and impose fines upon CAFs when they violate self-

⁴ Bidart Dairy No. 2, Annual Report (General Order No. R5-2007-0035) 2 (2023). All reports we cite are also available at <https://drive.google.com/drive/folders/1GXEVlzxWv7734PbUM4PKVRFpkoog9NoL?usp=sharing>.

reporting requirements imposed by Regional Boards. The State Board should do so.

3. The State Board should **monitor violations of substantive requirements and take appropriate enforcement actions.**

WDRs impose substantive requirements as well as self-reporting requirements. When CAFs self-report data that demonstrates a substantive violation of the law, the State Board and Regional Boards can and should act.

4. The State Board should **direct Regional Boards to make all annual reports publicly accessible.**

To increase public awareness and engagement in the regulatory process, all annual reports should be readily available online in a machine-readable format and in Spanish as well as English.

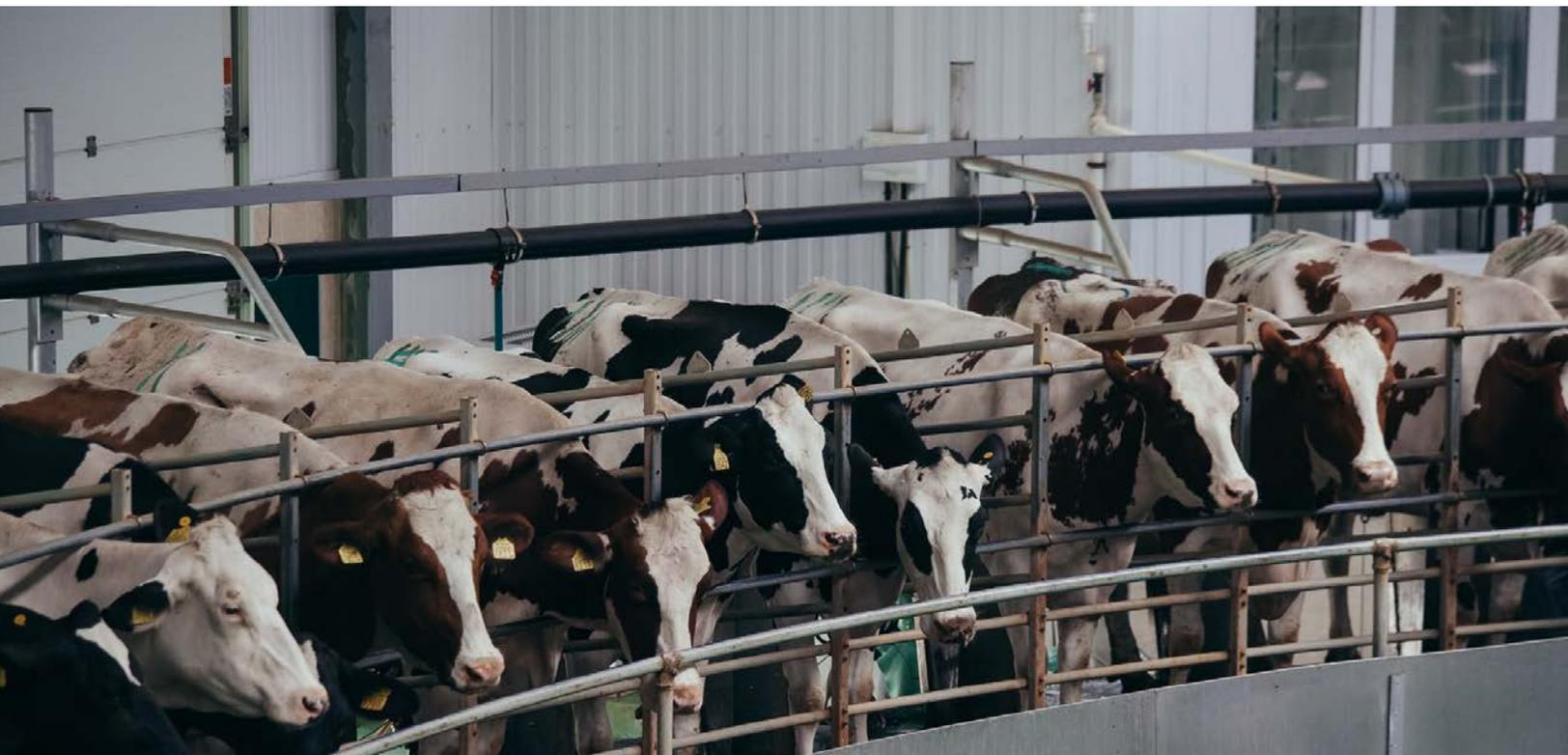


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Introduction

Within the 2,100 square mile expanse of Madera County lies Costa View Farms, a commercial dairy with (as of 2023) approximately 6,855 cows.⁵ In that year alone, the farm's herd of dairy cows produced 402 million pounds of manure.⁶ Broken into its chemical components, this manure contained 2.5 million pounds of nitrogen; 1.2 million pounds of potassium; and 419,000 pounds of phosphorus.⁷

⁵ Costa View Farms, Annual Report (General Order No. R5-2007-0035) 3 (2023). We summed the average number of dairy cows (6,025) and dry cows (830) to reach 6,855 total cows.

⁶ *Id.*

⁷ *Id.*

In addition to manure, the farm produced 137 million gallons of wastewater⁸ from cleaning facilities and processing the milk that its cows produced.⁹ This “process wastewater,” contaminated with excrement and spoiled milk, is similar in composition to manure itself. The 137 million gallons of process wastewater produced at Costa View Farms contributed another hundreds of thousands of pounds of nitrogen, phosphorus, and potassium to the dairy’s total nutrient production.¹⁰

Spreading outward from the facilities that contain Costa View Farms’ cows lie 3,447 acres of cropland for harvesting alfalfa, wheat, and corn.¹¹ These crops need nutrients to grow. So operators, in addition to applying commercial fertilizer to croplands, often also apply manure and wastewater generated on-site to the fields.¹²

Costa View Farms is far from unique. Other farms in the San Joaquin Valley—where nitrogen from manure stands to be approximately one-third of all nitrogen applied to agricultural fields—take the same approach.¹³ But our findings indicate that farmers significantly overapply these constituents to their fields. Soil already saturated with nutrients from commercial fertilizer or previous manure applications quickly loses its capacity to retain nutrients, and excess nutrients flow off the fields, often ultimately reaching surface waters or leaching into groundwater.¹⁴ This leaching likely

⁸ *Id.*

⁹ *See* California Regional Water Quality Control Board, San Francisco Bay Region, General Waste Discharge Requirements Attach. J 7; *see also* 40 C.F.R. § 412.2(d) (defining process wastewater).

¹⁰ Costa View Farms, Annual Report (General Order No. R5-2007-0035) 3 (2023).

¹¹ *Id.* at 8-113.

¹² *Id.* at 213.

¹³ Thomas Harter et al., Nitrogen Fertilizer Loading to Groundwater in the Central Valley 109 (2017).

¹⁴ State of California State Water Resources Control Board, Draft Order WQ 2024-00xx: In the Matter of Review of Waste Discharge Requirements General Order No. R5-2013-0122 for Milk Cow Dairies in the Central Valley Region Issued by the California Regional Water Quality Board, Central Valley Region 10 (2024) [hereinafter Draft Dairy Order].

contributed, at least in part, to elevated nitrogen in every single well that the Central Valley Dairy Representative Monitoring Program tested in 2018 beneath San Joaquin Valley dairies.¹⁵ As the State Board recently observed, dairy practices “adversely affect the beneficial uses of groundwater and cause severe social and economic impacts.”¹⁶ These practices, it wrote, “cannot continue unabated.”¹⁷

This report documents various shortcomings in California’s existing water quality regulations applicable to CAFs. We find that CAFs underreport the waste they produce and fail to account for the waste that they do report producing. To address these problems, we articulate several additional reporting requirements that the State and Regional Boards should implement. We also outline the statutory authority needed to implement these changes and point to possible funding mechanisms to support these improvements.

¹⁵ J.P. Cativiela et al., Central Valley Dairy Representative Monitoring Program, Summary Representative Monitoring Report 6 (2019).

¹⁶ Draft Dairy Order 10.

¹⁷ *Id.*



Background

Over 1,800 confined animal facilities (CAFs)¹⁸ contain nearly seventy-seven million agricultural animals in California.¹⁹ The California Code of Regulations defines a CAF as “any place where . . . animals are corralled, penned, tethered, or otherwise enclosed or held and where feeding is by means other than grazing.”²⁰ Unlike traditional farms, wherein animals are

¹⁸ California Integrated Water Quality System Project, Regulated Facility Report Summary (last visited Nov. 15, 2025).

¹⁹ USDA, 2022 California Census of Agriculture. Because this value aggregates animals across all animal agricultural facilities, it also includes animals reared in non-confined animal facilities. But, given that most livestock in the United States are reared in confined settings, this estimate serves as a rough approximation. See Hannah Ritchie, *Almost All Livestock in the United States is Factory Farmed*, OUR WORLD IN DATA (Feb. 12, 2025), <https://perma.cc/4VA2-6KUB>.

²⁰ 27 Cal. Code. Regs. § 20164.

put out to pasture to feed on grass, cattle in CAFs are thus generally reared in crowded pens and rely on facility staff to bring them feed.

Large CAFs are on the rise in California.²¹ Geographically, the majority of these facilities are located in the Central Valley,²² which is home to eighty-nine percent of the state's cows and eighty-one percent of the state's dairy farms.²³ CAFs are disproportionately located near low-income communities of color, particularly Hispanic and Native American communities.²⁴ These areas are also associated with other social vulnerabilities, including a greater proportion of disabled and elderly individuals.²⁵ Residents in these areas are also likely to be exposed to other environmental health hazards, such as air pollution generated by vehicles, compounding health impacts.²⁶

²¹ Sophie Barrowman, *More Milk, Fewer Farms, and Regional Concentration: Mapping Transformations in California's Dairy Industry*, 115 GEOGRAPHICAL REV. 49, 49 (2025).

²² *Id.* at 57-64.

²³ Draft Dairy Order 8.

²⁴ Pegga Mosavi, *Manure, Methane, and Money: The Anaerobic Digester Disaster in California*, 29 ANIMAL L. REV. 41, 44-45 (2023). *See also* Abor J.L. Quist et al., Earthjustice, *Disparities of Industrial Animal Operations in California, Iowa, and North Carolina* 7, <https://perma.cc/YUF3-KVAK>.

²⁵ Abor J.L. Quist et al., *supra* note 24, at 7.

²⁶ *Id.* at 6.

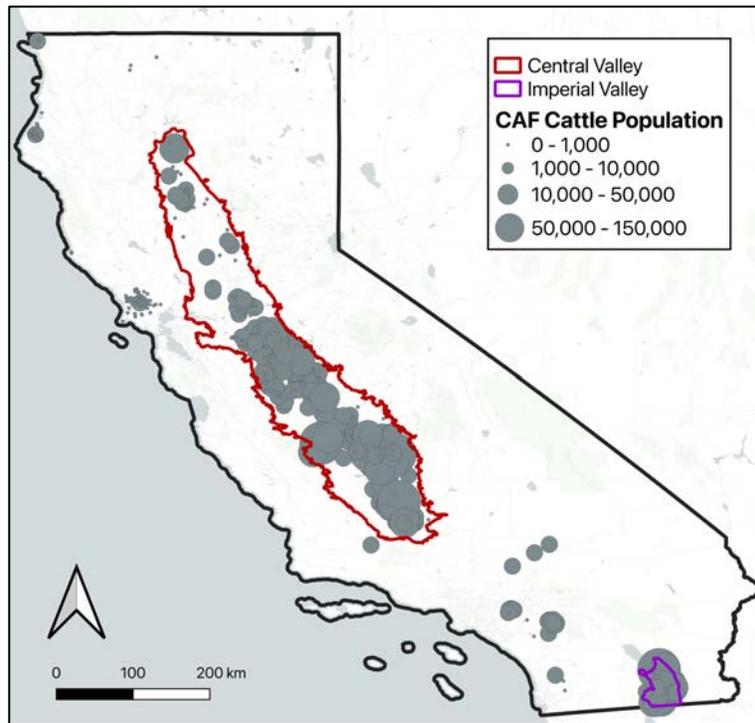


Fig. 1. Map of CAFs with cattle in California.²⁷

CAFs in California are also frequently situated near surface waters or above groundwaters. A comprehensive study of Tulare, a county situated in the Central Valley comprised of two-thirds Hispanic residents, found that over 93% of dairy CAFs in that region pose water quality threats.²⁸

²⁷ Created based on California Integrated Water Quality System Project, ANIMALWASTE Program Regulated Facilities Report, <https://ciwqs.waterboards.ca.gov/ciwqs/readOnly/CiwqsReportServlet?inCommand=reset&reportName=RegulatedFacility> (last accessed January 5, 2026). The authors excluded all facilities that did not have cattle (e.g., goats, turkeys, horses, etc.) before generating the map. The Central Valley and Imperial Valley regions are highlighted. California State University, Chico, The Central Valley Historic Mapping Project (2003); Imperial Irrigation District, Canals, Drains, and Reservoirs in Imperial Irrigation District (IID) (2005). The basemap is provided by CARTO. Carto, Positron Basemap without Labels, <https://perma.cc/3BN8-75EY>.

²⁸ Sunghoon Baek & Charlotte D. Smith, *Potential Contaminant Runoff from California's Dairy Concentrated Animal Feeding Operations (CAFOs): A Geospatial Analysis*, 11 INT'L J. WATER RES. & ENV'T ENG'G 1, 6 (2019).

Broadly, CAFs pose four distinct threats to water quality: (a) eutrophication, (b) groundwater contamination, (c) pathogen pollution, and (d) endocrine disruption.

- **Eutrophication.** Unprocessed manure contains nitrogen and phosphorus. When that manure is mismanaged, or when nutrients run off from a CAF, excess nitrogen and phosphorus enter surface waters. Eutrophication occurs when a water body receives excess nutrients, resulting in algae overgrowth.²⁹ If a water body is at nutrient equilibrium, the release of even a small quantity of nutrients can wreak havoc on surface waters: assuming ideal conditions for algal growth, releasing one pound of phosphorus can trigger the growth of up to 500 pounds of algae.³⁰ Though not all algal blooms are inherently toxic, algal blooms can produce toxins under certain conditions.³¹ These algal blooms, classified as harmful algal blooms, endanger animals across the food chain.³² Humans are also affected by the toxins these algal blooms release, which are associated with rashes. Ingestion of water contaminated with this harmful algae can also result in nausea or vomiting, headache, or diarrhea.³³ Finally, a high density of any algal bloom can consume oxygen that other aquatic organisms

²⁹ M. Nasir Khan & F. Mohammad, *Eutrophication: Challenges and Solutions*, in EUTROPHICATION: CAUSES, CONSEQUENCES AND CONTROL 12 (Abid A. Ansari & Sarvajeet Singh Gill eds., 2d ed. 2014).

³⁰ L.E. Kuentzel, *Phosphorus and Carbon in Lake Pollution*, 2 ENV'T LETTERS 101, 104 (1971).

³¹ Kevin G. Sellner et al., *Harmful Algal Blooms: Causes, Impacts, and Detection*, 30 J. INDUS. MICROBIOLOGY & BIOTECH. 383, 383 (2003).

³² JoAnn M. Burkholder et al., *Food Web and Ecosystem Impacts of Harmful Algae*, in HARMFUL ALGAL BLOOMS: A COMPENDIUM DESK REFERENCE 243, 243 (Sandra E. Shumway et al. eds., 2018).

³³ Sangeeta Sonak et al., *Causes, Human Health Impacts and Control of Harmful Algal Blooms: A Comprehensive Review*, 3 ENV'T POLLUTION & PROT. 41, 43-50 (2018).

need to survive, resulting in fish kills and compromised ecosystem function.³⁴

- **Groundwater contamination.** Most nitrogen enters the groundwater when farmers overapply manure and process wastewater to cropland.³⁵ When crops are unable to utilize all the nutrients present in that waste, excess nitrogen can leach through the soil and into the groundwater.³⁶ In the Central Valley, where CAFs are very common, a significant proportion of residents rely on groundwater wells to procure water for drinking, bathing, and other household needs.³⁷ Drinking water contaminated by nitrates can have serious health consequences. For instance, nitrates can interfere with red blood cells' ability to carry oxygen throughout the body, resulting in methemoglobinemia, a condition wherein hemoglobin—a protein responsible for carrying oxygen in red blood cells—is converted into methemoglobin, a protein unable to bind to oxygen.³⁸ Because infants have a different form of hemoglobin than adults, they are particularly susceptible to low oxygen levels, which can lead to the condition colloquially termed “blue baby syndrome.”³⁹ This condition can result in coma or death if not treated appropriately.⁴⁰

³⁴ Amanda Thronson & Antonietta Quigg, *Fifty-Five Years of Fish Kills in Coastal Texas*, 31 ESTUARIES & COASTS 802, 802-803 (2008).

³⁵ Draft Dairy Order 23.

³⁶ Harold M. van Es et al., *Effect of Manure Application Timing, Crop, and Soil Type on Nitrate Leaching*, 35 J. ENV'T QUALITY 670, 670 (2006).

³⁷ Draft Dairy Order 29.

³⁸ *Id.*

³⁹ Babies with sufficiently depleted oxygen take on a blue hue, which is why the condition is colloquially termed “blue baby syndrome.”

⁴⁰ Lynda Knobeloch et al., *Blue Babies and Nitrate-Contaminated Well Water*, 108 ENV'T HEALTH PERSPS. 675, 675 (2000).

- **Pathogens.** Alongside nutrients, manure contains a variety of pathogens, including bacteria (such as *E. coli* and *Salmonella*), protozoa (*Giardia*), and viruses.⁴¹ Antibiotic-resistant bacteria poses particular threats. To keep animals alive in crowded conditions, and often to facilitate rapid maturation, operators lace animal feed with low doses of antibiotics to prevent infection.⁴² But the overuse of antibiotics—especially when animals are treated at low doses over long periods of time—creates a breeding ground for antibiotic-resistant strains.⁴³ CAF operators also frequently treat livestock with antibiotics that are also used to treat infections in humans.⁴⁴ As a result, some antibiotic-resistant urinary tract infections (UTIs) are thought to be the consequence of CAF manure runoff.⁴⁵
- **Endocrine disruption.** Manure also contains a variety of hormones.⁴⁶ While some of these hormones arise naturally, other hormones present in manure are artificial, administered specifically to increase animal size and milk production.⁴⁷ Exposure to or ingestion of these hormones can disrupt the normal hormonal signaling of affected

⁴¹ Shamik Polley et al., *The Link Between Animal Manure and Zoonotic Disease*, in *ANIMAL MANURE: AGRICULTURAL AND BIOTECHNOLOGICAL APPLICATIONS* 297, 297 (Shubhangi Mahajan & Ajit Varma eds., 2022).

⁴² Michael J. Martin et al., *Antibiotics Overuse in Animal Agriculture: A Call to Action for Health Care Providers*, 105 *AM. J. PUB. HEALTH* 2409, 2409 (2015).

⁴³ *Id.*

⁴⁴ Sameer J. Patel et al., *Antibiotic Stewardship in Food-producing Animals: Challenges, Progress, and Opportunities*, 42 *CLINICAL THERAPEUTICS* 1649, 1649 (2020).

⁴⁵ Cindy M. Liu et al., *Using Source-Associated Mobile Genetic Elements to Identify Zoonotic Extraintestinal *E. coli* Infections*, *ONE HEALTH*, Feb. 28, 2023, at 1.

⁴⁶ Fredrick Owina Gudda et al., *Ecological and Human Health Risks of Manure-Borne Steroid Estrogens: A 20-year Global Synthesis Study*, *J. ENV'T MGMT.*, Oct. 5, 2021, at 1.

⁴⁷ U.S. Env't Prot. Agency, *Environmental Assessment of Proposed Revisions to the National Pollutant Discharge Elimination System Regulation and the Effluent Guidelines for Concentrated Animal Feeding Operations 2-15* (2001).

humans and animals.⁴⁸ Endocrine disruption is associated with a variety of effects including developmental abnormalities, reproductive interference, increased cancer risk, and disturbances in immune and nervous system functioning.⁴⁹

The Central Valley Regional Board has recognized that “[r]unoff from [CAFs] can impair both surface and ground water beneficial uses” by producing “significant amounts of coliform, ammonia, [and] nitrate[] contamination.”⁵⁰ Animal wastes enter the water supply due to facilities’ “inappropriate application of wastewater and manure” to croplands.⁵¹

To limit these detrimental impacts, and to ensure that the waters of the state are regulated for “the greatest public benefit,”⁵² the California legislature conceived of regional programs that regulate water quality within a framework of statewide coordination.⁵³ This plan culminated in the creation of the State Board alongside nine-semi-autonomous Regional Boards.⁵⁴ Each Regional Board is responsible for “establish[ing] water quality objectives in water quality control plans” for its region.⁵⁵ These water

⁴⁸ Anne T. Pollard & Matthew J. Mora, *Estrogens: Properties, Behaviors, and Fate in Dairy-Manure Amended Soils*, 25 ENV'T REV. 452, 452 (2017).

⁴⁹ *Id.* See also Edward F. Orlando et al., *Endocrine-Disrupting Effects of Cattle Feedlot Effluent on an Aquatic Sentinel Species, the Fathead Minnow*, 112 ENV'T HEALTH PERSPS. 353, 353 (2004) (explaining that fish exposed to manure runoff demonstrated “significant alterations in their reproductive biology”).

⁵⁰ California Regional Water Quality Control Board Central Valley Region, *The Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board Central Valley Region: The Sacramento River Basin and the San Joaquin River Basin 4-4* (5th ed. 2019).

⁵¹ *Id.*

⁵² Cal. Water Code § 105.

⁵³ Cal. Water Code § 13000.

⁵⁴ State Water Resources Control Board, *The Nine Regional Water Quality Control Boards in California*, <https://perma.cc/RJZ5-8Q4Y>.

⁵⁵ Cal. Water Code § 13241.

quality control plans, once approved by the State Board,⁵⁶ provide the foundation for any further water and waste management policies within the region.

Regional Boards set limits on CAF manure and wastewater discharges in waste discharge requirements (**WDRs**). These WDRs incorporate both state-level requirements and regional-level requirements. For example, in response to the state requirement that the “[a]pplication of manure and wastewater to . . . crop lands” to “be at rates which are reasonable for the crop, soil, climate, special local situations, management system, and type of manure,”⁵⁷ every Regional Board requires CAFs who apply manure or wastewater to their fields to submit a Nutrient Management Plan (NMP), or a similar document, as part of its suite of requirements for CAF.⁵⁸ Broadly, in the words of Region 2, an NMP serves to:

Identify the management practices used at the facility to minimize adverse impacts to surface water and groundwater from runoff and leaching from land application areas. The NMP is specific to a

⁵⁶ Cal. Water Code § 13245.

⁵⁷ 27 Cal. Code Regs. § 22563.

⁵⁸ California Regional Water Quality Control Board, North Coast Region Order No. R1-2019-0001, General Waste Discharge Requirements for Dairies within the North Coast Region [hereinafter Region 1 Order] 3 (noting some exceptions to the requirement); California Regional Water Quality Control Board, San Francisco Bay Region, Order No. R2-2016-0031: General Waste Discharge Requirements for Confined Animal Facilities within the San Francisco Bay Region [hereinafter Region 2 Order] 13; California Regional Water Quality Control Board, Central Valley Region, Order No. R5-2007-0035, Waste Discharge Requirements General Order for Existing Milk Cow Dairies [hereinafter Region 5 Order] 3; California Regional Water Quality Control Board, Colorado River Basin Region, Order R7-2021-0029, NPDES No. CAG017001, General Waste Discharge Requirements and National Pollutant Discharge Elimination System (NPDES) Permit for Concentrated Animal Feeding Operations within the Colorado River Basin Region [hereinafter Region 7 Order] 6; California Regional Water Quality Control Board, Santa Ana Region, Order No. R8-2018-0001, NPDES Permit No. CAG018001: General Waste Discharge Requirements for Concentrated Animal Feeding Operations (Dairies and Related Facilities) within the Santa Ana Region [hereinafter Region 8 Order] Attach. D 7. Region 1 allows some farms to not prepare an NMP.

particular facility and encompasses crops, soil types, climate, local conditions, sources of nutrients, and the non-nutrient salts applied to each field.⁵⁹

In sum, NMPs prospectively describe management practices that the farm will take to ensure compliance with WDRs.

After incorporating baseline state requirements, Regional Boards can also impose additional requirements in their respective WDRs. These vary greatly across regions. For example, Region 2 requires that manure lagoons be lined with impermeable materials to prevent seepage,⁶⁰ while Region 8 states that such measures are impractical in light of “financial distress . . . due to global competition for commodities.”⁶¹

The State and Regional Boards rely on self-reporting requirements to assess substantive compliance, including compliance with NMPs (which are generally not made available to the public).⁶² All five Regional Boards with significant CAF presence—Regions 1 (North Coast), 2 (San Francisco), 5 (Central Valley), 7 (Colorado River Basin), and 8 (Santa Ana)—require

⁵⁹ Region 2 Order Attach. D 1.

⁶⁰ Region 2 Order 12.

⁶¹ Region 8 Order Attach. D 17.

⁶² Only those regions that combine state CAF WDR and federal CAF NPDES permitting provide opportunities for initial public comment on the NMPs. *E.g.*, Region 7 Order 7. But in all other regions, and after initial public comment in NPDES regions, the public is precluded from reviewing the documents. *E.g.*, Region 8 Order 27 (explaining that the nutrient management plan is maintained on-site). NMPs notably need not be subject to frequent public review—they are not living documents that respond to the realities of waste application. There is, for instance, no requirement to update NMPs yearly to account for the previous season’s nutrient application. Indeed, operators are not required to update them at all unless a triggering event occurs. Region 2 requires a NMP revision only when there is a significant change in circumstances, such as the introduction of a new crop. Region 2 Order Attach. D 2. And Region 5 requires a revision to an NMP only when “monitoring shows that discharge from the land application fails to comply with the Groundwater Limitations of this Order or surface water quality objectives or criteria.” Region 5 Order 16.

CAFs to self-report information about their operations annually.⁶³ Each Regional Board specifies reporting requirements in its WDR.

Our research focused primarily on these self-reporting requirements, since failures within this self-reporting scheme can have significant substantive consequences downstream. If Regional Boards use annual reports to identify enforcement targets and priorities, then errors in CAF annual reports can lead to suboptimal enforcement. We recommend several measures to address that issue.



Image credit: stockbusters, iStock.

⁶³ Region 1 Order 8; Region 2 Order 22; Region 5 Order MRP-11; Region 7 Order E-18; Region 8 Order Attach. B 5.



Methodology

To investigate how CAFs complied with the reporting and substantive requirements embedded in WDRs, we examined annual reports from CAFs across five regions in California: Regions 1 (North Coast), 2 (San Francisco Bay), 5 (Central Valley), 7 (Colorado River Basin), and 8 (Santa Ana). In 2023, these regions had 106, 58, 1574, 31, and 79 CAFs, respectively. Of these totals, 104, 31, 1077, 31, and 70 had cows at their facilities. We obtained these totals from the California Integrated Water Quality System

(CIWQS),⁶⁴ a public database that lists known CAFs in the state.⁶⁵ Most cow-confining CAFs in California are dairies (facilities that produce milk) as opposed to feedlots (facilities that produce meat).

We requested 2023 annual reports via email from Regional Boards 1, 2, and 5 on October 8th, 2024 and from Regional Boards 7 and 8 on October 10th, 2024. Because Regions 1, 2, and 8 were described as having predominantly dairies, we only requested dairy annual reports from these regions.⁶⁶ By contrast, we requested annual reports for all CAFs from Regional Boards 5 and 7.

Ultimately, Region 1 provided 5 reports; Region 2 provided 29 reports; Region 5 provided 311 reports; Region 7 provided 21 reports; and Region 8 provided 56 reports. This variability is attributable in part to our decision to request either dairy annual reports or all CAF annual reports, though other factors were also at play.⁶⁷

⁶⁴ To obtain these totals, we filtered the CIWQS database by region, then selected “ANIMALWASTE” as the relevant program and “Animal Feeding Facility” as the relevant facility type. These search criteria outputted total numbers of facilities, disaggregated into three different types: “ANIWSTCOWS,” which are primarily dairies; “ANIWSTGRZ,” which are facilities with grazing cattle; and “ANIWSTOTHER,” which are other types of facilities. Our totals listed here (104, 31, 1077, 31, and 70, respectively) are of “ANIWSTCOWS” facilities only. CALIFORNIA INTEGRATED WATER QUALITY SYSTEM PROJECT, <https://ciwqs.waterboards.ca.gov/ciwqs/readOnly/CiwqsReportServlet?reportID=1521144&reportName=RegulatedFacilityDetail&inCommand=displayCriteria> (last accessed March 21, 2025).

⁶⁵ The federal government does not keep track of the locations of confined animal facilities. As a result, it is up to “states, researchers and activists, to build their own databases” tracking these facilities. Madison McVan, *Information on Factory Farms is Spotty at Best. The Government Has Been Hogtied From Doing More*, INVESTIGATE MIDWEST (Feb. 25, 2021), <https://perma.cc/UXB3-WETT>. And because CAFs are underwhelmingly compliant in submitting annual reports, counts of statewide CAFs are best described as approximations.

⁶⁶ *National Pollution Discharge Elimination System (NPDES)*, STATE WATER RES. CONTROL BD., <https://perma.cc/4Z83-EWW5>.

⁶⁷ The North Coast Regional Board (Region 1) stores their reports the Regional Water Boards Electronic Content Management (ECM) database and stated that it was unable to provide virtual access to the entire universe of reports. As to Region 5, we requested “as many reports”

While we requested 2024 annual reports from all Regional Boards that contain dairy CAFs, we only integrated analysis of Region 5’s 2024 reports into this white paper. We did so for two reasons. First, Region 5’s reports are quantitatively rich and consistently machine-readable. Second, initial inspection of other region’s reports indicate that they followed the same trends identified in the 2023 annual reports, and thus that additional research would not yield significantly different results.

<u>Region</u>	<u>CAFs</u>	<u>CAFs with cows</u>	<u>Annual reports provided</u>
1	106	104	5
2	58	31	29
3	1 – excluded from further analysis		
5	1574	1077	311
6	3 – excluded from further analysis		
7	31	31	21
8	79	70	56
9	9 – excluded from further analysis		

Table 1. 2023 annual reports analyzed across regions.

as the Regional Board could supply by contacting staff. Soon thereafter, Region 5 provided access to a collection of annual reports in a digital database. Because access to the digital database lapsed shortly after the provision of the reports, it remains unclear to authors how many total annual reports were initially available in the digital database (in other words, it is possible that the digital database provided access to additional reports that the authors of this white paper were not able to download before access lapsed).

<u>Region</u>	<u>CAFs</u>	<u>CAFs with cows</u>	<u>Annual reports provided</u>
5	1549	1058	858

Table 2. 2024 annual reports analyzed across regions.⁶⁸

Using an open-source Python library (pdfplumber) capable of scraping text from machine-readable PDF files, we compiled descriptive statistics to identify trends in Region 5 reporting.⁶⁹ Some operators in Region 5 used third-party consulting firms to prepare their reports, which deviated from the template form provided by Region 5 itself. This feature rendered those reports unsearchable by our software. Other dairies submitted scanned images of annual reports that were not easily machine-readable, complicating automated scraping efforts. All non-machine-readable reports were excluded from any quantitative analysis. Our sample of Region 5 reports was, accordingly, not random and thus may not be representative.⁷⁰

Overall, we quantitatively analyzed 170 of 481 Region 5 annual reports provided in 2023, and 588 of 858 reports in 2024. All 2023 and 2024 reports analyzed here, as well as Python notebooks for scraping and analysis, are available at <https://doi.org/10.5281/zenodo.17679792>.

⁶⁸ California Integrated Water Quality System, Regulated Facility Report Region 5 (last visited Nov. 16, 2025).

⁶⁹ J. Song, pdfplumber.com (2025), <https://perma.cc/2L3N-CWYQ>.

⁷⁰ See *supra* note 67 (describing how 2024 Region 5 annual reports were selected).



Findings

The State Board has been minimally involved in developing CAF reporting requirements. The only generally applicable State Board regulation requires CAF annual reports to include “(1) average daily volume of facility wastewater and volume or weight of manure; (2) total animal population at the facility, and types of animals; (3) location and size of use or disposal fields and retention ponds, including animal capacity; and (4) animal capacity of the facility.”⁷¹ However, Regions 1 and 2 do not appear to explicitly require manure production reporting in their WDRs, and Regions 1, 2, and 8 do not appear to explicitly require wastewater

⁷¹ 27 Cal. Code Regs. § 22560(b).

reporting in their WDRs.⁷² Regional Boards can impose additional reporting requirements on the CAFs within their jurisdiction via WDRs and have significant discretion in determining requirements.⁷³

The State Board can, however, impose additional mandatory requirements on CAFs when it deems Regional Board CAF regulations to be inadequate. For example, after conducting a review of Region 5 dairies, the State Board proposed statewide reporting requirements in its 2024 Draft Dairy Order.⁷⁴ While this Order does expand the scope of required reporting in important ways, it does not fully address existing problems with the self-reporting scheme. Accordingly, we outline several additional recommendations for improving reporting and associated monitoring and enforcement in the “Recommendations” section below.

The State and Regional Water Boards are responsible for regulating tens of millions of tons of manure each year. In 2024, 588 facilities in Region 5 produced 21,369,372 tons of manure.⁷⁵

⁷² See Region 2 Order Attach. A, 9-11; Region 1 Order 30-31; Region 8 Order Attach. B. 5-6; Form 3 1-2.

⁷³ Cal. Water Code § 13260.

⁷⁴ Draft Dairy Order 62 (requiring that CAFs report “the herd size, type of cows, amount of fertilizer application, amount of cropped acreage and types of crops, amount of manure exported or treated, the herd’s total excreted manure in liquid and solid form, volatilization loss, the amount of milk produced in lactating cows, dry matter intake, concentration of crude protein of total ration provided to heifers, amount of acreage to which liquid and solid manure is applied, amount of acreage to which manure is applied by a third party, the amount of acreage applied to leguminous crops, the amount of nitrogen uptake in the various types of crops, the yield of the crops, and the amount of nitrogen in irrigation water and the volume of water applied”).

⁷⁵ Underlying data used to calculate this statistic are available at <https://doi.org/10.5281/zenodo.17679792>.

Region	Wastewater production reporting required?	Manure production reporting required?	Nutrient content reporting required?	Groundwater sampling required?	Manure tracking manifests required?	Public access to nutrient management plans?
1	×	×	×	×	×	×
2	×	×	×	✓	×	×
5	✓	✓	✓	✓	✓	×
7	✓	✓	×	×	×	Limited ⁷⁶
8	×	✓	×	×	✓	Limited ⁷⁷

Table 3. Summary of existing annual reporting requirements imposed by different Regional Boards (described further herein).

1. CAFs often underreport or fail to report wastewater production.

The Region 5 WDR defines wastewater as:

Spillage or overflow from animal watering systems; washing, cleaning, or flushing pens, barns, manure pits, or other dairy facilities; washing or spray cooling of animals; or dust control . . . [it] includes any water

⁷⁶ New NMPs are available for public review and comment for 30 days. Region 7 Order 29. Later revisions to the NMP are also subject to public notice and comment. *Id.* at 31.

⁷⁷ New or amended NMPs must be available to the public for 30 days before approval. Region 8 Order 28.

or precipitation and precipitation runoff which comes into contact with any raw materials, products, or byproducts including manure, feed, milk, or bedding from cleaning cow-confinement facilities and processing the milk that its cows produced.⁷⁸

Because all animals require feed and bedding and produce manure, all CAFs produce wastewater that has likely been contaminated by excess nutrients and other chemicals through contact with animal products and byproducts. Whereas Regions 5 and 7 require farms to report how much wastewater they produce, Regions 1, 2, and 8 include no such requirement.⁷⁹

Even where wastewater reporting is required, dairies underreport wastewater production. In 2023, 29 of the 170 facilities we analyzed in Region 5 reported producing no wastewater at all, despite 15 of these farms reporting that they had non-zero herd sizes over the reporting period. In 2024, 81 of 588 dairies we analyzed reported no wastewater production, with 39 of these reporting non-zero herd sizes. In fact, in 2024, dairies reporting that they generated zero wastewater had an average herd size of 313.

Many farms that reported nonzero wastewater production still underreported when compared to relevant scientific literature. We calculated the ratio of wastewater produced to milk generated in the Region 5 annual reports that listed nonzero herd sizes, nonzero milk production, and nonzero wastewater production.⁸⁰ Studies suggest that processing one liter of milk generates between 2.5 and 10 liters of wastewater.⁸¹ Wastewater-

⁷⁸ Region 5 Order E-4.

⁷⁹ Region 5 Order MRP-9; Region 7 Order 39; *see also, e.g.*, McClelland Dairy West, Annual Report (General Order No. R1-2016-0011) 3 (2023); Volpi Dairy Inc., Annual Report (General Order No. R2-2016-0031) 7 (2023); William Koot Dairy, Annual Report (NPDES Permit No. CAG018001) 1 (2023).

⁸⁰ After we applied these filters, our analysis encompassed 136 dairy annual reports in 2023 and 462 dairy annual reports in 2024.

⁸¹ Lea Chua Tan et al., *Anaerobic Digestion of Dairy Wastewater by Side-Stream Membrane Reactors: Comparison of Feeding Regime and its Impact on Sludge Filterability*, ENV'T TECH.

to-milk ratios less than 2.5:1 thus likely represent underreporting of wastewater. By contrast, a ratio greater than 10:1 indicates excessive wastewater production (or at least, reports of excess production). A ratio greater than 10 could mean that a facility has non-dairying animals (for instance, a facility may keep feedlot cattle or immature animals alongside their milking cows) that deflate overall milk production, uses water inefficiently, or misreports wastewater production.

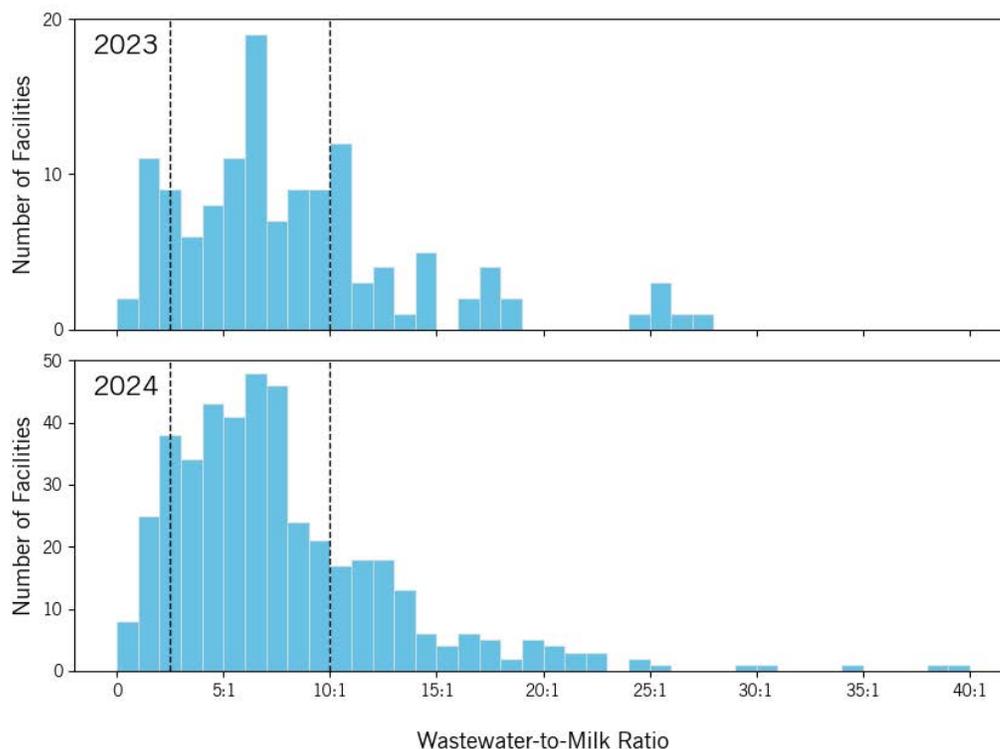


Fig. 2. Distribution of wastewater to milk ratios reported in machine-readable Region 5 dairy annual reports in 2023 and 2024. Vertical lines represent the typical range of wastewater to milk ratios identified in relevant literature (2.5:1 to 10:1).⁸²

& INNOVATION, May 2021, at 1; K. Bella & P. Venkateswara Rao, *Anaerobic Digestion of Dairy Wastewater: Effect of Different Parameters and Co-digestion Options—A Review*, 13 BIOMASS CONVERSION & BIOREFIN. 2527, 2527 (2023).

⁸² Lea Chua Tan et al., *supra* n. 81, at 1.

In 2023, 18 of the 136 dairies analyzed reported ratios less than 2.5:1, while 40 of the 136 facilities reported a wastewater-to-milk ratio greater than 10:1. In 2024, 51 of the 462 dairies analyzed reported ratios less than 2.5:1, while 114 reported ratios over 10:1.

Facilities in Region 7 are not required to report milk production, so their self-reporting cannot be readily validated. Nonetheless, in 2023, some farms in that region did report producing zero wastewater despite reporting the presence of animals.⁸³

2. CAFs often underreport manure production.

Because it is not feasible to weigh the manure of each individual cow, facilities instead use a “conversion factor” to approximate how much waste their cows produce. A manure conversion factor is the estimated amount of manure that a given cow excretes in a year. Different types of cows produce different amounts of manure, so the conversion factor necessarily differs depending on a herd’s composition. For instance, because they are repeatedly impregnated to produce milk, dairy cows produce more manure than feedlot cattle, calves, and other animal types. CAFs estimate how much manure and wastewater they produce by multiplying the size of their herd—weighted according to the quantities of each type of animal present—by these conversion factors.

Relying on data from 2002-2007, the U.S. Department of Agriculture (USDA) estimates that an adult dairy cow produces 20.34 tons of manure in

⁸³ *See, e.g.*, Grizzle Feedlot, Annual Report (General Order No. R7-2013-0800) 1-2 (2023) (reporting no dairy cows and striking through wastewater reporting requirement); Foster Feed Yard, Annual Report (General Order No. R7-2013-0800) 1-2 (2023) (reporting no manure or wastewater despite having a mix of 6,589 heifers and steer); Schaffner Dairy, Annual Report (General Order No. R7-2013-0800) 1-2 (2023) (reporting no adult dairy cows yet simultaneously reporting 2 milkings per day and the production of 20,800 gallons of process wastewater).

a year.⁸⁴ The Dairyland Institute at University of Wisconsin-Madison reports that each dairy cow produces 27.38 tons of manure per year.⁸⁵ While differences in feeding practices may produce different conversion factors, the location of a CAF generally should not drastically alter manure conversion factors. Accordingly, they should generally be in this range, at least approximately.

But different Regional Boards instruct facilities to use significantly different conversion factors in their reporting. The Region 7 and 8 WDRs direct CAFs to use a manure conversion factor of 4.1 tons per adult dairy cow⁸⁶—less than one sixth of the Dairyland Institute estimate above. The relevant WDRs do not describe the Regional Boards’ rationales for selecting those factors.⁸⁷

CAF’s in certain regions are also permitted to use their own conversion factors, which introduces additional challenges. First, facilities that use their own conversion factors are not required to justify the factors they select. Region 8 does not even ask operators to list their conversion factors if they depart from the WDR.⁸⁸ Region 7, by contrast, does require facilities to

⁸⁴ United States Department of Agriculture, Estimates of Recoverable and Non-Recoverable Manure Nutrients Based on the Census of Agriculture 33 (2014). This estimate has increased over time. Between 1982 and 1997, the USDA estimated that an adult dairy cow only produced 15.24 tons of manure annually. *Id.*

⁸⁵ *Manure Management*, THE DAIRYLAND INITIATIVE, <https://perma.cc/J38M-WXJR>.

⁸⁶ Region 7 Order G-2; Region 8 Order, Form 3, 1.

⁸⁷ These figures may be derived from North Carolina Department of Environmental Quality reports that a dairy calf produces 4.1 tons of manure per year. Heather Patt, NORTH CAROLINA WATER RESOURCES ENVIRONMENTAL QUALITY, A Comparison of PAN and P₂O₅ Produced from Poultry, Swine and Cattle Operations in North Carolina 15 (2017). But it is unclear on what basis the Regional Boards elected to use estimates associated with dairy calf production, rather than the higher estimates that apply to adult cows, in calculating the manure that adult cows produce.

⁸⁸ Region 8 Order, Form 3, 1.

“[p]rovide other [conversion] factor[s] if used”⁸⁹; however, operators often leave this section blank.⁹⁰

To determine whether facilities provided reasonable manure estimates when they could permissibly use their own conversion factors, we estimated the approximate ratios that operators used in Regions 7 and 8.⁹¹ Some operators used a higher WDR manure conversion factor than required by the region, albeit still lower than any credible scientific estimates.⁹² Others, however, used lower estimates. Bosch Dairy #2 in Region 8, for example, reports producing no manure whatsoever despite confining 570 dairy cows.⁹³ Slater Farm in Region 7 reported that its 4,505 cattle produced 211.5 tons of manure in 2023, implying a conversion factor of 0.05.⁹⁴ The WDR factor is 1.5 tons of manure a year per steer,⁹⁵ a value 30 times higher than that figure; meanwhile, the conversion factor provided by the United States Department of Agriculture is 10 tons of manure a year per steer, which is 200 times higher than Bosch Dairy #2’s implied conversion factor.

⁸⁹ Region 7 Order G-2.

⁹⁰ *E.g.*, Butter Spur, Annual Report (General Order No. R7-2013-0800) 2 (2023).

⁹¹ We do so using the ratio between Region 8’s manure conversion factors for different animal types. Region 8 asserts that milk-producing cows and feedlot cattle alike produce 4.1 tons of manure per year; that heifers (young female cows that have not yet birthed a calf) produce 1.5 tons of manure per year; and that calves produce 0.5 tons of manure per year. While these values may not be correct, we assume the ratios between them are. We can therefore calculate a CAF’s dairy cow manure conversion factor with the following equation: (dairy cows) (x) + (heifers) (1.5/4.1) (x) + (calves) (0.5) (4.1) (x) = total manure excreted by herd.

⁹² Legend Dairy Farms (8485 Edison Avenue), Annual Report (General Order No. R8-2013-0001, NPDES No. CAG018001) 2 (2023) (milking cows produced roughly 11 tons of manure each annually).

⁹³ Bosch Dairy #2, Annual Report (General Order No. R8-2013-0001, NPDES No. CAG018001) 2 (2023).

⁹⁴ Superior Cattle Feeders (Slater), Annual Report (General Order No. R7-2021-0029, NPDES No. CAG017001) 1 (2023).

⁹⁵ Region 7 Order G-2.

The Region 5 WDR requires dairies to report manure production but does not prescribe specific conversion factors.⁹⁶ In both 2023 and 2024, the mean manure conversion factor at dairies with nonzero herd sizes in the region was approximately 24 tons per cow per year. In 2023, 145 of 154 dairies with non-zero herd sizes in Region 5 had manure conversion factors between the USDA and Dairyland estimates. In 2024, this was true for 490 of 546 facilities with non-zero herd sizes in that region. In other words, in Region 5, 9 facilities in 2023 and 56 facilities in 2024 used conversion factors outside of the expected range.

Regions 1 and 2 do not appear to require farms to report manure production at all in their annual reports.⁹⁷

3. CAFs typically do not disclose where they send their waste when they export it.

Regional Boards require farms to prepare records called “manure tracking manifests” that include the destination, date, and amount of any waste exports. Regions 1, 2, 5, and 8 mandate this for all farms, while Region 7 only applies imposes the requirement on CAFs with over 700 dairy cows, 1000 calves, or 1000 other cattle.⁹⁸

The accessibility of these manifests varies between regions. Regions 1 and 2 require farms to keep tracking manifests on site.⁹⁹ Region 7 has a similar requirement but allows farms to dispose of the tracking manifests after five years.¹⁰⁰ Regions 1, 2, and 7 all do not appear to make these

⁹⁶ Region 5 Order MRP-12.

⁹⁷ *See, e.g.*, Alexandre Dairy, Annual Report (General Order No. R1-2019-0001) (2023).

⁹⁸ Region 7 Order 23; 40 C.F.R. § 122.23(b)(4) (delineating CAFO sizes).

⁹⁹ Region 1 Order 23.; Region 2 Order 59.

¹⁰⁰ Region 7 Order 81.

manifests publicly available in any way.¹⁰¹ Only Regions 5 and 8 require farms to include manure tracking manifests with their annual reports.¹⁰²

CAFs in Regions 5 and 8 frequently failed to comply with this requirement. Our review of annual reporting identified multiple forms submitted in 2023 that did not include them. For example, AC Enterprises, a Region 5 farm just outside the Tulare Basin town of Tipton, reports exporting 1,380 tons of manure, which contained 76,965 pounds of nitrogen.¹⁰³ But because the manifest itself is not included, the destination for that manure remains unclear.

Of course, a manure tracking manifest is only as good as the accuracy of its contents. However, several operators appear to have submitted incomplete or inaccurate information. DeJong's Dairy in Region 8, for example, includes a tracking manifest, but under "manure hauler information," the manifest states "locals from area." For "destination of haul," the manifest simply says "local." The manifest also fails to state how much manure was exported and when the manure hauling occurred.¹⁰⁴

4. The "whole farm nutrient accounting" required by WDRs falls short in practice.

Regional Boards have directed operators to track the life cycle of nutrients on their CAFs. If that tracking is precise and accurate, the nutrients produced by the animals in the form of manure and process wastewater should equal the nutrients applied to fields plus the nutrients

¹⁰¹ Region 7 requires "a certification that a Manure Tracking Manifest was prepared for each manure hauling event," Region 7 Order 23, but not the actual forms.

¹⁰² Region 5 Order MRP-13; Region 8 Order Attach. B 5.

¹⁰³ AC Enterprises, Annual Report (General Order No. R5-2007-0035) (2023).

¹⁰⁴ De Jong Dairy, Annual Report (General Order No. R8-2013-0001, NPDES No. CAG018001) 4 (2023).

exported from the facility. In other words, inputs and outputs should balance.

The State Board, however, has determined that dairies largely fail to engage in whole-farm nutrient accounting, resulting in “[l]arge amounts of unaccounted-for nitrogen.”¹⁰⁵ It is unclear where this unaccounted-for nitrogen is going, if it is not being applied to fields or exported. As suggested by the State Board, it is possible that this unaccounted-for nitrogen is over-applied to crops, which can in turn lead to nutrient runoff and groundwater leaching.¹⁰⁶

To illustrate this issue, we calculated unaccounted-for nitrogen for Costa View Farms, the facility described in the introduction of this paper. The facility’s 2023 report states that it produced 1,760,617 pounds of nitrogen from manure and 557,208 pounds of nitrogen from process wastewater.¹⁰⁷ Adding those values together, the facility produced 2,317,825 pounds of nitrogen from manure and wastewater. The facility applied much of this nitrogen to its crops—it reported applying all wastewater and 850,737 pounds of nitrogen from manure to crops.¹⁰⁸ Subtracting these land applications leaves Costa View Farms with a remaining 909,880 pounds of nitrogen.

The remainder of this nitrogen could, theoretically, be disposed of by exporting it from the CAF. However, the operator reports only a single nitrogen export: 154,511 pounds of nitrogen in a subsequent summary table.¹⁰⁹ The annual report accordingly leaves 755,369 pounds of nitrogen unaccounted for.

¹⁰⁵ Draft Dairy Order 60.

¹⁰⁶ *See id.* at 54.

¹⁰⁷ Costa View Farms, Annual Report (General Order No. R5-2007-0035) 3 (2023).

¹⁰⁸ *Id.* at 213.

¹⁰⁹ *Id.* at 5-6.

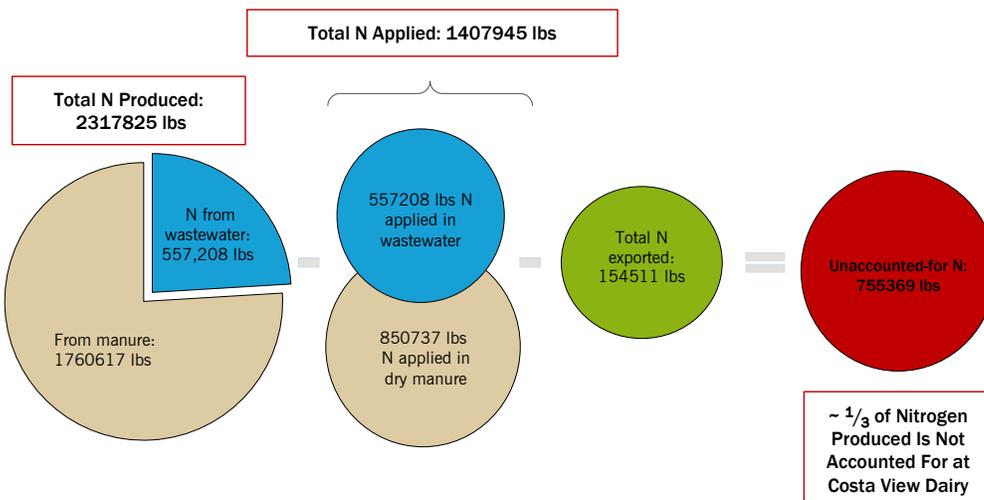


Fig. 3. Unaccounted-for nitrogen (lbs) at Costa View Dairy in 2023.

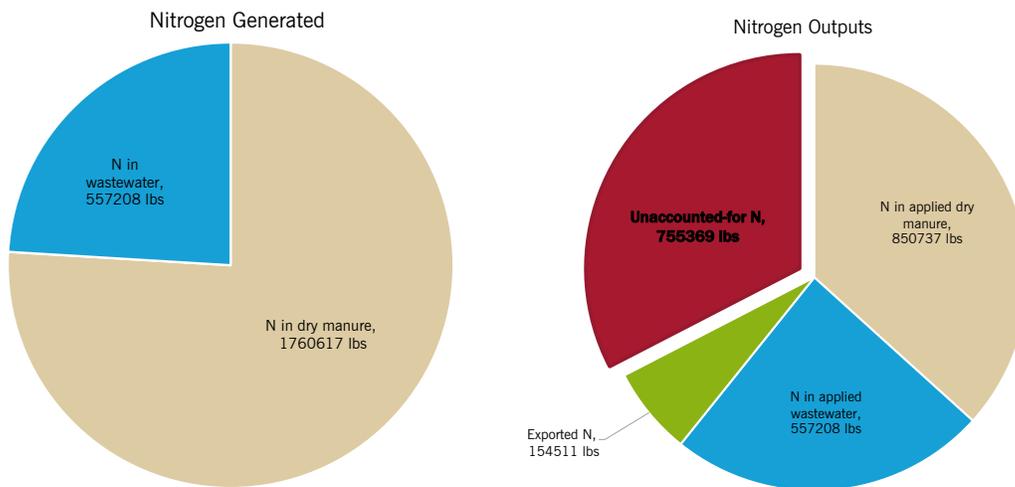


Fig. 4. Total generated, applied, and unaccounted-for nitrogen (in lbs) in Costa View Dairy in 2023.

We replicated this calculation for other facilities in Region 5. In 2023, of the 154 Region 5 facilities we analyzed that had nonzero herd sizes, 143 of them produced nitrogen that their reports did not account for.

In 2024, 498 of 546 Region 5 facilities with non-zero cattle herds had positive values for unaccounted-for nitrogen. **16 of the facilities we analyzed each produced more than 1 million pounds of unaccounted-for nitrogen**, with **total unaccounted-for nitrogen across all analyzed facilities weighing in at 64,688 tons**. Bidart Dairy #2 outside of Bakersfield, California had the highest amount of unaccounted-for nitrogen at 1.88 million pounds.¹¹⁰

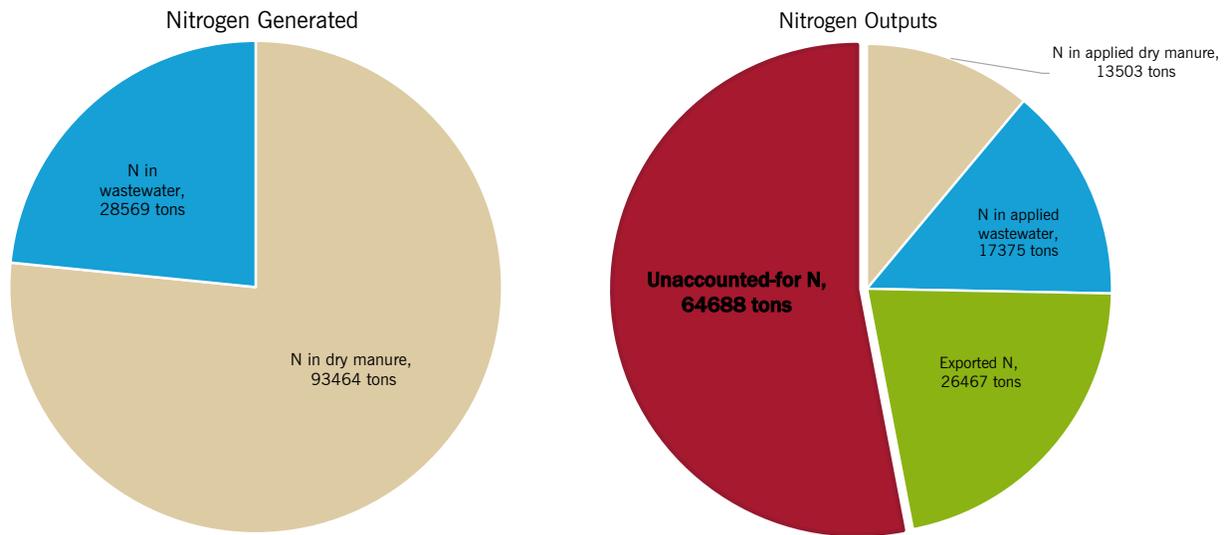


Fig. 5. Total generated, applied, and unaccounted-for nitrogen (in U.S. tons) across all 546 analyzed facilities with non-zero herd sizes in Region 5 in 2024.

Results were similar for other nutrients; unaccounted-for phosphorus and potassium across all analyzed dairies in 2024 weighed in at 12,098 tons and 27,887 tons, respectively.

¹¹⁰ Bidart Dairy #2, Annual Report (General Order No. R5-2007-0035) (2024).

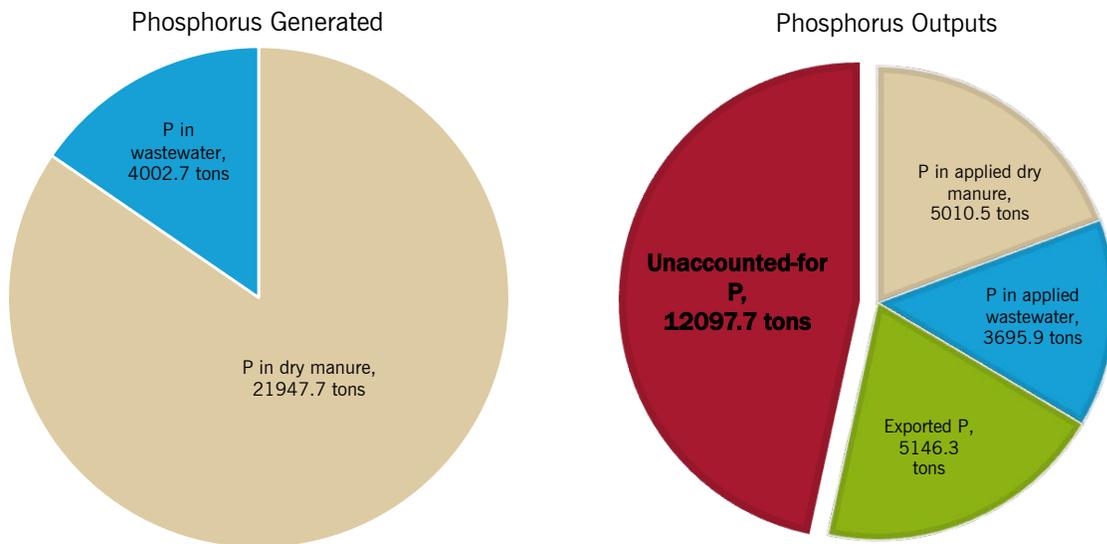


Fig. 6. Total generated, applied, and unaccounted-for phosphorus (in U.S. tons) across all 546 analyzed facilities with non-zero herd sizes in Region 5 in 2024.

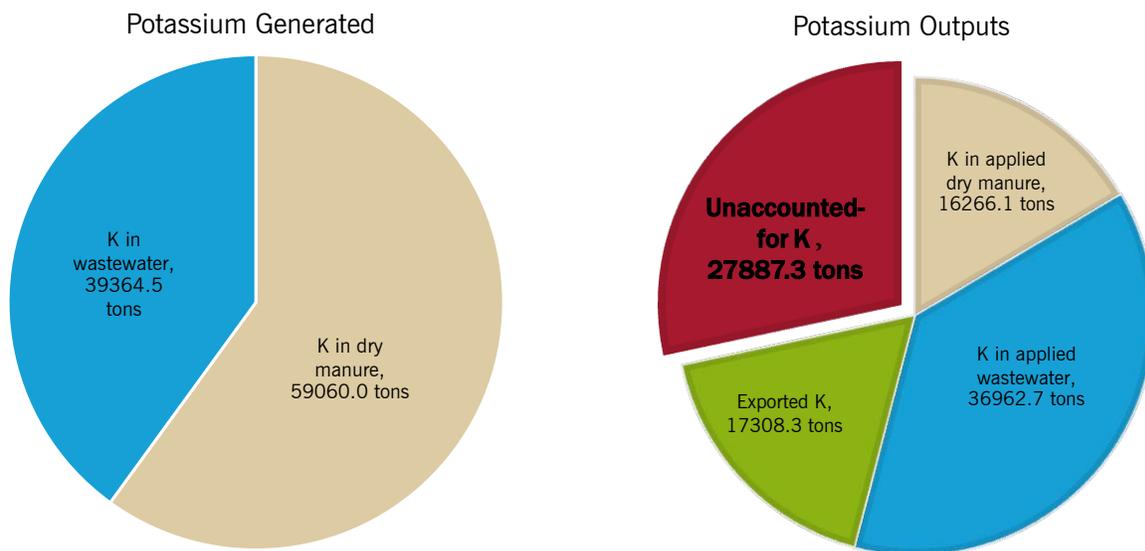


Fig. 7. Total generated, applied, and unaccounted-for potassium (in U.S. tons) across 546 analyzed facilities with non-zero herd sizes in Region 5 in 2024.

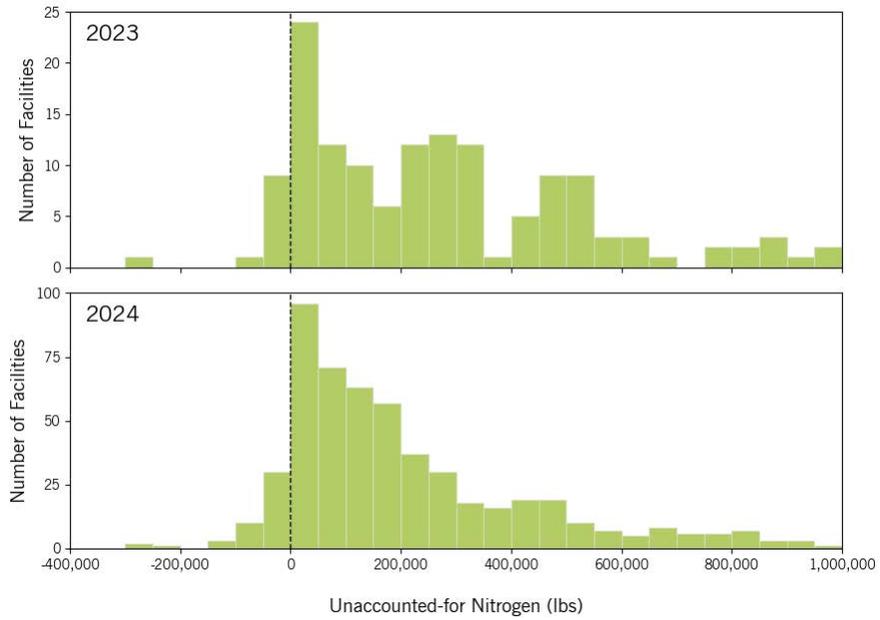


Fig. 8. Distribution of unaccounted-for nitrogen across all 546 analyzed facilities with non-zero herd sizes in Region 5.

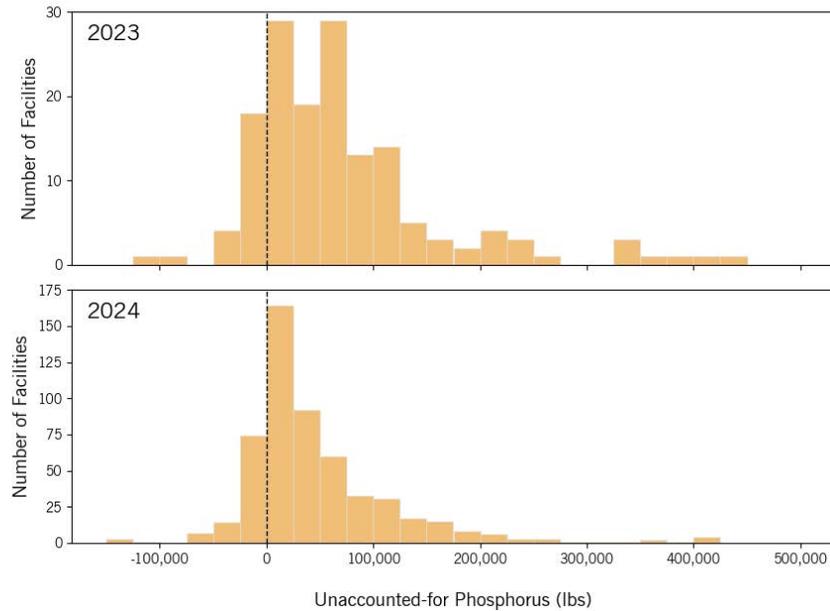


Fig. 9. Distribution of unaccounted-for phosphorus across all 546 analyzed facilities with non-zero herd sizes in Region 5.

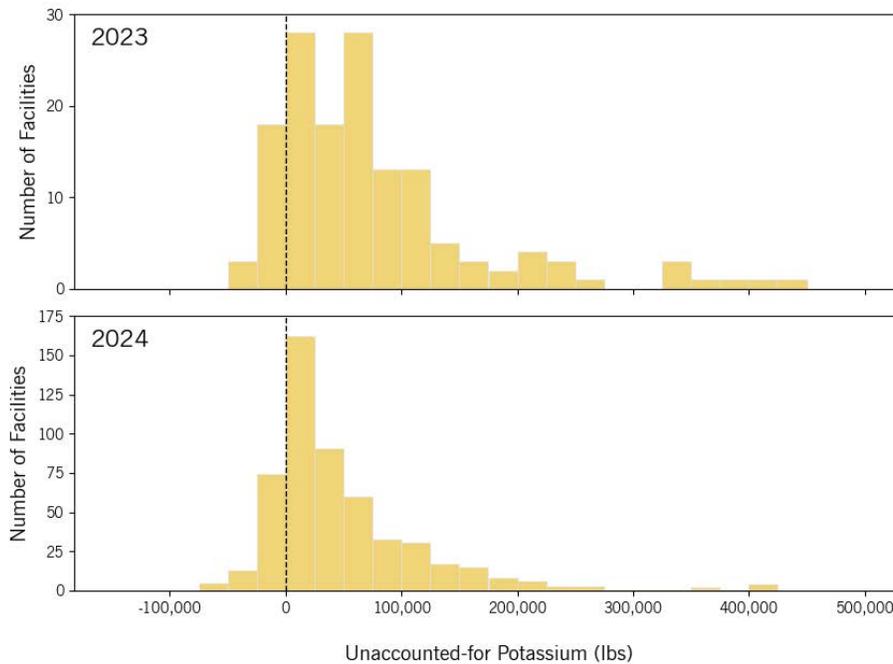


Fig. 10. Distribution of unaccounted-for potassium across all 546 analyzed facilities with non-zero herd sizes in Region 5.

5. Most CAFs are not required to report applying waste to crops—but when they do, they report significant overapplication.

According to the State Board, “[i]t is now generally acknowledged that the practice of applying manure, process wastewater, and fertilizer to dairy croplands, commonly referred to as land application, is responsible for the vast majority of dairies’ nitrogen impacts to groundwater quality.”¹¹¹ To curb the practice of excess application, regulators must first be able to track the rates at which nutrients are applied to and taken up by crops. But because NMPs generally remain private documents, CAFs’ nutrient application is, for practical purposes, only ascertainable through self-reporting in annual reports.¹¹² These self-reported applications are notably limited to the

¹¹¹ Draft Dairy Order 6.

¹¹² See *supra* note 62.

nutrients that CAFs apply to *on-site* croplands. This limitation necessarily precluded us from analyzing of how recipients of CAF manure and wastewater exports apply nutrients to their lands. Further research into nutrient recipients could provide insight into the rates at which nutrients are applied off-site.

WDRs in Regions 5, 7, and 8 each require CAFs to provide some information about how nutrients are applied to crops onsite. Region 5 imposes the most stringent reporting requirements: facilities in the Central Valley must report the “[e]stimated amount of total manure (tons) and process wastewater (gallons or acre-inches) applied to each land application area . . . and a calculation of the nitrogen, phosphorus, potassium, and total salt content” that this waste contains.¹¹³ Regions 7 and 8, by contrast, only require farms to report how much manure they apply—they need not report wastewater application, and they need not report the nutrient content of either wastewater applied or manure applied.¹¹⁴ Meanwhile, Region 1 asks farms to “describe the measures taken to avoid surface runoff of manure constituents from the dairy's land application areas.”¹¹⁵ Region 2 asks solely whether a farm has implemented an NMP.¹¹⁶

Reporting from Region 5 reveals that CAFs in the Central Valley significantly overapply nutrients to their fields. We scraped the ratio of applied to removed nutrients for machine-readable Region 5 reports, which promotes ready comparison between CAFs by normalizing nutrient applications across farms of different sizes. A ratio of 1:1 indicates that the crops utilized all nutrients applied to the cropland, whereas a ratio greater than 1:1 suggests that the farm applied a nutrient surplus to its cropland.

¹¹³ Region 5 Order MRP-12.

¹¹⁴ Region 7 Order G-8; Region 8 Order Form 3.

¹¹⁵ *See, e.g.*, McClelland Dairy West, Annual Report (General Order No. R1-2016-0011) 7 (2023).

¹¹⁶ *See, e.g.*, Travis Moreda Dairy, Annual Report (General Order No. R2-2016-0031) 2 (2023).

In 2023, across all 154 dairies reviewed in Region 5 with non-zero herd sizes, 91 facilities reported a nitrogen ratio above 1:1; 67 facilities reported a phosphorus ratio above 1:1; and 70 facilities reported a potassium ratio above 1:1. The maximum ratios reported for nitrogen, phosphorus, and potassium were 2.32,¹¹⁷ 3.18,¹¹⁸ and 4.95,¹¹⁹ respectively.

In 2024, of 546 facilities with non-zero herd sizes, 397 facilities reported a nitrogen ratio above 1:1, 244 facilities reported a phosphorus ratio above 1:1, and 258 facilities reported a potassium ratio above 1:1. Within the larger sample of annual reports we received for 2024, we found larger maximum applied-to-removed ratios for nitrogen, phosphorus, and potassium (10.36,¹²⁰ 14.40,¹²¹ and 17.14,¹²² respectively).

¹¹⁷ Coelho Farms Dairy Inc., Annual Report (General Order No. R5-2007-0035) (2023). This facility is an outlier—it reports only having three animals on-site.

¹¹⁸ Costa View Dairy North, Annual Report (General Order No. R5-2007-0035) (2023).

¹¹⁹ Jaques & Silva Dairy, Annual Report (General Order No. R5-2007-0035) (2023).

¹²⁰ Temple Creek Dairy, Inc., Annual Report (General Order No. R5-2007-0035) (2024).

¹²¹ Ben Mendonca & Family Dairy, Annual Report (General Order No. R5-2007-0035) (2024).

¹²² E. Mendes Dairy, Annual Report (General Order No. R5-2007-0035) (2024).

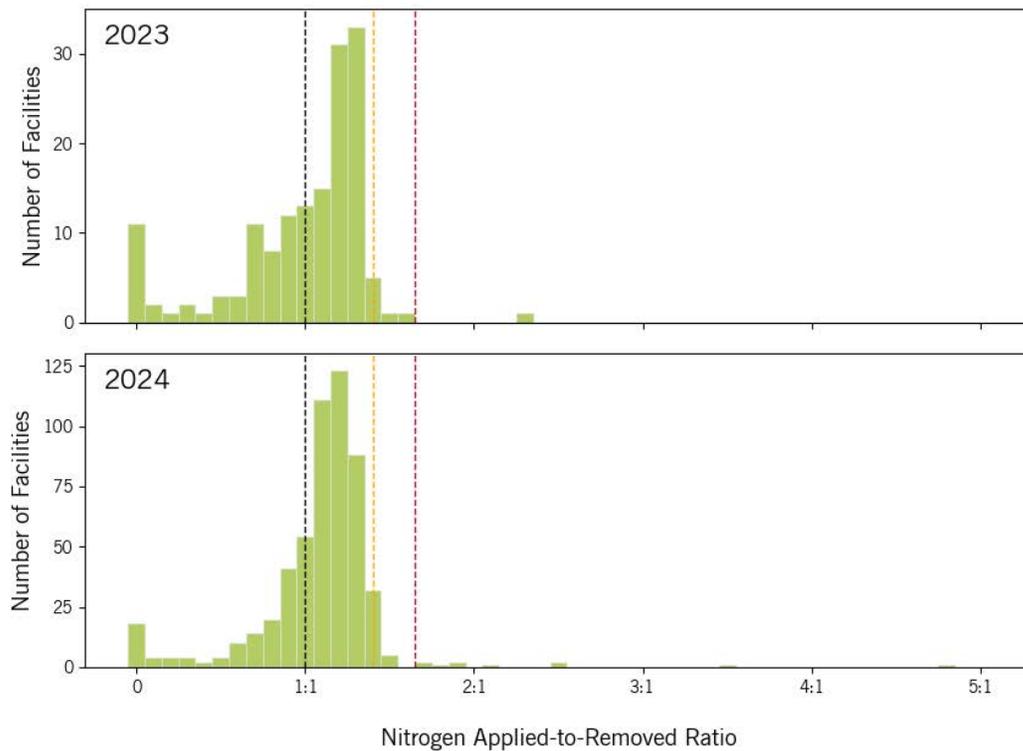


Fig. 11. Distribution of applied-to-removed nitrogen ratios among analyzed facilities with non-zero herd sizes in Region 5 in 2023 and 2024. Yellow vertical line denotes a 1.4:1 applied-to-removed ratio; red vertical line denotes a 1.65:1 applied-to-removed ratio. These ratios reflect various regulatory requirements.¹²³

¹²³ Region 5 generally requires applied-to-removed nitrogen values to not exceed 1.4:1. Region 5 Order C-11. And Region 5 imposes additional requirements on CAFs with applied-to-removed nitrogen values above 1.65:1. *Id.* (requiring the CAF to revise their “NMP to immediately prevent such exceedance or submit a report demonstrating that the application rates have not and will not pollute surface or ground water”).

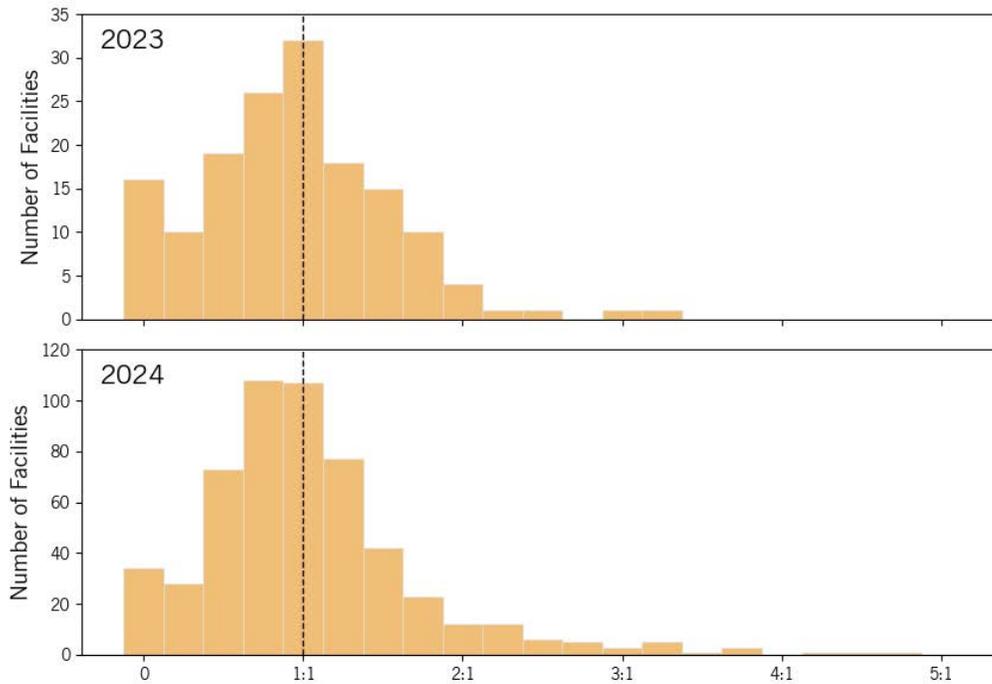


Fig. 12. Distribution of applied-to-removed phosphorus ratios among analyzed facilities with non-zero herd sizes in Region 5 in 2023 and 2024.¹²⁴

¹²⁴ Dashed line delineates equilibrium ratio of 1:1.

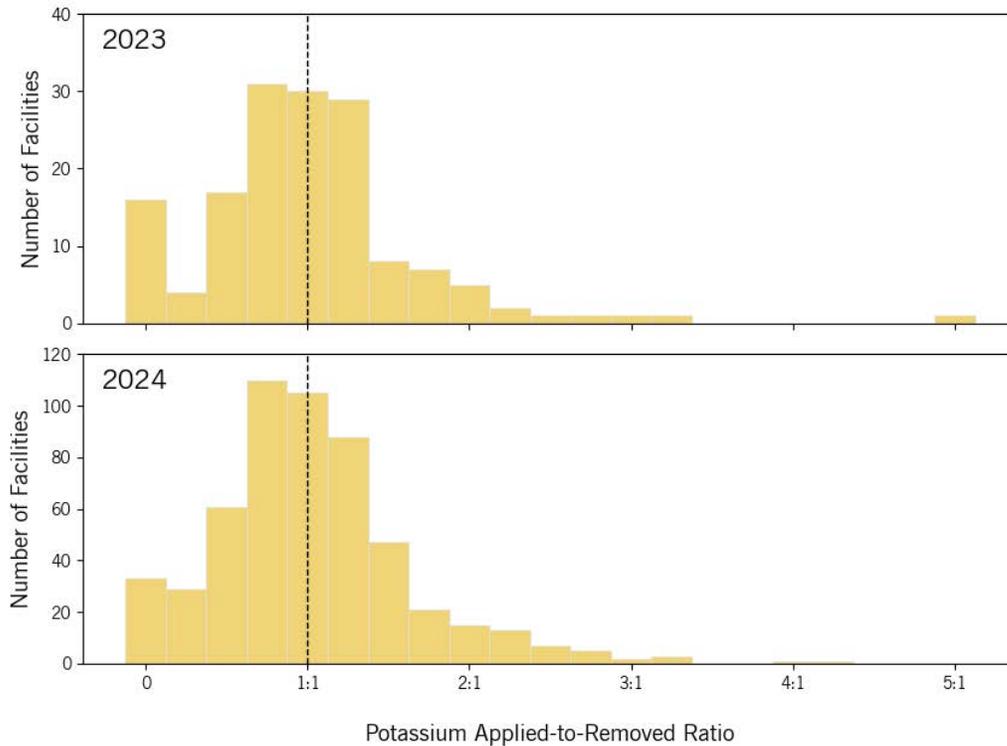


Fig. 13. Distribution of applied-to-removed potassium ratios among analyzed facilities with non-zero herd sizes in Region 5 in 2023 and 2024.¹²⁵

As high as these applied-to-removed ratios are, they likely understate the problem. Importantly, the Region 5 reporting scheme does not consider existing soil nutrient content when calculating field surpluses.

For instance, Bar None Van der Hoek Dairy’s 2024 annual report lists an applied-to-removed ratio of 1.20:1, which compares the 185,172 pounds of nitrogen applied to its fields to the 154,790 pounds of nitrogen were removed by its crops.¹²⁶ This calculation assumes that—prior to applying 185,172 pounds of nitrogen—the fields had zero nitrogen content. But the dairy’s 2023 annual report reveals that the CAF had a nitrogen *surplus* of 68,485 pounds in its fields at that time.¹²⁷ The dairy’s reported applied-to-

¹²⁵ Dashed line delineates equilibrium ratio of 1:1.

¹²⁶ Bar None Van der Hoek Dairy (General Order No. R5-2007-0035) 76 (2024).

¹²⁷ Bar None Van der Hoek Dairy (General Order No. R5-207-0035) 109 (2023).

removed ratio of 1.2:1 is thus inaccurate because it fails to account for the 68,845 pounds of nitrogen that already existed as surplus in the fields from the previous year's land application. Properly accounting for preexisting nitrogen yields an applied-to-removed ratio of 1.64, a value that exceeds recommended limits.¹²⁸

6. Regional Boards rarely enforce reporting requirements.

We identified many instances of CAFs falling short of reporting requirements. Some of these instances took the form of omissions or inconsistencies within reports. For instance, DeJong Dairy's manure tracking manifest reveals that the facility failed to disclose the destination of its waste;¹²⁹ Bosch Dairy #2's report of zero manure production for a herd of hundreds also appears to be a clear error.¹³⁰

But enforcement actions do not appear to regularly follow reporting violations. In theory, Regional Boards log all penalties and enforcement actions in CIWQS.¹³¹ But over the last five years, Regions 2 and 7 reported zero violations of either reporting or substantive requirements in any of their combined 89 CAFs, despite potential exceedances reported in several annual reports in 2023 and 2024 that appear to merit further investigation.¹³²

¹²⁸ See *supra* n. 123.

¹²⁹ De Jong Dairy, Annual Report (General Order No. R8-2013-0001, NPDES No. CAG018001) 4 (2023).

¹³⁰ Bosch Dairy #2, Annual Report (General Order No. R8-2013-0001, NPDES No. CAG018001) 2 (2023).

¹³¹ Because CAFs are treated quite differently by different regulators, facilities counts are not necessarily identical between CIWQS and other data sources—another issue that could be rectified by a more coordinated statewide approach to reporting and enforcement.

¹³² *Contrast* Regulated Facility Report, California Integrated Water Quality System Project, <https://perma.cc/27XV-BG9S> with *infra* n.167 and accompanying text (describing high fecal coliform near Region 2 facility), *supra* n.94 and accompanying text (describing manure conversion factor in Region 7 facility that differs from conversion factor in pertinent WDR).

Region 5 has more CAFs than the other regions combined and accordingly reports far more violations than the others. Over the 5-year period from 2021 to 2026, Region 5 reported 601 violations from 1,549 CAFs. Region 5 also reported substantive violations of annual reporting requirements, not just failures to timely submit annual reports. For example, of the eight violations reported for Elkhorn Dairy in Tulare County, three were for annual reporting deficiencies (failing to attach required manure, wastewater, and plant nutrient sampling documentation, respectively, to their self-reports).¹³³ Region 5 reports taking enforcement action 502 times.

Region	CAFs	Total Violations	Total Enforcement Actions
1	104	2	6
2	31	0	0
5	1081	505	406
7	31	0	0
8	69	15	20

Table 3. Summary of CIWQS violations from 2021-2026.¹³⁴

¹³³ Facility at a Glance—Elkhorn Dairy, California Integrated Water Quality System, <https://perma.cc/4V59-ED95>.

¹³⁴ Regulated Facility Report, California Integrated Water Quality System Project, <https://perma.cc/H4M6-96J4>; dataset available at <https://doi.org/10.5281/zenodo.17679792>. To identify facilities, violations, and enforcement actions, we filtered for only facilities categorized as "ANIWSTCOWS." To identify the number of unique facilities, we used Facility.Address as a proxy for a unique identifier for each facility. Enforcement actions do appear to exceed violations in certain regions, which further suggests that reporting in CIWQS is either flawed or incomplete.



Recommendations

Correcting deficiencies in the annual reporting and enforcement scheme could significantly improve water quality. And the State Board and Regional Boards have broad authority to implement corrective actions: indeed, the California Water Code grants the water boards “full power and jurisdiction to protect the quality of waters in the state” to advance “the health, safety and welfare of the people of the state.”¹³⁵

In addition, several of the proposals within this section have already been adopted by one or more Regional Boards. For instance, the Region 5

¹³⁵ Cal. Water Code § 13000.

WDR mandates extensive data collection, including by requiring farms to report process wastewater and calculate nutrient balances.¹³⁶ Region 5 also mandates that farms corroborate their reported figures with third-party documents.¹³⁷ Such small steps, if adopted by other Regional Boards, could lead to dramatic improvements in statewide reporting and disclosure.

1. Standardize reporting requirements across regions.

As a result of significant variability across regional reporting schemes, it is difficult to fully ascertain the impacts of CAFs in some regions and, consequently, to measure the impact of CAFs statewide. The variability in requirements across Regional Boards also does not appear to have, at least from an external perspective, any basis in their differing geographies. **Standardizing reporting requirements and annual report formats across regions—by including the statewide institution of the measures outlined below—would allow for greater transparency, more sophisticated analysis of reports, and apples-to-apples comparisons across facilities.**

2. Require reports to contain certain key metrics.

Standard statewide reporting requirements should include several crucial metrics.

a. Process wastewater

All CAFs should be required to report the process wastewater that they produce. Ideally, each Regional Board would collect wastewater data over time to appropriately tailor a wastewater conversion factor to the region's dairies. But if dairies lack the technological capacity to measure process wastewater, the facility should be required to use a “wastewater conversion factor” to estimate their wastewater production.

¹³⁶ Region 5 Order MRP-12.

¹³⁷ *Id.* at MRP-13.

Studies suggest that that processing 1 liter of whole milk generates between 2.5-10 liters of wastewater.¹³⁸ Accordingly, dairies not reporting at least producing 2.5 liters of wastewater per liter of milk produced should be flagged for further investigation. This estimate, while conservative, ensures that at least some of the nutrients derived from process wastewater will be included in nutrient accounting.

b. Whole-farm nutrient accounting

Whole-farm nutrient accounting, as described by the State Board, “requires all [nutrients] generated at [a CAF] be accounted for.”¹³⁹ As of yet, no CAF we examined appeared to have achieved true whole-farm nutrient accounting. This failure is attributable to, depending on the region, a combination of inadequate or inaccurate reporting and erroneous assumptions about nutrient usage.

We have identified two steps the State and Regional Boards should take to ensure that CAFs fully account for their nutrients. The first step is to **require CAFs to estimate waste nutrient content in annual reports**. While calculating the nutrients present in waste may initially seem unduly burdensome, CAFs are already required to undertake this analysis pursuant to compliance with their NMPs.¹⁴⁰ Because CAFs must already complete some level of nutrient waste analysis, the reform proposed here would require relatively few resources but would greatly increase transparency.

¹³⁸ Min Ye et al., *Evaluation of Anaerobic Membrane Bioreactor Treating Dairy Processing Wastewater: Elemental Flow, Bioenergy Production, and Reduction of CO₂ Emission*, BIOSOURCE TECHNOLOGY, June 20, 2023, at 2.

¹³⁹ Draft Dairy Order 60.

¹⁴⁰ *See, e.g.*, California Regional Water Quality Control Board Colorado River Basin Region, What Must be Included in a CAFO’s Nutrient Management Plan? 3 (“Nutrient values of soil, manure, process wastewater, and irrigation water shall be determined based on laboratory analysis. ‘Book values’ for manure and process wastewater may be used . . . if necessary.”)

There are two ways, requiring varying technological capacity, that CAFs can estimate waste nutrient content in annual reports. Facilities with lesser resources could rely on “book values” for nutrient content. That is, rather than analyzing the manure and process wastewater present at the facility, the CAF may instead rely on pounds-of-nutrient-per-ton-of-waste estimates provided by the Natural Resources Conservation Service.¹⁴¹

Alternatively, a CAF could intermittently conduct manure nutrient analyses and use these estimates to gauge nutrient production. This method would provide for more accurate estimates, since research has found that nutrient concentrations in manure can vary both across facilities and over time at the same facility.¹⁴²

The second step in whole-farm accounting is to **document all land applications and nutrient exports**. Whereas documenting nutrient exports is straightforward, operators’ current efforts to account for land applications are frequently inaccurate in a number of ways.¹⁴³ Importantly, Regional Boards must ensure that the soil nutrient content from previous years is considered when a facility calculates its nutrient balance.¹⁴⁴ They can do so either by requiring CAFs to (1) roll over nutrient balances from previous years or (2) to measure soil nutrient content at the start of each year.

Furthermore, accurate nutrient accounting demands that **operators report nutrient land applications by crop type**. Different crops require

¹⁴¹ California Regional Water Quality Control Board Colorado River Basin Region, *supra* n.140, at 3. See United States Department of Agriculture, Estimates of Recoverable and Non-Recoverable Manure Nutrients Based on the Census of Agriculture 33 (2014) (providing estimates of pounds of nitrogen and phosphorus per ton of wet weight of manure).

¹⁴² University of California Cooperative Extension, Dairy Manure Nutrient Content and Forms 1 (2010).

¹⁴³ See *supra* notes 104-110 and accompanying text.

¹⁴⁴ *Cf.* Costa View Farms, Annual Report (General Order No. R5-2007-0035) 213 (2023).

different quantities of nutrients.¹⁴⁵ The Central Valley region offers a useful example of a reporting scheme that considers crops' differing nutrient uptake rates: Region 5 requires a CAF to provide the type of crop grown on each of its fields. The CAF then must report manure and process wastewater applications by field. Anticipated crop nutrient removal values (*see* the green box in Fig. 13 *infra*) vary by nutrient and by crop. For example, the wheat in field CVW 5 is anticipated to remove 201.60 pounds of nitrogen per acre.¹⁴⁶

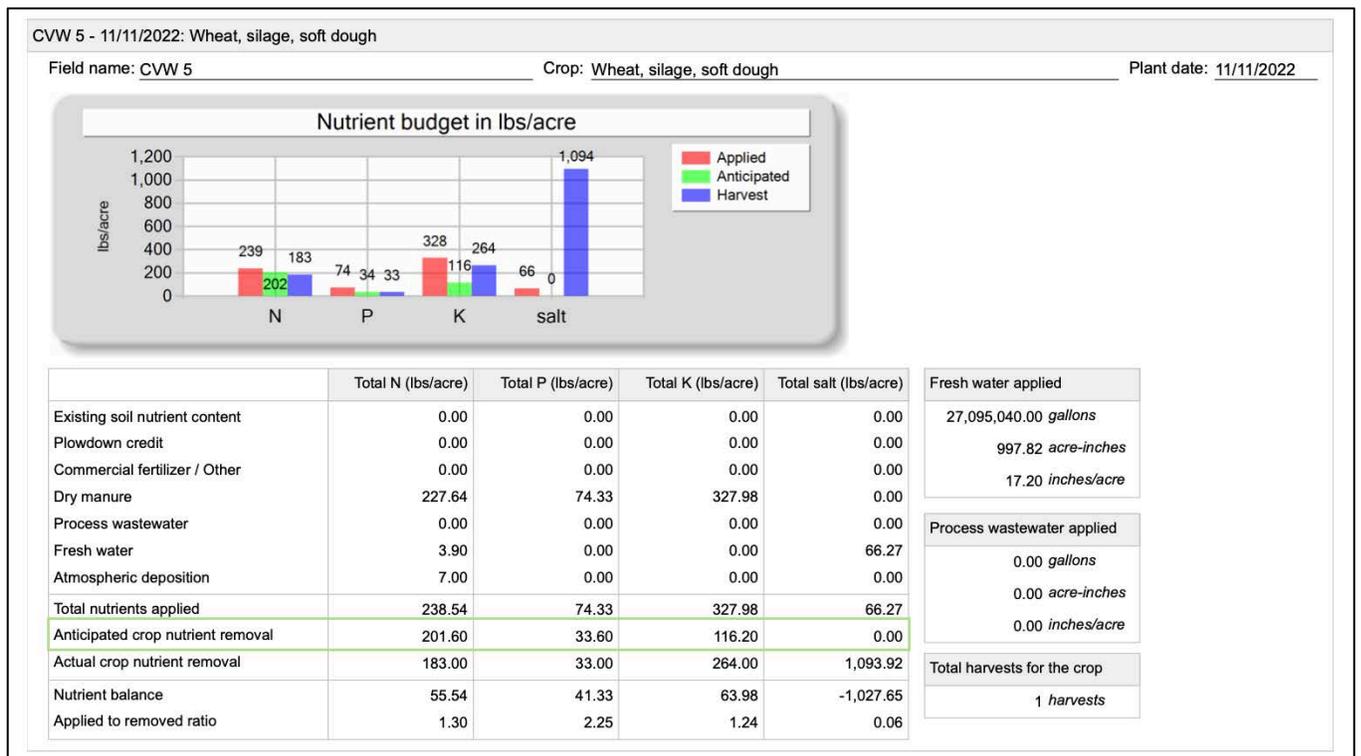


Fig. 14. CIWQS Dashboard for Costa View Farms Wheat Field “CVW 5” as of March 2025.

¹⁴⁵ See California Department of Food and Agriculture, *California Crop Fertilization Guidelines*, <https://perma.cc/6D29-WA49> (documenting different levels of fertilizer nutrients required for different crops).

¹⁴⁶ Costa View Farms, Annual Report (General Order No. R5-2007-0035) 170 (2023) (emphasis added by authors).

Field-by-field reporting, as opposed to a whole-farm nutrient application report, also better reflects the environmental impacts of nutrient applications. A CAF may report that, in aggregate, it applied as many nutrients as its crops extracted from the soil. But this conclusion could elide the fact that the farm under-applied nutrients to some fields, and over-applied nutrients to other fields, resulting in runoff and leaching. This is not to say that aggregate measures lack utility—aggregation across field reporting still provides useful insight into the cumulative impact of a CAF’s activity. But the two measures are most useful when provided together.

Ultimately, as the Draft Dairy Order has recognized, a “dairy achieves whole-farm [nutrient] balance when it applies [nutrients] on crops at no more than appropriate agronomic rates[, and a]ll excess [nutrients are] removed from the dairy (exported) or through other treatments (e.g., denitrified on farm).”¹⁴⁷ Achieving whole-farm nutrient balances, as the State Board has observed, should prevent CAF activity from “unreasonably affect[ing] beneficial uses.”¹⁴⁸

c. Groundwater sampling

Whole-farm nutrient accounting data is a critical but indirect measure of CAF environmental impacts. **This data should be supplemented with groundwater sampling data**, a more direct measure of impacts to water quality.

Groundwater sampling data can either be obtained from wells built explicitly for water quality monitoring or from existing wells. The State and Regional Boards have broad authority to take the measures necessary to build new wells to monitor and protect groundwater. The Water Code was amended in 2014 to provide that it is “the policy of the state that groundwater resources be managed sustainably,” and that “groundwater management is best achieved locally through the development,

¹⁴⁷ Draft Dairy Order 61.

¹⁴⁸ *Id.*

implementation, and updating of plans and programs based on the best available science.”¹⁴⁹

If additional resources for statewide well monitoring are not available, the San Francisco Bay region (Region 1) provides a flexible model of existing-well groundwater sampling.¹⁵⁰ That WDR reads as follows:

Any existing representative wells located at the confined animal facility, including domestic and agricultural supply wells, shall be sampled four (4) times total, approximately six (6) months apart. [And r]esults of groundwater samples collected consistently with the sampling protocols and within these time frames for another purpose (e.g., for a county health department or by the county milk inspector) [may be submitted in the annual report] instead of collecting additional samples.¹⁵¹

This approach efficiently allows farms to rely on sampling that is already required to fulfill the reporting requirement—preventing duplicative work. In all other cases, it requires only biannual sampling, a relatively straightforward and cost-effective measure.

3. Require CAFs to submit corroborating documents.

To ensure accuracy, the data supplied by CAFs in annual reports should be supported by independently corroborated documents. Two key sets of documents are necessary to support the data provided in annual reports: **(1) laboratory analyses and (2) manure tracking manifests.** Whereas laboratory analyses are utilized to corroborate land application and

¹⁴⁹ Cal. Water Code § 113.

¹⁵⁰ Region 2 Order Attach. A 7.

¹⁵¹ *Id.* It is worth noting that the San Francisco Bay region’s scheme delineated here applied only to “CAF’s with liquid waste retention ponds.” *Id.* The recommendation in this white paper is to require this practice for all CAFs, regardless of whether the facilities utilize liquid waste retention ponds.

water contamination data, manure tracking manifests corroborate manure and process wastewater exports.¹⁵²

Several Regional Boards, such as Region 5, already require CAFs to confirm the validity of their reporting with additional documentation.¹⁵³ But even in such cases, minor tweaks could make these documents much more useful. Annual reports for large facilities, if sufficiently detailed, can be hundreds of pages long. Laboratory analyses and manure tracking manifests are typically affixed to the end of annual reports in no consistent order. Moreover, naming conventions for fields in laboratory reports often do not match the naming conventions throughout the remainder of the document. Using a consistent naming scheme throughout the annual report, and ordering documents in a specified way within it, would help considerably in making these documents more accessible and more readily analyzed.

4. Require the use of a scientifically validated manure conversion factor.

In an ideal world, CAFs would accurately measure their total manure production, rendering estimates—and hence manure conversion factors—unnecessary. But until that approach is viable, **consistent use of scientifically validated manure conversion factors** offers a partial fix.

As discussed previously, manure production varies by animal type (cattle raised for beef versus cattle raised for dairying) and age. In addition, for dairy cows, manure production also varies with milk production.¹⁵⁴ The California Dairy Quality Assurance Program provides manure conversion factors that address variation amongst dairying cows in its worksheet entitled “Estimating daily manure generated.”¹⁵⁵ The San Francisco Bay region has

¹⁵² See generally Region 5 Order (identifying data requiring laboratory analysis).

¹⁵³ *Id.*

¹⁵⁴ See California Dairy Quality Assurance Program, Estimating Daily Manure Generated 2 (2022).

¹⁵⁵ *Id.*

previously utilized these manure conversion factors to aid CAFs in completing their annual reports.¹⁵⁶ The same resource also provides manure conversion factors for heifers—young, non-lactating cows—based on their average body weight.¹⁵⁷

As of this report’s publication, **we are not aware of any publicly available California-specific resource that provides manure conversion factors for the remaining populations of animals** (dairying calves, meat calves, and other cattle raised for meat). The Regional Boards could request study of these animals to generate better manure conversion estimates while, in the interim, relying on manure conversion factors provided by the National Resources Conservation Service.¹⁵⁸ The use of any validated manure conversion factor consistently throughout the state would already greatly improve reporting and nutrient accounting.

5. Monitor and respond to violations of reporting requirements.

Operators already must certify that each annual report is “true, accurate, and complete.”¹⁵⁹ But this certification provision is only as effective as its enforcement. To ensure accurate reporting, **the Regional Boards should devote additional resources to (1) monitoring and publicly documenting fraudulent reporting and (2) imposing penalties set out by the Water Code for violations of the certification provision.**

The Water Code directs the Regional Boards to make violations of annual reporting requirements public. Specifically, Section 13225 of the

¹⁵⁶ *Id.* These manure conversion factors are absent from more recent annual reports in that region.

¹⁵⁷ *Id.* at 1.

¹⁵⁸ United States Department of Agriculture, Estimates of Recoverable and Non-Recoverable Manure Nutrients Based on the Census of Agriculture 33 (2014).

¹⁵⁹ *See, e.g.*, Region 7 Order G-2.

Water Code requires the Regional Boards to “[r]eport rates of compliance with the requirements” of the water quality division of the Water Code.¹⁶⁰ And annual reports are reports submitted to comply with WDRs, which implement the water quality division of the Water Code.

Section 189.7 of the Water Code also requires the Regional Boards to “[d]evelop program-specific tools to better identify and prioritize state board and regional board compliance assessment and enforcement actions in disadvantaged communities.”¹⁶¹ Publicly identifying inaccurate reporting in annual reports could help such communities—disproportionately located near CAFs—to advocate for improvements.

The Water Code also sets out applicable penalties for false reporting: “A person who . . . knowingly furnishes a false report [to fulfill the requirements of a WDR], or who either willfully fails to furnish a report or willfully withholds information [required by a WDR] despite actual knowledge of that requirement, may be liable in accordance with subdivision (d) [delineating civil remedies] and is guilty of a misdemeanor.”¹⁶²

Regional Boards are empowered to administer civil penalties. The Water Code provides that “[c]ivil liability may be administratively imposed by a Regional Board . . . in an amount not exceeding five thousand dollars (\$5,000) for each day the violation occurs.”¹⁶³ This section also affords

¹⁶⁰ Cal. Water Code § 13225(c). The water quality division of the Water Code includes Sections 13000-16104. In turn, the water quality division of the Water Code requires that “[e]ach report submitted [pursuant compliance with a WDR] shall be sworn to, or submitted under penalty of perjury.” Cal. Water Code § 13260(h).

¹⁶¹ Cal. Water Code § 189.7.

¹⁶² Cal. Water Code § 13261(c). Section 13260 establishes who must adhere to waste discharge requirements. Cal. Water Code § 13260(a) (“Each of the following persons shall file with the appropriate regional board a report of the discharge, containing the information that may be required by the regional board [in their WDRs]: A person discharging waste, or proposing to discharge waste, within any region that could affect the quality of the waters of the state, other than into a community sewer system.”)

¹⁶³ Cal. Water Code § 13261(d)(1).

Regional Boards discretion in deciding the dollar amount of the penalty, so fines can be appropriately tailored to the nature of the issue.

6. Monitor, consistently disclose, and enforce substantive WDR violations evidenced by annual reporting.

Monitoring and disclosure. The WDRs contemplate careful review of annual reports by Regional Boards to ensure substantive compliance with the WDR’s directives.¹⁶⁴ The Santa Ana region WDR, for instance, provides that “[c]ompliance determination with the terms of this [WDR] shall be based [in part] on . . . [an e]valuation of the Annual Report of Animal Waste Discharge.”¹⁶⁵

This approach makes sense. When properly and accurately completed, annual reports reveal important information about potential impacts to water quality. They are also submitted under penalty of perjury: signatories attest that the information provided in the annual reports is “accurate.”¹⁶⁶ Thus when a dairy in the San Francisco Bay region reports bacteria coliform

¹⁶⁴ Region 1 Order 13 (“The effectiveness of [waste] management measures will be evaluated through required ground and surface water monitoring and reporting, including annual report submission.”); Region 2 Order 16 (“Compliance determination with the terms of this Order shall be based on . . . [e]valuation of the completed Annual Report and required information submitted according to the Monitoring and Reporting Program.”); Region 5 Order IS-23, IS-24 (“This General Order includes a provision that requires compliance with Monitoring and Reporting Program . . . The Monitoring and Reporting Program requires . . . annual reporting.”); Region 7 Order 40 (“Compliance determination with the terms of this Order shall be based on the . . . [e]valuation of the annual report.”).

¹⁶⁵ Region 8 Order 34.

¹⁶⁶ Region 2 Order 11 (“Each Annual Report and Noncompliance Report shall be signed by the Discharger or a duly authorized representative and shall contain the following statement: ‘I certify under penalty of law that I have personally examined and am familiar with the information submitted in this report and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete.’”)

at 300 times¹⁶⁷ the approved municipal rate,¹⁶⁸ the Regional Board can and should take the dairy at its word and investigate a potential violation.¹⁶⁹

Once the Regional Board identifies substantive violations, it then should **digitally catalogue these violations on the CIWQS database**. Notably, while the Water Code does require public disclosure of rates of compliance with water quality standards, it does not explicitly mandate the reporting of violations on CIWQS itself;¹⁷⁰ rather, it requires Regional Boards to “identify and post on the Internet a summary list of all enforcement actions.”¹⁷¹

Counterintuitively, CIWQS often will reflect that a CAF has had several enforcement actions taken against it—including evidence that the Regional Board issued the CAF several “notice[s] of violation”—but the CIWQS page will not report any “violations” under the violation header of the CIWQS dashboard (see Figure 13 below as an example).¹⁷² Eliminating this confusion would greatly improve transparency and public accountability.

¹⁶⁷ Travis Moreda Dairy, Annual Report (General Order No. R2-2016-0031) 12 (2023) (reporting fecal coliform at 310 MPN/100 ml³).

¹⁶⁸ Region 2 Order Attach. A 8 (setting benchmarks for total coliform bacteria at 1.1 MPN/100 ml³).

¹⁶⁹ See Cal. Code Civ. Proc. § 2015.5 (certification that facts are true under penalty of perjury generally amounts to proof of such facts, including in the context of administrative proceedings).

¹⁷⁰ California Water Code Section 13225(e) does require that regional boards “[r]eport rates of compliance with [water quality standards].” However, because this provision lacks the language “post on the Internet” that is utilized in the enforcement action provision, it appears that regional boards interpret Section 13225(e) to not require publication of violations.

¹⁷¹ Cal. Water Code § 13225(k).

¹⁷² Facility At-a-Glance Report—Chris Chaney Dairy, California Integrated Water Quality System, <https://perma.cc/3YGG-ME88> (last visited Feb. 5, 2025); see also n. 134 *supra*.

Regulatory Measures									
Reg Measure ID	Reg Measure Type	Region	Program	Order No.	WDID	Effective Date	Expiration Date	Status	Amended?
170714	Unregulated	5F	ANIWSTCOWS		5C10NC00150			Historical	N
335401	Enrollee	5F	ANIWSTCOWS	R5-2007-0035	5C10NC00150	06/29/2007	05/31/2012	Historical	N
Total Reg Measures: 2									

Violations							
Violation ID	Occurred Date	Violation Type	(-) Violation Description	Corrective Action	Status	Classification	Source
Report displays most recent five years of violations. Refer to the Interactive Violation Report for more data.							
Total Violations: 0				Priority Violations: 0			
*Click the "(+/-) Violation Description" link to expand and contract the violation description. *As of 5/20/2010, the Water Board's Enforcement Policy requires that all violations be classified as 1, 2 or 3, with class 1 being the highest. Prior to this, violations were simply classified as Yes or No. If a 123 classification has been assigned to a violation that occurred before this date, that classification data will be displayed instead of the Yes/No data.							
Violation Types							

Enforcement Actions				
Enf Id	Enf Type	Enf Order No.	Effective Date	Status
398312	Notice of Violation		08/29/2014	Historical
387778	Admin Civil Liability	R5-2012-0562	11/26/2012	Active
388680	Notice of Violation		08/16/2012	Historical
378952	Admin Civil Liability	R5-2011-0067	10/13/2011	Active
376147	Notice of Violation		09/30/2010	Historical
378000	Notice of Violation		08/16/2010	Historical
378002	Notice of Violation		08/16/2010	Historical
372846	13267 Letter		01/29/2010	Historical
372116	Expedited Payment Letter	R5-2009-0582-M	12/10/2009	Withdrawn
372825	13267 Letter		09/17/2009	Withdrawn
369269	Notice of Violation		07/23/2009	Historical
242576	Notice of Violation		07/29/2003	Historical
Total Enf Actions: 12				

Figure 15. CIWQS Dashboard for Chris Chaney Dairy as of March 2025 (last accessed November 29, 2025).

Enforcement. It is also important that Regional Boards investigate and take appropriate enforcement action when annual reports suggest substantive violations of water quality requirements. The ability to enforce lies well within each Regional Board’s powers.¹⁷³ As explained by the Central Valley WDR, “[a]ny instance of noncompliance with [a WDR] constitutes a violation of the California Water Code and its regulations. Such

¹⁷³ Cal. Water Code § 13261.

noncompliance is grounds for enforcement action, and/or termination of the authorization to discharge.”¹⁷⁴

If the Regional Boards fail to take the necessary enforcement action, the Water Code also affords the State Board with the power to act unilaterally. Section 13262 provides that “at the request of . . . the state board,” the Attorney General shall petition the state court “for the issuance of a temporary restraining order, temporary injunction, or permanent injunction, or combination thereof” to ensure compliance with WDRs.¹⁷⁵ Moreover, to protect groundwater, the State Board has a broad mandate “[t]o take *any additional action* as may be necessary or appropriate” to assure compliance with the federal Safe Drinking Water Act.¹⁷⁶

7. Make annual reports readily publicly accessible.

Though they are public documents, annual reports are difficult to access, which undermines the transparency goals expressed in Water Code Section 189.7. That section urges Regional Boards to “[e]ngage in equitable, culturally relevant community outreach” relevant to WDRs “and ensure that outreach and engagement shall continue throughout the waste discharge planning, policy, and permitting processes.”¹⁷⁷ The provision also sets out a mechanism to seek funding for these processes, as it allows for the “[e]stablish[ment of] a community capacity-building stipend program [to] provid[e] funding or services that allow members of the public to overcome barriers, such as technology, language, travel, and income, to public participation.”¹⁷⁸

To improve transparency, we recommend that the State Board
(1) require operators to submit annual reports to the State Board in

¹⁷⁴ Region 5 Order 19.

¹⁷⁵ Cal. Water Code § 13262.

¹⁷⁶ Cal. Water Code § 13169(a)(2) (emphasis added).

¹⁷⁷ Cal. Water Code § 189.7(a)(1).

¹⁷⁸ Cal. Water Code § 189.7(b)(2).

machine-readable form; (2) make all annual reports readily available to the public on a single, consolidated website; and (3) translate all annual reports into Spanish to reduce language barriers for communities near CAFs.¹⁷⁹

Machine readability. The State Board has clear authority to require annual reports to be machine readable. Section 13196 of the Water Code requires the State Board to “adopt a single, standard format for the electronic submission of analytical and environmental compliance data.”¹⁸⁰ The format chosen by the State Board must fulfill any “criteria the state board determines appropriate for an effective electronic report submission program,” such as machine readability.¹⁸¹ Having established an electronic format, the State Board then may require “a person submitting a report to the state board, a regional board, or a local agency to submit [their] report in [the designated] electronic format.”¹⁸²

Online availability. WDRs currently provide that “reports prepared and submitted [] in accordance with the terms of this [WDR] shall be available for public inspection at the [Regional Board offices].”¹⁸³ We recommend instead directing Regional Boards to publish annual reports on the State Board website. This measure would also avoid the need for individualized contact with a Regional Board to obtain annual reports. The current system, by contrast, makes reviewing annual reports, and the number of reports readily accessible, contingent on staff availability.

¹⁷⁹ Safe Water Alliance, Environmental Justice Coalition for Water, and the Internal Human Rights Law Clinic, University of California, Berkeley, School of Law, Barriers to Access to Safe and Affordable Water for Disadvantaged Communities in California 9.

¹⁸⁰ Cal. Water Code § 13196(b).

¹⁸¹ Cal. Water Code § 13196(b) (7).

¹⁸² Cal. Water Code § 13196(a).

¹⁸³ Region 5 Order 23.

Translation. Translating annual reports into Spanish supports the “culturally relevant community outreach” required by the Water Code.¹⁸⁴ Latino communities have disproportionately borne the burden of nitrate contamination in drinking water.¹⁸⁵ Translating these reports into Spanish serves the purpose of “overcom[ing] barriers [to participation like] language.”¹⁸⁶ Since California Water Code Section 189.7(b)(2) permits the Regional Boards to use funds for that purpose, they may also be able to obtain funding from the legislature to translate the reports.¹⁸⁷

8. Levy fees to fund additional staff who can facilitate these changes.

The Water Code also allows the State Board to assess fees to support its water quality programs. Every CAF subject to a WDR must submit an “annual fee according to a fee schedule established by the state board.”¹⁸⁸ The total amount of fees collected by the State Board is to “equal that amount necessary to recover costs incurred in connection with the issuance, administration, reviewing, monitoring, and enforcement of waste discharge requirements.”¹⁸⁹

The code further specifies that “[r]ecoverable costs may include, but are not limited to, costs incurred in reviewing waste discharge

¹⁸⁴ Cal. Water Code § 189.7(a)(1).

¹⁸⁵ Carolina Balazs et al., *Social Disparities in Nitrate-Contaminated Drinking Water in California’s San Joaquin Valley*, 119 ENV’T HEALTH PERSPS. 1272, 1278 (2011).

¹⁸⁶ Cal. Water Code § 189.7(b)(2).

¹⁸⁷ Cal. Water Code § 189.7(a)(2). (“Contingent upon a specific appropriation by the Legislature in the annual Budget Act or other statute for these purposes, the state board shall . . . [e]stablish community capacity-building stipend program to promote meaningful civic engagement by disadvantaged communities and tribal communities in the state board and regional board decision-making processes by providing funding or services that allow members of the public to overcome barriers, such as technology, language, travel, and income, to public participation.”).

¹⁸⁸ Cal. Water Code § 13260(d)(1)(A).

¹⁸⁹ Cal. Water Code § 13260(d)(1)(B).

[requirements]; prescribing terms of waste discharge requirements[]; enforcing and evaluating compliance with those [WDR] requirements[]; conducting surface water and groundwater monitoring and modeling; analyzing laboratory samples; adopting, reviewing, and revising water quality control plans . . . and administrative costs incurred in connection with carrying out these actions.”¹⁹⁰ In other words, **the State Board is allowed to collect fees to carry out the exact kind of measures we recommend here.**

The Water Code also includes provisions to ensure the State Board is equitable in assessing fees. When it levies a fee, the State Board is required to consider a variety of factors, notably the “size of the operation,” the “type and amount of discharge from the operation,” and “[a]ny compliance costs borne by the operation pursuant to state and federal water quality regulations.”¹⁹¹ These constraints ensure that any fee scheme will be carefully tailored to individual facilities’ contribution to water pollution.

Funds obtained this way could be used to **hire two key staff members to further support the implementation of the goals enumerated here: (1) a data scientist and (2) a groundwater administrator.** Assuming the State Board adopts our recommendation of placing annual reports in a machine-readable format, a data analyst could expediently determine whether a CAF’s annual report complies with reporting and substantive WDR requirements (for instance, by deploying code like the code we used to prepare this report). This compliance assessment would, in turn, provide Regional Board members with the information necessary to enforce violations, investigate borderline cases, and develop further regulations.

In addition to a data scientist, California’s water regulation regime would benefit from a groundwater administrator. The state has routinely

¹⁹⁰ Cal. Water Code § 13260(d)(1)(C).

¹⁹¹ Cal. Water Code §13260(d)(1)(D).

emphasized the importance of protecting groundwater,¹⁹² and, in its recent Draft Dairy Order, the State Board identified “critical drinking water impacts associated with groundwater nitrate contamination.”¹⁹³ A staff position dedicated to ameliorating and monitoring those impacts would accordingly align with the state’s priorities.

¹⁹² *See, e.g.*, Cal. Water Code § 113 (“It is the policy of the state that groundwater resources be managed sustainably for long-term reliability and multiple economic, social, and environmental benefits for current and future beneficial uses. Sustainable groundwater management is best achieved locally through the development, implementation, and updating of plans and programs based on the best available science.”).

¹⁹³ Draft Dairy Order 73.



Conclusion

In 2023 and 2024, the CAFs we examined largely failed to adequately and fully account for their waste in annual reporting. To remedy these problems, we recommend that the State and Regional Boards require operators to accurately report, or estimate using empirically validated conversion factors, the manure and wastewater they produce. CAFs should also tabulate their nutrient production, application, and exports to ensure that these nutrients are allocated appropriately and do not run off into surface waters or leach into groundwaters.

We also recommend that State and Regional Boards make use of fee authority pursuant to the Water Code to better monitor and enforce WDR violations, in addition to making annual reports easily accessible online to improve public engagement and enforcement. These changes would go a long way toward making regulation of CAFs and their impact on water quality more transparent, more evidence-based, and ultimately more effective.

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