



1,3-DICHLOROPROPENE REPORT FOR 2025

October 2026

Air Program
Environmental Monitoring Branch
California Department of Pesticide Regulation
1001 I Street, P.O. Box 4015, Sacramento, CA 95812
Report AIR 25-04

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1. TABLE OF CONTENTS

<u>1. TABLE OF CONTENTS</u>	<u>3</u>
<u>2. EXECUTIVE SUMMARY.....</u>	<u>4</u>
<u>3. INTRODUCTION</u>	<u>6</u>
<u>3.1. Background</u>	<u>6</u>
<u>3.2. Regulations and air concentration thresholds</u>	<u>6</u>
<u>4. PESTICIDE USE REPORT</u>	<u>7</u>
<u>4.1. Acres treated</u>	<u>9</u>
<u>4.2. Adjusted pounds by crop and fumigation code</u>	<u>10</u>
<u>5. MONITORING STATIONS</u>	<u>13</u>
<u>5.1. Highest 24-hour and 9-month concentrations</u>	<u>14</u>
<u>6. MODELING AIR CONCENTRATIONS</u>	<u>15</u>
<u>6.1. Highest-use townships</u>	<u>15</u>
<u>6.1.1. Township selection</u>	<u>15</u>
<u>6.1.2. Modeling approach and results</u>	<u>17</u>
<u>6.1.3. Additional evaluations on the township M15S18E</u>	<u>18</u>
<u>6.2. Monitoring stations</u>	<u>21</u>
<u>6.2.1. Site-specific modeling at air monitoring stations.....</u>	<u>21</u>
<u>6.2.2. Township modeling around the Parlier station</u>	<u>21</u>
<u>7. CONTRIBUTING FACTORS</u>	<u>21</u>
<u>7.1. Factors affecting use levels.....</u>	<u>22</u>
<u>7.2. Factors affecting air concentrations.....</u>	<u>23</u>
<u>8. CONCLUSIONS</u>	<u>24</u>
<u>APPENDIX 1</u>	<u>28</u>

2. EXECUTIVE SUMMARY

Pursuant to Department of Pesticide Regulation (DPR) regulation 22-005 (Title 3, California Code of Regulations [CCR] section 6448.4), this annual report evaluates the effectiveness of the 1,3-dichloropropene (1,3-D) regulation effective January 2024. The report identifies and evaluates the ten highest-use townships in California in 2025 and evaluates the air concentrations at all six DPR's 1,3-D monitoring stations. This second annual report also checks compliance with the 1,3-D regional use limit (township cap) of 136,00 adjusted total pounds (ATP)¹ which was temporarily in effect².

The townships identified and evaluated in this report represent the highest-use townships in each of the ten counties with the highest 1,3-D use, based on the ATP. The report identifies key factors influencing usage levels and air concentrations within the specified ten townships and includes detailed modeling to estimate the 95th percentile 1,3-D air concentrations over periods of 24 hours, 72 hours, and 1 year average as required by the regulation.

In 2025, 8,039,278 pounds of 1,3-D were used on 47,731 acres statewide, corresponding to 4,878,422 ATP and 1,447,904 pounds of emissions. Compared to the 2019-2023 average prior to the effective date of the regulation, these numbers correspond to a 21.0% decrease in pounds applied, a 17.3% decrease in acres treated, a 54.0% decrease in ATP, and a 48.4% decrease in calculated emissions based on use data. The crops with the most use were almonds, grapes, strawberries, sweet potatoes, and peaches. Application methods 1224 and 1226 (untarped, 24-inch minimum injection depth methods) were the most frequently used, resulting in lower emissions compared to the 2019-2023 average following implementation of DPR Regulation 22-005 in 2024. All townships complied with the township cap of 136,000 ATP, with the highest township having 124,031 ATP, which is in Merced County.

Modeling results showed that the highest estimated 95th percentile 24-hour, 72-hour, and 1-year air concentrations of 1,3-D are 35.5, 21.5, and 0.52 ppb, respectively, all of which were predicted in township M15S18E in Fresno County. These concentrations were below DPR's regulatory target concentrations of 55 ppb (72-hour average) and 0.56 ppb (70-year average). This township, M15S18E, is an agriculturally dominated township with no residential areas. Therefore, the concentrations modeled represent receptors in agricultural fields, not where residential bystanders are present. To better understand impacts to residential bystanders, DPR also modeled concentrations in the township that had the next highest ATP in Fresno County, M15S19E. Use patterns were similar between the two townships. The estimated 95th percentile annual average concentrations were 0.38 ppb for the township and 0.10 ppb for residential areas.

¹ Adjusted total pounds (ATP) is calculated for each application and refer to the amount of 1,3-D active ingredient multiplied by an application factor (AF) to account for differences in air concentrations due to emission differences between application methods, and weather differences between regions and seasons. ATP is the sum of adjusted pounds for all 1,3-D applications within a township during a calendar year. A township is a 6x6 mile area as defined by the Public Lands Survey System. The township cap was 136,000 ATP.

² Pursuant to court order, DPR maintained the annual township cap of a maximum of 136,000 ATP and the prohibition on December applications until the formal rulemaking addressing cancer risks from 1,3-D to occupational bystanders was completed in January 2026.

On September 30, 2026, the California Department of Food and Agriculture's (CDFA) Center for Analytical Chemistry, the independent laboratory that conducts the analysis of Air Monitoring Network (AMN) samples, [notified](#) DPR that it had recalled and voided all 1,3-D and methyl bromide monitoring results analyzed between October 24, 2025 and June 30, 2026. CDFA determined the laboratory reference standard used to analyze 1,3-D (cis- and trans- isomers) and methyl bromide samples significantly degraded, resulting in unusable and inaccurate analyses during this time.

For purposes of the Draft 2025 1,3-D Report, the CDFA decision impacts 1,3-D air monitoring samples collected by DPR beginning in early October 2025 through the end of that year. 1,3-D data that was analyzed by CDFA prior to October 24, 2025 remains valid, has not been recalled, and can be accessed via DPR's Pesticide Air Monitoring Results Database. However, based on CDFA's data recall, DPR has not included affected data in the Draft 2025 1,3-D Report. Reporting data known to be inaccurate or incomplete is misleading and can create confusion about potential health risks or the effectiveness of regulatory requirements.

By regulation, annual 1,3-D reports include an evaluation of monitoring locations with an average air concentration of more than 0.27 parts per billion (ppb) in the previous calendar year or an air concentration of more than 55 ppb for a 24-hour period. Where it is determined that an applicable air concentration threshold has been exceeded, the resulting evaluation includes an assessment of the validity and representativeness of the monitoring data and other factors to determine if the detected concentration is within the expected range. DPR is only required to conduct such an evaluation based on available and valid air monitoring data. For purposes of an evaluation, it is not required or possible for DPR to compare estimated concentrations to measured concentrations from air monitoring for any period for which monitoring data is unavailable or has been invalidated, such as the period covered by the CDFA data invalidation. In the interest of public transparency, DPR has elected to evaluate all six air monitoring stations. An evaluation of the Parlier monitoring station, which DPR initiated prior to receiving the CDFA notification, is included in section 6.2 of the Draft 2025 1,3-D Report. DPR intends to conduct further evaluation of the remaining five monitoring locations to be released as an update as soon as feasible.

Based on the air monitoring certified by the lab, the highest measured air concentrations at the monitoring stations were in Parlier, with 1.34 ppb for the 24-hour period. Modeling was performed for the Parlier township, M15S23E, and results showed that the annual average concentration was 0.17 ppb, which is below DPR's regulatory target of 0.56 ppb.

DPR posts use data on a quarterly schedule, with each quarter's data published by the end of the following month. Monitoring data follows a different timeline and is posted six months after the end of each quarter. As such, the data included in this report are already publicly available on [DPR's website](#).

In summary, DPR's pesticide use report (PUR) data analyses of high-use townships, ambient air concentrations from air monitoring stations, and modeling data indicate that current regulatory measures are functioning as intended.

3. INTRODUCTION

3.1. Background

California is the largest producer of specialty crops in the United States, accounting for 99% of production of almonds and walnuts, and 90% of grapes and strawberries nationwide. Soil fumigants are widely used to control soilborne pests and disease-causing organisms that may reduce agricultural yields and may be preferred over other options due to their broad-spectrum efficacy, simplicity of application, and affordability for growers. One major soil fumigant is 1,3-dichloropropene (1,3-D), sometimes referred to by its trade name Telone. 1,3-D is used to control a wide spectrum of pests, including soil nematodes and other soil pathogens, and is commonly applied as a pre-plant pesticide for orchards, strawberries, grapes, carrots, sweet potatoes, and other crops in California.

Registered as a soil fumigant for agricultural use in the United States in 1966 and in California in 1970, 1,3-D is a volatile organic compound listed as a carcinogen under California's Proposition 65. 1,3-D is listed as a toxic air contaminant and exposure above certain thresholds can lead to serious illness, or death at especially high concentrations. 1,3-D is also listed as a restricted material and requires special handling due to its potential toxicity or environmental impact. Restricted materials can only be purchased or used by certified applicators or those under their direct supervision.

Injected into the soil as a liquid, applied 1,3-D rapidly converts into a gas, allowing it to redistribute throughout the soil where it may encounter disease-causing organisms. This conversion into the gas phase also results in some 1,3-D emitting from the soil into the ambient air, where it may move away from application sites, increasing the probability of human exposure through inhalation. To protect public health and the environment, DPR established acute (72 hours) and lifetime (70 years) health threshold levels to mitigate the health effects of 1,3-D.

3.2. Regulations and air concentration thresholds

DPR regulation 22-005 (additions and amendments to Title 3, California Code of Regulations, sections 6448-6448.4, 6452, 6624, 6626, 6881) addresses 72-hour acute risk and 70-year lifetime cancer risk to residents and other non-occupational bystanders (adults and children) from 1,3-D (CDPR 2024). Regulation 22-005, hereafter the 2024 regulation, went into effect on January 1, 2024. Using worst-case application scenarios, computer models, and public comments, DPR developed rules and established requirements to minimize the release of 1,3-D in the air after its application in the soil. These mitigation measures include acreage limits, minimum setback distances from an occupied structure to a treated field, totally impermeable films, deeper fumigant injections, an increase in soil moisture requirements, quarterly use summaries, and an annual report, among other requirements.

Per 3 CCR section 6448.4, DPR is required to issue an annual report that identifies and assesses specific high-use townships. High-use townships are selected according to the ten townships with the highest use across the ten counties with the highest total use (Section 6.1). For these townships, DPR analyzes reported use, available emissions data, and local weather conditions using computer modeling to determine if the modeled air concentrations are within the

expected range. The modeled air concentrations are compared to the “regulatory target concentrations” specified in DPR’s 2016 and 2021 risk management directives (CDPR 2016, CDPR 2021) and shown in [Table 1](#). Modeled air concentrations that exceed a regulatory target concentration may indicate the need for additional mitigation measures.

DPR is also required to assess monitoring stations with measured air concentrations that exceed an “evaluation trigger” specified in 3 CCR section 6448.4(b)(1)(B)-(C) and shown in [Table 1](#). The assessment includes monitoring stations for DPR’s AMN and could include other monitoring stations that have valid and representative data. The evaluation triggers are more stringent than regulatory target concentrations and provide an additional margin of safety for DPR to evaluate air monitoring sites and consider the need for additional mitigation measures prior to exceeding a regulatory target concentration. Monitored air concentrations can also be compared to regulatory target concentrations; however, monitoring data for 72-hour air concentrations is not available and monitored air concentrations would normally exceed a more stringent evaluation trigger before exceeding a regulatory target concentration.

If any of the modeled or monitored air concentrations are higher than expected in comparison to previous data, the report includes a description of action(s) DPR will take to address the high levels and a timeline for taking the actions.

Table 1. DPR air concentration thresholds for 1,3-D. There are separate thresholds for monitored air concentrations and modeled air concentrations, and for different health risks.

Type of Risk	3 CCR 6448.4(b) Evaluation Trigger (for monitored air concentrations)	Regulatory Target Concentration (normally for modeled air concentrations)
Acute (short-term)	55 ppb as 24-hour average	55 ppb as 72-hour average
Cancer (lifetime)	0.27 ppb as 1-year average	0.56 ppb as 70-year average*

*Monitored air concentrations are one or multiple year averages depending on the availability of data. Modeled air concentrations are the most recent one to five-year averages depending on the availability of data. The one or multiple year averages are used as surrogates for lifetime 70-year averages.

4. PESTICIDE USE REPORT

State law requires a pesticide use report (PUR) to be submitted for each pesticide applied for the production of an agricultural commodity, including all 1,3-D applications. DPR’s [PUR database](#) contains information on the product applied, amount applied, acres treated, crop, application date, application location, and other information. PUR information on 1,3-D use is posted on DPR’s website on a quarterly basis and the full year of data and data summary is released annually for all reportable pesticide use in California.

In addition to evaluating 1,3-D use, DPR also calculates and evaluates its emissions primarily for its volatile organic compound (VOC) program and adjusted total pounds (ATP) for its township cap program. DPR tracks and controls the VOC emissions from agricultural and structural pesticide applications because they contribute to the formation of ozone, a major air pollutant.

For 1,3-D, DPR estimates the emissions for each application by multiplying the amount of active ingredient used by an emission ratio that ranges from 9 percent to 52 percent to account the effect of fumigation method on emissions (Brown, 2022).

Since the 1990s, DPR has required an annual regional use limit (township cap) for 1,3-D to mitigate cancer risk. The 2024 regulation does not include a township cap because DPR expects the setbacks and other requirements to mitigate both acute and cancer risk. However, due to a court order, the township cap remained in effect until DPR completed rulemaking for the occupational bystander regulation. The township cap is no longer in effect as of January 2026, but it remained in effect throughout 2025. A township is an area of 36 square miles used by the U.S. Bureau of Land Management as a way of subdividing and describing land in the United States as part of the Public Lands Survey System. In 2025, the township cap limit was 136,000 ATP of 1,3-D during the calendar year (CDPR 2016). The quantity of ATP accounts for the relative proportion of 1,3-D emitted into the air as a result of the application method used, as well as the impact of those emissions on air concentrations based on regional and seasonal differences in meteorology (Luo and Brown 2022 & 2023). For each individual 1,3-D application, the equivalent ATP is calculated as the total mass of 1,3-D applied multiplied by an application factor which varies from 0.21 to 2.93 (Table 2). These application factors were developed using field data and computer models and are defined according to a combination of field fumigation method (FFM), season, and region (Luo and Brown 2022 & 2023). The same application factors are used for all years. DPR makes every effort to quality control the PUR and correct errors, but in some cases PUR records with missing fumigation method codes are substituted with what is reported in registrant submitted use data. For the 92 records where the fumigation method codes are missing in both datasets, fumigation code 1201 is inferred to provide the most conservative estimates of 1,3-D ATP.

Table 2. Application factors based on fumigation method, location, and month.

Field fumigation methods (FFM codes)	Inland Nov-Feb	Inland Mar-Oct	Coastal Nov-Feb	Coastal Mar-Oct
Standard nontarped and nonTIF tarp shallow 12-inch methods (1201, 1202, 1203, 1204, 1205)	2.93	1.40	2.42	1.78
Standard nontarped and nonTIF tarp deep 18-inch methods (1206, 1207, 1208, 1210, 1211)	1.73	0.83	1.42	1.04
Chemigation (drip)/nonTIF tarp method (1209)	2.15	1.02	1.74	1.21
24-inch injection methods (1224, 1225, 1226, 1227)	1.00	0.48	0.82	0.61
TIF methods - broadcast and strip (1242, 1247, 1249)	0.46	0.21	0.37	0.24
TIF methods - bed and strip (1243, 1245, 1248, 1259)	0.76	0.36	0.62	0.45
40% TIF with 18-inch injection depth method (1250)	1.16	0.56	0.95	0.70
40% TIF with 24-inch injection depth method (1264)	0.71	0.34	0.58	0.43

The year 2025 marks the first year since 2020 where use of 1,3-D (in terms of pounds, ATP, and emissions) has increased compared to the previous year. Despite this increase, ATP and emissions in 2025 remain below any year in the 2019-2023 range ([Figure 1](#)). Compared to 2024, emissions increased by 11.4% and ATP increased by 20.0%, but are still below pre-regulation levels. Given that fumigation methods and weather conditions affect 1,3-D air concentrations, this report focuses on ATP of 1,3-D and compares 2025 and 2024 data against previous years to elucidate changes once the 2024 regulation went into effect. Throughout this report, the year 19-23 represents the annual average for 2019-2023. In addition, beginning this year, an average of years post-2024 regulation is calculated for comparison to the 19-23 average. For this report, the year 24-25 represents the average of years 2024 and 2025.

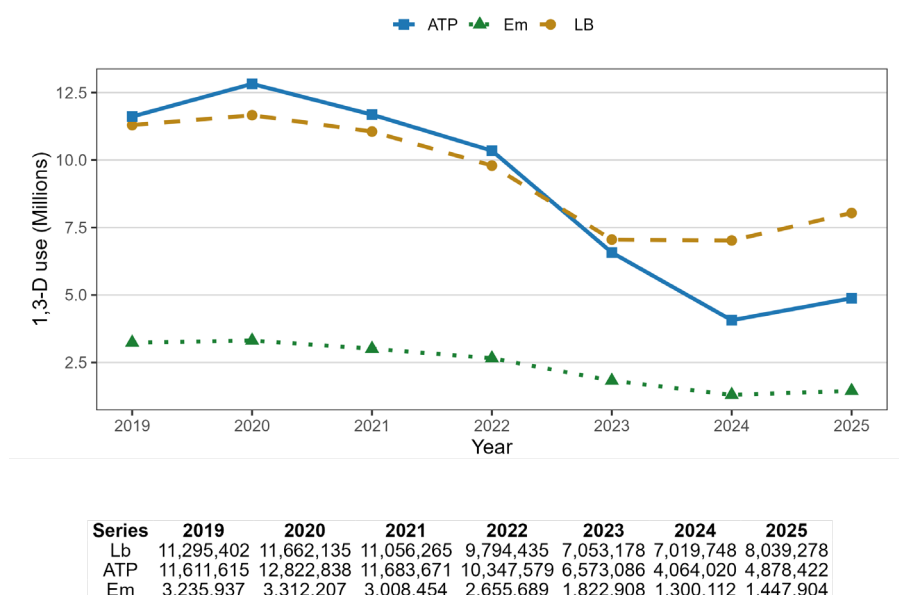


Figure 1. Pounds (Lb), adjusted total pounds (ATP), and calculated emissions (Em) of 1,3-D in 2019-2025.

4.1. Acres treated

In 2025, 47,731 acres of land were treated with 1,3-D ([Figure 2](#)). From 2019 to 2023, on average, 57,730 acres of land were treated with 1,3-D, so, despite the increase in acreage in 2025, overall use was lower than the 19-23 average by 17.3%. Despite the 2024 regulation limiting the application field size to 80 acres, 8 out of 3,396 applications (or 0.24%) reported treated fields greater than 80 acres in 2025. DPR's Enforcement Branch confirmed with the County Agricultural Commissioner's offices that the PUR records exceeding 80 acres are associated with combined records of multiple smaller applications occurring on separate dates to comply with restrictions in place.

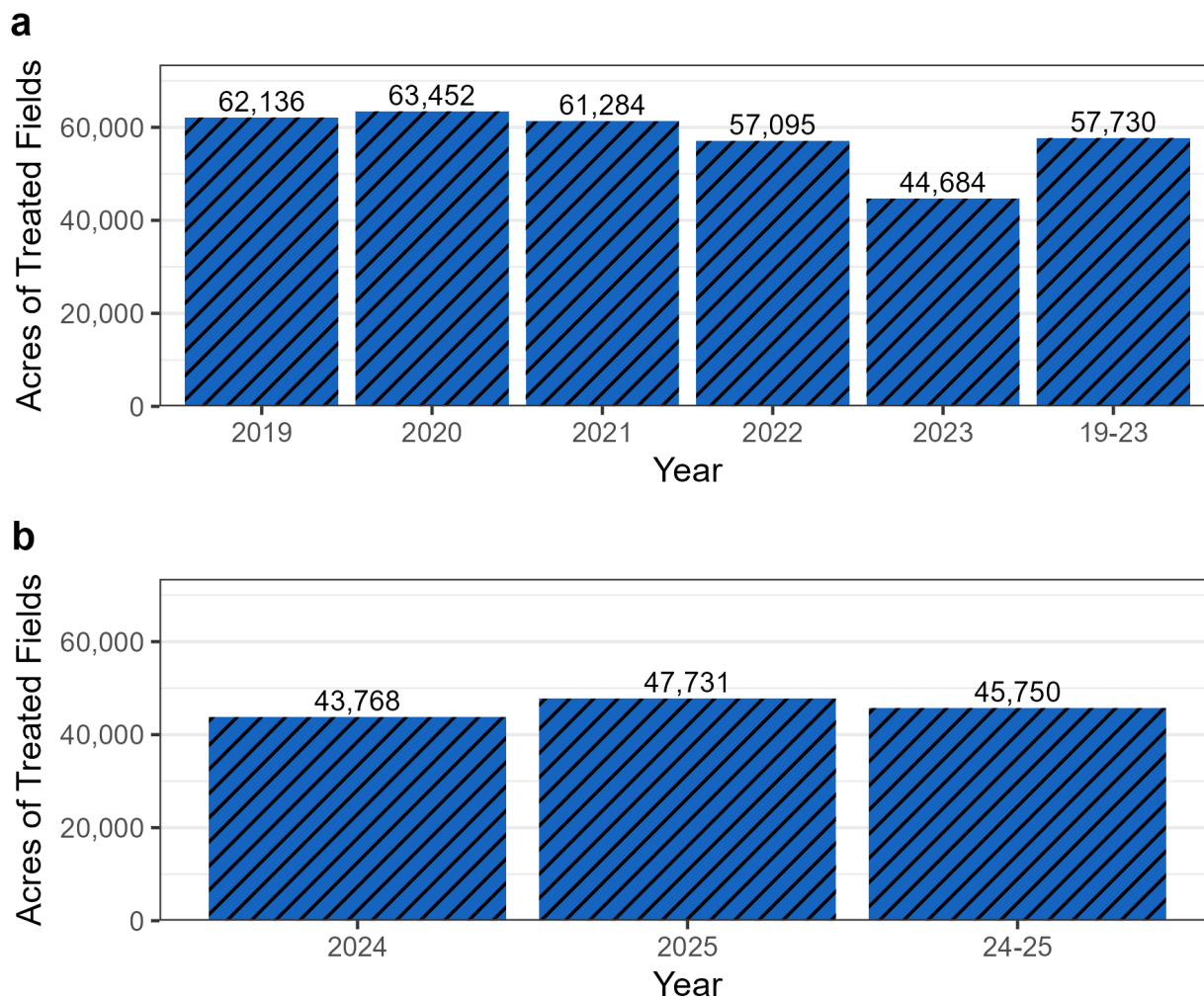


Figure 2. Acres of fields treated with 1,3-D from 2019 to 2025. Included are averages of 2019-2023 (19-23) and 2024-2025 (24-25).

4.2. Adjusted pounds by crop and fumigation code

Since 2019, the ten crop-specific categories with the most ATP of 1,3-D used were almonds, carrots, grapes, peaches, strawberries, sweet potato, tangerines, and walnuts (Table 3). In 2025, the ATP of 1,3-D was lower for every top crop in comparison to the 2019-2023 annual average, except for strawberries and peaches. Two non-crop-specific categories, uncultivated and pre-plant applications, also appeared in the top 10 listing. Non-crop-specific categories such as uncultivated and pre-plant applications are flagged so that counties may update the record with a more specific crop type in the future.

Table 3. ATP of 1,3-D for the top ten highest-use crops from 2019-2025. Included are the 19-23 average, 2024, 2025, and the 24-25 average ATP for each crop.

Crop	2019-2023 Mean	2024	2025	2024-2025 Mean
Almond	2,725,320	895,456	965,592	930,524
Carrots	869,547	444,159	302,024	373,091
Grapes	1,220,662	299,767	836,800	568,283
Peach	267,921	267,895	379,023	323,459
Pre-Plant	1,691,549	86,308	9,385	47,847
Strawberry	621,179	586,993	661,641	624,317
Sweet Potato	885,497	515,342	599,469	557,406
Tangerine	247,626	47,972	140,114	94,043
Uncultivated	407,233	39,761	91,350	65,555
Walnut	365,584	145,662	193,703	169,683
Other	1,305,640	734,704	699,322	717,013

As of 2025, DPR has established 25 field fumigation methods (FFM) allowed for 1,3-D in California, each with an assigned FFM code. Applicators must select the appropriate FFM based on their region, month of application, acreage, crop type, and other factors. The FFM with the highest ATP of 1,3-D applied since 2019 are:

- 1201: non-tarpaulin, 12 inches deep injection, broadcast or bed
- 1206: non-tarpaulin, 18 inches deep injection, broadcast or bed
- 1210: non-tarpaulin, 18 inches deep injection, strip
- 1224: non-tarpaulin, 24 inches deep injection, broadcast
- 1226: non-tarpaulin, 24 inches deep injection, strip
- 1259: total impermeable film TIF, chemigation (drip)

When ATP of the most-used FFMs were divided up by use by crop type, the data shows that applications that previously used (“legacy” methods) FFM 1206 and 1210 switched to 1224 and 1226 in 2024 (Figure 3 & Table 4), especially almond growers (Figure 4). Compared to 2024, 2025 corresponded with increases in FFMs 1224, 1226, 1259, and “other” fumigation methods and the legacy FFMs 1201 and 1206 saw a continued decline in use compared to 2024.

Table 4. ATP of 1,3-D for the highest-use FFM for the 19-23 average, 2024-2025, and the 24-25 average.

FFM	2019-2023 Mean	2024	2025	2024-2025 Mean
1201	980,281	273,477	237,170	255,323
1206	6,658,613	315,671	132,265	223,968
1210	2,059,393	0	0	0
1224	0	1,685,212	2,399,646	2,042,429
1226	0	1,076,884	1,227,922	1,152,403
1259	405,027	327,360	353,586	340,473
Other	504,444	385,416	527,832	456,624

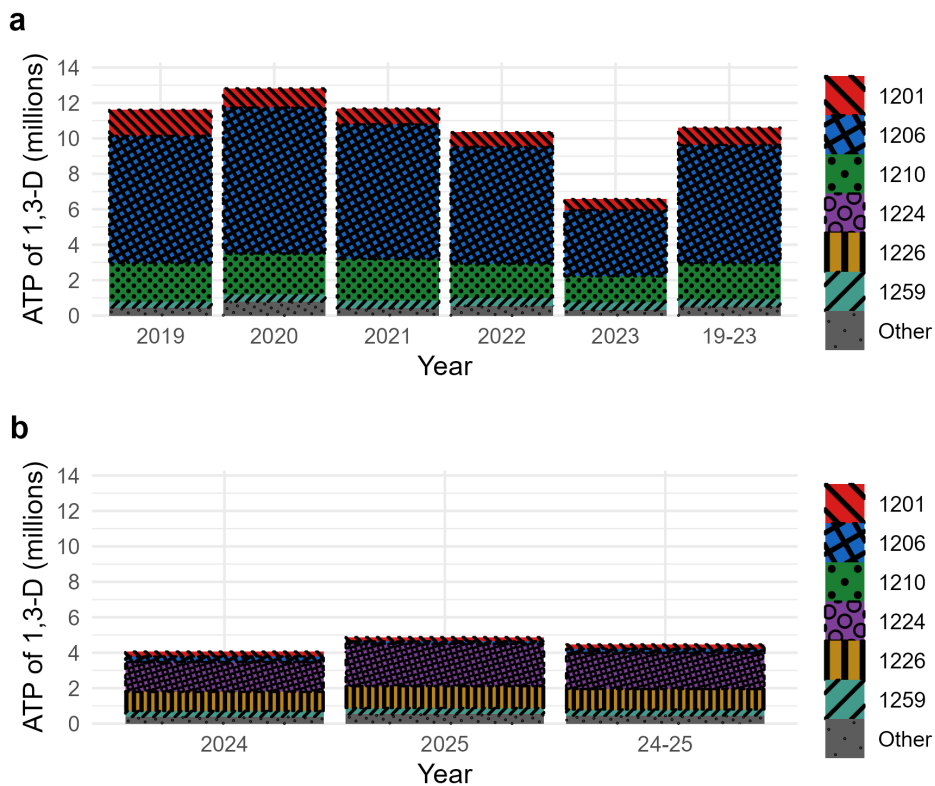


Figure 3. ATP of 1,3-D by year and FFM from 2019 to 2025. The year 19-23 represents the annual average for 2019-2023 while 24-25 represents the annual average for 2024-2025.

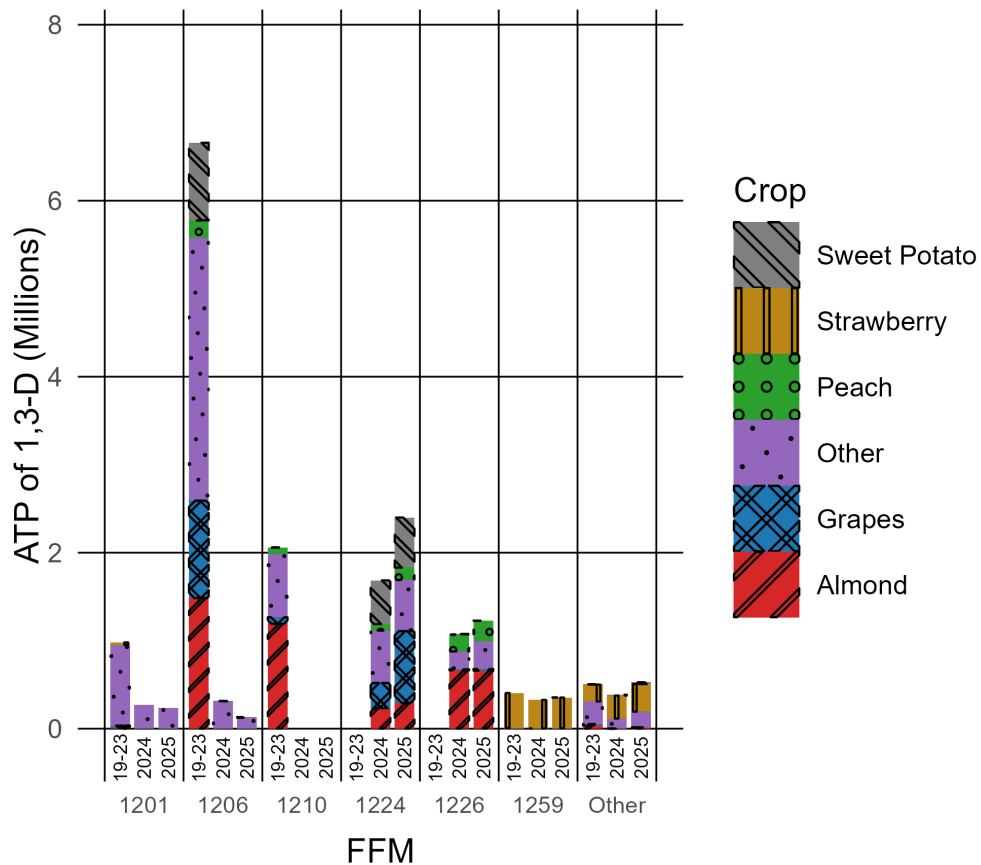


Figure 4. ATP of 1,3-D by FFM, year, and crop for the 2019-2023 annual average (19-23), 2024, and 2025. The crops chosen are based on the highest 1,3-D use in 2025.

5. MONITORING STATIONS

DPR has six air monitoring stations deployed across the state that monitor for 1,3-D and other pesticides: Oxnard, Santa Maria, Shafter, and Watsonville are part of the Air Monitoring Network (AMN, study 257), and Delhi and Parlier are part of study 309, which specifically monitors for 1,3-D (Figure 5).

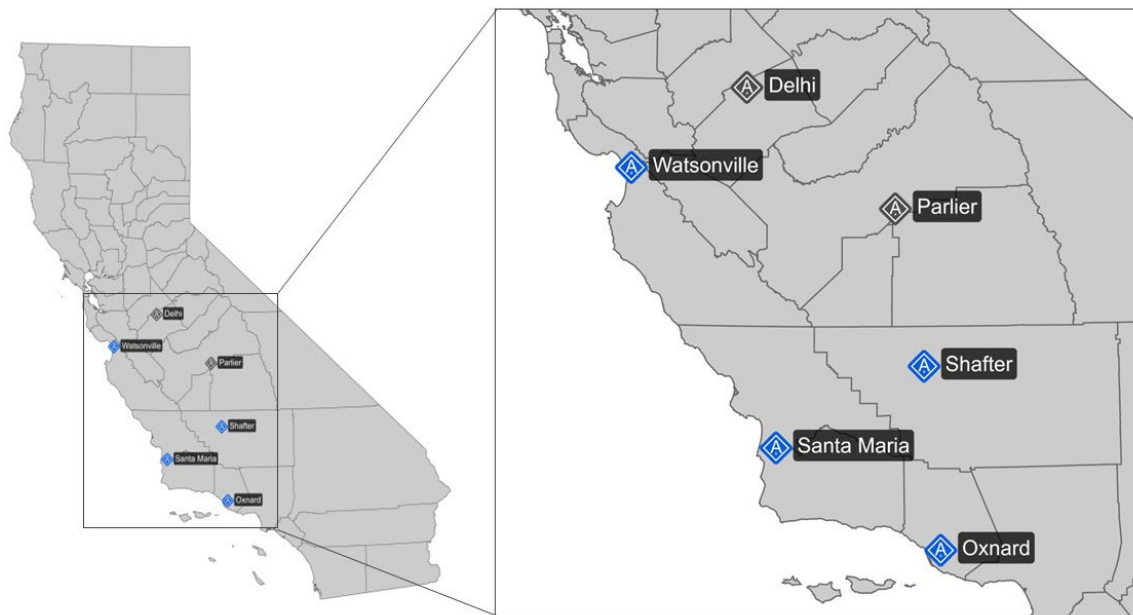


Figure 5. DPR stations monitoring the ambient air for 1,3-D in 2025.

5.1. Highest 24-hour and 9-month concentrations

The air samples collected in 2025 were analyzed by CDFA. On September 30, 2026, CDFA notified DPR that it had recalled and voided all 1,3-D and methyl bromide monitoring results analyzed between October 24, 2025 and June 30, 2026. CDFA determined the laboratory reference standard used to analyze 1,3-D (cis- and trans- isomers) and methyl bromide samples significantly degraded, resulting in unusable and inaccurate analyses during this time. When a standard degrades, labs can no longer measure chemical amounts correctly. This caused the reported 1,3-D air concentrations to be inaccurately elevated compared to the actual value. The last valid sample analyzed from the Oxnard site was collected by DPR on the week of September 28 (Table 5). For the 5 other monitoring sites, the last valid samples analyzed were collected by DPR on the week of October 5. As a result of the data invalidation, this report will include the 9-month average air concentrations of 1,3-D instead of the 1-year average. As discussed above, annual 1,3-D reports include an evaluation of monitoring locations with an average air concentration of more than 0.27 parts ppb in the previous calendar year or an air concentration of more than 55 ppb for a 24-hour period. However, DPR is only required to conduct such an evaluation based on available and valid air monitoring data. In the interest of transparency, DPR has elected to evaluate all air monitoring stations. An evaluation of the Parlier monitoring station, which DPR initiated prior to receiving the CDFA notification, is included in Section 6.2. DPR intends to conduct further evaluation of the remaining five monitoring locations to be released as an update as soon as feasible.

Table 5: Dates of the last valid and first invalid 1,3-D sample at each monitoring site.

Location	Last Valid Sample	First Invalid Sample
Delhi	10/6/2025	10/16/2025
Oxnard	9/29/2025	10/8/2025
Parlier	10/6/2025	10/16/2025
Santa Maria	10/7/2025	10/15/2025
Shafter	10/9/2025	10/15/2025
Watsonville	10/6/2025	10/15/2025

The 2024 regulation requires an assessment of the 24-hour and 1-year average air concentrations of 1,3-D from each of DPR's air monitoring stations that exceed the evaluation triggers shown in [Table 1](#).

Based on the valid 2025 air monitoring data, none of the six air monitoring stations reported a 24-hour concentration exceeding 55 ppb evaluation trigger. The highest 24-hour concentration among all monitoring stations was 1.34 ppb in Parlier, which was below the 55 ppb threshold ([Table 6](#)). As noted above, DPR does not have complete valid 1-year data for any of the monitoring stations. DPR cannot determine based on available valid data if the one-year average or 24-hour samples collected from October onward are over the trigger level for any of the monitoring locations.

Table 6. A comparison of the highest 24-hour and 9-month air concentrations of 1,3-D in parts per billion (ppb) in 2025.

Location	Study	Date	24-hour concentration	9-month concentration
Delhi	309	4/9/2025	0.90	0.16
Oxnard	257	8/8/2025	0.24	0.03
Parlier	309	10/6/2025	1.34	0.12
Santa Maria	257	10/1/2025	0.66	0.06
Shafter	257	4/4/2025	0.91	0.14
Watsonville	257	9/30/2025	0.65	0.06

6. MODELING AIR CONCENTRATIONS

6.1. Highest-use townships

6.1.1. Township selection

As specified by 3 CCR section 6448.4(b)(1), the highest-use township in each of the top 10 highest-use counties was selected for evaluation. The selection was made based on the

following criteria that provide a range of locations, crops, fumigation methods, and weather conditions for evaluation:

Step 1: To assign a township to one or more counties, calculate the fractional areas of a township in each county and apply a 10% cutoff threshold. For example, if Township X is located in three counties with fractional areas of 50% in County 1, 42% in County 2, and 8% in County 3, then County 3 is excluded, and Township X is considered only to be shared by Counties 1 and 2.

Step 2: Sort counties by 1,3-D ATP use. This list may have up to 58 ranked counties, depending on the number of counties reporting 1,3-D use in the year.

Step 3: To select the highest-use township in each county, three conditions were followed:

Condition 1: if the highest-use township is located only in one county (not shared), then this township is selected to represent the county.

Condition 2: if the highest-use township is located in more than one county (shared), then this township represents all the shared counties. The highest township from the next highest county is now included in the top 10 list. Additionally, all involved (shared) counties are removed from the “sorted list” (Step 2) and no longer participate in the township selection.

Condition 3: if the highest-use township is adjacent to a township previously selected, the township with lower use and its county are removed from the county list. The highest township from the next highest county is now included in the top 10 list.

The above procedures are conducted based on the 1,3-D use data from 2025 in using ATP. Following these criteria, despite being a top 10 highest use county, Stanislaus County (which originally ranked 7th) was eliminated due to sharing the top township with San Joaquin County, which ranked higher. San Luis Obispo County, which ranked 11 and was next in line for the top 10, was eliminated for having a top township that bordered the top township for Santa Barbara County. Therefore, Butte was selected as the 10th highest use county. The 10 selected townships for modeling and their represented counties are listed in [Table 7](#) and [Figure 6](#).

Table 7. Highest-use counties and their highest-use township, crop, and FFM in 2025.

Rank	County Name	County ATP	Township Location	Township ATP	Weather WBAN	Top Crop	Top FFM
1	Kern	810,726	S11N18W	109,076	23155	Grape	1224
2	Merced	696,484	M07S12E	124,031	23258	Sweet Potato	1224
3	Fresno	657,293	M15S18E	103,507	93193	Peach	1224
4	Tulare	395,288	M24S25E	78,777	23155	Grape	1224
5	Monterey	307,604	M14S03E	68,549	23233	Strawberry	1242
6	San Joaquin	299,727	M02S08E	61,235	23237	Almond	1226
7	Imperial	195,744	S16S16E	50,716	23199	Carrots	1201
8	Santa Barbara	182,168	S10N34W	69,669	23273	Strawberry	1259
9	Madera	131,330	M13S16E	47,195	93242	Grape	1224
10	Butte	104,018	M20N01E	53,257	93210	Almond	1224

Weather-Bureau-Army-Navy (WBAN) is an identifier for stations operated by National Weather Service

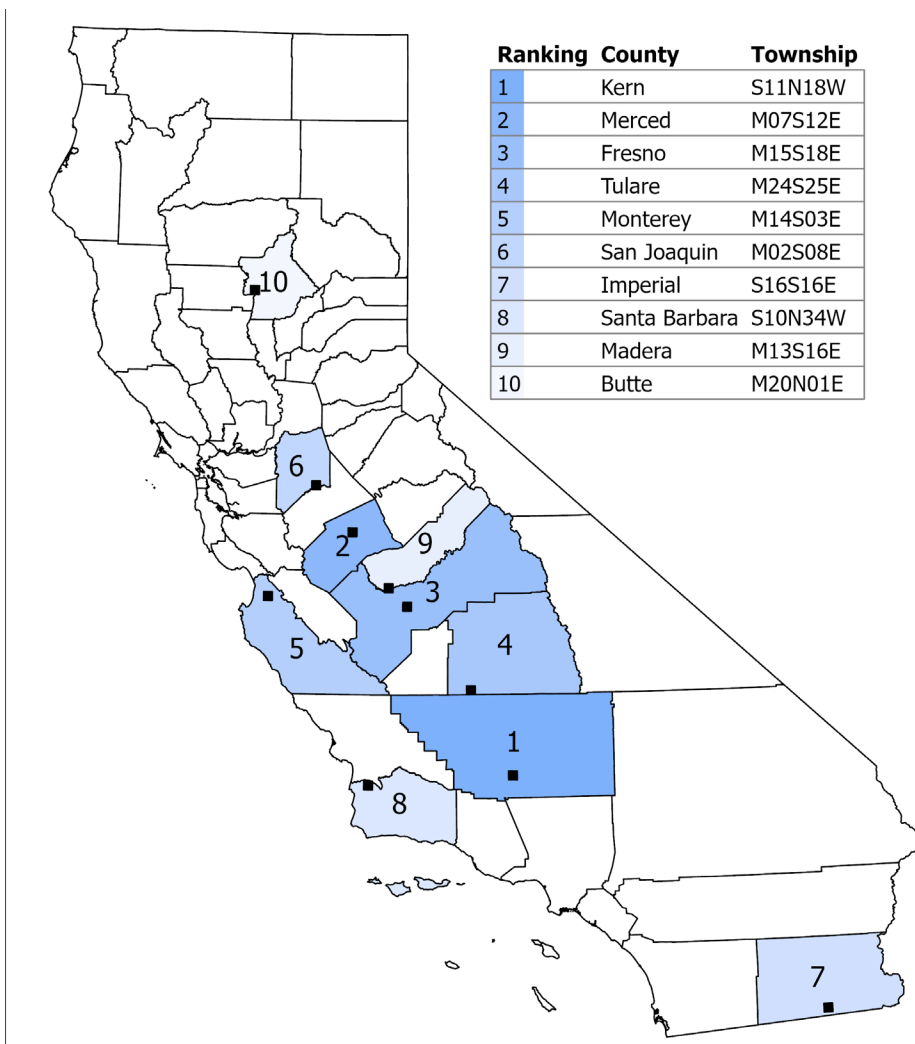


Figure 6. Map of California and the 10 highest-use counties of 1,3-D ATP in 2025. Black squares indicate the location of the highest-use townships in the county.

6.1.2. Modeling approach and results

Air concentrations of 1,3-D were simulated in AERFUM, an integrated air dispersion modeling system for soil fumigants developed by DPR (Luo, 2019). The current version of AERFUM uses the latest AERMOD v26135 (USEPA, 2026a). Meteorological data for 2025 are processed by the MetProc program (Luo, 2024) based on the latest data processors, AERMET v26135 and AERSURFACE v26135 (USEPA, 2026b, c), and the latest land use data processed by USEPA (2026d), National Land Cover Dataset (NLCD) version 2021. The 2026 GIS layers for field boundaries from the Cal Ag Permits (CAP) system are incorporated in the modeling to determine the location and dimensions of each treated field.

This study uses the same approach developed in the previous township cap modeling (Luo, 2022). The modeling results are presented as the 95th percentiles of the predicted annual

average air concentration, the highest 24-hour and 72-hour moving average air concentrations for each township. Using the highest-use townships along with weather data, modeling estimates show that the highest estimated 95th percentile 24-hour, 72-hour, and 1-year air concentrations of 1,3-D are 35.5, 21.5, and 0.52 ppb, respectively ([Table 8](#)); all of them were predicted in M15S18E (Fresno County). None of the estimated air concentrations exceeded DPR's regulatory target concentrations of 55 ppb as a 72-hour average or 0.56 ppb as a 70-year average (only one year of data is available for comparison to the 70-year target).

Table 8. Highest-use townships and their estimated 95th percentile air concentrations in parts per billion (ppb) for the highest 24-hour, 72-hour average, and annual averages in 2025.

Rank	County	Township	1-year	72-hour	24-hour
1	Kern	S11N18W	0.26	10.0	17.8
2	Merced	M07S12E	0.35	10.2	17.3
3	Fresno	M15S18E	0.52	21.5	35.5
4	Tulare	M24S25E	0.14	7.0	12.6
5	Monterey	M14S03E	0.09	2.9	5.4
6	San Joaquin	M02S08E	0.19	8.2	16.7
7	Imperial	S16S16E	0.05	8.5	7.9
8	Santa Barbara	S10N34W	0.10	5.2	8.5
9	Madera	M13S16E	0.14	10.0	17.4
10	Butte	M20N01E	0.10	10.3	12.8

6.1.3. Additional evaluations on the township M15S18E

In the modeling for the selected townships ([Table 8](#)), the highest 95th percentile annual air concentration was 0.52 ppb estimated in the township M15S18E (Fresno County). While the 0.52 ppb annual average does not exceed DPR's 70-year lifetime regulatory target of 0.56 ppb, it is higher than the 1-year average previously calculated by DPR when assessing the likely effect of the non-occupational bystander regulation (Segawa and Luo, 2022). As specified by 3 CCR section 6448.4(b)(2), if any of the estimated air concentrations are higher than expected in comparison to previous data, the annual report will include a description of action(s) the Department will take to address the high levels and a timeline for taking the actions.

The high model predictions in M15S18E were attributed to the intensive use of 1,3-D in a small area during winter season. In this township, all the 1,3-D uses in 2025 (total ATP=103,507) were

applied to adjacent fields in two sections within 11 days during 1/6/2025 to 1/17/2025 (Table 9 and Figure 7).

Table 9. All 1,3-D uses reported in M15S18E during 2025.

Applicate date	Section	Rate (lb/ac)	Size (ac)	FFM
1/6/2025	M15S18E13	137.1	77.5	1226
1/7/2025	M15S18E13	174.4	77.5	1226
1/8/2025	M15S18E14	172.6	78.5	1226
1/9/2025	M15S18E13	173.3	73	1226
1/10/2025	M15S18E14	167.7	78	1226
1/13/2025	M15S18E13	172.3	79	1226
1/14/2025	M15S18E14	173.1	74.5	1226
1/15/2025	M15S18E13	106.3	80	1226
1/17/2025	M15S18E13	63.5	80	1226

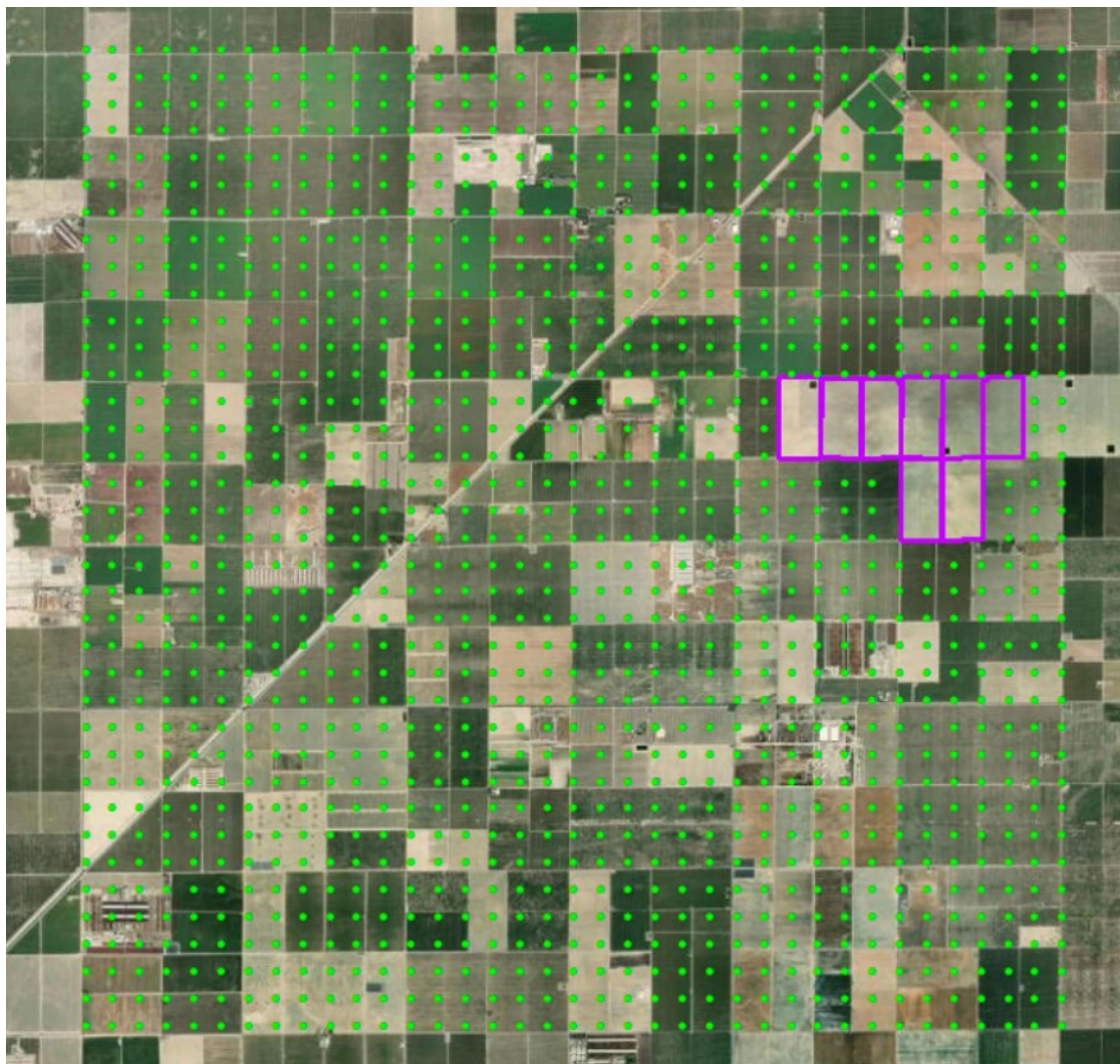


Figure 7. Treated fields (purple polygons) and receptors (green dots) for air dispersion modeling in M15S18E during 2025.

With the intensive uses of 1,3-D in M15S18E, high air concentrations were predicted around the treated fields (Figure 7) and resulted in high average concentrations as township-wide statistics. Refined modeling was not performed for this township since there is no residential community as defined by the U.S. Census Bureau as incorporated places and Census Designated Places (USCB, 2025), meaning the receptors (Figure 7) and associated modeling results represent ambient concentrations of 1,3-D in agricultural fields, not where residential bystanders are present. Instead, additional modeling was conducted for the township M15S19E enclosing the identified residential community of “Raisin City”. M15S19E is adjacent to M15S18E and with an ATP of 98,830 in 2025 (the second highest ATP in Fresno County). The two townships had similar fumigation methods (24-inch broadcast in M15S19E and 24-inch strip in M15S18E), timing (winter months), and spatial pattern (cluster of treated fields) for 1,3-D applications. In M15S19E, the township-wide annual average concentration was predicted as 0.38 ppb in 2025, while in the urban/residential areas within the township the predicted annual average was 0.10 ppb as the 95th percentile air concentration.

6.2. Monitoring stations

6.2.1. Site-specific modeling at air monitoring stations

The DPR regulation requires modeling the ambient air concentrations at the monitoring stations with 24-hour and 1-year exceedances. As specified by 3 CCR section 6448.4(b)(2), annual 1,3-D reports include an evaluation of monitoring locations with an average air concentration of more than 0.27 parts per billion (ppb) in the previous calendar year or an air concentration of more than 55 ppb for a 24-hour period. The evaluation will include an assessment of the validity and representativeness of the monitoring data, analysis of reported use, available emissions data, and local weather conditions to determine if the detected air concentrations are within the expected range. Per the notice provided to DPR from CDFA, 1,3-D air monitoring results collected by DPR from early October 2025 to the end of the year were voided and 1-year average concentrations cannot be estimated from a full year of valid monitoring results. As discussed above, DPR has elected to evaluate all air monitoring stations utilizing township modeling. An evaluation of the Parlier monitoring station, which DPR conducted prior to receiving the CDFA notification, is included below. DPR intends to conduct further evaluation of the remaining five monitoring locations to be released as an update as soon as feasible.

6.2.2. Township modeling around the Parlier station

The Parlier site is in the township M15S23E and additional modeling is conducted on this township. Model simulations are based on the same approach used for the highest-use townships, and the results are presented in [Table 10](#). The predicted 95th percentile 24-hour average in this township is 9.1 ppb. According to USEPA (2005), air dispersion models can be expected to reasonably match the magnitude of the maximum concentrations in a given area over a chosen period of time but cannot be expected to match exact time and location. The 95th percentile annual average concentration predicted in this township (0.17 ppb,) is still significantly lower than the DPR's 70-year lifetime regulatory target of 0.56 ppb.

Table 10. Additional township modeling for the Parlier site, reported as estimated 95th percentile air concentrations (ppb) for the highest 24-hour, 72-hour, and annual averages in 2025.

Township	County	WBAN	ATP	1-year	72-hour	24-hour
M15S23E	Fresno	93193	38,150	0.17	5.4	9.1

7. CONTRIBUTING FACTORS

Per 3 CCR 6448.4(b)(2), the 1,3-D annual report is to evaluate the major factors affecting use levels and air concentrations in those townships and monitoring locations included in the annual report. Factors affecting use within a township may include crop type distribution, number of applications, average application size, and typical application rates. Factors affecting the degree to which 1,3-D usage will impact air concentrations include the prevailing application

method within a township (Brown 2022) and seasonal distribution in 1,3-D application (Luo 2022). These factors can interact with one another in complex ways and no value taken alone may strongly predict air concentrations; however, these concepts are considered together in DPR's modeling process to predict township air concentrations (see [Table 8](#)), and the individual factors are discussed here in greater detail.

The Parlier township was included with the top 10 townships described in [Table 7](#) because the township modeling was completed for the Parlier township.

7.1. Factors affecting use levels

Crop distribution in each of the top townships was heavily weighted toward a single crop (see [Table A1-1](#), Appendix 1). Top townships in Butte, Fresno, Kern, Madera, San Joaquin, and Tulare counties were associated with tree and grape applications. Average application rates in these locations were at or near the per-acre maximum of 332 lbs/ac, while applications were primarily conducted with untarped deep field fumigation methods FFM 1224 or 1226 (see [Table A1-2](#), Appendix 1). Average reported application block sizes in these townships varied widely, with top townships in Madera, Kern, and Butte characterized by low numbers of high-acreage applications (i.e., >40 acres), in contrast to the more numerous but smaller-acreage applications reported in other townships ([Table 11](#)).

Table 11. Application statistics for each of the top 10 townships and the Parlier township, including number of applications in 2025, average application acreage, average mass of 1,3-D applied, average application rate, and average ATP. Top townships are grouped by primary crop(s).

Main Crop	County	Township	Number of Apps.	Avg. Area (ac)	Avg. Applied (lbs)	Avg. Rate (lbs/ac)	Avg. ATP
Tree & Grape	Butte	M20N01E	8	42	13,905	332	6,657
	Fresno	M15S18E	9	46	11,501	248	11,501
	Fresno	M15S23E	19	8	2,710	330	2,008
	Kern	S11N18W	8	42	13,635	327	13,635
	Madera	M13S16E	2	71	23,598	331	23,598
	San Joaquin	M02S08E	10	27	8,774	327	6,124
	Tulare	M24S25E	14	35	11,723	330	5,627
Strawberry	Monterey	M14S03E	202	9	1,139	122	339
	Santa Barbara	S10N34W	76	17	2,043	117	917
Root Crops	Imperial	S16S16E	12	43	4,075	94	4,226
	Merced	M07S12E	71	23	2,703	120	1,747

Usage within the townships in Monterey and Santa Barbara counties was mainly for pre-plant applications to strawberries. Application rates in these locations averaged between 117 and 122 lbs/ac and were primarily conducted using FFM 1242, a lower-emission shallow injection

broadcast application sealed with TIF tarp, and FFM 1259, a lower-emission method whereby 1,3-D is applied through drip lines in a raised bed system and the beds sealed under TIF tarp. Average block sizes varied, with an average block size of under 10 acres in Monterey County compared to an average field size of 17 acres in the Santa Barbara County township.

The last category of high-use townships was those associated with root vegetable crops, located in Merced and Imperial counties. Average application rates in these areas varied from 94 to 120 lbs/ac and were conducted mainly using untarped broadcast methods, mostly FFM 1201 (untarped shallow broadcast) or FFM 1206 (untarped deep broadcast) on carrots in Imperial County, or FFM 1224 (untarped 24-inch deep broadcast) and its variants being used on sweet potato applications in Merced County (see Table A1-3, Appendix 1). Average application block sizes were 43 acres in Imperial County and 23 acres in Merced County, with a total of 12 and 71 applications performed in each county, respectively.

7.2. Factors affecting air concentrations

Meteorology interacts with 1,3-D emissions in complex ways that may influence the degree to which emissions will affect air concentrations. Broadly, emissions in the winter will increase air concentrations more than if the same level of emissions were to occur in warmer months, due in part to the presence of inversion layers which inhibit the dilution and mixing of 1,3-D upward into the air column. The application factors developed by DPR (see [Table 2](#)) aim to quantify these relative impacts of meteorology depending on season and application site location, combined with the estimated proportion of fumigant emitted based on application method, thereby producing the quantity of ATP.

[Table 12](#) summarizes the distribution of winter versus non-winter usage of 1,3-D within each of the top townships. The proportion of wintertime applications ranged from 0 to 100%, with the townships S11N18W, M15S18E, and M13S16E located in Kern, Fresno, and Madera Counties having 100% of applications in the winter. In general, higher proportions of wintertime applications occurred in inland regions where use was mostly dedicated to pre-plant applications for tree and grape crops, but this varied by county and top townships in Tulare, Monterey, Imperial, and Butte had no reported wintertime usage. Applications in top townships where usage was primarily dedicated to strawberries likewise had zero or near-zero wintertime usage.

Table 12. Relative winter versus non-winter usage in each township, and total use, reported as pounds of active ingredient applied. The ATP value is also provided, demonstrating how seasonal effects and application method choice are estimated to mediate the relationship between mass applied and air concentrations. The dashed line represents the Parlier township.

Rank	County	Township	Nonwinter Use	Winter Use	Total Use	Township ATP
1	Kern	S11N18W	0	109,076	109,076	109,076
2	Merced	M07S12E	131,199	60,691	191,890	124,031

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3	Fresno	M15S18E	0	103,507	103,507	103,507
4	Tulare	M24S25E	164,119	0	164,119	78,777
5	Monterey	M14S03E	230,097	0	230,097	68,549
6	San Joaquin	M02S08E	50,972	36,769	87,741	61,235
7	Imperial	S16S16E	48,897	0	48,897	50,716
8	Santa Barbara	S10N34W	136,736	18,547	155,283	69,669
9	Madera	M13S16E	0	47,195	47,195	47,195
10	Butte	M20N01E	111,236	0	111,236	53,257
--	Fresno	M15S23E	25,646	25,840	51,486	38,150

Differences in application method also contributed to variation in estimated air concentrations across the evaluated townships. For instance, township M14S03E, located in Monterey County, was associated with by far the greatest overall use in terms of 1,3-D mass applied; however, due to the use of lower-emission application methods, ATP within the county ranked fifth and estimated annual air concentrations ranked ninth among those townships evaluated ([Table 7](#)). In contrast, township S11N18W, located in Kern County, ranked sixth in terms of total 1,3-D mass applied, but most applications were carried out in the winter using untarped application methods, and the township ultimately ranked second in terms of ATP.

The Parlier township (M15S23E) had roughly equal applications of 1,3-D in the winter and non-winter months. This township only used lower-emission FFM 1224 and 1226 for all applications ([Table A1-2](#)).

8. CONCLUSIONS

In accordance with Title 3 CCR §6448.4, this annual report evaluates the effectiveness of DPR Regulation 22-005. Key findings from 2025 include:

- 8,039,278 pounds of 1,3-D were used on 47,731 acres statewide, resulting in 4,878,422 ATP and 1,447,904 pounds of calculated emissions. These are increases compared to 2024 but remain below the 2019-2023 average.
- The commodities with the highest 1,3-D usage were almonds, grapes, strawberries, sweet potatoes, and peaches.
- Higher emission methods such as FFM 1206 and 1210 continued to decline from the previous year, while FFM 1224 and 1226 had further increases.
- CDFA has recalled and voided 1,3-D data for samples collected beginning in early October through the end of the year.
- As a result of three months of voided 1,3-D air monitoring results, the 9-month average air concentrations were calculated in place of the 1-year average. No monitoring station exceeded the evaluation trigger of 55 ppb for a 24-hour period based on 9-months of valid data.
- Township modeling will be used to evaluate all air monitoring sites as part of an updated draft of the report. An evaluation for the Parlier monitoring site, which was initiated

prior to the CDFA notification, is included in this version of the draft report and the predicted annual concentration of 0.17 ppb is well below the 70-year lifetime regulatory target of 0.56 ppb.

- Using modeling, the highest estimated 95th percentile 24-hour, 72-hour, and 1-year air concentrations of 1,3-D are 35.5, 21.5, and 0.52 ppb, respectively, all of which were predicted in M15S18E (Fresno County). None of the estimated air concentrations exceeded DPR's regulatory target concentrations of 55 ppb as a 72-hour average or 0.56 ppb as a 70-year average.
- Since township M15S18E had no residential areas, DPR conducted additional modeling in the township M15S19E, which is directly adjacent to M15S18E and has the second highest ATP applied in Fresno County. Both townships had similar use patterns. The 95th percentile annual average concentration in this township was 0.38 ppb and 0.10 ppb in the residential areas, significantly lower than the regulatory target concentration of 0.56 ppb.

DPR regulation 22-005 addresses 72-hour acute risk and 70-year lifetime cancer risk to residents/non-occupational bystanders by implementing setback distances, requiring deeper injection, soil with higher moisture, and introducing new fumigation methods and tarp requirements.

DPR's PUR data analyses on high-use townships, 9 months of ambient air concentrations from air monitoring stations, and modeled air concentrations indicate that current regulatory measures are effective. There is no evidence at this time to suggest that additional actions are necessary to meet the regulatory goals of DPR Regulation 22-005.

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APPENDIX 1

Table A1-1. Detailed breakdown of usage by crop within each top township during 2025. Table includes any crop accounting for 1% or more of total use within the township. The dashed line represents the Parlier township.

Rank	Township	County	Crop	Acreage Treated	1,3-D Applied (lbs)	Mean Rate (lbs/ac)	Fraction of Use
1	S11N18W	KERN	GRAPE	334	109,076	327	1
2	M07S12E	MERCED	SWEET POTATO	1,564	180,835	116	0.94
			ALMOND	35	11,055	317	0.06
3	M15S18E	FRESNO	PEACH	418	103,507	248	1
4	M24S25E	TULARE	GRAPE	497	164,119	330	1
5	M14S03E	MONTEREY	STRAWBERRY (ALL OR UNSPEC)	1,883	230,097	122	1
6	M02S08E	SAN JOAQUIN	GRAPE	113	37,462	332	0.43
			ALMOND	103	32,973	319	0.38
			WALNUT (ALL OR UNSPEC)	47	15,681	332	0.18
			PEACH	5	1,624	332	0.02
7	S16S16E	IMPERIAL	CARROTS, GENERAL	518	48,897	94	1
8	S10N34W	SANTA BARBARA	STRAWBERRY (ALL OR UNSPEC)	1,330	155,283	117	1
9	M13S16E	MADERA	GRAPE	143	47,195	331	1
10	M20N01E	BUTTE	ALMOND	334	110,729	332	1
--	M15S23E	FRESNO	PEACH	98.1	32,263	329	0.63
			PLUM (ALL OR UNSPEC)	28.7	9,488	331	0.18
			NECTARINE	26.2	8,647	330	0.17
			PEAR, ASIAN (ORIENTAL PEAR, YA, YA LI, NASHI)	3.06	1,089	356	0.02

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Table A1-2. Detailed breakdown of field fumigation methods used within each top township during 2025. Table includes any FFM accounting for 1% or more of total use within the township. The dashed line represents the Parlier township.

Rank	County	Township	FFM	Method Description	Acreage Treated	1,3-D Applied (lbs)	Fraction of Use
1	KERN	S11N18W	1224	Nontarpaulin/24 inches deep/broadcast	334	109,076	1
2	MERCED	M07S12E	1224	Nontarpaulin/24 inches deep/broadcast	1,491	179,825	0.94
			1226	Nontarpaulin/24 inches deep/strip	37	5,412	0.03
			1225	Tarpaulin/24 inches deep/broadcast	51	4,526	0.02
			1206	Nontarpaulin/deep/broadcast	15	1,513	0.01
3	FRESNO	M15S18E	1226	Nontarpaulin/24 inches deep/strip	418	103,507	1
4	TULARE	M24S25E	1224	Nontarpaulin/24 inches deep/broadcast	497	164,119	1
5	MONTEREY	M14S03E	1242	Tarpaulin/shallow/broadcast (w/ TIF)	1,247	166,642	0.72
			1259	Chemigation (drip system)/TIF tarpaulin	636	63,455	0.28
6	SAN JOAQUIN	M02S08E	1224	Nontarpaulin/24 inches deep/broadcast	203	66,738	0.76
			1226	Nontarpaulin/24 inches deep/strip	66	21,002	0.24
7	IMPERIAL	S16S16E	1206	Nontarpaulin/deep/broadcast	331	31,124	0.64
			1201	Nontarpaulin/shallow/broadcast or bed	187	17,774	0.36
8	SANTA BARBARA	S10N34W	1259	Chemigation (drip system)/TIF tarpaulin	1,215	139,275	0.9
			1242	Tarpaulin/shallow/broadcast (w/ TIF)	115	16,008	0.1
9	MADERA	M13S16E	1224	Nontarpaulin/24 inches deep/broadcast	143	47,195	1
10	BUTTE	M20N01E	1224	Nontarpaulin/24 inches deep/broadcast	334	110,729	1
--	FRESNO	M15S23E	1224	Nontarpaulin/24 inches deep/broadcast	96	31,488	0.61
			1226	Nontarpaulin/24 inches deep/strip	60	19,998	0.39

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Table A1-3. Detailed breakdown of field fumigation method by crop within each top township during 2025. Every reported combination of crop and field fumigation method (FFM) is listed. The dashed line represents the Parlier township.

Rank	County	Township	Crop	FFM	Acreage Treated	1,3-D Applied (lbs)
1	KERN	S11N18W	GRAPE	1224	334	109,076
2	MERCED	M07S12E	ALMOND	1224	29	8,946
			ALMOND	1226	6	2,108
			SWEET POTATO	1224	1,462	170,879
			SWEET POTATO	1225	51	4,526
			SWEET POTATO	1226	30	3,303
			SWEET POTATO	1206	15	1,513
			SWEET POTATO	1242	5	613
3	FRESNO	M15S18E	PEACH	1226	418	103,507
4	TULARE	M24S25E	GRAPE	1224	497	164,119
5	MONTEREY	M14S03E	STRAWBERRY (ALL OR UNSPEC)	1242	1,247	166,642
			STRAWBERRY (ALL OR UNSPEC)	1259	636	63,455
6	SAN JOAQUIN	M02S08E	ALMOND	1226	61	19,378
			ALMOND	1224	42	13,595
			GRAPE	1224	113	37,462
			PEACH	1226	5	1,624
			WALNUT (ALL OR UNSPEC)	1224	47	15,681
7	IMPERIAL	S16S16E	CARROTS, GENERAL	1206	331	31,124
			CARROTS, GENERAL	1201	187	17,774
8	SANTA BARBARA	S10N34W	STRAWBERRY (ALL OR UNSPEC)	1259	1,215	139,275
			STRAWBERRY (ALL OR UNSPEC)	1242	115	16,008
9	MADERA	M13S16E	GRAPE	1224	143	47,195
10	BUTTE	M20N01E	ALMOND	1224	334	110,729
			WALNUT (ALL OR UNSPEC)	1230	2	507

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--	FRESNO	M15S23E	NECTARINE	1224	20	6,515
			NECTARINE	1226	7	2,132
			PEACH	1226	51	16,777
			PEACH	1224	47	15,486
			PEAR, ASIAN (ORIENTAL PEAR, YA, YA LI, NASHI)	1226	3	1,089
			PLUM (ALL OR UNSPEC)	1224	29	9,488