California Environmental Protection Agency
Department of Pesticide Regulation

Agricultural Fumigants: Ongoing Efforts to Reduce Exposure to Workers and Bystanders

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Background: key laws affecting field fumigants

- State and federal laws pertain to all pesticides, including DPR's continuous evaluation and EPA's reregistration mandates
- CA Toxic Air Contaminant (TAC) Act requires DPR to evaluate and mitigate health risks from exposure to pesticides in air
- State implementation plan for the Clean Air Act requires DPR to track and reduce volatile organic compound (VOC) emissions to help achieve the ground-level ozone standard
- Montreal Protocol and Clean Air Act require EPA to phaseout methyl bromide due to stratospheric ozone depletion

Background: need for field fumigants

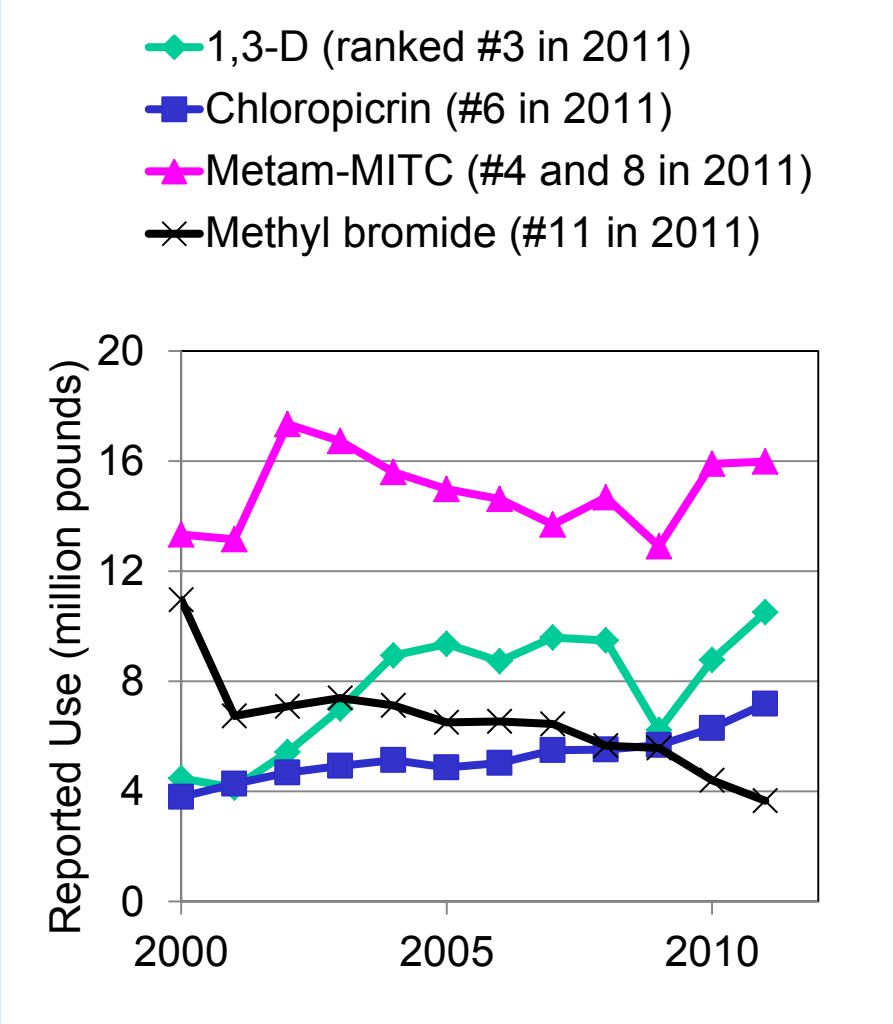
- Fumigants are applied to soil prior to planting for weeds, diseases, nematodes, and soil-borne insects that are difficult to control – few alternatives

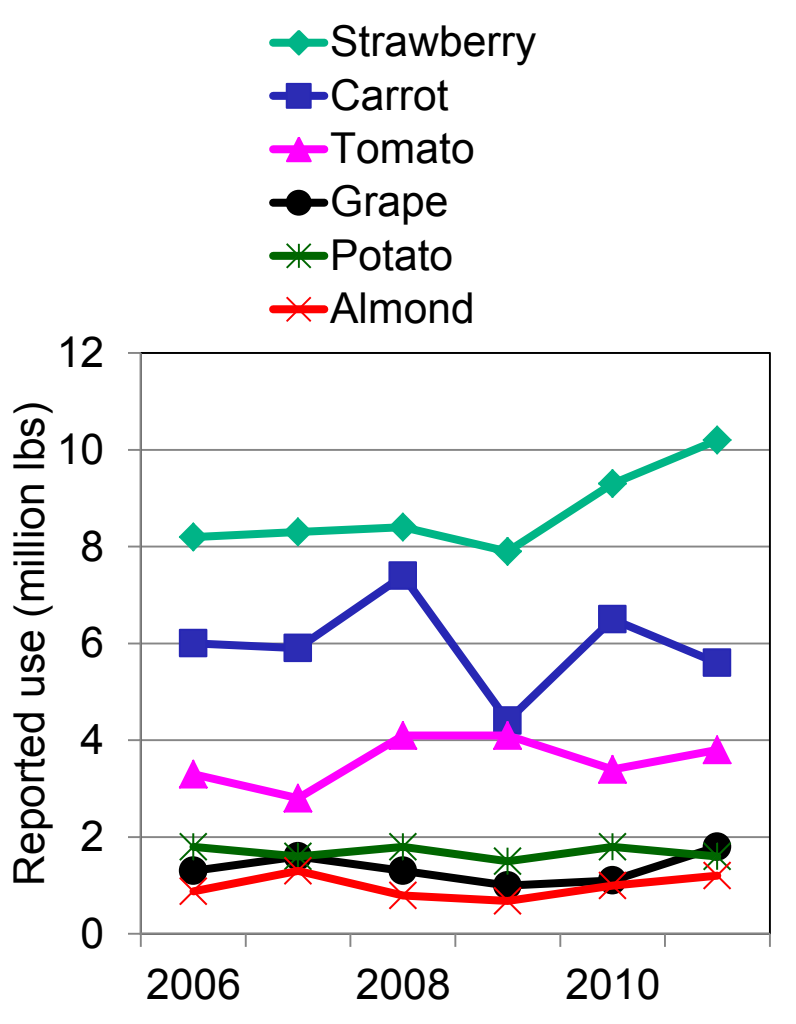
From Ajwa

Assessing and mitigating health risk of field fumigants

- State and federal laws require DPR and EPA to assess toxicity and exposure to pesticides
  - Fumigants may cause eye and respiratory irritation, neurotoxicity, and other adverse health effects
  - Fumigants have higher potential exposure and risk compared to most other pesticides due to high volatility and high use
- Risk can only be mitigated by reducing exposure
- Exposure estimates and mitigation measures are based primarily on
  - Pesticide use patterns (use reports)
  - Monitoring data (e.g. air network)

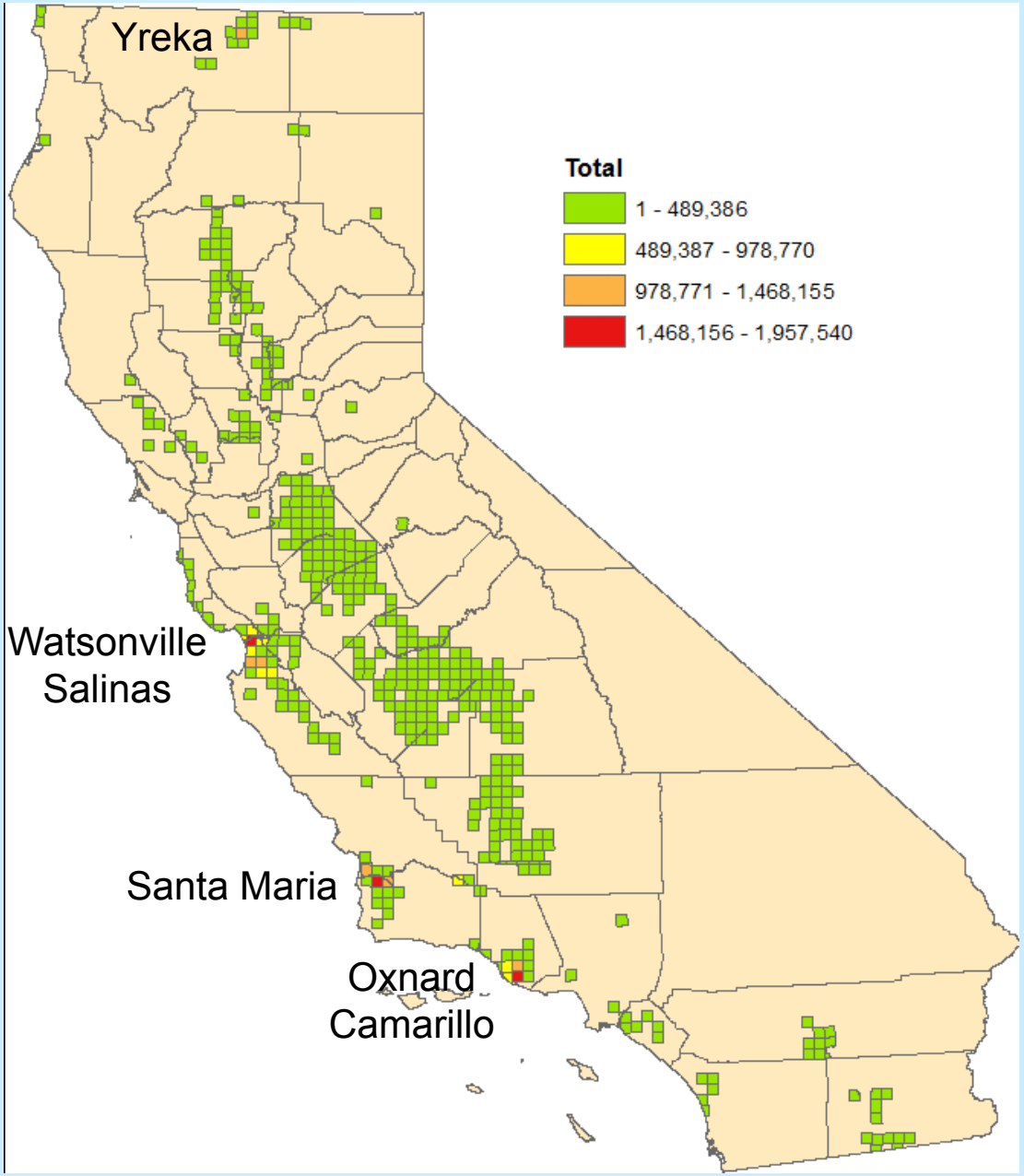
Fumigant use: top chemicals and crops





Fumigant use: locations in 2011

- Use by township (6x6 mile) areas
- Highest townships in strawberry regions

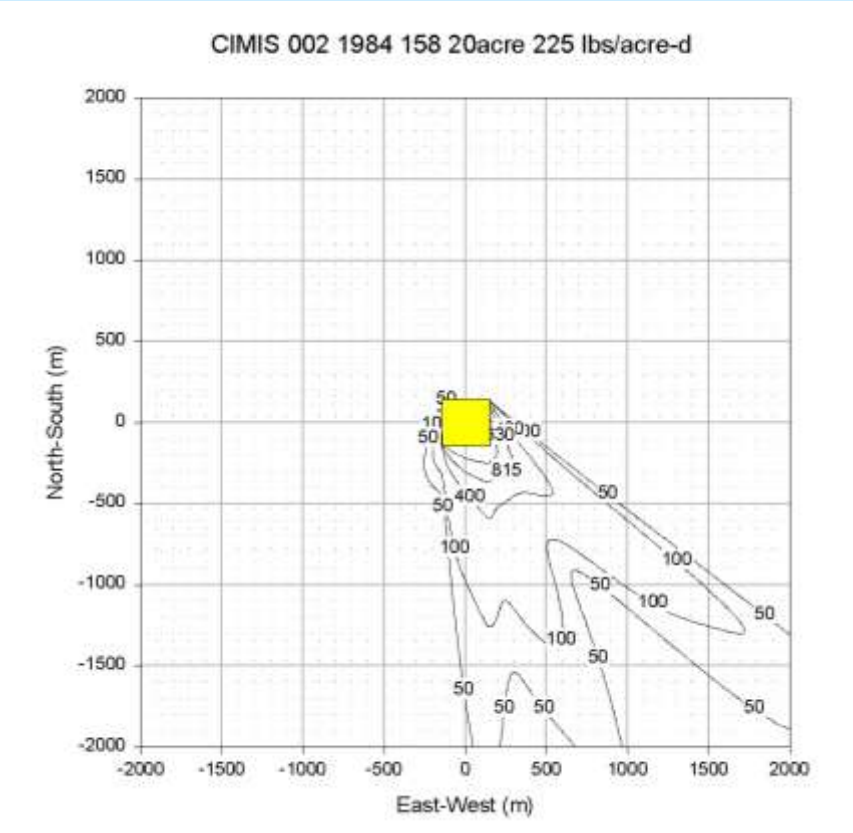


Fumigant use: method of application

- Fumigants are injected into the soil or applied through irrigation systems, and sometimes covered with a tarp

Air monitoring and computer modeling

- Monitoring to estimate exposures and develop mitigation measures
  - Worker/equipment monitoring
  - Application-site monitoring
  - Community monitoring
- Monitoring data supplemented with computer modeling



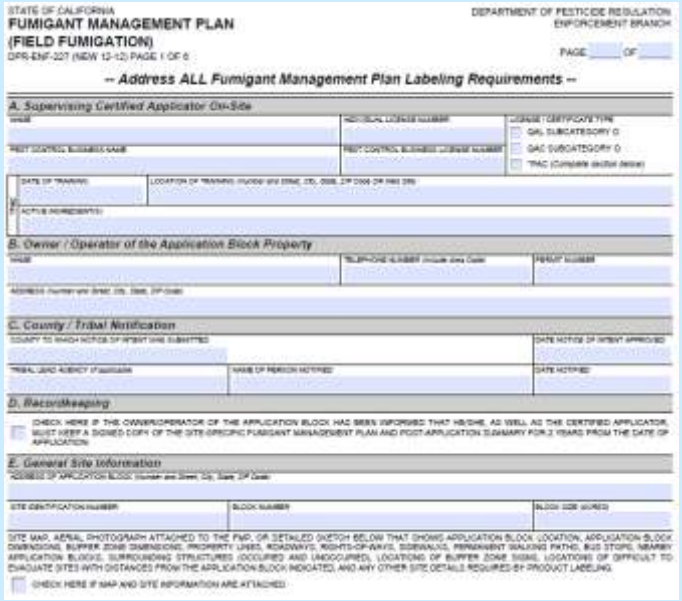
Reducing exposures to mitigate risk of fumigants

- Following its risk management process, DPR has
  - Issued regulations and permit conditions for methyl bromide (1993+)
  - Issued permit conditions for 1,3-D (1995+) and MITC (2011)
  - Proposed more stringent requirements for chloropicrin; interim permit conditions are in effect (2013)
- Labels and EPA registration requirements include
  - Pre-reregistration: worker protection standard, posting, env hazards, etc
  - Phase 1 revisions (Dec 2010): additional handler protections
  - Phase 2 revisions (Dec 2012): resident and bystander protections
  - No revisions for products containing 1,3-D as sole active ingredient
- Most requirements have exceptions or variations

Fumigant exposure restrictions: U.S. EPA Phase 1 revisions

- Certain workers designated as handlers
- Handler information requirements
- Handler respiratory protection
- Tarp perforation and removal requirements
- Entry restricted periods
- Good agricultural practices
- Application method and rate restrictions
- Fumigant management plans

From Ajwa


STATE OF CALIFORNIA
FUMIGANT MANAGEMENT PLAN
(FIELD FUMIGATION)
DPR-ENF-227 (NEW 12-12) PAGE 1 OF 6

DEPARTMENT OF PESTICIDE REGULATION
ENFORCEMENT BRANCH

PAGE ____ OF ____

-- Address ALL Fumigant Management Plan Labeling Requirements --

A. Supervising Certified Applicator On-Site

B. Owner / Operator of the Application Block Property

C. County / Tribal Notification

D. Recordkeeping

E. General Site Information

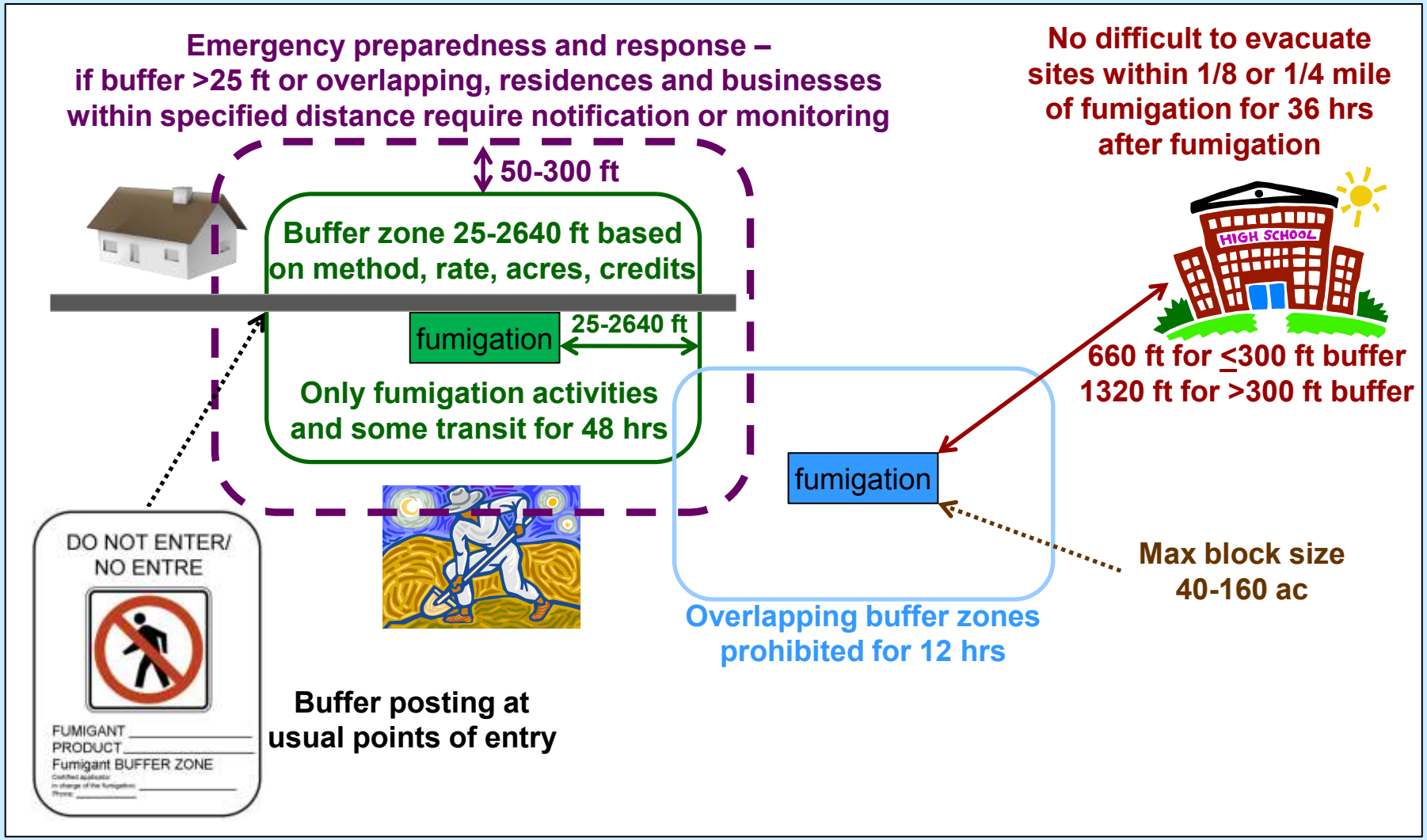
From Ajwa

Fumigant exposure restrictions: U.S. EPA Phase 2 revisions

- Certified applicator training
- Community outreach
- Information for first responders
- Emergency response plan
- Buffer zones and related requirements

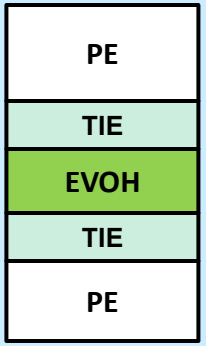
FIELD FUMIGATION EMERGENCY RESPONDER GUIDE: CHLOROPICRIN	
THIS GUIDE IS FOR VAPOR EXPOSURES TO AIRBORNE EMISSIONS OF CHLOROPICRIN FOLLOWING SOIL INJECTION TO AGRICULTURAL FIELDS. CHLOROPICRIN MAY BE APPLIED ALONE OR IN COMBINATION WITH METHYL BROMIDE, 1,3-DICHLOROPROPENE, IODOMETHANE, OR DIMETHYL DISULFIDE. SEE FIELD POSTING FOR ACTUAL PRODUCT APPLIED. SEE EMERGENCY RESPONDER GUIDE FOR EACH CHEMICAL APPLIED. SEE PESTICIDE LABEL FOR EXPOSURE TO LIQUID OR SPILLS.	
POTENTIAL HAZARDS	
HEALTH	Chloropicrin behaves as a mild irritant at concentrations between 75 ppb and 150 ppb and is usually detected through odor and eye sensation, within 5 minutes of exposure. At concentrations of about 75 ppb, eye sensation (prickliness or pinching) can be felt in about 20 minutes. Symptoms are temporary and reversible at concentrations up to 150 ppb. At levels above 150 ppb headache, nausea and vomiting may occur. At levels above 580 ppb for 8 hours or 2000 ppb for 10 minutes, life-threatening effects including pulmonary edema or death can occur The OSHA 8-hour TWA is 100 ppb. The NIOSH IDLH is 2000 ppb. Chloropicrin has been shown to not cause cancer in animal studies following long-term inhalation. Laboratory testing showed that at inhalation exposures below levels which produced permanent respiratory injury, birth defects or decrement in reproductive function did not occur. Chloropicrin is not expected to accumulate in human tissue.
CHEMICAL PROPERTIES	Chloropicrin is injected into the soil as a liquid where it becomes a vapor. Vapors are heavier than air, and will collect in low areas. Chloropicrin is volatile and concentrations may increase under still or low wind conditions. Vapors are not flammable or explosive.
PUBLIC SAFETY	

Fumigant exposure restrictions: Phase 2 label requirements for buffer zones and related restrictions



Fumigant exposure restrictions: more restrictive regulations or permit conditions

- Tarps assigned 60% buffer reduction credit by labels
  - Longer time before tarp cutting and removal
  - Longer entry restricted period
- Buffer zones
  - Some buffer zone distances are longer
  - Most buffer reduction credits are not allowed
  - Overlapping buffer requirements are more stringent
  - Some field (block) acreage limits are lower
- Some methyl bromide regulations are more stringent
- Township caps for methyl bromide and 1,3-D
- Some counties have more stringent requirements



From Ajwa

Fumigant exposure restrictions: most restrictive general requirements

Requirement	Chloropic	MITC	Methyl Br	1,3-D
Handler protection	Label	Label	CA	Not revised
Tarp cut and removal*	CA	CA	CA	CA
Entry restricted periods*	CA	CA	CA	CA
Good ag practices	Label	Similar	Similar	Not revised
Application methods	Label	Similar	Similar	Not revised
Fumigant mgmt plans	Label	Label	Similar	None
Training and outreach	Label	Label	Label	Not revised
Distance to occupied structure	None	None	None	CA
Township caps	None	None	CA	CA

*CA requirements more restrictive for 60% buffer credit tarps

Fumigant exposure restrictions: most restrictive buffer requirements

Requirement	Chloropic	MITC	Methyl Br	1,3-D
Buffer distances	Label*	Mixed	Same	None
Buffer credits	CA	CA	CA	None
Buffer duration	Label	Label	Label	None
Overlapping buffers	CA	CA	CA	None
Buffer posting	Label	Label	CA	None
Max field (block) acreage	CA	CA	CA	None
Emergency preparedness	Label*	Label	Mixed	None
Difficult to evac sites	Label	Label	Label	None

*DPR proposing more restrictive requirements

Fumigant exposure restrictions: DPR work in progress

- Proposing chloropicrin mitigation measures, comments by 8-31-13
- Evaluating HYDRUS computer model to estimate emissions
- Updating risk assessment for 1,3-D
- Conducting air monitoring

Long-term community air monitoring – to determine need for and effectiveness of township caps

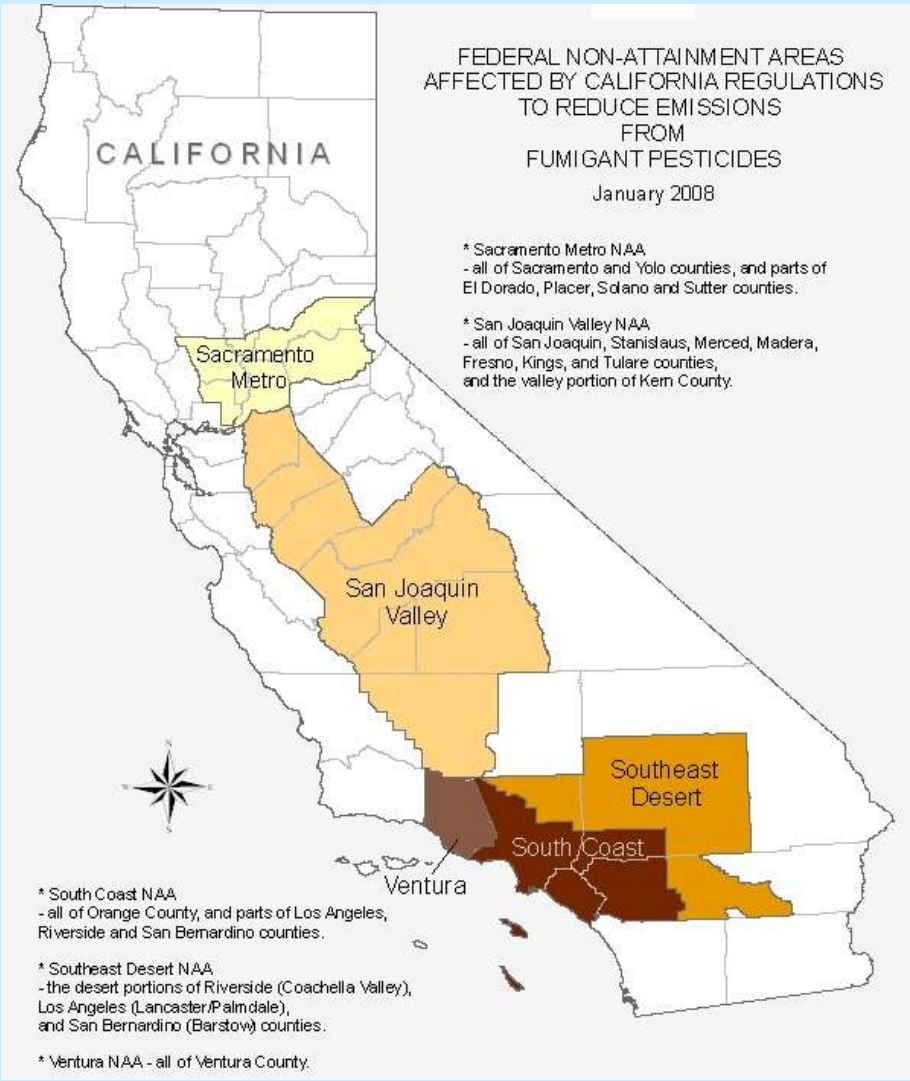
Community	Methyl Bromide (4-wk max, ug/m^3)	1,3-D (1-yr max, ug/m^3)
Parlier (2006 pilot)	1.1	2.00
Ripon (2011-2012 air network)	1.7	0.85*
Salinas (2011-2012 air network)	4.1	0.76*
Shafter (2011-2012 air network)	1.4	0.45
Oxnard (2011-2012 ARB)	3.4	0.56
Santa Maria (2011-2012 ARB)	6.3	0.74
Watsonville (2012 ARB)	3.3	Not available yet
DPR REGULATORY GOAL	**19.4**	**0.66**

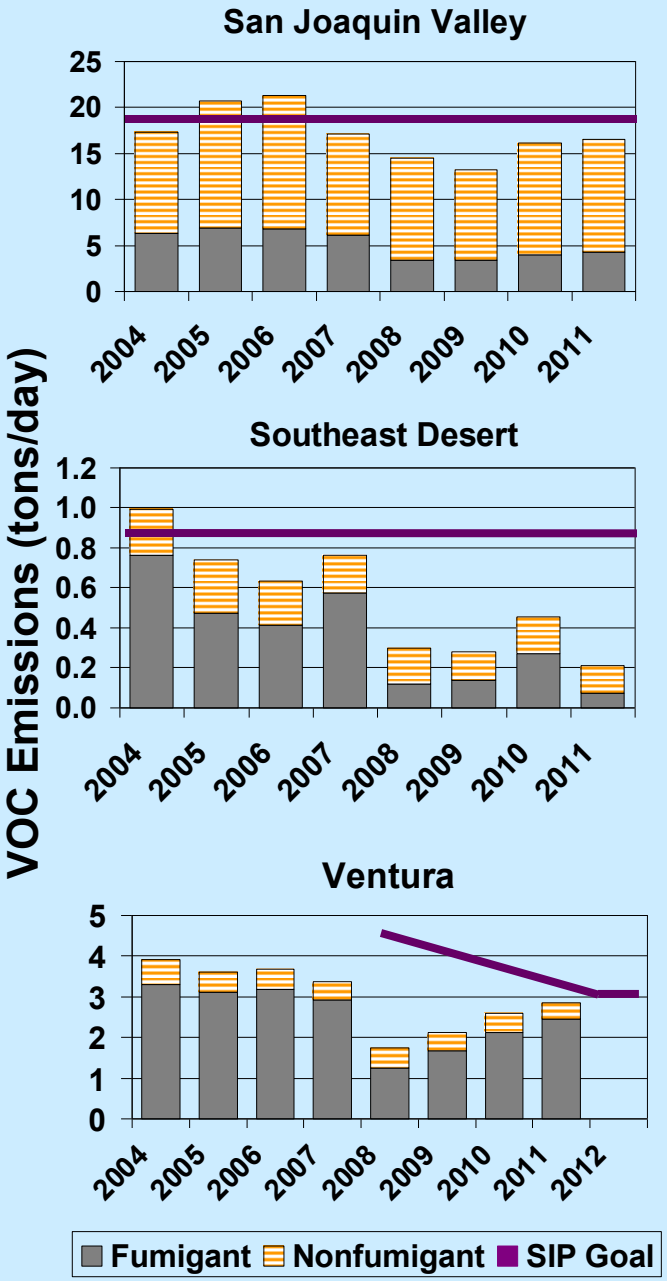
*6-month average concentration

Volatile organic compound emissions from fumigants

- Volatile organic compounds (VOCs) and nitrogen oxides (NOx) react with sunlight to form ozone, a major air pollutant
- Fumigants are a major pesticidal source of VOCs
- The state implementation plan for the Clean Air Act requires DPR to limit pesticide VOC emissions by specified amounts in ozone nonattainment areas
  - DPR's 2008 fumigant regulations require "low-emission" fumigation methods during May-Oct ozone season in three nonattainment areas
  - Ventura has a fumigant emission limit, enforced through grower allowances or stopping fumigations when the limit is reached

Pesticide VOC emission inventory





Concluding remarks

- Fumigant applications have stringent and complex requirements, making compliance expensive and difficult
- Fumigation may not be possible for parts or all of some fields

Additional information and questions

EPA fumigant toolbox:
http://www.epa.gov/pesticides/reregistration/soil_fumigants/

www.cdpr.ca.gov
“Air” link under QUICK FINDER

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