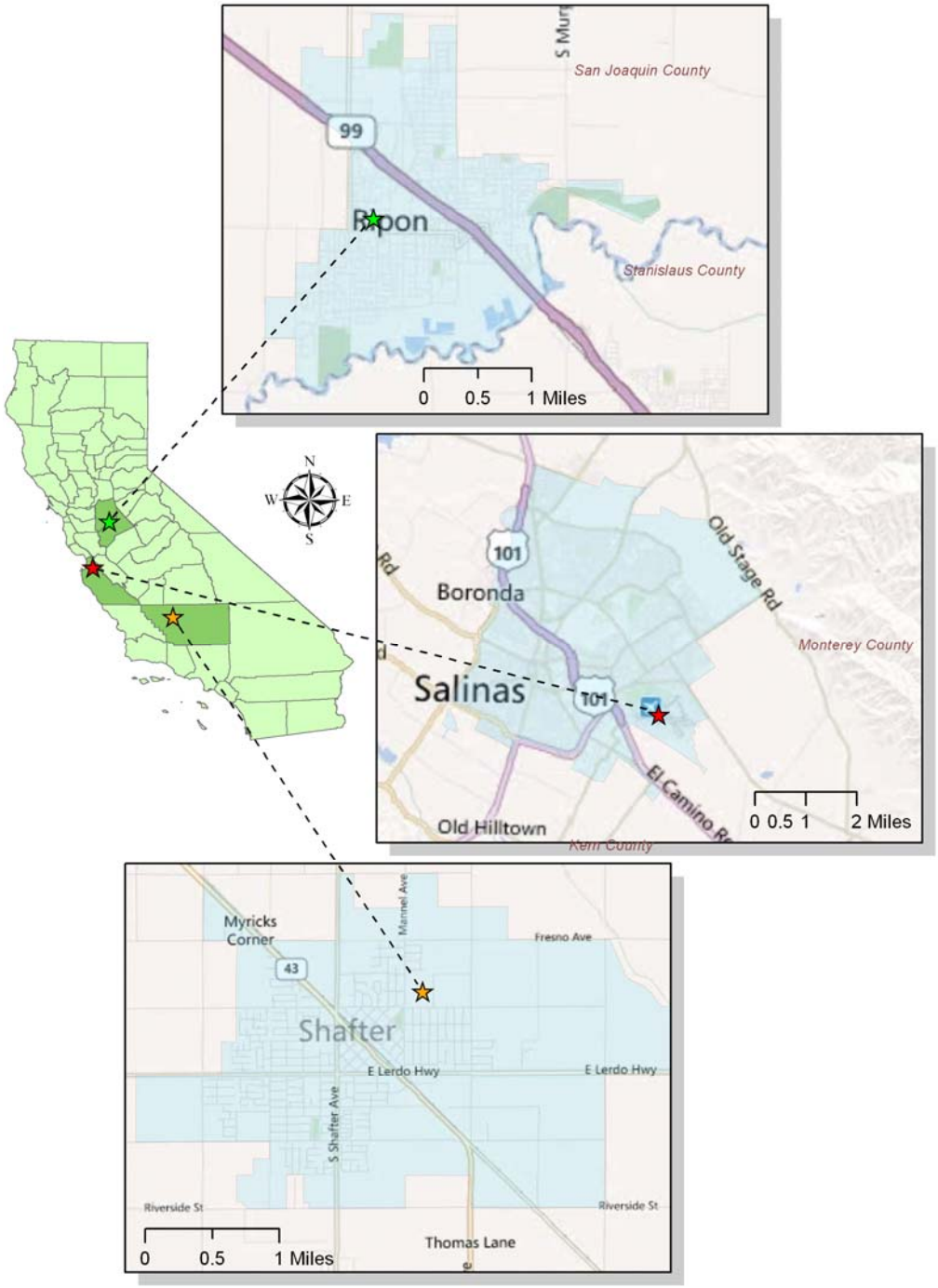
Air Monitoring Network Results for 2012

Presented by:

Air Program
California Department of Pesticide Regulation



Ripon:

- Located in San Joaquin County.
- Major crops: almonds, grapes and other field crops.

Salinas:

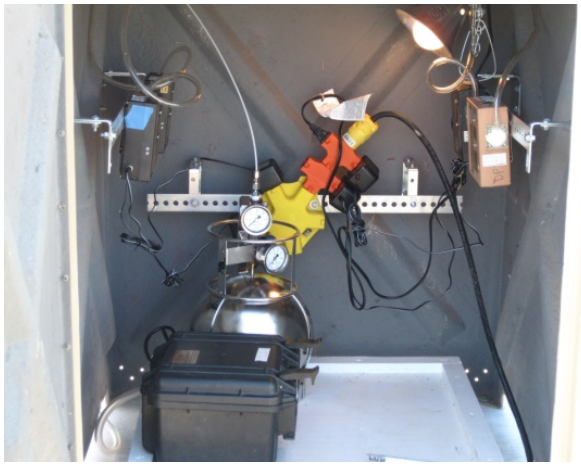
- Located in Monterey County.
- Major crops: strawberries, lettuce and other field crops.

Shafter:

- Located in Kern County.
- Major crops: almonds, grapes, and alfalfa.

Sampling Collection Procedure

- 24-hour samples were collected every week at each of the 3 sites.
- Sampling days were randomly selected and varied by week
- Sampling start times ranged from 9:00 a.m. to 2:00 pm and ran for 24 hours.



Sampling Methods

Four sampling methods were used for collection and examination of pesticides:

	Multi-Residue	VOC	MITC	Chloropicrin
# of pesticides	32	4	1	1
Sampling Media	XAD-4	Air vacuum	Coconut charcoal	XAD-4
Flow Rate	15 L/min	~3.5 mL/min	1500 mL/min	50 mL/min
Analysis Type	GC/MS & LC/MS	GC/MS	GC-NPD	GC-ECD

Results

- 156 sample sets (623 samples and 6,002 analyses) were collected from the three sites from January 1, 2012 to December 31, 2012.
  - 137 sample sets (88%) contained at least one detectable pesticide
  - 331 analyses (5.5%) contained detectable concentrations (both quantifiable and trace detections)
  - 81 analyses (1.3%) contained quantifiable concentrations.
- 14 chemicals monitored were not detected at concentrations above the detection limit.

1. DEF
2. Dicofol
3. Endosulfan Sulfate
4. Cypermethrin
5. Dimethoate
6. Oxydemeton methyl
7. Methyl Iodide
8. Chloropicrin
9. Phosmet
10. Norflurazon
11. Metolachlor
12. Methidathion
13. Permethrin
14. Bensulide

Results

- 13 pesticides monitored were only detected at trace levels (concentrations above MDL but below LOQ)

Chemical	Percent of possible detections*
1. Acephate	1%
2. Chlorothalonil	15%
3. Dacthal	17%
4. Diazinon	3%
5. Dimethoate OA	1%
6. Endosulfan	1%
7. Iprodione	2%
8. Malathion	5%
9. Oryzalin	3%
10. Oxyfluorfen	2%
11. Propargite	4%
12. Simazine	8%
13. Trifluralin	10%

*Based on 156 possible detections per chemical

Results

- 11 pesticides monitored were detected at quantifiable concentrations (detections above LOQ).

Chemical	Percent of possible detections*	Percent of quantifiable detections
1,3-Dichloropropene	3%	3%
Carbon Disulfide	1%	1%
Chlorpyrifos	28%	2%
Chlorpyrifos OA	25%	3%
DDVP	4%	1%
Diuron	21%	3%
Diazinon OA	3%	1%
EPTC	1%	1%
Malathion OA	17%	1%
Methyl Bromide	7%	7%
MITC	28%	28%

*Includes both quantifiable and trace detections

Results

- Number of detections of monitored chemicals by sampling location

Location	Number of possible detections	Percent of possible detections*	Percent of quantifiable detections
Salinas	2,000	5.4%	0.8%
Shafter	2,001	6.7%	2.4%
Ripon	2,001	4.5%	0.9%
Total	6,002	5.5%	1.3%

*Includes both quantifiable and trace detections

Results

- DPR developed health screening levels for the monitored pesticides to place the results in a health-based context.
- Screening levels:
  - Although not a regulatory standard, they can be helpful in the process of evaluating air monitoring results.
    - Air concentration **below** the screening level → would generally not undergo further evaluation.
    - Air concentration **above** the screening level → would indicate the need for a further and more refined evaluation.

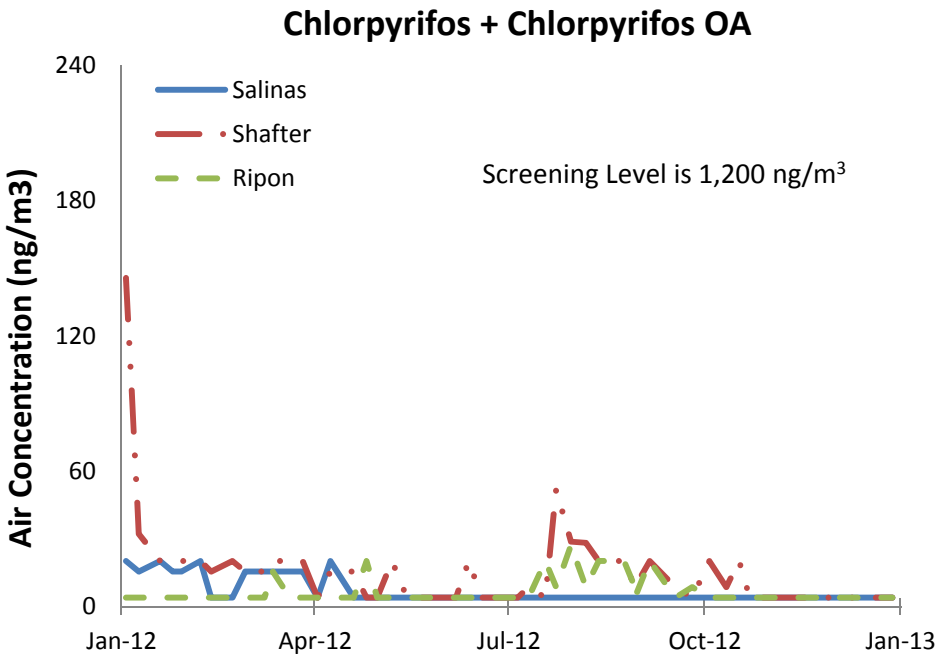
Results

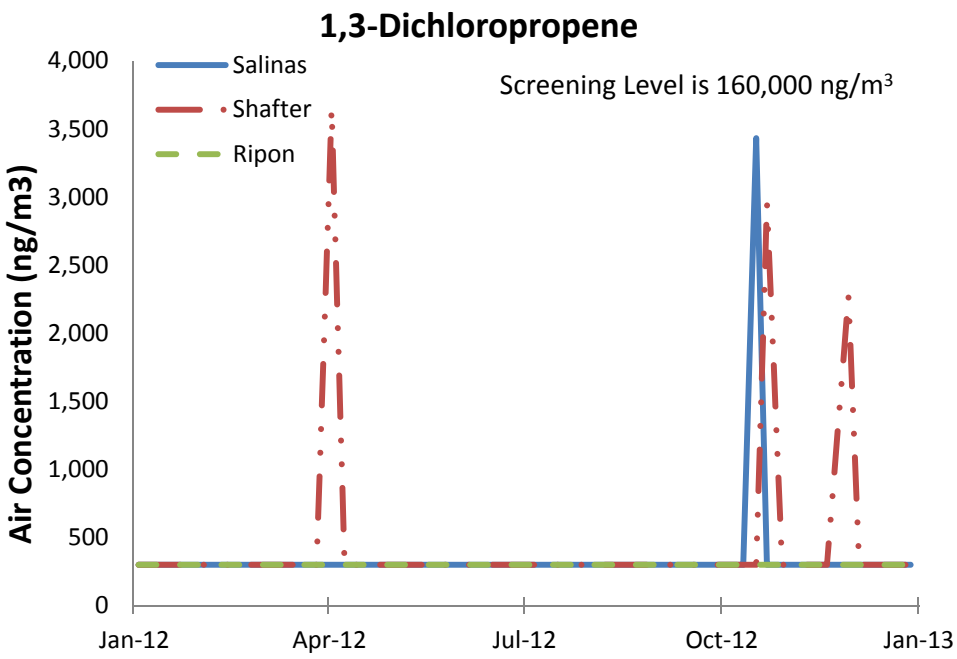
- Highest 24-hour concentrations for chemicals with quantifiable detections per sampling location

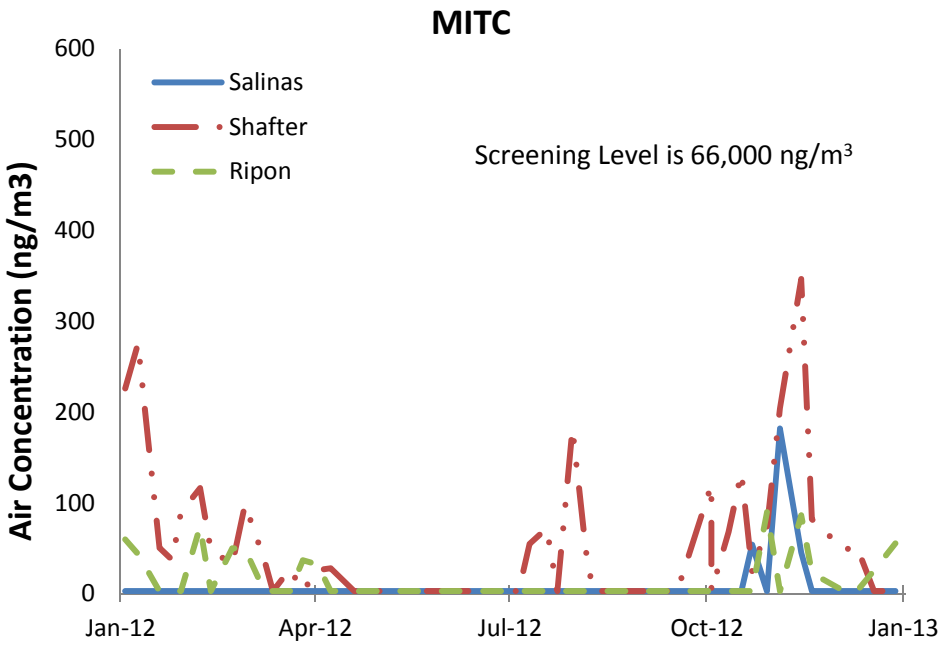
	Salinas	Shafter	Ripon	
Chemical	Highest 24-hr concentration	Highest 24-hr concentration	Highest 24-hr concentration	24-hour acute screening level
	Units of ng/m^3			
1,3-Dichloropropene	3,430	3,643	ND	160,000
Carbon Disulfide	616	ND	ND	1,550,000
Chlorpyrifos	Trace	131	Trace	1,200
Chlorpyrifos OA	Trace	17	13	1,200
DDVP	Trace	ND	69	11,000
Diazinon OA	ND	10	Trace	130
Diuron	32	Trace	Trace	170,000
EPTC	ND	18	ND	230,000
Malathion OA	Trace	11	Trace	112,500
Methyl Bromide	2,527	2,135	2,667	820,000
MITC	182	347	90	66,000

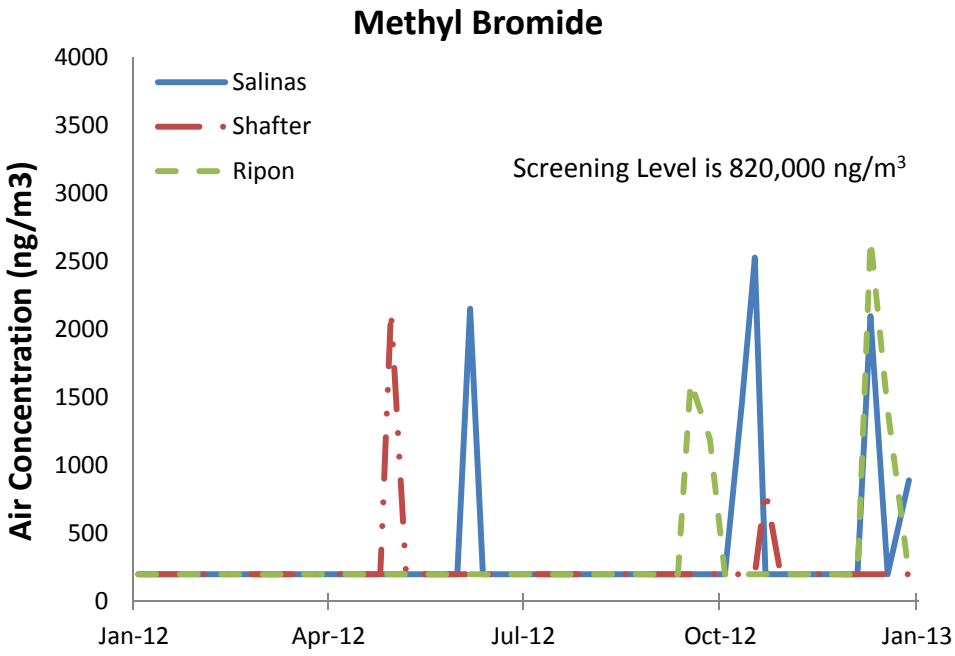
ND = Not Detected
Trace = Detection above MDL but below LOQ

24-hour concentrations over time for selected pesticides









Results

- Subchronic exposure calculations using 4-week rolling concentrations

	Salinas	Shafter	Ripon	
Chemical	Highest 4-wk rolling concentration	Highest 4-wk rolling concentration	Highest 4-wk rolling concentration	Subchronic screening level
	Units of ng/m^3			
1,3-Dichloropropene	1,082	1,135	300	120,000
Carbon Disulfide	271	156	156	800,000
Chlorpyrifos	14	46	11	850
Chlorpyrifos OA	4	13	8	850
DDVP	7	2	18	2,200
Diazinon OA	1	6	2	130
Diuron	20	6	5	17,000
EPTC	1	7	1	24,000
Malathion OA	5	4	5	80,600
Methyl Bromide	1,098	682	1,119	19,400
MITC	71	177	50	3,000

Average Concentrations

- Overall average concentrations for chemicals with quantifiable detections

Chemical	Overall average concentration (ng/m^3)	Chronic screening level (ng/m^3)	% of chronic screening level
1,3-Dichloropropene	371	120,000	0.31
Carbon Disulfide	159	800,000	0.02
Chlorpyrifos	7	510	1.32
Chlorpyrifos OA	3	510	0.57
DDVP	2	770	0.31
Diazinon OA	1	130	0.94
Diuron	4	5,700	0.07
EPTC	1	8,500	0.01
Malathion OA	2	8,100	0.02
Methyl Bromide	306	3,900	7.84
MITC	25	300	8.19

Cumulative Exposures

- Cumulative exposures were only calculated for organophosphate pesticides. These were the only pesticides that have a common mode of action (cholinesterase inhibition) and were detected at quantifiable concentrations.

Community	Acute hazard index	Subchronic hazard index	Chronic hazard index
Salinas	0.07	0.05	0.04
Shafter	0.24	0.11	0.06
Ripon	0.11	0.06	0.04

- Findings:
  - None of the hazard indices exceeded one, indicating that the screening levels were not exceeded for all organophosphates combined.
  - Shafter had higher risk than Salinas and Ripon for all exposure periods.
  - The acute risk was higher for all three communities, in comparison to the subchronic and chronic risk.

Relative Risk

- Overall maximum relative risk for chemicals with quantifiable concentrations.
  - A concentration greater than 100% of the screening level suggests the need for further evaluation.

Pesticide	% of acute screening level	% of subchronic screening level	% of chronic screening level
1,3-Dichloropropene	2.28	0.95	0.31
Carbon Disulfide	0.04	0.03	0.02
Chlorpyrifos + OA	12.36	6.99	1.88
DDVP	0.63	0.84	0.31
Diazinon OA	7.75	4.33	0.94
Diuron	0.02	0.12	0.07
EPTC	0.01	0.03	0.01
Malathion OA	0.01	0.01	0.02
Methyl Bromide	0.33	5.77	7.84
MITC	0.53	5.89	8.19

Conclusions

- Of the 33 pesticide and 5 breakdown products included in the AMN, 24 were detected in at least one sample. However, AMN results document low air concentrations for the pesticides and communities monitored.

- None of the pesticides exceeded their screening levels for any of the exposure periods, indicating low health risk to people in the monitored communities.

- Nine of the 11 pesticides (including three breakdown products) detected at quantifiable concentrations were either fumigants (1,3-dichloropropene, carbon disulfide, methyl bromide, and MITC) or organophosphate insecticides (chlorpyrifos + OA, DDVP, diazinon OA, and malathion OA).

- The hazard index (combined screening level) for organophosphates was less than one for all exposure periods, indicating a low risk from cumulative exposure.

Comparison of total detections between 2011 and 2012

Includes both trace and quantifiable

Number of pesticides that increased in the percentage of detections: **12**

Number of pesticides that decreased in the percentage of detections: **18**

Number of pesticide that had the same percentage of detections: **8**

Chemicals not detected above detection limit

2011	2012
	Bensulide
Carbon Disulfide	
	Chloropicrin
Cypermethrin	**Cypermethrin**
DEF	**DEF**
Dicofol	**Dicofol**
Dimethoate	**Dimethoate**
Dimethoate OA	
Endosulfan	
Endosulfan Sulfate	**Endosulfan Sulfate**
	Methidathion
Methyl Iodide	**Methyl Iodide**
	Metolachlor
	Norflurazon
Oxydemeton methyl	**Oxydemeton methyl**
	Permethrin
	Phosmet
10	**14**

Quantifiable detections

Pesticide	2011	2012
1,3-Dichloropropene	4%	3%
Carbon Disulfide	0%	1%
Chloropicrin	2%	0%
Chlorpyrifos	1%	2%
Chlorpyrifos OA	1%	3%
DDVP	0%	1%
Diazinon	1%	0%
Diazinon OA	1%	1%
Diuron	0%	3%
EPTC	4%	1%
Malathion	1%	0%
Malathion OA	0%	1%
Methyl Bromide	16%	7%
MITC	31%	28%
Possible detections	142	156

Chronic exposure

Chemical	% of chronic screening level 2011	% of chronic screening level 2012
1,3-Dichloropropene	0.53	0.31
Carbon Disulfide	Not quantifiable	0.02
Chloropicrin	10.16	Not quantifiable
Chlorpyrifos	0.93	1.32
Chlorpyrifos OA	0.39	0.57
DDVP	Not quantifiable	0.31
Diazinon	1.09	Not quantifiable
Diazinon OA	1.13	0.94
Diuron	Not quantifiable	0.07
EPTC	0.04	0.01
Malathion	0.02	Not quantifiable
Malathion OA	Not quantifiable	0.02
Methyl Bromide	17.82	7.84
MITC	12.46	8.19

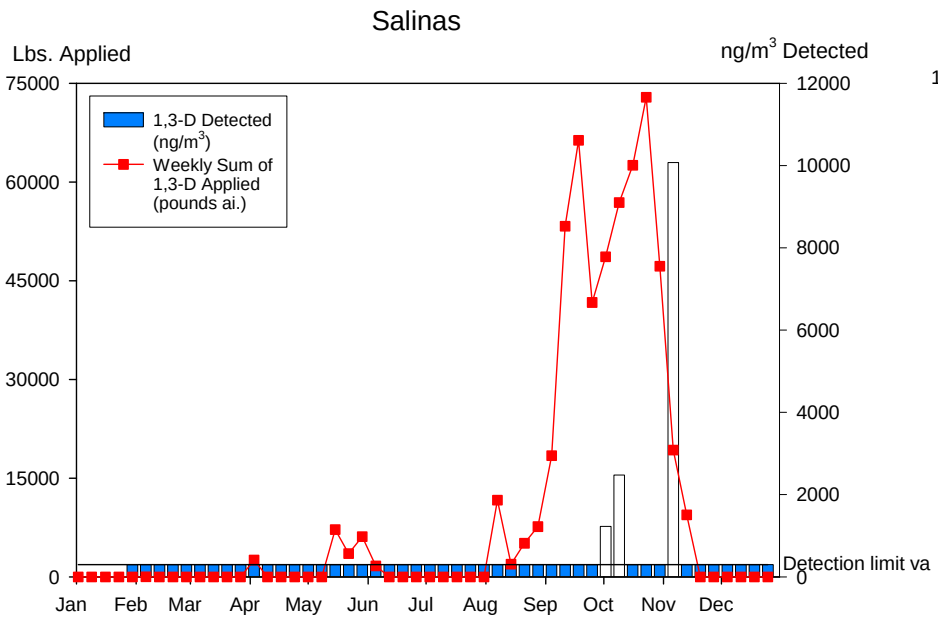
1,3-D Cancer Risk

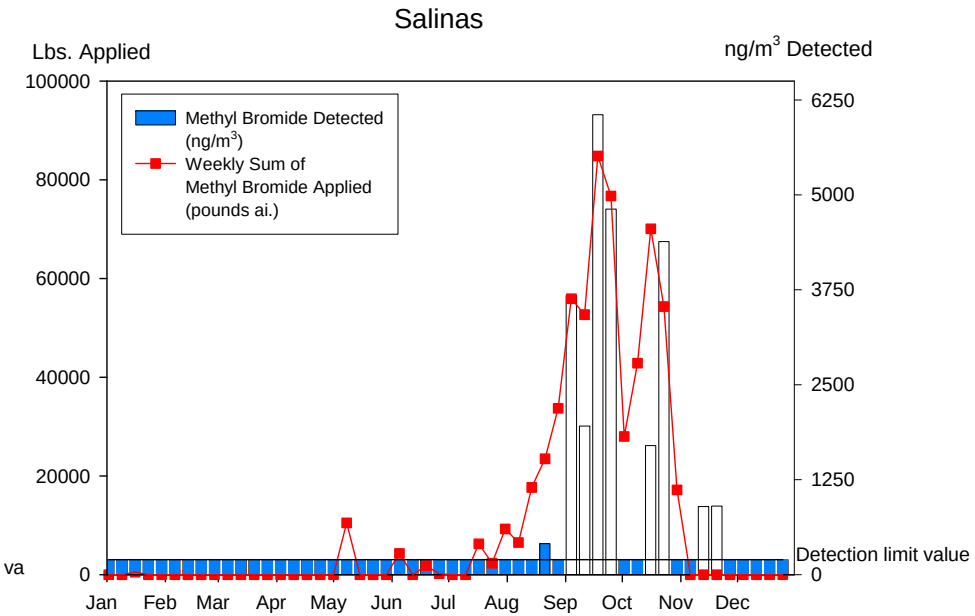
	2011*	2012
Salinas	1.37 in 100,000 (3)	0.53 in 100,000 (1)
Ripon	1.13 in 100,000 (2)	NQD
Shafter	NQD	0.77 in 100,000 (3)

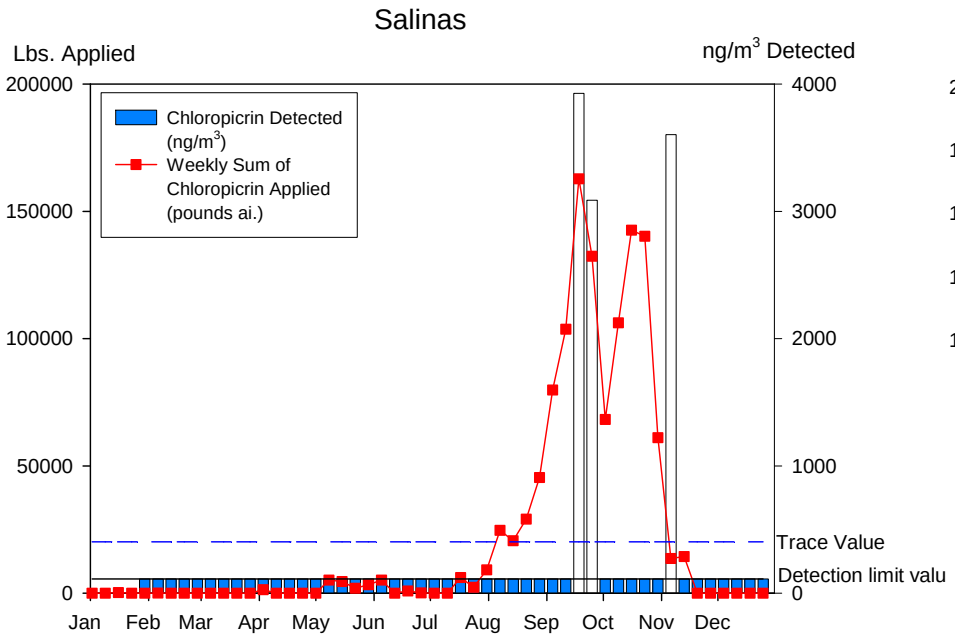
*only 6 months of data

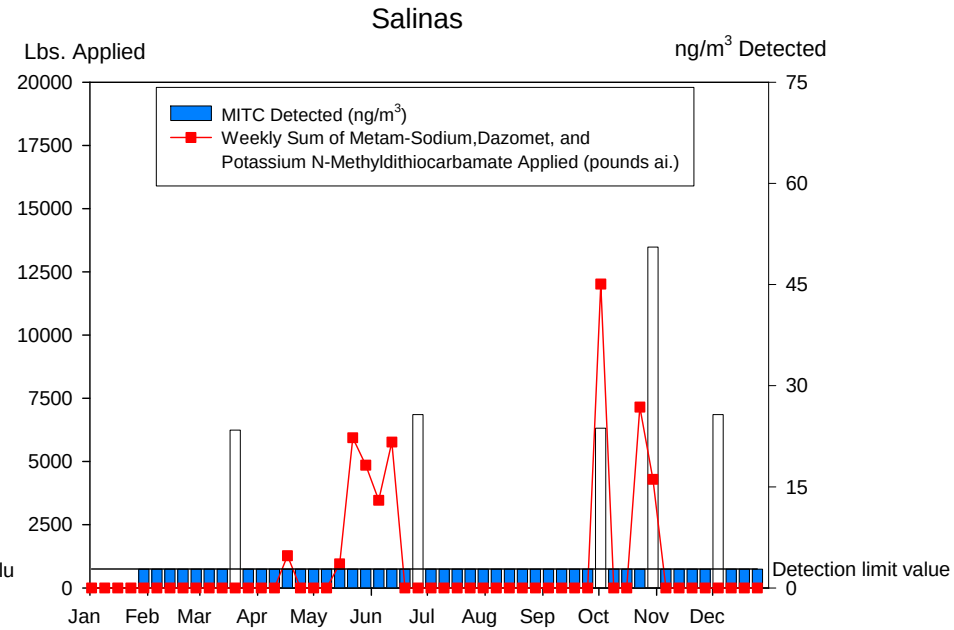
Further Analysis

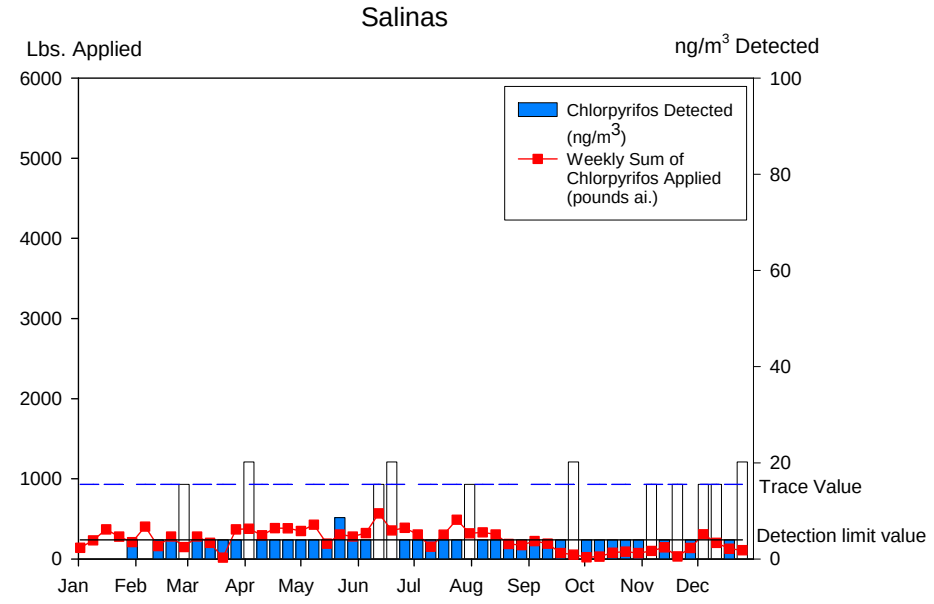
- Analysis of Pesticide Use Reports and detections
- Comparison to other communities not monitored
- Model dispersion of use with weather for comparison with detected concentrations

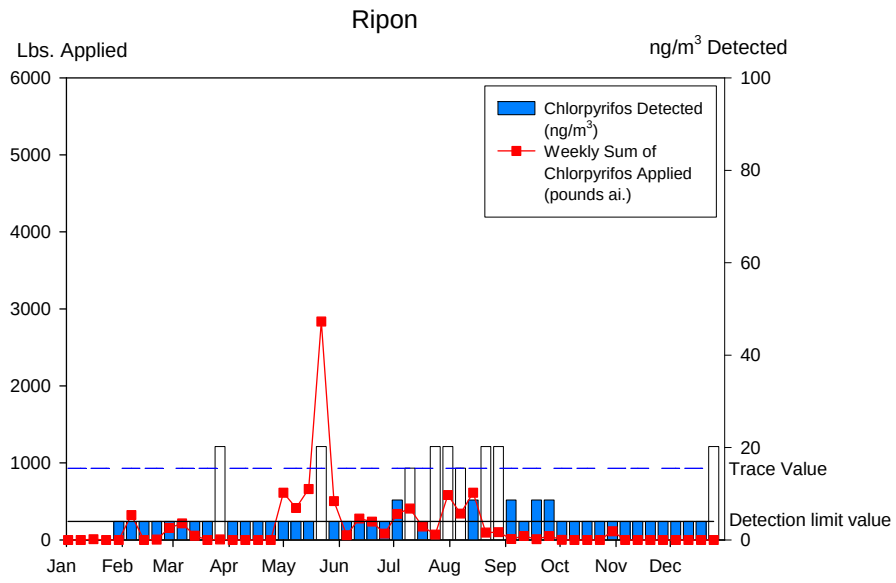

Salinas
Lbs. Applied
ng/m3 Detected
1,3-D Detected (ng/m3)
Weekly Sum of 1,3-D Applied (pounds ai.)
75000
60000
45000
30000
15000
0
12000
10000
8000
6000
4000
2000
0
Detection limit va
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

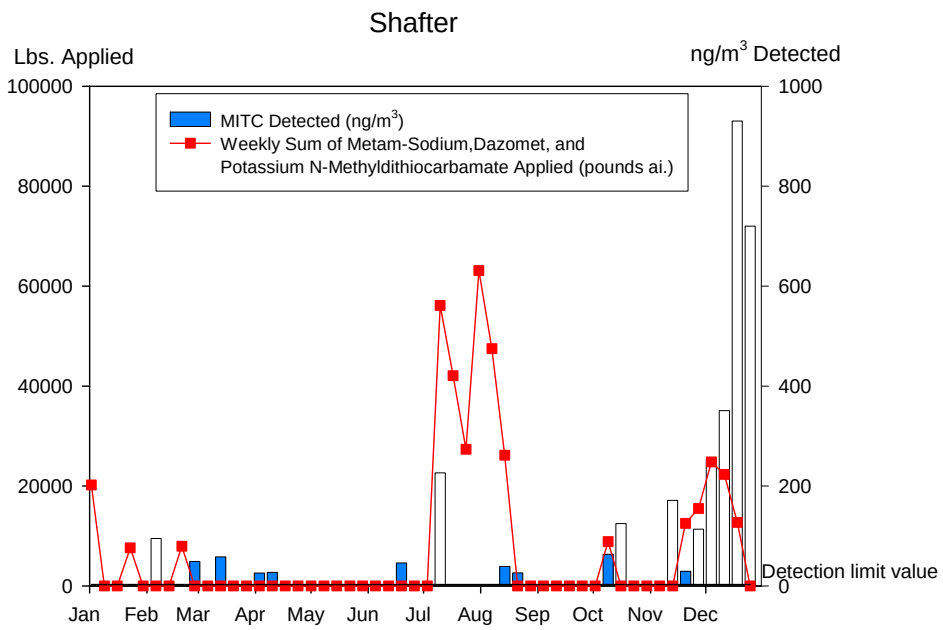

Salinas
Lbs. Applied
ng/m3 Detected
Methyl Bromide Detected (ng/m3)
Weekly Sum of Methyl Bromide Applied (pounds ai.)
100000
80000
60000
40000
20000
0
6250
5000
3750
2500
1250
0
Detection limit value
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

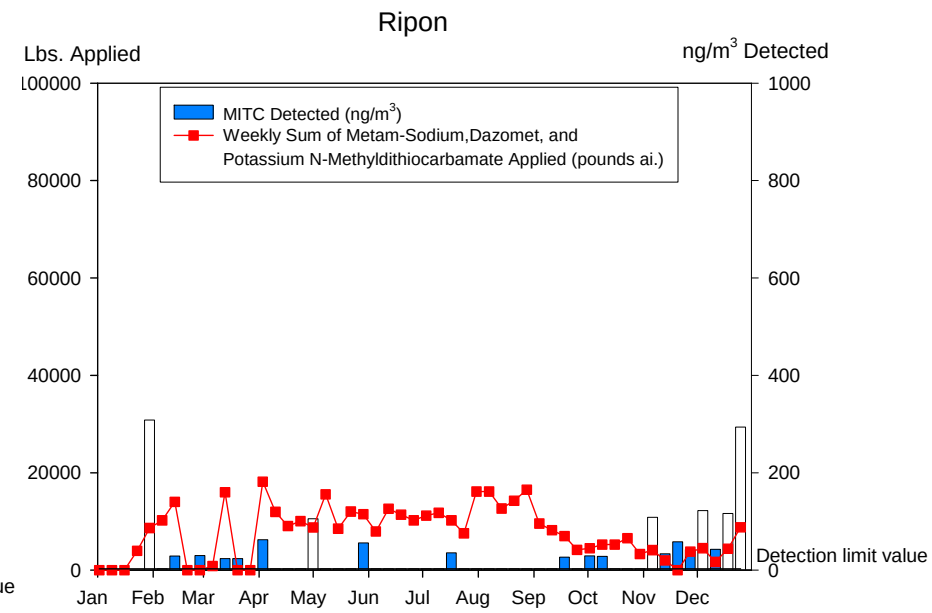

Salinas
Lbs. Applied
ng/m3 Detected
Chloropicrin Detected (ng/m3)
Weekly Sum of Chloropicrin Applied (pounds ai.)
200000
150000
100000
50000
0
4000
3000
2000
1000
0
Trace Value
Detection limit valu
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Salinas
Lbs. Applied
ng/m3 Detected
MITC Detected (ng/m3)
Weekly Sum of Metam-Sodium,Dazomet, and Potassium N-Methyldithiocarbamate Applied (pounds ai.)
20000
17500
15000
12500
10000
7500
5000
2500
0
75
60
45
30
15
0
Detection limit value
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Salinas
Lbs. Applied
ng/m3 Detected
Chlorpyrifos Detected (ng/m3)
Weekly Sum of Chlorpyrifos Applied (pounds ai.)
Trace Value
Detection limit value
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Ripon
Lbs. Applied
ng/m3 Detected
Chlorpyrifos Detected (ng/m3)
Weekly Sum of Chlorpyrifos Applied (pounds ai.)
Trace Value
Detection limit value
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Shafter
Lbs. Applied
ng/m3 Detected
MITC Detected (ng/m3)
Weekly Sum of Metam-Sodium,Dazomet, and Potassium N-Methyldithiocarbamate Applied (pounds ai.)
Detection limit value
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Ripon
Lbs. Applied
ng/m3 Detected
MITC Detected (ng/m3)
Weekly Sum of Metam-Sodium,Dazomet, and Potassium N-Methyldithiocarbamate Applied (pounds ai.)
Detection limit value
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Acknowledgments

We would like to thank:

- Salinas Airport Staff
- Cities of Ripon and Shafter
- Ag Commissioners of Monterey County, San Joaquin County, and Kern County.
- CDFA laboratory

Complete results and discussion can be found on:

Vidrio et al., 2013. Air Monitoring Results for 2012: Volume 2. Department of Pesticide Regulation. Sacramento, California.

Comments

Please send all comments and suggestions to:

Edgar Vidrio @ evidrio@cdpr.ca.gov
916.323.2778