Use Information and Air Monitoring Recommendation for the Pesticide Active Ingredients Methyl Bromide and Chloropicrin: Seasonal Ambient Monitoring in Siskiyou County

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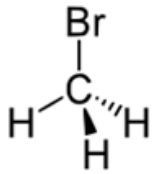
A. INTRODUCTION

The California Department of Pesticide Regulation (DPR) provides this recommendation to assist the California Air Resources Board (ARB) in the selection of appropriate locations to perform seasonal ambient air monitoring in Siskiyou County for the pesticide active ingredients methyl bromide and chloropicrin as part of the 2016 budget act proposed monitoring. This recommendation also includes general information regarding the physical-chemical properties and historical uses of methyl bromide and chloropicrin in California.

Methyl Bromide

Methyl bromide is a colorless, non-flammable gas that is odorless, even at toxic concentrations (Figure 1; ATSDR, 1992). Table 1 presents some of the physical-chemical properties of methyl bromide. Methyl bromide has a high vapor pressure and tends to partition in the air (Oros & Neal, 2010; US EPA, 2009b). Methyl bromide is stable in the lower atmosphere and is degraded slowly via hydrolysis with an estimated half-life of about 11 months (ATSDR, 1992). Volatilization is the primary route of dissipation of methyl bromide in the environment (Oros & Neal, 2010; US EPA, 2009b); other mechanisms of dissipation include hydrolysis, soil methylation, and microbial degradation (Yates et al., 2003). Losses of methyl bromide to the atmosphere from agricultural applications are greatly influenced by soil conditions such as soil moisture, organic matter, and texture, as well as application methods, including soil injection depth and use of various surface tarpaulins (Yagi et al., 1995; Yates et al., 2003;).

Figure 1. Chemical structure of methyl bromide.



Methyl Bromide

Table 1. Physical-chemical properties of methyl bromide[1]

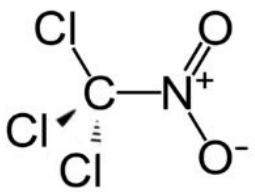
Chemical name	bromomethane
CAS number	74-83-9
Molecular formula	CH_3Br
Molecular weight	94.94 g/mol
Solubility in water	16,000-17,500 mg/L
Vapor pressure	1.4×10^3 mm Hg (20°C)
Henry's Law Solubility Constant	0.30 ± 0.02 (21°C)

[1] Yates et al., 2003

Chloropicrin

Chloropicrin has a high vapor pressure and Henry's law volatility constant (Figure 2, Table 2). It volatilizes rapidly from soil applications, although tarpaulin use can significantly reduce field emissions (DPR, 2015). Emissions of chloropicrin from agricultural applications are highly influenced by the application methods and application rates used, in addition to temperature, soil texture, soil moisture, and tarpaulin removal procedures (Ajwa et al., 2013; Brown, 2015; Gao et al., 2013). Chloropicrin is denser than air and may tend to move from field application sites near ground level or accumulate in confined, lowland, or stagnant areas (Center for Disease Control [CDC], 2011). Photolytic degradation of chloropicrin occurs rapidly and is the primary route of degradation in air, with a half-life of less than eight hours (US EPA, 2009a). Photodegradation of chloropicrin produces air pollutants such as phosgene, ozone, chlorine nitrate, and nitryl chloride (DPR, 2010). Additionally, other toxic gases including nitrogen oxides, chlorine, and carbon monoxide are released upon decomposition of chloropicrin (CDC, 2011).

Figure 2. Chemical structure of chloropicrin.



Chloropicrin

Table 2. Physical-chemical properties of chloropicrin.

Chemical name	trichloronitromethane
CAS number	76-06-2
Molecular formula	CCl_3NO_2
Molecular weight[1]	164.4 g/mol
Solubility in water[1]	2.00 g/L at 25°C
Vapor pressure[2]	23.8 mmHg at 25°C
Henry's Law Volatility Constant[2]	2.05×10^{-3} atm · m^3/mol at 25°C

[1] NIOSH, 2016; [2] US EPA, 2009a

B. CHEMICAL USES

Methyl Bromide

Methyl bromide is a broad-spectrum fumigant used for the control of fungi, weeds, insects, arachnids, microbes, nematodes, and vertebrates (US EPA, 2009b). Methyl bromide contributes to stratospheric ozone depletion, and in response, production and import has been phased out under the Montreal Protocol and the US Clean Air Act (US EPA, 2009b). However, certain uses of

methyl bromide are exempt from the phase-out, such as quarantine or pre-shipment uses and critical agricultural uses (US EPA, 2016). Table 3 shows agricultural use of methyl bromide in California is primarily on pre-plant soil preparation, strawberries, nursery-outdoor grown transplants, and nursery-outdoor container/field grown plants (DPR 2016a; Oros & Neal, 2010).

Table 3. Reported annual agricultural use of methyl bromide for top five commodities (pounds of active ingredient[1]) from 2012-2014.

Crop or Site	2012	2013	2014	Total
Soil Application, Preplant-Outdoor (Seedbeds, etc.)	1,239,600	1,049,700	1,034,700	3,324,100
Strawberry (All or Unspecified)	1,394,200	1,044,700	727,800	3,166,700
Nursery-Outdoor Grown Transplant/Propagative Material	492,400	575,400	373,600	1,441,400
Nursery-Outdoor Container/Field Grown Plants	337,500	391,100	268,000	996,700
Raspberry (All or Unspecified)	77,900	62,000	164,600	304,500
Other Fumigation	88,200	80,100	71,500	239,800
Total Use for Top Six Commodities	3,629,700	3,203,100	2,640,200	9,473,000
(Percent of Statewide Total)	(91)	(91)	(89)	(90)
Statewide Total	4,002,300	3,534,300	2,964,300	10,500,900

[1]Rounded to nearest hundred pounds

DPR currently registers 26 products containing methyl bromide for use in California (DPR, 2016b). Methyl bromide product labels allow for several application uses, including: preplant field fumigation and commodity fumigation in chambers, under sealed tarpaulins, shipholds, and commodity-containing structures, including warehouses, grain elevators, and food processing plants. California regulations currently permit five application methods for field fumigations using methyl bromide products (Title 3 California Code of Regulations [3 CCR] § 6447.3). Depending on application use, product label maximum application rates (measured using pounds of active ingredient) range from 350-400 pounds per acre for quarantine and preshipment uses, from 175-400 pounds per acre for crop and soil fumigation uses, and from 1-1.5 pounds per 100 square feet for orchard tree hole replanting. All methyl bromide products labeled for field application must contain chloropicrin as a warning agent if it is not included as an active ingredient in the formulation.

Chloropicrin

Chloropicrin is primarily used as a preplant soil fumigant to control root-attacking pathogens, nematodes, insects, and weed seeds. Chloropicrin is also used as a warning agent (due to its eye irritation and strong odor) for odorless fumigant chemicals (Kollman, 1990). In 2014, chloropicrin was among the top five most used pesticide active ingredients in California (DPR, 2016c). In California, agricultural use of chloropicrin is mainly for strawberries, pre-plant soil preparation, raspberries, and outdoor grown transplants (Table 4; DPR 2016).

DPR currently registers 28 products containing chloropicrin as an active ingredient for use in California (DPR, 2016b). State regulations allow for the use of ten application methods for field fumigations using chloropicrin products (3 CCR § 6449.1). Labels for products containing chloropicrin allow maximum soil fumigation rates of 43-350 pounds of chloropicrin per acre, depending on application method and crop to be treated, or 1-1.5 pounds of chloropicrin per 100 square feet for orchard tree hole replanting. California recommended permit conditions place additional restrictions on use.

Table 4. Reported annual agricultural use of chloropicrin for top five commodities (pounds of active ingredient[1]) from 2012-2014.

Crop or Site	2012	2013	2014	Total
Strawberry (All or Unspecified)	6,640,400	5,976,200	6,589,300	19,206,000
Soil Application, Preplant-outdoor (Seedbeds, etc.)	810,100	756,300	895,300	2,461,700
Raspberry (All or Unspecified)	587,400	705,200	636,600	1,929,200
Nursery-Outdoor Grown Transplant/Propagative Material	150,400	250,500	135,600	536,500
Uncultivated Agricultural Areas (All or Unspecified)	78,900	77,100	163,400	319,500
Tomato	106,700	87,000	96,000	289,700
Total for Top Six Commodities	8,374,000	7,852,300	8,516,300	24,742,500
(Percent of Statewide Total)	(94)	(96)	(95)	(95)
Statewide Total	8,930,800	8,220,400	8,992,800	26,144,000

[1]Rounded to nearest hundred pounds

Pesticide Use Summary

Pesticide use information was obtained for the calendar years 2012-2014 from the Pesticide Use Report (PUR) database maintained by DPR. Tables 5 and 6 present the annual use of chloropicrin and methyl bromide by county from 2012–2014. Statewide total annual use of methyl bromide (hundreds of pounds of active ingredient) ranged from 4,002,300 pounds in 2012 to 2,964,300 pounds in 2014 (Table 5). During the same period, statewide annual chloropicrin use ranged from 8,220,400 pounds in 2013 to 8,992,800 pounds in 2014 (Table 6). Siskiyou County had the highest reported agricultural use of methyl bromide during 2012-2014, followed by Monterey and Ventura Counties. Ventura County had the highest reported agricultural use of chloropicrin during the same period, followed by Monterey and Santa Barbara Counties. From 2012-2014, the top five counties using methyl bromide represented 62% of total use statewide and 82% for chloropicrin. Figures 3 and 4 show monthly summaries of methyl bromide and chloropicrin use for each of the top five counties from 2012-2014. Within the top five counties, methyl bromide and chloropicrin were primarily used in the late summer and early autumn months of July, August, September, and October (Figures 3 and 4; Appendix: Tables 1 and 2).

Table 5. Reported statewide annual use of methyl bromide (pounds of active ingredient[1]) by county from 2012-2014 and previous ARB or DPR ambient air monitoring studies.

County	2012	2013	2014	Total	Previous Monitoring?
Siskiyou	1,033,300	871,700	797,600	2,702,600	No
Monterey	686,600	529,900	325,800	1,542,300	Yes[2,3,4]
Ventura	328,200	184,300	290,500	802,900	Yes[5,6,7]
Stanislaus	269,400	246,300	227,400	743,100	No
San Joaquin	218,900	195,800	257,700	672,500	Yes[4]
Merced	151,500	293,900	173,600	619,000	No
Santa Barbara	210,500	116,000	130,700	457,200	Yes[7]
Santa Cruz	211,100	155,600	90,300	457,100	Yes[2,3,7]
Los Angeles	115,100	118,400	106,400	339,900	No
Sutter	138,300	102,200	91,100	331,600	No
All Other Counties	639,200	720,200	473,300	1,832,700	-
Total for Top Five Counties	2,536,500	2,028,000	1,898,900	6,463,400	-
(Percent of Statewide Use)	(63)	(57)	(64)	(62)	-
Total Statewide Use	4,002,300	3,534,300	2,964,300	10,500,900	-

[1]Rounded to nearest hundred pounds

[2]ARB, 2001; [3]Cook, 2002; [4]Tuli et al., 2015; [5]ARB, 2006; [6]ARB, 2007; [7]Vidrio et al., 2014

Table 6. Reported statewide annual use of chloropicrin (pounds of active ingredient[1]) by county from 2012-2014 and previous ARB or DPR ambient air monitoring studies.

County	2012	2013	2014	Total	Previous Monitoring?
Ventura	2,742,600	2,176,800	2,293,000	7,212,400	Yes[2]
Monterey	2,157,100	2,015,000	2,263,400	6,435,600	Yes[3,4]
Santa Barbara	1,397,800	1,275,200	1,416,700	4,089,600	Yes[2]
Santa Cruz	658,800	662,800	784,400	2,106,100	Yes[2,3]
Siskiyou	592,600	508,000	452,000	1,552,600	No
San Luis Obispo	417,700	446,900	480,800	1,345,400	No
San Joaquin	167,000	185,000	227,200	579,100	Yes[4]
Merced	95,300	198,400	193,500	487,300	No
Fresno	92,600	105,200	150,600	348,300	No
San Diego	56,800	114,700	124,800	296,300	No
All Other Counties	552,500	532,400	606,300	1,691,100	-
Total for Top Five Counties	7,548,900	6,637,900	7,209,600	21,396,400	-
(Percent of Statewide Use)	(85)	(81)	(80)	(82)	-
Total Statewide Use	8,930,800	8,220,400	8,992,800	26,144,000	-

[1]Rounded to nearest hundred pounds

[2]Vidrio et al., 2015; [3]Cook, 2004; [4]Tuli et al., 2015

Figure 3. Reported monthly methyl bromide use (pounds of active ingredient) in the top five counties from 2012-2014.

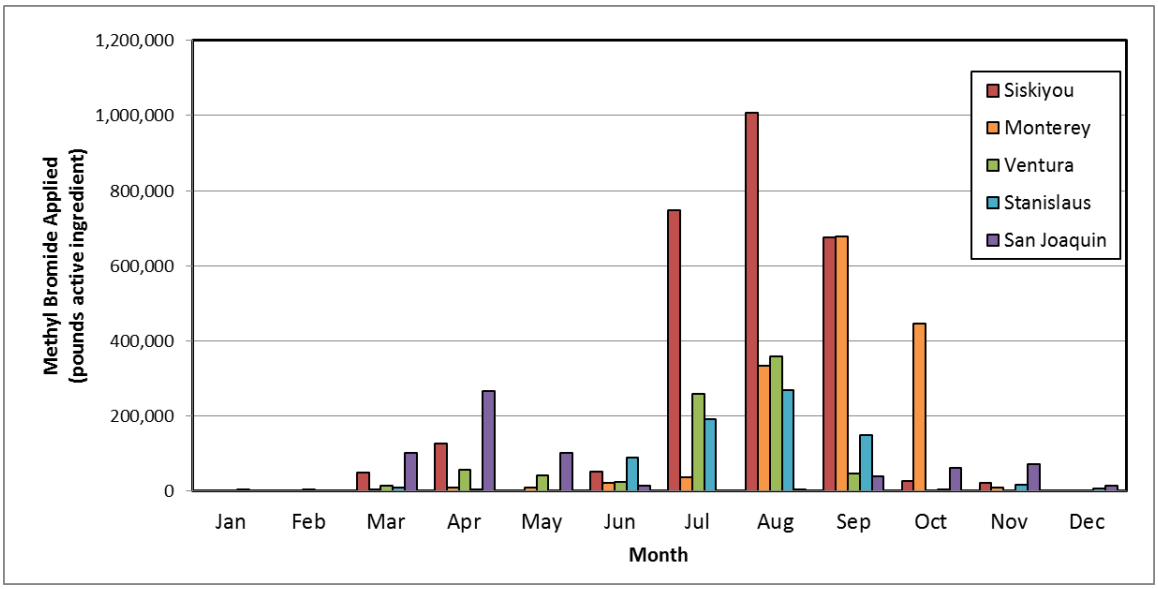
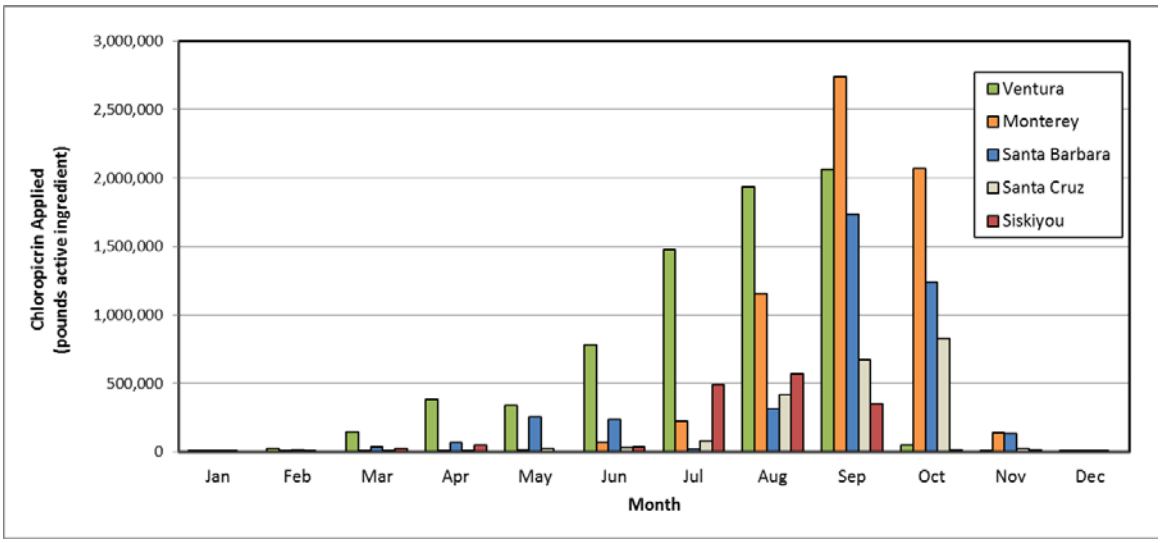


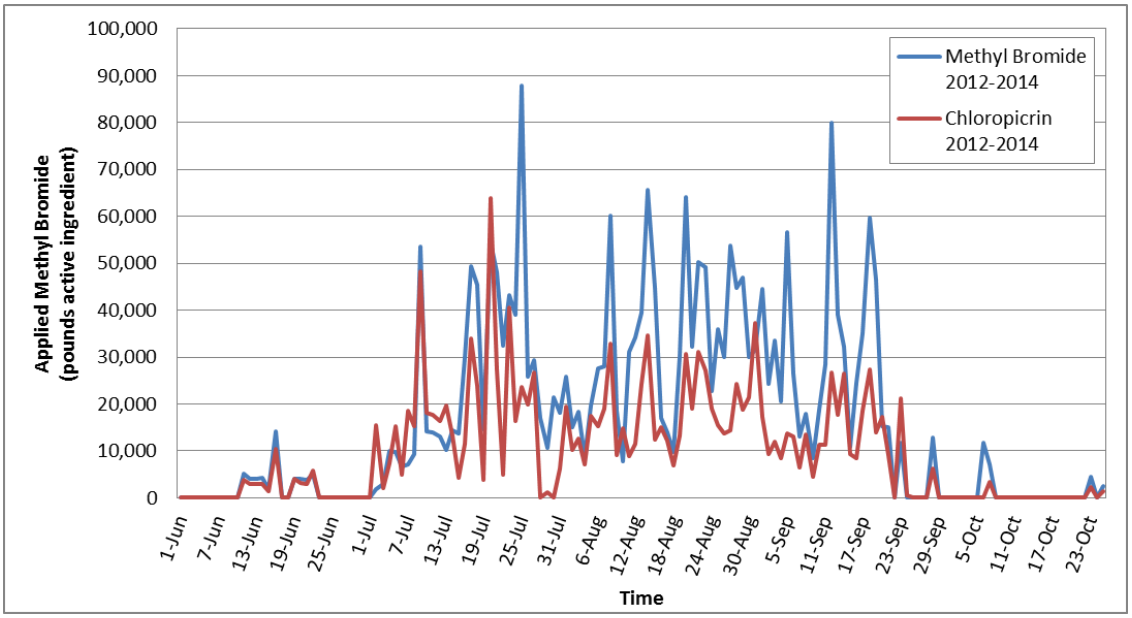
Figure 4. Reported monthly chloropicrin use (pounds of active ingredient) in the top five counties from 2012-2014.



The total pounds of methyl bromide applied statewide has declined, while the total pounds of chloropicrin applied has increased since 2006. These changes may be in response to the increasing cost and tighter regulatory requirements for use of methyl bromide (DPR, 2016c; DPR 2015). Growers may have adopted use of alternative soil fumigants, such as chloropicrin, in response to the phase out of the production and import of methyl bromide that was finalized in 2005 (Brown, 2015; Gao et al., 2013). Large decreases in annual methyl bromide use occurred from 2012 to 2014 in Monterey (-53%), Siskiyou (-23%) and Ventura Counties (-11%) (Table 5). Chloropicrin use in the top five counties was more variable during the same period. Annual use of chloropicrin decreased from 2012-2014 in Siskiyou (-24%) and Ventura Counties (-16%), but

increased in Santa Cruz (19%), and Monterey Counties (5%) during the same period (Table 6). Figure 5 shows the total daily pounds of methyl bromide and chloropicrin applied in Siskiyou County during June-October of 2012-2014. In the appendix, individual years contributing to the 2012-2014 cumulative total are plotted separately to show the annual variation of application timing during the high use period (Appendix: Figures 1 and 2).

Figure 5. Reported total methyl bromide and chloropicrin use (pounds of active ingredient) in Siskiyou County from June to October during 2012-2014.



C. RECOMMENDATIONS

Ambient Air Monitoring

DPR is most interested in considering monitoring in those counties where use for methyl bromide and chloropicrin is the highest: Siskiyou, Monterey, Ventura, Stanislaus, San Joaquin, Santa Barbara and Santa Cruz. DPR and ARB have conducted ambient air monitoring studies for methyl bromide and/or chloropicrin in all of the top five counties except Siskiyou and Stanislaus Counties (Tables 5 and 6). DPR has monitored ambient air for methyl bromide and chloropicrin in Monterey and San Joaquin counties as part of the Air Monitoring Network since 2011 (Tuli et al., 2015). Additionally, at the request of DPR, ARB conducted ambient air monitoring for methyl bromide and chloropicrin between 2010 and 2014 in Ventura, Santa Cruz and Santa Barbara counties as part of DPR's Toxic Air Contaminant Program (Vidrio et al., 2015). Siskiyou County had the highest annual use of methyl bromide from 2012-2014 and ranked fifth in terms of annual chloropicrin use during the same period (Tables 5 and 6). Therefore, DPR requests that ARB conduct seasonal ambient monitoring for methyl bromide and chloropicrin in 3-8 locations within Siskiyou County near areas of high methyl bromide and chloropicrin use, as well as in one background site located away from areas of use.

Figures 6 and 7 show statewide use of methyl bromide and chloropicrin as a cumulative total for each township during 2012-2014 and locations of current DPR- and ARB-operated air

monitoring stations. The figures include an inset of methyl bromide and chloropicrin use in Siskiyou County within each Public Land Survey System (PLSS) section from 2012-2014. Figures 8 and 9 show methyl bromide and chloropicrin use by PLSS sections in Siskiyou County from July to September during 2012-2014. California Irrigation Management Information System (CIMIS) meteorological data from 2011-2015 for CIMIS Station 91 near Tulelake is shown as a windrose to indicate the percent of time that wind is blowing *from* each direction.

DPR recommends that monitoring focus on methyl bromide and chloropicrin. However, since 1,3-dichloropropene is included in the analytical method for methyl bromide, DPR requests that ARB also report 1,3-dichloropropene results if possible.

DPR recommends that monitoring sites be located on schools or other public properties, near the edge of the community and downwind of high use areas (Figures 8 and 9). Monitoring should be conducted over a 12-week period starting the first week of July (Figures 3, 4, and 5). At each sampling site, DPR recommends collecting four 24-hour samples per week in sequence during each week of the 12-week sampling period. The four-day sampling period should begin each week on a randomly chosen day over the full seven-day week, including weekends. In addition to the primary samples, replicate (co-located) samples are needed for at least 10% of the total number of samples collected during the 12-week period. Field spike samples should be collected under the same environmental conditions (e.g., temperature, humidity, exposure to sunlight) and monitoring study conditions (e.g., air flow rates, sample transportation and storage) as those occurring at the time of ambient air sampling. Field blanks should also be collected. DPR recommends target 24-hour quantitation limits of at least 0.03 parts per billion (ppb) for methyl bromide, 0.003 ppb for chloropicrin, and 0.10 ppb for 1,3-dichloropropene (*cis* and *trans*) (Vidrio et al., 2015).

DPR requests that ARB provide the following in its ambient air monitoring report submitted to DPR:

1. Location of each sampler (if at a school, location of sampler within school grounds);
2. Sampling height and any information relevant to the study (presence of trees, buildings, particular industrial or commercial facilities and activities);
3. Proximity of the sampler to treated or potentially treated fields, including distance and direction;
4. Latitude and longitude coordinates for sampling sites, including the Datum used (e.g., NAD 27 or NAD 83); and
5. A map of the monitoring site locations and photographs of sample locations.

Suggested Communities for Air Monitoring

DPR evaluated 1,267 communities for methyl bromide and chloropicrin use. The communities included all cities and census designated places (CDPs) in California, except those within the urban counties of Los Angeles, Orange, San Diego, and San Francisco (Andrews and Verder-Carlos, 2014).

DPR evaluated and rated each of the 1,267 California communities using the following criteria:

a) Regional use density (lbs of active ingredient used) during 2012-2014 (between 1 and 5 miles outside community boundary)
b) Local use density during 2012-2014 (within 1 mile outside community boundary)
c) Community use density during 2012-2014 (within the community boundary)

County rankings were given to the communities within Siskiyou County according to the statewide scores of the 1,267 communities evaluated. Table 7 summarizes the results of the evaluation of pesticide use and the Office of Environmental Health Hazards Assessment's (OEHHA) CalEnviroScreen (CES) 2.0 Population Characteristics percentile for those communities. For any California census tract, the CES 2.0 Population Characteristics percentile factors the following parameters: percent of children and elderly in the population, percent of low birth-weight births, and the rates of asthma emergency department visits, educational attainment, linguistic isolation, poverty, and unemployment (OEHHA, 2014).

The highest use of methyl bromide and chloropicrin from 2012 to 2014 occurred in Mount Hebron and Macdoel CDPs, followed by the cities of Dorris and Tulelake. Methyl bromide and chloropicrin use near Tulelake occurred in just one PLSS section during 2012 to 2014 (Figures 6 and 7, inset), and use was notably lower in this area than the use near the other three communities. Methyl bromide and chloropicrin use north of Weed (Figures 6 and 7, inset) was near a very sparsely populated area and mostly occurred outside of the summer peak use season. For these reasons, Figures 8 and 9 exclude Tulelake and the area north of Weed. Tulelake had the highest CES 2.0 Population Characteristics ranking, followed by Dorris, Macdoel CDP and Mount Hebron CDP, which were located within the same census tract and therefore received the same ranking.

DPR recommends ARB select communities with highest reported use of methyl bromide and chloropicrin, guided by the community pesticide use rankings and the CalEnviroScreen 2.0 Population Characteristics rankings from Table 7. Due to the limited number of communities available in Siskiyou County and the size of the communities, DPR understands that the number of locations will be limited, but requests that at least three sites be monitored. DPR recommends that ARB select an additional monitoring site distant to methyl bromide and chloropicrin applications for rural background samples.

Table 7. Pesticide use and environmental justice factors ratings for communities in Siskiyou County near methyl bromide and chloropicrin high use areas during 2012-2014.

Community	Methyl Bromide Use		Chloropicrin Use		CES 2.0 Population Characteristics	
	Statewide Rank[1]	County Rank[2]	Statewide Rank[1]	County Rank[2]	Percentile	Rank[3]
Mount Hebron CDP	1	1	16	1	55	2
Macdoel CDP	2	2	19	2	55	2
Dorris City	20	3	41	3	55	2
Tulelake City	124	4	149	4	65	1

[1] Community pesticide reported use ranking is out of possible 1,267 California communities evaluated.
[2] Siskiyou county rankings based on reported methyl bromide and chloropicrin use, with lower numbers indicating higher nearby pesticide use.
[3] Rankings for the top methyl bromide and chloropicrin reported use communities in Siskiyou County, with lower numbers indicating higher environmental justice priority.

Figure 6. Reported methyl bromide use statewide from 2012-2014. The reported cumulative total pounds of active ingredient applied in each township is grouped by quantiles according to the statewide agricultural use of methyl bromide from 2012-2014. (Siskiyou County Inset: Cumulative total pounds of methyl bromide applied within Sisikiyou County in each PLSS section is grouped by quantiles according to the statewide agricultural use of methyl bromide from 2012-2014.)

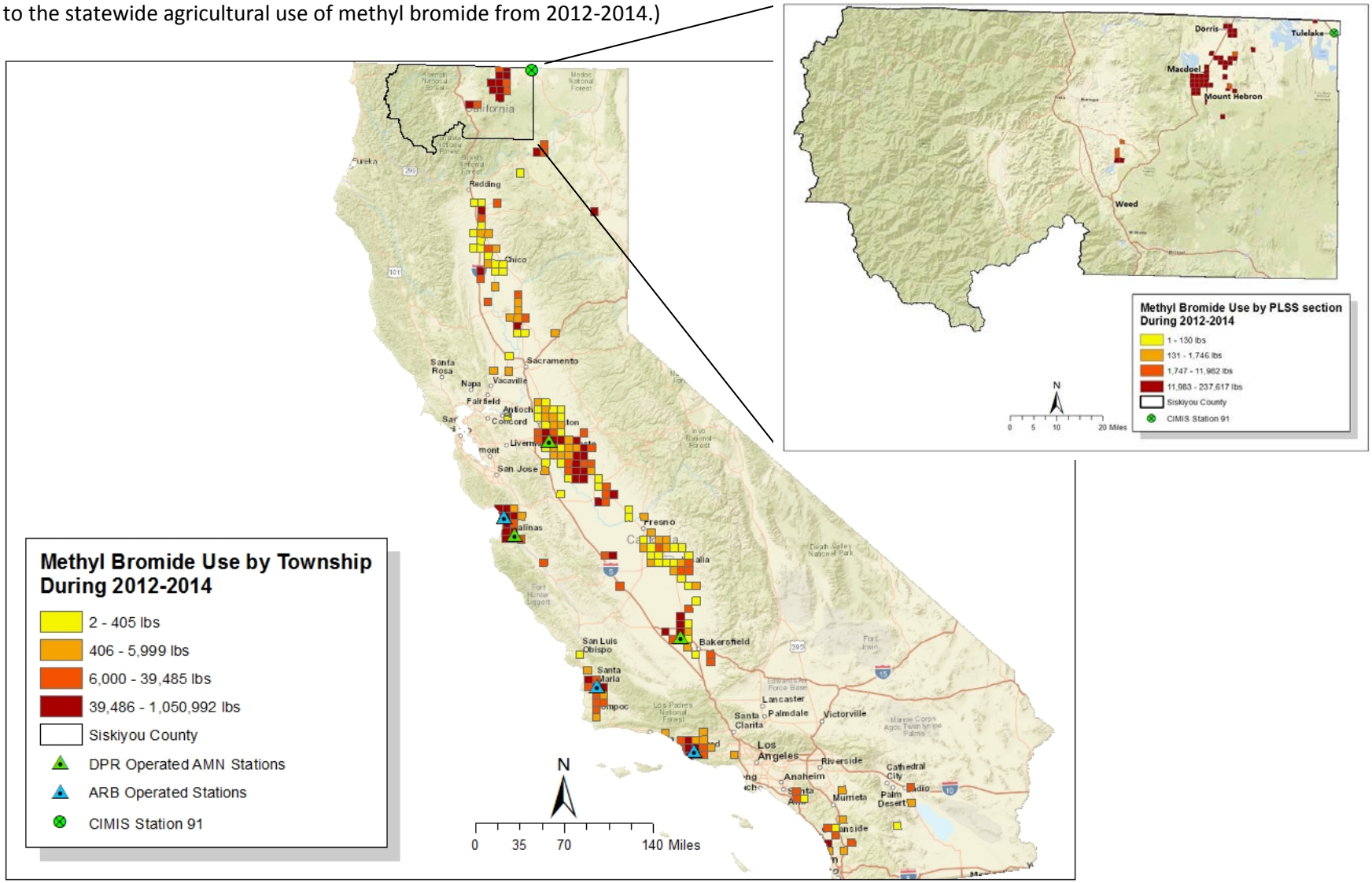


Figure 7. Reported chloropicrin use statewide from 2012-2014. The reported cumulative total pounds of active ingredient applied in each township is grouped by quantiles according to the statewide agricultural use of chloropicrin from 2012-2014. (Inset: Siskiyou County- Cumulative total pounds of chloropicrin applied within Siskiyou County in each PLSS section is grouped by quantiles according to the statewide agricultural use of chloropicrin from 2012-2014.)

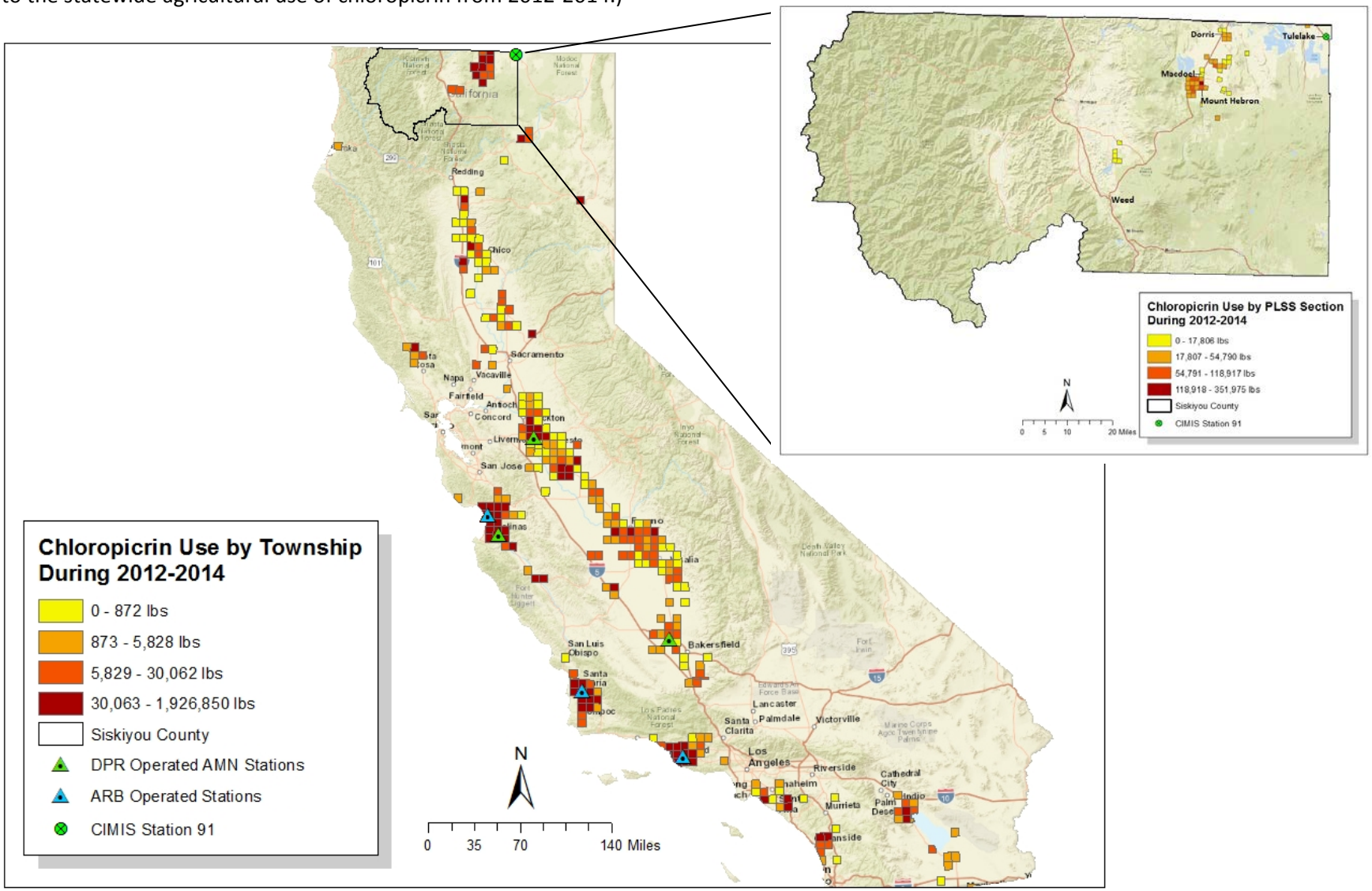


Figure 8. Reported methyl bromide use in Siskiyou County during July-September of 2014. The reported total pounds of active ingredient applied in each section is grouped by quantiles according to the agricultural use of methyl bromide in Siskiyou County during July-September of 2014. Windrose data is from 2011-2015 for CIMIS Station 91 near Tulelake.

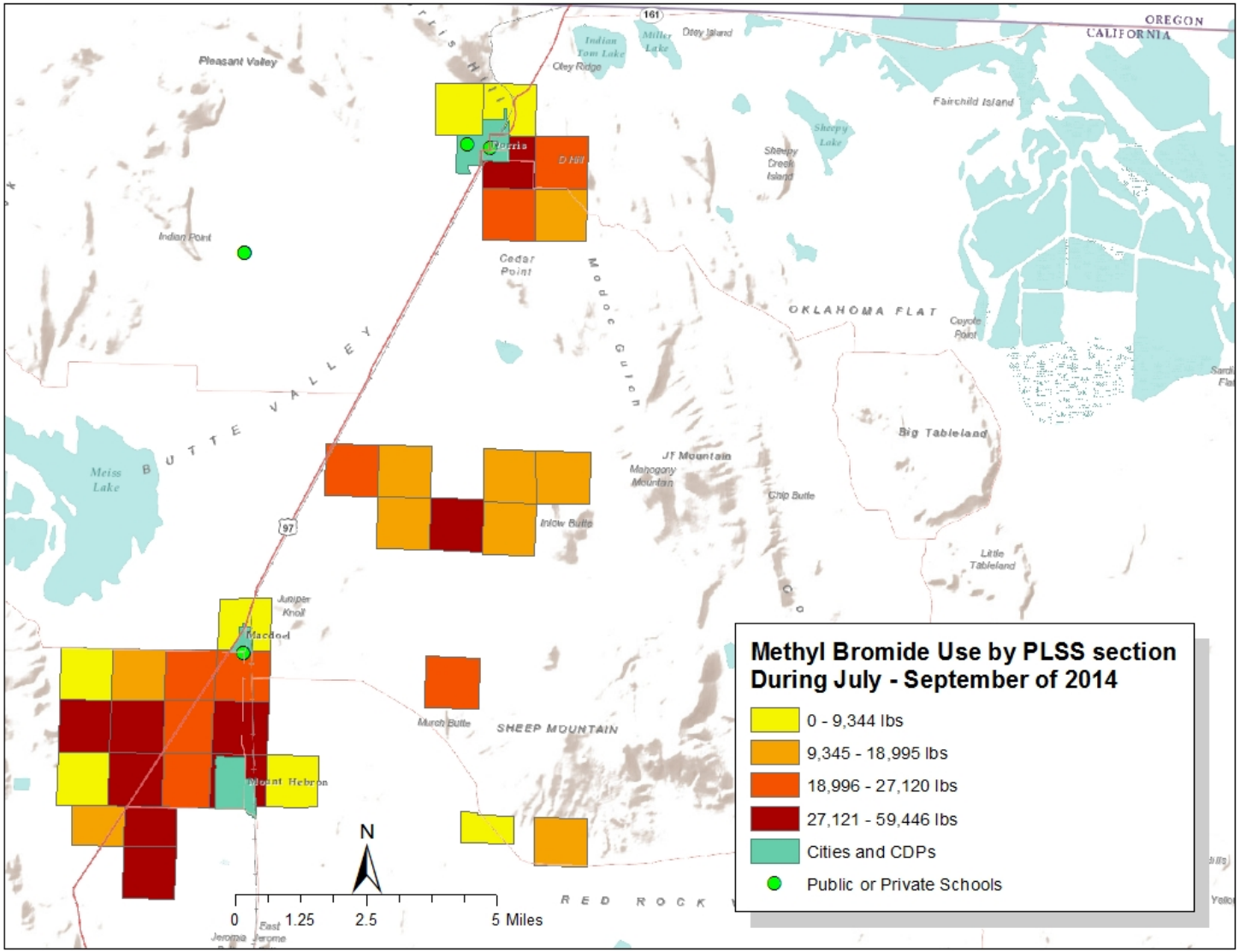
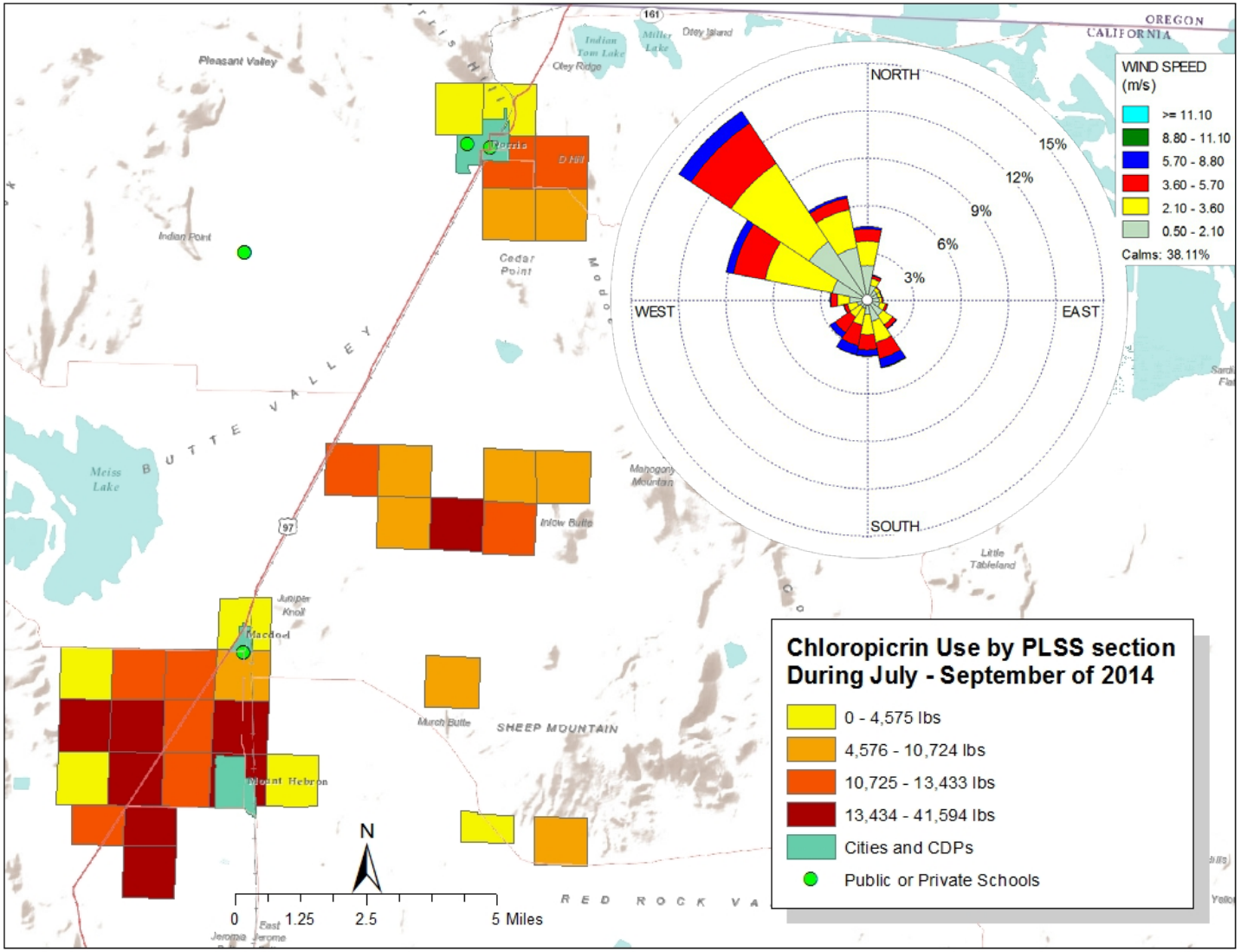


Figure 9. Reported chloropicrin use in Siskiyou County during July-September of 2014. The reported total pounds of active ingredient applied to each section is grouped by quantiles according to the agricultural use of chloropicrin in Siskiyou County during July-September of 2014. Windrose data is from 2011-2015 for CIMIS Station 91 near Tulelake.



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Appendix

Table 1. Reported statewide monthly methyl bromide use (pounds of active ingredient[1]) by county from 2012-2014.

County	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Siskiyou	-	-	48,600	125,900	-	50,600	747,300	1,007,200	675,800	26,100	21,300	-	2,702,600
Monterey	-	500	4,200	7,600	8,200	20,500	36,100	332,500	677,200	445,600	9,300	600	1,542,300
Ventura	500	5,100	13,100	56,600	40,900	22,900	257,200	358,400	45,200	600	100	2,200	802,900
Stanislaus	5,100	1,400	10,100	3,700	1000	88,500	190,800	268,000	149,700	3,400	15,900	5,700	743,100
San Joaquin	2,000	1,300	100,700	266,000	101,100	14,300	200	3,800	38,000	60,900	70,800	13,400	672,500
Merced	3,900	41,800	152,700	194,200	11,900	10,200	300	11,400	37,300	127,500	16,500	11,400	619,000
Santa Barbara	2,700	400	9,300	300	19,300	20,200	3,800	95,000	206,100	68,700	26,300	5,100	457,200
Santa Cruz	-	-	2,900	2,700	6,900	8,500	17,900	68,400	179,200	165,900	4,700	0	457,100
Los Angeles	40,400	42,400	62,500	51,400	30,200	19,000	18,200	20,900	16,500	15,100	8,900	14,400	339,900
Sutter	300	300	500	800	400	16,500	23,800	210,200	50,900	18,100	9,600	200	331,600
All other Counties	45,200	13,600	55,700	204,800	42,700	70,900	205,900	482,000	265,200	264,400	64,400	118,000	1,832,700
Statewide Total	100,100	106,800	460,300	914,000	262,600	342,100	1,501,500	2,857,800	2,341,100	1,196,300	247,800	171,000	10,500,900
Top Five Counties	7,600	8,300	176,700	459,800	151,200	196,800	1,231,600	1,969,900	1,585,900	536,600	117,400	21,900	6,463,400
(% CA Total)	(8)	(8)	(38)	(50)	(58)	(58)	(82)	(69)	(68)	(45)	(47)	(13)	(62)

[1]Rounded to nearest hundred pounds

Table 2. Reported statewide monthly chloropicrin use (pounds of active ingredient[1]) by county from 2012-2014.

County	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Ventura	100	29,300	146,200	382,100	338,200	783,700	1,478,500	1,934,400	2,061,900	48,400	6,500	3,200	7,212,400
Monterey	0	100	4,500	8,200	12,200	68,400	225,600	1,157,100	2,742,700	2,070,700	143,600	2,400	6,435,600
Santa Barbara	6,100	14,000	38,100	71,800	254,000	240,100	23,400	317,200	1,739,500	1,239,600	136,500	9,300	4,089,600
Santa Cruz	0	200	900	2,900	24,200	33,100	83,700	422,300	676,400	833,400	29,000	100	2,106,100
Siskiyou	-	-	23,800	52,000	-	37,300	489,700	568,400	353,300	12,900	15,200	-	1,552,600
San Luis Obispo	0	300	2,100	63,600	43,500	30,400	800	60,100	444,800	663,300	36,700	0	1,345,400
San Joaquin	900	33,100	148,300	216,700	52,600	6,700	1,100	1,500	12,700	36,400	50,400	18,600	579,100
Merced	2,400	56,200	145,300	104,700	4,400	3,200	0	5,700	25,900	92,000	15,400	31,800	487,300
Fresno	29,500	89,500	17,600	-	-	-	5,200	25,300	7,900	17,100	44,000	112,200	348,300
San Diego	200	0	46,300	49,400	52,600	5,300	2,300	40,000	93,800	4,700	1000	800	296,300
All Other Counties	119,200	117,600	101,700	93,400	39,200	28,700	101,800	233,600	383,200	254,600	131,000	87,200	1,691,100
Statewide Total	158,400	340,300	674,800	1,044,800	820,900	1,236,900	2,412,100	4,765,600	8,542,100	5,273,100	609,300	265,600	26,143,800
Top Five Counties	6,200	43,600	213,500	517,000	628,600	1,162,600	2,300,900	4,399,400	7,573,800	4,205,000	330,800	15,000	21,396,300
(% CA Total)	(4)	(13)	(32)	(49)	(77)	(94)	(95)	(92)	(89)	(80)	(54)	(6)	(82)

[1]Rounded to nearest hundred pounds

Figure 1. Reported methyl bromide use (pounds of active ingredient) in Siskiyou County from June to October for individual years during 2012-2014 presented as a stacked line graph.

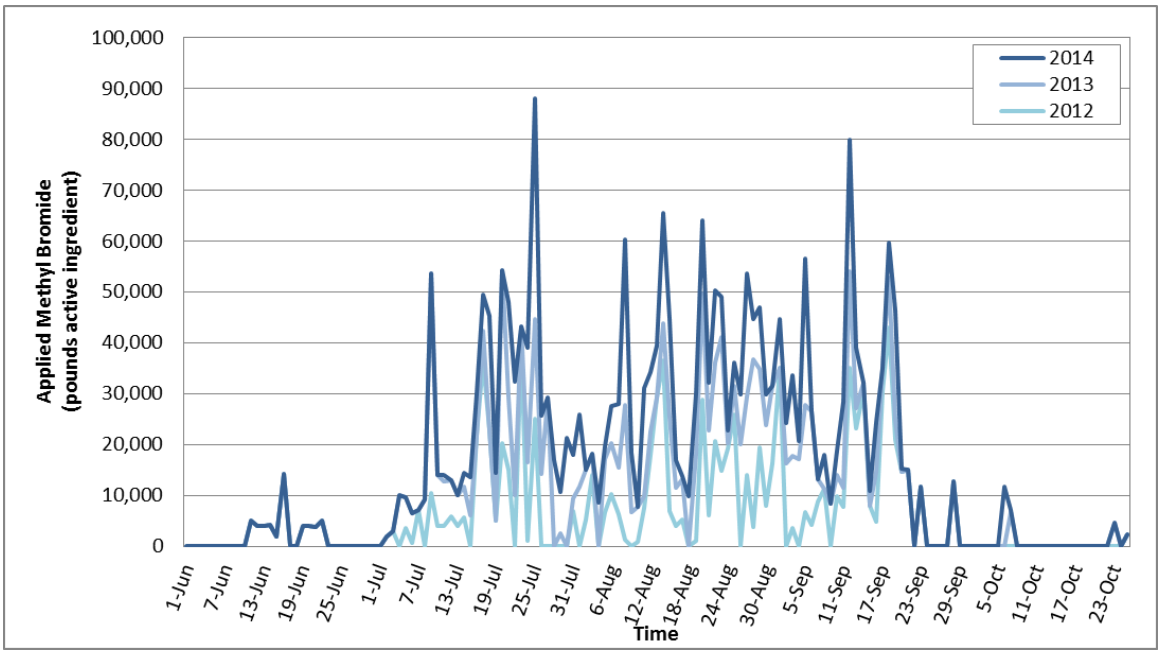
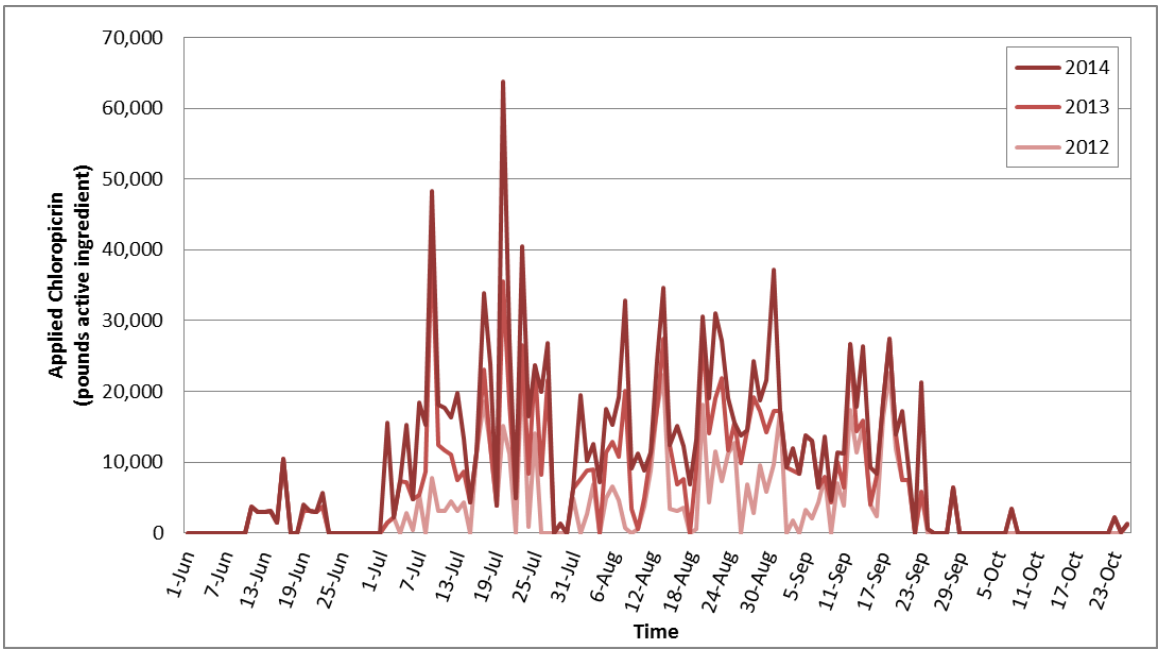
Figure 2. Reported chloropicrin use (pounds of active ingredient) in Siskiyou County from June to October for individual years during 2012-2014 presented as a stacked line graph.