Justification for Revisions Proposed in the Karuk Tribe's 2014 Water Quality Control Plan

Prepared for the:
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SUMMARY

This document summarizes and provides justification for the proposed 2014 revisions to the Karuk Tribe's 2002 Water Quality Control Plan (WQCP). It is organized by pollutant. Table numbers correspond to those used in the 2014 WQCP. The figures included in this document do not appear in the 2014 WQCP, so are numbered according to their appearance herein.

PROPOSED REVISIONS

Ammonia

Objectives in 2002 WQCP:
None.

Proposed objectives:

The ammonia objective applies to water designated Aquaculture (AQUA); Cold Freshwater Habitat (COLD); Rare, Threatened, or Endangered Species (RARE); Spawning, Reproduction, and/or Early Development (SPWN); and Warm Freshwater Habitat (WARM). The ammonia objective varies according to the temperature (T) and the pH of the waterbody, in addition to the presence or absence of salmonids in the genus *Oncorhynchus* (i.e., Pacific salmon and rainbow/steelhead trout):

Acute criterion:

The one-hour average concentration of total ammonia nitrogen (in mg TAN/L) is not to exceed, more than once every three years on the average, the CMC (acute criterion magnitude) calculated using the following equations:

Where salmonids in the genus *Oncorhynchus* are present:

$$CMC = MIN\left(\left(\frac{0.275}{1+10^{7.204-pH}}+\frac{39.0}{1+10^{pH-7.204}}\right),\left(0.7249\times\left(\frac{0.0114}{1+10^{7.204-pH}}+\frac{1.6181}{1+10^{pH-7.204}}\right)\times\left(23.12\times 10^{0.036\times(20-T)}\right)\right)\right)$$

Where salmonids in the genus *Oncorhynchus* are absent:

$$CMC = 0.7249\times\frac{0.0114}{1+10^{7.204-pH}}+\frac{1.6181}{1+10^{pH-7.204}}\times MIN\left(51.93, 23.12\times 10^{0.036\times(20-T)}\right)$$

Chronic criterion:

The thirty-day rolling average concentration of total ammonia nitrogen (in mg TAN/L) is not to exceed, more than once every three years on the average, the chronic criterion magnitude (CCC) calculated using the following equation:

$$CCC = 0.8876 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times \left(2.126 \times 10^{0.028\times(20-MAX(T,7))}\right)$$

In addition, the highest four-day average within the 30-day averaging period should not be more than 2.5 times the CCC (e.g., 2.5 x 1.9 mg TAN/L at pH 7 and 20°C or 4.8 mg TAN/L) more than once in three years on average.

Based on the equations above, tables providing the temperature and pH-dependent values for the CMC and CCC are included as Appendix A.

[The proposed Appendix A is not included here due to its length, please refer to the 2014 WQCP. Note: Appendix A of the WQCP is different than Appendix A of this justification document]

Justification:
The 2002 WQCP did not contain any objectives for ammonia. Aquatic organisms that are important to the Karuk Tribe, including salmonids and mussels, are sensitive to ammonia, so we propose that ammonia objectives be included in the revised WQCP. The proposed objectives are based on the recent U.S. EPA (2013a) recommended criteria for ammonia. U.S. EPA conducted a thorough review and analysis of available toxicity literature to derive its recommended criteria.

Bacteria

Objectives in 2002 WQCP:

The bacteriological quality of Tribal waters shall not be degraded beyond natural background levels. In no case shall fecal coliform, *E.coli* or *enterococci* concentrations in Tribal waters exceed the following:

In waters designated municipal and domestic supply (MUN) the median fecal coliform concentration based on a minimum of not less than five samples for any 30 day period shall not exceed 1 CFU/100 mL at the drinking source.

In waters designated for cultural contact water (CUL-1) and contact recreation (REC 1), the median *E.coli* or *enterococci* concentration based on a minimum of not less than five samples for any 30 day period shall not exceed 126/100 mL or 33/100 mL respectively.

In waters designated for cultural non-contact water (CUL-2) and non-contact water recreation (REC 2), the median fecal coliform concentration based on a minimum of not less than five samples for any 30 day period shall not exceed 1000 CFU/100 mL, nor shall more than ten percent of total samples during any 30 day period exceed 2000 CFU/100 mL.

Proposed objectives (edited/added text underlined):

> The bacteriological quality of Tribal waters shall not be degraded beyond natural background levels. In no case shall fecal coliform, E.coli or enterococci concentrations in Tribal waters exceed the following:
>
> In waters designated municipal and domestic supply (MUN) the median fecal coliform concentration based on a minimum of not less than five samples for any 30 day period shall not exceed 1 CFU/100 mL at the drinking source.
>
> In waters designated for cultural contact water (CUL-1) and contact recreation (REC-1):
> 1. The geometric mean of E.coli or enterococci concentration shall not exceed 100 or 30 cfu/mL, respectively, in any 30 day period, nor shall the statistical threshold value (STV) of E.coli or enterococci concentration exceed 320 or 100 cfu/mL, respectively, in any 30 day period.
> 2. The median fecal coliform concentration based on a minimum of not less than five samples for any 30-day period shall not exceed 50/100 ml, nor shall more than ten percent of total samples during any 30-day period exceed 400/100 ml
>
> At all areas where shellfish may be harvested for human consumption (SHELL), the fecal coliform concentration throughout the water column shall not exceed 43/100 ml for a 5-tube decimal dilution test or 49/100 ml when a three-tube decimal dilution test is used (National Shellfish Sanitation Program, Manual of Operation).
>
> In waters designated for cultural non-contact water (CUL-2) and non-contact water recreation (REC 2), the median fecal coliform concentration based on a minimum of not less than five samples for any 30 day period shall not exceed 1000 CFU/100 mL, nor shall more than ten percent of total samples during any 30 day period exceed 2000 CFU/100 mL.

Justification:

Using an analysis of available research and science, the U.S. EPA's 2012 Recreational Water Quality Criteria provides guidance to states and tribes regarding setting bacterial standards to protect primary contact recreation use. The U.S. EPA (2012) guidance provides two sets of recommended criteria, one based on estimated illness rate of 36 per 1,000 primary contact recreators and the other based on an estimated illness rate of 32 per 1,000 primary contact recreators. We selected the more stringent criteria, based on the Karuk Tribe's high priority on environmental protection.

In addition, fecal coliform objectives were added to create consistency with the North Coast Regional Water Quality Control Board's (NCRWQCB), the regulatory authority adjacent to Karuk trust lands. The fecal coliform objectives added are identical to the NCRWQCB (2011) Basin Plan.

Copper

Objectives in 2002 WQCP:
Objectives for copper were included in Table 2.1 of the 2002 WQCP. The Criterion Maximum Concentration (CMC) was 13 ug/L and the Criterion Continuous Concentration (CCC) was 9.0 ug/L.

Proposed objectives:

> The concentration of dissolved copper is not to exceed, more than once every three years on the average, the site-specific and season-specific values in Table 3:

Table 3. Site-specific and season-specific criteria for dissolved copper.

Location	Criterion Maximum Concentration (CMC) (ug/L)				Criterion Continuous Concentration (CCC) (ug/L)			
	Winter (Jan-Mar)	Spring (Apr-Jun)	Summer (Jul-Sep)	Fall (Oct-Dec)	Winter (Jan-Mar)	Spring (Apr-Jun)	Summer (Jul-Sep)	Fall (Oct-Dec)
Klamath R.: Near Doggett Cr to Scott R.	17.6	22.1	25.6	15.3	10.9	13.7	15.9	9.5
Klamath R.: Scott R. to Happy Camp	12.8	13.9	18.6	22.2	7.9	8.6	11.5	13.8
Klamath R.: Happy Camp to Orleans	6.4	8.1	9.7	11.7	4.0	5.1	6.0	7.3
Salmon R. and tributaries	2.5	3.4	2.8	2.4	1.6	2.1	1.7	1.5
Tributaries to Scott R.	7.5	7.9	7.1	5.8	4.6	4.9	4.4	3.6
Tributaries to Shasta R.	19.1	45.0	50.5	14.3	11.9	28.0	31.4	8.9
All other streams	2.5	3.4	2.8	2.4	1.6	2.1	1.7	1.5

Justification:
The proposed copper objectives were derived by feeding site-specific data from the Lower Klamath Basin into the Biotic Ligand Model (BLM) that was developed by U.S. EPA (2007) and HydroQual, Inc. (2007) as part of U.S. EPA's 2007 recommended criteria for copper. U.S. EPA conducted a thorough review and analysis of available toxicity literature to develop and calibrate the BLM model. The BLM model requires data for ten site-specific input parameters: temperature, pH, dissolved organic carbon (DOC), calcium, magnesium, sodium, potassium, sulfate, chloride, and alkalinity. No single entity on the Klamath River collects all of these

parameters, so we used a combination of several datasets. The primary dataset was a compilation by Asarian and Kann (2013) of water sample and continuous monitoring data for the years 2001-2011 collected by many entities, including the Karuk Tribe. These data were supplemented by additional data from the California Department of Water Resources (CDWR) collected in the years 2001-2013 and downloaded from the California Water Data Library (http://www.water.ca.gov/waterdatalibrary/). The copper BLM model is most sensitive to DOC and pH, with higher concentrations of DOC and higher pH generally leading to higher (less stringent) criteria values for copper (U.S. EPA 2002, as cited by U.S. EPA undated). Unfortunately, DOC data were not regularly collected in the Lower Klamath Basin until 2007.

Data were processed for input into the BLM model using the following steps:

1) Start with 2007-2011 water sample data compiled by Asarian and Kann (2013) for the following parameters: alkalinity, calcium, magnesium, and DOC.
2) From the Asarian and Kann (2013) daily summaries of continuous water quality data, extract the daily average water temperature and daily minimum pH for each date and site. Minimum pH was chosen to be protective (copper toxicity is higher at lower pH).
3) Use the following parameters from the 2001-2013 CDWR data: sodium, potassium, sulfate, and chloride, pH, and temperature
4) Join the results of steps #1, #2, and #3 together, using date and sites as key variables.
5) Using results from step #4, calculate long-term median concentrations for every parameters (except DOC) each site and season: winter (Jan-Mar), spring (Apr-Jun), summer (Jul-Sep), and fall (Oct-Dec).
6) From the result of step #4 down, extract only those rows (302 samples) which had values for DOC. Then fill in data gaps for all parameters (except DOC) using long-term median values for each season and site. There were no sulfate or potassium data available for the Salmon River in the summer or winter season, so data from the Trinity River were used instead.
7) Add columns for Humic Acid Fraction of DOC and sulfide and fill in using the constant values recommended by HydroQual, Inc. (2007)– 10% for Humic Acid Fraction of DOC and 0.0000000001 mg/L for sulfide.
8) Input the results of step #7 into the Windows XP application of the BLM model, run the model to calculate the CMC and CCC for each sample, and export then CMC and CCC results to a spreadsheet. The results are shown in Figure 1 below.

The BLM model provides a CMC and CCC value for each data point (i.e. a unique site and date) input into the model. Judgment is then required to choose final objectives from the many CMC and CCC values. U.S. EPA (undated) does not provide explicit guidance on how to choose final values but does provide some options. The CMC and CCC results indicate non-random variation according to site and season, with higher values at sites (e.g., Iron Gate Dam and Shasta River) and seasons (e.g. summer) with high DOC and pH (Figure 1); thus, we chose separate objectives for each site and season, rather than lumping all sites together or all seasons together). We chose to set the final objectives at the 10th percentile of the CMC and CCC values for each site and season. The relatively limited available input data likely did not capture the most adverse conditions that may occur; thus, using the 10^{th} percentile is consistent with the Karuk Tribe's high priority on environmental protection and is meant to ensure protection of water quality.

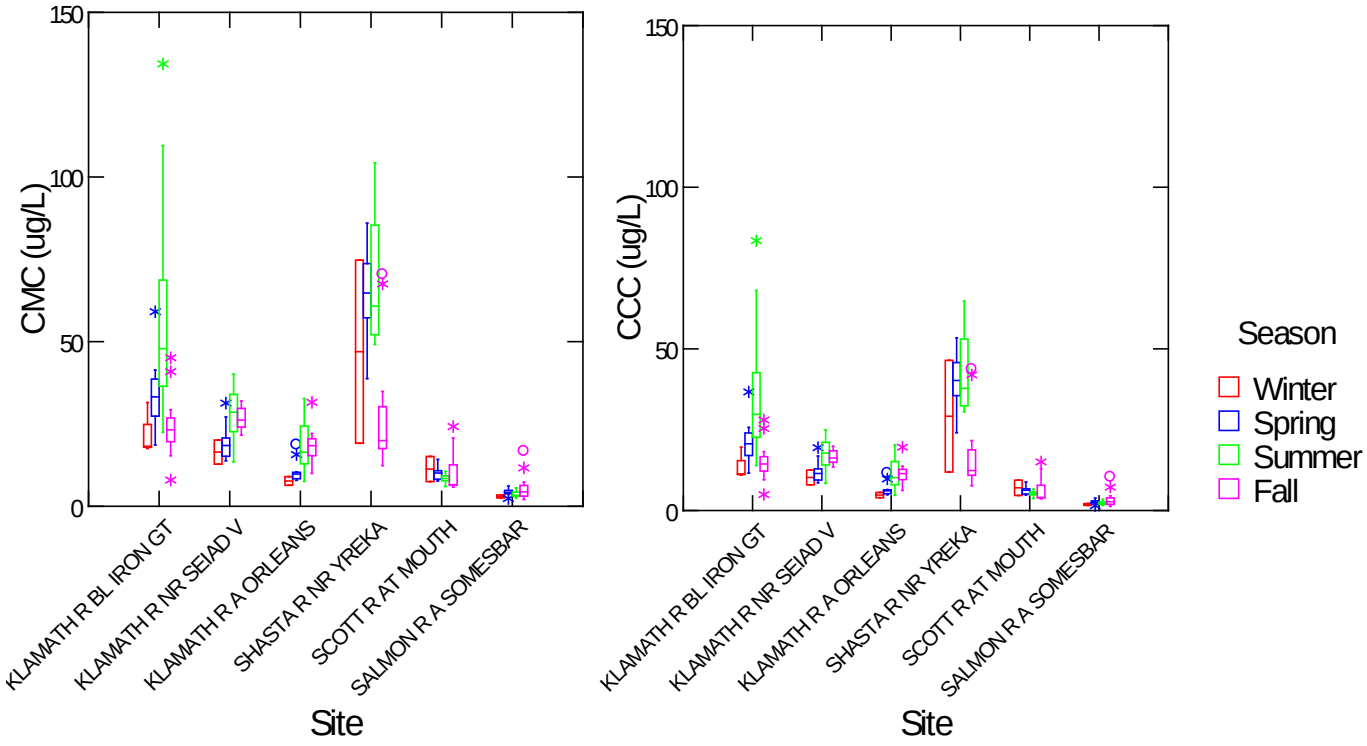

Figure 1. Box plot summarizing copper Criterion Maximum Concentration (CMC) and Criterion Continuous Concentration (CCC) outputs from the Biological Ligand Model for sites on the mainstem Klamath River and tributaries.

The following table shows which monitoring locations were used to establish objectives for each location:

Location for Objectives	Based on Data from Monitoring Data From
Klamath R.: Near Dogget Cr to Scott R.	Klamath R. at Iron Gate Dam
Klamath R.: Scott R. to Happy Camp	Klamath R. at Seiad Valley
Klamath R.: Happy Camp to Orleans	Klamath R. at Orleans
Salmon R. and tributaries	Salmon R. near mouth
Tributaries to Scott R.	Scott R. near mouth
Tributaries to Shasta R.	Shasta R. near mouth
All other streams	Salmon R. near mouth

Comparison of recent conditions to proposed objectives:

Dissolved copper concentrations measured in every CDWR 2001-2013 sample (Figure 2) were well below the proposed objectives (Table 3). The highest measured copper concentration at any site was 1.79 ug/L in Shasta River, which is much lower than the proposed CCC objectives for that site (8.9 - 28.0 ug/L, depending on the season), and is the only sampled that had a high concentration than the lowest CCC objective for any site/season (1.6 ug/L for Salmon River in winter). However, the CDWR dataset only includes data only the larger rivers, not smaller streams where copper concentrations could be very high due to abandoned mines, such as the Grey Eagle Mine on Indian Creek (U.S. EPA 2013b).

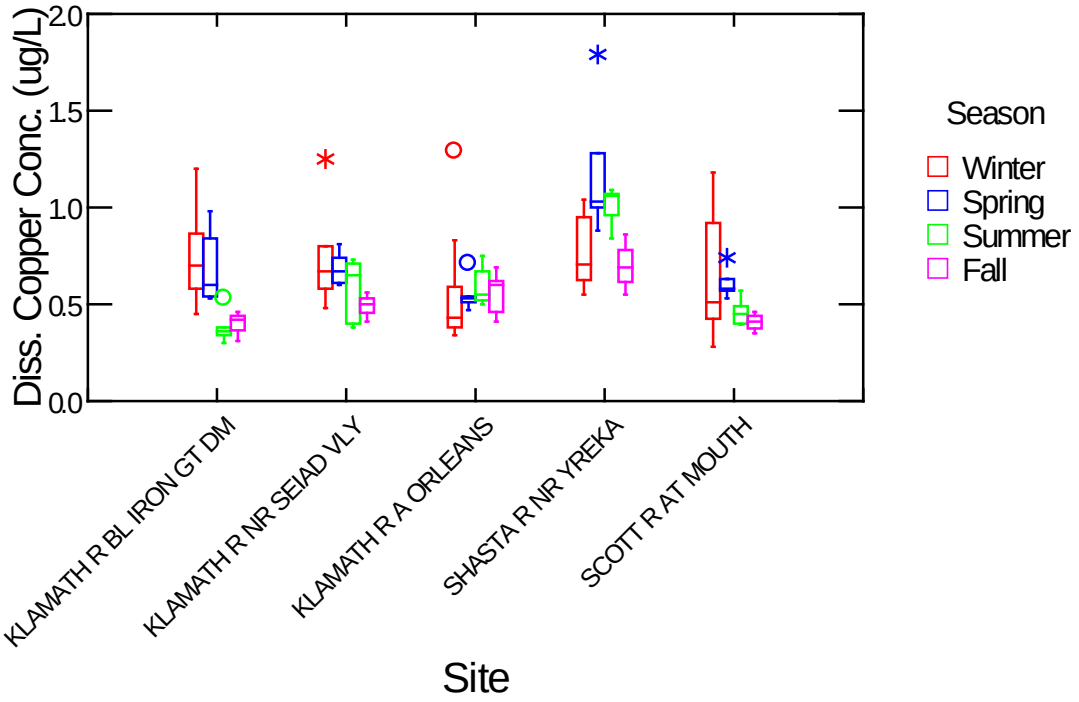

Figure 2. Box plot of dissolved copper concentrations in CDWR water samples from sites on the mainstem Klamath River and tributaries 2001-2013.

Cyanobacterial Toxins and Cyanobacteria Cell Density

Objectives in 2002 WQCP:
None.

Proposed objectives:

> Concentrations of cyanobacteria (blue-green algae) cells and cyanobacterial toxins shall conform to those limits listed in Table 4.

Justification:
The Rationale for Proposed column in the table provides a summary of the justification. Details are provided in a technical memo (Kann 2014) that is included as Appendix B.

Table 4 Cyanobacterial toxin and cell density criteria.

Parameter	Designated Uses	Proposed Standard	Rationale for Standard
Microcystis aeruginosa cell density	Drinking water (MUN)	**Below detection**	The Minnesota (2012a, 2012b) Heinze-based BMDL short-term non-cancer "Health Based Value" of 0.04 µg/L essentially does not allow for the detection of any cells.
	Contact: Cultural (CUL-1) Recreational (REC-1)	**<1,000 cells/mL:** Initial media outreach and general informational signage. Begin routine monitoring.	Cell density corresponding to OEHHA "Action Level"
		<5,000 cells/mL: Additional Media outreach and specific public health postings that warning against water contact due to levels that are 5x the OEHHA "action level"	Cell density corresponding to 5x OEHHA "Action Level"
		<10,000 cells/mL: Repeat Media outreach and specific public health postings warning against water contact due to levels that are 10x the OEHHA "action level"	Cell density corresponding to 10x OEHHA "Action Level"
Total microcystin toxin concentration[1]	Drinking water (MUN)	**<0.04 µg/L total microcystins**[2]	Minnesota (2012a, 2012b) Heinze-based BMDL short-term non-cancer "Health Based Value" of 0.04 µg/L.
	Contact: Cultural (CUL-1) Recreational (REC-1)	**<0.8 mg/L total microcystin**: Initial media outreach and general informational signage. Begin routine monitoring.	OEHHA "Action Level"
		<4.0 mg/L total microcystin: Additional Media outreach and specific public health postings that warn against water contact due to levels that are 5x the OEHHA "action level"	5x OEHHA "Action Level"
		<8.0 mg/L total microcystin: Repeat Media outreach and specific public health postings warning against water contact due to levels that are 10x the OEHHA "action level"	10x OEHHA "Action Level"
Total potentially toxigenic blue-green algal species[3]	Contact: Cultural (CUL-1) Recreational (REC-1)	**<100,000 cells/mL or Cyanobacterial scums**	WHO/SWRCB guidelines
Anatoxin-a	Contact: Cultural (CUL-1) Recreational (REC-1)	**<90 µg/L**	OEHHA (2012)
Cyanotoxins in Fish/ Shellfish	Shellfish Harvesting, Fish Consumption (SHELL, FC)	**<10 ng/g microcystins, <5000 ng/g anatoxin, <4 ng/g cylindrospermopsin** (wet weight)	OEHHA (2012)

[1] While there are numerous congeners of microcystin (e.g., microcystin-LA, RR, and YR) the most extensive toxicological information is available for the microcystin-LR congener. However, the literature indicates that most of these congeners appear to have similar toxicological effects (OEHHA 2012). Therefore, the toxicity criteria apply to the total of all microcystin congeners (if measured separately the concentration of the various congeners is summed), or if ELISA methodology is used then the reported value is already assumed to represent the total.

[2] Value based on the older WHO studies, and although OEHHA (2012) did not evaluate drinking water "action levels", the Minnesota Department of Health (2012a, 2012b) utilized the same Heinze-based BMDL of 0.0064 mg/kg/day that OEHHA used to arrive at a short-term non-cancer "Health Based Value" of 0.04 µg/L.

[3] Includes: *Anabaena, Microcystis*, *Planktothrix, Gloeotrichia* and *Oscillatoria*

Dissolved Oxygen, Specific Conductance, pH, Hardness, and Boron

Objectives in 2002 WQCP:

Dissolved oxygen concentrations shall conform to those limits listed in Table 2. For waters not listed in Table 2 and where dissolved oxygen objectives are not prescribed the dissolved oxygen concentrations shall not be reduced below the following minimum levels at any time.

Waters designated WARM	5.0 mg/L
Waters designated COLD	6.0 mg/L
Waters designated SPWN	7.0 mg/L
Waters designated SPWN during critical spawning and egg incubation periods	9.0 mg/L

Proposed objectives:

Dissolved oxygen concentrations shall conform to those limits listed in Table 6 and Table 7. For waters not listed in Table 6 or Table 7 and where dissolved oxygen objectives are not prescribed the dissolved oxygen concentrations shall not be reduced below the following minimum levels at any time.

Waters designated WARM	5.0 mg/L
Waters designated COLD	6.0 mg/L
Waters designated SPWN	7.0 mg/L
Waters designated SPWN during critical spawning and egg incubation periods	9.0 mg/L

Table 6 Specific Water Quality Objectives for Tribal waterbodies

Hydrologic Area	Waterbody	Specific Conductance (micromhos) @ 25 °C		Dissolved Oxygen (mg/L)[4]		Hydrogen Ion (pH units)[5]		Hardness (mg/L as $CaCO_3$)	Boron (mg/L as B)	
		90% Upper Limit[1]	50% Upper Limit[2]	Min	50% Lower Limit[2]	Max	Min	50% Upper Limit[2]	90% Upper Limit[1]	50% Upper Limit[2]
Shasta Valley	All Streams	700	400	7	9	8.5	7	200	0.5	0.1
	Groundwaters[3]	800	500	-	-	8.5	7	180	1	0.3
Scott Valley	All Streams	400	275	7	9	8.5	7	120	0.2	0.1
	Groundwaters[3]	500	250	-	-	8.0	7	120	0.1	0.1
Salmon River	All Streams	150	125	9	10	8.5	7	60	0.1	0
Middle Klamath River	Klamath R (near Doggett Creek to Orleans)	350	275	[4]	[4]	8.5	7	80	0.5	0.2
	Other Streams	300	150	7	9	8.5	7	60	0.1	0
	Groundwaters[3]	750	600	-	-	8.5	7.5	200	0.3	0.1

[1]90% upper and lower limits represent the 90 percentile values for a calendar year. 90% or more of the values must be less than or equal to an upper limit and greater than or equal to a lower limit.

[2]50% upper and lower limits represent the 50 percentile values of the monthly means for a calendar year. 50% or more of the monthly means must be less than or equal to an upper limit and greater than or equal to a lower limit.

[3]Value may vary depending on the aquifer being sampled. This value is the result of sampling over time, and as pumped, from more than one aquifer.

[4]The Site Specific Objectives (SSOs) for dissolved oxygen (DO) for the mainstem Klamath River are presented separately in Table 7.

Table 7 Dissolved Oxygen Objectives for the Mainstem Klamath River

Location	Percent DO Saturation Based On Natural Receiving Water Temperatures[2]	Time Period
Klamath River from near Doggett Creek to the Scott River	90%	October 1 through March 31
	85%	April 1 through September 30
Klamath River from Scott River to Orleans	90%	Year round

[1]Corresponding DO concentrations are calculated as daily minima, based on site-specific barometric pressure, site-specific salinity, and natural receiving water temperatures as estimated by the T1BSR run of the Klamath TMDL model and described in Tetra Tech, December 23, 2009, Modeling Scenarios: Klamath River Model for TMDL Development. The estimates of natural receiving water temperatures used in these calculations may be updated as new data or method(s) become available.

Justification:
The proposed revisions would create consistency with the North Coast Regional Water Quality Control Board's (NCRWQCB), the regulatory authority adjacent to Karuk trust lands. The dissolved oxygen objectives added here are identical to the NCRWQCB (2011) Basin Plan.

Comparison of recent conditions to proposed objectives:
Asarian and Kann (2013) analyzed water quality data collected in the years 2001 through 2011 with continuous multi-parameter probes in the lower and middle Klamath River by the Karuk Tribe and other entities. The analysis included the calculation of percent exceedances of various water quality thresholds, including those shown in the following table:

Table showing percent of measurements by month that exceed regulatory or biological thresholds at monitoring stations on the mainstem Klamath River and tributaries, 2001-2011. Months with significant data gaps are excluded. The month of October has fewer years with data than other months. Not all 0 values are actually zeroes; some are very low frequency of exceedances rounded to zero. Table adapted from Table 3 in Asarian and Kann (2013). Cells are color-coded by % exceedance:

0 | >0.001 to ≤10 | >10 to ≤25 | >25 to ≤50 | >50 to ≤100

Parameter and Threshold	Month	Percent of Measurements Exceeding Criteria (by Site and Month)					
		Mainstem Klamath River			Tributaries		
		River mile 189.73 Iron Gate (IG)	River mile 128.58 Seiad Valley (SV)	River mile 59.12 Orleans (OR)	Shasta River (SH)	Scott River Mouth (SC)	Salmon River (SA)
D.O. <90% Saturation	Jun	13	19	4	37		10
	Jul	20	28	14	49	16	18
	Aug	24	34	14	41	25	30
	Sep	39	28	10	21	22	29
	Oct	74	14	6	1	11	13
	Jun thru Oct	33	25	10	33	17	21
D.O. <85% Saturation	Jun	5	3	0	17	2	1
	Jul	12	13	1	33	4	6
	Aug	14	18	3	20	16	10
	Sep	24	10	1	4	11	7
	Oct	61	3	0	0	3	0
	Jun thru Oct	22	9	1	17	7	5
D.O. <8 mg/L	Jun	20	21	5	50	12	5
	Jul	53	50	33	74	36	24
	Aug	55	51	26	67	51	35
	Sep	50	29	9	26	20	13
	Oct	62	1	0	0	0	0
	Jun thru Oct	48	31	16	49	25	17
D.O. <6 mg/L	Jun	0	0	0	3	0	0
	Jul	1	1	0	9	0	0
	Aug	3	0	0	2	0	0
	Sep	6	0	0	0	0	0
	Oct	11	0	0	0	0	0
	Jun thru Oct	4	0	0	3	0	0
pH >8.5	Jun	6	16	2	65	25	0
	Jul	10	30	9	53	35	4
	Aug	53	40	19	68	39	4
	Sep	47	32	12	73	36	3
	Oct	6	11	10	38	34	0
	Jun thru Oct	23	26	11	60	34	3

Nutrients and Organic Matter

Objectives in 2002 WQCP:
None.

Proposed objectives:

Nutrients and organic matter shall conform to those limits listed in Table 8.

Table 8 Nutrient and Organic Matter Objectives for Tribal waterbodies.

Location	Parameter	Mean Concentration (mg/L) for Time Period														
		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Dry season: May – Oct	Wet season: Nov – Apr	Annual
Klamath R.: Near Doggett Cr to Scott R	TP	0.032	0.029	0.029	0.027	0.028	0.029	0.032	0.033	0.029	0.031	0.032	0.033			
	TN	0.327	0.247	0.217	0.221	0.245	0.275	0.299	0.328	0.270	0.334	0.340	0.333			
	$CBOD_5$	2	2	2	2	2	2	1	2	2	3	3	2			
Klamath R.: Scott R to Happy Camp	TP	0.029	0.027	0.027	0.025	0.027	0.029	0.030	0.031	0.024	0.026	0.027	0.027			
	TN	0.299	0.246	0.208	0.208	0.237	0.270	0.289	0.307	0.245	0.294	0.307	0.305			
	$CBOD_5$	3	2	2	2	2	2	1	2	2	2	3	3			
Klamath R.: Happy Camp to Orleans	TP	0.023	0.022	0.022	0.022	0.024	0.026	0.027	0.026	0.021	0.022	0.023	0.023			
	TN	0.229	0.207	0.182	0.184	0.212	0.242	0.241	0.233	0.173	0.198	0.218	0.221			
	$CBOD_5$	2	2	2	2	2	1	1	1	1	2	2	2			
Shasta River	TP													0.071	0.071	
	TN													0.210	0.210	
	$CBOD_5$													2	2	
Scott River	TP													0.028	0.019	
	TN													0.310	0.325	
	$CBOD_5$													4	3	
Salmon River	TP													0.018	0.028	
	TN													0.229	0.194	
	$CBOD_5$													2	2	
Other tributaries to Klamath River	TP															0.014
	TN															0.077
	$CBOD_5$															1

Justification:
The 2002 WQCP did not contain any objectives for nutrients or organic matter, other than the narrative criteria for biostimulatory substances. Excessive levels of nutrients and organic matter have been identified as causing deleterious effects to water quality and aquatic ecosystems in the Klamath River (NCRWQCB 2010). The proposed criteria are based on the NCRWQCB (2010) Total Maximum Daily Loads (TMDLs) for the Klamath River and its tributaries. Concentrations for the Klamath River mainstem locations were calculated from hourly outputs from the TMDL' TCD2RN (dams-out) model scenario, obtained from NCRWQCB (Clayton Creager, pers. comm.), and concentrations from tributaries were extracted from NCRWQCB (2010) Tables 5.15 and 5.16. The follow list indicates which TMDL model nodes were used to set Klamath River reach objectives: Klamath River near Doggett Cr to Scott River based on US_SCOTT node (Klamath River upstream of Scott River), Klamath River from Scott River to Happy Camp based on US_INDIAN node (Klamath River upstream of Indian Creek), and Klamath River from Happy Camp to Orleans based on DS_SALMON node (Klamath River downstream of Salmon River).

Pesticides

Objectives in 2002 WQCP:

> No individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses. There shall be no bioaccumulation of pesticide concentrations found in bottom sediments or aquatic life.
>
> Waters designated for use as domestic or municipal supply shall not contain concentrations of pesticides in excess of the limiting concentrations listed in Table 3.

Proposed objectives (edited/added text underlined):

> No individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses. There shall be no bioaccumulation of pesticide concentrations found in bottom sediments or aquatic life.
>
> Waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of pesticides in excess of the limiting concentrations listed in Table 10. Waters designated Aquaculture (AQUA); Cold Freshwater Habitat (COLD); Rare, Threatened, or Endangered Species (RARE); Spawning, Reproduction, and/or Early Development (SPWN); and Warm Freshwater Habitat (WARM) shall not contain concentrations of pesticides in excess of the limiting concentrations listed in Table 9.

[The proposed Tables 9 and 10 are not included here due to their length, please refer to the 2014 WQCP].

Justification:
The 2002 WQCP did not contain any objectives for pesticides in waters not designated MUN. Pesticides can affect aquatic organisms important to the Karuk Tribe, so we propose that the pesticide objectives be expanded to include other beneficial uses. The proposed concentrations are based on the U.S. EPA's National Recommended Water Quality Criteria.

To assess which pesticides are most likely to be present in Karuk waters, we analyzed data from the California Department of Pesticide Regulation's (CDPR) Pesticide Use Reporting database[1]. Data for the years 2001–2010 were summarized by sub-basins of the Klamath Basin according to the total pounds of active ingredient applied. The ten pesticides applied in the highest amounts to the California portions of the Klamath Basin (Oregon is not included in the database) were: (1) Methyl Bromide; (2) Metam-Sodium; (3) Chloropicrin; (4) 1,3-Dichloropropene; (5) Mancozeb; (6) Maleic Hydrazide, Potassium Salt; (7) Chlorothalonil; (8) 2,4-D, Dimethylamine Salt; (9) Glyphosate, Isopropylamine Salt; and (10) Paraquat Dichloride. Additional results are presented in Appendix A.

Other Numeric Water Quality Objectives

Objectives in 2002 WQCP:
The 2002 WQCP includes "Table 2.1 Water Quality Objectives for Aquatic Life & Organism Consumption". This table appears to be based on values from the U.S. EPA (2001) draft proposed rule titled "Federal Water Quality Standards for Indian Country and Other Provisions Regarding Federal Water Quality Standards." The U.S. EPA website[2] notes that the proposed rule was never published in the Federal Register, and is not an official version upon which EPA ever sought public comment.

Proposed objectives:
We propose to replace Table 2.1 with a new Table 9, based on U.S. EPA's current recommended water quality criteria.
[The proposed Table 9 is not included here due to its length, please refer to the 2014 WQCP].

Justification:
The Table 2.1 from the 2002 WQCP was based on now-outdated recommended criteria from U.S. EPA. Our proposed replacement is based on the current version of U.S. EPA's National Recommended Water Quality Criteria. The U.S. EPA recommended criteria are available in several formats. A Human Health Criteria Table and Aquatic Life Criteria Table are available on the U.S. EPA website[3] as separate tables. However, Table 2.1 of the 2002 WQCP combined the Human Health Criteria Table and Aquatic Life Criteria Table into a single table. U.S. EPA does not provide the most current version of its National Recommended Water Quality Criteria as a single table; however, it does provide the 2009 version of the National Recommended Water Quality Criteria as a single table in PDF format (U.S. EPA 2009). Therefore, to maintain consistency with the format of the 2002 WQCP, we extracted the combined table from the PDF version of the 2009 National Recommended Water Quality Criteria and then updated it for carbaryl, the only parameter in Table 9 that U.S. EPA updated in the years 2010-2013 (ammonia and bacteria were also updated in 2010-2013, but those are addressed separately in the 2014 WQCP, not in Table 9). The U.S. EPA table came with many footnotes but for the sake of brevity we only included those footnotes that were relevant to the Karuk WQCP. Footnotes were retained if they explained how to interpret the table but many were generally deleted if they solely explained how EPA derived the values or if they pertained only to saltwater (there is no saltwater within Karuk Trust lands).

[1] http://calpip.cdpr.ca.gov/main.cfm
[2] http://water.epa.gov/scitech/swguidance/standards/wqsregs.cfm
[3] http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm

Temperature

Objectives in 2002 WQCP:

The natural receiving water temperature of intratribal waters shall not be altered unless it can be demonstrated to the satisfaction of the Department of Natural Resources that such alteration in temperature does not adversely affect beneficial uses.

At no time or place shall the temperature of any cold freshwater habitat (COLD) water be increased by more than 5°F above natural receiving water temperature. In order to support beneficial uses and tribal trust resources associated with COLD waters, a maximum temperature of 21°C and a maximum seven-day average of 15.5°C will be applied.

Proposed objectives:

The natural receiving water temperatures shall not be altered unless it can be demonstrated to the satisfaction of the Department of Natural Resources that such alteration in temperature does not adversely affect beneficial uses.

At no time or place shall the temperature of any cold freshwater habitat (COLD) water be increased by more than 5°F above natural receiving water temperature.

The seven-day average of daily maximum (7DADM) ambient water temperatures shall conform to the limits listed in Table 5, year-round. These objectives are for ambient water temperatures that represent the main portion of flow and therefore cannot be solely met by presence of localized cold water refugia.

In addition, in all flowing waterbodies during the September-June period of salmonid spawning and incubation, 7DADM temperatures shall not exceed 13°C (55°F).

Table 5. Year-round water temperature objectives for Tribal waterbodies.

Waterbody	Salmonid Uses During Summer Maximum Temperature Conditions	Ambient Temperature Objective (7DADM[1])
Klamath River	Salmon and trout rearing and migration	18°C (64°F)
Salmon River	Salmon and trout rearing and migration	18°C (64°F)
All other streams	Core cold water rearing[2]	16°C (61°F)

Notes:
1. 7DADM = Seven-day average of daily maximum temperature
2. The use of the phrase "Core cold water rearing" for "All other streams" is not intended to suggest that Klamath and Salmon Rivers lack the potential to provide critically important salmonid rearing habitats during the summer months. The difference in designation here only reflects the understanding that large rivers are naturally expected to be warmer than smaller streams in the summer, due to the longer distance along which the water has been exposed to warming.

Justification:

The proposed objectives are based on U.S. EPA's (2003) Region 10 guidance to states and tribes for establishing temperature water quality standards in the Pacific Northwest.

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Summary of Pesticide Usage in the California Portions of the Klamath Basin 2001-2010

Table 1. Summary of reported pesticide usage in the California portions of the Klamath Basin for the period 2001–2010, by active chemical ingredient (AI) and sub-basin. Chemicals are sorted according to total pounds applied. The top three crops are listed for each chemical. Pesticide usage data are from the California Department of Pesticide Regulation's (CDPR) California Pesticide Use Reporting database (http://calpip.cdpr.ca.gov/main.cfm). Records flagged as outliers by CDPR are excluded. Chemical code/names were not provided for approximately 50% (53,768 of 106,361) of records and so are not included. Use Type and toxicity information for each chemical are from the Pesticide Action Network's (PAN) Pesticide Database (http://www.pesticideinfo.org), except the "salmonid" column which notes pesticides subject to the Washington Toxics Coalition, et al. v. EPA court ruling. Keys to Use Type and toxicity codes are provided in footnotes following the table. The Salmon River sub-basin is not listed in the table because the database shows no records of pesticide use in the sub-basin.

CDPR Chem. Code	Chemical Name	Use Type	Toxicity						Pounds Applied to Top Three Crops	Total (All Sub-Basins) Pounds Applied	Pounds Applied Per Sub-basin (4th-field HUC)							
			Prop 65 Carcinogen	Prop 65 Devel. Tox.	GW Contam.	Salmon Tox.	Acute Aqua. Tox.	Chronic Aquat. Tox.			Butte	Lost	Upper Klam.	Lower Klam.	Shasta	Scott	Trinity	SF Trin.
385	METHYL BROMIDE	Fu, In, He, Ne	N	Y	ID	N	M	Y	Soil Application, Preplant-Outdoor (Seedbeds,Etc.): 4294644 Lbs; Strawberry (All Or Unspec): 105555 Lbs; N-Outdr Grwn Trnsplnt/Prpgtv Mtrl: 75836 Lbs	4,508,923	4,240,321	100,671			167,931			
616	METAM-SODIUM	Fu, He, Fu, Mi, Al	Y	Y	ID	N	VH	Y	Potato (White, Irish, Red, Russet): 2949579 Lbs; Soil Application, Preplant-Outdoor (Seedbeds,Etc.): 339259 Lbs; Uncultivated Agricultural Areas (All Or Unspec): 180444 Lbs	3,528,398	75,692	3,440,853			11,853			
136	CHLOROPICRIN	Fu, Ne	N	N	P	N	VH	Y	Soil Application, Preplant-Outdoor (Seedbeds,Etc.): 2473307 Lbs; Strawberry (All Or Unspec): 55650 Lbs; N-Outdr Grwn Trnsplnt/Prpgtv Mtrl: 37083 Lbs	2,583,903	2,433,645	67,752			82,505			
573	1,3-DICHLOROPROPENE	Fu, Ne	Y	N	K	Y	M	Y	Potato (White, Irish, Red, Russet): 74458 Lbs; Uncultivated Agricultural Areas (All Or Unspec): 50118 Lbs; Soil Application, Preplant-Outdoor (Seedbeds,Etc.): 6707 Lbs	131,994	1,927	129,895			173			
211	MANCOZEB	Fn	Y	N	P	N	H	Y	Potato (White, Irish, Red, Russet): 84860 Lbs; Onion (Dry, Spanish, White, Yellow, Red, Etc.): 42010 Lbs; Wheat, General: 538 Lbs	127,448	11,945	115,417			86			
2130	MALEIC HYDRAZIDE, POTASSIUM SALT	PGR, He	N	N	ID	N	NE	NE	Potato (White, Irish, Red, Russet): 124725 Lbs; Wheat, General: 777 Lbs; Onion (Dry, Spanish, White, Yellow, Red, Etc.): 754 Lbs	126,255	3,980	122,275						
677	CHLOROTHALONIL	Fn	Y	N	P	Y	VH	Y	Potato (White, Irish, Red, Russet): 89292 Lbs; Onion (Dry, Spanish, White, Yellow, Red, Etc.): 21675 Lbs; Strawberry (All Or Unspec): 10227 Lbs	121,541	11,161	109,620			660	28	72	
806	2,4-D, DIMETHYLAMINE SALT	He	N	N	P	N	N	Y	Wheat, General: 52895 Lbs; Barley, General: 38020 Lbs; Oats, General: 6979 Lbs	113,094	4,815	97,373	349		3,642	6,913		2

CDPR Chem. Code	Chemical Name	Use Type	Toxicity						Pounds Applied to Top Three Crops	Total (All Sub-Basins) Pounds Applied	Pounds Applied Per Sub-basin (4th-field HUC)							
			Prop 65 Carcinogen	Prop 65 Devel. Tox.	GW Contam.	Salmon Tox.	Acute Aqua. Tox.	Chronic Aquat. Tox.			Butte	Lost	Upper Klam.	Lower Klam.	Shasta	Scott	Trinity	SF Trin.
1855	GLYPHOSATE, ISOPROPYLAMINE SALT	He	N	N	P	N	M	Y	Forest Trees, Forest Lands (All Or Unspec): 58358 Lbs; Uncultivated Agricultural Areas (All Or Unspec): 11444 Lbs; Onion (Dry, Spanish, White, Yellow, Red, Etc.): 9865 Lbs	102,889	4,600	29,365	5,616	1	5,704	8,639	44,536	4,427
1601	PARAQUAT DICHLORIDE	He	N	N	P	N	M	Y	Alfalfa (Forage - Fodder) (Alfalfa Hay): 77586 Lbs; Mint (All Or Unspec): 16872 Lbs; Pastures (All Or Unspec): 231 Lbs	94,939	8,482	53,881	1,991		13,879	16,706		
1692	METRIBUZIN	He	N	N	P	Y	M	Y	Alfalfa (Forage - Fodder) (Alfalfa Hay): 49333 Lbs; Potato (White, Irish, Red, Russet): 19220 Lbs; Forage - Fodder Grasses (All Or Unspec) (Hay): 1271 Lbs	69,891	8,412	45,488	225		5,019	10,747		
1871	HEXAZINONE	He	N	N	K	N	S	Y	Alfalfa (Forage - Fodder) (Alfalfa Hay): 32954 Lbs; Forest Trees, Forest Lands (All Or Unspec): 29337 Lbs; Mint (All Or Unspec): 30 Lbs	62,353	10,411	11,267	13,701		10,681	13,149	3,143	
104	CAPTAN	Fn	Y	N	ID	Y	H	Y	Strawberry (All Or Unspec): 51405 Lbs; N-Outdr Grwn Trnsplnt/Prpgtv Mtrl: 1674 Lbs; Uncultivated Agricultural Areas (All Or Unspec): 15 Lbs	53,096	47,836	673			4,585		3	
2210	FOSETYL-AL	Fn	N	N	P	N	M	Y	Strawberry (All Or Unspec): 43111 Lbs; Soil Application, Preplant-Outdoor (Seedbeds,Etc.): 625 Lbs; N-Outdr Grwn Trnsplnt/Prpgtv Mtrl: 404 Lbs	44,214	41,358	80			2,770		6	
367	MALATHION	In	N	N	P	Y	H	Y	Onion (Dry, Spanish, White, Yellow, Red, Etc.): 15120 Lbs; Wheat, General: 12404 Lbs; Barley, General: 5227 Lbs	43,286	4,316	38,399			537	33		
216	DIMETHOATE	In	N	N	P	Y	H	Y	Alfalfa (Forage - Fodder) (Alfalfa Hay): 24739 Lbs; Wheat, General: 5356 Lbs; Potato (White, Irish, Red, Russet): 215 Lbs	30,513	1,114	29,207	44		148			
253	CHLORPYRIFOS	In, Ne	N	N	ID	Y	VH	Y	Onion (Dry, Spanish, White, Yellow, Red, Etc.): 14193 Lbs; Alfalfa (Forage - Fodder) (Alfalfa Hay): 10367 Lbs; Forage - Fodder Grasses (All Or Unspec) (Hay): 1551 Lbs	29,481	2,786	20,910			1,418	4,356	11	
445	PROPARGITE	In	Y	Y	ID	Y	H	Y	Mint (All Or Unspec): 25122 Lbs; Strawberry (All Or Unspec): 32 Lbs; N-Outdr Grwn Trnsplnt/Prpgtv Mtrl: 13 Lbs	25,171		25,122			45		4	
151	COPPER HYDROXIDE	Fu, Mi, Ne	N	N	ID	N	H	Y	Strawberry (All Or Unspec): 12608 Lbs; Onion (Dry, Spanish, White, Yellow, Red, Etc.): 5254 Lbs; Potato (White, Irish, Red, Russet): 3456 Lbs	22,341	12,157	8,449			1,642		93	

CDPR Chem. Code	Chemical Name	Use Type	Toxicity						Pounds Applied to Top Three Crops	Total (All Sub-Basins) Pounds Applied	Pounds Applied Per Sub-basin (4th-field HUC)							
			Prop 65 Carcinogen	Prop 65 Devel. Tox.	GW Contam.	Salmon Tox.	Acute Aqua. Tox.	Chronic Aquat. Tox.			Butte	Lost	Upper Klam.	Lower Klam.	Shasta	Scott	Trinity	SF Trin.
1697	METHAMIDOPHOS	In, BP	N	N	P	N	H	Y	Potato (White, Irish, Red, Russet): 20063 Lbs; Research Commodity: 20 Lbs; Alfalfa (Forage - Fodder) (Alfalfa Hay): 11 Lbs	20,094		19,989			104			
2257	IMAZAPYR, ISOPROPYLAMINE SALT	He	N	N	P	N	N	Y	Forest Trees, Forest Lands (All Or Unspec): 19099 Lbs; Aquatic Areas, Water Areas (All Or Unspec): 95 Lbs	19,194	144	95	1,094	6,113	139	699	9,241	1,670
5820	GLYPHOSATE, POTASSIUM SALT	He	N	N	P	N	NE	NE	Onion (Dry, Spanish, White, Yellow, Red, Etc.): 7370 Lbs; Alfalfa (Forage - Fodder) (Alfalfa Hay): 4130 Lbs; Uncultivated Agricultural Areas (All Or Unspec): 1878 Lbs	18,772	2,942	15,392	138		295	6		
786	MCPA, DIMETHYLAMINE SALT	He	N	N	P	N	N	Y	Wheat, General: 12820 Lbs; Barley, General: 2216 Lbs; Alfalfa (Forage - Fodder) (Alfalfa Hay): 954 Lbs	17,846	308	16,785			487	267		
2170	TRICLOPYR, BUTOXYETHYL ESTER	He	N	N	P	Y	M	Y	Forest Trees, Forest Lands (All Or Unspec): 17284 Lbs; Ornamental Turf (All Or Unspec): 10 Lbs; Farm Or Ag Structures And Equip. (All Or Unspec): 3 Lbs	17,297	572		171	11,556	1,089	26	3,192	691
560	SULFUR	Fu, In	N	N	ID	N	N	Y	Strawberry (All Or Unspec): 8789 Lbs; Grapes: 5101 Lbs; Grapes, Wine: 1279 Lbs	16,018	8,313	1,031		883	147		4,321	1,323
231	DIURON	He	Y	N	K	Y	M	Y	Mint (All Or Unspec): 11803 Lbs; Alfalfa (Forage - Fodder) (Alfalfa Hay): 4046 Lbs; Farm Or Ag Structures And Equip. (All Or Unspec): 3 Lbs	15,852	1,980	11,843	76		416	1,538		
45	ATRAZINE	He	N	N	K	N	H	Y	Forest Trees, Forest Lands (All Or Unspec): 15807 Lbs	15,807			938	13,544	158	1,107	59	
1910	OXAMYL	In, Ne	N	N	ID	N	M	Y	Potato (White, Irish, Red, Russet): 9073 Lbs; Onion (Dry, Spanish, White, Yellow, Red, Etc.): 5668 Lbs	14,742	467	14,275						
1929	PENDIMETHALIN	He	N	N	ID	Y	M	Y	Onion (Dry, Spanish, White, Yellow, Red, Etc.): 7516 Lbs; Potato (White, Irish, Red, Russet): 5141 Lbs; Alfalfa (Forage - Fodder) (Alfalfa Hay): 711 Lbs	13,435	1,091	11,567			132	645		
230	DISULFOTON	In, Ne	N	N	P	Y	VH	Y	Barley, General: 9214 Lbs; Wheat, General: 3728 Lbs; Research Commodity: 36 Lbs	13,013		13,013						
5790	BOSCALID	Fn	N	N	ID	N	NE	NE	Potato (White, Irish, Red, Russet): 8320 Lbs; Strawberry (All Or Unspec): 3832 Lbs; Onion (Dry, Spanish, White, Yellow, Red, Etc.): 490 Lbs	12,646	3,831	8,758			57			

CDPR Chem. Code	Chemical Name	Use Type	Toxicity						Pounds Applied to Top Three Crops	Total (All Sub-Basins) Pounds Applied	Pounds Applied Per Sub-basin (4th-field HUC)							
			Prop 65 Carcinogen	Prop 65 Devel. Tox.	GW Contam.	Salmon Tox.	Acute Aqua. Tox.	Chronic Aquat. Tox.			Butte	Lost	Upper Klam.	Lower Klam.	Shasta	Scott	Trinity	SF Trin.
229	DIQUAT DIBROMIDE	He, De	N	N	P	N	M	Y	Potato (White, Irish, Red, Russet): 12392 Lbs; Landscape Maintenance: 29 Lbs; N-Grnhs Grwn Plants In Containers: 8 Lbs	12,430	114	12,279				37		0
1944	BENTAZON, SODIUM SALT	He	N	N	K	N	NE	NE	Mint (All Or Unspec): 12367 Lbs	12,367		12,367						
849	DICAMBA, DIMETHYLAMINE SALT	He	N	N	P	N	N	Y	Wheat, General: 8039 Lbs; Barley, General: 2407 Lbs; Pastures (All Or Unspec): 501 Lbs	12,321	547	11,237	31		321	186		
809	2,4-D, ISOOCTYL ESTER	He	N	N	P	N	M	Y	Oats, General: 23 Lbs; Uncultivated Agricultural Areas (All Or Unspec): 20 Lbs; Forage - Fodder Grasses (All Or Unspec) (Hay): 18 Lbs	12,025	569		72	8,181	1,709	1,102	213	179
1685	ACEPHATE	In	N	N	P	N	S	Y	Mint (All Or Unspec): 11792 Lbs; N-Outdr Grwn Cut Flwrs Or Greens: 12 Lbs; N-Grnhs Grwn Cut Flwrs Or Greens: 6 Lbs	11,814		11,792			1	1	19	
4011	MEFENOXAM	Fn	N	N	P	N	S	Y	Strawberry (All Or Unspec): 5895 Lbs; Potato (White, Irish, Red, Russet): 4930 Lbs; Onion (Dry, Spanish, White, Yellow, Red, Etc.): 468 Lbs	11,326	5,539	5,549			238			
155	COPPER SALTS OF FATTY AND ROSIN ACIDS	Fn	N	N	ID	N	H	Y	Strawberry (All Or Unspec): 10451 Lbs; Soil Application, Preplant-Outdoor (Seedbeds,Etc.): 122 Lbs; N-Outdr Grwn Trnsplnt/Prpgtv Mtrl: 7 Lbs	10,580	9,789				791			
1622	2,4-D, 2-ETHYLHEXYL ESTER	He	N	N	P	N	M	Y	Forest Trees, Forest Lands (All Or Unspec): 3329 Lbs; Wheat, General: 2373 Lbs; Barley, General: 904 Lbs	8,619	461	607	274	1,450	3,212	1,721	828	64
4037	AZOXYSTROBIN	Fn	N	N	P	N	H	Y	Potato (White, Irish, Red, Russet): 4779 Lbs; Strawberry (All Or Unspec): 1710 Lbs; Onion (Dry, Spanish, White, Yellow, Red, Etc.): 1087 Lbs	8,590	1,912	6,569			98		10	
838	4(2,4-DB), DIMETHYLAMINE SALT	He	N	N	P	N	M	Y	Alfalfa (Forage - Fodder) (Alfalfa Hay): 7254 Lbs; Forage - Fodder Grasses (All Or Unspec) (Hay): 632 Lbs; Clover (All Or Unspec) (Forage - Fodder): 82 Lbs	7,968	2,620	3,859	79		307	1,103		
1930	DIFENZOQUAT METHYL SULFATE	?	?	?	?	N	?	?	Wheat, General: 3711 Lbs; Barley, General: 3262 Lbs; Potato (White, Irish, Red, Russet): 41 Lbs	7,013		7,013						
259	ENDOSULFAN	In	N	N	ID	N	VH	Y	Strawberry (All Or Unspec): 6354 Lbs	6,354	6,115				240			
1973	OXYFLUORFEN	He	N	N	ID	N	VH	Y	Onion (Dry, Spanish, White, Yellow, Red, Etc.): 5115 Lbs; Mint (All Or Unspec): 845 Lbs; Grapes, Wine: 23 Lbs	6,010	250	5,719			17			23

CDPR Chem. Code	Chemical Name	Use Type	Toxicity						Pounds Applied to Top Three Crops	Total (All Sub-Basins) Pounds Applied	Pounds Applied Per Sub-basin (4th-field HUC)							
			Prop 65 Carcinogen	Prop 65 Devel. Tox.	GW Contam.	Salmon Tox.	Acute Aqua. Tox.	Chronic Aquat. Tox.			Butte	Lost	Upper Klam.	Lower Klam.	Shasta	Scott	Trinity	SF Trin.
802	2,4-D, BUTOXYETHANOL ESTER	He	N	N	P	N	M	Y	Forest Trees, Forest Lands (All Or Unspec): 151 Lbs; Alfalfa (Forage - Fodder) (Alfalfa Hay): 125 Lbs; Pastures (All Or Unspec): 117 Lbs	5,152	319	3,559	296		927	51		
2305	FLUTOLANIL	Fn	N	N	P	N	M	Y	Potato (White, Irish, Red, Russet): 4034 Lbs	4,034		4,034						
1696	THIOPHANATE-METHYL	Fn	N	N	P	N	S	Y	Strawberry (All Or Unspec): 3624 Lbs; N-Outdr Grwn Cut Flwrs Or Greens: 24 Lbs; Potato (White, Irish, Red, Russet): 12 Lbs	3,666	3,624				12	6	24	
5815	FLUAZIFOP-P-BUTYL	He	N	N	ID	N	NE	NE	Onion (Dry, Spanish, White, Yellow, Red, Etc.): 3254 Lbs; Uncultivated Agricultural Areas (All Or Unspec): 12 Lbs; Barley, General: 10 Lbs	3,277	103	3,174						
5759	PYRACLOSTROBIN	Fn	N	N	P	N	NE	NE	Strawberry (All Or Unspec): 2223 Lbs; Wheat, General: 698 Lbs; Potato (White, Irish, Red, Russet): 176 Lbs	3,159	2,169	953			36			
4000	CYPRODINIL	Fn	N	N	P	N	H	Y	Strawberry (All Or Unspec): 3015 Lbs; Raspberry (All Or Unspec): 5 Lbs	3,020	2,974	27			18			
383	METHOMYL	In, BP	N	N	P	Y	H	Y	Onion (Dry, Spanish, White, Yellow, Red, Etc.): 2651 Lbs; Mint (All Or Unspec): 248 Lbs; Forage - Fodder Grasses (All Or Unspec) (Hay): 52 Lbs	3,019	26	2,993						
2081	IPRODIONE	Fn	Y	N	P	N	H	Y	Onion (Dry, Spanish, White, Yellow, Red, Etc.): 1346 Lbs; Strawberry (All Or Unspec): 901 Lbs; Potato (White, Irish, Red, Russet): 689 Lbs	2,963	353	2,035			555	18	3	
2008	PERMETHRIN	In	N	N	ID	N	VH	Y	Potato (White, Irish, Red, Russet): 2150 Lbs; Onion (Dry, Spanish, White, Yellow, Red, Etc.): 645 Lbs; Alfalfa (Forage - Fodder) (Alfalfa Hay): 73 Lbs	2,887	0	2,865			8		14	
834	BROMOXYNIL OCTANOATE	He	N	Y	P	Y	VH	Y	Mint (All Or Unspec): 1094 Lbs; Onion (Dry, Spanish, White, Yellow, Red, Etc.): 946 Lbs; Alfalfa (Forage - Fodder) (Alfalfa Hay): 431 Lbs	2,821	299	2,082	49		328	63		
105	CARBARYL	In, PGR, Ne	Y	Y	P	Y	H	Y	Strawberry (All Or Unspec): 1553 Lbs; Pastures (All Or Unspec): 710 Lbs; Potato (White, Irish, Red, Russet): 289 Lbs	2,774	1,553	289			514	413	5	
4002	CYMOXANIL	Fn	N	N	ID	N	S	Y	Potato (White, Irish, Red, Russet): 2699 Lbs; Onion (Dry, Spanish, White, Yellow, Red, Etc.): 28 Lbs; Barley, General: 9 Lbs	2,745	166	2,578						

CDPR Chem. Code	Chemical Name	Use Type	Toxicity						Pounds Applied to Top Three Crops	Total (All Sub-Basins) Pounds Applied	Pounds Applied Per Sub-basin (4th-field HUC)							
			Prop 65 Carcinogen	Prop 65 Devel. Tox.	GW Contam.	Salmon Tox.	Acute Aqua. Tox.	Chronic Aquat. Tox.			Butte	Lost	Upper Klam.	Lower Klam.	Shasta	Scott	Trinity	SF Trin.
5123	FENOXAPROP-P-ETHYL	He	N	N	ID	N	NE	NE	Wheat, General: 2170 Lbs; Barley, General: 472 Lbs; Uncultivated Agricultural Areas (All Or Unspec): 6 Lbs	2,647		2,647						
765	PETROLEUM OIL, UNCLASSIFIED	In, He, Fu, Ad	N	N	ID	N	NE	NE	Peach: 1386 Lbs; Apple: 528 Lbs; Pear: 287 Lbs	2,593					2,143		450	
597	TRIFLURALIN	He	N	N	ID	Y	H	Y	Alfalfa (Forage - Fodder) (Alfalfa Hay): 2559 Lbs; Pastures (All Or Unspec): 8 Lbs	2,566					1,157	1,409		
2223	CYFLUTHRIN	In	N	N	ID	N	VH	Y	Alfalfa (Forage - Fodder) (Alfalfa Hay): 2077 Lbs; Potato (White, Irish, Red, Russet): 374 Lbs; Forage - Fodder Grasses (All Or Unspec) (Hay): 38 Lbs	2,502	187	1,245	15		282	773	0	
636	2,4-D	He, PGR	N	N	P	Y	VH	Y	Wheat, General: 1447 Lbs; Barley, General: 357 Lbs; Uncultivated Agricultural Areas (All Or Unspec): 307 Lbs	2,472	298	2,005	74		20	76		
404	ETHOPROP	In, Ne	Y	N	P	Y	VH	Y	Mint (All Or Unspec): 2198 Lbs	2,198		2,198						
346	DICOFOL	In	N	N	ID	N	H	Y	Mint (All Or Unspec): 1102 Lbs; Strawberry (All Or Unspec): 958 Lbs	2,060	882	1,102			76			
5766	POTASSIUM PHOSPHITE	Fn	N	N	ID	N	NE	NE	Potato (White, Irish, Red, Russet): 1705 Lbs; Strawberry (All Or Unspec): 321 Lbs	2,026	1,087	939						
5027	FLUDIOXONIL	Fn	N	N	P	N	NE	Y	Strawberry (All Or Unspec): 2010 Lbs; Raspberry (All Or Unspec): 3 Lbs; Potato (White, Irish, Red, Russet): 0 Lbs	2,013	1,983	18			12			
1794	HYDROGEN PEROXIDE	Mi, Fu, He, Ro	N	N	ID	N	S	Y	N-Grnhs Grwn Plants In Containers: 1969 Lbs; Landscape Maintenance: 12 Lbs; Strawberry (All Or Unspec): 11 Lbs	1,992	11					1,981		
3566	CLETHODIM	He	N	N	P	N	S	Y	Mint (All Or Unspec): 743 Lbs; Alfalfa (Forage - Fodder) (Alfalfa Hay): 344 Lbs; Potato (White, Irish, Red, Russet): 244 Lbs	1,458	78	1,340			5	35		
5657	BIFENAZATE	In	N	N	P	N	H	Y	Mint (All Or Unspec): 864 Lbs; Strawberry (All Or Unspec): 333 Lbs; Potato (White, Irish, Red, Russet): 32 Lbs	1,240	310	896			23		11	
3835	RIMSULFURON	He	N	N	P	N	N	Y	Potato (White, Irish, Red, Russet): 1162 Lbs; Wheat, General: 2 Lbs; Barley, General: 0 Lbs	1,164	36	1,126			2			

CDPR Chem. Code	Chemical Name	Use Type	Toxicity						Pounds Applied to Top Three Crops	Total (All Sub-Basins) Pounds Applied	Pounds Applied Per Sub-basin (4th-field HUC)							
			Prop 65 Carcinogen	Prop 65 Devel. Tox.	GW Contam.	Salmon Tox.	Acute Aqua. Tox.	Chronic Aquat. Tox.			Butte	Lost	Upper Klam.	Lower Klam.	Shasta	Scott	Trinity	SF Trin.
90104	CAPTAN, OTHER RELATED	Fn	N	N	ID	N	NE	NE	Strawberry (All Or Unspec): 1114 Lbs; N-Outdr Grwn Trnsplnt/Prpgtv Mtrl: 36 Lbs; Uncultivated Agricultural Areas (All Or Unspec): 0 Lbs	1,151	1,039	13			99		0	
3946	GLUFOSINATE-AMMONIUM	He	N	N	P	N	S	Y	Potato (White, Irish, Red, Russet): 1140 Lbs; Landscape Maintenance: 0 Lbs	1,140		1,140				0		
2997	GLYPHOSATE	He	N	N	P	N	M	Y	Uncultivated Agricultural Areas (All Or Unspec): 562 Lbs; Corn (Forage - Fodder): 230 Lbs; Alfalfa (Forage - Fodder) (Alfalfa Hay): 171 Lbs	1,076			266		401	410		
5757	IMAZAMOX, AMMONIUM SALT	He	N	N	P	N	NE	NE	Alfalfa (Forage - Fodder) (Alfalfa Hay): 987 Lbs; Wheat, General: 27 Lbs; Forage - Fodder Grasses (All Or Unspec) (Hay): 22 Lbs	1,036	266	473	3		84	210		
5919	DIMETHENAMID-P	He	N	N	P	N	M	Y	Onion (Dry, Spanish, White, Yellow, Red, Etc.): 655 Lbs; Potato (White, Irish, Red, Russet): 346 Lbs	1,001	18	984						
2245	MYCLOBUTANIL	Fn	N	Y	ID	N	H	Y	Strawberry (All Or Unspec): 920 Lbs; N-Outdr Grwn Trnsplnt/Prpgtv Mtrl: 63 Lbs; N-Outdr Grwn Cut Flwrs Or Greens: 4 Lbs	990	768	33			183		6	
5331	INDOXACARB	In	N	N	ID	N	VH	Y	Potato (White, Irish, Red, Russet): 864 Lbs; Mint (All Or Unspec): 99 Lbs; Alfalfa (Forage - Fodder) (Alfalfa Hay): 12 Lbs	976		976						
358	LIME-SULFUR	In, Fu	N	N	ID	N	M	Y	Grapes: 414 Lbs; Peach: 348 Lbs; Apple: 115 Lbs	964				50	391		523	
5050	CLOPYRALID, MONOETHANOLAMINE SALT	He	N	N	P	N	N	Y	Mint (All Or Unspec): 306 Lbs; Rangeland (All Or Unspec): 224 Lbs; Pastures (All Or Unspec): 215 Lbs	950	22	309		0	141	278	111	90
5878	FAMOXADONE	Fn	N	N	ID	N	NE	NE	Potato (White, Irish, Red, Russet): 837 Lbs; Onion (Dry, Spanish, White, Yellow, Red, Etc.): 28 Lbs	865	28	837						
5972	GLYPHOSATE, DIMETHYLAMINE SALT	He	N	N	ID	N	NE	NE	Forest Trees, Forest Lands (All Or Unspec): 858 Lbs	858							858	
2234	FENPROPATHRIN	In	N	N	ID	N	VH	Y	Strawberry (All Or Unspec): 771 Lbs	771	758				13			
2297	LAMBDA-CYHALOTHRIN	In	N	N	ID	N	VH	Y	Onion (Dry, Spanish, White, Yellow, Red, Etc.): 681 Lbs; Alfalfa (Forage - Fodder) (Alfalfa Hay): 58 Lbs; Potato (White, Irish, Red, Russet): 16 Lbs	770	109	656			5	0		

CDPR Chem. Code	Chemical Name	Use Type	Toxicity						Pounds Applied to Top Three Crops	Total (All Sub-Basins) Pounds Applied	Pounds Applied Per Sub-basin (4th-field HUC)							
			Prop 65 Carcinogen	Prop 65 Devel. Tox.	GW Contam.	Salmon Tox.	Acute Aqua. Tox.	Chronic Aquat. Tox.			Butte	Lost	Upper Klam.	Lower Klam.	Shasta	Scott	Trinity	SF Trin.
3850	TEBUCONAZOLE	Fn	N	N	P	N	H	Y	Onion (Dry, Spanish, White, Yellow, Red, Etc.): 744 Lbs; Grasses Grown For Seed (All Or Unspec): 18 Lbs; Grapes: 3 Lbs	765		762					3	
3983	SPINOSAD	In	N	N	ID	N	H	Y	Onion (Dry, Spanish, White, Yellow, Red, Etc.): 724 Lbs; Strawberry (All Or Unspec): 28 Lbs; Potato (White, Irish, Red, Russet): 5 Lbs	762	28	730			4	0		
264	EPTC	He	N	Y	P	N	S	Y	Potato (White, Irish, Red, Russet): 747 Lbs	747		399			348			
5829	BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN ABTS-351, FERMENTATION SOLIDS AND SOLUBLES	In	N	N	ID	N	NE	NE	Mint (All Or Unspec): 622 Lbs; Potato (White, Irish, Red, Russet): 84 Lbs; N-Outdr Grwn Cut Flwrs Or Greens: 15 Lbs	728		707					21	
3956	BETA-CYFLUTHRIN	In	N	N	ID	N	NE	NE	Alfalfa (Forage - Fodder) (Alfalfa Hay): 644 Lbs; Potato (White, Irish, Red, Russet): 37 Lbs; Pastures (All Or Unspec): 17 Lbs	703	58	155	17		99	374		
3849	IMIDACLOPRID	In	N	N	P	N	VH	Y	Potato (White, Irish, Red, Russet): 519 Lbs; Strawberry (All Or Unspec): 148 Lbs; Ornamental Turf (All Or Unspec): 6 Lbs	676	141	519			13	0	2	0
2276	PROPICONAZOLE	Fn	N	N	P	N	M	Y	Wheat, General: 522 Lbs; Strawberry (All Or Unspec): 107 Lbs; Barley, General: 42 Lbs	671	107	564					0	
2177	SETHOXYDIM	He	N	N	P	N	M	Y	Potato (White, Irish, Red, Russet): 428 Lbs; Mint (All Or Unspec): 156 Lbs; Onion (Dry, Spanish, White, Yellow, Red, Etc.): 34 Lbs	657	35	605			4	14		
401	MINERAL OIL	In, Ad	N	N	ID	N	N	Y	Grapes: 421 Lbs; Peach: 94 Lbs; Apple: 42 Lbs	602				421	181			
1552	BENOMYL	?	?	?	?	N	?	?	Strawberry (All Or Unspec): 548 Lbs; N-Outdr Grwn Trnsplnt/Prpgtv Mtrl: 38 Lbs; Peach: 0 Lbs	586	514				72		0	
1626	ETHEPHON	PGR	N	N	ID	N	N	Y	Wheat, General: 291 Lbs; Barley, General: 279 Lbs	570		570						
3939	PYRIDATE	?	?	?	?	N	?	?	Mint (All Or Unspec): 559 Lbs; Potato (White, Irish, Red, Russet): 6 Lbs	565		565						
5791	FENAMIDONE	Fn	N	N	P	N	NE	NE	Onion (Dry, Spanish, White, Yellow, Red, Etc.): 537 Lbs	537	41	496						

CDPR Chem. Code	Chemical Name	Use Type	Toxicity						Pounds Applied to Top Three Crops	Total (All Sub-Basins) Pounds Applied	Pounds Applied Per Sub-basin (4th-field HUC)							
			Prop 65 Carcinogen	Prop 65 Devel. Tox.	GW Contam.	Salmon Tox.	Acute Aqua. Tox.	Chronic Aquat. Tox.			Butte	Lost	Upper Klam.	Lower Klam.	Shasta	Scott	Trinity	SF Trin.
5321	TRIFLOXYSTROBIN	Fn	N	N	ID	N	S	Y	Wheat, General: 502 Lbs; N-Outdr Grwn Cut Flwrs Or Greens: 11 Lbs; N-Grnhs Grwn Cut Flwrs Or Greens: 1 Lbs	514		502					12	
5036	BROMOXYNIL HEPTANOATE	He	N	N	P	Y	VH	Y	Mint (All Or Unspec): 308 Lbs; Alfalfa (Forage - Fodder) (Alfalfa Hay): 46 Lbs; Onion (Dry, Spanish, White, Yellow, Red, Etc.): 31 Lbs	446	39	346			37	24		
5946	SPINETORAM	In	N	N	P	N	NE	NE	Onion (Dry, Spanish, White, Yellow, Red, Etc.): 432 Lbs; Strawberry (All Or Unspec): 5 Lbs	437	5	432						
2034	DICLOFOP-METHYL	?	?	?	?	N	?	?	Wheat, General: 297 Lbs; Barley, General: 131 Lbs	428		428						
5007	DIGLYCOLAMINE SALT OF 3,6-DICHLORO-O-ANISIC ACID	He	N	N	P	N	N	Y	Barley, General: 329 Lbs; Wheat, General: 44 Lbs; Oats, General: 19 Lbs	405	9	396						
2240	IMAZAMETHABENZ	He	N	N	ID	N	N	Y	Barley, General: 223 Lbs; Wheat, General: 172 Lbs	396		396						
5232	PYMETROZINE	In	Y	N	P	N	NE	NE	Potato (White, Irish, Red, Russet): 355 Lbs; N-Outdr Grwn Cut Flwrs Or Greens: 19 Lbs; N-Grnhs Grwn Cut Flwrs Or Greens: 0 Lbs	374		355					19	
90045	ATRAZINE, OTHER RELATED	He	N	N	ID	N	NE	NE	Forest Trees, Forest Lands (All Or Unspec): 329 Lbs	329			19	284	3	22	1	
464	PCNB	Fu, Ne, Al	N	N	ID	N	VH	Y	Potato (White, Irish, Red, Russet): 307 Lbs	307		307						
2106	PETROLEUM DISTILLATES, REFINED	In	N	N	ID	N	NE	NE	Grapes: 276 Lbs	276							276	
2149	SULFOMETURON-METHYL	He	N	N	P	N	S	Y	Forest Trees, Forest Lands (All Or Unspec): 266 Lbs; Rights Of Way: 10 Lbs	276			38	198	10			30
94011	MEFENOXAM, OTHER RELATED	Fn	N	N	ID	N	NE	NE	Strawberry (All Or Unspec): 128 Lbs; Potato (White, Irish, Red, Russet): 95 Lbs; Onion (Dry, Spanish, White, Yellow, Red, Etc.): 8 Lbs	232	121	104			7			
626	ZINC PHOSPHIDE	Ro	N	N	ID	N	NE	NE	Alfalfa (Forage - Fodder) (Alfalfa Hay): 197 Lbs; Potato (White, Irish, Red, Russet): 11 Lbs; Forage - Fodder Grasses (All Or Unspec) (Hay): 8 Lbs	227		51				175		
2019	NORFLURAZON	He	N	N	K	N	M	Y	Alfalfa (Forage - Fodder) (Alfalfa Hay): 224 Lbs	224					16	209		

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			Prop 65 Carcinogen	Prop 65 Devel. Tox.	GW Contam.	Salmon Tox.	Acute Aqua. Tox.	Chronic Aquat. Tox.			Butte	Lost	Upper Klam.	Lower Klam.	Shasta	Scott	Trinity	SF Trin.
106	CARBOFURAN	In, Ne	N	N	P	Y	H	Y	Alfalfa (Forage - Fodder) (Alfalfa Hay): 223 Lbs	223	223							
1868	ORYZALIN	He	Y	N	P	N	H	Y	Landscape Maintenance: 131 Lbs; N-Grnhs Grwn Plants In Containers: 76 Lbs; Ornamental Turf (All Or Unspec): 4 Lbs	211					4	207		
2341	IMAZETHAPYR, AMMONIUM SALT	He	N	N	P	N	NE	NE	Alfalfa (Forage - Fodder) (Alfalfa Hay): 190 Lbs	190	47	121			1	21		
5928	AMINOPYRALID, TRIISOPROPANOLAMINE SALT	He	N	N	ID	N	NE	NE	Pastures (All Or Unspec): 77 Lbs; Rangeland (All Or Unspec): 61 Lbs; Uncultivated Agricultural Areas (All Or Unspec): 16 Lbs	174	4		16		78	42	1	34
5864	PYRIMETHANIL	Fn	N	N	ID	N	NE	NE	Onion (Dry, Spanish, White, Yellow, Red, Etc.): 167 Lbs	167		167						
2340	IMAZETHAPYR	?	?	?	?	N	?	?	Alfalfa (Forage - Fodder) (Alfalfa Hay): 159 Lbs; Uncultivated Agricultural Areas (All Or Unspec): 3 Lbs; Oats, General: 1 Lbs	164	39	108			3	13		
5802	FLUMIOXAZIN	He	N	N	ID	N	NE	Y	Mint (All Or Unspec): 155 Lbs; Alfalfa (Forage - Fodder) (Alfalfa Hay): 4 Lbs; Potato (White, Irish, Red, Russet): 1 Lbs	160		156			4			
156	COPPER OXYCHLORIDE	Fn	N	N	ID	N	VH	Y	Peach: 95 Lbs; Nectarine: 27 Lbs; Apple: 13 Lbs	153					153			
658	MANGANESE SULFATE		N	N	ID	N	H	Y	Potato (White, Irish, Red, Russet): 125 Lbs; Onion (Dry, Spanish, White, Yellow, Red, Etc.): 8 Lbs	133		133						
5333	MCPP-P, DIMETHYLAMINE SALT	He	N	N	ID	N	NE	Y	Ornamental Turf (All Or Unspec): 117 Lbs	117					117			
5761	HARPIN PROTEIN	Fu, Ne, PGR	N	N	ID	N	NE	NE	Strawberry (All Or Unspec): 105 Lbs; N-Outdr Grwn Trnsplnt/Prpgtv Mtrl: 4 Lbs; Soil Application, Preplant-Outdoor (Seedbeds,Etc.): 1 Lbs	110	99				11			
5037	POTASSIUM BICARBONATE	Fn	N	N	ID	N	NE	Y	N-Outdr Grwn Trnsplnt/Prpgtv Mtrl: 59 Lbs; Grapes: 20 Lbs	79.5				20.5	59.0			
5858	SPIROMESIFEN	In	N	N	ID	N	NE	NE	Potato (White, Irish, Red, Russet): 61 Lbs; Strawberry (All Or Unspec): 12 Lbs	72.8	11.3	60.8			0.7			
5457	TRALKOXYDIM	He	N	N	P	N	NE	Y	Wheat, General: 54 Lbs; Barley, General: 18 Lbs	72.2		72.2						

CDPR Chem. Code	Chemical Name	Use Type	Toxicity						Pounds Applied to Top Three Crops	Total (All Sub-Basins) Pounds Applied	Pounds Applied Per Sub-basin (4th-field HUC)							
			Prop 65 Carcinogen	Prop 65 Devel. Tox.	GW Contam.	Salmon Tox.	Acute Aqua. Tox.	Chronic Aquat. Tox.			Butte	Lost	Upper Klam.	Lower Klam.	Shasta	Scott	Trinity	SF Trin.
90849	DICAMBA, DIMETHYLAMINE SALT, OTHER RELATED	He	N	N	ID	N	NE	NE	Barley, General: 32 Lbs; Wheat, General: 21 Lbs; Oats, General: 10 Lbs	69.5		65.7			3.7			
5447	QST 713 STRAIN OF DRIED BACILLUS SUBTILIS	Fn	N	N	ID	N	NE	NE	Potato (White, Irish, Red, Russet): 47 Lbs; Onion (Dry, Spanish, White, Yellow, Red, Etc.): 21 Lbs	68.1		68.1						
3551	COPPER ETHANOLAMINE COMPLEXES, MIXED	Al	N	N	ID	N	NE	Y	Aquatic Areas, Water Areas (All Or Unspec): 66 Lbs	65.9			37.7			28.2		
2822	POLYACRYLAMIDE, POLYETHYLENE GLYCOL MIXTURE	Ad	N	N	ID	N	NE	NE	Potato (White, Irish, Red, Russet): 14 Lbs; Onion (Dry, Spanish, White, Yellow, Red, Etc.): 14 Lbs; Alfalfa (Forage - Fodder) (Alfalfa Hay): 12 Lbs	62.7	4.9	57.8						
4023	BACILLUS THURINGIENSIS, SUBSP. KURSTAKI, STRAIN HD-1	In	N	N	ID	N	NE	NE	Potato (White, Irish, Red, Russet): 46 Lbs; Peach: 12 Lbs; Nectarine: 2 Lbs	62.2		46.3			15.9			
531	SIMAZINE	He	N	N	K	N	H	Y	Forest Trees, Forest Lands (All Or Unspec): 60 Lbs	60.1			60.1					
484	ALUMINUM PHOSPHIDE	Fu, Fu	N	N	ID	N	NE	Y	Feed/Food Storage Areas (Unspecified): 51 Lbs; Wheat, General: 7 Lbs	57.4			50.8		6.6			
79	BORAX	In, He	N	N	ID	N	N	Y	Forest Trees, Forest Lands (All Or Unspec): 45 Lbs; Strawberry (All Or Unspec): 9 Lbs; Raspberry (All Or Unspec): 0 Lbs	54.5	9.5	45.0						
5964	CHLORANTRANILIPROLE	In	N	N	P	N	NE	NE	Mint (All Or Unspec): 51 Lbs	51.4		51.4						
5810	GLYPHOSATE, DIAMMONIUM SALT	He	N	N	P	N	NE	NE	N-Outdr Grwn Cut Flwrs Or Greens: 45 Lbs; N-Grnhs Grwn Cut Flwrs Or Greens: 1 Lbs	46.1							46.1	
2131	TRICLOPYR, TRIETHYLAMINE SALT	He	N	N	P	N	N	Y	Forest Trees, Forest Lands (All Or Unspec): 30 Lbs; Pastures (All Or Unspec): 8 Lbs; Rights Of Way: 4 Lbs	41.8			8.4	5.2		7.8	20.3	
473	PETROLEUM HYDROCARBONS	?	?	?	?	N	?	?	Alfalfa (Forage - Fodder) (Alfalfa Hay): 41 Lbs	41.1		34.1			7.0			

CDPR Chem. Code	Chemical Name	Use Type	Toxicity						Pounds Applied to Top Three Crops	Total (All Sub-Basins) Pounds Applied	Pounds Applied Per Sub-basin (4th-field HUC)							
			Prop 65 Carcinogen	Prop 65 Devel. Tox.	GW Contam.	Salmon Tox.	Acute Aqua. Tox.	Chronic Aquat. Tox.			Butte	Lost	Upper Klam.	Lower Klam.	Shasta	Scott	Trinity	SF Trin.
5762	ACETAMIPRID	In	N	N	P	N	VH	Y	Onion (Dry, Spanish, White, Yellow, Red, Etc.): 39 Lbs	39.1		39.1						
2132	METALAXYL	Fn	N	N	P	N	S	Y	Strawberry (All Or Unspec): 28 Lbs; Potato (White, Irish, Red, Russet): 4 Lbs	32.4	28.2	4.2						
2321	ESFENVALERATE	In	N	N	ID	N	VH	Y	Potato (White, Irish, Red, Russet): 23 Lbs; Peas, General: 6 Lbs; Forest Trees, Forest Lands (All Or Unspec): 1 Lbs	30.1		29.4				0.0	0.7	
162	COPPER SULFATE (BASIC)	Fu, Al, Mo	N	N	ID	N	M	Y	Peach: 18 Lbs; Nectarine: 5 Lbs; Apple: 2 Lbs	29.1					29.1			
2143	CHLORSULFURON	He	N	Y	P	N	S	Y	Pastures (All Or Unspec): 18 Lbs; Rangeland (All Or Unspec): 7 Lbs; Uncultivated Agricultural Areas (All Or Unspec): 2 Lbs	26.9		14.0			0.6	12.3		
5538	2,4-D, TRIISOPROPANOLAMINE SALT	He	N	N	P	N	NE	NE	Barley (Forage - Fodder): 26 Lbs	25.8					25.8			
3979	CLARIFIED HYDROPHOBIC EXTRACT OF NEEM OIL	In	N	N	ID	N	M	Y	Onion (Dry, Spanish, White, Yellow, Red, Etc.): 24 Lbs	23.5		23.5						
5787	QUINOXYFEN	Fn	N	N	ID	N	NE	NE	Strawberry (All Or Unspec): 21 Lbs	21.4	21.2				0.2			
335	PHOSMET	In	N	N	P	N	VH	Y	Pear: 10 Lbs; Apple: 10 Lbs	20.3					2.1		18.2	
3857	BACILLUS THURINGIENSIS (BERLINER), SUBSP. ISRAELENSIS, SEROTYPE H-14	In	N	N	ID	N	NE	NE	N-Outdr Grwn Cut Flwrs Or Greens: 20 Lbs	19.7							19.7	
5130	CARFENTRAZONE-ETHYL	He	N	N	ID	N	M	Y	Wheat (Forage - Fodder): 8 Lbs; Barley, General: 6 Lbs; Wheat, General: 3 Lbs	18.8			3.0		13.9	1.9		
394	METHYL PARATHION	In, Ne	N	N	P	Y	VH	Y	Onion (Dry, Spanish, White, Yellow, Red, Etc.): 19 Lbs	18.8		18.8						
554	STRYCHNINE	Ro, Av	N	N	ID	N	M	Y	Alfalfa (Forage - Fodder) (Alfalfa Hay): 12 Lbs; Forest Trees, Forest Lands (All Or Unspec): 2 Lbs; Pastures (All Or Unspec): 2 Lbs	18.4	2.6	3.1	1.4		7.4	4.0		

CDPR Chem. Code	Chemical Name	Use Type	Toxicity						Pounds Applied to Top Three Crops	Total (All Sub-Basins) Pounds Applied	Pounds Applied Per Sub-basin (4th-field HUC)							
			Prop 65 Carcinogen	Prop 65 Devel. Tox.	GW Contam.	Salmon Tox.	Acute Aqua. Tox.	Chronic Aquat. Tox.			Butte	Lost	Upper Klam.	Lower Klam.	Shasta	Scott	Trinity	SF Trin.
3858	BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, SEROTYPE 3A,3B	In	N	N	ID	N	NE	NE	N-Outdr Grwn Cut Flwrs Or Greens: 16 Lbs; Peach: 2 Lbs; Nectarine: 1 Lbs	18.0					2.5		15.6	
667	ZINC SULFATE	Mi, He	N	N	ID	N	M	Y	Potato (White, Irish, Red, Russet): 16 Lbs; Onion (Dry, Spanish, White, Yellow, Red, Etc.): 1 Lbs	17.1		17.1						
379	METALDEHYDE	Mo	N	N	P	N	N	Y	N-Outdr Grwn Cut Flwrs Or Greens: 16 Lbs; N-Grnhs Grwn Plants In Containers: 0 Lbs	16.5						0.0	16.5	
629	ZIRAM	Fu, Mi, MR	N	N	ID	N	VH	Y	Pear: 8 Lbs; Apple: 7 Lbs	14.8							14.8	
5598	THIAMETHOXAM	Fu, In	N	N	P	N	NE	Y	Potato (White, Irish, Red, Russet): 9 Lbs; Mint (All Or Unspec): 5 Lbs; N-Outdr Grwn Cut Flwrs Or Greens: 0 Lbs	14.4		14.0					0.4	
175	COPPER OXIDE (OUS)	Fu, In	N	N	ID	N	VH	Y	Grapes: 14 Lbs	14.3				14.3				
3862	BACILLUS THURINGIENSIS (BERLINER), SUBSP. KURSTAKI, STRAIN SA-11	In	N	N	ID	N	NE	NE	Peach: 8 Lbs; Nectarine: 4 Lbs; Cherry: 1 Lbs	13.8					13.8			
2254	AVERMECTIN	In	N	Y	ID	N	VH	Y	Mint (All Or Unspec): 9 Lbs; Strawberry (All Or Unspec): 2 Lbs; N-Outdr Grwn Cut Flwrs Or Greens: 2 Lbs	12.9	2.4	8.8					1.7	0.0
2328	AZADIRACHTIN	In, Ne	N	N	ID	N	VH	Y	Onion (Dry, Spanish, White, Yellow, Red, Etc.): 9 Lbs; Sage (All Or Unspec) (Flavoring And Spice Crop): 0 Lbs; Potato (White, Irish, Red, Russet): 0 Lbs	10.1		9.6			0.5		0.0	
3993	BEAUVERIA BASSIANA STRAIN GHA	In	N	N	ID	N	NE	NE	Alfalfa (Forage - Fodder) (Alfalfa Hay): 10 Lbs	10.0						10.0		
1992	DIFLUBENZURON	In	N	N	ID	Y	VH	Y	Pastures (All Or Unspec): 8 Lbs	8.2						8.2		
1596	POTASH SOAP	He, In, Ad	N	N	ID	N	NE	NE	N-Outdr Grwn Cut Flwrs Or Greens: 4 Lbs; Stone Fruits (All Or Unspec): 2 Lbs; N-Grnhs Grwn Cut Flwrs Or Greens: 2 Lbs	7.8				2.2	1.4		4.2	

CDPR Chem. Code	Chemical Name	Use Type	Toxicity						Pounds Applied to Top Three Crops	Total (All Sub-Basins) Pounds Applied	Pounds Applied Per Sub-basin (4th-field HUC)							
			Prop 65 Carcinogen	Prop 65 Devel. Tox.	GW Contam.	Salmon Tox.	Acute Aqua. Tox.	Chronic Aquat. Tox.			Butte	Lost	Upper Klam.	Lower Klam.	Shasta	Scott	Trinity	SF Trin.
2303	HEXYTHIAZOX	IGR	N	N	ID	N	M	Y	N-Outdr Grwn Cut Flwrs Or Greens: 5 Lbs; Mint (All Or Unspec): 2 Lbs; N-Grnhs Grwn Cut Flwrs Or Greens: 0 Lbs	7.7		2.3					5.4	
5955	SPIROTETRAMAT	In	N	N	ID	N	NE	NE	Potato (White, Irish, Red, Russet): 7 Lbs	7.2		7.2						
1016	MCPP, DIMETHYLAMINE SALT	He	N	N	P	N	N	Y	Regulatory Pest Control: 4 Lbs; Ornamental Turf (All Or Unspec): 3 Lbs	7.0					7.0			
4032	FENHEXAMID	Fn	N	N	P	N	M	Y	N-Grnhs Grwn Plants In Containers: 6 Lbs	5.9						5.9		
1980	FENARIMOL	Fn	N	N	P	N	M	Y	N-Outdr Grwn Cut Flwrs Or Greens: 5 Lbs	5.5							5.5	
2133	TRIADIMEFON	Fn	N	Y	P	N	S	Y	N-Outdr Grwn Cut Flwrs Or Greens: 3 Lbs; Grapes: 2 Lbs	5.4							5.4	
198	DIAZINON	In	N	N	P	Y	H	Y	N-Outdr Grwn Cut Flwrs Or Greens: 2 Lbs; Peach: 2 Lbs; Apple: 1 Lbs	5.1							5.1	
3866	(S)-CYPERMETHRIN	In	N	N	ID	N	NE	NE	Onion (Dry, Spanish, White, Yellow, Red, Etc.): 5 Lbs	4.8		4.8						
488	PIPERALIN	Fn	N	N	P	N	M	Y	N-Outdr Grwn Cut Flwrs Or Greens: 5 Lbs	4.7							4.7	
480	MEVINPHOS	?	?	?	?	N	?	?	Alfalfa (Forage - Fodder) (Alfalfa Hay): 4 Lbs	4.2					4.2			
2277	CINNAMALDEHYDE	MR, Fu, In	N	N	ID	N	NE	Y	N-Grnhs Grwn Plants In Containers: 4 Lbs; Landscape Maintenance: 0 Lbs	3.8						3.8		
7	DAMINOZIDE	PGR	Y	N	ID	N	N	Y	N-Grnhs Grwn Cut Flwrs Or Greens: 4 Lbs	3.6					3.6			
2339	CLOPYRALID,TRIETHYLAMINE SALT	He	N	N	P	N	NE	NE	Pastures (All Or Unspec): 3 Lbs	2.9						2.9		
90480	MEVINPHOS, OTHER RELATED	?	?	?	?	N	?	?	Alfalfa (Forage - Fodder) (Alfalfa Hay): 3 Lbs	2.8					2.8			
238	DINOSEB	?	?	?	?	N	?	?	Alfalfa (Forage - Fodder) (Alfalfa Hay): 2 Lbs	2.4		2.4						
5159	GLUTAMIC ACID	?	?	?	?	N	?	?	Onion (Dry, Spanish, White, Yellow, Red, Etc.): 2 Lbs	2.2		2.2						
5160	GAMMA AMINOBUTYRIC ACID	?	?	?	?	N	?	?	Onion (Dry, Spanish, White, Yellow, Red, Etc.): 2 Lbs	2.2		2.2						
5984	PINOXADEN	He	N	N	ID	N	NE	NE	Barley, General: 2 Lbs	2.1		2.1						
448	ORTHO-PHENYLPHENOL	Mi	Y	N	ID	N	H	Y	N-Grnhs Grwn Plants In Containers: 2 Lbs	1.8						1.8		

CDPR Chem. Code	Chemical Name	Use Type	Toxicity						Pounds Applied to Top Three Crops	Total (All Sub-Basins) Pounds Applied	Pounds Applied Per Sub-basin (4th-field HUC)							
			Prop 65 Carcinogen	Prop 65 Devel. Tox.	GW Contam.	Salmon Tox.	Acute Aqua. Tox.	Chronic Aquat. Tox.			Butte	Lost	Upper Klam.	Lower Klam.	Shasta	Scott	Trinity	SF Trin.
5332	CANOLA OIL	In, Ad	N	N	ID	N	NE	NE	N-Grnhs Grwn Cut Flwrs Or Greens: 2 Lbs	1.6							1.6	
510	PYRETHRINS	In	N	N	ID	N	H	Y	Potato (White, Irish, Red, Russet): 1 Lbs; N-Outdr Grwn Cut Flwrs Or Greens: 0 Lbs; N-Grnhs Grwn Cut Flwrs Or Greens: 0 Lbs	1.1		1.0					0.1	
873	ESSENTIAL OILS	?	?	?	?	N	?	?	N-Grnhs Grwn Plants In Containers: 1 Lbs	1.0						1.0		
5865	PYRAFLUFEN-ETHYL	He	N	N	ID	N	NE	NE	Potato (White, Irish, Red, Russet): 1 Lbs	1.0		1.0						
90394	METHYL PARATHION, OTHER RELATED	In, Ne	N	N	ID	N	NE	NE	Onion (Dry, Spanish, White, Yellow, Red, Etc.): 1 Lbs	1.0		1.0						
86	BACILLUS THURINGIENSIS (BERLINER)	?	?	?	?	N	?	?	Peach: 1 Lbs; Nectarine: 0 Lbs; Apricot: 0 Lbs	1.0					1.0			
2289	ISOXABEN	He	N	N	P	N	M	Y	Ornamental Turf (All Or Unspec): 1 Lbs	0.9					0.9			
3936	(S)-KINOPRENE	IGR	N	N	ID	N	NE	NE	N-Grnhs Grwn Plants In Containers: 0 Lbs	0.5						0.5		
991	THYMOL	Mi	N	N	ID	N	M	Y	Beehives (All Or Unspec): 0 Lbs	0.4			0.4					
2142	(Z)-9-DODECENYL ACETATE	Ph	N	N	ID	N	NE	NE	Forest Trees, Forest Lands (All Or Unspec): 0 Lbs	0.4	0.0				0.0		0.4	
2300	BIFENTHRIN	In	N	N	ID	N	VH	Y	N-Grnhs Grwn Plants In Containers: 0 Lbs	0.2						0.2		
165	COUMAPHOS	In	N	N	ID	Y	H	Y	Beehives (All Or Unspec): 0 Lbs	0.2			0.0		0.1			0.0
5770	BACILLUS PUMILUS, STRAIN QST 2808	PGR	N	N	ID	N	NE	NE	Grapes: 0 Lbs	0.1				0.1				
5225	COPPER OCTANOATE	Fn	N	N	ID	N	M	Y	N-Grnhs Grwn Cut Flwrs Or Greens: 0 Lbs	0.1							0.1	
5451	KRESOXIM-METHYL	Fn	N	N	P	N	VH	Y	Grapes: 0 Lbs	0.1				0.1				
2195	TAU-FLUVALINATE	In	N	Y	ID	N	VH	Y	Beehives (All Or Unspec): 0 Lbs	0.1					0.1			
90518	ROTENONE, OTHER RELATED	In	N	N	ID	N	NE	NE	N-Outdr Grwn Cut Flwrs Or Greens: 0 Lbs	0.1							0.1	
518	ROTENONE	In	N	N	ID	N	VH	Y	N-Outdr Grwn Cut Flwrs Or Greens: 0 Lbs	0.1							0.1	

CDPR Chem. Code	Chemical Name	Use Type	Toxicity						Pounds Applied to Top Three Crops	Total (All Sub-Basins) Pounds Applied	Pounds Applied Per Sub-basin (4th-field HUC)							
			Prop 65 Carcinogen	Prop 65 Devel. Tox.	GW Contam.	Salmon Tox.	Acute Aqua. Tox.	Chronic Aquat. Tox.			Butte	Lost	Upper Klam.	Lower Klam.	Shasta	Scott	Trinity	SF Trin.
225	DIPHACINONE	Ro	N	N	ID	N	S	Y	Alfalfa (Forage - Fodder) (Alfalfa Hay): 0 Lbs; Farm Or Ag Structures And Equip. (All Or Unspec): 0 Lbs; Uncultivated Agricultural Areas (All Or Unspec): 0 Lbs	0.0	0.0		0.0			0.0		
5014	IRON PHOSPHATE	Mo	N	N	ID	N	NE	NE	N-Grnhs Grwn Plants In Containers: 0 Lbs	0.0				0.0		0.0		
520	RYANODINE ALKALOID	?	?	?	?	N	?	?	Strawberry (All Or Unspec): 0 Lbs	0.0	0.0							
2259	PACLOBUTRAZOL	PGR	N	N	ID	N	S	Y	N-Grnhs Grwn Plants In Containers: 0 Lbs	0.0						0.0		
2137	NOSEMA LOCUSTAE SPORES	In	N	N	ID	N	NE	NE	Pastures (All Or Unspec): 0 Lbs	0.0					0.0			
2225	CODLING MOTH GRANULOSIS VIRUS	IGR	N	N	ID	N	NE	NE	Apple: 0 Lbs; Pear: 0 Lbs	0.0					0.0			
1625	CHLOROPHACINONE	Ro	N	N	ID	N	H	Y	Rights Of Way: 0 Lbs	0.0			0.0					
1851	E,E-8,10-DODECADIEN-1-OL	Ph	N	N	ID	N	NE	NE	Apple: 0 Lbs; Pear: 0 Lbs	0.0					0.0			

1. Use Type: Most common use(s) for a chemical, from PAN. Ad = Adjuvant, Al = Algaecide, An = Antifoulant, Av = Avicide, Ba = Bait, BP = Breakdown product, Df = Defoliant, De = Dessicant, Dy = Dye, Fr = Fragrance, Fm = Fumigant, Fn = Fungicide, He = Herbicide, Im = Impurity, IGR = Insect Growth Regulator, IR = Insect Repellent, In = Insecticide, MR = Mammal Repellent, Mi = Microbiocide, Mo = Molluscicide, Ne = Nematicide, pH = pH Adjustment, Ph = Pheromone, PGR = Plant Growth Regulator, Pr = Preservative, PA = Pruning Aid, Ro = Rodenticide, SS = Soap/Surfactant, So = Solvent, Sy = Synergist, WT = Water Treatment, WP = Wood Preservative, ? = chemical not in PAN database, blank = no use listed in PAN database.

2. Prop 65 Carcinogen: Notes if chemical is listed by the state of California under Proposition 65 as a carcinogen. Y = Yes, N = No, ? = chemical not in PAN database. (http://www.pesticideinfo.org/Docs/ref_toxicity3.html#CAProp65Carcinogens)

3. Prop 65 Devel. Tox.: Notes if chemical is listed by the state of California under Proposition 65 as a developmental toxin. Y = Yes, N = No, ? = chemical not in PAN database. (http://www.pesticideinfo.org/Docs/ref_toxicity4.html#ReproDevelopmental)

4. GW Contam.: PAN rating of potential for groundwater contamination potential. K = Known, P = Potential, ID = Insufficient data to assess, ? = chemical not in PAN database. (http://www.pesticideinfo.org/Docs/ref_regulatoryCA.html#PANGWrating)

5. Salmon Tox.: Notes if chemical is subject to the Washington Toxics Coalition, et al. v. EPA court ruling that established pesticide buffers around streams to protect endangered salmon. (http://www.epa.gov/espp/litstatus/wtc/maps.htm#wtc6)

6. Acute Aquat. Tox.: PAN rating of potential acute aquatic toxicity. VH = Very High, H = High, M = Moderate, S = Slight, N = Not Acutely Toxic, NE = Not Evaluated, ? = chemical not in PAN database (http://www.pesticideinfo.org/Docs/ref_ecotoxicity3.html#BAAcuteAqua)

7. Chronic Aquat. Tox: PAN rating of potential chronic aquatic toxicity. Y = Yes, NE = Not Evaluated, ? = chemical not in PAN database

Appendix B:
Technical Memorandum: Evaluation of Cyanobacteria and Cyanobacterial Toxins with Reference to Selection of Water Quality Criteria for the Karuk Tribe of California

Note: this document was updated in June 2014, so the February 2014 appendix is moot and is superceded by the June 2014 version which is now a standalone document:

Kann, J. 2015. Evaluation of Cyanobacteria and Cyanobacterial toxins with reference to Selection of Water Quality Criteria for the Karuk Tribe of California. Technical Memorandum prepared for the Karuk Tribe Natural Resources Department, Orleans, CA. June 2014. 40 p.