Appendix N. Wastewater and Industrial Discharges

This appendix provides information on the number, type and location of the facilities that could be affected by the requirements for municipal wastewater and industrial (non-storm water) discharges described in Section 6.12 and Section 6.13 of the Staff Report. This includes facility types and locations of the discharges, ambient mercury levels in water, and concentrations of mercury in the discharges (Section N.1); a summary of relative load mercury from these discharges compared to other mercury sources from mercury Total Maximum Daily Loads (TMDLs) (Section N.2); and information on Regional Monitoring Programs (Section N.3).

More specifically, the facilities described in this appendix are those with individual National Pollutant Discharge Elimination System (NPDES) permits for non-storm water discharges in California. This appendix (and Section 6.12 and 6.13 of the Staff Report) focuses on dischargers with "individual" permits, rather than dischargers that are enrolled in a general permit that includes multiple facilities. These are referred to as "wastewater and industrial discharges" in this appendix. The information in this appendix was obtained from U.S. EPA's Enforcement and Compliance History Online (ECHO database) and the State Water Board's California Integrated Water Quality System (CIWQS database), or as otherwise noted.

N.1 Information on Current Wastewater and Industrial Discharges

There are roughly 460 individually permitted dischargers, but a little less than half of those dischargers are not included in the scope of the Provisions (the Project) (Figure N-1). The Project includes "**discharges to rivers and bays**" and "**discharges to reservoirs and upstream of impaired[22] reservoirs**" (see descriptions below). The Project does not include discharges to the ocean, since the geographic scope includes only discharges to inland surface waters, enclosed bays, and estuaries. Some dischargers are not included in the Provisions because they are included in mercury TMDLs, which the Project does not intend to supersede (see Staff Report, Section 3.5). Figure N-1 shows the proportion of facilities in each of these categories. Figure N-2 shows the locations of the facilities.

N.1.1 Discharges to reservoirs and upstream of impaired reservoirs

There are about 50 discharges to reservoirs or upstream of mercury impaired reservoirs. A separate project is being developed to address these waters, referred to as the Reservoir Program (see Staff Report, Section 1.6). However, the Reservoir Program and the Provisions are still in the early phases of development. Discharges that would be included in the Reservoir Program may also be included in the Provisions if the Provisions are adopted by the State

[22] The term "impaired" is used as shorthand to indicate a water body that is not meeting water quality objectives and is, therefore placed on the Clean Water Act section 303(d) list (Staff Report, Section 3.4).

Water Board before the Reservoir Program is adopted. Once the Reservoir Program is adopted then those discharges will be regulated under the Reservoir Program. Therefore, in this appendix, information on these discharges is presented separately in many of the Figures and Tables. On the whole, the discharges that would be included in the Reservoir Program are smaller and there are fewer of them, as shown in the figures and tables in this appendix.

N.1.2 Discharges to rivers and bays

The largest group of discharges that may be affected by the Provisions are referred to as "discharges to rivers and bays". This category includes discharges to streams, creeks, estuaries, sloughs or similar waters, as described below. There are no wastewater or industrial discharges to natural lakes.

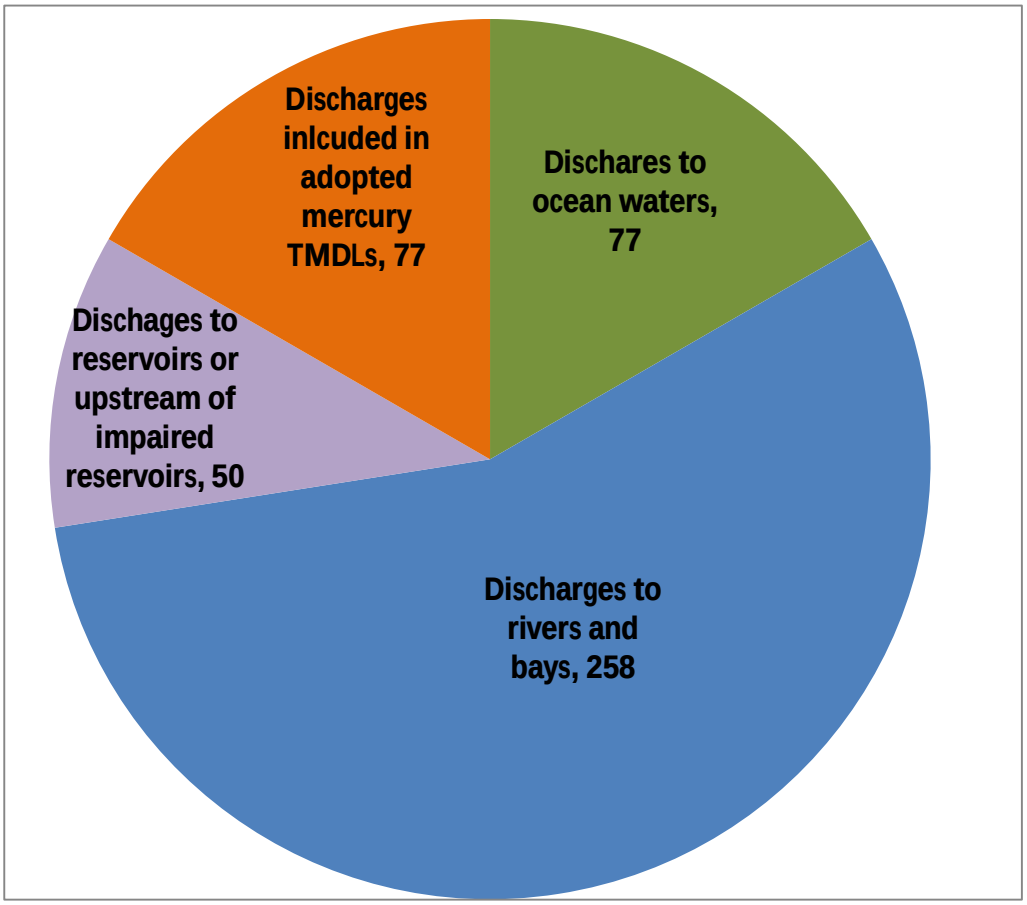

Figure N-1. California individual wastewater and industrial dischargers. A little more than half (about 307) of the dischargers in the state could be affected by the Provisions, including discharges to rivers and bays (258), and discharges to reservoirs and upstream of reservoirs (50). The total does not add up to 460 because there are three facilities with discharge points that fall into more than one category.

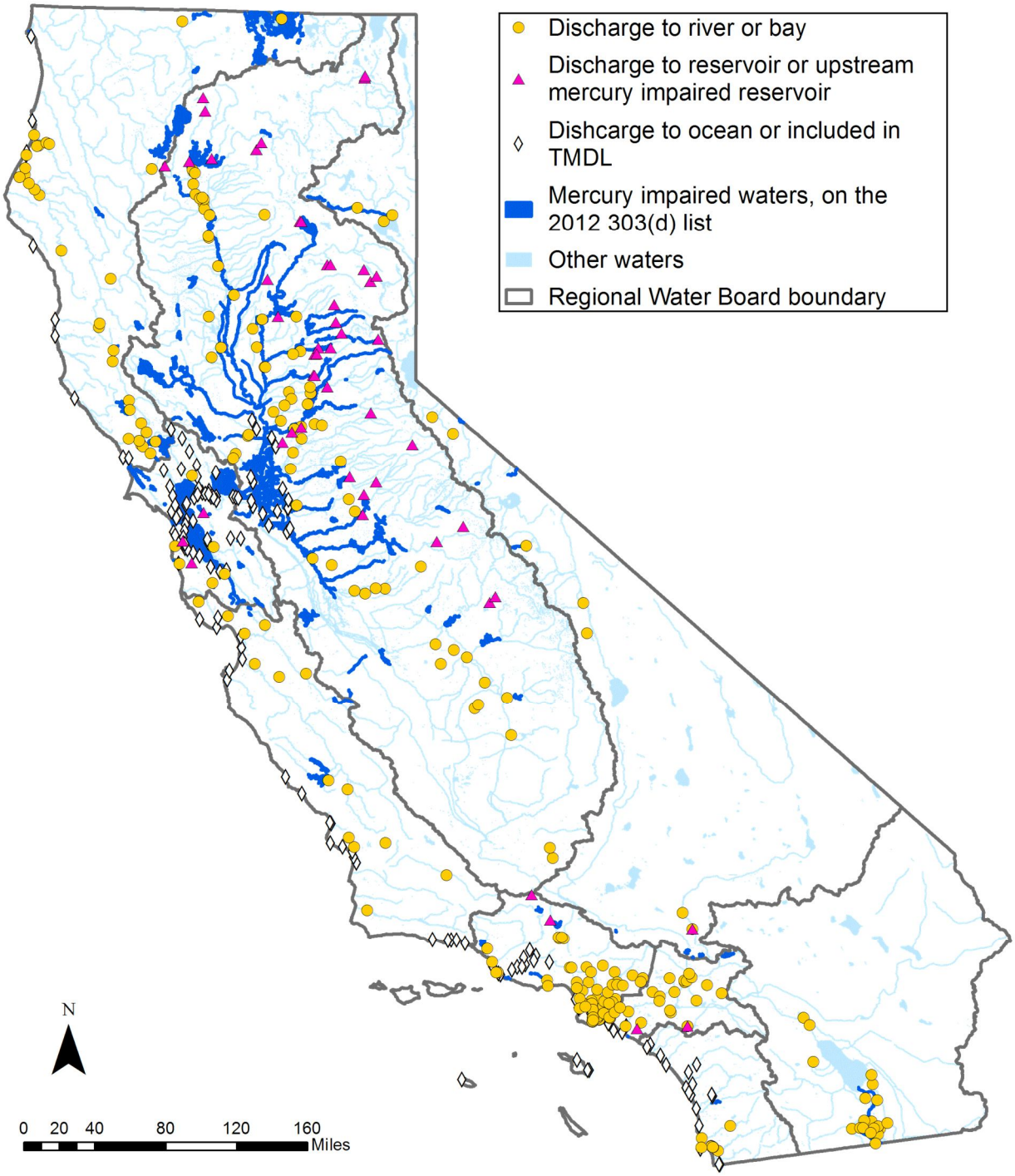

Figure N-2. Locations of the 460 wastewater and industrial dischargers and their proximity to mercury impaired waters.

N.1.3 Facility Types and Locations

Of the discharges included in the Project, the number of municipal wastewater, industrial, major and minor facilities are shown in Table N-1 and facilities by region are shown in Table N-2. Wastewater and industrial facilities are classified as major or minor depending on whether the design flow is greater than 1 MGD (million gallons per day).

Table N-1a. Individual Wastewater and Industrial Discharges to Rivers and Bays

Facility type	Major	Minor	Total
Municipal Wastewater Treatment Facility	87	39	126
Industrial, Other	20	105	125
Federal Facility	2	5	7
All types	109	149	258

Table N-1b. Individual Wastewater and Industrial Discharges to Reservoirs and Upstream Impaired Reservoirs

Facility type	Major	Minor	Total
Municipal Wastewater Treatment Facility	5	16	21
Industrial, Other	3	23	26
Federal Facility	1	2	3
All types	9	41	50

Table N-2. Number of Individual Wastewater and Industrial Discharges by Water Board Region

Water Board Region	1	2	3	4	5	6	7	8	9
Rivers and Bays	31	6	14	75	70	10	21	22	9
Reservoirs or upstream of Impaired Reservoirs	0	3	0	2	42	1	0	2	0

The types of waters the discharges flow into and the proximity to impaired waters is shown in Tables N-3a through N-3c and Figure N-3. In California, most inland discharges flow into rivers, streams, and creeks, few discharges flow directly into reservoirs.

Table N-3a. Receiving Water Type for Wastewater and Industrial Discharges to Rivers and Bays

Type of receiving water (number of individual discharges)	Number of discharges	Percent of facilities*
Creek (84), river (73), wash (3), tributary (4), spring (2), stream (1)	167	65 %
Channel (22), canal (5), drain (18), ditch (3)	48	19 %
Harbor (17), bay (10)	27	10 %
Estuary (7), slough (4), wetland (3), tidal prism (2), pond (2), marsh (1)	19	7 %
Total	261*	101%*

*The totals do not add up to 258 and 100% because a few facilities have multiple discharges that flow into two different water body types.

Table N-3b. Proximity to Impaired Waters of Individual Wastewater and Industrial Discharges to Rivers and Bays

Type of receiving water	Number of facilities	Percent of facilities
Mercury impaired water	19	7 %
Un-impaired water, upstream of mercury impaired water	71	28 %
Un-impaired water that could or sometimes flows into mercury impaired water downstream	14	5 %
Un-impaired water, upstream of un-impaired waters*	154	60%
Total	258	100 %

*Waters may be un-impaired because they have not been assessed.

Table N-3c. Receiving Water Type for Individual Wastewater and Industrial Discharges to Reservoirs and Upstream Impaired Reservoirs

Type of receiving water	Number of facilities	Percent of facilities
Mercury impaired reservoir	3	6 %
Un-impaired reservoir*	6	12 %
Discharge to river, stream, or creek, upstream a mercury impaired reservoir	41	82 %
Total	50	100 %

*Waters may be un-impaired because they have not been assessed.

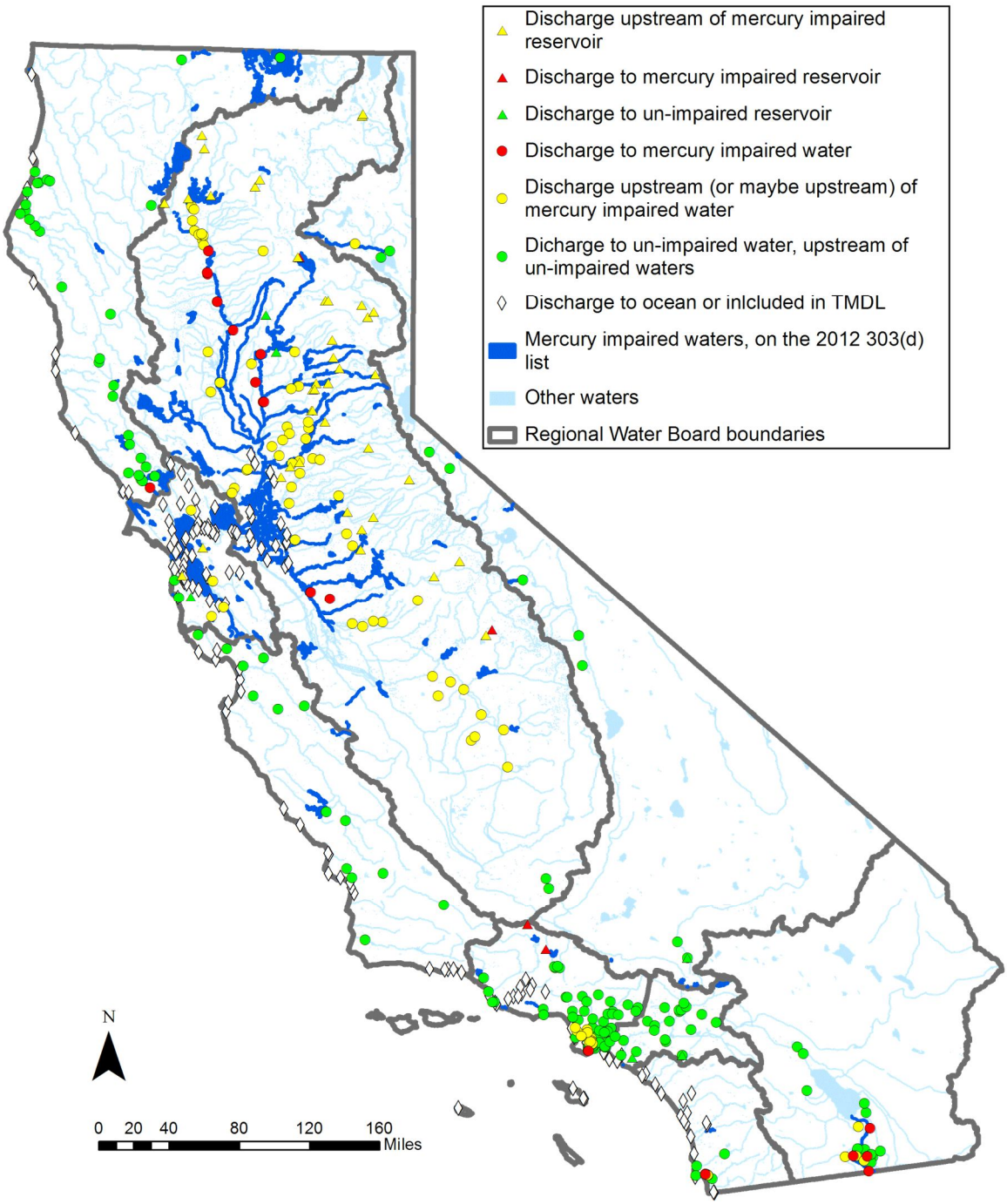

Figure N-3. Proximity of wastewater and industrial discharges to mercury impaired waters. Discharges are highlighted that 1) discharge directly into a receiving water that is mercury impaired (red); or 2) discharge upstream or might discharge upstream of mercury impaired waters (yellow).

Wastewater and industrial facilities are also classified according to the Threat to Water Quality (TTWQ). TTWQ is a relative categorization of the waste discharge's potential effect upon the

surface or ground water quality and the beneficial uses of those waters. The TTWQ categories are:

- Category I includes those discharges that could cause long-term loss of a beneficial use, such as drinking water supply, aquatic habitat, etc.
- Category II includes those discharges that could impair the designated beneficial uses, cause short-term violations of water quality objectives, violate secondary drinking water standards, etc.
- Category III are those discharges that could degrade water quality without violating objectives or could cause minor impairment of beneficial uses.

Table N-4 provides the TTWQ categories for facilities discharging to rivers and bays and those that discharge to a reservoir or upstream an impaired reservoir. There are relatively few facilities in the highest threat category (6) that discharge to reservoirs or upstream of an impaired reservoir, while there are many more facilities in the highest threat category (78) discharging to rivers and bays.

Table N-4. Characteristics of Facilities

Major/Minor	Threat to Water Quality	Number of Facilities Discharging to Rivers and Bays	Number of Facilities in the Discharging to Reservoirs or Upstream Impaired Reservoirs
Major		**109**	**9**
	1	76	6
	2	29	2
	3	4	1
Minor		**149**	**41**
	1	19	6
	2	78	26
	3	51	8
	Not available	1	1
Grand Total		**258**	**50**

N.1.4 Ambient Mercury Levels

Figure N-4 shows mercury concentrations in receiving waters. This information is typically used to determine which facilities will need effluent limitations (reasonable potential analysis, see Staff Report Section 6.12). Additionally, statistics on the ambient mercury concentrations in water are in the Staff Report, in Section 4.5.1.

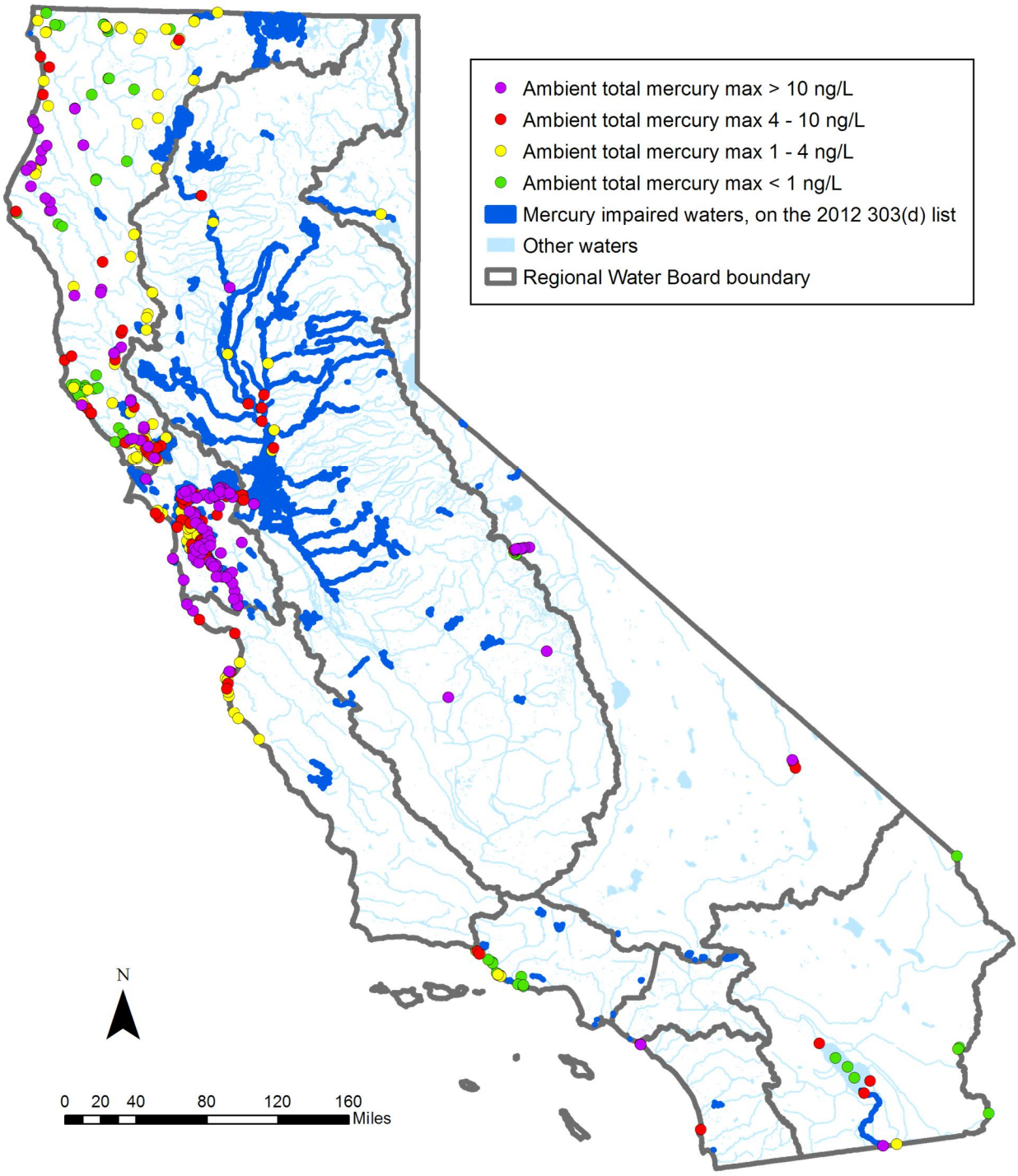

Figure N-4. Ambient mercury concentrations in receiving waters. Data from the California Environmental Data Exchange Network (www.ceden.org) for samples dated 2005-2015.

N.1.5 Effluent Mercury Concentrations

Effluent mercury concentration data were obtained from electronic Self-Monitoring Reports (eSMR) through the CIWQS eSMR Analytical Report. This public website provides analytical and calculated data provided by NPDES wastewater and industrial permit holders. "Mercury Total" and "Mercury Total Recoverable" were selected from "Parameter." Dates from January 1, 2005 to September 1, 2015 were selected. However no results were retuned for years prior to 2009. For year 2009 only two results were returned. Other fields were left with no specific parameter selected.

Several characteristics were checked to gather data suitable for the analysis. Data were not used if the detection limit was higher than 4 ng/L and the result was "non-detect (ND)" or "detected not quantified (DNQ)". Otherwise, for results that were not detected, a value of one half of the detection limit was used. For results that were qualified as detected but not quantified, the result provided was used. Other values were omitted if the results were 1,000 times higher than typical results (indicated units were reported incorrectly) or if the permit writer noted the value as an outlier and excluded the result from the reasonable potential analysis. Data from storm water or wet weather overflow discharge points were excluded since they are not issued the same requirements as NPDES non-storm water discharges (wastewater and industrial discharges). Only mercury concentration measured in effluent samples were used. Mercury concentrations from samples from other parts of the treatment process or other monitoring locations were omitted.

The annual average was calculated for every year for each facility for which there was suitable data from the years 2009 through 2015. From about 30,000 original results from the query, 9883 results met suitability criteria and were used for the analyses. The data set included results from 157 facilities, yielding 626 annual averages over the six years considered. Table N-5 summaries the number of facilities for which there was suitable data available. Table N-5 also shows how many annual averages were calculated from the six years of data. Figure N-5 shows how representative the final data set was compared to all facilities statewide.

Tables N-6, N-7, N-8, N-9 show the proportion of facilities with mercury levels exceeding proposed options for new regulatory thresholds (See Section 6.12 and Section 6.13 of the Staff Report). These tables show the percent of facilities that had one annual average above the threshold, from the data available from 2009 to 2015. In the next column, the tables show the percent of annual averages, collectively from all facilities, which were above the thresholds, from the data available from 2009 to 2015. In Table N-10, the statistics shown (e.g. average, 95th percentile) were calculated from the annual averages. The range of the maximum annual average total mercury concentrations for each facility (if available) is shown on a map in Figure N-6. In this map, the maximum is the highest annual average for years 2009 - 2015.

Table N-5. Available Monitoring Data for Years 2009 to 2015

	Discharges to all waters		Discharges to rivers & bays		Discharges to rivers, bays & upstream impaired reservoirs*	
Type of discharge	# facilities with data	# annual averages	# facilities with data	# annual averages	# facilities with data	# annual averages
All	154	626	70	263	83	306
POTW	122	527	57	237	65	556
Non POTW & Federal	35	99	13	26	18	113

*No data was available for direct discharges to reservoirs. Of the 460 discharges in the state, only about ten flow directly into a reservoir.

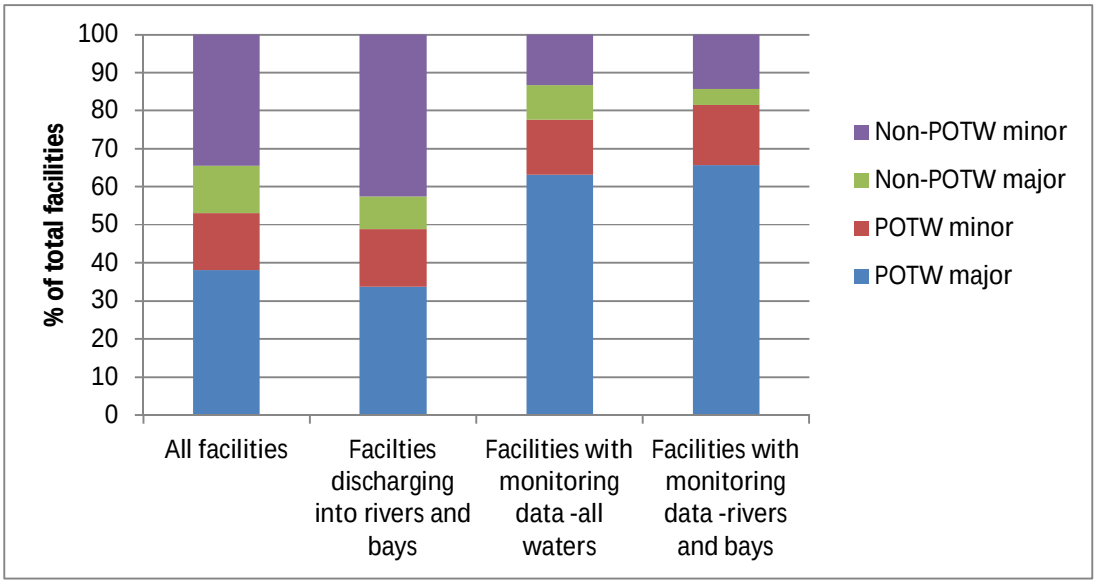

Figure N-5. Representativeness monitoring data: Comparison of the types of facilities in California vs. the types of facilities for which monitoring data was available.

Table N-6. Percent of Facilities Exceeding 12 ng/L Total Mercury

	Discharges to all waters		Discharges to rivers & bays		Discharges to rivers, bays & upstream impaired reservoirs	
Type of discharge	% facilities >12 ng/L[1]	% averages > 12 ng/L[2]	% facilities >12 ng/L	% averages > 12 ng/L	% facilities >12 ng/L	% averages > 12 ng/L
All	13	7	7	3	8	3
POTW	8	3	9	3	8	1
Non POTW & Federal	29	27	0	0	28	3

[1] The percent of facilities that had one annual average above the threshold, from the data available from 2009 to 2015. See text in Section N.1.5.

[2] The percent of annual averages, collectively from all facilities, which were above the thresholds, from the data available from 2009 to 2015. See text in Section N.1.5.

Table N-7. Percent of Facilities Exceeding 4 ng/L Total Mercury

	Discharges to all waters		Discharges to rivers & bays		Discharges to rivers, bays & upstream impaired reservoirs	
Type of discharge	% facilities > 4 ng/L[1]	% averages > 4 ng/L[2]	% facilities > 4 ng/L	% averages > 4 ng/L	% facilities > 4 ng/L	% averages > 4 ng/L
All	40	27	26	14	27	15
POTW	39	23	30	16	29	7
Non POTW & Federal	43	46	8	4	17	6

[1] The percent of facilities that had one annual average above the threshold, from the data available from 2009 to 2015. See text in Section N.1.5.

[2] The percent of annual averages, collectively from all facilities, which were above the thresholds, from the data available from 2009 to 2015. See text in Section N.1.5.

Table N-8. Percent of Facilities Exceeding 1 ng/L Total Mercury

	Discharges to all waters		Discharges to rivers & bays		Discharges to rivers, bays & upstream impaired reservoirs	
Type of discharge	% facilities >1 ng/L[1]	% averages > 1 ng/L[2]	% facilities >1 ng/L	% averages > 1 ng/L	% facilities >1 ng/L	% averages > 1 ng/L
All	83	73	73	59	73	59
POTW	87	75	79	62	80	30
Non POTW & Federal	63	68	46	31	50	15

[1] The percent of facilities that had one annual average above the threshold, from the data available from 2009 to 2015. See text in Section N.1.5.

[2] The percent of annual averages, collectively from all facilities, which were above the thresholds, from the data available from 2009 to 2015. See text in Section N.1.5.

Table N-9. Percent of Facilities Exceeding Reservoir Program Thresholds*

	Discharges to all waters		Discharges to rivers & bays		Discharges to rivers, bays & upstream impaired reservoirs	
Type of discharge	% facilities > thresholds[1]	% averages > threshold[2]	% facilities > thresholds	% averages > thresholds	% facilities > thresholds	% averages > thresholds
All	11	5	10	4	8	3
POTW	11	5	12	4	11	2
Non POTW & Federal	11	6	0	0	0	0

* Estimated with approximate categories and thresholds of: Major POTWS: 10 ng/L, Minor POTW: 20 ng/L, Major Non-POTW: 30 ng/L, Minor Non-POTW: 60 ng/L (see Staff Report Section 6.13).

[1] The percent of facilities that had one annual average above the threshold, from the data available from 2009 to 2015. See text in Section N.1.5.

[2] The percent of annual averages, collectively from all facilities, which were above the thresholds, from the data available from 2009 to 2015. See text in Section N.1.5.

Table N-10. Annual Average Total Mercury Concentrations (ng/L) in Effluent

	Discharges to all waters			Discharges to rivers & bays		
Type of discharge	average of annual averages	95th percentile of annual averages	99th percentile of annual averages	average of annual averages	95th percentile of annual averages	99th percentile of annual averages
All	4	14	35	2	8	21
POTW	3	10	17	3	8	22
Non POTW & Federal	9	33	48	1	3	4

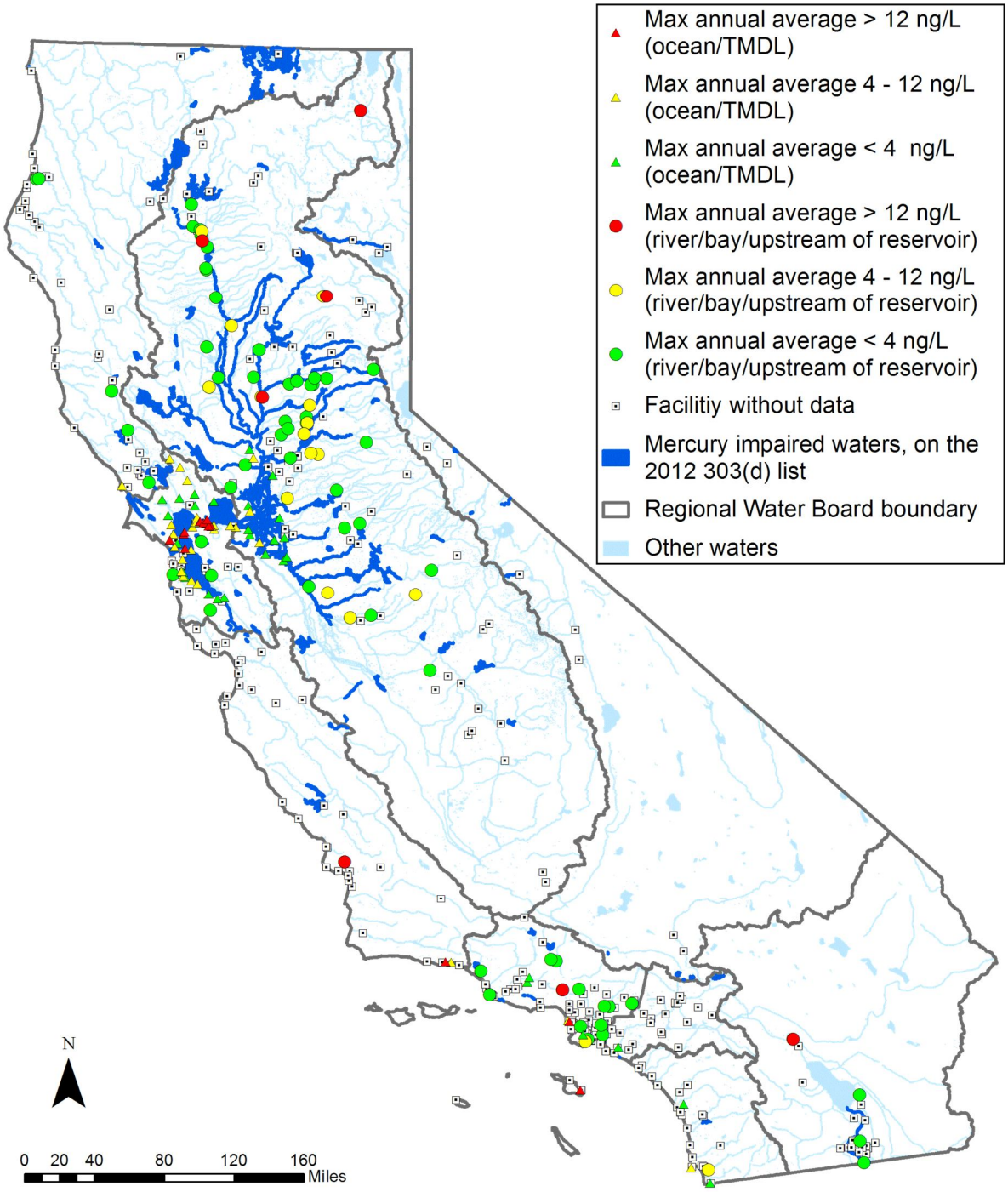

Figure N-6. Locations of wastewater and industrial dischargers in which at least one annual average total mercury concentrations during 2009-2015 was equal to or above 4 ng/L and 12 ng/L.

N.2 Relative Source Contribution of Wastewater and Industrial Discharges

Information indicating whether wastewater and industrial discharges are an insignificant mercury source statewide would help support a recommendation for the implementation requirements for wastewater and industrial discharges. Information from adopted TMDLs, Water Board databases, and a comparison to mercury deposited from atmospheric emissions is summarized below.

N.2.1 Relative Source Contribution for Wastewater and Industrial Discharges from TMDLs

Of the adopted mercury TMDLs, only three included wastewater and industrial discharges as a source of mercury. Of those three TMDLs, the Calleguas Creek/Mugu Lagoon TMDL (Los Angeles Water Board 2006) does not include a quantitative source analysis. The sources analyses form the San Francisco Bay (San Francisco Bay Water Board 2006) and the Sacramento-San Joaquin Delta TMDL (Central Valley Water Board 2010) are reproduced in Table N-11.

From the estimates in Table N-11, atmospheric deposition is not a major source of mercury. In the Sacramento-San Joaquin Delta TMDL, municipal wastewater is more significant than atmospheric deposition. If this information is used to extrapolate relative source contribution to the state as a whole, then for any watershed without historic gold or mercury mining, wastewater and industrial dischargers can be a significant source of mercury.

Table N-11. Estimated Mercury Loadings from the Sacramento-San Joaquin Delta TMDL (Delta) and the San Francisco Bay TMDL.

Sources	Delta *Methylmercury* (g/day)	San Francisco Bay *Total Mercury* (g/day)	Delta (% total)	San Francisco Bay (% total)
Tributaries (Central Valley)	8.2	1205	57	36
Guadalupe River Watershed (Historic mining, San Francisco Bay only)	-	252	-	8
Sediments in water body (Delta: open water, wetlands. San Francisco Bay: Bed erosion)	5.1	1260	36	38
Atmospheric deposition (San Francisco Bay: direct deposition only. Delta: direct and indirect, so includes atmospheric mercury carried by nonpoint source storm water, but not urban storm water)	0.06	74	0.4	2
Non-urban storm water (San Francisco Bay only: includes mercury enriched sediments and atmospheric mercury. Delta: Atmospheric mercury from non-urban storm water is included in 'atmospheric deposition')	-	68	-	2.0
Urban runoff (Caltrans, MS4s, Construction, Industrial)	0.05	438	0.3	13
Municipal wastewater and **Industrial discharges** (Delta had only municipal wastewater)	0.6	49	4	1.5
Agricultural return flows (Delta only)	0.3	-	2	-
Total	14.31	3348	100	100

N.3 Regional Monitoring Programs

Regional Monitoring Programs (RMPs) have been created in some areas to fulfill some of the ambient monitoring required of dischargers in their permits. These RMPs are the second major program involved in collecting mercury data, in addition to the Water Board's Surface Water Ambient Monitoring Program (SWAMP). RMPs are partnerships between regulators, dischargers, scientists, industry representatives and community activists to measure water quality. Each party has some input on the program. A large proportion of the funds generally come directly from dischargers.

RMPs are discussed in Section 6.12 of the Staff Report as a possible means to aid in collecting fish tissue data. However, RMPs do not cover all waters in the state, so the programs are not able to help in all locations. To provide an idea of how much of the state is monitored by RMPs and where the RMPs monitor, a map of RMPs is shown (Figure N-7). Not all RMPs currently monitor mercury in fish tissue.

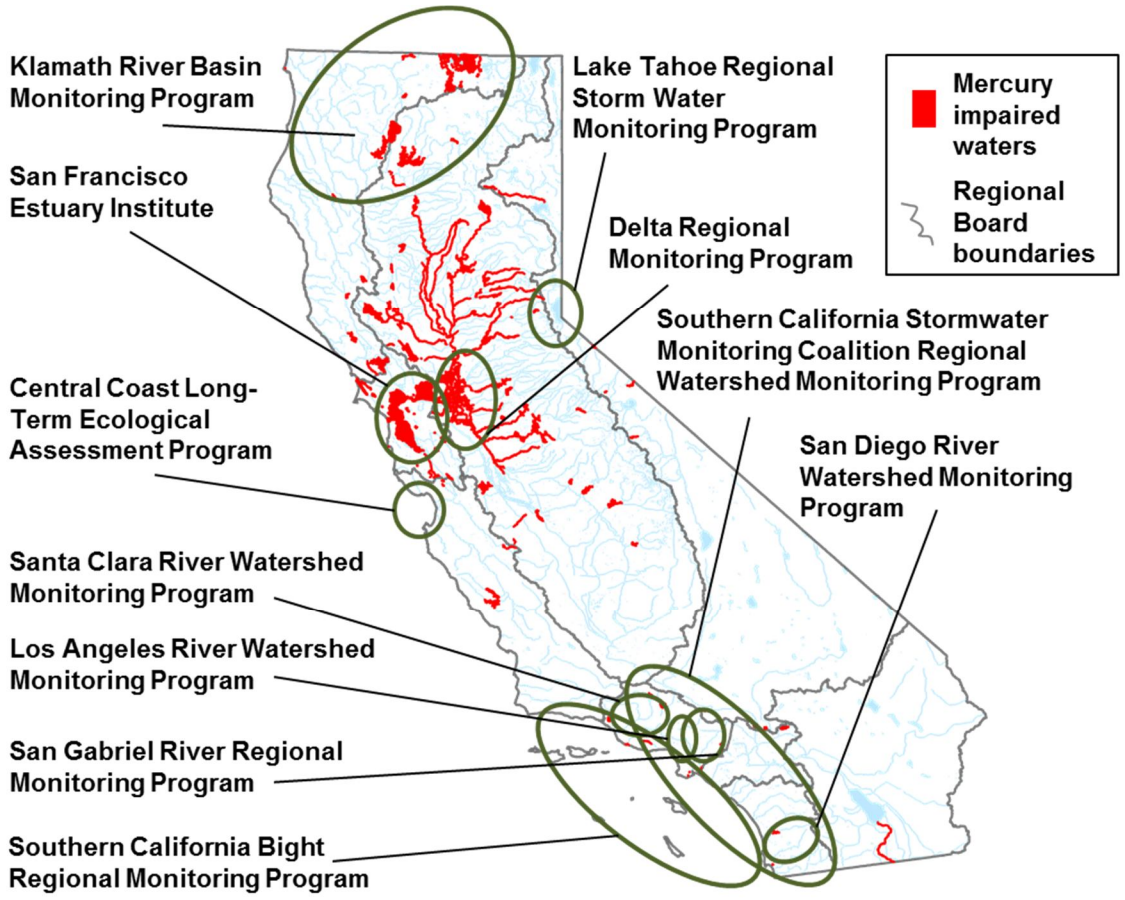

Figure N-7. Approximate waters included in Regional Monitoring Programs (information from: www.waterboards.ca.gov/water_issues/programs/swamp/contacts.shtml#rb).

References

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