

Final California 2010 Integrated Report(303(d) List/305(b) Report)

Supporting Information

Regional Board 5 - Central Valley Region

Water Body Name: [Shasta Lake](#)
Water Body ID: CAL5061000020080922152749
Water Body Type: Lake & Reservoir

DECISION ID 12120

Region 5

Shasta Lake

Pollutant: Mercury
Final Listing Decision: List on 303(d) list (TMDL required list)
Last Listing Cycle's Final Listing Decision: New Decision
Revision Status: Revised
Sources: Resource Extraction
Expected TMDL: 2021
Completion Date:
Impairment from Pollutant or Pollution: Pollutant

Conclusion: This pollutant is being considered for placement on the section 303(d) list under section 3.1 of the Listing Policy. Under section 3.1 a single line of evidence is necessary to assess listing status.

Four lines of evidence are available in the administrative record to assess this pollutant. Forty-one of the samples exceed the water quality objective.

Based on the readily available data and information, the weight of evidence indicates that there is sufficient justification in favor of placing this water segment-pollutant combination on the section 303(d) list in the Water Quality Limited Segments category.

This conclusion is based on the staff findings that:

1. The data used satisfies the data quality requirements of section 6.1.4 of the Policy.
2. The data used satisfies the data quantity requirements of section 6.1.5 of the Policy.
3. Thirty-two of 106 samples exceed the USEPA fish tissue criterion for human health, 9 of 38 exceed the OEHHA screening value protect human health when consuming fish, and this exceeds the allowable frequency listed in Table 3.1 of the Listing Policy.
4. Pursuant to section 3.11 of the Listing Policy, no additional data and information are available indicating that standards are not met.

RWQCB Board Staff Decision: After review of the available data and information, RWQCB staff concludes that the water body-pollutant combination should be placed on the section 303(d) list because applicable water quality standards are exceeded and a pollutant contributes to or causes the problem.

SWRCB Board Staff Decision: After review of the available data and information, SWRCB staff concludes that the water body-pollutant combination should be placed on the section 303(d) list because applicable water quality standards are exceeded and a pollutant contributes to or causes the problem.

USEPA Action (if applicable): USEPA approved the listing of this water body as a water quality limited segment requiring a TMDL for this pollutant.

Line of Evidence (LOE) for Decision ID 12120, Mercury**Region 5****Shasta Lake**

LOE ID:	22607
Pollutant:	Mercury
LOE Subgroup:	Pollutant-Tissue
Matrix:	Tissue
Fraction:	Total
Beneficial Use:	Commercial or recreational collection of fish, shellfish, or organisms
Number of Samples:	94
Number of Exceedances:	25
Data and Information Type:	PHYSICAL/CHEMICAL MONITORING
Data Used to Assess Water Quality:	Fish were sampled for tissue analysis at four locations from Shasta Lake. 1) McCloud River Arm: 8 of 24 samples exceeded 0.3 ppm; 0.09-0.54 ppm (average 0.27 ppm). 2) Pit River Arm near Silverhorn Bay: 8 of 34 samples exceeded 0.3 ppm; 0.03-0.56 ppm (average 0.23 ppm). 3) Sacramento River Arm near Lakeshore: 5 of 20 samples exceeded 0.3 ppm; 0.03-0.40 ppm (average 0.18 ppm). 4) Sacramento River Arm near Sugarloaf: 4 of 16 samples exceeded 0.3 ppm; 0.08-0.81 ppm (average 0.26 ppm). Fish tissue was analyzed from Bluegill, Carp, Channel Catfish, Chinook Salmon, Largemouth Bass, Rainbow Trout and Spotted Bass. All 94 samples were collected from fish with total lengths greater than 150 mm, which represent fish most commonly caught and consumed by sport fishers and their families.
Data Reference:	Fish Mercury Project, Year 2 Annual Report, Sport Fish Sampling and Analysis, Final Report, October 2007
Water Quality Objective/Criterion:	All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life. The objective applies regardless of whether the toxicity is caused by a single substance or the interactive effect of multiple substances.
Objective/Criterion Reference:	Water Quality Control Plan for the California Regional Water Quality Control Board Central Valley Region, Sacramento and San Joaquin River Basins, 4th ed
Evaluation Guideline:	The USEPA Fish Tissue Residue Criterion for methylmercury in fish is 0.3 mg/kg (0.3 ppm) for the protection of human health. This is the concentration in fish tissue that should not be exceeded based on a total fish and shellfish consumption-weighted rate of 0.0175 kg fish/day. (USEPA, 2001)
Guideline Reference:	Water Quality Criterion for the Protection of Human Health: Methylmercury, Final, United States Environmental Protection Agency Office of Science and Technology Office of Water, EPA-823-R-01-001, January 2001
Spatial Representation:	Samples were collected at four locations from Shasta Lake: the McCloud River Arm, Pit River Arm near Silverhorn Bay, Sacramento River Arm near the town of Lakeshore and Antlers Campground, and Sacramento River Arm near the town of Sugarloaf.
Temporal Representation:	Fish samples were collected during two sampling events on 5/6/2006 and between 7/10/2006 and 7/12/2006.
Environmental Conditions:	Significant gold mining activity occurred during the Gold Rush era within the Shasta Lake watershed (USGS, 2005).
QAPP Information:	Data quality: Excellent.. Quality Control for all of the elements described in section 6.1.4 of the Policy was conducted in accordance with the Laboratory

QAPP developed by Moss Landing Marine Laboratories (MLML, 2005). This data was also collected and analyzed in accordance with the CALFED Mercury Project QAPP (Puckett and van Buuren, 2000).

QAPP Information Reference(s):

**Line of Evidence (LOE) for Decision ID 12120, Mercury
Shasta Lake**

Region 5

LOE ID:	22615
Pollutant:	Mercury
LOE Subgroup:	Pollutant-Tissue
Matrix:	Tissue
Fraction:	Total
Beneficial Use:	Commercial or recreational collection of fish, shellfish, or organisms
Number of Samples:	1
Number of Exceedances:	0
Data and Information Type:	PHYSICAL/CHEMICAL MONITORING
Data Used to Assess Water Quality:	One 2-fish composite sample of Largemouth Bass was collected at one location from Shasta Lake. The wet weight mercury concentration of this fish tissue sample was 0.10 ppm, which does not exceed the USEPA criterion. The composite sample was collected from fish with total lengths greater than 150 mm, which represents fish most commonly caught and consumed by sport fishers and their families.
Data Reference:	SWRCB-DWQ. 2002. Toxic Substances Monitoring Program: Freshwater Bioaccumulation Monitoring: TSM Program Data 1978-2000. State Water Resources Control Board, Division of Water Quality
Water Quality Objective/Criterion:	All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life. The objective applies regardless of whether the toxicity is caused by a single substance or the interactive effect of multiple substances.
Objective/Criterion Reference:	Water Quality Control Plan for the California Regional Water Quality Control Board Central Valley Region, Sacramento and San Joaquin River Basins. 4th ed
Evaluation Guideline:	The USEPA Fish Tissue Residue Criterion for methylmercury in fish is 0.3 mg/kg (0.3 ppm) for the protection of human health. This is the concentration in fish tissue that should not be exceeded based on a total fish and shellfish consumption-weighted rate of 0.0175 kg fish/day. (USEPA, 2001)
Guideline Reference:	Water Quality Criterion for the Protection of Human Health: Methylmercury. Final. United States Environmental Protection Agency Office of Science and Technology Office of Water. EPA-823-R-01-001. January 2001
Spatial Representation:	The sample was collected at one location from Shasta Lake on the west Squaw Creek Arm.
Temporal Representation:	The fish sample was collected on 9/10/1981.
Environmental Conditions:	Significant gold mining activity occurred during the Gold Rush era within the Shasta Lake watershed (USGS, 2005).
QAPP Information:	Data quality: Good.. Quality Control for the fish sampling, tissue preparation, mercury analysis, and QA sample analysis portions of this study was conducted as described in the Toxic Substance Monitoring Report for 1981 (La Karo et al., 1982).
QAPP Information Reference(s):	

Line of Evidence (LOE) for Decision ID 12120, Mercury**Region 5****Shasta Lake**

LOE ID:	22614
Pollutant:	Mercury
LOE Subgroup:	Pollutant-Tissue
Matrix:	Tissue
Fraction:	Total
Beneficial Use:	Commercial or recreational collection of fish, shellfish, or organisms
Number of Samples:	11
Number of Exceedances:	7
Data and Information Type:	PHYSICAL/CHEMICAL MONITORING
Data Used to Assess Water Quality:	Fish were sampled for tissue analysis at four locations from Shasta Lake. 1) Bridge Bay: 1 of 2 composite samples exceeded 0.3 ppm; 0.11 and 0.31 ppm. 2) Hirz Bay: 1 of 2 composite samples exceeded 0.3 ppm; 0.24 and 0.45 ppm. 3) Pit River Arm: 4 of 5 samples exceeded 0.3 ppm; 0.13- 0.66 ppm (average 0.43 ppm). 4) Sacramento River Arm: 1 of 2 composite samples exceeded 0.3 ppm; 0.20 and 0.30 ppm. Fish tissue was analyzed from Channel Catfish and Spotted Bass. All 11 composite samples were collected from fish with average total lengths greater than 150 mm, which represent fish most commonly caught and consumed by sport fishers and their families.
Data Reference:	Mercury Contamination in Fish from Northern California Lakes and Reservoirs. State of California. The Resources Agency. Department of Water Resources. Northern District. July 2007
Water Quality Objective/Criterion:	All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life. The objective applies regardless of whether the toxicity is caused by a single substance or the interactive effect of multiple substances.
Objective/Criterion Reference:	Water Quality Control Plan for the California Regional Water Quality Control Board Central Valley Region, Sacramento and San Joaquin River Basins. 4th ed
Evaluation Guideline:	The USEPA Fish Tissue Residue Criterion for methylmercury in fish is 0.3 mg/kg (0.3 ppm) for the protection of human health. This is the concentration in fish tissue that should not be exceeded based on a total fish and shellfish consumption-weighted rate of 0.0175 kg fish/day. (USEPA, 2001)
Guideline Reference:	Water Quality Criterion for the Protection of Human Health: Methylmercury. Final. United States Environmental Protection Agency Office of Science and Technology Office of Water. EPA-823-R-01-001. January 2001
Spatial Representation:	Samples were collected at four locations from Shasta Lake: Bridge Bay near I-5, Hirz Bay in the McCloud River Arm, Pit River Arm and Sacramento River Arm.
Temporal Representation:	Fish samples were collected during the spring and summer of 2000 and 2001.
Environmental Conditions:	Significant gold mining activity occurred during the Gold Rush era within the Shasta Lake watershed (USGS, 2005).
QAPP Information:	Data quality: Excellent.. Quality control for sample collection, preparation, handling, and analyses were conducted in accordance with the Surface Water Ambient Monitoring Program Quality Assurance Program Plan (Puckett, 2002) with the following exception: instead of wrapping fish in Teflon sheets before being frozen and transported to the laboratory, the fish were wrapped in aluminum foil (dull side to skin). This wrapping method should not have affected mercury concentrations. Quality control procedures for selection of target fish species and compositing of samples followed the General Protocol for Sport Fish

Sampling and Analysis developed by OEHHA (Gassel and Brodberg, 2005). Gassel, M. and R.K. Brodberg. 2005. General Protocol for Sport Fish Sampling and Analysis. California Environmental Protection Agency, Office of Environmental Health Hazard Assessment (OEHHA), Pesticide and Environmental Toxicology Branch. December 2005.

QAPP Information Reference(s):

**Line of Evidence (LOE) for Decision ID 12120, Mercury
Shasta Lake**

Region 5

LOE ID:	31040
Pollutant:	Mercury
LOE Subgroup:	Pollutant-Tissue
Matrix:	Tissue
Fraction:	Fish fillet
Beneficial Use:	Commercial or recreational collection of fish, shellfish, or organisms
Number of Samples:	38
Number of Exceedances:	9
Data and Information Type:	Fish tissue analysis
Data Used to Assess Water Quality:	Fish were collected for tissue analysis at four locations from Shasta Lake. A total of 38 sample composites were generated from two species: Spotted Bass (36) and Channel Catfish (2). Details of the compositing protocol can be found in the March 2009 report entitled: "Contaminants in Fish from California Lakes and Reservoirs: Technical Report on Year One of a Two-Year Screening Study" (SWAMP, 2009). A total of 9 out of 38 samples exceeded the OEHHA fish tissue screening value for human health.
Data Reference:	Data associated with report entitled: Contaminants in Fish from California Lakes and Reservoirs: Technical Report on Year One of a Two-Year Screening Survey. A Report of the Surface Water Ambient Monitoring Program (SWAMP). California State Water Resources Control Board, Sacramento, CA Contaminants in Fish from California Lakes and Reservoirs: Technical Report on Year One of a Two-Year Screening Survey. A Report of the Surface Water Ambient Monitoring Program (SWAMP). California State Water Resources Control Board, Sacramento, CA Cruise Report for the Surface Waters Ambient Monitoring Program (SWAMP) Bioaccumulation Screening Study in California Lakes and Reservoirs. Sampling Dates: June 2007- March 2008
Water Quality Objective/Criterion:	All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life. The objective applies regardless of whether the toxicity is caused by a single substance or the interactive effect of multiple substances.
Objective/Criterion Reference:	Water Quality Control Plan for the California Regional Water Quality Control Board Central Valley Region, Sacramento and San Joaquin River Basins. 4th ed
Evaluation Guideline:	Office of Environmental Health Hazard Assessment (OEHHA) Screening Value of 0.3 mg/kg to protect human health when consuming fish (OEHHA, 1999).
Guideline Reference:	Prevalence of Selected Target Chemical Contaminants in Sport Fish From Two California Lakes: Public health designed screening study. Sacramento, CA: Office of Environmental Health Hazard Assessment
Spatial Representation:	Samples were collected from four locations in Shasta Lake. As discussed in the Lakes and Reservoirs Report (SWAMP, 2009), individual sample locations

consisted of an area within a given waterbody with an approximate one-mile diameter, from which multiple fish tissue samples were collected. The number of sample locations per waterbody was based on the overall size of the waterbody. Specifics of individual sampling locations can be found in the supplemental report entitled "Cruise Report for the Surface Waters Ambient Monitoring Program (SWAMP) Bioaccumulation Screening Study in California Lakes and Reservoirs, Sampling Dates: June 2007- March 2008" (SWAMP, 2008).

Temporal Representation: Samples were collected on August 14, 2007

Environmental Conditions: There are no known environmental conditions (e.g., seasonality, land use practices, fire events, storms, etc.) that are related to these data.

QAPP Information: Samples were collected, processed, and analyzed in accordance with the methods described in "Quality Assurance Project Plan Screening Study of Bioaccumulation in California Lakes and Reservoirs." (SWAMP, 2008).

QAPP Information Reference(s): [Quality Assurance Project Plan Screening Study of Bioaccumulation in California Lakes and Reservoirs. Moss Landing Marine Labs. Prepared for SWAMP BOG, 49 pages plus appendices and attachments](#)