Initial Study & Mitigated Negative Declaration

Use of Copper to Control Algae and Aquatic Animal Invasive Species in Lake Casitas

California Environmental Quality Act
Initial Study And
Mitigated Negative Declaration

April 15, 2022

Prepared for:
Casitas Municipal Water District
1055 Ventura Ave
Oak View, CA 93022
Contact: Kelley Dyer
(805) 649-2251

Prepared by:
Blankinship & Associates, Inc.
1615 5th Street, Suite A
Davis, CA 95616
Contact: Stephen Burkholder
(530) 757-0941

Use of Copper to Control Algae and Aquatic Animal Invasive Species in Lake Casitas

CEQA Initial Study & Mitigated Negative Declaration

Table of Contents

List of Figures

List of Tables

List of Appendices

Limitations

The services used to prepare this document were performed consistent with the agreement with Casitas Municipal Water District and were rendered in a manner consistent with generally accepted professional consulting principles and practices using the level of care and skill ordinarily exercised by other professional consultants under similar circumstances at the same time the services were performed. No warranty, express or implied, is included. This document is solely for the use of our client. Any use or reliance on this document by a third party is not authorized and is at such party's sole risk.

LIST OF ACRONYMS AND ABBREVIATIONS

AB.....Assembly Bill

AF.....Acre-feet

AGR.....Agricultural Supply (beneficial use designation)

APAP.....Aquatic Pesticide Application Plan

BIOL.....Preservation of Biological Habitats of Special Significance (beneficial use designation)

BLM.....Biotic Ligand Model

BMP.....Best Management Practice

CAC.....County Agricultural Commissioner

CARB.....California Air Resources Board

CCR.....California Code of Regulations

CDFW.....California Department of Fish and Wildlife

CEQA.....California Environmental Quality Act

Cfs.....Cubic feet per second

CNDDB.....California Natural Diversity Database

CO.....Carbon monoxide

CO_2.....Carbon dioxide

CO_3^{-2}.....Carbonate

COLD.....Cold Freshwater Habitat (beneficial use designation)

CTR.....California Toxics Rule

Cu^{2+}.....Cupric ion

District.....Casitas Municipal Water District

DO.....Dissolved oxygen

DOC.....Dissolved organic carbon

DPS.....Distinct population segment

DPR.....California Department of Pesticide Regulation

EC.....Electrical conductivity

EC50.....Median effect concentration

ECOS.....Environmental Conservation Online System

EST.....Estuarian Habitat (beneficial use designation)

FRSH.....Freshwater Replenishment (beneficial use designation)

GWR.....Groundwater Recharge (beneficial use designation)

H^+.....Hydrogen

HCO_3^- ..... Bicarbonate
H_2CO_3 ..... Carbonic acid
H_2O ..... Water
HAB ..... Harmful algal bloom
HOS ..... Hypolimnetic oxygenation system
IND ..... Industrial Service Supply (beneficial use designation)
IPaC ..... Information for Planning and Conservation
IS ..... Initial Study
LC50 ..... Median lethal concentration
LD50 ..... Median lethal dose
LOC ..... Level of Concern
MAR ..... Marine Habitat (beneficial use designation)
MIB 2-Methylisoborneol
MMRP ..... Mitigation Monitoring and Reporting Program
MND ..... Mitigated Negative Declaration
MUN ..... Municipal and Domestic Supply (beneficial use designation)
NAHC ..... Native American Heritage Commission
NMFS ..... National Marine Fisheries Service
NO_2 ..... Nitrogen dioxide
NO_3 ..... Nitrate
NOA ..... Notice of Applicability
NOAEC ..... No observed adverse effect concentration
NOAEL ..... No observed adverse effect level
NOI ..... Notice of Intent
NPDES ..... National Pollutant Discharge Elimination System
O_3 ..... Ozone
PCA ..... Pest Control Adviser
PM2.5 ..... Fine particulate matter (less than 2.5 µm in diameter)
PM10 ..... Respirable particulate matter (less than 10 µm in diameter)
POW ..... Hydropower Generation (beneficial use designation)
PROC ..... Industrial Process Supply (beneficial use designation)
PSIS ..... Pesticide Safety Information Series
QAC ..... Qualified Applicator Certificate
QAL ..... Qualified Applicator License

RARE	Rare, Threatened or Endangered Species (beneficial use designation)
REC1	Water Contact Recreation (beneficial use designation)
REC2	Non-Contact Recreation (beneficial use designation)
RQ	Risk quotient
RWL	Receiving Water Limit
RWQCB	Regional Water Quality Control Board
SAL	Inland Saline Habitat (beneficial use designation)
SCCAB	South Central Coast Air Basin
SCP	Sodium carbonate peroxyhydrate
SDS	Safety Data Sheet
SIP	Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries in California (“State Implementation Plan”)
SO_2	Sulfur dioxide
SPWN	Spawning, Reproduction, and/or Early Development (beneficial use designation)
SR	State Route
SWRCB	State Water Resources Control Board
TPD	Total dissolved phosphorus
TDS	Total dissolved solids
United Water	United Water Conservation District
USBR	U.S. Bureau of Reclamation
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VCAPCD	Ventura County Air Pollution Control District
WARM	Warm Freshwater Habitat (beneficial use designation)
WILD	Wildlife Habitat (beneficial use designation)

1. INTRODUCTION

Casitas Municipal Water District ("District") proposes to apply copper-containing aquatic algaecides and/or molluscicides to Lake Casitas on an as-needed basis for purposes of algae and aquatic invasive animal control. Primary targets for algaecide treatments are species that pose operational, management, or human, domestic animal and wildlife health issues. These include planktonic and filamentous green-algae and cyanobacteria (also known as blue-green algae) that may clog water treatment system infrastructure (intakes, screens, filters, etc.), diminish the aesthetic and recreational beneficial uses of the lake, impart taste and odors to raw and treated lake water, and produce toxins that are harmful to humans and animals. The primary animal invasive species of concern for are *Dreissena rostriformis bugensis* (quagga mussels) and *Dreissena polymorpha* (zebra mussels), which have been identified in nearby waterbodies and are known to spread rapidly, posing an immediate threat to waterbodies in the Western United States.

This document was prepared in a manner consistent with Section 21064.5 of the California Public Resources Code and Article 6 of the California Environmental Quality Act (CEQA) Guidelines (14 California Code of Regulations).

This Initial Study (IS), Environmental Checklist, and evaluation of potential environmental effects were completed in accordance with Section 15063 of the State CEQA Guidelines to determine if the proposed Project could have potentially significant effect on the physical environment, and if so, what mitigation measures would be imposed to reduce such impacts to less-than-significant levels.

Casitas Municipal Water District is the Lead Agency for the Project and has determined that mitigation measures can be implemented which reduce impacts to environmental resources to less than significant levels, and that the preparation of a Mitigated Negative Declaration (MND) is appropriate.

2. PROJECT DESCRIPTION

2.1. Project Background

Lake Casitas is a non-contact waterbody managed by the District primarily for drinking water supply, irrigation water supply, and recreation. Additional benefits include fire protection and flood risk management. Current existing beneficial uses include municipal and domestic supply (MUN), industrial service supply (IND), industrial process supply (PROC), agricultural supply (AGR), warm freshwater habitat (WARM), cold freshwater habitat (COLD), wildlife habitat (WILD), rare, threatened or endangered species (RARE), and non-contact recreation (REC2). Current potential beneficial uses include groundwater recharge (GWR), freshwater replenishment (FRSH), hydropower generation (POW), and water contact recreation (REC1) (LARWQCB, 2020).

The District proposes to use U.S. Environmental Protection Agency (USEPA) and California Department of Pesticide Regulation (DPR)-registered copper-containing aquatic algaecides and/or molluscicides in compliance with Water Quality Order No. 2013-0002-DWQ (General Permit No. CAG990005) *Statewide General National Pollutant Discharge Elimination System (NPDES) Permit for Residual Aquatic Pesticide Discharges to Waters of the United States from Algae and Aquatic Weed Control Applications* ("Aquatic Weed Control NPDES General Permit") and Water Quality Order No 2016-XXXX-DWQ (General Permit No. CAG990006) *Statewide General National Pollutant Discharge Elimination System (NPDES) Permit for Biological Pesticides and Residual Chemical Pesticide Discharges to Waters of the United States from Aquatic Animal Invasive Species Control Applications* ("Aquatic Animal Invasive Species Control NPDES General Permit") to control algae and aquatic animal invasive species that threaten to degrade existing and potential beneficial uses of water if not properly controlled.

Nuisance algae growth can present operational challenges to reservoir and water treatment facility managers. Excessive algae blooms may clog filtration systems and degrade aesthetic and recreational functions of the lake. In addition to the issues caused by green algae blooms, cyanobacteria (blue-green algae) blooms often produce geosmin and 2-methylisoborneol (MIB) which impart undesirable taste and odors to lake water and drinking water and may produce cyanotoxins that can be harmful to humans, domesticated animals, and wildlife.

The objective of algaecide application is to prevent or reduce the severity and associated impacts of algae blooms that degrade existing and/or potential beneficial uses of Lake Casitas. Of primary concern are harmful algal blooms (HABs), where certain genera of cyanobacteria produce toxins that can be harmful or deadly to humans, domestic animals, and wildlife.

Aquatic animal invasive species refer to species that establish and reproduce rapidly in a water body outside of their native range and may threaten the diversity or abundance of native species through competition for resources, predation, parasitism, hybridization with native populations, introduction of pathogens, or physical or chemical alteration of the invaded habitat. The primary animal invasive species of concern are *Dreissena rostriformis bugensis* (quagga mussels) and *Dreissena polymorpha* (zebra mussels), collectively referred to herein as "dreissenid mussels." At this time, dreissenid mussels have not yet been discovered in the lake but have been identified in nearby waterbodies, including Lake Piru and the Santa Clara River.

The objective of molluscicide application is to eradicate and/or reduce the spread of dreissenid mussels if they are identified in Lake Casitas. Because Dreissenid mussels spread rapidly, they

pose an immediate threat to waterbodies in the Western United States. Among the adverse impacts caused by Dreissenid mussels is their ability to clog drinking water intakes, thereby reducing the availability of drinking water to District customers. Therefore, the ability to act quickly to eradicate or prevent further spread of these organisms is critical to a successful control program.

2.1.1. Existing Conditions: Nuisance Algae

Algae are naturally occurring organisms in aquatic habitats; however, large blooms may hinder beneficial uses by discouraging recreation, altering natural habitats, or diminishing ecological health. For example, algal respiration at night and the decomposition of large algal masses can decrease dissolved oxygen concentrations in water. If severe, decreases in dissolved oxygen may affect the survival of fish, aquatic insects, or other aquatic life (Walter, 2015). Where a waterbody is used as a source for drinking water, excessive algae growth can disrupt water treatment processes, most commonly by clogging screens and filters. Algae, especially cyanobacteria, can impart undesirable tastes and odors into the water. High densities of algae in raw water requires additional treatment at drinking water facilities and can increase the formation of disinfection byproducts. When cyanobacteria is present, disinfection may cause algae cells to lyse, releasing toxins. Many water treatment plants do not have processes in place to remove algae cells or treat their cyanotoxins (Pernitsky, 2020).

The District implements a preventative program to handling algal blooms. The preventative program is outlined in Casitas Municipal Water District Phytoplankton Monitoring and Treatment Internal Guidance Document for Algal Blooms in Lake Casitas. A Hypolimnetic Oxygenation System (HOS), installed in 2015, is intended to prevent anoxic conditions at the water-sediment interface, which prevents the release of nutrients from the sediment into the water column (internal loading) and helps to mitigate algae blooms as algae is typically phosphorus-limited. However, during warmer months, Lake Casitas experiences seasonal algae blooms. As part of the Monitoring and Treatment Program, the District monitors algae densities. When densities of problematic algae species exceed acceptable thresholds, treatment using algaecides is considered. Algaecide treatments may also be considered prior to threshold exceedance, based on predicted growth rate and density, historical algae trends, bloom location relative to water intake, weather, water temperatures, and other variables. The District is permitted to apply algaecides, including copper-containing algaecides under the Aquatic Weed Control NPDES General Permit, and has utilized copper- and sodium carbonate peroxyhydrate (SCP)-containing algaecides for control of nuisance algae. As required by this permit, the District completed a Notice of Intent (NOI), prepared and submitted an Aquatic Pesticide Application Plan (APAP), and has received a Notice of Applicability (NOA). The District conducts water quality monitoring and submits reports annually to the State Water Resources Control Board (SWRCB) and Regional Water Quality Control Board (RWQCB).

2.1.2. Existing Conditions: Aquatic Invasive Animals

Neither quagga nor zebra mussels have been discovered in Lake Casitas to date. Dreissenid mussels were first discovered in California in January 2007 in Lake Havasu and have since been discovered at multiple sites within Ventura County, specifically within Lake Piru and its watershed in 2013, including Lower Piru Creek and the Santa Clara River. Dreissenid mussels are an immediate threat to the Western United States. They are harmful fouling organisms and efficient filter feeders, able to colonize in and block water delivery infrastructure and strip food from the water that is necessary to sustain other aquatic life. Direct economic costs are on the

order of $100 million a year in the eastern United States and could be greater in the West, as cities, farms, and industries in the West depend on the effective transport of huge quantities of water across large distances through complex and vulnerable systems of canals, pipes, reservoirs, and pumping stations (Cohen, 2007).

Dreissenid mussels are native to drainages in eastern Europe and western Asia. These species spread rapidly, attach to submerged objects, and can form enormous masses. They were first identified in the United States in the late 1980s within the Great Lakes-region of the US and have since spread to at least 34 states including California (USGS, 2021a, 2021b).

Consistent with California Department of Fish and Wildlife requirements presented in California Code of Regulations (CCR) Title 14 § 672 and elsewhere, the District has implemented a Dreissenid mussel control, prevention and inspection program. The District's (2016a) preventative program has been reviewed by the California Department of Fish and Wildlife (CDFW), and is outlined in Lake Casitas Prevention, Control, and Management Plan for Invasive Mussels. The District has also established a Rapid Response Plan which will be implemented upon discovery of an infestation. Further, the District has received funding from the California Division of Boat and Waterways to implement the "Lake Casitas Quagga and Zebra Mussel Prevention Public Outreach and Education" program. The District is taking numerous proactive measures to prevent infestation, including routine monitoring and a stringent boat inspection protocol which has been in place for nearly a decade.

The water chemistry of the Lake Casitas is well suited to support an infestation of quagga and/or zebra mussels in upper levels of the reservoir (CMWD, 2016a). The reservoir is at great risk of infestation by quagga or zebra mussels should they become introduced from Lake Piru or other sources. In the 2016 vulnerability assessment, if the lake were evaluated on a scale of 1 to 5, with 5 being the highest risk, Lake Casitas would qualify for risk rating of 5 (CMWD, 2016b).

2.2. Environmental Setting

Lake Casitas was created by the completion of Casitas Dam on Coyote Creek in the Ojai Valley in 1959, as part of the Ventura River Project. The lake's surface area is approximately 2,710 acres with approximately 35 miles of shoreline. At full capacity, the lake is able to store 237,760 acre-feet (AF) of water with an average depth of 94 feet and a maximum depth of 267 feet. The lake is the Ventura River watershed's main source of surface water and was designed to maintain supplies during a multi-year dry period (Walter, 2015). Inflow to the lake comes primarily through Coyote Creek, Santa Ana Creek, and the Ventura River (through the Robles Diversion Canal). Discharges from the lake could occur through a valve at the base of Casitas Dam or over the top of Dam spillway, both of which spill to Coyote Creek, which joins the Ventura River approximately 2 miles downstream of the dam, and then to the Pacific Ocean. The landscape surrounding Lake Casitas is largely undeveloped. The lake is bordered by the Santa Ana Valley to the southwest and the Ventura River Valley to the east. The area is mountainous, with the Santa Ynez Mountains to the northwest, the Topatopa Mountains to the northeast, Sulphur Mountain on the east side and Red Mountain on the southwest.

The region has a Mediterranean climate with long, dry summers, and brief winters with short, sometimes intense, winter storm events. Annual rainfall averages from about 14 to 16 inches, with most rainfall occurring during winter months (December–March). Snow accumulation is minimal and does not contribute significantly to run-off volume or magnitude. Surface flow in the

streams associated with Lake Casitas can be strongly influenced by groundwater. Many rivers and streams in this region naturally exhibit interrupted surface flow patterns (i.e., alternating reaches with perennial and seasonal surface flow) controlled by geologic formations and the strongly seasonal precipitation pattern characteristic of a Mediterranean climate.

Land use in the area surrounding Lake Casitas includes residential, commercial, industrial, public facilities, open space, and recreational use. Land to the north and west of Lake Casitas is nearly all open space. The unincorporated communities of Casitas Springs and Oak View lie directly to the east of Lake Casitas, and the city of Ojai is approximately 6 miles to the north-east.

The native vegetation surrounding Lake Casitas consist of arid, chapparal/shrub vegetation characteristic of the California coastal sage and chapparal terrestrial sub-ecoregion. Agricultural products grown in the area surrounding Lake Casitas include avocado, citrus, grains and grapes (DWR, 2016).

2.2.1. Project Location

Lake Casitas is located in the Ojai Valley, approximately 78 miles northwest of the City of Los Angeles and 13 miles north of the City of Ventura, near the intersection of State Route (SR) 33 and SR 150, in Ventura County California, San Bernardino Meridian T3N, R24W (**Figure 1).**

0	4/12/22	Map Creation	SM

DATE	DESCRIPTION	INIT.

Blankinship & Associates, Inc.
Ag & Environmental Science & Engineering

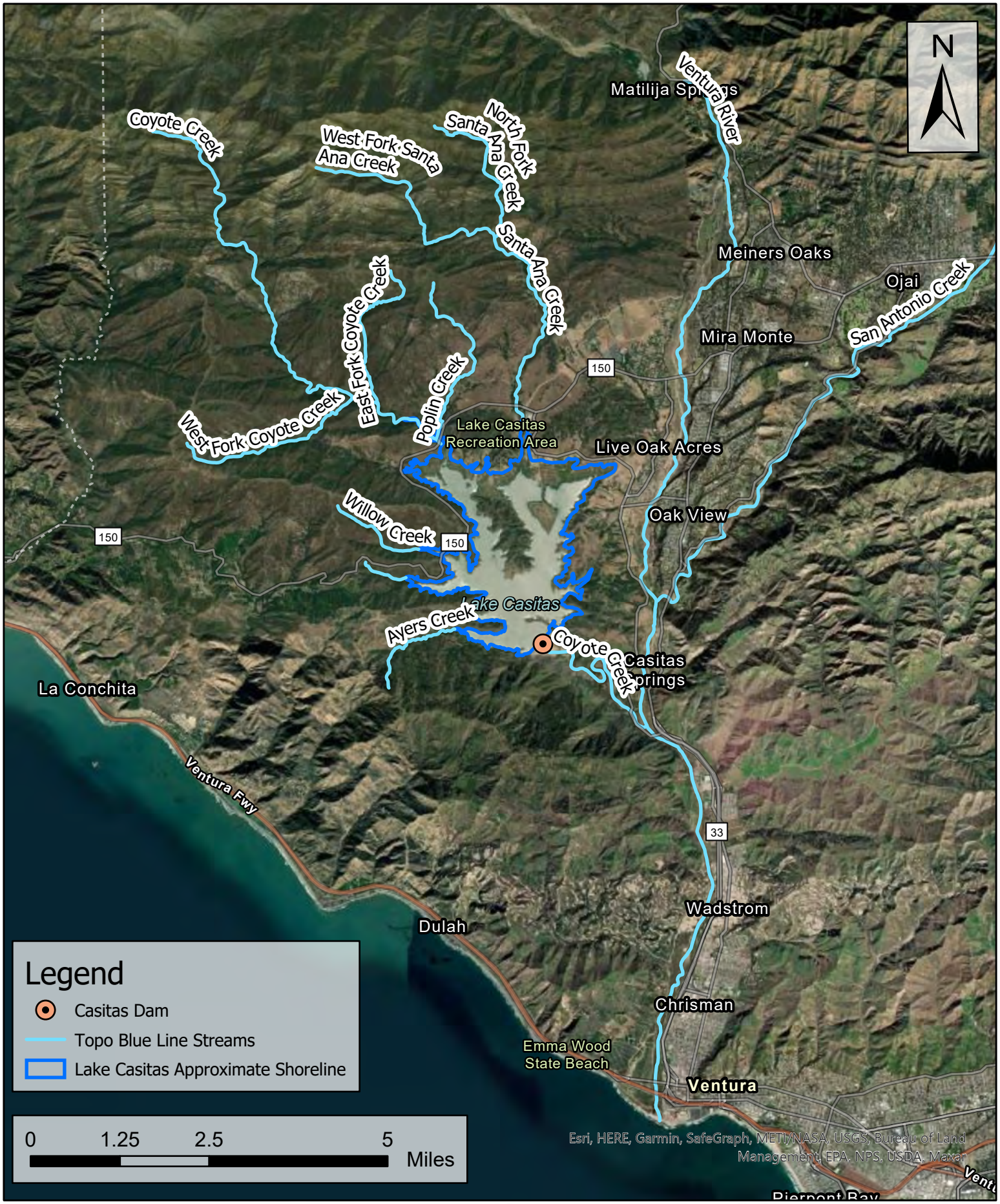
Notes:

PROJECT: Casitas Municipal Water District ISMND

FIGURE: 1A

DESCRIPTION: Project Location Map

DATE: 4/12/2022



0	4/12/22	Map Creation	SM
⚠ DATE		DESCRIPTION	INIT.

Blankinship & Associates, Inc.
Ag & Environmental Science & Engineering

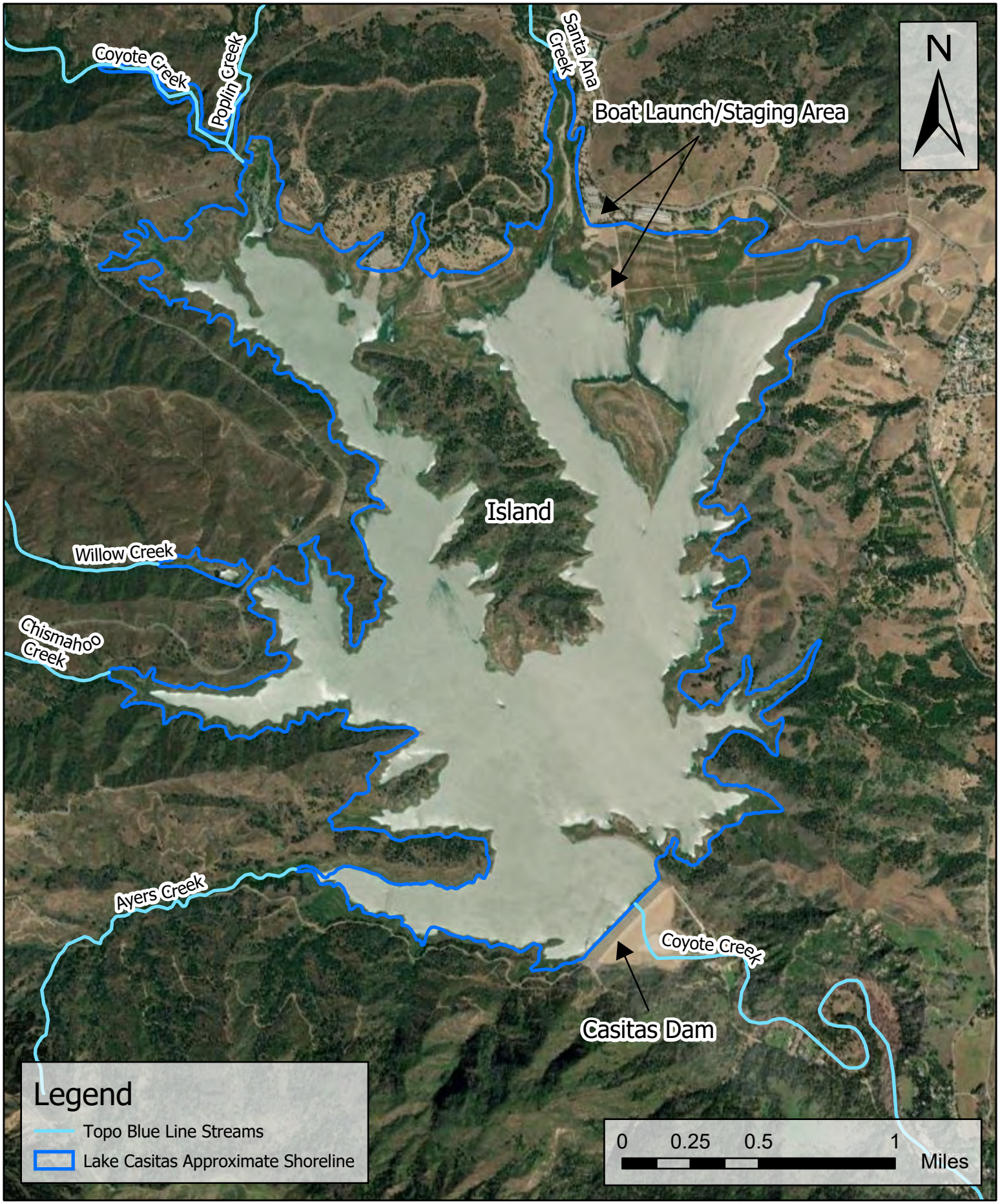
Notes:

PROJECT: Casitas Municipal Water District ISMND

FIGURE: 1B

DESCRIPTION: Project Vicinity Map

DATE: 4/12/2022



0	4/12/22	Map Creation	SM
DATE		DESCRIPTION	INIT.

Blankinship & Associates, Inc.
Ag & Environmental Science & Engineering

Notes:

PROJECT: Casitas Municipal Water District ISMND

FIGURE: 1C

DESCRIPTION: Project Site Map

DATE: 4/12/2022

2.2.2. Water Rights and Uses

Based on annual summary data from 1955 to 2019, on average, each year Lake Casitas receives approximately 43% (11,290 AF) of inflow from Coyote Creek and Santa Ana Creek, 41% (10,672 AF) from the Ventura River through the Robles Diversion Canal, and 16% (4,203 AF) from precipitation on the lake surface. The primary mechanism of outflow is through the District's conveyance system for delivery to municipal, industrial, and agricultural water users. Discharges to Coyote Creek could occur via releases from a hollow jet valve at the base of Casitas Dam or over the Casitas Dam spillway. Active measures are taken to prevent discharges over the dam spillway. Water diversions through the Robles Diversion Canal are discontinued when lake elevation approaches spill level. Accordingly, spills from Lake Casitas are rare and typically associated with winter rain events. Spills occurred in 8 years over the period between 1959 and 2020 during water years that had above average precipitation and resultant runoff into the lake. The lake reached full capacity and spilled in 1978, and the last spill occurred in 1998. There are currently no regular releases from the lake to Coyote Creek at any time of the year.

In addition to its primary function as a source of drinking and irrigation water supply, Lake Casitas is open to non-contact recreation. The Lake Casitas Recreation Area provides access to over 600,000 visitors each year. Swimming and wading are prohibited in Lake Casitas; on and near-water activities include motor boating, sailing, kayaking, canoeing, and fishing. Lake Casitas has been stocked with black crappie (*Pomoxis nigromaculatus*), bluegill (*Lepomis macrochirus*), largemouth bass (*Micropterus salmoides*), catfish species (*Ictalurus* spp.) and rainbow trout (*Oncorhychus mykiss*). In addition to the stocked fish mentioned above, several introduced species are present in Lake Casitas, including green sunfish (*Lepomis cyanellus*), and mosquitofish (*Gambusia affinis*).

The capacity of Lake Casitas, if available, provides attenuation of flood flows downstream of the dam. Additionally, up to 500 cubic feet per second (cfs) can be diverted from the Ventura River to Lake Casitas to increase water levels in the lake or to divert floodwaters that could threaten public safety and property in and along the Ventura River (Walter, 2015). To prevent discharge from the reservoir, diversions from the Ventura River can be stopped when the lake surface elevation approaches spill level.

2.2.3. Water Quality

Water quality in Lake Casitas is generally good. The District and the U.S. Bureau of Reclamation (USBR) maintain proactive programs to monitor and maintain water quality in the lake. Approximately 6,641 acres of land immediately surrounding the lake are federally protected to prevent land uses that could threaten water quality (Walter, 2015). Like many reservoirs in California, Lake Casitas is listed on the Section 303(d) list of impaired waterbodies for mercury. Likely sources of mercury include mining and air pollution which settles onto land and into water. The District monitors water quality in Lake Casitas at least monthly, using in-situ monitoring probes to record dissolved oxygen (DO), pH, electrical conductivity (EC), total dissolved solids (TDS), and turbidity at multiple water depths. Additional sampling monitors for fecal indicators (*Escherichia coli* and *Enterococcus* spp.), nitrate, phosphate, and other chemical parameters.

The most recent available water quality data for Lake Casitas was from 2019 (internal data). In addition to data from 2018, summaries of water quality data from 2012–2017 were reported by Water Quality Solutions (2018). These data were used to summarize reservoir habitat and water

quality. Reservoirs like Lake Casitas generally exhibit thermal stratification driven by meteorological conditions including air temperature, solar radiation, and wind. As air temperature and solar radiation increase in the spring and summer, a thermocline develops. In the fall and winter, decreasing air temperature and solar radiation cool water at the lakes surface and deepen the thermocline until "turnover," the time when a reservoir becomes un-stratified and vertical mixing is uninhibited by stratification. The timing of turnover of a reservoir is affected by meteorological conditions and reservoir depth. Some deep reservoirs like Lake Casitas may not completely turnover each year. A by-product of thermal stratification is the inhibition of oxygen transfer from the atmosphere to the hypolimnion. Historically, this generally resulted in anoxic conditions in the hypolimnion of Lake Casitas. The District has implemented strategies to reduce hypolimnetic anoxia, the most recent being installation of an HOS system in 2015.

Lake Casitas is thermally stratified during the summer with the thermocline around 20–30 meters deep. When stratified, surface temperatures can reach as high as 26°C and dissolved oxygen is near saturation levels, above 8 mg/L. Below the thermocline water temperature is generally around 14°C, and before installation of the HOS system, dissolved oxygen dropped as low as 1 mg/L. Lake Casitas is generally well-mixed from top to bottom during winter and spring months with temperatures around 13–15°C and dissolved oxygen near saturation levels (7–10 mg/L). In general, DO levels are directly dependent on the development of the thermocline, phytoplankton activity, and sediment oxygen demand. Before the installation of the HOS, hypolimnetic DO levels exhibited a seasonal decline starting in the spring and lasting until turnover. After the HOS became fully operational in spring of 2016, DO levels in the hypolimnion remained near saturation levels during summer stratification, but DO in the hypolimnion can remain low in areas further away from the HOS system.

The electrical conductivity of Lake Casitas water from 2012 to 2019 ranged from 473 to 660 µS/cm and increased over this time frame due to lower inflows rates and water loss from evaporation. Conductivity generally decreases below the thermocline.

Lake Casitas pH values from above the thermocline ranged from approximately 7.5 to over 9.5 and depend largely on seasonal factors such as the development of the thermocline and algal productivity and decay. In general, elevated pH in the epilimnion is an indicator of algal production. It is also noted that pH generally decreases in the hypolimnion when the lake is stratified. This is usually a result of organic decomposition and sediment release of carbon dioxide (CO_2) to the water column. CO_2 may combine with water (H_2O) to form carbonic acid (H_2CO_3), a weak acid that dissociates to hydrogen (H^+) and bicarbonate (HCO_3^-). The HCO_3^- could further dissociate to H^+ and carbonate (CO_3^{-2}), further lowering pH. During periods of lake turnover and mixing, pH levels in the water column became vertically uniform with a value of approximately 7.5.

The presence of nutrients in the water column, coupled with relatively warm water and an abundance of light in the spring and summer, provide conditions that are ideal for the growth of algae. The two primary nutrients required for algal growth are phosphorus and nitrogen. In general, algal growth is hampered by the shortage of these nutrients. Maximum nutrient values for Lake Casitas during 2012–2017 are summarized in **Table 1**, below.

Table 1. Summary of Maximum Nutrient Values 2012-2017

Maximum Nutrient Concentration (mg/L)	2012	2013	2014	2015	2016	2017
Total Phosphorus	0.28	0.46	0.40	0.36	0.15	0.12
Dissolved Phosphorus	0.29	0.28	0.39	0.35	0.14	0.05
Nitrate-N	0.30	0.40	0.32	0.45	0.80	3.16 (0.73)*
Ammonia-N	0.42	0.30	1.35	0.71	0.09	0.09

* The highest hypolimnetic Nitrate-N concentration for Year 2017 is 3.16 mg/L, at a depth of 9.1 meters on March 1, 2017. This value is significantly higher than the measured values above and below this depth, before and after the sampling date. So it is possibly a sampling outlier or the result of a high nitrogen inflow in the preceding period. Of note: 1) NH_3 levels were not elevated during this profile, or the previous month's profile. 2) There were no similarly high values of N at the other depths in the March profile of during the previous (February) or following (April) months. 3) Weekly distribution system samples for nitrate remained within the normal range (0.9 mg/L as N) during the month of March. If this data point were taken out, the highest hypolimnetic Nitrate-N concentration would be 0.73 mg/L.

Source: WQS, 2018

Total dissolved phosphorus (TDP) levels in the summer generally decline in the epilimnion due to uptake by algae and increase in the hypolimnion due to internal loading. After turnover, TDP levels are uniform. Installation of the HOS system in 2015 led to a reduction in TDP levels in the hypolimnion.

Nitrate (NO_3^-) concentrations are fairly uniform after turnover. In the hypolimnion, there is a spike in NO_3^- during the spring and summer, with decreasing values in the fall. As is typical, the surface concentration of NO_3^- decreases during spring and summer when water temperatures and day length increase, stimulating algal growth and uptake of NO_3^-. After HOS installation, in years 2016 and 2017, hypolimnetic NO_3^- levels remained high due to oxygenation. Ammonia follows a similar pattern to NO_3^-.

Water clarity (as indicated by Secchi depth measurements) generally decreases during the spring and summer as algae growth increases.

Water hardness averages approximately 237.5 mg/L, which is classified as hard by USEPA standards.

Maintaining water quality in Lake Casitas and the ability to convey that water from the lake to the District's treatment plant and on to customers is critical to the District's mission of providing safe and reliable drinking water. Nuisance, and potentially harmful algae blooms and infestation of the lake by dreissenid mussels presents ongoing and emerging threats to the District's mission.

2.3. Regulatory Setting

The Project will conform with the requirements of the Aquatic Weed Control NPDES General Permit (Order No. 2013-0002-DWQ, General Permit No. CAG990005) and the Aquatic Animal Invasive Species Control NPDES General Permit (Order No. 2016-XXXX-DWQ, General Permit No. CAG990006). These Permits require compliance with the following:

- Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries in California ("State Implementation Policy" or "SIP")
- California Toxics Rule (CTR) (40 CFR § 131.38, 2018)
- 2012 California Ocean Plan
- Los Angeles RWQCB Basin Plan
- SWRCB Resolution 68-16 (Antidegradation Policy)

The SIP assigns limitations for CTR priority pollutants and prohibits their discharge into receiving waters in excess of applicable water quality criteria or receiving water limit (RWL). Although the SIP generally prohibits these discharges, Section 5.3 of the SIP allows for short-term or seasonal exceptions of water quality criteria exceedances if determined to be necessary to implement control measures either (1) for resource or pest management conducted by public entities to fulfill statutory requirements, or (2) regarding drinking water conducted to fulfill statutory requirements under the federal Safe Drinking Water Act or the California Health and Safety Code. Exceptions may also be granted for draining water supply reservoirs, canals, and pipelines for maintenance, for draining municipal storm water conveyances during cleaning or maintenance, or for draining water treatment facilities during cleaning or maintenance. The District has concluded that it meets one or more of the criteria for gaining a Section 5.3 SIP exception.

Public entities that are eligible to use a SIP Exception must satisfactorily complete several steps, including preparation of technical and other documents to satisfy CEQA requirements. These documents typically include analysis of existing environmental conditions, water quality assessment, and review of the environmental fate and potential impacts to ecological receptors of the pollutant for which an exception is sought.

The California Ocean Plan allows exceptions from meeting RWLs for pollutants discharged into the Pacific Ocean when the exception will not compromise protection of ocean waters for beneficial uses and the public interest will be served. This Plan would be applicable only in the event that copper-treated water is discharged over the Casitas Dam spillway and enters the ocean via Coyote Creek and the Ventura River (refer to **Section 2.2.1**).

2.3.1. Potentially Applicable Policies and Permit Coverage

- Los Angeles RWQCB Basin Plan
- California Ocean Plan
- SWRCB Resolution 68-16 (Antidegradation Policy)
- Aquatic Weed Control NPDES General Permit
- Aquatic Animal Invasive Species Control NPDES General Permit

2.3.2. Discretionary Approvals

Elements of the Project could be subject to the permitting and/or approval authority of regional, state, and federal agencies. Potential approvals and approving bodies could include, but are not limited to:

- State Water Resource Control Board
- Los Angeles Regional Water Quality Control Board

To obtain approval of an exception under Section 5.3 of the SIP to temporarily exceed the CTR criterion for dissolved copper, the District will submit the following documents to the SWRCB:

a) A detailed description of the proposed action, including the proposed method of completing the action;
b) A time schedule;
c) A discharge and receiving water quality monitoring plan (before Project initiation, during the Project, and after Project completion, with the appropriate quality assurance and quality control procedures);
d) CEQA documentation;
e) Contingency plans (to the extent applicable).

Upon completion of the Project, the discharger shall provide certification by a qualified biologist that the receiving water beneficial uses have been restored.

2.3.3. NPDES Permit Notifications

Every calendar year, at least 15 days prior to the first application of algaecides and/or aquatic herbicides, the District will send a one-time notification to potentially affected public and governmental agencies. The District may also post the notification on its website. The notification must include the following information:

1) A statement of the District's intent to apply algaecide and/or molluscicide(s);
2) Name of algaecide and/or molluscicide(s);
3) Purpose of use;
4) General time period and locations of expected use;
5) Any water use restrictions or precautions during treatment; and
6) A phone number that interested persons may call to obtain additional information from the District.

The District typically sends the annual notification to the following agencies: Ventura County Agricultural Commissioner, CDFW, and U.S. Fish and Wildlife Service (USFWS).

2.4. Standard Operating Procedures for Algae Control

The District implements an Integrated Pest Management, or IPM-based approach to monitoring and responding to algal blooms in Lake Casitas. The District's preventative program is outlined in the "Draft Casitas Municipal Water District Phytoplankton Monitoring and Treatment Internal Guidance Document for Algal Blooms in Lake Casitas" (CMWD, October 31, 2019). The program includes guidance for monitoring and establishes thresholds above which control may be needed. When thresholds are exceeded, applications of algaecides may be made to protect beneficial uses, especially municipal and domestic drinking water supply, non-contact recreation, and fish habitat. The program includes a monitoring plan for algae in areas where blooms typically establish, an evaluation of their potential for harm (e.g., generation of disinfection byproducts or algal toxins), and an outline to create an action plan to address, manage, and mitigate the effects of algal blooms.

In 2014, the District applied for, and received coverage to apply aquatic herbicides and/or algaecides, including materials containing the active ingredients copper and/or SCP, under the Aquatic Weed Control NPDES General Permit. As required by this Permit, the District completed an NOI, prepared and submitted an APAP, and received an NOA. The District's APAP includes a description of the water body, pests requiring chemical treatment, types of herbicides and/or algaecides expected to be used and the methods by which they are applied, factors influencing the decision to select aquatic herbicide and/or algaecide applications for weed and algae control, control structures used to reduce discharges or residual herbicide and/or algaecide to potentially affected receiving waters, descriptions of best management practices (BMPs), possible alternatives to aquatic herbicide and/or algaecide use and evaluation of management options, and a monitoring and reporting plan (CMWD, 2014).

Since enrollment in the Aquatic Weed Control NPDES General Permit, the District has carried out several applications using copper-containing algaecides and one application using an SCP-containing algaecide. No algaecide applications have resulted in adverse impacts to wildlife or beneficial uses of Lake Casitas, and no treated water has been spilled to Coyote Creek.

Historical treatment details, including target species, acreage and depths were reviewed for purposes of modeling in this document. A large-scale algaecide application is considered to be an application to 250 surface acres, or 10% of the surface area of Lake Casitas, and to a water depth of up to 25 feet, resulting in a treatment volume of up to 6,250 acre-feet, or 2.6% of full lake volume. Applications of copper-containing algaecides were assumed to be made to reach the target concentration of 1 mg/L copper within the treatment area. Consistent with label instructions, the minimum retreatment interval between consecutive treatments is 14 days.

Prior to an application of copper-containing algaecides, for the protection of worker and public safety, the following tasks are accomplished:

1) A written recommendation is prepared by a DPR-licensed Pest Control Adviser (PCA). A PCA undergoes 40 hours of training every 2 years on issues including health and safety and prevention of exposure to sensitive receptors. The written recommendation prepared by the PCA is based on site-scouting and results of the District's algae monitoring activities, and evaluates proximity of recreational activities, presence of people, health and environmental hazards and restrictions relative to the treatment area. The PCA recommendation includes a certification that alternatives and mitigation

measures that substantially lessen any significant adverse impact on the environment have been considered and adopted, if feasible.

2) Under the District's current operating plan, algaecide applications are overseen by staff possessing a PCA license and/or a Qualified Applicator Certificate (QAC) or Qualified Applicator License (QAL). This requirement extends to contractors the District may hire to complete this work. The PCA prepares a written Pest Control Recommendation, which includes the location (or locations) to be treated, the algaecide to be used, the target concentration of the algaecide and total amount of the algaecide to be used, the acreage to be treated, and safety precautions and other mitigations, where necessary. The PCA may provide safety training for all involved in the application. The Qualified Applicator oversees the staff performing the application. The Qualified Applicator maintains records of the algaecide application, and reports algaecide use data to County Agricultural Commissioner (CAC) as required.
3) All District personnel and their contractors review and strictly adhere to the aquatic algaecide product label, which has clear and specific warnings that alert users to hazards that may exist. An example of a specific product label is included in **Appendix A**.
4) All District personnel and their contractors review and consult the aquatic algaecide Safety Data Sheet (SDS) (example included in **Appendix A)**, and the DPR Worker Health and Safety Branch Pesticide Safety Information Series (PSIS). The PSIS and SDS have specific information that describes precautions to be taken during the use of the aquatic algaecide.
5) The condition of the treatment area within Lake Casitas is evaluated to confirm that the application is necessary, feasible and can be conducted safely and according to label. This evaluation considers target species, level of infestation, water quality conditions, alternate control methods, the target concentration and amount of aquatic algaecide(s) to be applied.
6) The treatment area volume and size (acreage) and treatment dose varies based on the location and growth stage of the bloom, target algae type and how deep it is observed. Typically, only the top 10 to 25 feet of water column are treated. District or application contractor staff calculate the volume of water being treated prior to applying algaecides to determine the amount of algaecide needed to achieve target concentrations.
7) The District reviews current storage levels in Lake Casitas to evaluate the risk of discharging treated water via overtopping spill. Generally, there is no reasonable potential for a discharge of water containing concentrations of copper that exceed freshwater or saltwater RWLs if lake storage is less than 85% of capacity at the time of application. If lake storage is between 85 and 95% of capacity, the District evaluates the likelihood of a spill-inducing storm event based on seasonality and weather forecasts prior to making applications of copper-containing algaecides. If lake storage is at or above 95% capacity, the District avoids making applications of copper-containing algaecides, if feasible.
8) District staff prepares treatment area maps, collects data on dissolved copper concentrations before and after treatment. As needed, water quality monitoring for the Aquatic Weed Permit is conducted. District and/or application contractor staff evaluate post-treatment efficacy and continue monitoring algae density, type, location, and water quality.

2.5. Standard Operating Procedures for Mussel Management

The District implements a preventative program to handling invasive dreissenid mussels. The District's preventative program is outlined in Lake Casitas Prevention, Control, and Management Plan for Invasive Mussels (CMWD, 2016a). The program includes guidance for prevention, monitoring and identification of dreissenid mussels, and establishes thresholds above which control is needed. The survey protocol for presence and absence of dreissenid veligers and adult mussels is intended to provide early detection of mussels in the reservoir. If dreissenid mussels become established, the monitoring protocol is to be modified to track the breeding season of the mussels, growth rates and distribution patterns within the lake. Based on the monitoring and tracking of distribution, density and water quality, the District can evaluate the optimal treatment timing and location(s) relative to water temperature and mussel life cycle.

The goal of the mussel plan is early detection and rapid response to keep the lake, associated drinking water treatment infrastructure and downstream waterbodies (e.g. Coyote Creek and the Ventura River) free of dreissenid mussels. Thus, the threshold for treatment may be exceeded if veligers or even a minor, localized infestation of adult mussels are encountered. When thresholds are exceeded, applications of molluscicides may be made to protect beneficial uses of Lake Casitas.

Consistent with the District's program for the prevention of mussel infestations, the following activities will be undertaken:

1) Strict watercraft tracking and tagging requirements, including vessel decontamination and inspections, and an on- or off-site 35 day quarantine period are part of the Lake Casitas Prevention, Control and Management Plan for Invasive Mussels (CMWD, 2016a).
2) Monitoring, sampling, and surveying for dreissenid mussels, consisting of several techniques including visual snorkel surveys, placement of artificial settlement substrates, water-column sampling and inspection for dreissenid veligers, and monitoring of water quality. If an invasion occurs, the standard operating procedures transition from presence/absence detection and focuses on assessing the densities of larvae and adults, determining periods of settlement, locations within the lake, and evaluating maximum sizes and biomass of adults, development rates of larvae, and growth rates of adults.
3) Education and Outreach, including signage that reminds boaters it is illegal to possess or transport dreissenid mussels in California; additional "Clean, Drain, Dry" and "Don't Move a Mussel" signage and educational placards are present near boat launch facilities at the lake.
4) Response steps for Quagga Mussels in Lake Casitas, which include immediate notification of an appropriate CDFW Regional Scientist, verification that the observed mussel is an invasive species, and transition into post-invasion monitoring. After an infestation is confirmed, the District will implement its Rapid Response Plan to prevent further spread and will implement a program to control or eradicate invasive mussels, and decontaminate water containing larval mussels.

Prior to the use of DPR-approved molluscicides, the District will obtain coverage under the Aquatic Animal Invasive Species Control NPDES General Permit.

The District has conducted literature reviews, consulted with state and federal regulatory agencies, academia, United Water Conservation District ("United Water") staff who have experience working on invasive mussel issues, and suppliers and applicators of molluscicide and aquatic organism control products. Priority was placed on identifying a molluscicide product that would be effective (with the goal of achieving eradication) and could be utilized with relatively low risk to environmental receptors. To date, the only documented molluscicides that have high potential for successful eradication of mussels on a whole waterbody scale have been potash and copper-based products. The efficacy of a selected product is dependent on water chemistry, temperature, and species of mussel.

The District intends to use EarthTec QZ®, a DPR-registered molluscicide containing copper in the cupric ion form (a biologically active form of copper), or its equivalent. The current decision to use EarthTec QZ is based on studies conducted by United Water, the owner and operator of Lake Piru in Ventura County, California and other case studies conducted using EarthTec QZ to control quagga mussels (Hammond and Ferris, 2019; UWCD, 2017).

United Water designed a pilot study to test the efficacy of copper-based molluscicides using water and quagga mussels from Lake Piru. Results indicate that maintaining a target concentration of 190 ppb dissolved copper at 22°C (or 72°F) for 5 to 8 days achieved 100% control. Applications to Lake Casitas would comply with EPA and DPR regulations and molluscicide label instructions. An example label is presented in **Appendix A**. The District intends to use the data generated by United Water as the basis for molluscicide application methodology to treatments at Lake Casitas, due to the proximity of Lake Piru to Lake Casitas and the similar characteristics shared by the sites.

EarthTec QZ has no degradation byproducts, and no adjuvants or surfactants are used in the product or are needed during application. The District may evaluate the suitability of using other copper-based molluscicides as new products and formulations are developed and obtain Federal and California registration. Application methods may vary depending on the scale of infestation. Isolated "spot" treatments and broad-scale treatments would likely be conducted by boat, but small, localized treatments could be made from the shore or marina docks or by other methods, if warranted. Final sites for treatment will be determined based on monitoring data and other factors prior to application and may be made to any portion of Lake Casitas or infrastructure managed by the District.

The District's initial control plan includes treating up to half of the lake's water volume by making boat-based application of a copper-containing molluscicide along all shorelines; this is intended to target the substrates where mussels are most likely encountered. EarthTec representatives have reported success with this approach. For purposes of modeling a molluscicide application in this document; a broad-scale molluscicide treatment is considered to be an application to 50% of the lake's typical summer water volume at a rate of 0.19 mg/L copper. The target concentration of 0.19 mg/L copper was assumed to be maintained for a period of 8 days. Based on historical reservoir volume data, the 95% upper confidence level for typical water levels in Lake Casitas between May and September is 84% of total capacity, approximately 199,720 AF.

Additional lab-bench testing may be conducted using water and mussels from Lake Casitas, as needed, to more accurately estimate concentrations and treatment durations that result in 100% mussel mortality.

Other dreissenid mussel control methods include mechanical scraping, oxygen deprivation and desiccation. These methods may be employed in lieu of or in combination with molluscicide use. United Water reported that these alternative methods were only effective at reducing populations within treatment areas and were not capable of achieving eradication (CWMD, 2018).

In the event of a confirmed dreissenid mussel infestation, prior to an application of molluscicides the following tasks are accomplished:

1) A written recommendation is prepared by a DPR-licensed PCA. The written recommendation prepared by the PCA is based on site-scouting, results of dreissenid mussel monitoring, bench-top efficacy testing if utilized, and evaluates proximity of recreational activities, presence of people, health and environmental hazards and restrictions relative to the treatment area. The PCA recommendation includes a certification that alternatives and mitigation measures that substantially lessen any significant adverse impact on the environment have been considered and adopted, if feasible.
2) Under the District's current operating plan, molluscicide are overseen by staff possessing a PCA and/or QAC or QAL. This requirement extends to contractors the District may hire to complete this work. The PCA prepares a written Pest Control Recommendation, which includes the location (or locations) to be treated, the molluscicide to be used, the target concentration of the molluscicide, reapplication conditions to maintain the target concentration for the duration of the treatment period, total amount of the molluscicide to be used for initial application, the acreage to be treated, and safety precautions and other mitigations, where necessary. The PCA may provide safety training for all involved in the application. The Qualified Applicator oversees the staff performing the application. The Qualified Applicator maintains records of the molluscicide application, and reports use data to the CAC as required.
3) All District personnel and their contractors review and strictly adhere to the aquatic molluscicide product label that has clear and specific warnings that alert users to hazards that may exist. An example of a specific product label is included in **Appendix A**.
4) All District personnel and their contractors review and consult the aquatic molluscicide SDS (example included in **Appendix A)**, and the DPR Worker Health and Safety Branch PSIS. The PSIS and SDS have specific information that describes precautions to be taken during the use of the aquatic molluscicide.
5) The condition of the treatment area within Lake Casitas is evaluated to confirm that the application is necessary, feasible and can be conducted safely and according to label. This evaluation considers target species, dreissenid mussel density and location(s) of infestation, water quality conditions, alternate control methods, the target concentration and amount of aquatic molluscicide(s) to be applied.
6) The treatment area volume and area may vary based on the location and level of mussel infestation. To achieve lake-wide mussel control, the District may target the entire shoreline of the lake, including islands, to treat up to half the water volume at the time of application. The District maintains charts to estimate treatment volumes based on the water surface elevation of the lake to help determine the amount of molluscicide required. District or application contractor staff calculates the surface area and water

volume being treated prior to applying molluscicide to determine the amount needed to achieve target concentrations. The PCA will calculate additional amounts used in subsequent application, which may be required to maintain the target concentration for the duration of the treatment, based on copper concentration monitoring and will direct applicators on the location and amount of product to apply.

7) The District reviews current storage levels in Lake Casitas to evaluate the risk of discharging treated water via overtopping spill. Generally, there is no reasonable potential for a discharge of water containing concentrations of copper that exceed freshwater or saltwater RWLs if lake storage is less than 85% of capacity at the time of application. If lake storage is between 85 and 95% of capacity, the District evaluates the likelihood of a spill-inducing storm event based on seasonality and weather forecasts prior to making applications of copper-containing molluscicides. If lake storage is at or above 95% capacity, the District avoids making applications of copper-containing molluscicides, if feasible.

8) District staff and/or licensed PCA prepares treatment area maps and collects data on dissolved copper concentrations before and after treatment. As needed, water quality monitoring for the Aquatic Animal Invasive Species Permit will be conducted. District and/or application contractor staff evaluate post-treatment efficacy and will monitor water quality, mussel mortality, and overall water body response to the application.

3. ENVIRONMENTAL CHECKLIST

This document was prepared in a manner consistent with Section 21064.5 of the California Public Resources Code and Article 6 of the State CEQA Guidelines (14 California Code of Regulations).

This Initial Study, Environmental Checklist, and evaluation of potential environmental effects were completed in accordance with Section 15063 of the State CEQA Guidelines to determine if the proposed Project could have potentially significant effect on the physical environment, and if so, what mitigation measures would be imposed to reduce such impacts to less-than-significant levels.

An explanation is provided for all determinations, including the citation of sources as listed in **Section 5**. A "No Impact" or a "Less-than-Significant Impact" determination indicates that the proposed Project would not have a significant effect on the physical environment for that specific environmental category.

Mitigation measures will be implemented to reduce the potentially significant impacts to less-than-significant levels.

3.1. Project Information

1. Project Title:	Use of Copper to Control Algae and Aquatic Animal Invasive Species in Lake Casitas
2. Lead Agency Name and Address:	Casitas Municipal Water District 1055 Ventura Ave Oak View, CA 93022
3. Contact Person and Phone Number:	Jordan Switzer Water Quality Specialist (805) 649-2251 x 145
4. Project Location:	Lake Casitas, Ventura County, California
5. Project Sponsor's Name and Address:	See #2 above
6. General Plan Designation:	Open Space
7. Zoning:	Open Space
8. Description of Project:	See **Section 2**
9. Surrounding Land Uses and Planning:	Drinking Water Reservoir, Recreation Area, Open Space
10. Other Public Agencies Whose Approval is Required:	See **Section 2.3.2**

11. Have California Native American tribes traditionally and culturally affiliated with the project area requested consultation pursuant to Public Resources Code section 21080.3.1?	Yes (See **Section 3.4.18**)

3.2. Environmental Factors Potentially Affected

The environmental factors checked below would be potentially affected by this Project, involving at least one impact that is a "Potentially Significant Impact," as indicated by the checklist on the following pages.

☐ Aesthetics	☐ Agriculture/Forestry Resources	☐ Air Quality
☒ Biological Resources	☐ Cultural Resources	☐ Energy
☐ Geology/Soils	☐ Greenhouse Gas Emissions	☐ Hazards and Hazardous Materials
☒ Hydrology/Water Quality	☐ Land Use/Planning	☐ Mineral Resources
☐ Noise	☐ Population/Housing	☐ Public Services
☐ Recreation	☐ Transportation	☐ Tribal Cultural Resources
☐ Utilities/Service Systems	☐ Wildfire	☒ Mandatory Findings of Significance

3.3. Determination (To be completed by lead agency)

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☒ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

DocuSigned by: Michael Flood EAEF4C59BFE8465...	6/23/2022
Signature	Date
Michael Flood	Casitas Municipal Water District
Printed Name	For

3.4. Evaluation of Environmental Impacts

3.4.1. Aesthetics

Except as provided in Public Resources Code Section 21099, would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☒
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
c) In nonurbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?	☐	☐	☐	☒
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒

Discussion

Item a): *No Impact*

The watershed area surrounding Lake Casitas is designated a Scenic Resource Area by Ventura County (County of Ventura, 2020). The Project would not have an adverse effect on a scenic vista. To the contrary, it may enhance the visual quality of Lake Casitas by reducing the magnitude of algae blooms and preventing the proliferation of invasive dreissenid mussels that could degrade water quality and habitat conditions in Lake Casitas. The Project would not result in the development of new structures that have the potential to block or adversely affect scenic vistas nor would it alter, deface, degrade, or destroy any existing structures, desirable vegetation, or geological features.

Item b): *No Impact*

No state scenic highways are present in the Project Area. State Route 150, which traverses the Project area, running near the western and northern shorelines of Lake Casitas, is eligible but has not been officially designated as a scenic highway (Caltrans, 2021). The nearest officially designated scenic highway is State Route 33 from Wheeler Springs to the Santa Barbara County border, approximately 5 miles northeast of the Project area at its closest point. Project

activities do not include work that would impact trees, rock outcroppings, historic buildings or other scenic resources.

Item c): *No Impact*

The watershed area surrounding Lake Casitas is designated a Scenic Resource Area by Ventura County. Project work would occur in a non-urbanized area and is not expected to degrade the existing visual character or quality of public views of the site and surroundings. The use of copper to control nuisance algae would reduce the magnitude of algal blooms and would enhance the aesthetic value of the Project area.

Item d): *No Impact*

Project work would occur only during daylight hours. No new source of substantial light or glare which affects day or nighttime views in the area of Lake Casitas would be created as a result of Project activities. Additionally, the Project would not result in the installation of permanent structures or the prolonged presence of equipment with reflective surfaces that could produce glare in the daylight.

3.4.2. Agriculture and Forestry Resources

In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California District of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code Section 12220(g)), timberland (as defined by Public Resources Code Section 4526), or timberland zoned	☐	☐	☐	☒

Timberland Production (as defined by Government Code Section 51104(g))?				
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☒

Discussion

Items a through e): ***No Impact***

The Project would not convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to non-agricultural use; conflict with existing zoning or agricultural use, or a Williamson Act contract; conflict with zoning related to forest land or timberland; result in the conversion of forest land or conversion of forest land to non-forest use; or otherwise involve changes to the existing environment which could result conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use.

3.4.3. Air Quality

Where available, the significance criteria established by the applicable air quality management district or air pollution control district may be relied upon to make the following determinations. Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☒
b) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?	☐	☐	☐	☒
c) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☒
d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?	☐	☐	☐	☒

Discussion

Items a) and b): *No Impact*

The Project would require the use of pick-up trucks or other service vehicles for purposes of transporting personnel, equipment, and algaecides and/or molluscicides to their place of use. Motorboats would be used during algaecide and/or molluscicide application and for site reconnaissance before, during, and after applications. Gas-powered pumps would be used to inject algaecides and/or molluscicides into the water column or to spray algaecides and/or molluscicides onto the water's surface. Equipment would be properly maintained, and unnecessary idling would be discouraged to minimize emissions generated from Project activities. The use of vehicles and equipment necessary for Project work is not expected to conflict with air quality plans or violate air quality standards.

Vehicle and equipment emissions would be generated during algaecide and/or molluscicide application; however, they would be minor since applications would be applied on an "as-needed" basis throughout the year and may not be necessary each year. For example, the District made four applications of copper-containing algaecides and between 2013 and 2020. No applications of copper-containing molluscicides have been made to date and would only be made upon discovery of mussels.

The District allows visitors to operate motorboats on Lake Casitas. Compared to baseline emissions from on-going recreational boating on the lake, emissions as a result of the Project would be insignificant. Additionally, the District currently applies copper-containing algaecides to the lake, as permitted under the Aquatic Weed Control NPDES General Permit. The Project would not result in emissions that would exceed those produced under existing conditions but would allow for short-term or seasonal exceptions from meeting the copper criteria for purposes of resource or pest management.

Lake Casitas is located in the South Central Coast Air Basin (SCCAB), which includes San Luis Obispo, Santa Barbara, and Ventura counties. Air pollution control activities, including permitting, facility inspection, air quality attainment planning, rulemaking, monitoring, and incentive program development are provided by the Ventura County Air Pollution Control District (VCAPCD). The application of algaecides and/or molluscicides does not conflict with Ventura County Air Quality Management Plans, violate any air quality standards, or considerably contribute to an existing or projected nonattainment status based on data available from the VCAPCD.

Health and Safety Code section 39608 requires the California Air Resources Board (CARB) to provide area designation maps for each of the ten (10) state criteria pollutants designated for state standards and seven (7) national criteria pollutants for national standards and update the maps annually. As of October 2021, CARB's website presents data last updated in August 2019 as being the most current available. **Table 2** summarizes the current State and National designations for Ventura County.

Table 2. Ventura County Ambient Air Quality Standard Attainment Status

Pollutant	State Designation	National Designation
Ozone (O_3)	Nonattainment	Nonattainment (8-Hr)
Respirable Particulate Matter (PM10)	Nonattainment	Unclassified
Fine Particulate Matter (PM2.5)	Attainment	Unclassified/Attainment
Carbon Monoxide (CO)	Attainment	Unclassified/Attainment
Nitrogen Dioxide (NO_2)	Attainment	Unclassified/Attainment
Sulfur Dioxide (SO_2)	Attainment	Unclassified/Attainment
Lead	Attainment	Unclassified/Attainment
Visibility Reducing Particles	Unclassified	No National Standard
Sulfates	Attainment	No National Standard
Hydrogen Sulfide	Unclassified	No National Standard

Sources: CARB, 2019a, 2019b

CARB maps show levels of ozone and PM10 in Ventura County have exceeded the State Ambient Air Quality Standards, and therefore the area is designated as a "nonattainment" area for these pollutants. PM10 consists of coarse particles, 2.5 to 10 micrometers in diameter. Sources of PM10 include release from the crushing and grinding of material such as stone and metal, and the release of dust particles into the atmosphere when earth is disturbed. Ozone is the byproduct of reactions between nitrogen oxides and volatile organic compounds in the presence of sunlight. The Project is not expected to result in a cumulatively considerable net increase in these nonattainment pollutants.

Items c) and d): *No Impact*

Copper-containing algaecides and/or molluscicides would be applied by District personnel wearing appropriate personal protective equipment for the task being conducted. Applications are typically brief in duration (i.e., 2 to 8 hours) and made infrequently (i.e., 1 to 3 applications per year, if any). The lake is not located near, nor would any applications be made near schools, health care facilities, or day care facilities, thereby reducing or eliminating exposure to airborne pollutants to sensitive receptors. Similarly, there would be no objectionable odors that affect a substantial number of people as a result of the Project.

3.4.4. Biological Resources

Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☒	☐	☐

b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☐	☐	☒
c) Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☒
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

Discussion

Item a): *Less Than Significant with Mitigation Incorporated*

A list of special status species was compiled using records from CDFW's California Natural Diversity Database (CNDDB) and USFWS's Environmental Conservation Online System (ECOS) Information for Planning and Conservation (IPaC) (CNDDB, 2021; USFWS, 2019). Location-specific species information for Ventura County is available from ECOS IPaC. Special status species data from CNDDB was obtained for the two U.S. Geological Survey (USGS) 7.5 x 7.5 minute quadrangles that Lake Casitas falls within (i.e., core quads) as well as ten peripheral quadrangles (i.e., border quads). This approach was used to identify species that might be located in the surrounding areas, but not necessarily reported to CNDDB as a sighting within the boundaries of the Project area. Data was queried from the CDFW and USFWS databases for these quads and combined into one table. Once this list was compiled, a preliminary assessment of the Project area was performed to characterize the actual habitats present on-site and the likelihood of special status species occurrence and interaction with treated water.

A summary of the listed species, their conservation status, and whether they were considered for evaluation of potential impact is presented in **Appendix B** (Table B-1). Species habitat and rationale for removal from further consideration is presented in Table B-1 of **Appendix B** and more detailed species life history information can be found in the same appendix.

There are three special status species for which habitat may be present in or near Lake Casitas and could potentially be affected by proposed Project activities. Two species that could be exposed to treated water within the lake: the western pond turtle and two-stripe gartersnake. Additionally, if treated water is discharged to Coyote Creek and downstream to the Ventura River, the steelhead trout Southern California distinct population segment (DPS) could be exposed to treated water. Steelhead do not occur in Lake Casitas and cannot enter the lake from the Ventura River or Coyote Creek. Coyote Creek does not provide suitable habitat for steelhead, primarily due to channelization and seasonal drying.

An ecological risk assessment (ERA) was conducted for these species to evaluate potential impacts from management of mussels or algae with copper-containing materials. The ERA calculated a risk quotient (RQ) by comparing the estimated exposure with the concentration associated with a toxicity endpoint. Details of the risk assessment process, endpoint and exposure data, and estimations of risk for the three potentially affected special status species are presented in **Appendix C** and summarized below.

Toxicity endpoints routinely used by USEPA (2020) in calculating risk assessments for animals include the median lethal dose (LD50), median lethal concentration (LC50), or median effect concentration (EC50) for acute assessments and the No Observed Adverse Effect Level (NOAEL) or Concentration (NOAEC) for chronic assessments. There are limited or absent toxicity data available for various taxonomic groups like reptiles for many chemicals. As a result, avian (bird) toxicity endpoints were used in place of specific toxicity values for reptile species in this assessment. For aquatic receptors like steelhead, the effects of physicochemical factors on copper toxicity to aquatic receptors are both diverse and site-specific. As a result, USEPA (2007, 2009) has recommended use of the Biotic Ligand Model (BLM) to predict relative effects of physicochemical exposure factors on copper bioavailability, toxicity and estimate a site-specific toxicity endpoint.

Using the BLM to predict copper speciation, a total of 27 graphs were generated to illustrate how variations in water quality parameters including pH, alkalinity, hardness, and dissolved organic carbon (DOC) influence the concentration of bioavailable Cu^{2+}, commonly referred to as cupric ion. See **Appendix D**. Generally, an increase in one or more of these water parameters lowers the concentration of the Cu^{2+} species, thereby lowering the bioavailability of copper.

Once an RQ is calculated, it is compared to the Level of Concern (LOC) to determine whether an adverse effect for a given species is likely to occur. The possibility of unacceptable risk occurs when the RQ exceeds the LOC. Exposure is not considered to pose an unacceptable risk when the RQ is lower than the LOC.

The two application scenarios described in **Section 2.4** and **Section 2.5** for algae and mussel control were modeled separately to estimate risk to the three special status species receptors. Note that, due to the rapid dissipation of copper anticipated when very small portions of water bodies are treated (e.g., single application of copper to 3% of Lake Casitas by volume) and label language restricting algaecide applications from occurring more frequently than every 14 days, algaecide applications at the maximum label rate of 1 mg/L were evaluated as acute exposures to aquatic receptors.

Consistent with label language allowing for longer exposures at lower doses when controlling quagga and zebra mussels, molluscicide applications to Lake Casitas were assumed to be made such that a copper concentration of 0.19 mg/L is maintained for 8 days and were

therefore evaluated as chronic exposures. Although acute exposure could occur following a molluscicide treatment, the molluscicide application rate of 0.19 mg/L was considered less protective than the algaecide application rate of 1 mg/L and was therefore not included in the acute assessment.

For evaluation of risk to the two-striped gartersnake and western pond turtle, an application of copper-containing algaecides at the maximum label application rate of 1 mg/L was estimated to result in the accumulation of approximately 37.1 milligrams of copper per kilogram dry weight of aquatic prey item based on a 24-hour (acute) exposure period. After incorporation of food and water intake rates normalized to body weight, daily exposure to copper was estimated to be approximately 0.41 and 0.31 milligrams of copper per kilogram body weight per day for the snake and turtle, respectively, resulting in an RQ of approximately 0.005 and 0.003, respectively. Because neither RQ exceeds the acute threatened or endangered species LOC for terrestrial animals of 0.1, copper applied to Lake Casitas for algae control does not appear to pose acute risk to the two-striped gartersnake or western pond turtle.

Application of copper-containing molluscicides at a rate of 0.19 mg/L was estimated to result in the accumulation of approximately 21.8 milligrams of copper per kilogram dry weight of aquatic prey item based on an 8-day (chronic) exposure period. After incorporation of food and water intake rates normalized to body weight, daily exposure to copper was estimated to be approximately 0.20 and 0.16 milligrams of copper per kilogram body weight per day for the snake and turtle, respectively, resulting in an RQ of approximately 0.007 and 0.005, respectively. Because neither RQ exceeds the chronic LOC for terrestrial animals of 1.0, copper applied to Lake Casitas for invasive mussel control does not appear to pose chronic risk to the two-striped gartersnake or western pond turtle.

In support of these findings, the California Department of Fish and Game (now “Wildlife”) conducted a study on the effects of oral and dermal exposure to copper (ethylenediamine complex) on two species of garter snakes and did not observe and acute adverse effects (CDFG, 2004).

For evaluation of risk to steelhead, the estimated concentration of copper in the Ventura River following a spill from Lake Casitas 24 hours after an application was estimated to be 4.0 ug/L and 5.3 ug/L, for a molluscicide application and an algaecide application, respectively. These estimates are based on the assumptions presented **Appendix C**. An RQ of 0.02 for the molluscicide application scenario and 0.03 for the algaecide application scenario was calculated by dividing the estimated exposure concentration in the Ventura River by the BLM-derived LC50. Because neither RQ exceeds the acute endangered species LOC for aquatic animals of 0.05, copper applied to Lake Casitas for algae or invasive mussel control does not appear to pose risk to steelhead in the Ventura River.

To further minimize risk to steelhead, the District will implement the following mitigation measure:

BIO-1. The District will, to the extent feasible, prevent discharging water from Lake Casitas to steelhead habitat following an application of copper-containing algaecides and/or molluscicides until dissolved copper concentrations in Lake Casitas have diminished to below the background concentration or to a level where exceedances of the freshwater and saltwater RWL would not occur.

If storage levels in Lake Casitas are equal to or greater than 85% of capacity, the District will consult weather forecasts and will consider the probability of precipitation that could lead to overtopping spill, based on current storage levels, as part of their treatment planning process. If storage levels are equal to or greater than 95% of capacity, the District will delay treatment, if feasible, until lake levels drop below 95%.

Post-application water-quality sampling, conducted within seven (7) days of the completion of the algaecide or molluscicide treatment as part of compliance with the Districts APAP(s) and NPDES Permit(s), will demonstrate whether dissolved copper concentrations within the treatment area have dissipated to concentrations below applicable RWLs. If dissolved copper concentration within the treatment area exceeds applicable RWLs, additional in-lake sampling will be conducted to track concentrations within the treatment area until it is shown that dissolved copper concentrations have dissipated to levels below the RWL. If copper concentrations within the treatment area continue to exceed applicable RWLs during a spill event, the District will collect additional samples from downstream of Casitas Dam within Coyote Creek and within the Ventura River downstream of the confluence with Coyote Creek. If results show an exceedance of an applicable copper RWL and/or observations of adverse impacts to non-target species, the District will notify the RWQCB.

This mitigation measure was developed based on an evaluation of the risk of overtopping spill from Lake Casitas to downstream steelhead habitat using precipitation and storage change data collected by the District between 1993 and 2019, and an evaluation of the risk of discharges of water containing concentrations of copper that could impact steelhead.

It is estimated that following an application of copper-containing algaecides and/or molluscicides, copper concentrations in Lake Casitas would dissipate to levels where a spill from Lake Casitas would not result in an exceedance of the freshwater or saltwater copper RWL in the Ventura River 6.3 days and 6.1 days following applications for algae and mussel control, respectively (see **Section 3.4.10** for additional information).

Dissolved copper RWLs were selected to be protective of all beneficial uses including Warm Freshwater Habitat (WARM), Cold Freshwater Habitat (COLD), Inland Saline Habitat (SAL), Estuarine Habitat (EST), Marine Habitat (MAR), Wildlife Habitat (WILD), Preservation of Biological Habitats of Special Significance (BIOL), Rare, Threatened, and Endangered Species (RARE), Spawning, Reproduction, and/or Early Development (SPWN). Therefore, discharges of water from Lake Casitas that reach the Ventura River should not result in adverse impacts to steelhead if water is held in Lake Casitas for at least 6.3 and 6.1 days following an algae control treatment or a mussel control treatment, respectively.

In order to contain treated water within Lake Casitas, the District would consider the storage level and the potential for an overtopping spill while planning applications of copper-containing algaecides and/or molluscicides. Based on storage change and precipitation data provided by the District, the peak 7-day storage change was an increase of 28,731 AF, corresponding with a 7-day precipitation total of 16.36 inches, which falls within the bounds of a 7-day, 25-year storm event (NOAA, 2021). A storm of this magnitude has the potential to result in overtopping discharge when storage levels are at or above 85% at the time of the storm. Based on this information, there is no reasonable expectation that there could be a discharge of water that

would result in an RWL exceedance in the Ventura River if an application of copper-containing algaecides and or molluscicides is made to Lake Casitas while storage levels are below 85% of capacity.

The peak 24-hour storage change was 13,223 AF, corresponding with a 24-hour precipitation total of 5.75 inches, which falls within the bounds of a 24-hour, 5-year storm event (NOAA, 2021). A storm of this magnitude has the potential to result in overtopping discharge when storage levels are at or above 95% of capacity. Based on this information, where feasible, the District would avoid making applications of copper-containing algaecides and/or molluscicides if lake storage is at or above 95% of capacity.

When storage is between 85% and 95% of capacity, the District will consult with weather forecasts and evaluate, on a case-by-case basis, the potential for overtopping spill. Generally, treatments for both algae control and for mussel control are made during the summer months (May through September). For algae control, blooms are most prevalent during the summer where water temperature and photoperiod are conducive to rapid growth. Mussels may establish and colonize at any time of year; however, applications of copper-containing molluscicides are more effective when made to warmer waters (e.g., above 22 degrees Celsius) due to the increased metabolism of the organisms in warmer waters which leads to an increased uptake of copper. As a result, treatments targeting eradication should also be made in the summer months in order to improve efficacy. Due to the climate in the Project area, rain events, especially large storms, are uncommon, especially in the summer. Each of the three spill events occurring between 1993 and 2019 started between January and February. Should an application of copper-containing algaecides and/or molluscicides be required outside of the window between May and September, special consideration should be given to storage level, climatic conditions, and the potential for overtopping spill within 6 days following an application.

Item b): *No Impact*

The Project would target algae and dreissenid mussels residing within Lake Casitas and is not expected to result in impacts to non-target plant or animal communities (e.g., shoreline habitat, downstream riverine/riparian habitat). Therefore, the Project would not impact riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by CDFW or USFWS.

Item c): *No Impact*

The Project involves the application of copper-containing algaecides and/or molluscicides to water in Lake Casitas and, therefore, would not have a substantial adverse impact on state or federally protected wetlands through direct removal, filling, or hydrological interruption.

Item d): *No Impact*

Project activities would not adversely influence movement of native resident, or migratory fish or wildlife species. No impacts to movement of established native resident or migratory wildlife corridors or impede the use of native wildlife nursery sites would occur as a result of Project activities.

Items e) and f): *No Impact*

The Project would not conflict with, and has no impact to any local policies, ordinances, or plans protecting biological resources.

3.4.5. Cultural Resources

Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Cause a substantial adverse change in the significance of a historical resource pursuant to § 15064.5?	☐	☐	☐	☒
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to § 15064.5?	☐	☐	☐	☒
c) Disturb any human remains, including those interred outside of dedicated cemeteries?	☐	☐	☐	☒

Discussion

Items a) through c): *No Impact*

Pursuant to § 15064.5, a substantial adverse change in the significance of an historical resource means physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be material impaired. Further, the significance of an historical resource is materially impaired when a project demolishes or materially alters in an adverse manner those physical characteristics of an historical resource that conveys its historical significance and that justify its inclusion in, or eligibility for, inclusion in the California Register of Historical Resources; or demolishes or materially alters in an adverse manner those physical characteristics that account for its inclusion in a local register of historical resources pursuant to section 5020.1(k) of the Public Resources Code or its identification in an historical resources survey meeting the requirements of section 5024.1(g) of the Public Resources Code, unless the public agency reviewing the effects of the project establishes by a preponderance of evidence that the resource is not historically or culturally significant; or demolishes or materially alters in an adverse manner those physical characteristics of an historical resource that convey its historical significance and that justify its eligibility for inclusion in the California Register of Historical Resources as determined by a lead agency for purposes of CEQA.

The Project would not require any construction, demolition, or ground disturbing activity and would not demolish, destroy, relocate, or alter historical or architectural resources, nor would it disturb human remains.

3.4.6. Energy

Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?	☐	☐	☐	☒
b) Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?	☐	☐	☐	☒

Discussion

Item a): *No Impact*

Project activities would not significantly increase the consumption of energy resources beyond current uses by Casitas Municipal Water District; therefore, no significant environmental impacts due to wasteful, inefficient, or unnecessary consumption of energy resources are expected. No additional electrical energy resources are needed for Project implementation. The primary energy use of the Project would be the operation of motorized boats and pumps for the purpose of applying copper-containing algaecides and/or molluscicides to the lake. Motorized boats and equipment are used routinely by the District in daily operations, and the Project would not significantly increase the amount of fuel used by the District. To conserve energy, equipment would be properly maintained, and unnecessary idling would be discouraged.

Item b): *No Impact*

Project activities would not conflict with or obstruct state or local plans for renewable energy or energy efficiency. The application of copper-containing algaecides and/or molluscicides would not interfere with the local and state plans and infrastructure in regard to renewable energy and energy efficiency.

3.4.7. Geology and Soils

Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:	☐	☐	☐	☒

i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map, issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	☒
ii) Strong seismic ground shaking?	☐	☐	☐	☒
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☒
iv) Landslides?	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☒
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☐	☒
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?	☐	☐	☐	☒
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☒
f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒

Discussion

Items a) through f): *No Impact*

The Project consists of the application of algaecides and/or molluscicides that contain copper to Lake Casitas. The Project would not include any new structures, ground disturbances, or other elements that could expose persons or property to geological hazards. There would be no change in soil erosion, loss of topsoil, risk of landslide, lateral spreading, subsidence, liquefaction, or collapse due to Project activities. Since no new structures are part of Project activities, there is no change in risk to life or property if expansive soils were located in the area. The Project would not require installation of septic or other wastewater disposal systems. No paleontological resource, site, or unique geologic feature would be affected as a result of the Project.

3.4.8. Greenhouse Gas Emissions

Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☒	☐

Discussion

Items a) and b): *Less Than Significant Impact*

The Project would require the use of trucks or other service vehicles for purposes of transporting algaecides and/or molluscicides to locations where the material is loaded onto boats for application. One or more boats may be used to make applications of algaecides and/or molluscicides, depending on the treatment area size and volume. Application boats are typically outfitted with gas-powered pumps that inject algaecides and/or molluscicides into the water column to control algae and/or mussels. Boats are regularly used for water quality monitoring and equipment maintenance at Lake Casitas. Boats would be used for site reconnaissance before, during, and after application of algaecides and/or molluscicides. Applications are typically brief in duration (1 to 12 hours) and made infrequently (i.e., zero to a few times per year).

The use of trucks, boats and application equipment described above are not expected to conflict with or violate greenhouse gas emission standards. Although short-term boat or vehicle emissions would be generated during algaecide and/or molluscicide application, these emissions would be minor and would not create additional greenhouse gas emissions that would have a significant impact on the environment. To minimize impacts, all equipment would be properly tuned and muffled, and unnecessary idling would be minimized. As a result, Project activities are not expected to be cumulatively considerable.

3.4.9. Hazards and Hazardous Materials

Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Create a significant hazard to the public or the environment through the	☐	☐	☒	☐

routine transport, use, or disposal of hazardous materials?				
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☒	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code § 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?	☐	☐	☐	☒
f) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
g) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires?	☐	☐	☐	☒

Discussion

Items a) and b): *Less Than Significant Impact*

The Project would involve handling copper-containing products which may be regulated as hazardous materials when reportable quantities, as described in 40 CFR Subtitle B, Chapter I, Subchapter C, are transported. Acute exposure to humans of the undiluted, formulated product can cause eye, skin, and respiratory irritation, and can be harmful if swallowed. Refer to the product SDSs presented in **Appendix A**. Use of these material could create a potential for spills that could affect worker safety and the environment. The spills could potentially occur at District storage facilities, at the boat ramp where mixing and loading of algaecide and/or molluscicide products occurs, or during transport. District staff or its application contractor would handle, store, and transport copper-containing products and dispose of containers in accordance with federal, state, and county requirements and manufacturer's recommendations.

Application personnel would attend tail-gate safety meetings prior to starting application work to review information with District and applicator staff on emergency response to accidental

releases of hazardous material. District or application contractor staff who mix, load, apply, transport or dispose of copper-containing algaecides or molluscicides are trained to contain spilled material. Spill kits would be available at sites of storage, use or disposal. Spill kits typically include booms for containment, and absorbent materials such as vermiculite, diatomaceous earth, kitty litter, or spill "pigs" or "pillows" to prevent released material from creating a hazard to the environment or the public. Spills would be reported, as required, and affected material would be properly disposed of or decontaminated.

By following the manufacturer's label and SDS directions, and federal, state and county transportation, handling and disposal requirements, the District would minimize the risk of spills, or other accidental releases that could cause a hazard to the public or the release of hazardous materials into the environment.

Item c): *No Impact*

There are no schools located within ¼ mile of locations of the Project. Furthermore, aquatic algaecide and/or molluscicide applications generally do not result in a release of copper to air; therefore, no airborne risk is present. Once copper has been applied to the water, there are no restrictions to contact with treated water.

Item d): *No Impact*

The Project is not located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code § 65962.5.

Item e): *No Impact*

The Project would not take place within two miles of a public airport or public use airport; therefore, it would not result in a safety hazard or excessive noise for people residing or working in the Project area.

Item f): *No Impact*

No public roadways would be affected by the Project; therefore, Project activities would not impair implementation of or physically interfere with adopted emergency response plans or emergency evacuation plans.

Item g): *No Impact*

The Project would not expose people or structure, either directly or indirectly, to a significant risk of loss, injury or death involving wildlife fires. The Project would not increase fire hazard within the Project area. Vehicle and equipment access and parking near or at Project sites would be organized in a manner to minimize contact with naturally occurring, potentially combustible materials such as dry grass.

3.4.10. Hydrology and Water Quality

Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?	☐	☒	☐	☐
b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?	☐	☐	☐	☒
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:	☐	☐	☐	☒
i) Result in a substantial erosion or siltation on- or off-site;	☐	☐	☐	☒
ii) Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite;	☐	☐	☐	☒
iii) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or	☐	☐	☐	☒
iv) Impede or redirect flood flows?	☐	☐	☐	☒
d) In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?	☐	☐	☐	☒
e) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?	☐	☐	☐	☒

Discussion

The District implements an IPM program for dreissenid mussel and algae control as described in **Section 2.4** and **Section 2.5**. The following documents prepared by the District provide guidance on the extensive monitoring, potential adverse impacts and response actions related to dreissenid mussels or algae management:

- Casitas Municipal Water District Phytoplankton Monitoring and Treatment Internal Guidance Document for Algal Blooms in Lake Casitas
- Lake Casitas Prevention, Control, and Management Plan for Invasive Mussels

Generally, an IPM-based approach involves scouting for mussels or algae, establishment of thresholds above which control is needed, and making applications on an "as-needed" basis to achieve the desired mussel or algae control. Algaecide applications may not be necessary every year. Applications of copper-containing molluscicides may follow guidance presented in the above reference documents, the APAP, lab-bench efficacy trials or contemporary research on dreissenid mussel control.

When applied during algaecide and/or molluscicide treatment, copper dissipation from the water column occurs by way of multiple processes including dilution, sorption, and precipitation. Due to processes such as advection, diffusion, and dispersion and because label language prohibits the application of copper-containing algaecides and/or molluscicides to more than half of a water body, dilution is presumed to be a major dissipation process after initial application (Calomeni et al., 2017). When very small portions of water bodies are treated with copper (e.g., 3% by volume), dilution is expected to occur at a faster rate than in water bodies where large portions are treated (e.g., 50% by volume).

Copper in the water column occurs as dissolved ions and as part of inorganic and organic complexes. Unlike organic chemicals, copper does not degrade over time, instead transforming from one form to another based on environmental properties such as pH, alkalinity, temperature, ionic strength, and organic carbon content. Many such physiochemical characteristics influence copper speciation, associated bioavailability, and resultant toxicity to aquatic organisms. The form of copper most commonly associated with aquatic toxicity is the free cupric ion (Cu^{2+}) (USEPA, 2009). The likelihood and magnitude of toxicity to aquatic receptors exposed to the cupric ion is typically greater in waters characterized by low levels of hardness, pH, ionic strength, and dissolved organic carbon than in waters with higher hardness, pH, ionic strength, and dissolved organic carbon. Copper bioavailability in water is also influenced by the presence of biotic ligands such as algae and the gill membranes of fish. When used as an algaecide, application to water containing higher algal density is associated with lower bioavailability and lower risk of copper toxicity to non-target aquatic receptors than application to water containing lower algal density (Franklin et al., 2002).

Item a): *Less Than Significant With Mitigation Incorporated*

As discussed previously in this document, the District intends to obtain coverage for residual algaecide and molluscicide discharges under the current Aquatic Weed and Aquatic Animal Invasive Species Permits, which require compliance with the Basin Plan, SIP and the CTR. Discharges of copper-containing materials may exceed the hardness-adjusted RWL for dissolved copper as described in the Permit(s), Basin Plan, SIP and CTR. As allowed by both permits and the SIP, the District intends to use this CEQA analysis to support the request for an exception under Section 5.3 of the SIP to allow applications of copper-containing algaecides and/or molluscicides that exceed CTR water quality criteria for a short-term or seasonal basis within the treatment area or in receiving waters.

For purpose of determining exceedance of the dissolved copper RWL, receiving waters are considered to be untreated portions of Lake Casitas or, if treated water were discharged from

Lake Casitas, downstream of Casitas Dam in Coyote Creek and the Ventura River. Compliance with the permits requires implementation of a monitoring and reporting program. This program requires the Discharger collect and analyze water quality samples to determine compliance with applicable RWLs.

Applications of copper-containing algaecides and/or molluscicides may result in short-term or temporary exceedance of the freshwater and/or saltwater dissolved copper RWL. For freshwater, the dissolved copper RWL is calculated using the following hardness-based equation:

$$\text{Dissolved Copper Freshwater RWL} = 0.960^{\{0.8545 * [\ln(\text{hardness})] - 1.702\}}$$

Where:
Dissolved Copper Freshwater RWL is expressed in ug/L
Hardness is expressed in mg $CaCO_3$/L

Based on data from 2018 and 2019, the average hardness of Lake Casitas is 237.5 mg/L. Hardness values in the Ventura River at and downstream of Foster Park are expected to be similar to those in Lake Casitas (LARWQCB, 2002). Therefore, based on the Permits, the associated freshwater RWL for dissolved copper is estimated at 18.8 ug/L for Lake Casitas and the Ventura River. According to the Ocean Plan and Permits, the dissolved copper RWL in saltwater is 3.1 ug/L.

Note that the applicability of the freshwater or saltwater dissolved copper RWL is determined by the salinity of the receiving waterbody. For waters in which the salinity is equal to or less than 1 part per thousand 95% or more of the time, the freshwater criteria apply. For waters in which the salinity is equal to or greater than 10 parts per thousand 95% or more of the time, saltwater criteria apply. For waters in which the salinity is between 1 and 10 parts per thousand, the applicable criteria are the more stringent of the freshwater or saltwater criteria.

Two application scenarios were evaluated to determine the potential duration that copper concentrations may exceed the RWL in receiving waters:

1) Invasive mussel control copper application to up to 50% of the typical summer lake volume at a rate of 0.19 mg/L total copper.
2) Algae control copper application to 250 surface acres treated to a depth of up to 25 feet, resulting in a treatment volume of up to 6,250 acre-feet (approximately 3% of the typical summer lake volume) at the maximum labeled rate of 1 mg/L for algae control.

Refer to **Appendix C** for information on the assumptions made to estimate the dissipation of copper within the treatment area of Lake Casitas and the concentration of copper that may be present in the Ventura River following a spill shortly after application (24 hours). Assumptions made to estimate the dissipation of copper within the untreated area of Lake Casitas are presented below.

Based on results from a Sylvia Lake monitoring study in which a maximum of approximately 12% of the applied dose was detected in the untreated portion of the lake following treatment of two-thirds of the lake volume at a rate of 0.5 mg/L (Serdar, 1995), the untreated portion of Lake Casitas was assumed to receive 20% of the applied copper dose (0.038 mg/L) following a

molluscicide treatment of 50% of the lake volume at a rate of 0.19 mg/L. The untreated portion of Lake Casitas was assumed to receive 5% of the applied copper dose (0.05 ug/L) following an algaecide treatment of 3% of the lake volume at a rate of 1.0 mg/L. Sylvia Lake is a soft water lake with a reported hardness of 44-51 mg/L (Serdar, 1995).

As described in **Appendix C**, initial copper dissipation shortly after application of algaecides and/or molluscicides is expected to occur rapidly due in large part to dilution and sorption. After this period of rapid dissipation, the rate of copper dissipation in the water column is expected to decrease as chemical equilibrium within the water column is approached and other processes such as precipitation become more prominent. Therefore, the half-life of copper after the initial 24-hour dissipation period was conservatively assumed to be 14 days following molluscicide application. This is consistent with findings in the Sylvia Lake monitoring study in which the time required for copper concentrations in the untreated portion of the lake to decrease by half was approximately 3 to 7 days (Serdar, 1995). Peak concentrations in the untreated portion of the lake were observed 24 hours after application. For algaecide application, the half-life of copper after the initial 24-hour dissipation period was assumed to be 7 days, consistent with rationale described in **Appendix C**.

Based on these assumptions, the copper concentration following molluscicide application in the untreated portion of Lake Casitas is expected to exceed the freshwater RWL for up to 15.2 days. Copper concentrations within the treatment area may exceed the freshwater RWL for approximately 19.7 days. In the event of an overtopping spill occurring 24 hours after application, the concentration of copper in the Ventura River is not expected to exceed the freshwater RWL; however, the concentration of copper in the Ventura River may exceed the saltwater RWL (applicable in the tidally influenced section of the Ventura River and in the Pacific Ocean) for up to 5.1 days. Therefore, if water is not spilled for at least 6.1 days after copper application for mussel control, no saltwater RWL exceedance is expected to occur.

Following algaecide applications, the copper concentration in the untreated portion of Lake Casitas is expected to exceed the freshwater RWL for up to 10.9 days. Copper concentrations within the treatment area may exceed the freshwater RWL for approximately 13.1 days. In the event of an overtopping spill occurring 24 hours after application, the concentration of copper in the Ventura River is not expected to exceed the freshwater RWL; however, the concentration of copper in the Ventura River may exceed the saltwater RWL (applicable in the tidally influenced section of the Ventura River and in the Pacific Ocean) for up to 5.3 days. Therefore, if water is not spilled for at least 6.3 days after copper application for mussel control, no RWL saltwater exceedance is expected to occur.

Although a SIP exception allows for short-term or seasonal exceedances of applicable RWLs, the District intends to follow mitigation measure **BIO-1** to avoid impacts to steelhead potentially present in the Ventura River, which would also substantially reduce the potential of exceeding freshwater or saltwater RWLs in waterbodies downstream of Lake Casitas. **BIO-1** requires the District to consider lake storage levels and the likelihood of precipitation prior to application. See **Section 3.4.4** for additional discussion.

A summary of the potential duration of RWL exceedance is presented in **Table 3** and **Table 4**.

Table 3. Estimated Duration of RWL Exceedance Following Application of Copper-Containing Molluscicides

Receiving Water	Freshwater RWL[1] Exceedance Duration (days)	Saltwater RWL[1] Exceedance Duration (days)
Lake Casitas (treatment area)	19.7	NA
Lake Casitas (untreated portion)	15.2	NA
Ventura River	0	NA
Pacific Ocean[2]	NA	6.1

[1] For waters in which the salinity is equal to or less than 1 part per thousand 95% or more of the time, the freshwater criteria apply. For waters in which the salinity is equal to or greater than 10 parts per thousand 95% or more of the time, saltwater criteria apply. For waters in which the salinity is between 1 and 10 parts per thousand, the applicable criteria are the more stringent of the freshwater or saltwater criteria.

[2] Includes the Pacific Ocean and sections of the Ventura River where salinity is greater than 1 part per thousand 95% of more of the time

Table 4. Estimated Duration of RWL Exceedance Following Application of Copper-Containing Algaecides

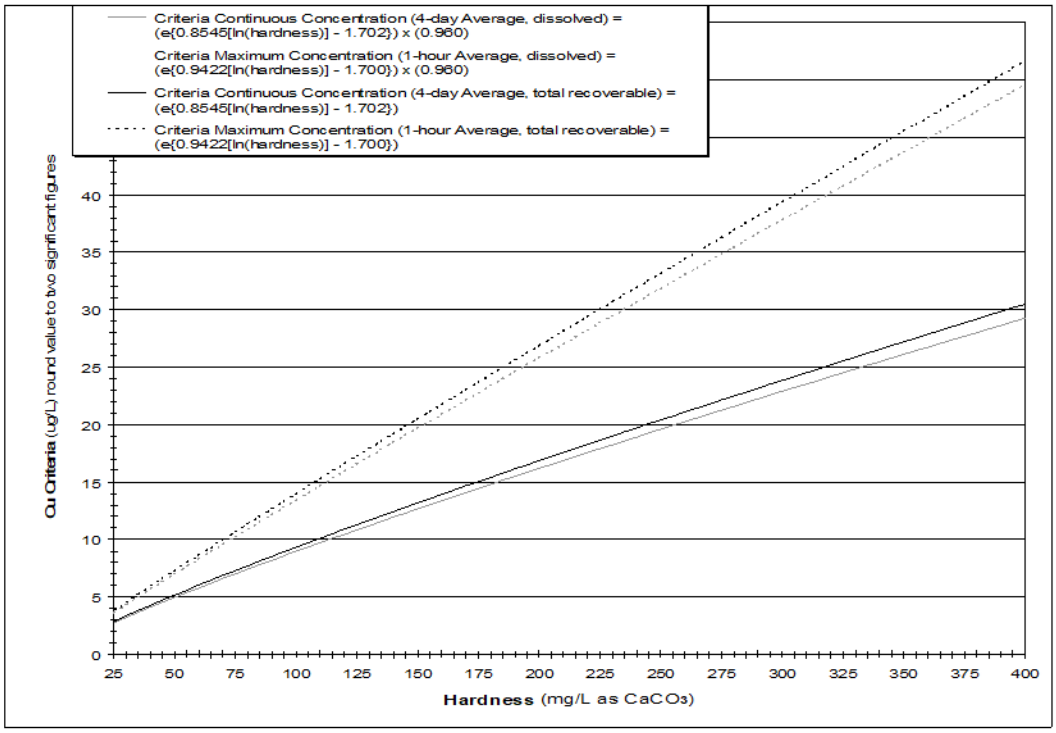
Receiving Water	Freshwater RWL1 Exceedance Duration (days)	Saltwater RWL[1] Exceedance Duration (days)
Lake Casitas (treatment area)	13.1	NA
Lake Casitas (untreated portion)	10.9	NA
Ventura River	0	NA
Pacific Ocean[2]	NA	6.3

[1] For waters in which the salinity is equal to or less than 1 part per thousand 95% or more of the time, the freshwater criteria apply. For waters in which the salinity is equal to or greater than 10 parts per thousand 95% or more of the time, saltwater criteria apply. For waters in which the salinity is between 1 and 10 parts per thousand, the applicable criteria are the more stringent of the freshwater or saltwater criteria.

[2] Includes the Pacific Ocean and sections of the Ventura River where salinity is greater than 1 part per thousand 95% of more of the time

Refer to **Figure 2** for additional information regarding the hardness-based approach to calculating RWLs.

Figure 2. Copper Criteria vs. Hardness Graph



Source: SWRCB, 2016

In addition to the significant evidence that suggests that when used according to label directions by qualified personnel, applications of copper-containing aquatic algaecides and molluscicides would have no significant impact, the District would implement the following mitigation measures to assess potential impacts, and may modify their treatment approach if adverse impacts are identified:

HWQ-1. The District will comply with Aquatic Pesticide Application Plans (APAPs) and other provisions of relevant NPDES permits. Monitoring and reporting described in the APAP will include the permit-required surface water sampling and analysis, a quality control and quality assurance plan, as well as several time-sensitive reporting requirements if adverse impacts to water quality or non-target organisms are detected. The water quality sampling and annual reporting required by the APAP and permits will assess the impact, if any, that the Project may have on water quality and beneficial uses of the water in Lake Casitas. Additionally, consistent with SIP exception requirements, the District will arrange for a qualified biologist to assess the extent of restoration of receiving water beneficial uses after the use of copper-containing algaecides and/or molluscicides upon Project completion.

Item b): *No Impact*

The Project would not involve any construction activities or require the use of groundwater, so there is no impact on groundwater recharge or supplies that may impede the sustainable groundwater management of the basin.

Items c) and d): *No Impact*

The Project would not involve construction of any structures or activities that would alter drainage patterns, increase erosion or siltation on- or off-site, increase runoff amount or rate, create or contribute additional runoff, or impact flood flows. The Project would not risk release of pollutants due to Project inundation in a flood hazard, tsunami or seiche zone.

Item e): *No Impact*

Project activities are not expected to result in any conflict with or obstruction to implementation of a water quality control plan. As discussed, the SIP and CTR specifically allow for dischargers to request a Section 5.3 SIP exception. Project activities would have no impact to a sustainable groundwater management plan.

3.4.11. Land Use and Planning

Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Physically divide an established community?	☐	☐	☐	☒
b) Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒

Discussion

Item a): *No Impact*

The Project would be implemented within Lake Casitas and would not involve any construction of structures, canals, roads, etc.; therefore, no established communities in the Project area would be physically divided.

Item b): *No Impact*

The Project would not conflict with land use plans, policies, or regulations adopted for the purpose of avoiding or mitigating an environmental effect. As such, the Project would not cause a significant environmental impact due to a conflict.

3.4.12. Mineral Resources

Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Result in the loss of availability of a known mineral resource that would be a value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

Discussion

Items a) and b): *No Impact*

The Project involves the application of copper-containing algaecides and/or molluscicides to Lake Casitas and would not impact the availability of any known mineral resource or locally important mineral resource recovery site.

3.4.13. Noise

Would the project result in:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☒
b) Generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☒
c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

Discussion

Item a): *No Impact*

Sources of Project-related noise may include pickup trucks or other service vehicles used for transporting algaecides and/or molluscicides to locations where they are needed, boats used to make applications of algaecides and/or molluscicides, and small portable motors used to pump liquid algaecides and/or molluscicides into Lake Casitas. Boats are also used for purposes of site reconnaissance before, during, and after applications of algaecides and/or molluscicides. Applications are typically brief in duration (1 to 12 hours) and made infrequently (i.e., zero to a few times per year).

The use of motorized vehicles, boats, and pumps in the Project vicinity to aid in the application of algaecides and/or molluscicides would not generate a substantial increase in ambient noise levels since motor vehicles and boats are already regularly used in and around Lake Casitas for routine operations and recreational activities. Furthermore, the use of motorized vehicles, boats, equipment for Project activities would be temporary and infrequent. The Ventura County (2020) General Plan indicates that associated noise impacts, if any, may be determined to be insignificant if their effects last for a limited period of time and reasonable care is exercised to minimize adverse noise impacts. As a result, the Project would not lead to the generation of a substantial temporary or permanent increase in ambient noise levels in excess of standards established in the local general plan.

Item b): *No Impact*

The Project would not generate groundborne noise or vibration, thus no person could be exposed to groundborne noise or vibration.

Item c): *No Impact*

The Project would not be located within the vicinity of a private airstrip or airport land use plan and is not within two miles of a public airport or public use airport; therefore, the Project would not expose people residing or working in the Project area to excessive noise levels.

3.4.14. Population and Housing

Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing people or housing,	☐	☐	☐	☒

necessitating the construction of replacement housing elsewhere?	

Discussion

Items a) and b): *No Impact*

No new homes, business areas, roads or other infrastructure are part of the proposed Project. No displacement of existing homes or people would occur. As such, no impact to population and housing are anticipated as a result of the Project.

3.4.15. Public Services

Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:	☐	☐	☐	☒
Fire protection?	☐	☐	☐	☒
Police protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒

Discussion

Item a): *No Impact*

No new homes, business areas, roads or other infrastructure would be created. The Project would not alter or require the construction of new schools, parks, governmental facilities, or other public facilities, nor would it increase the need for police or fire services, or other public service infrastructure.

3.4.16. Recreation

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒

Discussion

Items a) and b): *No Impact*

The Project would not increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated. Project activities do not include construction of or modification to recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment. Treatment of algae and invasive mussels is expected to improve water quality and habitat conditions in Lake Casitas and, as a result, enhance the quality of the existing associated recreational activities such as boating and fishing.

3.4.17. Transportation

Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?	☐	☐	☐	☒
b) Would the project conflict or be inconsistent with CEQA Guidelines § 15064.3, subdivision (b)?	☐	☐	☐	☒
c) Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒

d) Result in inadequate emergency access?	☐	☐	☐	☒

Discussion

Items a) and b): *No Impact*

The Project would require the use of pickup trucks or other service vehicles for purposes of transporting algaecides and/or molluscicides to locations where they are needed. Pickup trucks would also be used to transport boats for application and site reconnaissance before, during, and after applications of algaecides and/or molluscicides. The Project would not conflict with any known programs, plans, ordinances, or policies addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities. Generally, activity would be limited to one or two vehicles at any given time. Given the infrequent number of applications per year, Project activities would not lead to a substantial increase in vehicle miles traveled relative to existing conditions. The Project would be limited to the application of copper-containing algaecides and molluscicides and would not involve any land use modifications, construction, or changes to roadway capacity.

Item c:) *No Impact*

The Project would not include the construction or modification of roads or changes to current roadway uses; therefore, Project activities would not increase hazards due to a geometric design feature or incompatible uses.

Item d:) *No Impact*

The Project would not involve construction of facilities or activities that would influence or adversely impact emergency access.

3.4.18. Tribal Cultural Resources

Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code § 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or	☐	☐	☐	☒
b) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be	☐	☐	☐	☒

significant pursuant to criteria set forth in subdivision (c) of Public Resources Code § 5024.1? In applying the criteria set forth in subdivision (c) of Public Resource Code § 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	

Discussion

Items a) and b): *No Impact*

The Project involves the treatment of algae and/or dreissenid mussels which is not expected to cause a substantial adverse change in the significance of a tribal cultural resource as defined in Public Resources Code § 21074. To confirm the protection of tribal cultural resources in the Project area, a request was submitted to the Native American Heritage Commission (NAHC) on September 13, 2019 to obtain a contact list for Native American tribes in the area. The Ventura County Planning Department and District consultation lists were also referenced to determine if additional notifications would be necessary for the Project. The request was made consistent with the requirements of Assembly Bill (AB) 52, which established a "tribal cultural resources" category for CEQA project consideration and consultation process for California tribes.

On October 16, 2019, letters of notification were sent to each of the tribes on the contact list and two additional tribes who previously requested project notification from the District. The letters were sent to establish contact and notify tribes to submit their request for consultation, as needed. Letters were sent via United States Postal Service Certified Mail, and follow-up emails were also sent when email addresses were available for the tribal group. Notifications were sent to the following groups:

- The Barbareño/Ventureño Band of Mission Indians
- San Gabriel Band of Mission Indians
- Torres Martinez Desert Cahuilla Indians
- Chumash Council of Bakersfield
- Coastal Band of the Chumash Nation
- Northern Chumash Tribal Council
- San Luis Obispo County Chumash Council
- Santa Ynez Band of Chumash Indians
- yak tityu tityu yak tilhini Northern Chumash Tribe

Per AB 52, tribes have 30 days to respond and request further project information and request formal consultation. One group, the Barbareño/Ventureño Band of Mission Indians, requested that the District provide a copy of the IS/MND once it becomes publicly available. The District will directly submit the IS/MND and associated appendices to the tribe and coordinate review and/or consultation with this group concurrent with the public comment period. The other groups contacted did not respond or indicated they did not require consultation.

No ground-disturbing activities or construction activities would occur as part of the Project. Introduction of copper-containing materials to water in Lake Casitas would not cause a substantial adverse change in the significance of tribal cultural resources, therefore no impacts would occur to tribal cultural resources.

3.4.19. Utilities and Service Systems

Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?	☐	☐	☐	☒
b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?	☐	☐	☐	☒
c) Result in a determination by the wastewater treatment provider, which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
d) Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?	☐	☐	☐	☒
e) Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?	☐	☐	☐	☒

Discussion

Items a) and b): *No Impact*

The Project would not require or result in the relocation or construction of new or expanded water, wastewater treatment or stormwater drainage, electric power, natural gas, or telecommunications facilities. The application rate for algaecide and/or molluscicide treatment is calculated based on the volume of water to be treated in order to achieve a desired concentration of copper by way of diffusion. Because the copper-containing algaecides and/or molluscicides do not require dilution prior to application, Project implementation would not rely on existing water supplies; therefore, there would be no impact to the water supplies available to

serve the Project and reasonably foreseeable future development during normal, dry, and multiple dry years.

Items c) through e): *No Impact*

The Project would not discharge to a wastewater treatment plant and would not generate any solid waste. All containers used to store and transport algaecides and/or molluscicides are typically returned to the vendor for reuse or recycling.

3.4.20. Wildfire

If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Substantially impair an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
b) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?	☐	☐	☐	☒
c) Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?	☐	☐	☐	☒
d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?	☐	☐	☐	☒

Discussion

Items a) through d): *No Impact*

The scope of the Project is limited to in-water applications of copper-containing algaecides and/or molluscicides. The Project would not impair the ability to follow an emergency response or evacuation plan, exacerbate wildfire risks, require installation or maintenance of associated infrastructure, or result in runoff, post-fire slope instability, or drainage changes that would expose people or structures to significant risks.

3.4.21. Mandatory Findings of Significance

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☒	☐	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	☐	☐	☒	☐
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☒

Discussion

Item a): *Less Than Significant with Mitigation Incorporated*

The Project involves the use of copper-based algaecides and/or molluscicides applied to Lake Casitas at concentrations that temporarily exceed the CTR water quality objectives for dissolved copper. Significant evidence suggests that, when used according to label directions by qualified personnel, CTR exceedance is short-term and impacts of these algaecides and/or molluscicides are less than significant. Further, the District will implement mitigation measure **HWQ-1** to reduce any potential impacts to water quality to a less than significant level.

To reduce the risk of copper applications for the steelhead, the District will implement mitigation measure **BIO-1**.

As discussed in **Appendix C** and summarized in **Section 3.4.4** (Biological Resources), a site-specific ecological risk assessment of the fate and toxicity of copper was completed for the two-striped garter snake, western pond turtle and steelhead trout. The exposure to these receptors from the application of copper-containing material is not expected to result in an unacceptable

risk. Therefore, the Project is not anticipated to adversely impact the habitat or population of these special status species.

Although copper-containing algaecides and/or molluscicides may be hazardous materials, under the standard operating procedures that will be used by District personnel and/or their application contractor, there would be a less than a significant potential for impact.

Item b): *Less Than Significant Impact*

The cumulative impacts of this Project are less than significant in relation to other past, current or anticipated projects that would result in impacts beyond those anticipated from the proposed Project.

An effective dreissenid mussel eradication program in Lake Casitas is contingent upon early detection and rapid response. The benefit to recreational beneficial uses within Lake Casitas, Coyote Creek and the Ventura River are greater than the short-term, temporary impacts from the application of copper-containing molluscicides. Additionally, impacts to District water treatment infrastructure and facilities could limit the District's ability to provide safe drinking water to its approximately 70,000 customers in Ventura County. As such, District staff implement a robust plan that includes monitoring, public education, vessel inspection and quarantine. The ability to quickly respond to mussel detections within the lake before extensive colonization and/or downstream movement of mussels is critical to an effective control plan. Implementation of a mussel eradication strategy as soon as feasible after detection will help prevent adverse impacts and further spread into the Ventura River watershed. Generally, fewer applications and smaller quantities of molluscicide are needed to achieve eradication if management actions are initiated during early stages of an invasion.

Available evidence indicates that of the application of copper-based algaecides and/or molluscicides is not cumulatively significant. Studies examining the relationship between sediment copper concentration and toxicity support the conclusion that sediment-bound copper is not bioavailable. Deaver and Rodgers (1996) compared limnetic water and copper-amended sediment toxicity to *Hyalella azteca*, an epibenthic detritivore sentinel species, and found that sediment concentrations were not predictive of copper toxicity across various water and sediment conditions. The limnetic water LC50 of the free cupric ion, however, varied by <4% in the sediment-toxicity tests, indicating that the form of copper associated most strongly with toxicity (i.e., the bioavailable fraction) is more toxic in its aquatic phase than when sediment-bound. These results are corroborated by those of Suedel et al. (1996) which showed that copper toxicity to several aquatic organisms, including fish, water fleas, a midge, and an amphipod species, were correlated with overlying (limnetic) water concentration rather than sediment or pore water concentration. As noted in this document and its appendices, copper-containing algaecides and/or molluscicides rapidly dissipate and/or form inorganic and organic complexes that reduce its bioavailability shortly after application, particularly when applied to hard water such as in Lake Casitas.

Toxicity studies have also been conducted using water and sediment samples from copper herbicide application sites. Gallagher et al. (2005) collected water and sediment samples from a 20,234-hectare lake treated for 10 years in some areas with Komeen, a product formulated with chelated copper, applied annually at concentrations of 1 mg/L of copper. This application rate is similar to the rate the District anticipates using for algaecide applications, and higher than the rate necessary for dreissenid mussel control. The Gallagher study also looked at untreated

areas to assess bioavailability to *Hyalella azteca* and *Ceriodaphnia dubia*. No statistical differences in response of either *H. azteca* or *C. dubia* to treated (16.3-18.0 mg/kg of copper) and untreated (0.3 mg/kg of copper) sediments were observed when compared to control sediments. In a 10-day exposure study by Huggett et al. (1999), sediments were collected from Steilacoom Lake in Washington and amended with $CuSO_4$ (800-2,000 mg/kg of copper dry weight) to assess copper bioavailability to *H. azteca, Chironomous tentans*, and *C. dubia*. When comparing the NOAECs derived under these experimental conditions (906-2,010 mg/kg of copper) with the current concentrations of copper in the lake sediment (180-1,110 mg/kg of copper), it was apparent that the sediment-bound copper in the lake was not bioavailable to the three species.

Mitigation has been incorporated into the Project (**HWQ-1**). This mitigation reduces the impact to a less than significant level.

Item c): *No Impact*

The Project would not have environmental effects which would cause substantial adverse effects to humans, either directly or indirectly.

4. MITIGATION MEASURES

4.1. Summary of Mitigation Measures

BIO-1. The District will, to the extent feasible, prevent discharging water from Lake Casitas to steelhead habitat following an application of copper-containing algaecides and/or molluscicides, until dissolved copper concentrations in Lake Casitas have diminished to below the background concentration or to a level where exceedances of the freshwater and saltwater RWL would not occur.

If storage levels in Lake Casitas are equal to or greater than 85% of capacity, the District will consult weather forecasts and will consider the probability of precipitation that could lead to overtopping spill, based on current storage levels, as part of their treatment planning process. If storage levels are equal to or greater than 95% of capacity, the District will delay treatment, if feasible, until lake levels drop below 95%.

Post-application water-quality sampling, conducted within seven (7) days of the completion of the algaecide or molluscicide treatment as part of compliance with the Districts APAP(s) and NPDES Permit(s), will demonstrate whether dissolved copper concentrations within the treatment area have dissipated to concentrations below applicable RWLs. If dissolved copper concentrations within the treatment area exceed applicable RWLs, additional in-lake sampling will be conducted to track concentrations within the treatment area until it is shown that dissolved copper concentrations have dissipated to levels below the RWL. If copper concentrations within the treatment area continue to exceed applicable RWLs during a spill event, the District will collect additional samples from downstream of Casitas Dam within Coyote Creek and within the Ventura River downstream of the confluence with Coyote Creek. If results show an exceedance of an applicable copper RWL and/or observations of adverse impacts to non-target species, the District will notify the RWQCB. Note however, that the SIP exception for which this IS/MND is being prepared, allows for short term exceedances of the RWL.

HWQ-1. The District will comply with Aquatic Pesticide Application Plans (APAPs) and other provisions of relevant NPDES permits. Monitoring and reporting described in the APAP will include the permit-required surface water sampling and analysis, a quality control and quality assurance plan, as well as several time-sensitive reporting requirements if adverse impacts to water quality or non-target organisms are detected. The water quality sampling and annual reporting required by the APAP and permits will assess the impact, if any, that the Project may have on water quality and beneficial uses of the water in Lake Casitas. Additionally, consistent with SIP exception requirements, the District will arrange for a qualified biologist to assess the extent of restoration of receiving water beneficial uses after the use of copper-containing algaecides and/or molluscicides upon Project completion.

4.2. Mitigation Monitoring and Reporting Program

CEQA requires agencies to adopt mitigation monitoring and reporting program (MMRP) when measures are necessary to mitigate or avoid significant effects on the environment. To maintain compliance with mitigation measures over the course of the Project, this MMRP will be

implemented by the District to track water quality data collected during applications of copper-containing algaecides and molluscicides, and to verify that mitigation measures are followed. Records shall be kept by District water quality staff and reviewed annually. Examples of the records to be kept include annual reports and data collected as part of compliance with the Aquatic Weed and Aquatic Animal Invasive Species NPDES permits. Upon review, the District may consult with the SWRCB and/or RWQCB, its application contractor, and subject matter experts regarding the addition, discontinuation, or modification of mitigation measures, including application techniques, products or timing to allow for effective algae and/or molluscicide control while meeting MMRP and NPDES permit objectives.

Implementation of the mitigation measures as described above, the completion of and compliance with the APAP, submission of the NPDES General Permit annual report, and the assessment of biological resources according to SIP requirements meets the CEQA mitigation monitoring and reporting requirements as described in California Public Resources Code § 21081.6.

5. REFERENCES

California Air Resources Board (CARB). 2019a. Proposed 2019 Amendments to Area Designations for State Ambient Air Quality Standards, Appendix C: Maps and Tables of Area Designations for State and National Ambient Air Quality Standards. California Environmental Protection Agency. Sacramento, CA.

California Air Resources Board (CARB). 2019b. 2019 Amendments to Area Designations for State Ambient Air Quality Standards. Resolution 19-30. California Environmental Protection Agency. Sacramento, CA.

California Department of Fish and Game (CDFG). 2004. Acute oral and dermal toxicity of aquatic herbicides and a surfactant to garter snakes. California Department of Fish and Game, Office of Spill Prevention and Response. Rancho Cordova, CA.

California Department of Transportation (Caltrans). 2021. California State Scenic Highway System Map. Available: https://caltrans.maps.arcgis.com/apps/webappviewer/index.html?id=465dfd3d807c46cc8e8057116f1aacaa (Accessed: September 16, 2021).

California Department of Water Resources (DWR). 2016. Statewide Crop Mapping 2016. Available: https://gis.water.ca.gov/app/CADWRLandUseViewer/ (Accessed: September 16, 2021).

California Natural Diversity Database (CNDDB). 2021. RareFind 5. California Department of Fish and Wildlife, Biogeographic Data Branch. Available: https://apps.wildlife.ca.gov/rarefind/view/RareFind.aspx (Accessed: September 16, 2021).

Calomeni, A.J., K.J. Iwinski, A.D. McQueen, C.M. Kinley, M. Hendrikse, and J.H. Rodgers, Jr. 2017. Characterization of Copper Algaecide (Copper Ethanolamine) Dissipation Rates Following Pulse Exposures. Water, Air, & Soil Pollution 228(11): 1-13.

Casitas Municipal Water District (CMWD). 2014. Casitas Municipal Water District Aquatic Pesticide Application Plan 2014.

Casitas Municipal Water District (CMWD). 2016a. Lake Casitas Prevention, Control, and Management Plan for Invasive Mussels.

Casitas Municipal Water District (CMWD). 2016b. Lake Casitas Vulnerability Assessment for Invasive Mussels.

Casitas Municipal Water District (CMWD). Undated. Draft Casitas Municipal Water District Phytoplankton Monitoring and Treatment Plan for Algal Blooms in Lake Casitas (CMWD, unpublished dated October 31, 2019)

Casitas Municipal Water District (CMWD). 2018. Aquatic Pesticide Application Plan. Prepared for Draft Water Quality Order 2016-XXXX-DWQ General Permit CAG 990006 California Statewide General National Pollutant Discharge Elimination System (NPDES) Permit for Biological Pesticides and Residual Chemical Pesticide Discharges to Waters of the United States From Aquatic Animal Invasive Species Control Applications.

Cohen, A.N., R. Moll, J.T. Carlton, C.R. O'Neill, Jr., L. Anderson, and P.B. Moyle. 2007. California's Response to the Zebra/Quagga Mussel Invasion in the West. Prepared for the California Incident Command.

County of Ventura. 2020. Ventura County 2040 General Plan. Available: https://vcrma.org/ventura-county-general-plan (Accessed: January 3, 2021).

Deaver, E. and J.H. Rodgers, Jr. 1996. Measuring Bioavailable Copper Using Anodic Stripping Voltammetry. Environmental Toxicology and Chemistry 15(11): 1925-1930.

Franklin, N.M., J.L. Stauber, S.C. Apte, and R.P. Lim. 2002. Effect of Initial Cell Density on the Bioavailability and Toxicity of Copper in Microalgal Bioassays. Environmental Toxicology and Chemistry 21(4): 742-751.

Gallagher, J.S., B.M. Duke, and J.H. Rodgers, Jr. 2005. Responses of Hyalella azteca and Ceriodaphnia dubia to Reservoir Sediments Following Chelated Copper Herbicide Applications. Journal of Aquatic Plant Management 43: 95-99.

Hammond, D.F. and G. Ferris. 2019. Low doses of EarthTec QZ ionic copper used in effort to eradicate quagga mussels from an entire Pennsylvania lake. Management of Biological Invasions 10(3): 500-516.

Huggett, D.B., W.B. Gillespie, Jr., and J.H. Rodgers, Jr. 1999. Copper Bioavailability in Steilacoom Lake Sediments. Archives of Environmental Contamination and Toxicology 36: 120-123.

Los Angeles Regional Water Quality Control Board (LARWQCB). 2002. State of the Watershed – Report on Surface Water Quality for the Ventura River Watershed. Los Angeles, CA. 83 pp.

Los Angeles Regional Water Quality Control Board (LARWQCB). 2020. Water Quality Control Plan – Los Angeles Region. Basin Plan for the Coastal Watersheds of Los Angeles and Ventura County. Available: https://www.waterboards.ca.gov/losangeles/water_issues/programs/basin_plan/basin_plan_documentation.html (Accessed: September 17, 2021).

National Oceanic and Atmospheric Administration (NOAA). 2021. NOAA Atlas 14 Point Precipitation Frequency Estimates for Ventura, California. NOAA Atlas 14, Volume 6, Version 2. Available: https://hdsc.nws.noaa.gov/hdsc/pfds/ (Accessed: October 27, 2021).

Pernitsky, D., B. Black, and N. McLellan. 2020. Stopping Algae in its Tracks Before It Disrupts Your Water Treatment Plant. Available: https://www.stantec.com/en/ideas/stopping-algae-in-its-tracks-before-it-disrupts-your-water-treatment-plant (Accessed: September 17, 2021).

Serdar, D. 1995. Results of Monitoring Copper Sulfate Application to Sylvia Lake. Ecology Report #95-322. Washington State Department of Ecology.

State Water Resources Control Board (SWRCB). 2016. A Compilation of Water Quality Goals. 17th Edition. California Environmental Protection Agency. Sacramento, CA. 62 pp.

Suedel, B.C., E. Deaver, and J.H. Rodgers, Jr. 2016. Experimental Factors That May Affect Toxicity of Aqueous and Sediment-Bound Copper to Freshwater Organisms. Archives of Environmental Contamination and Toxicology 30: 40-46.

U.S. Environmental Protection Agency (USEPA). 2007. Aquatic Life Ambient Freshwater Quality Criteria – Copper (2007 Revision). EPA-822-R-07-001. Office of Water. Washington, D.C.

U.S. Environmental Protection Agency (USEPA). 2009. Reregistration Eligibility Decision (RED) for Coppers. EPA 738-R-09-304. Office of Prevention, Pesticides and Toxic Substances. Washington, D.C.

U.S. Environmental Protection Agency (USEPA). 2020. Technical Overview of Ecological Risk Assessment: Risk Characterization. Available: https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/technical-overview-ecological-risk-assessment-risk (Accessed: August 2, 2021).

US. Fish and Wildlife Service (USFWS). 2019. Environmental Conservation Online System (ECOS) Information for Planning and Conservation (IPaC). Available: https://ecos.fws.gov/ipac/ (Accessed: September 17, 2021).

United States Geological Survey (USGS). 2021a. Specimen observation data for Dreissena rostriformis bugensis (Andrusov, 1897), Nonindigenous Aquatic Species Database. Available: https://nas.er.usgs.gov/viewer/omap.aspx?SpeciesID=95 (Accessed: April 26, 2021).

United States Geological Survey (USGS). 2021b. Specimen observation data for Dreissena polymorpha (Pallas, 1771), Nonindigenous Aquatic Species Database. Available: https://nas.er.usgs.gov/viewer/omap.aspx?SpeciesID=5 (Accessed: April 26, 2021).

United Water Conservation District (UWCD). 2017. Quagga Mussel Monitoring and Control Plan. Lake Piru, California.

Walter, L. 2015. Ventura River Watershed Management Plan. Ventura River Watershed Council. Oak View, CA.

Water Quality Solutions (WQS). 2018. Yearly Water Quality Reports for Lake Casitas Years 2012-2017. Prepared for Casitas Municipal Water District.

6. PERSONS AND AGENCIES CONTACTED

1) Gurgagn Chand, SWRCB
2) Kyle Evans, CDFW
3) Los Angeles Regional Water Quality Control Board
4) Andrew Green, NAHC
5) Mike Gibson, Casitas Municipal Water District
6) Julie Tumamait-Stenslie, Chair, Barbareño/Ventureño Band of Mission Indians
7) Anthony Morales, Chief, San Gabriel Band of Mission Indians
8) Michael Mirelez, Cultural Resource Coordinator, Torres Martinez Desert Cahuilla Indians
9) Julio Quair, Chairperson, Chumash Council of Bakersfield
10) Gino Altamirano, Chairperson, Coastal Band of the Chumash Nation
11) Fred Collins, Spokesperson, Northern Chumash Tribal Council
12) Mark Vigil, Chief, San Luis Obispo County Chumash Council
13) Kenneth Kahn, Chairperson, Santa Ynez Band of Chumash Indians
14) Mona Tucker, Chairsperson, yak tityu tityu yak tilhini Northern Chumash Tribe

7. LIST OF PREPARERS

1) Jordan Switzer, Water Quality Supervisor, Casitas Municipal Water District
2) Kelley A. Dyer, P.E., Assistant General Manager, Casitas Municipal Water District
3) Michael L. Flood, General Manager, Casitas Municipal Water District
4) Michael S. Blankinship, PE, PCA, Blankinship & Associates, Inc.
5) Stephen Burkholder, PCA, Senior Scientist, Blankinship & Associates, Inc.
6) Steve Metzger, Project Scientist, Blankinship & Associates, Inc.
7) Alyssa Nagai, Staff Scientist, Blankinship & Associates, Inc.
8) Nikki Slade, Staff Scientist, Blankinship & Associates, Inc.
9) Kelly Phang, Assistant Scientist, Blankinship & Associates, Inc.
10) Michael Zadeh, Assistant Scientist, Blankinship & Associates, Inc.
11) Matt Drenner, PhD, Senior Fisheries Biologist, Stillwater Sciences
12) Dirk Pedersen, Senior Fisheries Ecologist, Stillwater Sciences

This page intentionally left blank.

Appendix A

Algaecide and Molluscicide Label and SDS Examples

EARTHTEC QZ™

Molluscicide For Control of Quagga and Zebra Mussels in Impounded Waters; Lakes; Ponds; Lagoons; Wastewater Lagoons; Reservoirs; Potable Water Supplies*; Canals; Ditches; Aqueducts; and Equipment/Structures that deliver water directly to publicly owned water treatment facilities to include pipes, intake structures, gatehouses, screens, pumping stations, weirs, and penstocks.
Bactericide* - Nonpublic Health Bacteria
Potable Water Supplies+ - Water Destined to Be Used as Drinking Water (this water must receive additional and separate potable water treatment)

ACTIVE INGREDIENT	
Copper Sulfate Pentahydrate*(CAS No. 7758-99-8)	19.8%
OTHER INGREDIENTS	80.2%
Total	100.0%
*Metallic Copper	5%

THIS PRODUCT WEIGHS 9.91 LB PER GALLON (1.188 kg/L)
AND CONTAINS 0.493 LBS ELEMENTAL COPPER PER GALLON.

EPA REGISTRATION NO. 64962-1
EPA ESTABLISHMENT NO. 64962-NE-001

NET CONTENTS:
☐ TWO AND ONE-HALF (2.5) U.S. GALLONS (Commercial Use Only)
☐ THIRTY (30) U.S. GALLONS
☐ FIFTY-FIVE (55) U.S. GALLONS
☐ TWO HUNDRED SEVENTY-FIVE (275) U.S. GALLONS

BATCH NO.

Manufactured by: Earth Science Laboratories, Inc. 113 SE 22nd Street, Suite 1, Bentonville, AR 72712 Phone: (800) 257-9283

KEEP OUT OF REACH OF CHILDREN

WARNING • AVISO

If you do not understand this label, find someone to explain it to you in detail.
(Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle.)

FIRST AID

IF IN EYES: Hold eye open and rinse slowly and gently with water for 20 minutes. Remove contact lenses, if present, after first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for advice.

IF SWALLOWED: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything to an unconscious person.

IF ON SKIN OR CLOTHING: Take off contaminated clothing. Rinse skin immediately with plenty of soap and water for 15 to 20 minutes. Call a poison control center or doctor for treatment.

NOTE TO PHYSICIAN: Probable mucosal damage may contraindicate the use of gastric lavage.

Have the product container or label with you when calling a poison control center or doctor, or going for treatment.

You may also contact INFOTRAC 1-800-535-5053 for emergency medical treatment.

SEE ADDITIONAL PRECAUTIONARY STATEMENTS ON THE SIDE OR BACK PANEL.

PRECAUTIONARY STATEMENTS
Hazards to Humans and Domestic Animals
WARNING

Causes substantial but temporary eye injury. Harmful if swallowed. Harmful if absorbed through skin. Do not get in eyes or on clothing. Avoid contact with skin. Wear protective eyewear (goggles, face shield or safety glasses), long sleeved shirt, long pants, shoes, socks and chemical-resistant gloves made of any waterproof material. Some materials that are chemical-resistant to this product are polyvinyl chloride, polyethylene and viton. Wash thoroughly with soap and water after handling. Remove contaminated clothing and wash clothing before reuse.

ENVIRONMENTAL HAZARDS

This pesticide is toxic to fish and aquatic invertebrates. Waters treated with this product may be hazardous to aquatic organisms. Treatment of aquatic weeds and algae can result in oxygen loss from decomposition of dead algae and weeds. This oxygen loss can cause fish and invertebrate suffocation. To minimize this hazard, do not treat more than ½ of the water body to avoid depletion of oxygen due to decaying vegetation. Wait at least 14 days between treatments. Begin treatment along the shore and proceed outward in bands to allow fish to move into untreated areas. Consult with the state or local agency with primary responsibility for regulating pesticides before applying to public waters to determine if a permit is required.
Certain water conditions including low pH (≤6.5), low dissolved organic carbon (DOC) levels (3.0 mg/L or lower) and "soft" waters (i.e. alkalinity less than 50 mg/L) increases the potential acute toxicity to non-target aquatic organisms. The application rates on this label are appropriate for water with alkalinity greater than 50 mg/L. Do not use these application rates for water with less than 50 ppm alkalinity (e.g., soft or acid waters) because trout and other species of fish may be killed under such conditions.
Consult your local state fish and game agency before applying this product to public waters. Permits may be required before treating such waters.
For applications in waters destined for use as drinking water, those waters must receive additional and separate potable water treatment. Do not apply more than 1.0 ppm as metallic copper in these waters (background + applied copper).

PERSONAL PROTECTIVE EQUIPMENT
USER SAFETY REQUIREMENTS

Mixers, loaders, applicators and other handlers must wear the following:

- Long-sleeved shirt
- Long pants
- Shoes plus socks
- Chemical-resistant gloves made of any waterproof material (Chemical Resistance Category A)
- Protective eyewear

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry. Discard clothing and other absorbent material that have been drenched or heavily contaminated with the product's concentrate. Do not reuse them.

USER SAFETY RECOMMENDATIONS

- Users should wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.
- Users should remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Users should remove PPE immediately after handling this product. As soon as possible,wash thoroughly and change into clean clothing.
- Wash the outside of gloves before removing.

DIRECTIONS FOR USE

It is a violation of federal law to use this product in a manner inconsistent with its labeling. Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirement specific to your state and tribe, consult the agency responsible for pesticide regulation.

USE INFORMATION

EarthTec QZ™ is used to control quagga and zebra mussels in impounded waters; lakes; ponds; lagoons; wastewater lagoons; reservoirs; potable water supplies*; canals; ditches; aqueducts; and equipment/structures that deliver water directly to publicly owned water treatment facilities to include pipes, intake structures, gatehouses, screens, pumping stations, weirs, and penstocks.
EarthTec QZ™ is an algaecide/bactericide*/molluscicide consisting of a soluble formulation of copper. EarthTec QZ™'s proprietary formulation ensures that the active ingredient – metallic copper – is delivered in the form of the biologically available cupric ion, Cu++.
Before treating bodies of water, consult NPDES permitting authorities. Do not exceed a free metallic copper concentration (background + applied copper) in treated water of 1.0 ppm (mg/L), equivalent to 16.7 mg/L of EarthTec QZ™.
This product has diffusional properties that move the ions through the water according to physical conditions. The product will stay soluble in the water until the ions are taken up by the algae/bacteria (non-public health) or affected by physical properties.
When treating flowing waters use a metering pump or similar means to apply a continuous dose so as to achieve a final dilution within the recommended range. See Specific Directions for Use.

SPECIFIC DIRECTIONS FOR USE
MOLLUSCICIDE

OPEN WATERS: To Control Quagga and Zebra Mussels in Lakes, Ponds, Lagoons, Reservoirs, and Potable Water Supplies+: In open or slow-moving, quiescent waters use as a curative measure, i.e., when mussels (veliger, juvenile or adult) have been detected. EarthTec QZ™ is miscible in water and has ionic diffusion properties that cause it to readily disperse throughout the water column. Apply near the water surface and allow to disperse, or where means exist, deliver via hose and pump to the depths,sites, and surfaces of worst infestation. When applying to large areas, dispense along a route with gaps no greater than 200 feet. When fish are present, do not treat more than one-half of the body of water at a time, starting near one shore and moving outward in bands so as to allow fish to move away. When treating half of a body of water, the second half must not be treated within 14 days from the last treatment.
For effective control of adult and juvenile mussels, apply at the recommended rate of 2 to 16 parts per million EarthTec QZ™ (i.e., 2 to 16 gallons of EarthTec QZ™ per million gallons of water) to yield a rate of 0.120 to 0.960 mg/L (ppm) metallic copper. Do not exceed 1.0 mg/L (equivalent to 16.7 ppm EarthTec QZ™) metallic copper in any single application or in the treated water (background + applied). Allow at least 4 days for mortality to occur. Colder water temperatures may require longer exposures and doses closer to the high end of the allowable range. Within the half of the water body being treated repeat applications are permissible if needed to maintain lethal concentrations of copper for sufficient time period. When re-applying, do not exceed a resulting concentration of 1.0 mg/L of metallic copper (background + applied copper) in the treated water. Do not treat the second half of the body of water within 14 days of the last treatment of the first half.
Effective control can also be achieved by longer exposures (e.g., 5-30 days) at lower doses (1 to 5 parts per million EarthTec QZ™, to yield a rate of 0.06 to 0.30 mg/L (ppm) metallic copper.) Repeat doses are permissible and may be required for severe infestations. When reapplying, do not exceed a resulting concentration of 1.0 mg/L (ppm) metallic copper in the treated water (background + applied).

Dose Rate for Molluscicide EarthTec QZ™ in Open Waters (LOW DOSES)

Acres	Depth (ft)	Acre-Ft to Treat	Million Gallons to Treat	Desired ppm, EarthTec	Desired ppm, as copper	EarthTec Dose Rate (gals)	Desired ppm, EarthTec	Desired ppm, as copper	EarthTec Dose Rate (gals)
0.1	3	0.3	0.1	1.0	0.06	0.10	2.0	0.12	0.20
0.5	3	1.5	0.5	1.0	0.06	0.50	2.0	0.12	1
1	3	3.0	1.0	1.0	0.06	1	2.0	0.12	2
1	6	6.0	2.0	1.0	0.06	2	2.0	0.12	4
10	3	30	10	1.0	0.06	10	2.0	0.12	20
10	4.5	45	15	1.0	0.06	15	2.0	0.12	30
10	6	60	20	1.0	0.06	20	2.0	0.12	40
20	3	60	20	1.0	0.06	20	2.0	0.12	40
100	3	300	100	1.0	0.06	100	2.0	0.12	200
1000	3	3,000	1,000	1.0	0.06	1,000	2.0	0.12	2,000

Dose Rate for Molluscicide EarthTec QZ™ in Open Waters (MEDIUM DOSES)

Acres	Depth (ft)	Acre-Ft to Treat	Million Gallons to Treat	Desired ppm, EarthTec	Desired ppm, as copper	EarthTec Dose Rate (gals)	Desired ppm, EarthTec	Desired ppm, as copper	EarthTec Dose Rate (gals)
0.1	3	0.3	0.1	4.0	0.240	0.40	10.0	0.600	1.00
0.5	3	1.5	0.5	4.0	0.240	2.00	10.0	0.600	5
1	3	3.0	1.0	4.0	0.240	4	10.0	0.600	10
1	6	6.0	2.0	4.0	0.240	8	10.0	0.600	20
10	3	30	10	4.0	0.240	40	10.0	0.600	100
10	4.5	45	15	4.0	0.240	60	10.0	0.600	150
10	6	60	20	4.0	0.240	80	10.0	0.600	200
20	3	60	20	4.0	0.240	80	10.0	0.600	200
100	3	300	100	4.0	0.240	400	10.0	0.600	1,000
1000	3	3,000	1,000	4.0	0.240	4,000	10.0	0.600	10,000

Dose Rate for Molluscicide EarthTec QZ in Open Waters (MAXIMUM DOSE)

Acres	Depth (ft)	Acre-Ft to Treat	Million Gallons to Treat	Desired ppm, EarthTec	Desired ppm, as copper	EarthTec Dose Rate (gals)
0.1	3	0.3	0.1	16.7	1.0	1.7
0.5	3	1.5	0.5	16.7	1.0	8.4
1	3	3.0	1.0	16.7	1.0	16.7
1	6	6.0	2.0	16.7	1.0	33.5
10	3	30	10	16.7	1.0	167
10	4.5	45	15	16.7	1.0	251
10	6	60	20	16.7	1.0	335
20	3	60	20	16.7	1.0	335
100	3	300	100	16.7	1.0	1,673
1000	3	3,000	1,000	16.7	1.0	16,733

For reference:

1 acre-foot = 325,851 gal
1 million gal = 3.07 acre-feet
1 hectare = 2.47 acres
1 meter = 3.28 feet
1 ppm (1 part per million) =1 mg/L and/or 1 gal per million gallons
1 gal = 3.785 L = 3,785 mL

When calculating dose rates for a given volume of water, achieve a desired concentration of metallic copper in the water to be treated by using the following general formula:

$$\frac{\text{Gallons of EarthTec QZ™ Applied:}}{\text{Million Gallons to be Treated}} \times \text{0.06= parts per million Copper in the Treated Water}$$

For example, treating 3 million gallons with 4.5 gallons of EarthTec QZ™ (a rate of 1.5 ppm as EarthTec QZ™) will yield a final copper dose of: (4.5 gals / 3 million gallons) x 0.06 = 0.09 mg/L as copper = 90 ppb as copper.
Always use volumetric measurement devices that are calibrated in accordance with manufacturer specifications.

FLOWING WATERS: To Control the Mollusk Pests Quagga and Zebra Mussels in flowing potable water supplies+; canals; ditches; aqueducts; and equipment/structures that deliver the treated water directly to publicly owned water treatment facilities to include pipes, intake structures, gatehouses, screens, pumping stations, weirs, penstocks: In flowing waters, use when mollusks (veliger, juvenile, or adult) have been detected. May be used as a curative measure when adult or juvenile mollusks are present, or as a preventative measure (to inhibit colonization) when adults and/or planktonic larval mollusks have been detected.
EarthTec QZ™ may be used continuously on flowing waters as a means of preventing further spread and colonization of mollusks. Start the continuous application when mollusks are present and end application when mollusks are no longer present. Use a metering pump to apply a continuous dose so as to achieve a final dilution of 1 to 16 ppm EarthTec QZ™ (0.06 to 0.96 ppm metallic copper, or mg/L). Do not exceed 1.0 ppm free metallic copper (background + applied) in the flowing water, equivalent to 16.7 ppm as EarthTec QZ™. If adult mollusks are already present, allow at least 4 days for mortality to occur, or longer for very well-established populations where adults appear in clumps. For most situations satisfactory control will be obtained at a continuous dose of 1 to 5 ppm EarthTec QZ™ (i.e., 0.06 to 0.30 mg/L (ppm) metallic copper). Colder water temperatures may require longer exposure and a dose rate closer to the high end of the allowable range.
Once the initial infestation has been cleared from surfaces, a continuous maintenance dose of 0.6 to 2.0 ppm EarthTec QZ™ (yielding a metallic copper concentration of 36 to 120 ppb) can be used to prevent further colonization.

Example Dose Rates for EarthTec QZ™ in Flowing Waters (LOW DOSE)

cfs	gal/min	MGD	Desired ppm, EarthTec	Desired ppm, as copper	EarthTec Feed Rate (fluid oz/ min)	EarthTec Feed Rate (ml/min)	Desired ppm, EarthTec	Desired ppm, as copper	EarthTec Feed Rate (fluid oz/ min)	EarthTec Feed Rate (ml/min)
1	449	0.65	1.0	0.06	0.06	1.70	2.0	0.12	0.11	3.40
1.55	696	1.0	1.0	0.06	0.09	2.63	2.0	0.12	0.18	5.27
3	1,346	1.9	1.0	0.06	0.17	5.10	2.0	0.12	0.34	10.2
4	1,795	2.6	1.0	0.06	0.23	6.80	2.0	0.12	0.46	13.6
5	2,244	3.2	1.0	0.06	0.29	8.49	2.0	0.12	0.57	17.0
10	4,488	6.5	1.0	0.06	0.57	17.0	2.0	0.12	1.15	34.0
15.47	6,943	10	1.0	0.06	0.89	26.3	2.0	0.12	1.78	52.6
50	22,442	32	1.0	0.06	2.87	84.9	2.0	0.12	5.74	170
100	44,883	65	1.0	0.06	5.74	169.9	2.0	0.12	11.5	340
155	69,429	100	1.0	0.06	8.89	262.8	2.0	0.12	17.8	526
1,000	448,830	646	1.0	0.06	57	1,699	2.0	0.12	115	3,398

Example Dose Rates for EarthTec QZ™ in Flowing Waters (MEDIUM AND HIGH DOSES)

cfs	gal/min	MGD	Desired ppm, EarthTec	Desired ppm, as copper	EarthTec Feed Rate (fluid oz/ min)	EarthTec Feed Rate (ml/min)	Desired ppm, EarthTec	Desired ppm, as copper	EarthTec Feed Rate (fluid oz/ min)	EarthTec Feed Rate (ml/min)
1	449	0.65	5.0	0.30	0.29	8.49	16.0	0.96	0.92	27.2
1.55	696	1.0	5.0	0.30	0.45	13.2	16.0	0.96	1.42	42.1
3	1,346	1.9	5.0	0.30	0.86	25.5	16.0	0.96	2.76	81.5
4	1,795	2.6	5.0	0.30	1.15	34.0	16.0	0.96	3.68	109
5	2,244	3.2	5.0	0.30	1.44	42.5	16.0	0.96	4.60	136
10	4,488	6.5	5.0	0.30	2.87	84.9	16.0	0.96	9.19	272
15.47	6,943	10	5.0	0.30	4.44	131	16.0	0.96	14.2	420
50	22,442	32	5.0	0.30	14.4	425	16.0	0.96	46.0	1,359
100	44,883	65	5.0	0.30	28.7	849	16.0	0.96	91.9	2,718
155	69,429	100	5.0	0.30	44.4	1,314	16.0	0.96	142	4,205
1,000	448,830	646	5.0	0.30	287	8,494	16.0	0.96	919	27,180

MGD = Million Gallons per Day, cfs = Cubic Feet per Second

APPLICATION AND HANDLING EQUIPMENT

Application, handling or storage equipment MUST consist of fiberglass, PVC, polypropylene, viton, corrosion resistant plastics or stainless steel. Never use mild steel, nylon, brass or copper around EarthTec®. Always rinse and clean equipment thoroughly each night with plenty of fresh, clean water.

PESTICIDE STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.
PESTICIDE STORAGE: Store in a safe place away from pets and keep out of the reach of children. Store away from excessive heat. EarthTec QZ™ will freeze. Always store EarthTec QZ™ above 32 degrees F (Do Not Freeze). Freezing may cause product separation.

DO NOT FREEZE

Always keep container closed. Keep away from galvanized pipe, and any nylon storage or handling equipment.

DISPOSAL

PESTICIDE DISPOSAL: Pesticide wastes are acutely hazardous. Improper disposal of excess EarthTec QZ™ mixture or rinsate is a violation of federal law. If these wastes cannot be disposed of by use according to label instructions, contact your state pesticide or environmental control agency, or the hazardous waste representative at the nearest EPA regional office for guidance. In the event of spill, neutralize with limestone or baking soda before disposal. May deteriorate concrete.

CONTAINER HANDLING:

Containers with capacities less than 5 gallons: Nonrefillable container. Do not reuse or refill this container. Triple rinse container (or equivalent) promptly after emptying. Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container 1/4 full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure 2 more times. Offer for recycling if available. If recycling is not available, puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

Containers with capacities greater than 5 gallons: Nonrefillable container. Do not reuse or refill this container. Offer for recycling, if available. Triple rinse container (or equivalent) promptly after emptying. Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container ¼ full with water. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least 1 complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Repeat this procedure 2 more times. Offer for recycling if available. If recycling is not available, puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

Containers too large to shake: Refillable container. Refill this container with pesticide only. Do not reuse this container for any other purpose. Cleaning the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller. To clean the container before final disposal, empty the remaining contents from this container into application equipment or mix tank. Fill the container about 10% full with water. Agitate vigorously or recirculate water with the pump for 2 minutes. Pour or pump rinsate into application equipment or rinsate collection system. Repeat this rinsing procedure 2 more times. Offer for recycling if available or puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

IMPORTANT
READ BEFORE USING
LIMITED WARRANTY AND LIMITATION OF REMEDIES

Read the entire Directions for Use, Limited Warranty and Limitation of Remedies (including limitations on liability) before using this product. If terms are not acceptable, return the unopened product container at once. By using this product, user or buyer accepts the following conditions, disclaimer of warranties and limitations of liability.

The Directions for Use of this product are believed to be adequate and must be followed carefully. However, it is impossible to eliminate all risks associated with the use of this product. Crop injury, ineffectiveness or other unintended consequences may result because of such factors as weather conditions, presence of other materials, or the manner of use application, all of which are beyond the control of Earth Science Laboratories, Inc. To the extent consistent with applicable law, all such risks shall be assumed by the user or buyer.

To the extent consistent with applicable law, seller warrants that the product conforms to the chemical description and is reasonably fit for the purpose stated on the label for use under normal conditions, but makes no other warranties of FITNESS OR MERCHANTABILITY expressed or implied, or any other warranty if the product is used contrary to the label instructions, or under conditions not foreseeable to the seller. To the extent consistent with applicable law, the seller shall not be liable for more than the cost of this product to the buyer and will in no event be liable for any consequential, special or indirect damages connected with the use or handling of this product. This product is offered and the buyer or user accepts it subject to the foregoing terms which may not be varied. Seller makes no warranty for product which has been frozen.

NSF Certified to NSF/ANSI 60

6 46791 44392 5

SAFETY DATA SHEET
According to OSHA Hazard Communication Standard 29 CFR 1910.1200 (GHS)

EARTH SCIENCE LABORATORIES, INC.
113 SE 22nd Street, Suite 1
Bentonville, AR 72712
earthsciencelabs.com

Emergency Phone Number: 1-800-535-5053 (Infotrac)
Information Phone Number: 1-479-271-7381

Material Name: *EarthTec QZ™*

Issue Date: 01/14
Revision Date: 01/17

Section 1 –IDENTIFICATION

Product Name: EarthTec QZ™ **EPA Reg. No.** 64962-1

Certified to: NSF/ANSI Standard 60. Do not exceed 19 mg/L.

Section 2 –HAZARDS IDENTIFICATION

Classification

Acute toxicity - Inhalation	**Category 4**
Skin corrosion/irritation	**Category 2**
Serious eye damage/eye irritation	**Category 2**

Symbol

Primary Routes of Entry: *Absorption and ingestion.*
Eyes: Causes substantial but temporary eye injury. Do not get in eyes.
Skin: Harmful if absorbed through skin. Avoid contact with skin.
Ingestion: Harmful if swallowed.

Section 3 –COMPOSITION/INFORMATION ON INGREDIENT

Components	CAS#	OSHA PEL	ACGIH TLV	%
Copper sulfate pentahydrate	7758-99-8	1mg/m^3	1mg/m^3	18.25-21.75%

Section 4 – FIRST AID MEASURES

If in Eyes: Hold eye open and rinse slowly and gently with water for 20 minutes. Remove contact lenses, if present, after first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for advice.
If on Skin or Clothing: Take off contaminated clothing. Rinse skin immediately with plenty of soap and water for 15 to 20 minutes. Call a poison control center or doctor for treatment.
If Swallowed: Call a poison control center or doctor immediately for treatment advice. Have a person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything to an unconscious person.
Note to Physician: Probable mucosal damage may contraindicate the use of gastric lavage.
Have the product container or label with you when calling a poison control center or doctor or going for treatment. You may also contact INFOTRAC 1-800-535-5053 for emergency treatment.

Section 5 – FIRE FIGHTING MEASURES

Flash Point: N/E **UFL:** N/E **LFL:** N/E

Hazardous Combustion Products: May react with high carbon metals to produce hydrogen gas, which can form an explosive mixture.
Fire Fighting Equipment/Instructions: Firefighters must wear MSHA/NIOSH approved positive pressure breathing apparatus (SCBA) with full face mask and full protective equipment.

NFPA Ratings:	**Fire:** 0	**Health:** 2	**Reactivity:** 1	**Other:** X
HMIS III Ratings:	**Fire:** 0	**Health:** 2	**Reactivity:** 1	**Personal Protection:** X

Section 6 – ACCIDENTAL RELEASE MEASURES

Containment Procedures: Flush with water into retaining area or container. Caution should be exercised regarding personal safety and exposure to released product.
Clean-Up Procedures: Neutralize solution with bicarbonate of soda.
Evacuation Procedures: Keep unnecessary people away; isolate hazard area and deny entry.
Special Instructions: Notify local authorities and the National Response Center, if required.

Section 7 – HANDLING AND STORAGE

Application and Handling Equipment: Application, handling or storage equipment MUST consist of fiberglass, PVC, polypropylene, viton, corrosion resistant plastics or stainless steel. Never use mild steel, nylon, brass or copper around product. Always rinse and clean equipment thoroughly each night with plenty of fresh, clean water.
Storage: Store in a safe place away from pets and keep out of the reach of children. Store away from excessive heat. Product will freeze. Always store product above 32 degrees F (Do Not Freeze). Freezing may cause product separation. Always keep container closed. Keep away from galvanized pipe, and any nylon storage or handling equipment.

Section 8 – EXPOSURE CONTROLS/PERSONAL PROTECTION

Personal Protective Equipment (PPE)
Mixers, loaders, applicators and other handlers must wear the following: long-sleeved shirt, long pants, shoes plus socks, chemical-resistant gloves made of any water proof material (Chemical Resistance Category A), and protective eyewear.

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry. Discard clothing and other absorbent material that have been drenched or heavily contaminated with the product's concentrate. Do not reuse them.

Section 9 – PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Clear blue liquid
Physical State: Liquid
pH: 0.5
Vapor Pressure: 0.1mm 68º F
Boiling Point: 220º F
Melting Point: N/A
Odor: Minimal odor
Vapor Density (Air=1): 1.0
Evaporation Rate: N/A
Solubility in Water: Complete
Specific Gravity (H_20=1): 1.188 +/- 0.05

Section 10 – STABILITY AND REACTIVITY

Chemical Stability: Stable.
Conditions to Avoid: Avoid mixing with strong bases and strong reducing agents.
Incompatibility: Incompatible with strong bases and strong reducing agents.
Hazardous Decomposition Products: Sulfur dioxide and sulfur trioxide may be produced with decomposition.
Hazardous Polymerization: Will not occur.

Section 11 - TOXICOLOGICAL INFORMATION

Acute Toxicity / Chronic Toxicity: Continued overexposure to this solution may cause systemic toxicity.
Carcinogenicity: N/A
Signs and Symptoms of Exposure: Overexposure may cause the following specific symptoms, depending on the concentration and duration of exposure: vomiting, shallow respiration and lung function changes.

Section 12 - ECOLOGICAL INFORMATION

Waters treated with this product may be hazardous to aquatic organisms.

Section 13 – DISPOSAL CONSIDERATIONS

Pesticide wastes are acutely hazardous. Improper disposal of excess product mixture or rinsate is a violation of federal law. If these wastes cannot be disposed of by use according to label instructions, contact your state pesticide or environmental control agency, or the hazardous waste representative at the nearest EPA regional office for guidance. In the event of spill, neutralize with limestone or baking soda before disposal. May deteriorate concre

Section 14 – TRANSPORT INFORMATION

DOT Information
Proper Shipping Name: Corrosive liquid, acidic, inorganic, n.o.s., (contains cupric sulfate)
Hazard Class: 8
UN/NA #: UN3264
Packing Group: III

- *Packages that contain more than 5.1 US gallons are **RQ** (reportable quantity)*
- *Packages that contain less than 4.0 liters could be **ORM-D***
- *The proper shipping information is the responsibility of the shipper and this information is only guidelines.*
-

Section 15 - REGULATORY INFORMATION

This chemical is a pesticide product registered by the Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for Safety Data Sheets, and for workplace labels of non-pesticide chemicals. Following is the hazard information as required on the pesticide label:

WARNING
Causes substantial but temporary eye injury.
Harmful if swallowed.
Harmful if absorbed through skin.

Section 16 - OTHER INFORMATION

Date of Last Revision: January, 2017

The information set forth herein is furnished free of charge and is based on technical data that Earth Science Laboratories, Inc. believes to be reliable. It is intended for use by persons having technical skill and at their own discretion and risk. Since conditions of use are outside our control, we make no warranties, express or implied, and assume no liability in connection with any use of the information. Nothing herein is to be taken as a license to operate under or a recommendation to infringe any patents.

CUTRINE® PLUS
Algaecide and Herbicide

FOR USE IN: LAKES; POTABLE WATER RESERVOIRS; PONDS; FISH HATCHERIES AND RACEWAYS; CROP AND NON-CROP IRRIGATION CONVEYANCE SYSTEMS (DITCHES, CANALS AND LATERALS)

ACTIVE INGREDIENTS:

Copper Ethanolamine Complex, Mixed (Mono CAS# 14215-52-2 and Tri CAS# 82027-59-6)*	27.9%
OTHER INGREDIENTS:	72.1%
TOTAL	100.0%

*Metallic copper equivalent, 9%. Contains 0.909 lbs. of elemental copper per gallon.

KEEP OUT OF REACH OF CHILDREN

CAUTION

Si usted no entiende la etiqueta busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

See Additional Precautions on Label

Manufactured for:
Applied Biochemists
1400 Bluegrass Lakes Pkwy
Alpharetta, GA 30004
1-800-558-5106

Pat. No. 3,930,834
EPA Reg. No. 8959-10
EPA Est. No. 42291-GA-1

FIRST AID

If on skin or clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a Poison Control Center or doctor for treatment advice.

If swallowed: Call a Poison Control Center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a Poison Control Center or doctor. Do not give anything by mouth to an unconscious person.

If in eyes: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a Poison Control Center or doctor for treatment advice.

If inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a Poison Control Center or doctor for further treatment advice.

Have the product container or label with you when calling a Poison Control Center or doctor, or going for treatment.

In case of emergency call 1-800-654-6911

GENERAL INFORMATION

This product is a liquid copper-based formulation containing ethanolamine chelating agents to prevent the precipitation of copper with carbonates and bicarbonates in the water. This product effectively controls a broad range of algae including: **Planktonic** (suspended) forms such as the Cyanobacteria (*Microcystis*, *Anabaena* & *Aphanizomenon*), Green algae (*Raphidocelis* & *Cosmarium*) Golden algae (*Prymnesium parvum*) and diatoms (*Navicula* & *Fragilaria*); **Filamentous** (mat-forming) forms such as the Green Algae (Spirogyra, *Cladophora*, *Ulothrix* & *Rhizoclonium*) and **Benthic** (bottom-growing) forms such as Chara and Nitella. This product has also been proven effective in controlling the rooted aquatic plant, *Hydrilla verticillata*. Waters treated with this product may be used for swimming, fishing, further potable water treatment, livestock watering or irrigating turf, ornamental plants or crops after treatment.

DIRECTIONS FOR USE

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling. For applications in waters destined for use as drinking water, those waters must receive additional and separate potable water treatment. Do not apply more than 1.0 ppm as metallic copper in these waters. Read entire label and use strictly in accordance with precautionary statements and directions.

GENERAL APPLICATION RESTRICTIONS:

{For end-use products in containers ≥ 5 gallons or ≥ 50 pounds.}

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your State or Tribe, consult the State or Tribe agency responsible for pesticide regulation.

{For end-use consumer products in containers less than 5 gallons or less than 50 pounds}

Do not apply this product in a way that will contact adults, children, or pets, either directly or through drift. Some states may require permits for the application of this product to public waters. Check with your local authorities.

{For all sizes}

Do not enter or allow others to enter until application of product has been completed.

PRE-TREATMENT CONSIDERATIONS:

{For end-use products in containers ≥ 5 gallons or ≥ 50 pounds.}

In Potable Water Reservoirs, Lakes, Industrial Ponds & Wastewater or other monitored water systems, initial treatment with this product must be considered at the onset of nuisance bloom conditions as evidenced by initial taste and odor complaints; high cell counts or chlorophyll *a* concentrations; high MIB or geosmin concentrations; visible surface scum formations; low Secchi disk readings; significant daily fluctuations in dissolved oxygen; and/or sudden increases in pH. Monitoring of several of these parameters on a regular basis will assist in optimizing the timing of treatments and reducing the amounts of this product needed for seasonal control. Identification of primary nuisance species or genera may also be helpful in determining and refining dosage rates.

{For end-use consumer products in containers less than 5 gallons or less than 50 pounds}

In Ponds (Farm, Fire, Fish, Golf Course, Irrigation, Ornamental, Storm water Retention, Swimming), Small Lakes, Fish Hatcheries, Aquaculture Facilities, treatment with this product should be started when visible, actively growing algae and susceptible plants appear in spring, preferably before significant surface accumulations occur. Aeration and/or fountain system, where available, should be in operation at the time of treatment.

Spray Drift Management

A variety of factors including weather conditions (e.g., wind direction, wind speed, temperature, relative humidity) and the method of application (e.g., ground, aerial, airblast, chemigation) can influence pesticide drift. The applicator must evaluate all factors and make appropriate adjustments when applying this product.

Droplet Size

Apply only as a medium or coarser spray (ASAE standard 572) or a volume mean diameter of 300 microns or greater for spinning atomizer nozzles.

Wind Speed

Do not apply at wind speeds greater than 15 mph. Only apply this product if the wind direction favors on-target deposition (approximately 3 to 10 mph), and there are no sensitive areas within 250 feet down wind.

Temperature Inversions

If applying at wind speeds less than 3 mph, the applicator must determine if a) conditions of temperature inversion exist, or b) stable atmospheric conditions exist at or below nozzle height. Do not make applications into areas of temperature inversions or stable atmospheric conditions.

Other State and Local Requirements

Applicators must follow all state and local pesticide drift requirements regarding application of copper compounds. Where states have more stringent regulations, they must be observed.

Equipment

All ground application equipment must be properly maintained and calibrated using appropriate carriers or surrogates.

SURFACE SPRAY / INJECTION

SLOW-FLOWING OR QUIESCENT WATER BODIES

ALGAECIDE APPLICATION

For effective control, proper chemical concentration must be maintained for a minimum of three hours contact time. The application rates in the chart are based on static or minimal flow situations. Where significant dilution or loss of water from unregulated inflows or outflows occur (raceways) within a three hour period, chemical may have to be metered in.

1. Identify the form of algae growth present as one of the following types: Planktonic (suspended), Filamentous (mat forming), or Benthic (Chara/Nitella) and estimate the density of growth (Low, Medium, High). Use Table 1 - Copper Concentration to select the desired PPM (Parts per Million) Copper needed, based upon the algal form and density.

Table 1 – Copper Concentration

Form of Algal Growth	Density of Growth		
	Low	Medium	High
Planktonic	0.2	0.4	0.6
Filamentous	0.2	0.6	0.8
Benthic	0.4	0.7	1.0

2. Refer to the Table 2 –Product Application Rate and determine gallons of product needed per Acre-foot corresponding to the desired PPM concentration determined in step #1.

Table 2 – Product Application Rate (Gallons)									
PPM Copper	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Gallon per Acre-ft	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3.0

3. Determine acre-feet within the intended treatment area (area of infestation) by measuring length, width plus averaging several depth readings within the treatment area. Use the formula:

$$\frac{\text{Length (ft.)} \times \text{Width (ft.)} \times \text{Avg. Depth (ft.)}}{43{,}560} = \text{Acre-Feet}$$

4. Multiply Acre-Feet calculated in Step #3 times the gallons of this product determined in Step #2 to determine number of gallons of this product required for the intended treatment area.
5. Before applying, dilute the required amount of this product with enough water to ensure even distribution with the type of equipment being used. Typical dilution range is 9:1 when using backpack-type sprayer or up to 50:1 when using water pump equipment or large tank sprayers.
6. Break up floating algae mats manually before spraying or with force of power sprayer if one is used. Use hand or power sprayer adjusted to rain-sized droplets to cover area evenly taking water depth into consideration. If using underwater injection systems such as drop hoses or booms with weighted drop hoses, ensure boat pattern is uniform throughout treatment area. Spray shoreline areas first to avoid trapping fish.
7. Clean spray equipment by flushing with clean water after treatment and follow STORAGE AND DISPOSAL instructions on the label for empty or remaining partial containers.
8. Under conditions of heavy infestation, treat only 1/3 to ½ of the water body at a time to avoid fish suffocation caused by oxygen depletion from decaying algae. (see additional Environmental Hazards).

OTHER TREATMENT FACTORS AND CONSIDERATIONS

- Calm and sunny conditions when water temperature is at least 60°F will usually expedite control results.
- Effective control of algae requires direct contact with all cells throughout the water column, since these plants do not have vascular systems to transport copper from cell to cell.
- Visible reduction in algae growth should be observed in 24 to 48 hours following application with full infestation and water temperatures.
- Re-treat areas if re-growth or new growth begins to appear and seasonal control is desired. Identify new growth to re-check required copper concentration that may be needed for control. Apply treatment along the shore and proceed outwards in bands to allow fish to move into untreated areas.
- No more than 1/2 of the water body may be treated at one time. (refer to Environmental Hazards for additional guidance)
- The minimum retreatment interval between consecutive treatments is 14 days.

CUTRINE® PLUS Granular Algaecide may be used as an alternative in low volume flow situations, spot treatments or treatment of bottom-growing algae in deep water.

Permits:
Some states may require permits for the application of this product to public waters. Check with your local authorities.

HERBICIDE APPLICATION (For Hydrilla Control)
CUTRINE® PLUS: Control of *Hydrilla verticillata* can be obtained from copper concentrations of 0.4 to 1.0 ppm resulting from product treatment. Choose the application rate based upon stage and density of Hydrilla growth and respective water depth from the chart below.

CUTRINE® PLUS: HARVESTER™ TANK MIX
On waters where enforcement of use restrictions for recreational, domestic and irrigation uses are acceptable, the

Application Rates Gallons/Surface Acre*							
Growth/Stage Relative Density	PPM Copper	DEPTH IN FEET 1	2	3	4	5	6
Early Season Low Density	0.4	1.2	2.4	3.6	4.8	6.0	7.2
	0.5	1.5	3.0	4.5	6.0	7.5	9.0
	---0.6---	---1.8---	---3.6---	---5.4---	---7.2---	---9.0---	---10.8---
Mid-Season Moderate Density	0.7	2.1	4.2	6.3	8.4	10.5	12.6
	---0.8---	---2.4---	---4.8---	---7.3---	---9.6---	---12.0---	---14.4---
Late Season High Density	0.9	2.7	5.4	8.1	10.8	13.5	16.2
	1.0	3.0	6.0	9.0	12.0	15.0	18.0

** Application rates for depths greater than six feet may be obtained by adding the rates given for the appropriate combination of depths. Application rates should not result in excess of 1.0 ppm copper concentration within treated water.*

following mixture can be used as an alternative Hydrilla control method.
Tank mix 3 gallons of CUTRINE® PLUS with 2 gallons of HARVESTER™. Apply mixture at the rate of 5 gallons per surface acre. Dilute with at least 9 parts water and apply as a surface spray or underwater injection. Observe all cautions and restrictions on the labels of both products used in this mixture.

FLOWING WATER
DRIP SYSTEM APPLICATION - FOR USE IN POTABLE WATER AND IRRIGATION CONVEYANCE SYSTEMS

PRE-TREATMENT CONSIDERATIONS
In Crop and Non-Crop Irrigation Conveyance Systems: Ditches Canals & Laterals, product treatments must be applied as soon as algae or aquatic vascular plants begin to interfere noticeably with normal delivery of water (clogging of lateral headgates, suction screens, weed screens and siphon tubes). Delaying treatment could perpetuate the problem causing massing and compacting of plants. Heavy infestations and low flow conditions may require increasing water flow rate during application.

Accurately determine water flow rates. In the absence of weirs, orifices, or similar devices which give accurate water flow measurements, volume of flow may be estimated by the following formula:

Average Width (feet) x Average Depth (feet) x Velocity* (feet/second) x 0.9 = Cubic Feet per Second (C.F.S.)

*Velocity is the time it takes a floating object to travel a given distance. Dividing the distance traveled (feet) by the time (seconds) will yield velocity (feet/second). Repeat this measurement at least three times at the intended application site then average.

- After accurately determining the water flow rate in C.F.S. or gallons/minute, find the corresponding product drip rate on the chart below.

WATER FLOW RATE		PRODUCT DRIP RATE*		
C.F.S.	Gal./Min.	Qts./Hr.	mL/Min.	Fl.Oz./Min.
1	450	1	16	0.5
2	900	2	32	1.1
3	1350	3	47	1.6
4	1800	4	63	2.1
5	2250	5	79	2.7

- Calculate the amount of this product needed to maintain the drip rate for a period of 3 hours by multiplying Qts./Hr. x 3; ml/Min. x 180; or Fl. Oz./Min. x 180. Dosage will maintain 1.0 ppm Copper concentration in the treated water for the 3 hour period. Introduction of the chemical should be made in the channel at weirs or other turbulence-creating structures to promote the dispersion of chemical.

- Pour the required amount of this product into a drum or tank equipped with a brass needle valve and constructed to maintain a constant drip rate. Use a stop watch and appropriate measuring container to set the desired drip rate. Readjust accordingly if flow rate changes during the 3 hour treatment period.

- Distance of control obtained down the waterway will vary depending upon density of vegetation growth. Treatment period may have to be extended up to 6 hours in areas where control may be difficult due to high flows or significant growth. Periodic maintenance treatments may be required to maintain seasonal control.

Chemigation System Application
This product may be applied for the maintenance of chemigation systems. To control algae in chemigation systems this product should be applied continuously during water application. For continuous addition application apply 0.60 – 3.0 gallons of this product per 1,000,000 (one million) gallons of water (1.80 - 9.0 gallons of this product per acre-foot of water). The copper concentration range is 0.20 to 1.0 ppm. Do not exceed 1.0 ppm of copper or 2.75 gallons of this product per 100,000 gallons of water. For additional guidance regarding specific calibrations or application techniques contact application equipment manufacturer, supplier, or pest control advisor. It is not necessary to agitate or dilute this product in the supply tank before application to chemigation systems.

Application Rates for Chemigation Systems	
Copper Concentration (ppm)	Amount of This Product Per Acre-Foot Gallons
0.2	0.60
0.3	0.90
0.4	1.20
0.5	1.50
0.6	1.80
0.7	2.10
0.8	2.40
0.9	2.70
1.0	3.00

CHEMIGATION SYSTEM APPLICATION
- Apply product only through sprinkler and drip irrigation systems including: center pivot, lateral move, end tow, side (wheel) roll, traveler, big gun, solid set, or hand move; flood (basin), furrow, border or drip systems.
- Crop injury, lack of effectiveness, or illegal pesticide residues in the crop can result from non-uniform distribution of treated water.
- If you have questions about calibration, contact Applied Biochemists, State Extension Service, equipment manufacturer, or other experts.

- Do not connect an irrigation system (including greenhouse systems) used for pesticide application to a public water system unless the pesticide label-prescribed safety devices for public water systems are in place (refer to the Chemigation Systems Connected to a Public Water Supply section of this label).
- Trained personnel, knowledgeable of the Chemigation system and responsible for its operation or under the supervision of the responsible person, shall shut the system down and make necessary adjustments should the need arise. The system should be inspected, calibrated, and maintained before product application begins.

Chemigation Systems Connected to a Public Water Supply

- Public water system is a system for the provision to the public of piped water for human consumption if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year.
- Chemigation systems connected to public water systems must contain a functional, reduced-pressure zone, back flow preventer (RPZ) or the functional equivalent in the water supply line upstream from the point of pesticide introduction. There shall be a complete physical break (air gap) between the flow outlet end of the fill pipe and the top or overflow rim of the reservoir tank of at least twice the inside diameter of the fill pipe.
- The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the backflow of solution toward the injection.
- The pesticide injection pipeline must contain a functional, normally closed, solenoid operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down.
- The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops or in cases where there is no water pump, when the water pressure decreases to the point where pesticide distribution is adversely affected.
- Systems must use a metering pump, such as a positive displacement injection pump (e.g.,diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides in use and capable of being fitted with a system interlock.
- Inspect, calibrate and maintain the system before product application.

Sprinkler Chemigation Requirements

- The system must contain a functional check valve, vacuum relief valve, and low pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from back flow.
- The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the backflow of solution toward the injection pump.
- The pesticide injection pipeline must also contain a functional, normally closed, solenoid operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down.
- The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops.
- The irrigation line or water pump must include a functional pressure switch which will stop the water pump motor when the water pressure decreases to the point where pesticide distribution is adversely affected.
- Systems must use a metering pump, such as a positive displacement injection pump (e.g. diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock.
- Do not apply when drift would extend beyond the area intended for treatment.

Floor (Basin). Furrow and Border Chemigation Requirements

- Gravity Flow Systems pesticide dispensing system must meter the pesticide into the water at the head of the field and downstream of a hydraulic discontinuity such as a drop structure or weir box to decrease potential for water source contamination from back flow if water flow stops.
- Pressurized water systems with a pesticide injection system must meet the following requirements:
  - The system must contain a functional check valve, vacuum relief valve, and low pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from back flow.
  - The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the backflow of solution toward the injection pump.
  - The pesticide injection pipeline must also contain a functional, normally closed,solenoid-operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down.
  - The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops.
  - The irrigation line or water pump must include a functional pressure switch which will stop the water pump motor when the water pressure decreases to the point where pesticide distribution is adversely affected.
  - Systems must use a metering pump, such as a positive displacement injection pump (e.g., diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock.

Drip Chemigation Requirements

- The system must contain a functional check valve, vacuum relief valve, and low pressure drain appropriately located on the irrigation pipeline to prevent water source contamination from back flow.
- The pesticide injection pipeline must contain a functional, automatic, quick-closing check valve to prevent the backflow of solution toward the injection pump.
- The pesticide injection pipeline must also contain a functional, normally closed, solenoid operated valve located on the intake side of the injection pump and connected to the system interlock to prevent fluid from being withdrawn from the supply tank when the irrigation system is either automatically or manually shut down.
- The system must contain functional interlocking controls to automatically shut off the pesticide injection pump when the water pump motor stops.
- The irrigation line or water pump must include a functional pressure switch which will stop the water pump motor when the water pressure decreases to the point where pesticide distribution is adversely affected.
- Systems must use a metering pump, such as a positive displacement injection pump (e.g.. diaphragm pump) effectively designed and constructed of materials that are compatible with pesticides and capable of being fitted with a system interlock.

Submersed Plant Control Applications

This product can be applied to control hydrilla (*Hydrilla verticillata*), egeria (*Egeria densa*), and other aquatic weeds susceptible to copper treatment. Apply at a rate to achieve 0.70 to 1.0 ppm copper (3.72 to 5.32 Gallons/Acre foot). In heavily infested areas, a second application after the 14 day retreatment interval may be necessary.

Tank Mix Applications

This product can be tank mixed with other herbicides to improve efficacy; and to control algae in areas where heavy algae growth may cover target submersed plant species and interfere with herbicide exposure. Do not mix concentrates in tank without first adding water. To ensure compatibility, conduct a jar test before application. This product must not be mixed with any product containing a label prohibition against such mixing and must be used in accordance with the most restrictive label limitations and precautions. Label dosage rates must not be exceeded.

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

CAUTION. Harmful if swallowed or absorbed through skin. Causes moderate eye irritation. Avoid contact with skin, eyes or clothing.

Personal Protective Equipment (PPE)

Mixers, loaders, applicators, and other handlers must wear the following:

- Long-sleeve shirt and long pants,
- Shoes and socks.

USER SAFETY REQUIREMENTS

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry. Discard clothing and other absorbent material that have been drenched or heavily contaminated with the product's concentrate. Do not reuse them. Users must wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing. Remove PPE immediately after handling this product. As soon as possible, wash thoroughly and change into clean clothing.
Wash outside of gloves before removing.
Potable water sources treated with this product may be used as drinking water only after proper additional potable water treatments.

ENVIRONMENTAL HAZARDS:

Do not use in waters containing Koi and hybrid goldfish. Not intended for use in small volume, garden pond systems.

FISH AND AQUATIC ORGANISMS: Waters treated with this product may be hazardous to aquatic organisms. Treatment of aquatic weeds and algae can result in oxygen loss from decomposition of dead algae and weeds. This oxygen loss can cause fish and invertebrate suffocation. To minimize hazard, do not treat more than ½ of the water body to avoid depletion of oxygen due to decaying vegetation. Wait at least 10 to 14 days between treatments. Begin treatment along the shore and proceed outwards in bands to allow fish to move into untreated areas. In regions where ponds freeze in winter, treatment should be done 6 to 8 weeks before expected freeze time to prevent masses of decaying algae under an ice cover. Consult with the State or local agency with primary responsibility for regulating pesticides before applying to public waters, to determine if a permit is required. This pesticide is toxic to some fish and aquatic invertebrates and may contaminate water through runoff. This product has a potential for runoff for several months or more after application. Poorly draining soils and soils with shallow water tables are more prone to produce runoff that contains this product. Do not contaminate water when disposing of equipment wash-waters or rinsate.

Certain water conditions including low pH (≤6.5) low dissolved organic carbon (DOC) levels (3.0 mg/L or lower), and "soft" waters (i.e., alkalinity less than 50 mg/L), increases the potential acute toxicity to non-target aquatic organism. Potable water sources treated with copper products may be used as drinking water only after proper additional potable water treatments. Trout and other species of fish may be killed at application rates recommended on the label, especially in soft or acidic waters as described above. Do not contaminate water when disposing of equipment wash-waters or rinsate.

To protect listed species in California, contact your County Agricultural Commissioner or refer to the Department of Pesticide Regulation's PRESCRIBE Internet Database: http://www.cdpr.ca.gov/docs/endspec/prescint

STORAGE & DISPOSAL:

Do not contaminate water, food or feed by storage or disposal. Open dumping is prohibited.

PESTICIDE STORAGE:
Keep container closed when not in use. Keep pesticide in original container. Do not put concentrate or dilute into food or drink containers. Do not reuse or refill container. Do not contaminate feed, feedstuffs, or drinking water. Do not store or transport near feed or food.

PESTICIDE DISPOSAL:
Wastes resulting from the use of this product must be disposed of on site or at an approved waste disposal facility.

{For ≤5 gallon non-refillable containers only}
CONTAINER DISPOSAL:
Nonrefillable container. Do not reuse container. Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container ¼ full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times. Then offer for recycling or reconditioning if available or puncture and dispose of in approved landfill, or incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke. Consult Federal, State or local authorities for approved alternative procedures.

{For >5 gallon non-refillable containers only}
CONTAINER DISPOSAL:
Nonrefillable container. Do not reuse container. Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container ¼ with water and recap. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand container on its end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Repeat this procedure two more times. Then offer for recycling or reconditioning if available or puncture and dispose of in approved landfill, or incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke. Consult Federal, State or local authorities for approved alternative procedures.

{For refillable totes only}
CONTAINER DISPOSAL:
Refillable container. Cleaning the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller. To clean the container before final disposal, empty the remaining contents from this container into application equipment or mix tank. Fill container about 10 percent full with water. Agitate vigorously or recirculate water with pump for 2 minutes. Pour or pump rinsate into application equipment or rinsate collection system. Repeat rinsing procedure two more times. Then offer for recycling or reconditioning if available or puncture and dispose of in approved landfill, or incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke. Consult Federal, State or local authorities for approved alternative procedures.

SAFETY DATA SHEET
according to US Regulation 29 CFR 1910.1200 and the Canadian HPA

AB CUTRINE-PLUS

Version 2.1 | Revision Date 2020.05.13 | Print Date 2020.11.17

SECTION 1. IDENTIFICATION

Commercial Product Name : Applied Biochemists

Product name : AB CUTRINE-PLUS

Manufacturer or supplier's details

Company : Innovative Water Care, LLC
1400 Bluegrass Lakes Parkway
Alpharetta, GA
30004

Telephone : 1-800-511-6737 (Outside the USA: 1-423-780-2347)
E-mail address : sds@sigurawater.com
Emergency telephone number : 1-800-654-6911 (Outside the USA: 1-423-780-2970)

Recommended use of the chemical and restrictions on use

Recommended use : Water treatment chemical

SECTION 2. HAZARDS IDENTIFICATION

GHS Classification

Acute toxicity (Oral) : Category 4

GHS label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : H302 Harmful if swallowed.

Precautionary statements : **Prevention:**
P264 Wash hands thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
Response:
P301 + P312 IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell.
P330 Rinse mouth.

Disposal:
P501 Dispose of contents/container in accordance with local regulation.

Other hazards

None known.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Hazardous components

Chemical name / Synonyms	CAS-No.	Concentration (% w/w)
2,2',2''-Nitrilotriethanol	102-71-6	10 - 15
2-Aminoethanol	141-43-5	10 - 15

SECTION 4. FIRST AID MEASURES

General advice : Call a poison control center or doctor for treatment advice. For 24-hour emergency medical assistance, call Arch Chemical Emergency Action Network at 1-800-654-6911. Have the product container or label with you when calling a poison control center or doctor, or going for treatment.

If inhaled : IF INHALED: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a poison control center or doctor for further treatment advice.

Move to fresh air.
Consult a physician after significant exposure.
If unconscious, place in recovery position and seek medical advice.
If breathing is irregular or stopped, administer artificial respiration.
Keep respiratory tract clear.

In case of skin contact : IF ON SKIN OR CLOTHING: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.

After contact with skin, wash immediately with plenty of soap and water.
If on clothes, remove clothes.
In the case of skin irritation or allergic reactions see a physician.

In case of eye contact : IF IN EYES: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present,

		after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice. In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Remove contact lenses. Protect unharmed eye. Keep eye wide open while rinsing.
If swallowed	:	IF SWALLOWED: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything by mouth to an unconscious person. Clean mouth with water and drink afterwards plenty of water. Never give anything by mouth to an unconscious person. If symptoms persist, call a physician.
Most important symptoms and effects, both acute and delayed	:	No information available.
Notes to physician	:	Treat symptomatically.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Carbon dioxide (CO2) Dry chemical Foam Water spray Alcohol-resistant foam Dry chemical
Unsuitable extinguishing media	:	High volume water jet
Specific hazards during firefighting	:	Will not burn Heating or fire can release toxic gas. Do not allow run-off from fire fighting to enter drains or water courses.
Further information	:	Use water spray to cool unopened containers. In case of fire, use normal fire-fighting equipment and the personal protective equipment recommended in Section 8 to include a NIOSH approved self-contained breathing apparatus. Use water spray to cool unopened containers. Collect contaminated fire extinguishing water separately. This must not be discharged into drains.

Special protective equipment for firefighters	:	In the event of fire, wear self-contained breathing apparatus. Use personal protective equipment.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Use the personal protective equipment recommended in Section 8 and a NIOSH approved self-contained breathing apparatus. Use personal protective equipment. Use respirator when performing operations involving potential exposure to vapour of the product. Prevent further leakage or spillage if safe to do so. Evacuate personnel to safe areas. Use personal protective equipment as required.
Environmental precautions	:	If the product contaminates rivers and lakes or drains inform respective authorities.
Methods and materials for containment and cleaning up	:	Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). Do not flush into surface water or sanitary sewer system.

SECTION 7. HANDLING AND STORAGE

Advice on protection against fire and explosion	:	Take precautionary measures against static discharges.
Advice on safe handling	:	Do not take internally. Avoid contact with skin, eyes and clothing. Upon contact with skin or eyes, wash off with water. Avoid breathing mist or vapor. Avoid formation of aerosol. Do not breathe vapours/dust. Avoid contact with skin and eyes. Smoking, eating and drinking should be prohibited in the application area. Provide sufficient air exchange and/or exhaust in work rooms. Dispose of rinse water in accordance with local and national regulations.
Conditions for safe storage	:	Store in a cool, dry and well ventilated place. Isolate from incompatible materials. Keep container tightly closed. Keep in a well-ventilated place. Containers which are opened must be carefully resealed and

kept upright to prevent leakage.
Electrical installations / working materials must comply with the technological safety standards.
To maintain product quality, do not store in heat or direct sunlight.

Materials to avoid : Refer to Section 10, "Incompatible Materials."

Do not store near acids.

Further information on storage stability : No decomposition if stored and applied as directed.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
2,2',2''-Nitrilotriethanol	102-71-6	TWA	5 mg/m3	ACGIH
2-Aminoethanol	141-43-5	TWA	3 ppm	ACGIH
		STEL	6 ppm	ACGIH
		STEL	6 ppm 15 mg/m3	NIOSH/GUIDE
		REL	3 ppm 8 mg/m3	NIOSH/GUIDE

Engineering measures : Local exhaust ventilation or other engineering controls are normally required when handling or using this product to keep airborne exposures below the TLV, PEL or other recommended exposure limit.

Personal protective equipment

Respiratory protection : Wear a NIOSH approved respirator if levels above the exposure limits are possible.
A NIOSH approved air purifying respirator with organic vapor cartridge and N95 particulate filter. Air purifying respirators should not be used in oxygen deficient or IDLH atmospheres or if exposure concentrations exceed ten (10) times the published limit.

In the case of vapour formation use a respirator with an approved filter.
Respirator with ABEK filter.

Respirator with a vapour filter (EN 141)

Hand protection		
Material	:	Nitrile rubber
Remarks	:	Avoid contact with skin. Impervious gloves Wear protective gloves. Break through time : > 480 min
Eye protection	:	Safety glasses with side-shields Safety glasses with side-shields conforming to EN166 Wear face-shield and protective suit for abnormal processing problems.
Skin and body protection	:	Impervious clothing Choose body protection according to the amount and concentration of the dangerous substance at the work place.
Protective measures	:	Emergency eyewash should be provided in the immediate work area.
Hygiene measures	:	Avoid contact with skin, eyes and clothing. When using do not eat or drink. When using do not smoke.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Colour	:	dark blue
Odour	:	Amine
Odour Threshold	:	no data available
pH	:	10.3 - 10.5
Melting point/freezing point	:	no data available
Boiling point/boiling range	:	no data available
Flash point	:	boils without flashing
Evaporation rate	:	no data available
Flammability (solid, gas)	:	Product is not known to be flammable, combustible or pyrophoric.
Flammability (liquids)	:	no data available
Self-ignition	:	no data available

Upper explosion limit	:	no data available
Lower explosion limit	:	no data available
Vapour pressure	:	no data available
Relative vapour density	:	> 1 (Air = 1.0)
Relative density	:	1.220 - 1.230 (75 °F / 24 °C)
Density	:	Not applicable
Bulk density	:	no data available
Water solubility	:	completely miscible
Partition coefficient: n-octanol/water	:	Not applicable
Auto-ignition temperature	:	no data available
Decomposition temperature	:	None known.
Viscosity, dynamic	:	no data available
Viscosity, kinematic	:	no data available
Explosive properties	:	no data available
Oxidizing properties	:	no data available
Minimum ignition energy	:	no data available

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	No decomposition if stored and applied as directed.
Chemical stability	:	Stable under recommended storage conditions.
Possibility of hazardous reactions	:	Stable under normal conditions. Stable under recommended storage conditions. No hazards to be specially mentioned.
Conditions to avoid	:	High temperatures Heat
Incompatible materials	:	Strong acids Nitrates

		Strong acids and strong bases Oxidizing agents
Hazardous decomposition products	:	Carbon oxides Nitrogen oxides (NOx) No decomposition if used as directed.

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure :

Eyes
Skin
Ingestion

Acute toxicity

Acute oral toxicity : LD50 (Rat): Believed to be approximately 1,000 mg/kg

Acute inhalation toxicity : Acute toxicity estimate: > 40 mg/l
Exposure time: 4 h
Test atmosphere: vapour
Method: Calculation method

Acute toxicity estimate: > 40 mg/l
Exposure time: 4 h
Test atmosphere: vapour
Method: Calculation method

Acute dermal toxicity : LD50 (Rabbit): > 5,000 mg/kg

Acute toxicity (other routes of administration) :

Remarks: May cause mild eye irritation. Ingestion may cause mild gastrointestinal discomfort.
Inhalation of mist or vapor may cause irritation to the mucous membranes of the respiratory tract.

Skin corrosion/irritation

Remarks: Not expected to cause irritation.

Serious eye damage/eye irritation

Result: No eye irritation

Respiratory or skin sensitisation
Remarks: This material is not known or reported to be a skin or respiratory sensitizer.

Germ cell mutagenicity
Genotoxicity in vitro : Remarks: no data available

Carcinogenicity
Remarks: no data available

IARC No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

OSHA No component of this product present at levels greater than or equal to 0.1% is on OSHA#s list of regulated carcinogens.

NTP No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

ACGIH No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

Reproductive toxicity
Effects on fertility : Remarks: no data available

STOT - single exposure
Remarks: no data available

STOT - repeated exposure
Remarks: no data available

Repeated dose toxicity
Remarks: Not known or reported to cause subchronic or chronic toxicity.

Aspiration toxicity
No aspiration toxicity classification

Further information
Remarks: no data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Toxicity to fish : Remarks: no data available

Persistence and degradability

no data available

Bioaccumulative potential

Bioaccumulation : Remarks: no data available

Components:

2,2',2''-Nitrilotriethanol:

Partition coefficient: n-octanol/water : log Pow: -2.3

2-Aminoethanol:

Partition coefficient: n-octanol/water : log Pow: -1.91 (25 °C)
Method: OECD Test Guideline 107

Mobility in soil

Distribution among environmental compartments : Remarks: no data available

Other adverse effects

Ozone-Depletion Potential : Regulation: US. EPA Clean Air Act (CAA) Section 602 Ozone-Depleting Substances (40 CFR 82, Subpt. A, App A & B)
Remarks: This product neither contains, nor was manufactured with a Class I or Class II ODS as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).

Additional ecological information : Toxic to fish and other aquatic organisms.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : If this product becomes a waste, it will be a nonhazardous waste.
As a nonhazardous liquid waste, it should be disposed of in accordance with local, state and federal regulations.

SECTION 14. TRANSPORT INFORMATION

DOT	:	Not dangerous goods
UN number	:	Not applicable
Proper shipping name	:	Not applicable
Transport hazard class	:	Not applicable
Packing group	:	Not applicable
TDG	:	Not dangerous goods
UN number	:	Not applicable
Proper shipping name	:	Not applicable
Transport hazard class	:	Not applicable
Packing group	:	Not applicable
IATA		Not dangerous goods
UN number	:	Not applicable
Proper shipping name	:	Not applicable
Transport hazard class	:	Not applicable
Packing group	:	Not applicable
IMDG		Not dangerous goods
UN number	:	Not applicable
Proper shipping name	:	Not applicable
Transport hazard class	:	Not applicable
Packing group	:	Not applicable
ADR	:	Not dangerous goods
UN number	:	Not applicable
Proper shipping name	:	Not applicable
Transport hazard class	:	Not applicable
Packing group	:	Not applicable
RID	:	Not dangerous goods
UN number	:	Not applicable
Proper shipping name	:	Not applicable
Transport hazard class	:	Not applicable
Packing group	:	Not applicable
Special precautions for user	:	none
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	:	Not applicable

SECTION 15. REGULATORY INFORMATION

This chemical is a pesticide product registered by the United States Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets (SDS), and for workplace labels of non-pesticide chemicals.

EPA Registration number	:	8959-10
Signal word	:	CAUTION!
Hazard statements	:	Harmful if swallowed. Harmful if absorbed through skin. Causes moderate eye irritation.

EPCRA - Emergency Planning and Community Right-to-Know Act

CERCLA Reportable Quantity

This material does not contain any components with a CERCLA RQ.

SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

SARA 311/312 Hazards

See above: SECTION 2. Hazard Identification-GHS Classification

SARA 313

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

Clean Air Act

This product neither contains, nor was manufactured with a Class I or Class II ODS as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).

This product does not contain any hazardous air pollutants (HAP), as defined by the U.S. Clean Air Act Section 112 (40 CFR 61).

This product does not contain any chemicals listed under the U.S. Clean Air Act Section 112(r) for Accidental Release Prevention (40 CFR 68.130, Subpart F).

The following chemical(s) are listed under the U.S. Clean Air Act Section 111 SOCMI Intermediate or Final VOC's (40 CFR 60.489):

Components	CAS-No.	Concentration
2-Aminoethanol	141-43-5	10 - 20 %

This product does not contain any VOC exemptions listed under the U.S. Clean Air Act Section 450.

Clean Water Act

This product does not contain any Hazardous Chemicals listed under the U.S. CleanWater Act, Section 311, Table 117.3.

This product does not contain any Hazardous Substances listed under the U.S. CleanWater Act, Section 311, Table 116.4A.

This product does not contain any toxic pollutants listed under the U.S. Clean Water Act Section 307

US State Regulations

Massachusetts Right To Know

Components	CAS-No.
2,2',2''-Nitrilotriethanol	102-71-6
2-Aminoethanol	141-43-5

Pennsylvania Right To Know

Components	CAS-No.
2,2',2''-Nitrilotriethanol	102-71-6
Copper triethanolamine complex	82027-59-6
Copper, bis[2-(amino-.kappa.N)ethanolato-.kappa.O]-	14215-52-2
2-Aminoethanol	141-43-5

New Jersey Right To Know

Components	CAS-No.
2,2',2''-Nitrilotriethanol	102-71-6
Copper triethanolamine complex	82027-59-6
Copper, bis[2-(amino-.kappa.N)ethanolato-.kappa.O]-	14215-52-2
2-Aminoethanol	141-43-5

California Prop. 65

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

Canadian lists

NPRI

Canadian National Pollutant Release Inventory (NPRI): No component is listed on NPRI.

The components of this product are reported in the following inventories:

TSCA : This product is regulated under the Federal Insecticide, Fungicide and Rodenticide Act. It must be used for purposes consistent with its labeling.

SECTION 16. OTHER INFORMATION

Full text of other abbreviations

ACGIH : US. ACGIH Threshold Limit Values
NIOSH/GUIDE : US. NIOSH: Pocket Guide to Chemical Hazards, as amended

AICS - Australian Inventory of Chemical Substances; ASTM - American Society for the Testing of Materials; bw - Body weight; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DOT - Department of Transportation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; EHS - Extremely Hazardous Substance; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; HMIS - Hazardous Materials Identification System; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; MSHA - Mine Safety and Health Administration; n.o.s. - Not Otherwise Specified; NFPA - National Fire Protection Association; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; RCRA - Resource Conservation and Recovery Act; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RQ - Reportable Quantity; SADT - Self-Accelerating Decomposition Temperature; SARA - Superfund Amendments and Reauthorization Act; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative

Revision Date : 2020.05.13

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Date format : yyyy/mm/dd

US / EN

Appendix B

Special Status Species List and Species Descriptions

1. Approach

A list of special status species was compiled using records from the California Department of Fish and Wildlife's (CDFW) California Natural Diversity Database (CNDDB), and the U.S. Fish and Wildlife Service's (USFWS) Environmental Conservation Online System (ECOS) Information for Planning and Conservation (IPaC) (CNDDB, 2021; USFWS, 2019). Location-specific species information for Ventura County is available from ECOS IPaC. Special status species data from CNDDB was obtained for the two United States Geological Survey (USGS) 7.5 x 7.5-minute quadrangles that the Project area falls within (i.e., core quads) as well as ten peripheral quadrangles (i.e., border quads). This approach was used to identify species that might be located in the surrounding areas, but not necessarily reported to CNDDB as a sighting within the boundaries of the Project area. Data was queried from the CDFW and USFWS databases for these quads and combined into one table. Once this list was compiled, a preliminary assessment of the Project area was performed to characterize the actual habitats present on-site and the likelihood of special status species occurrence and interaction with treated water.

A summary of the listed species, their conservation status, and whether they were considered for evaluation of potential impact is presented in **Table B-1**. Species habitat and rationale for removal from further consideration is presented in **Table B-1** and more detailed species life history information can be found below.

Table B-1. Species and Habitat Summary

Taxon	Common Name	Scientific Name	Status	Habitat	Not Present in Project Area; Species Eliminated from Further Consideration	Potentially Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potentially Present in Project Area and Potential Exposure will be Considered
Mammals	American badger	*Vireo bellii pusillus*	SSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils.	X		
Mammals	Buena Vista Lake ornate shrew	*Sorex ornatus relictus*	FE	Marshlands and riparian areas in the Tulare Basin.	X		
Mammals	Dulzura pocket mouse	*Chaetodipus californicus femoralis*	SSC	Variety of habitats including coastal scrub, chaparral & grassland in San Diego County.	X		
Mammals	giant kangaroo rat	*Dipodomys ingens*	FE	Annual grasslands on the western side of the San Joaquin Valley, marginal habitat in alkali scrub.	X		
Mammals	Mexican long-tongued bat	*Choeronycteris mexicana*	SSC	Occasionally found in San Diego County, which is on the periphery of their range.		X (1)	
Mammals	pallid bat	*Antrozous pallidus*	SSC	Deserts, grasslands, shrublands, woodlands and forests. Most common in open, dry habitats with rocky areas for roosting.	X		
Mammals	San Diego desert woodrat	*Neotoma lepida intermedia*	SSC	Coastal scrub of Southern California from San Diego County to San Luis Obispo County.	X		
Mammals	San Joaquin kit fox	*Vulpes macrotis mutica*	FE	Annual grasslands or grassy open stages with scattered ydrolo vegetation.	X		

Taxon	Common Name	Scientific Name	Status	Habitat	Not Present in Project Area; Species Eliminated from Further Consideration	Potentially Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potentially Present in Project Area and Potential Exposure will be Considered
Mammals	southern sea otter	*Enhydra lutris nereis*	FT	Nearshore marine environments from about Ano Muevo, San Mateo Co. to Point Sal, Santa Barbara Co.	X		
Mammals	western mastiff bat	*Eumops perotis californicus*	SSC	Many open, semi-arid to arid habitats, including conifer & deciduous woodlands, coastal scrub, grasslands, chaparral, etc.	X		
Birds	American peregrine falcon	*Falco peregrinus anatum*	FD, SD, SFP	Near wetlands, lakes, rivers, or other water; on cliffs, banks, dunes, mounds; also, human-made structures.		X (2)	
Birds	bank swallow	*Riparia riparia*	ST	Colonial nester; nests primarily in riparian and other lowland habitats west of the desert.		X (3)	
Birds	Belding's savannah sparrow	*Passerculus sandwichensis beldingi*	SE	Inhabits coastal salt marshes, from Santa Barbara south through San Diego County.	X		
Birds	burrowing owl	*Athene cunicularia*	SSC	Open, dry annual or perennial grasslands, deserts, and scrublands characterized by low-growing vegetation.	X		
Birds	California black rail	*Laterallus jamaicensis coturniculus*	ST, SFP	Inhabits freshwater marshes, wet meadows and shallow margins of saltwater marshes bordering larger bays.	X		

Taxon	Common Name	Scientific Name	Status	Habitat	Not Present in Project Area; Species Eliminated from Further Consideration	Potentially Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potentially Present in Project Area and Potential Exposure will be Considered
Birds	California condor	*Gymnogyps californianus*	FE, SE, SFP	Require vast expanses of open savannah, grasslands, and foothill chaparral in mountain ranges of moderate altitude.	X		
Birds	California least tern	*Sternula antillarum browni*	FE, SE, SFP	Nests along the coast from San Francisco Bay south to northern Baja California.	X		
Birds	coastal California gnatcatcher	*Polioptila californica californica*	FT, SSC	Obligate, permanent resident of coastal sage scrub below 2500 ft in Southern California.	X		
Birds	common loon (breeding)	*Gavia immer*	SSC	Nesting locations at certain large lakes and reservoirs in interior of state, primarily in northeastern plateau region.		X (4)	
Birds	Kern primrose sphinx moth	*Euproserpinus euterpe*	FT	Found in the Walker Basin, Kern County, and several other scattered locations (Carrizo Plain, Pinnacles NM).	X		
Birds	least Bell's vireo	*Vireo bellii pusillus*	FE, SE	Summer resident of Southern California in low riparian in vicinity of water or in dry river bottoms; nests placed along margins of bushes or on twigs projecting into pathways, usually willow, Baccharis, mesquite.		X (2)	
Birds	light-footed Ridgeway's rail	*Rallus obsoletus levipes*	FE	Coastal marhses and lagoons with shallow water, mudflats and	X		

Taxon	Common Name	Scientific Name	Status	Habitat	Not Present in Project Area; Species Eliminated from Further Consideration	Potentially Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potentially Present in Project Area and Potential Exposure will be Considered
Birds	marbled murrelet	*Brachyramphus marmoratus*	FT	Feeds near-shore; nests inland along coast from Eureka to Oregon border and from Half Moon Bay to Santa Cruz.	X		
Birds	southwestern willow flycatcher	*Empidonax traillii extimus*	FE, SE	Riparian Woodlands in Southern California		X (2)	
Birds	tricolored blackbird	*Agelaius tricolor*	ST, SSC	Highly colonial species, most numerous in Central Valley & vicinity. Largely endemic to California.		X (5)	
Birds	western snowy plover	*Charadrius nivosus nivosus*	FT, SSC	Sandy beaches, salt pond levees & shores of large alkali lakes.	X		
Birds	western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	FT, SE	Riparian forest nester, along the broad, lower flood-bottoms of larger river systems.		X (2)	
Birds	yellow warbler	*Setophaga petechia*	SSC	Riparian plant associations in close proximity to water. Also nests in montane shrubbery in open conifer forests in Cascades and Sierra Nevada.		X (2)	
Reptiles	Blunt-nosed leopard lizard	*Gambelia silus*	FE	Resident of sparsely vegetated alkali and desert scrub habitats, in areas of low topographic relief.	X		

Taxon	Common Name	Scientific Name	Status	Habitat	Not Present in Project Area; Species Eliminated from Further Consideration	Potentially Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potentially Present in Project Area and Potential Exposure will be Considered
Reptiles	coast horned lizard	*Phrynosoma blainvillii*	SSC	Frequents a wide variety of habitats, most common in lowlands along sandy washes with scattered low bushes.	X		
Reptiles	coast patch-nosed snake	*Salvadora hexalepis virgultea*	SSC	Brushy or shrubby vegetation in coastal Southern California.	X		
Reptiles	coastal whiptail	*Aspidoscelis tigris stejnegeri*	SSC	Found in deserts and semi-arid areas with sparse vegetation and open areas. Also found in woodland & riparian areas.	X		
Reptiles	leatherback sea turtle	*Dermochelys coriacea*	FE	Pelagic forager seasonally found off the California Coast	X		
Reptiles	Northern California legless lizard	*Anniella pulchra*	SSC	Sandy or loose loamy soils under sparse vegetation.	X		
Reptiles	California legless lizard	*Anniella spp.*	SSC	Contra Costa County south to San Diego, within a variety of open habitats. This element represents California records of Anniella not yet assigned to new species within the Anniella pulchra complex.	X		

Taxon	Common Name	Scientific Name	Status	Habitat	Not Present in Project Area; Species Eliminated from Further Consideration	Potentially Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potentially Present in Project Area and Potential Exposure will be Considered
Reptiles	Southern California legless lizard	*Anniella stebbinsi*	SSC	Generally south of the Transverse Range, extending to northwestern Baja California. Occurs in sandy or loose loamy soils under sparse vegetation. Disjunct populations in the Tehachapi and Piute Mountains in Kern County.	X		
Reptiles	olive ridley sea turtle	*Lepidochelys olivacea*	FE (Pacific breeding population)	Open ocean to shallow bays and lagoons.	X		
Reptiles	two-striped gartersnake	*Thamnophis hammondii*	SSC	Coastal California from vicinity of Salinas to northwest Baja California. From sea to about 7,000 ft elevation.			X
Reptiles	western pond turtle	*Emys marmorata*	SSC	A thoroughly aquatic turtle of ponds, marshes, rivers, streams, and irrigation ditches, usually with aquatic vegetation, below 6000 ft elevation.			X
Amphibians	arroyo (=arroyo southwestern) toad	*Anaxyrus californicus*	FE	Semi-arid regions near washes or intermittent streams, including valley-foothill and desert riparian, desert wash, etc.	X		
Amphibians	California red-legged frog	*Rana draytonii*	FT, SCC	Lowland foothills in or near permanent sources of deep water with dense, shrubby, or emergent riparian vegetation.	X		

Taxon	Common Name	Scientific Name	Status	Habitat	Not Present in Project Area; Species Eliminated from Further Consideration	Potentially Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potentially Present in Project Area and Potential Exposure will be Considered
Amphibians	Coast Range newt	*Taricha torosa*	SSC	Coastal drainages from Mendocino County to San Diego County.	X		
Amphibians	foothill yellow-legged frog	*Rana boylii*	SE, SSC	Partly-shaded shallow streams & riffles with a rocky substrate in a variety of habitats; need at least some cobble-sized substrate for egg-laying.	X		
Amphibians	southern mountain yellow-legged frog	*Rana muscosa*	FE	Federal listing refers to populations in the San Gabriel, San Jacinto, and San Bernadino mountains (southern DPS).	X		
Fish	arroyo chub	*Gila orcuttii*	SSC	Native to streams from Malibu Creek to San Luis Rey River basin. Introduced into streams in Santa Clara, Ventura, Santa Ynez, Mojave & San Diego river basins.	X		
Fish	Santa Ana sucker	*Catostomus santaanae*	FT	Endemic to Los Angeles Basin south coastal streams.	X		
Fish	steelhead – southern California DPS	*Oncorhynchus mykiss irideus pop. 10*	FE	Federal listing refers to populations from Santa Maria River south to southern extent of range (San Mateo Creek in San Diego County).			X (7)

Taxon	Common Name	Scientific Name	Status	Habitat	Not Present in Project Area; Species Eliminated from Further Consideration	Potentially Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potentially Present in Project Area and Potential Exposure will be Considered
Fish	tidewater goby	*Eucyclogobius newberryi*	FE, SSC	Brackish water habitats along the California coast from Agua Hedionda Lagoon, San Diego County to the mouth of the Smith River.	X		
Fish	unarmored threespine stickleback	*Gasterosteus aculeatus williamsoni*	FE, SE, SFP	Weedy pools, backwaters, and among emergent vegetation at the stream edge in small Southern California streams.	X		
Invertebrates	conservancy fairy shrimp	*Branchinecta conservatio*	FE	Endemic to the grasslands of the northern two-thirds of the Central Valley; found in large, turbid pools.	X		
Invertebrates	Riverside fairy shrimp	*Streptocephalus woottoni*	FE	Endemic to Western Riverside, Orange, and San Diego counties in areas of tectonic swales/earth slump basins in grassland coastal sage scrub.	X		
Invertebrates	vernal pool fairy shrimp	*Branchinecta lynchi*	FT	Endemic to the grasslands of the Central Valley, Central Coast mountains, and South Coast mountains, in astatic rain-filled pools.	X		
Plants	Abrams' oxytheca	*Acanthoscyphus parishii var. abramsii*	CRPR-1	Chaparral.	X		

Taxon	Common Name	Scientific Name	Status	Habitat	Not Present in Project Area; Species Eliminated from Further Consideration	Potentially Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potentially Present in Project Area and Potential Exposure will be Considered
Plants	Mt. Pinos onion	*Allium howellii var. clokeyi*	CRPR-1	Great Basin scrub, pinyon and juniper woodland, meadows, and seeps (edges).	X		
Plants	aphanisma	*Aphanisma blitoides*	CRPR-1	Blooms March through June.	X		
Plants	Marsh Sandwort	*Arenaria paludicola*	FE, SE, CRPR-1	Marshes and swamps.	X		
Plants	Braunton's milk-vetch	*Astragalus brauntonii*	FE	Chaparral, coastal scrub, valley and foothill grassland.	X		
Plants	Miles' milk-vetch	*Astragalus didymocarpus var. milesianus*	CRPR-1	Coastal scrub.	X		
Plants	Ventura Marsh milk-vetch	*Astragalus pycnostachyus var. lanosissimus*	FE, SE, CRPR-1	Marshes and swamps, coastal dunes, coastal scrub.	X		
Plants	Coulter's saltbush	*Atriplex coulteri*	CRPR-1	Coastal bluff scrub, coastal dunes, coastal scrub, valley and foothill grassland.	X		
Plants	south coast saltscale	*Atriplex pacifica*	CRPR-1	Coastal scrub, coastal bluff scrub, playas, coastal dunes.	X		
Plants	Davidson's saltscale	*Atriplex serenana var. davidsonii*	CRPR-1	Coastal bluff scrub, coastal scrub.	X		
Plants	Island Barberry	*Berberis pinnata ssp. Insularis*	FE	Closed-cone coniferous forest, cismontane woodland, chaparral, coastal scrub.	X		

Taxon	Common Name	Scientific Name	Status	Habitat	Not Present in Project Area; Species Eliminated from Further Consideration	Potentially Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potentially Present in Project Area and Potential Exposure will be Considered
Plants	late-flowered mariposa-lily	*Calochortus fimbriatus*	CRPR-1	Chaparral, cismontane woodland, riparian woodland.	X		
Plants	Palmer's mariposa-lily	*Calochortus palmeri var. palmeri*	CRPR-1	Meadows and seeps, chaparral, lower montane coniferous forest.	X		
Plants	Plummer's mariposa-lily	*Calochortus plummerae*	CRPR-4	Coastal scrub, chaparral, valley and foothill grassland, cismontane woodland, lower montane coniferous forest.	X		
Plants	California jewelflower	*Caulanthus californicus*	FE	Chenopod scrub, valley and foothill grassland, pinyon and juniper woodland.	X		
Plants	Lemmon's jewelflower	*Caulanthus lemmonii*	CRPR-1	Pinyon and juniper woodland, valley and foothill grassland.	X		
Plants	southern tarplant	*Centromadia parryi ssp. Australis*	CRPR-1	Marshes and swamps (margins), valley and foothill grassland, vernal pools.	X		
Plants	Orcutt's pincushion	*Chaenactis glabriuscula var. orcuttiana*	CRPR-1	Coastal bluff scrub, coastal dunes.	X		
Plants	salt marsh bird's-beak	*Chloropyron maritimum ssp. Maritimum*	FE, CRPR-1	Marshes and swamps, coastal dunes.	X		
Plants	umbrella larkspur	*Delphinium umbraculorum*	CRPR-1	Cismontane woodland, chaparral.	X		
Plants	Slender-horned spineflower	*Dodecahema leptoceras*	FE	Chaparral, cismontane woodland, coastal scrub (alluvial fan sage scrub).	X		

Taxon	Common Name	Scientific Name	Status	Habitat	Not Present in Project Area; Species Eliminated from Further Consideration	Potentially Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potentially Present in Project Area and Potential Exposure will be Considered
Plants	Conejo dudleya	*Dudleya abramsii ssp. parva*	FT	Coastal scrub, valley and foothill grassland.	X		
Plants	Marcescent dudleya	*Dudleya cymosa ssp. marcescens*	FT	Chaparral.	X		
Plants	Santa Monica dudleyea	*Dudleya cymose ssp. ovatifolia*	FT	Chaparral, coastal scrub.	X		
Plants	Verity's dudleya	*Dudleya verityi*	FT	Chaparral, cismontane woodland, coastal scrub.	X		
Plants	Kern mallow	*Eremalche kernensis*	FE	Chenopod scrub, valley and foothill grassland, pinyon and juniper woodlands.	X		
Plants	southern mountain buckwheat	*Eriogonum kennedyi var. austromontanum*	FT	Pebble plain, lower montane coniferous forest.	X		
Plants	Ojai fritillary	*Fritillaria ojaiensis*	CRPR-1	Broadleaved upland forest (mesic), chaparral, lower montane coniferous forest, cismontane woodland.	X		
Plants	mesa horkelia	*Horkelia cuneata var. puberula*	CRPR-1	Chaparral, cismontane woodland, coastal scrub.	X		
Plants	California satintail	*Imperata brevifolia*	CRPR-2	Coastal scrub, chaparral, riparian scrub, mojavean desert scrub, meadows and seeps (alkali), riparian scrub.	X		

Taxon	Common Name	Scientific Name	Status	Habitat	Not Present in Project Area; Species Eliminated from Further Consideration	Potentially Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potentially Present in Project Area and Potential Exposure will be Considered
Plants	Coulter's goldfields	*Lasthenia glabrata ssp. coulteri*	CRPR-1	Coastal salt marshes, playas, vernal pools.	X		
Plants	pale-yellow layia	*Layia heterotricha*	CRPR-1	Cismontane woodland, coastal scrub, pinyon and juniper woodland, valley and foothill grassland.	X		
Plants	Robinson's pepper-grass	*Lepidium virginicum var. robinsonii*	CRPR-4	Chaparral, coastal scrub.	X		
Plants	Santa Barbara honeysuckle	*Lonicera subspicata var. subspicata*	CRPR-1	Chaparral, cismontane woodland, coastal scrub.	X		
Plants	Davidson's bush-mallow	*Malacothamnus davidsonii*	CRPR-1	Coastal scrub, riparian woodland, chaparral, cismontane woodland.	X		
Plants	Mexican malacothrix	*Malacothrix similis*	CRPR-2	Coastal dunes.	X		
Plants	Island malacothrix	*Malacothrix squalida*	FE	Chaparral, cismontane woodland, coastal bluff scrub.	X		
Plants	white-veined monardella	*Monardella hypoleuca ssp. hypoleuca*	CRPR-1	Chaparral, cismontane woodland.	X		
Plants	Tehachapi monardella	*Monardella linoides ssp. oblonga*	CRPR-1	Lower montane coniferous forest, upper montane coniferous forest, pinyon and juniper woodland.	X		
Plants	San Joaquin woollythreads	*Monolopia congdonii*	FE	Chenopod scrub, valley and foothill grassland.	X		

Taxon	Common Name	Scientific Name	Status	Habitat	Not Present in Project Area; Species Eliminated from Further Consideration	Potentially Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potentially Present in Project Area and Potential Exposure will be Considered
Plants	aparejo grass	*Muhlenbergia utilis*	CRPR-2	Meadows and seeps, marshes and swamps, chaparral, coast scrub, cismontane woodland.	X		
Plants	Gambel's watercress	*Nasturtium gambelii*	FE, ST, CRPR-1	Marshes and swamps.	X		
Plants	Spreading navarretia	*Navarretia fossalis*	FT	Vernal pools, chenopod scrub, marshes and swamps, playas.	X		
Plants	Ojai navarretia	*Navarretia ojaiensis*	CRPR-1	Chaparral, coastal scrub, valley and foothill grassland.	X		
Plants	Baja navarretia	*Navarretia peninsularis*	CRPR-1	Lower montane coniferous forest, chaparral, meadows and seeps, pinyon and juniper woodland.	X		
Plants	chaparral nolina	*Nolina cismontana*	CRPR-1	Chaparral, coastal scrub.	X		
Plants	California Orcutt grass	*Orcuttia californica*	FE	Vernal pools.	X		
Plants	Lyon's pentachaeta	*Pentachaeta lyonii*	FE	Chaparral, valley and foothill grassland, coastal scrub.	X		
Plants	white rabbit-tobacco	*Pseudognaphalium leucocephalum*	CRPR-2	Riparian woodland, cismontane woodland, coastal scrub, chaparral.	X		
Plants	Nuttall's scrub oak	*Quercus dumosa*	CRPR-1	Closed-cone coniferous forest, chaparral, coastal scrub.	X		
Plants	Hoffmann's bitter gooseberry	*Ribes amarum var. hoffmannii*	CRPR-3	Chaparral, riparian woodland.	X		

Taxon	Common Name	Scientific Name	Status	Habitat	Not Present in Project Area; Species Eliminated from Further Consideration	Potentially Present in Project Area; Species Eliminated from Further Consideration for Reasons Given (see numbered notes)	Potentially Present in Project Area and Potential Exposure will be Considered
Plants	Sanford's arrowhead	*Sagittaria sanfordii*	CRPR-1	Marshes and swamps.		X (6)	
Plants	Hoffmann's sanicle	*Sanicula hoffmannii*	CRPR-4	Broadleaved upland forest, coastal scrub, chaparral, cismontane woodland, lower montane coniferous forest.	X		
Plants	salt spring checkerbloom	*Sidalcea neomexicana*	CRPR-2	Playas, chaparral, coastal scrub, lower montane coniferous forest, Mojavean desert scrub.	X		
Plants	southern jewelflower	*Streptanthus campestris*	CRPR-1	Chaparral, lower montane coniferous forest, pinyon and juniper woodland.	X		

Sources: CNDDB, 2021; USFWS, 2019

Table B-1 Numbered Notes:

1) Project area is outside of the range for this species.
2) Species not likely to have any exposure to copper-containing prey items as its target prey base consists of terrestrial species.
3) These species may forage for emergent aquatic insects over water. These insects may be temporarily impacted by copper. Given the large amount of potential foraging area, the emergent aquatic insects from a treated waterbody or receiving water would likely only contribute an insignificant percentage of the total diet. Therefore, no unacceptable risk due to copper exposure is anticipated.
4) Only winters in vicinity of project site; Project activity will not impact breeding.
5) Project activity will not affect foraging or nesting.
6) The population of Sanford's arrowhead in Ventura County is presumed extirpated due to development and altered site hydrology. The shoreline of Lake Casitas is not suitable habitat for Sanford's arrowhead with the variable water level. Additionally, Sanford's arrowhead is not a submerged aquatic plant; therefore, exposure to copper treated water is indirect, if any. Exposure will only occur through root uptake of soil water. Copper concentration in root zone water is not expected to be sufficient to impair growth or cause death.
7) No fish passage exists from Coyote Creek, Robles Diversion Dam, or the Ventura River into Lake Casitas. Steelhead in the Ventura River could potentially be exposed to water from Lake Casitas during or shortly after winter storm events if the lake fills and is spilling water to Coyote Creek.

Table B-1 Status Abbreviations:

FD - Federally Delisted
FE - Federally Listed as Endangered
FT - Federally Listed as Threatened
SD - State Delisted
SE - State Listed as Endangered
SFP - State Fully Protected
SSC - CDFW Species of Special Concern
ST - State Listed as Threatened
CRPR-1 - California Native Plant Society Rare Plant Rank 1, threatened or extinct in CA
CRPR-2 - California Native Plant Society Rare Plant Rank 2, rare, threatened or endangered in CA, but more common elsewhere.
CRPR-3 - California Native Plant Society Rare Plant Rank 3, plants about which we need more information
CRPR-4 - California Native Plant Society Rare Plant Rank 4, plants of limited distribution

2. Species Information

Life history information for species potentially present in the project area is presented below.

2.1. Birds

American peregrine falcon (*Falco peregrinus anatum*)
The American peregrine falcon is a State Fully Protected species. The populations of peregrine falcons have sufficiently recovered in California and across the United States, resulting in it being delisted from the Federal and California Endangered Species Acts. The habitat of peregrine falcons generally includes cliffs, for nesting, with open areas of air and generally open landscapes for foraging. In addition to natural habitats peregrine falcons also use urban, human-built environments such as towers, buildings, etc. Most prey is captured in the air while in flight, but they also capture prey from the surface of water or the ground. The most common prey includes birds (from songbirds to small geese), occasionally mammals, and rarely amphibians, fish, and insects (White et al., 2002). Because its target prey base consists of terrestrial species, the feeding habits of peregrine falcons will greatly limit their exposure to copper applied to Lake Casitas for the control of invasive mussels and algae.

Bank swallow (*Riparia riparia*)
The bank swallow is a State Threatened species. Bank swallows breed in eroded vertical banks of friable soil along ocean coasts, rivers, streams, lakes, reservoirs, and wetlands (American Ornithologists' Union, 1998 in Garrison, 1999; Cramp et al., 1988 in Garrison, 1999; Turner and Rose, 1989 in Garrison, 1999). They require vertical banks, cliffs, and bluffs in alluvial, friable soils for nesting. Bank swallows forage while flying and consume flying or jumping insects and occasionally eat terrestrial and aquatic insects or larvae (Garrison, 1999). They feed over lakes, ponds, rivers and streams, meadows, fields, pastures, and bogs. They occasionally feed over forests and woodlands (Gross, 1942 in Garrison, 1999; Stoner, 1936 in Garrison, 1999; Turner and Rose, 1989 in Garrison, 1999). During the breeding season, they generally forage within 200 m of their nests for feeding the nestlings (Mead, 1979 in Garrison, 1999; Turner, 1980 in Garrison, 1999). There are no known extant populations of bank swallows in Lake Casitas or its tributaries in Ventura County (CNDDB, 2021). Applications of copper-containing algaecides to water may result in adverse impact to exposed aquatic invertebrates (e.g., juvenile aquatic insects). As a result, there may be a minor and temporary reduction in food source production immediately following application of copper-containing algaecides or molluscicides. No impact is anticipated for insects which emerged from the water prior to the application of copper-containing algaecides. Because bank swallow colonies are typically located in areas with sufficient insect resources (Garrison, 1999), their reproductive success is unlikely to be impacted by a small reduction in food source production following application of copper-containing algaecides. Therefore, no risk is anticipated.

Common loon (*Gavia immer*)
The common loon is a breeding season Species of Special Concern (Shuford and Gardali, 2008). It is categorized as extirpated from the state totally or in its primary seasonal or breeding role and never listed as State Threatened or Endangered. Common loons do not breed in California, but winter inshore along the coast and in coastal waters. In the summer, they are rarely found along the northern California coast, and not found in southern California. Nearly the entire wintering population migrates north to its main breeding grounds in northern U.S. and

Canada, departing California April to May and arriving again in September to November (Granholm, 1990). Most loons winter inshore, over shoals, and in sheltered bays, inlets, and channels. A few have been recorded to winter inland in larger lakes, reservoirs, and rivers. They select habitat for stable food and avoidance of extreme storm exposure and turbidity. Loons feed on fish, and forage by diving mostly for small fish (McIntyre and Barr, 1997). Because they may only winter in the vicinity of Lake Casitas, project activities will not impact breeding. Therefore, no risk is anticipated.

Least Bell's vireo (*Vireo bellii pusillus*)
Least Bell's vireos are California and Federally listed as endangered. They occur as summer breeders from mid- to late March through late September. Early to mid-successional riparian habitat is typically used for nesting because it supports the dense shrub cover required for nest concealment as well as a structurally diverse canopy for foraging. Vegetation characteristics of riparian stands between five to ten years of age are most suitable for nesting. Least Bell's vireos obtain prey primarily by foliage gleaning (picking prey from leaf or bark substrates), and hovering (removing prey from vegetation surfaces while fluttering in the air). Foraging occurs at all levels of the canopy but appears to be concentrated in the lower to mid-strata, particularly when pairs have active nests. Least Bell's vireos are insectivores, preying on a wide variety of insect types including bugs, beetles, grasshoppers, moths, and particularly caterpillars (Kus, 2002). Because its target prey base consists of terrestrial species, the feeding habits of Least Bell's vireos will greatly limit their exposure to copper applied to Lake Casitas for the control of invasive mussels and algae.

Southwestern willow flycatcher (*Empidonax traillii extimus*)
Southwestern willow flycatchers are listed as California and Federally Endangered. They are a summer resident and arrive in early May to early June and leave mid- to late August. The southwestern willow flycatcher usually breeds in patchy to dense riparian habitats along streams or other wetlands, near or adjacent to surface water or underlain by saturated soil. Common tree and shrub species comprising nesting habitat include willows. Willow flycatcher is an insectivore and catches insects while flying, hovers to glean them from foliage, and occasionally captures insects on the ground. Flycatchers forage within and above the canopy, along the patch edge, in openings within the territory, above water, and glean from tall trees as well as herbaceous ground cover (USFWS, 2002). Because its target prey base consists of terrestrial species, the feeding habits of the flycatcher will greatly limit its exposure to copper applied to Lake Casitas for the control of invasive mussels and algae.

Tricolored blackbird (*Agelaius tricolor*)
Tricolored blackbird is a State Threatened species and Species of Special Concern. Breeding habitat of tricolored blackbirds includes large marshes (Payne, 1969 in Beedy and Hamilton, 1999). Nesting colonies are generally in emergent aquatic vegetation, but may also be found in trees along streams, weed patches, and grain and alfalfa fields, mustard, safflower, thistle, along irrigation ditches, or in trees along a river (Orians, 1960, 1961). In the Central Valley of California, breeding colonies were described where nests were placed in cattail-bulrush in dry and irrigated pasture; cattail in dry grassland, along a creek, rice and wheat fields, or dry and irrigated pasture; and in blackberry in dry grassland and along a creek (Crase and DeHaven, 1977). Tricolored blackbirds forage in cultivated row crops, orchards, vineyards, and heavily grazed rangelands, but these are considered low-quality forage habitats. High quality forage areas include irrigated pastureland, lightly grazed rangeland, dry seasonal pools, mowed alfalfa fields, feedlots, and dairies (Beedy and Hamilton, 1997 in Beedy and Hamilton, 1999). Nestling

tricolored blackbirds consume 86% animal matter on a volumetric basis, 11.2% plant matter, and 2.7% grit. The animal matter is primarily insects (79% of total diet) with the majority being beetles (61% of total diet). Plant matter is split evenly between cultivated grains such as oats, wheat, and miscellaneous plant matter (Crase and DeHaven, 1977).

Project activities will take place directly within Lake Casitas for the control of algae and invasive mussels; they will not affect foraging or nesting habitats. Furthermore, since tricolored blackbirds are unlikely to feed directly from Lake Casitas, they will have minimal to no exposure to copper-containing algaecides and/or molluscicides applied. Therefore, no risk is anticipated.

Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*)
The western yellow-billed cuckoo is both Federally Threatened and State Endangered. Yellow-billed cuckoos were extirpated north of the Sacramento Valley by the 1950s. Breeding is now restricted to isolated sites in the Sacramento, Amaragosa, Kern, Santa Ana, and Colorado River valleys in California (Hughes, 1999). Western populations suffered catastrophic range reductions in the twentieth century due to loss of riparian habitat through clearing for agriculture, flood control, and urbanization. In southern California, western yellow-billed cuckoos prefer desert riparian woodlands (Hughes, 1999). Nests are commonly placed in willows, but cottonwoods are used extensively for foraging. They are also found in orchards adjacent to river bottoms for 2–3 weeks prior to breeding, then move into riparian areas to breed. Breeding lasts from mid-May into October (Hughes, 1999). Western yellow-billed cuckoos feed primarily on large insects, such as caterpillars, katydids, cicadas, grasshoppers, and crickets, and occasionally on small frogs, arboreal lizards, and the eggs and young of birds. Fruit and seeds are rarely eaten in the summer, but more frequently in winter. They forage in open areas, woodland, orchards, and adjacent streams (Hughes 1999). Yellow-billed cuckoos have an estimated foraging area of approximately 50 acres. Because its target prey base consists of terrestrial species, the feeding habits of the cuckoo will greatly limit its exposure to copper applied to Lake Casitas for the control of invasive mussels and algae.

Yellow warbler (*Setophaga petechia*)
The yellow warbler is a California Species of Special Concern. Yellow warblers inhabit scrub-shrug wetlands, forested wetlands, open scrub, second-growth woodlands, and thickets (NatureServe, 2021). Nests are placed in upright forks or crotches of bushes, saplings, or large trees, from less than a meter above ground to high in tall trees. Nesting locations are chosen based primarily on characteristics of the vegetation patch rather than the characteristic of the nest plant itself. They primarily eat terrestrial insects (especially caterpillars) and spiders, taking most food items from leaves or bark. Because their food base consists of terrestrial species, yellow warblers are not likely to be exposed to copper-containing algaecides and/or molluscicides applied to Lake Casitas.

2.2. Fish

Steelhead – Southern California DPS (*Oncorhynchus mykiss irideus* pop. 10)
The Southern California steelhead DPS is a Federally Endangered species of naturally spawned anadromous steelhead originating below natural and manmade impassable barriers from the Santa Maria River to the U.S.-Mexico Border (NMFS, 2021). In the vicinity of Lake Casitas, the distinct population segment of Steelhead Trout is known to occur within the Ventura River watershed. The Ventura River begins in the mountains, and carries water from Matilija Creek, San Antonio Creek, and Canada Larga Creek. Ventura River is considered one of the

four major steelhead-bearing watersheds in Southern California and is one of five priority stream systems selected as part of the California Water Action Plan. Due to the construction of Casitas Dam in 1959, located in the southeast corner of Casitas Lake, a physical barrier prevents the endangered migrating steelhead population from entering Lake Casitas during their spawning season (Capelli, 1997). Consequentially, anadromous fish populations do not exist in the lake. However, there may have been residual fish populations of *O. mykiss* in Lake Casitas and its upstream tributaries, Coyote Creek and Santa Ana Creek, in the non-anadromous, residential form (Walter, 2015).

According to the Ventura River Watershed Management Plan, the critical habitat includes the Ventura River Estuary, at the mouth of the Ventura River, and extends north to Matilija Dam, ending within a segment of the North Fork Matilija Creek. The critical habitat also includes Canada Larga Creek, Coyote Creek at the southeast end of Lake Casitas, San Antonio Creek and Lion Canyon Creek (Walter, 2015). This reach of Coyote Creek has been highly modified as a result of the construction and operation of Casitas Dam, which has essentially eliminated baseflows and annual flushing flows. This altered flow regime has led to encroachment of the stream channel by riparian vegetation, and heavy accumulation of siltation in the channel bed (Capelli, 1997). The lower portion of Coyote Creek is therefore not currently sufficient to support steelhead populations (CDFW, 2021).

Ideal spawning grounds for *O. mykiss* include the currently inaccessible tributaries upstream of Lake Casitas, including Coyote Creek and Santa Ana Creek. In the event of a copper application to control algae or dreissenid mussels, treated water may be released into the Ventura River through Coyote Creek if the lake fills due to stormwater inputs and water is discharged to Coyote Creek. Stream-dwelling steelhead feed primarily on drifting aquatic organisms and terrestrial insects. They may also feed on active bottom invertebrates (Moyle, 2002). Their potential presence in the Ventura River and feeding habits indicate the Southern California steelhead DPS may consume prey items exposed to copper-containing algaecides and/or molluscicides applied to Lake Casitas, as well has have direct exposure to treated water in the event that water is discharged over the Casitas Dam. Although there is potential for dietary exposure to copper, direct exposure to treated water is expected to be the most significant exposure pathway this population segment. Refer to **Appendix C** for a summary of exposure and risk analysis for the steelhead. Refer to Mitigation Measure **BIO-1** in the IS/MND text.

2.3. Mammals

Mexican long-tongued bat (*Choeronycteris Mexicana*)
The Mexican long-tongued bat is a California Species of Special Concern that occurs in a variety of habitats from arid thorn scrub to tropical deciduous forest and mixed oak-conifer forest (Arroyo-Cabrales et al., 1987). Though the bat's distribution is primarily in Mexico, its range can extend to southern California. Available museum records and previous sightings suggest the species distribution in California is limited primarily to San Diego County (Pierson and Rainey, 1998). Mines, caves, and rock fissures are among the preferred roosting sites for the Mexican long-tongued bat (Banks and Parrish, 1965 in Pierson and Rainey, 1998; Barbour and Davis, 1969 in Pierson and Rainey, 1998; Hoffmeister, 1986 in Pierson and Rainey, 1998; Huey, 1954a in Pierson and Rainey, 1998). The Mexican long-tongued bat feeds primarily on nectar, though its diet also includes fruit, pollen, and likely some insects (Gardner, 1977 in Pierson and Rainey, 1998). Lake Casitas is outside the known range for this species and does not provide

desirable roosting habitat. Furthermore, since the bat's food base consists of terrestrial species, it will have minimal to no exposure to copper-containing algaecides and/or molluscicides applied to Lake Casitas. Therefore, no risk is anticipated.

2.4. Plants

Sanford's arrowhead (*Sagittaria sanfordii*)
Sanford's arrowhead is a rhizomatous monocot that is native and endemic to California (CalFlora, 2021). It is an aquatic perennial herb that occurs in freshwater wetlands, marshes, swamps, and other assorted shallow freshwater (CNPS, 2021). Sanford's arrowhead is a member of the water plantain family; it is an obligate wetland plant. Its habitat includes the margins of wetland areas such as streams, rivers, ponds, drainage channels, or irrigation canals. It is native to California and is endemic (limited) to California alone. It is included in the CNPS Inventory of Rare and Endangered Plants on list 1B.2 (rare, threatened, or endangered in CA and elsewhere).

Generally, copper is described as a contact herbicide because it expresses herbicidal activity only on the parts of the plant it touches. Because Sanford's arrowhead is not a submerged aquatic plant, exposure to copper will only occur through root uptake of soil water. Chloroplasts, which are responsible for carrying out the photosynthetic processes required for plant growth and survival, are the most vulnerable sites of copper toxicity (Costa et al., 2018) and are not naturally found in plant root cells. Therefore, adverse impacts to rooted, emergent vegetation such as the Sanford's arrowhead are not anticipated.

2.5. Reptiles

Western pond turtle (*Emys marmorata*)
The western pond turtle historically existed from Washington to British Columbia to northern Baja California, west of the Cascade-Sierra crest (Ernst et al., 1994) and is currently a California Species of Special Concern. They occupy a wide variety of wetland habitats including lakes, ponds, reservoirs, rivers and streams, stock ponds, and sewage treatment lagoons (Holland, 1994). Optimal habitat has adequate emergent basking sites, emergent vegetation, refugia in the form of banks, submerged vegetation, mud, rocks, and logs (Holland, 1994). Populations are in decline mainly due to habitat destruction. The species diet consists of a variety of food items including algae, various plants, snails, crustaceans, isopods, insects, fish, and frogs (Bury, 1986). Their habitat requirements and feeding habits indicate western pond turtle may consume prey items exposed to algaecides and/or molluscicides applied to Lake Casitas, as well has have direct exposure to treated water. Refer to **Appendix C** for a summary of exposure and risk analysis for the western pond turtle.

Two-striped gartersnake (*Thamnophis hammondii*)
The two-striped gartersnake is a California Species of Special Concern. Two-striped gartersnakes in California may show seasonal habitat differences. In summer they occupy streamside sites; in winter, they occupy nearby uplands. During the day this gartersnake often basks on streamside rocks or on densely vegetated stream banks. When disturbed it usually retreats rapidly to water. They are a highly aquatic species and forage primarily in and along streams preying on fishes, especially trout and sculpins and their eggs, as well as amphibians and amphibian larvae. Small mammals and invertebrates such as leeches and earthworms are also potential prey (Kucera, 2000). The habitat requirements and feeding habits of the gartersnake indicate that it may consume prey items exposed to copper-containing algaecides

and/or molluscicides applied to Lake Casitas, as well has have direct exposure to treated water. A summary of exposure and risk analysis for the two-striped gartersnake is presented in **Appendix C**.

3. References

American Ornithologists' Union. 1998. Check-list of North American Birds. 7th edition. American Ornithologists' Union. Washington, D.C.

Arroyo-Cabrales, J., R.R. Hollander, and J.K. Jones, Jr. 1987. *Choeronycteris mexicana*. Mammalian Species 291: 1-5.

Banks, R.C. and C. Parrish. 1965. Additional records of *Choeronycteris mexicana* from Southern California and Baja California. Bulletin of the Southern California Academy of Sciences 64:163-64.

Barbour, R.W. and W.H. Davis. 1969. Bats of America. Univ. Kentucky Press, Louisville, KY. 285 pp.

Beedy, E.C. and W.J. Hamilton, III. 1997. Tricolored blackbird status update and management guidelines. September (Jones and Stokes Associates, Inc. 97-099.) Sacramento, CA. Prepared for U.S. Fish and Wildlife Service, Portland, Oregon, and California Department of Fish and Game, Sacramento, CA.

Beedy, E.C. and W.J. Hamilton, Jr. 1999. Tricolored blackbird (*Agelaius tricolor*). In The Birds of North America, No. 423 (Poole, A.; Gill, F., Eds.). The Birds of North America, Inc., Philadelphia, PA. 24 pp.

Bury, R.B. 1986. Feeding ecology of the turtle, *Clemmys marmorata*. J. Herpeton. 20:515-521.

CalFlora. 2021. The CalFlora Database. Available: https://www.calflora.org/ (Accessed: August 11, 2021).

California Department of Fish and Wildlife (CDFW). 2021. Draft Instream Flow Regime Recommendations for the Lower Ventura River, Ventura County. California Department of Fish and Wildlife. San Diego, CA.

California Natural Diversity Database (CNDDB). 2021. RareFind 5. California Department of Fish and Wildlife, Biogeographic Data Branch. Available: https://apps.wildlife.ca.gov/rarefind/view/RareFind.aspx (Accessed: September 16, 2021).

California Native Plant Society (CNPS). 2021. Inventory of Rare and Endangered Plants of California. Available: https://rareplants.cnps.org/Home/Index/ (Accessed: August 11, 2021).

Capelli, M.H. 1997. Ventura River Steelhead Survey. California Department of Fish and Game. San Diego, CA.

Costa, M.B., F.V. Tavares, C.B. Martinez, I.G. Colares, C.G. Martins. 2018. Accumulation and effects of copper on aquatic macrophytes *Potamogeton pectinatus L*.: Potential application to environmental monitoring and phytoremediation. Ecotoxicology and Environmental Safety 155: 117-124.

Crase, F.T. and R.W. DeHaven. 1977. Food of nestling tricolored blackbirds. Condor 79(2): 265-269.

Cramp, S., D.J. Brooks, E. Dunn, R. Gillmor, J. Hall-Craggs et al. 1988. The birds of the western Palearctic. Volume 5: tyrant flycatchers to thrushes. Oxford University Press, Oxford, UK.

Ernst, C.H., J.E. Lovich, and R.W. Barbour. 1994. Turtles of the United States and Canada. Smithsonian Institution Press, Washington, D.C.

Gardner, A.L. 1977. Feeding habits. Pp. 293-350, In: Biology of bats of the New World Family Phyllostomidae (R. J. Baker, J. K. Jones, Jr., and D. C. Carter, eds.). Texas Tech. Univ., Lubbock, TX.

Garrison, B.A. 1999. Bank swallow (*Riparia riparia*). In The Birds of North America, No. 414 (Poole, A.; Gill, F., Eds.). Philadelphia: The Birds of North America, Inc. 28 pp.

Granholm, S. 1990. Common Loon (*Gavia immer*). In: Zeiner, D.C., W.F. Laudenslayer, Jr., K.E. Mayer, and M. White, eds. California's Wildlife, Volume 2: Birds. California Department of Fish and Wildlife. Sacramento, CA.

Gross, A.O. 1942. Bank swallow. Pp. 400-424 in Life histories of North American flycatchers, larks, swallows, and their allies (A.C. Bent, ed.). U.S. National Museum Bulletin 179.

Hoffmeister, D.F. 1986. The mammals of Arizona. Univ. Arizona Press and Arizona Game and Fish Department, Tucson. 601 pp.

Holland, D.C. 1994. The western pond turtle: habitat and history. U.S. Department of Energy, Bonneville Power Administration, Portland, Oregon. 11 chapter + appendices.

Huey, L. 1954a. *Choeronycteris mexicana* from southern California and Baja California, Mammals of Mexico, 35:436-7.

Hughes, J.M. 1999. Yellow-billed Cuckoo (*Coccyzus americanus*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology.

Kucera, T. 2000. Two-striped Gartersnake (*Thamnophis hammondii*). California Wildlife Habitat Relationships System, California Department of Fish and Wildlife, California Interagency Wildlife Task Group. Available: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=2809 (Accessed: August 11, 2021).

Kus, B. 2002. Least Bell's Vireo (*Vireo bellii pusillus*). In The Riparian Bird Conservation Plan: a strategy for reversing the decline of riparian-associated birds in California. California Partners in Flight. Available: http://www.prbo.org/calpif/htmldocs/species/riparian/least_bell_vireo.htm (Accessed: August 11, 2021).

McIntyre, J.W. and J.F. Barr. 1997. Common loon (Gavia immer). In The Birds of North America, No. 313 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, DC. 32 pp.

Mead, C.J. 1979. Colony fidelity and interchange in the sand martin. Bird Study 26: 99-106.

Moyle, P.B. 2002. Inland Fishes of California. University of California Press, Berkeley and Los Angeles, CA. 413 pp.

National Marine Fisheries Service (NMFS). 2021. Southern California Steelhead. Available: https://www.fisheries.noaa.gov/west-coast/endangered-species-conservation/southern-california-steelhead (Accessed: September 16, 2021).

NatureServe. 2021. NatureServe Explorer Database. Available: https://www.natureserve.org/ (Accessed: August 2021).

Orians, G.H. 1960. Autumnal breeding in the tricolored blackbird. Auk 77(4): 379-398.

Orians, G.H. 1961. The ecology of blackbird (*Agelaius*) social systems. Ecological Monographs 31(3): 285-312.

Payne, R. 1969. Breeding seasons and reproductive physiology of tricolored blackbirds and red winged blackbirds. University of California Publications of Zoology 90: 1-137.

Pierson, E.D. and W.E. Rainey. 1998. Mexican long-tongued bat, *Choeronycteris mexicana*. In: B.C. Bolster (Ed.), *Terrestrial Mammal Species of Special Concern in California*. Draft Final Report prepared by P.V. Brylski, P.W. Collins, E.D. Pierson, W.E. Rainey and T.E. Kucera. Report submitted to California Department of Fish and Game Wildlife Management Division, Nongame Bird and Mammal Conservation Program for Contract No. FG3146WM. Available: https://wildlife.ca.gov/Conservation/SSC/Mammals (Accessed: August 2021).

Shuford, W.D. and T. Gardali (Eds). 2008. California Bird Species of Special Concern. Studies of Western Birds No. 1. Western Field Ornithologists, Camarillo, CA and California Department of Fish and Game, Sacramento, CA.

Stoner, D. 1936. Studies on the bank swallow, *Riparia riparia riparia* (Linnaeus) in the Oneida Lake Region. Roosevelt Wild Life Annals 4: 126-233.

Turner, A.K. 1980. The use of time and energy by aerial-feeding birds. Ph.D. dissertation, University of Stirling, Scotland.

Turner, A.K. and C. Rose. 1989. Swallows and martins and identification guide and handbook. Houghton Mifflin Co., Boston, MA.

U.S. Fish and Wildlife Service (USFWS). 2002. Final Recovery Plan for Southwestern Willow Flycatcher (*Empidonax traillii estimus*). Region 2, U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

U.S. Fish and Wildlife Service (USFWS). 2019. Environmental Conservation Online System (ECOS) Information for Planning and Conservation (IPaC). [Online] https://ecos.fws.gov/ipac/. (Accessed: January 2019).

Walter, L. 2015. Ventura River Watershed Management Plan. Ventura River Watershed Council. Oak View, CA.

White, C.M., N.J. Clum, T.J. Cade, and W.G. Hunt. 2002. Peregrine falcon (*Falco peregrinus*). In The Birds of North America, No. 660 (A. Poole and F. Gill, eds.). The Birds of North America, Philadelphia, PA. 48 pp.

Appendix C

Copper Species-Specific Risk and Ecological Toxicity Data

1. Background

1.1. Copper Exposure and Toxicity in Terrestrial Versus Aquatic Animals

Copper is a naturally occurring, essential micronutrient for all organisms. Copper homeostasis is tightly regulated through a complex system of copper transporters and chaperone proteins (Gaetke et al., 2014) and most organisms have homeostatic mechanisms to process excess copper or to manage the deficiency of copper levels (USEPA, 2009). Copper exposure in terrestrial animals such as birds, reptiles and mammals primarily occurs through dietary intake. While exposure to high levels of copper in the diet can interfere with the ability to maintain homeostasis in terrestrial animals, animals with repeated exposure to copper concentrations which do not cause irreversible adverse impacts may undergo enzymatic adaptation and ultimately develop tolerance for greater levels of exposure (USEPA, 2009).

Aquatic animals such as fish are exposed to copper through both the dietary and direct uptake routes and are more susceptible to copper-induced toxicity than terrestrial animals. Copper toxicity in fish is primarily caused by its rapid binding to the gill membranes (USEPA, 2009). Copper accumulation in this way causes damage to the gill membranes and interferes with osmoregulatory processes. When exposed to sublethal concentrations of copper, many fish and mobile aquatic invertebrates exhibit an avoidance response, preferring areas within the waterbody that have lower concentrations of dissolved copper (Folmar, 1976, 1978).

1.2. Copper Fate in Aquatic Systems and Influence on Aquatic Toxicity

When applied during algaecide and/or molluscicide treatment, copper dissipation from the water column occurs by way of multiple processes including dilution, sorption, and precipitation. Due to processes such as advection, diffusion, and dispersion and because label language prohibits application of copper-containing algaecides and molluscicides to more than half of a water body, dilution is presumed to be a major dissipation process after initial application (Calomeni et al., 2017). When very small portions of water bodies are treated with copper (e.g., 3% by volume), dilution is expected to occur at a faster rate than in water bodies where large portions are treated (e.g., 50% by volume).

Copper in the water column occurs as dissolved ions and as part of the vast array of inorganic and organic complexes in water. Unlike organic chemicals, copper does not degrade over time, instead transforming from one form to another based on environmental properties such as pH, alkalinity, temperature, ionic strength, and organic carbon content. Many such physiochemical characteristics influence copper speciation, associated bioavailability, and resultant toxicity to aquatic organisms. The form of copper most commonly associated with aquatic toxicity is the free cupric ion (Cu^{2+}) (USEPA, 2009). The likelihood and magnitude of toxicity to aquatic receptors exposed to the cupric ion is typically greater in waters characterized by low levels of hardness, pH, ionic strength, and dissolved organic carbon than in hard waters with higher pH, ionic strength, and dissolved organic carbon. Copper bioavailability in water is also influenced by the presence of biotic ligands such as algae and the gill membranes of fish. When used as an algaecide, application to water containing higher density algae blooms is associated with lower bioavailability and risk of copper toxicity to non-target aquatic receptors than application to water containing lower density algae blooms (Franklin et al., 2002).

2. Risk Assessment Process Overview

There are two special status species, the two-striped gartersnake and western pond turtle, that could have habitat within or adjacent to Lake Casitas and potentially be affected by proposed Project activities. A third special status species, the southern California DPS steelhead may be present downstream of Lake Casitas, in the Ventura River, and could potentially be affected if treated water were discharged to the Ventura River through Coyote Creek. A quantitative ecological risk assessment was conducted for these species to evaluate potential impacts from management of mussels or algae with copper-containing algaecides and/or molluscicides. For contaminants frequently considered in ecological risk assessments, regulatory agencies such as USEPA recommend the evaluation of exposure compared to a toxicity endpoint to derive a risk quotient (RQ). RQs are often calculated as a method to identify high- or low-risk scenarios. The RQ is calculated by comparing the estimated exposure with the concentration associated with a toxicity endpoint. Toxicity endpoints routinely used by USEPA (2020) in calculating RQs for screening-level risk assessments for animals include the median lethal dose (LD50), median lethal concentration (LC50), or median effect concentration (EC50) for acute assessments and the No Observed Adverse Effect Level (NOAEL) or Concentration (NOAEC) for chronic assessments.

$$\text{Risk Quotient (RQ)} = \text{Exposure} / \text{Toxicity}$$

Once an RQ is calculated, it is compared to the Level of Concern (LOC) to determine whether an adverse effect for a given species is likely to occur. Risk is present when the RQ exceeds the LOC. Exposure is not considered to pose a risk when the RQ is lower than the LOC. USEPA (2020) uses the following LOCs for endangered animal species in regulatory decision-making:

- Terrestrial animal (birds and mammals) acute risk LOC = 0.1
- Terrestrial animal (birds and mammals) chronic risk LOC = 1.0
- Aquatic animal acute risk LOC = 0.05
- Aquatic animal chronic risk LOC = 1.0

Specific details regarding the estimation of risk in the two-striped gartersnake, western pond turtle, and steelhead from exposure to water following an application of copper-containing algaecides and/or molluscicides in Lake Casitas are presented below.

Note that, due to the rapid dissipation of copper anticipated when very small portions of water bodies are treated (e.g., single application of copper to 3% of Lake Casitas by volume) and label language restricting algaecide applications from occurring more frequently than every 14 days, algaecide applications at the maximum label rate of 1 mg/L were evaluated as acute exposures to aquatic receptors. Consistent with label language allowing for longer exposures at lower doses when controlling quagga and zebra mussels, molluscicide applications to Lake Casitas were assumed to be made such that a copper concentration of 0.19 mg/L is maintained for 8 days and were therefore evaluated as chronic exposures. Although acute exposure could occur following a molluscicide treatment, the molluscicide application rate of 0.19 mg/L was considered less conservative estimate of risk than the algaecide application rate of 1 mg/L and was therefore not included in the acute assessment.

2.1. Two-Striped Gartersnake and Western Pond Turtle Risk Estimation

For many pesticides, there are limited to no toxicity data available for various taxonomic groups. For example, database and literature searches for copper toxicity testing of reptiles did not yield any useable studies. As a result, avian (bird) toxicity endpoints were used in place of specific toxicity values for reptile species. The uncertainty involved with using avian endpoint data to estimate risk to a reptile species does not require the application of an additional safety factor (USEPA, 2004). The endpoints used to estimate risk of copper to the two-striped gartersnake and western pond turtle were found in USEPA's (2019) OPP database (Table B-1). The most sensitive acute endpoint for birds was 357.9 mg copper sulfate pentahydrate/kg body weight, equal to approximately 91.1 mg metallic copper/kg body weight. The associated NOAEL was 120 mg copper sulfate pentahydrate/kg body weight, equal to approximately 30.5 mg metallic copper/kg body weight.

Table C-1. Copper Ecological Oral Toxicity Studies Considered

Species	A.I. (Purity)	Study Duration	Endpoint (mg A.I./kg-bw)	Endpoint (mg Cu/kg-bw)
Bobwhite quail (*Colinus virginianus*)	Copper citrate (5.03%)	14 d	LD50 = 2236 NOEL = 486	LD50 = 242.1 NOEL = 52.6
Bobwhite quail (*Colinus virginianus*)	Copper sulfate, pentahydrate (99%)	14 d	LD50 = 368 NOEL < 120	LD50 = 93.7 NOEL < 30.5
Bobwhite quail (*Colinus virginianus*)	**Copper sulfate, pentahydrate (99%)**	**14 d**	**LD50 = 357.9 NOEL = 120**	**LD50 = 91.1 NOEL = 30.5**
Mallard duck (*Anas platyrhynchos*)	Copper triethanolamine formulation (54.8%)	NR	LD50 > 2000 NOEL = 500	LD50 > 603.1 NOEL = 150.8

General Notes: Data obtained from USEPA (2019). The bolded study was used to derive a reptilian endpoint for risk assessment.
Abbreviations: A.I. - Active ingredient (A.I.), Median lethal dose (LD50), No Observed Effect Level (NOEL), Not reported (NR)

In this assessment, only oral exposure was considered for the two-striped gartersnake and western pond turtle because little or no dermal and inhalation toxicity data exist for ecological receptors. Therefore, the sole exposure pathway that could be evaluated in the assessment of risk for these receptors is oral exposure. The two-striped garter snake and western pond turtle were assumed to eat and drink solely from copper-treated water in Lake Casitas.

Aquatic prey items were assumed to bioaccumulate copper following application of copper-containing algaecides and molluscicides. Two aquatic prey item exposure scenarios were considered based on the anticipated use of copper-containing algaecides and/or molluscicides in Lake Casitas:

1) Acute (24-hour) exposure to water treated at a rate of 1 mg/L for algae control.
2) Chronic (8-day) exposure to water treated at a rate of 0.19 mg/L for invasive mussel control.

The rate and magnitude of copper bioaccumulation in organisms varies between species based on factors such as metabolic need, feeding mode, and exposure concentration and duration. Similarly, the bioavailability of copper compounds in treated water and subsequently accumulated within exposed receptors varies widely based on the species and exposure

conditions (USEPA, 2007a). Examples of the differential bioaccumulation patterns in a variety of ecological receptors are provided later in this appendix.

Biomagnification (i.e., transfer of copper from lower trophic levels to higher trophic levels within a food web) was presumed to occur when copper-exposed prey items such as fish were consumed by predators such as the snake and the turtle. Per USEPA (2007a), inorganic metal compounds rarely biomagnify across three or more trophic levels. Due to the relatively small number of metals and predator-prey relationships evaluated in the literature, in addition to the site-specific nature of copper bioavailability, the ability to make generalizations regarding anticipated toxicity resulting from dietary exposure to copper is limited (USEPA, 2007a) and a simplified approach was used for this assessment.

The juvenile common carp (*Cyprinus carpio*) was used to represent fish and other aquatic prey items potentially exposed to copper via uptake of treated water in Lake Casitas. Whole body bioaccumulation patterns in the common carp were estimated based on data provided by Delahaut et al. (2020). Aquatic prey items were assumed to be exposed to a constant concentration of copper equal to the application rate for the duration of the exposure scenario without consideration of copper dissipation or sequestration from the water column. This conservative approach does not take into account the assessment of bioavailable copper as provided for using the Biotic Ligand Model as presented in **Appendix D** and later in this appendix.

Copper uptake through food intake and drinking water was estimated to determine the exposure amount. A standard food intake factor, a multiplier used to calculate food intake based on metabolic rate, dietary preferences, and metabolizable energy content of the diet, was used to calculate the dose from aquatic prey items such as fish. Intake of copper through water consumption was calculated using a multiplier based on metabolic need and body weight. Due to the limited availability of data on body weight of the two-striped gartersnake, the body weight of the common garter snake was used as a surrogate in the calculation of food and water intake rates. Data was available for the western pond turtle, and its weight was used to calculate food and water intake rates.

All food items were assumed to be consumed from within the treatment area. The food intake rate used in exposure calculations was approximately 1.2 grams dry weight/day for the snake and approximately 4.2 grams of dry weight/day for the turtle. The methodology for estimating these values was provided by Nagy (2001).

The methodology for estimating water intake rates is contained in USEPA's (1993) Wildlife Exposure Factors Handbook. The concentration of copper in drinking water was assumed to be equal to the application rate, and water intake was assumed to occur only within the treatment area. The water intake rate used for exposure calculations in the current assessment was approximately 0.017 liters per day for the snake and 0.044 liters per day for the turtle.

Daily copper exposure was estimated using the sum of consumption of aquatic prey items exposed to copper plus consumption of copper-treated drinking water. Exposure was divided by the appropriate endpoint to calculate an RQ which was subsequently compared to the LOC to assess the extent of risk.

Application of copper-containing algaecides at the maximum label application rate of 1 mg/L of metallic copper was estimated to result in the accumulation of approximately 37.1 milligrams of copper per kilogram dry weight of aquatic prey item based on a 24-hour (acute) exposure period. After incorporation of food and water intake rates normalized to body weight, daily exposure to copper was estimated to be approximately 0.41 and 0.31 milligrams of copper per kilogram body weight per day for the snake and turtle, respectively. This resulted in an RQ of approximately 0.005 and 0.003 for the snake and the turtle, respectively. Because neither RQ exceeds the acute threatened or endangered species LOC for terrestrial animals of 0.1, copper applied to Lake Casitas for algae control does not appear to pose acute risk to the two-striped gartersnake or western pond turtle.

Application of copper-containing molluscicides at a rate of 0.19 mg/L was estimated to result in the accumulation of approximately 21.8 milligrams of copper per kilogram dry weight of aquatic prey item based on an 8-day (chronic) exposure period. After incorporation of food and water intake rates normalized to body weight, daily exposure to copper was estimated to be approximately 0.20 and 0.16 milligrams of copper per kilogram body weight per day for the snake and turtle, respectively. This resulted in an RQ of approximately 0.007 and 0.005 for the snake and turtle, respectively. Because neither RQ exceeds the chronic LOC for terrestrial animals of 1.0, copper applied to Lake Casitas for invasive mussel control does not appear to pose chronic risk to the two-striped gartersnake or western pond turtle.

In support of these findings, the California Department of Fish and Game (now “Wildlife”) conducted a study on the effects of oral and dermal exposure to copper (ethylenediamine complex) on two species of garter snakes and did not observe and acute adverse effects (CDFG, 2004).

2.2. Steelhead Risk Estimation

Because the effects of physicochemical factors on copper toxicity to aquatic receptors are both diverse and site-specific, USEPA (2007b, 2009) has recommended use of the Biotic Ligand Model (BLM) to predict relative effects of physicochemical exposure factors on copper bioavailability and toxicity. The BLM supplements USEPA’s previously published recommendation of using a hardness-based estimation method and better accounts for the reduction in copper bioavailability that results from competitive binding of copper to other molecules in the water column.

In order to predict copper toxicity to aquatic organisms in relation to water quality parameters, the BLM uses the following water quality inputs: temperature; pH; dissolved organic carbon (DOC); percent humic acid (HA); major cations including calcium (Ca), magnesium (Mg), sodium (Na), potassium (K); major anions including sulfate (SO4), chloride (Cl); sulfur (S); and alkalinity. When the model is run in toxicity prediction mode, it predicts the concentration of dissolved copper that is expected to result in a particular endpoint (e.g., LC50 or EC50 for acute toxicity and EC20 for chronic toxicity) for a selected aquatic species.

When run in speciation prediction mode, the model can estimate the concentration of various forms of copper in the water column (e.g., $CuCO_3$, CuOH, $CuSO_4$, Cu^{2+}, organic carbon-bound copper, biotic ligand-bound copper) when known copper concentration in water is used as an input in the model. For an overview of how variations in water quality parameters including pH,

alkalinity, and DOC influence the concentration of bioavailable copper (i.e., cupric ion) relative to the total copper concentration in the water column, refer to **Appendix D**.

The BLM was used to evaluate potential adverse impacts to steelhead following application of copper-containing algaecides and/or molluscicides in the event of a discharge of treated water from Lake Casitas to Coyote Creek before entering the Ventura River. Such discharges are rare; only eight spill events have been recorded since the construction of the Casitas Dam in 1978, three of which occurred between 1993 and 2019. Spills from Lake Casitas have historically occurred when the maximum capacity of the lake was exceeded during winter rain events; water is typically not otherwise discharged from the dam. At the time of the spills, the maximum lake capacity was estimated to be 254,000 acre-feet (AF) via topometric survey. The maximum capacity of the lake is currently 237,760 AF (Tetra Tech, 2017).

Based on data from 2018 and 2019, water in Lake Casitas has an average alkalinity of 145 mg/L, pH of 7.7, conductivity of 660 uS/cm, and DOC of 4.92 mg/L. Water from Lake Casitas has an average hardness of 237.5 mg/L which is classified as “very hard” by EPA standards. Hardness values in the Ventura River at and downstream of Foster Park are expected to be similar to those in Lake Casitas (LARWQCB, 2002).

BLM inputs used to predict copper speciation and toxicity in Lake Casitas are shown in **Table C-2**.

Table C-2. BLM Inputs for Lake Casitas

Parameter	Value
Temperature (°C)	20[1]
pH	7.7
Dissolved Organic Carbon (mg/L)	4.92
Humic Acid (%)	10[1]
Calcium (mg/L)	53
Magnesium (mg/L)	25.5
Sodium (mg/L)	30
Potassium (mg/L)	3.5
Sulfate (mg/L)	161
Chlorine (mg/L)	19
Alkalinity (mg $CaCO_3$/L)	145
Sulfur (mg/L)	1.00E-10[1]

[1] Estimated based on professional judgement

When applied at the target molluscicide control concentration of 0.19 mg copper/L, up to 0.1% of the applied copper is predicted by BLM to exist as the free cupric ion in within the treatment area in Lake Casitas. When applied at the maximum label rate of 1 mg copper/L as an algaecide, up to 1% of the applied copper is predicted by BLM to exist as the free cupric ion in within the treatment area in Lake Casitas. See **Appendix D** for graphs of copper speciation outputs from the BLM model relative to water quality parameters.

Two application scenarios were considered:

1) Invasive mussel control copper application to 50% of the typical summer lake volume at a rate of 0.19 mg/L total copper. The concentration of 0.19 mg/L was assumed to be maintained for an 8-day exposure period (i.e., chronic exposure).
2) Algaecide copper application to 250 surface acres treated to a depth of 25 feet, resulting in a treatment volume of 6,250 acre-feet (approximately 3% of the typical summer lake volume) at the maximum label rate of 1 mg/L for algae control. The concentration of 1 mg/L was assumed to be achieved following a single application event (i.e., acute exposure).

To estimate the total amount of copper that could be applied to Lake Casitas to represent the above scenarios, the volume of water to be treated was calculated based on historical lake volume, inflow, rain, evaporation and spill information recorded by the District. Copper application was assumed to occur when the lake is filled to typical summer capacity and no rain is expected to occur within 24 hours after application. Based on historical reservoir volume data, the 95% upper confidence level for typical water levels in Lake Casitas between May and September is 199,720 AF, or 84% of the current maximum capacity. Therefore, discharge of treated water over the Casitas Dam may occur when a volume in excess of 38,040 AF of water is added to Lake Casitas due to rainfall or other inflow, subsequently exceeding the maximum capacity of the lake. As a result, the concentration of copper applied when the lake is at 84% capacity is diluted as the lake fills to 100% capacity.

The amount of discharge contributed to the Ventura River from Lake Casitas, via Coyote Creek was estimated using the 95% lower confidence level of the ratio of the flow in the Ventura River to flow induced from a historical discharge event from the lake, resulting in a ratio of 10:1. For example, for every 10 CFS of flow in the Ventura River as measured at the USGS Station 11118500 (Ventura River at Foster Park), one (1) CFS is assumed to be discharged from Lake Casitas through Coyote Creek to the river. Therefore, the copper concentration occurring in the Ventura River after a discharge event was assumed to be equal to 10% of the copper concentration occurring in Lake Casitas at the time of the spill. Because applications of copper-containing algaecides and/or molluscicides are sufficiently intermittent, as are the frequency of anticipated spills from Lake Casitas to the Ventura River, only acute exposures were considered for the steelhead. Dietary exposure was excluded from the analysis since copper toxicity in fish is primarily associated with direct uptake and rapid binding of the cupric ion to gill membranes. Summaries of a variety of fish dietary toxicity studies are included later in this appendix for reference.

Assumptions were made to estimate the dissipation of copper in Lake Casitas shortly after application to characterize the potential concentration of copper in the Ventura River following a discharge from Lake Casitas. As discussed in **Section 1.2**, there are multiple dissipation and sequestration pathways that reduce the concentration of available copper after application. Dissipation and sequestration will continue to occur as water travels from Lake Casitas into and through Coyote Creek and then in to the Ventura River and will almost certainly result in lower cupric ion concentrations than what is estimated in Lake Casitas. However, because the extent to which these phenomena occur in the Coyote Creek/Ventura River system is unknown, a simplifying and conservative assumption was made that these phenomena do not occur.

Chemical dissipation and sequestration in the environment are typically characterized by the chemical's half-life (i.e., the time required for the concentration to decrease by half).

For mussel control, two half-lives were assumed to elapse within the first 24 hours after copper application. This is supported by a monitoring study conducted by Serdar (1995) in Sylvia Lake, Washington which was considered comparable to the modeled molluscicide application scenario in Lake Casitas based on treatment area size and dose rate (i.e., low dose application to at least 50% of the total water volume). In the study, two-thirds of the soft water lake (hardness = 44-51 mg/L, pH = 6.5-7.8, conductivity = 110-135 uS/cm) was treated with copper at a rate of 0.5 mg/L. Sampling results indicated that a maximum of 41% of the applied dose was detected in the treatment area 1 hour after treatment and copper concentrations decreased by an additional ≥50% at 24 hours after treatment. Because the Sylvia Lake study involved treating a greater portion of the lake at a higher concentration than what is anticipated to occur in Lake Casitas, the assumption of two half-lives elapsing within 24 hours after molluscicide application in Lake Casitas was considered sufficiently conservative.

For algae control, four half-lives were assumed to elapse within the first 24 hours after copper application based in part on the assumption that copper-containing algaecides would only be applied during an algal bloom sufficient to necessitate treatment. As previously discussed, the increased presence of biotic ligands such as algae in the water column is associated with lower bioavailability of applied copper. Copper fate assumptions were also supported by a study conducted by Calomeni et al. (2017) which was considered comparable to the modeled algaecide application scenario in Lake Casitas based on treatment area size and dose rate (i.e., maximum label dose rate applied to 3% of the total water volume). In the study, copper applied to achieve a target concentration of 1 mg/L within approximately 1% of the volume of a soft water lake in South Carolina (hardness = 72 mg/L, pH = 7.27, conductivity = 301 uS/cm) for algae control dissipated with a half-life of 0.03 days (0.72 hours). This half-life was consistent with the dilution-specific half-life separately estimated in situ using rhodamine dye. After 24 hours, approximately 1.5% of the applied copper remained in the treatment area, representing approximately 6 half-lives.

The concentration of copper in the Ventura River following a spill from Lake Casitas 24 hours after a molluscicide and algaecide application was estimated to be up to 4.0 ug/L and 5.3 ug/L, respectively, based on the assumptions presented above.

Average physiochemical properties of Lake Casitas water were used as inputs in the BLM to derive a site-specific LC50 for rainbow trout of 169.25 ug/L. Because the steelhead was not available for use as a model organism in the BLM, rainbow trout was used as a surrogate. This is the concentration of copper at which median acute toxicity would be observed in Lake Casitas water. BLM-derived LC50s and EC50s for various fish and aquatic invertebrate species are shown in **Table C-3** below.

Table C-3. BLM-Derived Acute Toxicity Values

Species	Endpoint (ug/L)
Bluegill sunfish (*Lepomis macrochirus*)	LC50 = 2183.69
Chinook salmon (*Oncorhynchus tshawytscha*)	LC50 = 309.86
Fathead minnow (*Pimephales promelas*)	LC50 = 218.43
Rainbow trout (*Oncorhynchus mykiss*)	**LC50 = 169.25**
Midge (*Chironomus tentans*)	EC50 = 312.97
Fatmucket clam (*Lampsilis siliquoidea*)	LC50 = 181.98
Paper pondshell (*Utterbackia imbecillis*)	LC50 = 369.61
Wavy-rayed lampmussel (*Lampsilis fasciola*)	EC50 = 430.92
Water flea (*Ceriodaphnia dubia*)	EC50 = 84.04
Water flea (*Daphnia magna*)	EC50 = 63.77
Water flea (*Daphnia pulex*)	LC50 = 90.33

General Notes: Data generated using BLM software (see https://www.windwardenv.com/biotic-ligand-model/). The bolded value was used as the acute endpoint for steelhead risk assessment.
Abbreviations: Median lethal concentration (LC50), Median effect concentration (EC50)

An RQ of 0.02 for the molluscicide application scenario and 0.03 for the algaecide application scenario was calculated by dividing the estimated exposure concentration in the Ventura River by the BLM-derived LC50. Because neither RQ exceeds the acute endangered species LOC for aquatic animals of 0.05, copper applied to Lake Casitas for algae or invasive mussel control does not appear to pose an unacceptable risk to steelhead occupying the Ventura River.

3. Summary of Bioaccumulation Studies

Edwards et al., 1998
The uptake of copper in common nettle (*Urtica dioica*) and earthworms (*Eisenia fetida*) from a contaminated dredge spoil was measured. In the aerial portions of the common nettle, the biological absorption coefficient (concentration in plant tissue ÷ concentration in soil) was 0.072 to 0.265. In root tissue, the biological absorption coefficient was 0.075 to 0.303. To determine the uptake of copper in earthworms, contaminated soil was brought into the laboratory and earthworms introduced for 28 days. Soil copper levels were 16 times higher in the contaminated soil than in control soil, but the concentrations in the earthworms only differed by 2.6 times. The earthworms did absorb copper from the contaminated soils, but not to an extent reflecting the level of contamination.

Gintenreiter et al., 1993
Copper concentrations in the tissues of the gypsy moth (*Lymantria dispar*) increased from earlier to later developmental stages, but the trend was not smooth. Fourth instars showed a decrease when compared to 3rd instars, and adults had lower concentrations than pupae. Concentration factors were 2 to 5. Copper concentrations were passed from one generation to the next.

Gomot and Pihan, 1997
Bioconcentration of copper was evaluated in two subspecies of terrestrial snails, *Helix aspersa aspersa* and *Helix aspersa maxima*. These snails showed a tendency to accumulate copper in excess of the amount available from its diet. The subspecies exhibited different bioconcentration factors for different tissues. For the foot, *H.a. aspersa* had factors ranging from 2.3 to 13.2, whereas *H.a. maxima* had factors ranging from 1.7 to 10.2. For the viscera, *H.a. aspersa* had factors ranging from 2.1 to 9.1, whereas *H.a. maxima* had factors ranging from 1.9 to 9.0. Differences in the bioconcentration factor appear to be more related to the other components of the diet, not the copper concentration in the diet.

Gomot de Vaufleury and Pihan, 2000
Copper concentrations were measured in terrestrial snails (*Helix aspersa*). Differences were demonstrated among laboratory and field values. However, no soil or vegetation samples for the laboratory and field sites were analyzed for copper, so it is not possible to determine whether copper was accumulated at rates above background or whether they reflect some fraction of background levels.

Han et al., 1996
Shellfish accumulated copper in natural and aquaculture ponds in Taiwan. The sediments in the aquaculture ponds were finer grain and contained 4 different concentrations of copper. Five mollusks were collected, but only purple clams (*Hiatula diphos*) and hard clams (*Meretrix lusoria*) were collected from both environments. The relative accumulation in each environment did not show a consistent pattern for both species indicating that the concentration in the shellfish was not controlled only by total copper concentrations in the sediments.

Haritonidis and Malea, 1999
Copper concentrations in green algae (*Ulva rigida*) (2.2 ± 0.2 µg/g dry weight) collected from Thermaikos Gulf, Greece were less than seawater concentrations (1.5 ± 0.08 µg/L) and sediment (2.7 ± 0.5 µg/g dry weight). This suggests that copper will not bioconcentrate in algae.

Harrahy and Clements, 1997
Bioaccumulation factors were calculated for the benthic invertebrate, *Chironomus tentans*, to be 16.63 and 12.99 during two uptake tests. However, depuration was rapid. Copper concentrations were similar to background within four days. The authors caution that the bioaccumulation factors presented may be related to bioavailability that is driven by sediment characteristics.

Hendriks et al., 1998
Bioaccumulation ratios were determined for zebra mussels (*Dreissena polymorpha*), a freshwater aquatic species, from the Rhine-Meuse Delta in the Netherlands. For copper, the ratio between mussels and suspended solids was 0.31 indicating tissue concentrations did not exceed environmental concentrations and that copper had not bioaccumulated

Janssen and Hogervorst, 1993
Concentration factors were calculated for nine terrestrial arthropod species inhabiting the forest litter layer in a clean reference site and a polluted site in the Netherlands: pseudoscorpion (*Neobisium muscorum*), harvestman (*Paroligolophus agrestis*), carabids (*Notiophilus biguttatus* and *Calathus melanocephalus*), mites (*Pergamasus crassipes*, *P. robustus*, and *Platynothrus peltifer*), dipluran (*Campodea staphylinus*), and collembolan (*Orchesella cincta*). No significant differences in copper accumulation were observed between the sites.

Khan et al., 1989
Bioconcentration factors in grass shrimp (*Palaemonetes pugio*), an aquatic species, were determined for two populations, one from an industrialized site and another from a relatively pristine site. Levels of copper measured in shrimp from the industrialized site were greater than from the pristine site, but the industrialized site showed a concentration factor of 0.07, whereas the pristine site showed a concentration factor of 1.1 when compared to sediment concentrations.

Marinussen et al., 1997a
Earthworms (*Dendrobaena veneta*) were exposed to soils containing various levels of copper. Earthworm tissue concentrations increased proportionally to the soil copper concentrations up to 150 ppm. Above 150 ppm in the soils, tissue concentrations leveled off at about 60 ppm.

Marinussen et al., 1997b
Soil, containing 815 ± 117 ppm Cu, was collected from a contaminated site in the Netherlands. Earthworms (*Dendrobaena veneta*) were introduced to the soil in the laboratory. Earthworms appeared to reach equilibrium with the soil exhibiting tissue concentrations of *c.* 60 ppm through 56 days of exposure. At 112 days exposure, the tissue concentrations increased to *c.* 120 ppm. The authors did not have an explanation for this anomaly. After being transferred to uncontaminated soil, the earthworms eliminated the copper according to a two-compartment model with the half-life times being, $t_{1/2\text{-}1}$ = 0.36 d and $t_{1/2\text{-}2}$ = 37 d.

Morgan and Morgan, 1990
Earthworms (Lumbricus rubellus) were collected from an uncontaminated site and four metalliferous mine sites. Copper concentrations in soil and in tissues were measured. The worms were held under clean conditions to allow eliminate soil from their alimentary canal. The

concentrations of copper in earthworm tissues reflected the concentrations in the soil. The authors conclude that there was no evidence that copper was sequestered in earthworms.

Morgan and Morgan, 1999
Copper concentrations in earthworm (*Aporrectodea caliginosa* and *Lumbricus rubellus*) tissue were lower than in their ingesta. This suggests that copper does not bioaccumulate in earthworms.

Neuhauser et al., 1995
Overall, copper did not bioconcentrate in earthworm in contaminated soil, but showed a slight tendency to bioconcentrate when soil copper concentrations were low.

Pyatt et al., 1997
Appreciable concentrations (0.3 – 4.6%) of copper were measured in all tissues of the freshwater snail (*Lymnaea stagnalis*), whereas no measurable quantities of copper were found in food or water. The authors conclude that bioaccumulation occurred.

Svendsen and Weeks, 1997a, 1997b
There is an inverse relationship between the bioconcentration factors and soil concentrations under laboratory conditions for the earthworm *Eisenia andrei* and under field conditions for the earthworm *Lumbricus rubellus*. Bioconcentration factors ranged from 4.0 using control soil and 0.30 using soil amended with 339 ppm copper under laboratory conditions. Bioconcentration factors in the field ranged from 4.1 under control conditions to 0.4 when the soil plots contained 231 ppm copper.

4. Summary of Fish Dietary Toxicity Studies

Berntssen et al., 1999
Laboratory tests were conducted to determine the effects of dietary copper on Atlantic salmon (*Salmo salar*). Dietary concentrations were 0, 35, and 700 mg Cu/kg diet for an experiment lasting 28 days. Addition of the copper supplemented diet did not cause an increase in the water concentrations of copper. Dietary exposure significantly increased intestinal cell proliferation and apoptosis (degeneration of cells into membrane-bound particles that are then phagocytosed by other cells). The copper exposed groups did not grow during the trial.

Draves and Fox, 1998
In a reach of the Montreal River in northern Ontario contaminated from gold mine tailings, water concentrations were significantly higher for Cu, Cd, and Pb, but not for Zn. Juvenile yellow perch (*Perca flavescens*), a benthic feeding species, had significantly less food in their stomachs in the contaminated reach than perch in an uncontaminated reach. However, body weights of juvenile perch did not differ between the contaminated and uncontaminated reaches. Within the contaminated reach, Cu body burdens were significantly negatively correlated with body weight. Concentrations of Cu in Chironomidae, Hemiptera, Cladocera, Odonata, and Amphipoda were compared between reaches. Concentrations in Chironomidae, Hemiptera, Cladocera, and Amphipoda were greater in the contaminated reach, but Cu concentrations were greater in Odonata in the uncontaminated reach.

Farag et al., 1994
Rainbow trout were fed invertebrates collected from the Clark Fork River, Montana and from an uncontaminated reference site for 21 days. Juvenile fish received invertebrates containing 1.54 As, 0.10 Cd, 18.57 Cu, 0.86 Pb, 32.09 Zn (all µg/g wet weight). Adult fish received invertebrates containing 3.20 As, 0.24 Cd, 26.13 Cu, 1.77 Pb, 68.99 Zn (all µg/g wet weight). Water was either standard laboratory water or contained metal concentrations based on the U.S. EPA's water-quality criteria with concentrations of 2.2 µg Cd/L, 24 µg Cu/L, 6.4 µg Pb/l and 100 µg Zn/L. Mortality of juveniles was significantly greater in tanks with metal-treated water regardless of whether the dietary invertebrates contained metals. Mortality was slightly increased in juveniles in laboratory water that received invertebrates with metals. No differences in growth were observed in any treatment. No mortality was observed in adult trials. Exposure to metals either in the water or via diet caused scale loss in adults. Juveniles were too small to evaluate scale loss. Physiological condition of fish fed invertebrates containing metals was compromised.

Handy, 1993
Rainbow trout (*Oncorhynchus mykiss*) were fed commercial trout chow with and without 10 mg Cu/kg dry weight for 28 days. The water concentrations of Cu remained below 1 ppb. Fish were hand-fed to satiation daily. No outward signs of toxicity were noted and a single mortality occurred in the Cu-treated fish on day 6 of treatment. Despite some regurgitation of diet pellets, no body weight loss was noted. Dietary copper increased tissue concentrations at day 28 to 2.52, 72.66, and 0.636 µg Cu/g weight in the gills, liver and muscle. Concentration in the kidneys were not elevated.

Lundebye et al., 1999
Laboratory tests were conducted to determine the effects of dietary copper on Atlantic salmon (*Salmo salar*). Dietary concentrations were 0, 35, and 700 mg Cu/kg diet for an experiment lasting 28 days, and 5, 35, 500, 700, 900, and 1750 mg Cu/kg diet in an experiment lasting 12

weeks. Mean weights of fish used in the tests were 72 and 0.9 g in the first and second experiments, respectively. No mortality was observed in the first experiment, and only 2% died in the second experiment. Food consumption was not altered in either experiment at any dietary concentration. Cells of the intestinal lining were damaged in fish at both dietary concentrations in the first experiment. Growth of fish in the second experiment was reduced at dietary concentrations ≥900 mg/kg after 10 weeks and at dietary concentrations ≥700 mg/kg after 12 weeks.

Miller et al., 1993
When rainbow trout (*Oncorhynchus mykiss*) were exposed in the laboratory simultaneously to dietary Cu concentrations of up to 684 µg/g dry weight and water concentrations of up to 127 µg/L, no overt signs of toxicity were noted. Fish were fed to satiation three times daily. Dietary exposure was the principal source of tissue Cu, but as water concentrations were increased, uptake from water increased. However, exposure to waterborne Cu was more effective at inducing tolerance to subsequent exposure to toxic concentrations of Cu.

Mount et al., 1994
Rainbow trout (*Oncorhynchus mykiss*) were fed brine shrimp (*Artemia sp*.) enriched with Cu, Cd, Pb, and Zn alone or as a mixture along with As for 60 days. The water contained 12 µg/L Cu, 1.1 µg/L Cd, 3.2 µg/L Pb, and 50 µg/L Zn. Cu concentrations in the shrimp were 20, 40, and 80 µg/g fresh weight when trout were exposed to Cu alone. Survival of trout was decreased in the medium and high Cu treatments with 69 and 72% survival, respectively. Weight and length of trout were not impacted by feeding on brine shrimp containing Cu. Cu concentrations in whole fish were elevated as compared to controls either in clean water or metal-containing water, but the Cu concentrations did not differ among dietary treatment levels. No detrimental impacts were observed in the exposures to multiple metals via the diet. In that exposure scenario, concentrations in the diet were 0.5, 1, 1.5 and 2X the low concentrations from the first scenario.

Murai et al., 1981
Channel catfish were provided diets containing supplemental copper at concentrations of 0, 2, 4, 8, 16, and 32 mg/kg for 16 weeks. At the end of 4 weeks, average weight gain had been reduced in the group receiving 32 mg/kg in the diet. After 16 weeks, average weight gain was reduced in the group receiving 16 mg/kg also. Weight gain/diet consumed was reduced for catfish receiving ≥ 8 mg/kg dietary Cu after 16 weeks. Packed cell volume in the blood and hemoglobin were not adversely affected, but the number of erythrocytes was reduced in the group receiving 16 mg/kg.

Woodward et al., 1995
Rainbow trout (*Oncorhynchus mykiss*) and brown trout (*Salmo trutta*) were held in standard laboratory water or contained metal concentrations based on 50% the U.S. EPA's water-quality criteria with concentrations of 1.1 µg/L Cd, 12 µg/L Cu, 3.2 µg/L Pb, and 50 µg/L Zn from hatching to 88 days of age. Three diets were provided that comprised of benthic invertebrates collected from three locations on the Clark Fork River, Montana. Fish received pelleted invertebrates containing 6.5 As, no Cd, 87 Cu, 6.9 Pb, and 616 Zn (all mg/g dry weight); 19 As, no Cd, 178 Cu, 15 Pb, and 650 Zn (all mg/g dry weight); or 19 As, 0.26 Cd, 174 Cu, 15 Pb, and 648 Zn (all mg/g dry weight). Survival was not affected for either species by any combination of water or diet. Growth of brown trout was reduced in the groups receiving the diets with higher metals concentration and by exposure to metal-containing water from day 26 onward in the test.

In rainbow trout, no effects were seen on growth at day 18, but by day 53, growth was reduced in fish exposed to higher metal concentrations in diet or water. However, the rainbow trout exposed to diets with higher metals concentrations had similar growth patterns regardless of whether they were also exposed to metals-containing water. Also, the growth of the rainbow trout exposed to treated water and the diet with low metal concentrations recovered by day 88 and were no longer significantly different from fish in untreated water.

5. References

Berntssen, H.G., K. Hylland, S.E. Wendelaar Bonga, and A. Maage. 1999. Toxic levels of dietary copper in Atlantic salmon (*Salmo salar* L.) parr. Aquatic Toxicology 46(2): 87-99.

California Department of Fish and Game (CDFG). 2004. Acute oral and dermal toxicity of aquatic herbicides and a surfactant to garter snakes. Rancho Cordova, CA.

Calomeni, A.J., K.J. Iwinski, A.D. McQueen, C.M. Kinley, M. Hendrikse, and J.H. Rodgers, Jr. 2017. Characterization of Copper Algaecide (Copper Ethanolamine) Dissipation Rates Following Pulse Exposures. Water, Air, & Soil Pollution 228(11): 1-13.

Delahaut, V., B. Raskovic, M.S. Salvado, L. Bervoets, R. Blust, and G. De Boeck. 2020. Toxicity and bioaccumulation of Cadmium, Copper and Zinc in a direct comparison at equitoxic concentrations in common carp (*Cyprinus carpio*) juveniles. PLoS ONE 15(4): 1-24.

Draves, J.F. and M.G. Fox. 1998. Effects of a mine tailings spill on feeding and metal concentrations in yellow perch (*Perca flavescens*). Environmental Toxicology and Chemistry 17(8): 1626-1632.

Edwards, S.C., C.L. MacLeod, and J.N. Lester. 1998. The bioavailability of copper and mercury to the common nettle (*Urtica dioica*) and the earthworm Eisenia fetida from contaminated dredge spoil. Water, Air, and Soil Pollution 102: 75-90.

Farag, A.M., C. J. Boese, D.F., Woodward, H.L. Bergman. 1994. Physiology changes and tissue metal accumulation in rainbow trout exposed to foodborne and waterborne metals. Environmental Toxicology and Chemistry 13(2): 2021-2029.

Folmar, L.C. 1976. Overt avoidance reaction of rainbow trout fry to nine herbicides. Bulletin of Environmental Contamination and Toxicology 15(5): 509-514.

Folmar, L.C. 1978. Avoidance chamber response of mayfly nymphs exposed to eight herbicides. Bulletin of Environmental Contamination and Toxicology 19(3): 312-318.

Franklin, N.M., J.L. Stauber, S.C. Apte, and R.P. Lim. 2002. Effect of Initial Cell Density on the Bioavailability and Toxicity of Copper in Microalgal Bioassays. Environmental Toxicology and Chemistry 21(4): 742-751.

Gaetke, L.M., H.S. Chow-Johnson, and C.K. Chow. 2014. Copper: Toxicological relevance and mechanisms. Archives of Toxicology 88(11): 1929-1938.

Gintenreiter, S., J. Ortel, and H.J. Nopp. 1993. Bioaccumulation of cadmium, lead, copper, and zinc in successive developmental stages of *Lymantria dispar* L. (Lymantriidae, Lepid)—a life cycle study. Archives of Environmental Contamination and Toxicology 25: 55-61.

Gomot, A. and F. Pihan. 1997. Comparison of the bioaccumulation capacities of copper and zinc in two snail subspecies (*Helix*). Ecotoxicology and Environmental Safety 38(2): 85-94.

Gomot de Vaufleury, A. and F. Pihan. 2000. Growing snails used as sentinels to evaluate terrestrial environment contamination by trace elements. Chemosphere 40(3): 275-284.

Han, B.C., W.L. Jeng, T.C. Hung, and M.Y. Wen. 1996. Relationship between copper speciation in sediments and bioaccumulation by marine bivalves of Taiwan. Environmental Pollution 91(1): 35-39.

Handy, R.D. 1993. The effect of acute exposure to dietary Cd and Cu on organ toxicant concentration in rainbow trout, *Oncorhynchus mykiss*. Aquatic Toxicology 27(1-2): 1-14.

Haritonidis, S. and P. Malea. 1999. Bioaccumulation of metals by the green alga Ulva rigida from Thermaikos Gulf, Greece. Environmental Pollution 104(3): 365-372.

Harrahy, E.A. and W.H. Clements. 1997. Toxicity and bioaccumulation of a mixture of heavy metals in *Chironomus tentans* (Diptera: Chironomidae) in synthetic sediment. Environmental Toxicology and Chemistry 16(2): 317-327.

Hendriks, A.J., H. Pieters, and J. de Boer. 1998. Accumulation of metals, polycyclic (halogenated) aromatic hydrocarbons, and biocides in zebra mussels and eel from the Rhine and Meuse Rivers. Environmental Toxicology and Chemistry 17(10): 1885-1898.

Janssen, M.P.M. and R.F. Hogervorst. 1993. Metal accumulation in soil arthropods in relation to micro-nutrients. Environmental Pollution 79: 181-189.

Khan, A.T., J.S. Weis, and L. D'Andrea. 1989. Bioaccumulation of four heavy metals in two populations of grass shrimp, *Palaemonetes pugio*. Bulletin of Environmental Contamination and Toxicology 42: 339-343.

Los Angeles Regional Water Quality Control Board (LARWQCB). 2002. State of the Watershed – Report on Surface Water Quality for the Ventura River Watershed. Los Angeles, CA. 83 pp.

Lundebye, A.-K., M.H.G. Berntssen, S.E. Wendelaar Bonga, and A. Maage. 1999. Biochemical and physiological responses in Atlantic salmon (*Salmo salar*) following dietary exposure to copper and cadmium. Marine Pollution Bulletin 39(1-12): 137-144.

Marinussen, M.P.J.C, S.E.A.T.M. van der Zee, and F.A.M. de Haan. 1997a. Cu accumulation in the earthworm *Dendrobaena veneta* in a heavy metal (Cu, Pb, Zn) contaminated site compared to Cu accumulation in laboratory experiments. Environmental Pollution 96(2): 227-233.

Marinussen, M.P.J.C., S.E.A.T.M. van der Zee, F.A.M. de Haan, L.M. Bouwman, and M.M. Hefting. 1997b. Heavy metal (copper, lead, and zinc) accumulation and excretion by the earthworm, *Dendrobaena veneta*. Journal of Environmental Quality 26(1): 278-284.

Miller, P.A., R.P. Lanno, M.E. McMaster, and D.G. Dixon. 1993. Relative contributions of dietary and waterborne copper to tissue copper burdens and waterborne-copper tolerance in rainbow trout (*Oncorhynchus mykiss*). Canadian Journal of Fisheries and aquatic sciences 50(8): 1683-1689.

Morgan, J.E., and A.J. Morgan. 1990. The distribution of cadmium, copper, lead, zinc, and calcium in the tissues of the earthworm *Lumbricus rubellus* sampled from one uncontaminated and four polluted sites. Oecologia 84(4): 559-566.

Morgan, J.E. and A.J. Morgan. 1999. The accumulation of metals (Cd, Cu, Pb, Zn, and Ca) by two ecologically contrasting earthworm species (*Lumbricus rubellus* and *Aporrectodea caliginosa*): implications for ecotoxicological testing. Applied Soil Ecology 13: 9-20.

Mount, D.R., A.K. Barth, T.D. Garrison, K.A. Barten, and J.R. Hockett. 1994. Dietary and waterborne exposure of rainbow trout (*Oncorhynchus mykiss*) to copper, cadmium, lead and zinc using a live diet. Environmental Toxicology and Chemistry 13(12): 2031-2041.

Murai, T., J.W. Andrews, and R.G. Smith, Jr. 1981. Effects of dietary copper on channel catfish. Aquaculture 22(4): 353-357.

Nagy, K.A. 2001. Food requirements of wildlife animals: predictive equations for free-living mammals, reptiles, and birds. Nutrition Abstracts and Reviews Series B: Livestock Feeds and Feeding 71(10): 21R-32.

Neuhauser, E.F., Z.V. Cukic, M.R. Malecki, R.C. Loehr, P.R. Durkin. 1995. Bioconcentration and biokinetics of heavy metals in the earthworm. Environmental Pollution 89(3): 293-301.

Pyatt, F.B., A.J. Pyatt, and V.W. Pentreath. 1997. Distribution of metals and accumulation of lead by different tissues in the freshwater snail *Lymnaea stagnalis* (L.). Environmental Toxicology and Chemistry 16(6): 1393-1395.

Serdar, D. 1995. Results of Monitoring Copper Sulfate Application to Sylvia Lake. Ecology Report #95-322. Washington State Department of Ecology.

Svendsen, C. and J.M. Weeks. 1997a. Relevance and applicability of a simple earthworm biomarker of copper exposure: I. Links to ecological effects in a laboratory study with *Eisenia andrei*. Ecotoxicology and Environmental Safety 36(1): 72-79.

Svendsen, C. and J.M. Weeks. 1997b. Relevance and applicability of a simple earthworm biomarker of copper exposure: II. Validation and applicability under field conditions in a mesocosm experiment with *Lumbricus rubellus*. Ecotoxicology and Environmental Safety 36(1): 80-88.

Tetra Tech. 2017. Lake Casitas Bathymetric & Aerial LiDAR Survey, March 2016. April 18, 2017.

U.S. Environmental Protection Agency (USEPA). 1993, Wildlife Exposure Factors Handbook. U.S. Environmental Protection Agency. Report EPA/600/R-93/187.

U.S. Environmental Protection Agency (USEPA). 2004. Overview of the ecological risk assessment process in the Office of Pesticide Programs, U.S. Environmental Protection Agency: Endangered and Threatened Species Effects Determinations. Office of Prevention, Pesticides and Toxic Substances, Office of Pesticide Programs, Washington, D.C.

U.S. Environmental Protection Agency (USEPA). 2007a. Framework for Metals Risk Assessment. EPA 120/R-07/001. Office of the Science Advisor. Washington, D.C.

U.S. Environmental Protection Agency (USEPA). 2007b. Aquatic Life Ambient Freshwater Quality Criteria – Copper (2007 Revision). EPA-822-R-07-001. Office of Water. Washington, D.C.

U.S. Environmental Protection Agency (USEPA). 2009. Reregistration Eligibility Decision (RED) for Coppers. EPA 738-R-09-304. Office of Prevention, Pesticides and Toxic Substances. Washington, D.C.

U.S. Environmental Protection Agency (USEPA). 2019. Office of Pesticide Programs (OPP) Pesticide Ecotoxicity Database. Integrated Pest Management Center, U.S. Department of Agriculture, National Institute of Food and Agriculture. Available: https://ecotox.ipmcenters.org/ (Accessed: August 2021).

U.S. Environmental Protection Agency (USEPA). 2020. Technical Overview of Ecological Risk Assessment: Risk Characterization. Available: https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/technical-overview-ecological-risk-assessment-risk (Accessed: August 2, 2021).

Woodward, D.F., A.M. Farag, H.L. Bergman, A.J. DeLonay, E.E. Little, C.E. Smith, F.T. Barrows. 1995. Metals-contaminated benthic invertebrates in the Clark Fork River,

Montana: effects on age-0 brown trout and rainbow trout. Canadian Journal of Fisheries and Aquatic Sciences 52(9): 1994-2004.

Appendix D

Copper Speciation Graphs from the Biotic Ligand Model

1. Biotic Ligand Model Copper Speciation Graphs for Varying Water Parameters

In addition to using a hardness-based equation to quantify water quality criteria or receiving water limits, the USEPA suggests the use of another model, described below, to analyze and/or predict toxicity of bioavailable copper in the water column. In the 2007 revision of Aquatic Life Ambient Freshwater Quality Criteria-Copper (USEPA, 2007), the USEPA recommended the Biotic Ligand Model (BLM) as a more accurate approach than a hardness-based equation for assessing toxicity and deriving freshwater quality criteria for copper. The BLM supplements USEPA's previously published recommendation of using the hardness-based estimation and better accounts for the reduction in copper bioavailability that results from competitive binding of copper to other substances in the water column.

The BLM was developed to predict copper toxicity to aquatic organisms in relation to water quality parameters including pH, hardness, alkalinity, and dissolved organic carbon (DOC). According to the BLM, copper bioavailability is strongly influenced by these parameters. The free cupric ion (Cu^{2+}) is the primary driver of copper bioavailability and toxicity in aquatic ecosystems (USEPA, 2007).

In order to derive freshwater quality criterion for copper, the BLM uses ten water quality inputs: temperature; pH; dissolved organic carbon (DOC); major cations including calcium (Ca), magnesium (Mg), sodium (Na), potassium (K); major anions including sulfate (SO_4), chloride (Cl); and alkalinity. Copper may be measured for comparison with site-specific criteria, but it is not required as an input to the model to determine copper freshwater quality criteria. The BLM-based water quality criterion for copper may be more or less stringent than the hardness-based criteria depending on the water quality parameters. However, it is more accurate than hardness-based criteria because it is based on copper bioavailability to aquatic species and takes into account more parameters than just hardness.

The BLM may also be used to predict copper toxicity and speciation in varying water conditions. When the model is run in toxicity prediction mode, it predicts the concentration of dissolved copper that produces a particular endpoint (e.g., LC50, EC50, EC20) for the selected aquatic species. When run in speciation prediction mode, the model can determine the various forms (e.g., $CuCO_3$, Cu^{2+}, copper bound to DOC) and concentrations of copper in the water when known copper concentration in water is input in the model.

Using the Biotic Ligand Model in copper speciation prediction mode, a total of 27 graphs have been generated to illustrate how variations in water quality parameters including pH, alkalinity, and dissolved organic carbon (DOC) influence the concentration of bioavailable Cu^{2+}. See **Table D-1** and **Graph 1** through **Graph 27** below. Generally, an increase in one or more of the three water parameters lowers the concentration of the Cu^{2+} species, thereby lowering the bioavailability of copper.

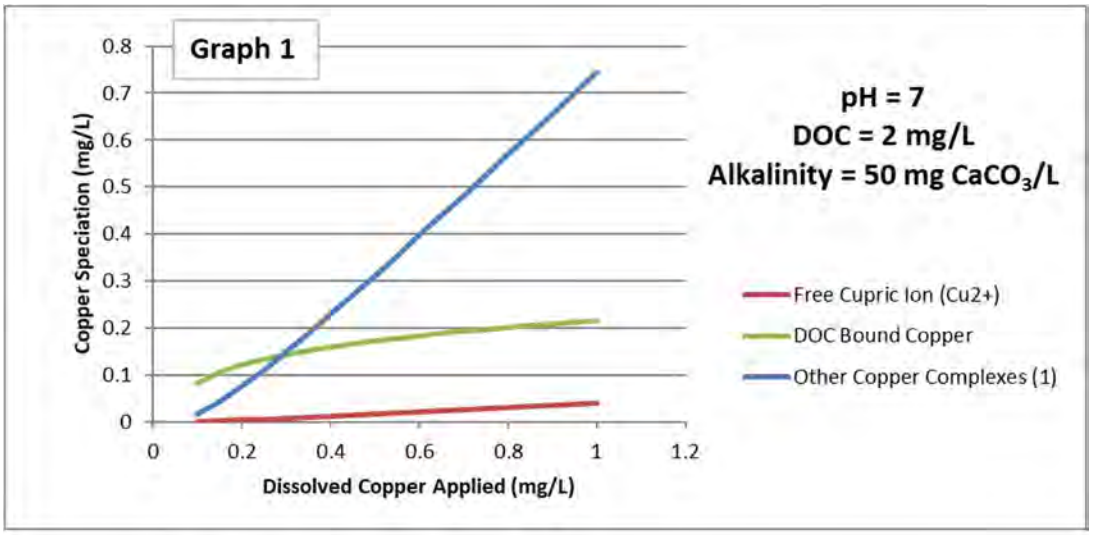
Based on data from 2018 and 2019, water in Lake Casitas has an average DOC of 4.92 mg/L, pH of 7.7, and alkalinity of 145 mg/L. Therefore, the graphs that most closely represent conditions at Lake Casitas are Graphs 13, 14, 16, 17, 22, 23, 25, and 26, which illustrate DOC ranging from 2 to 4 mg/L, pH ranging from 7 to 8, and alkalinity ranging from 100 to 200 mg/L.

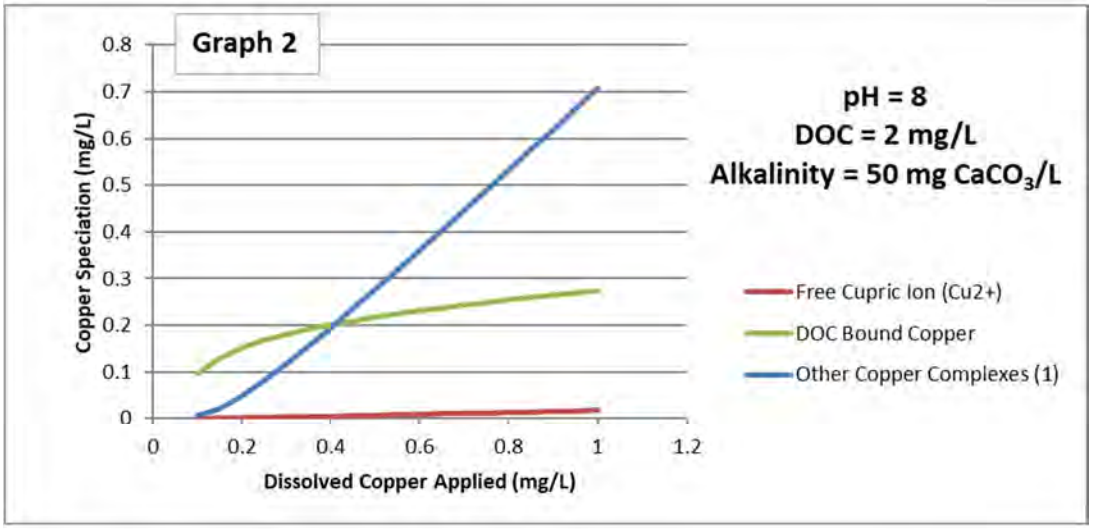
Table D-1. BLM Input Parameters Used to Generate Graphs 1-27

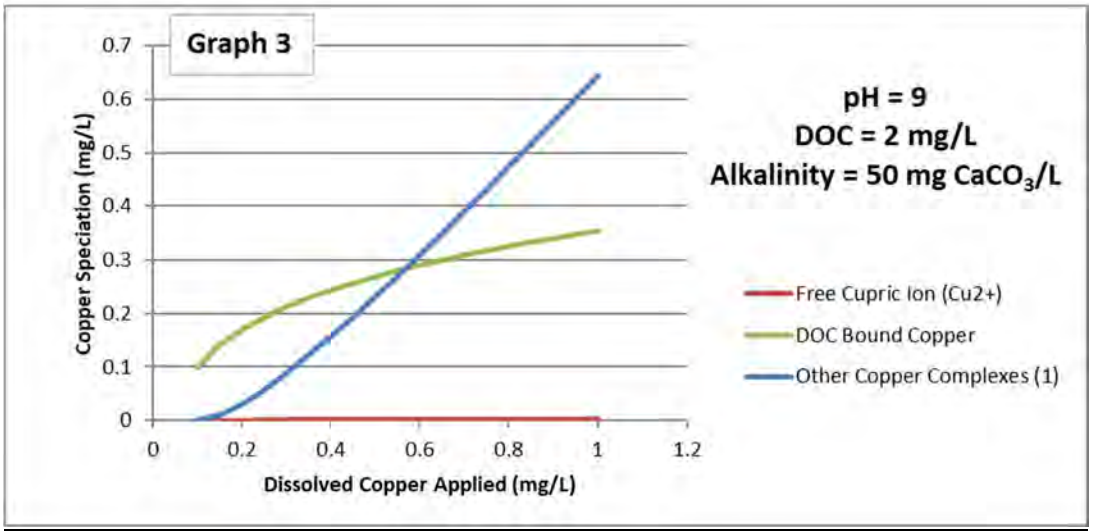
Graph #	DOC (mg/L)	pH	Alkalinity (mg $CaCO_3$/L)
1	2	7	50
2	2	8	50
3	2	9	50
4	2	7	100
5	2	8	100
6	2	9	100
7	2	7	200
8	2	8	200
9	2	9	200
10	4	7	50
11	4	8	50
12	4	9	50
13	4	7	100
14	4	8	100
15	4	9	100
16	4	7	200
17	4	8	200
18	4	9	200
19	6	7	50
20	6	8	50
21	6	9	50
22	6	7	100
23	6	8	100
24	6	9	100
25	6	7	200
26	6	8	200
27	6	9	200

General Notes:

1) Copper speciation was modeled using Biotic Ligand Model (BLM) software, version 3.41.2.45 (see https://www.windwardenv.com/biotic-ligand-model/).
2) DOC is the dissolved organic carbon capable of complexing with copper cations, rendering them non-bioavailable. The humic acid content of DOC was assumed to be 10% consistent with guidance provided in the BLM User's Guide.
3) Temperature was assumed to be 25°C. Hardness and alkalinity, both expressed as $CaCO_3$, were assumed equal. Calcium concentration inputs were estimated based on assumed hardness. All other parameter inputs (Mg, Na, K, SO_4, Cl, and S) were assumed to be negligible (1.00E-15 mg/L).

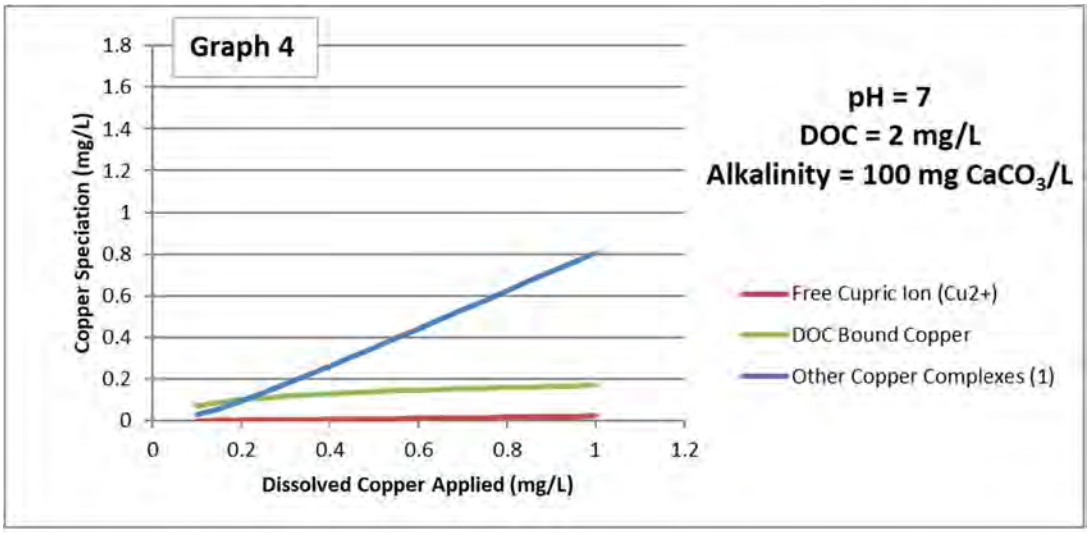


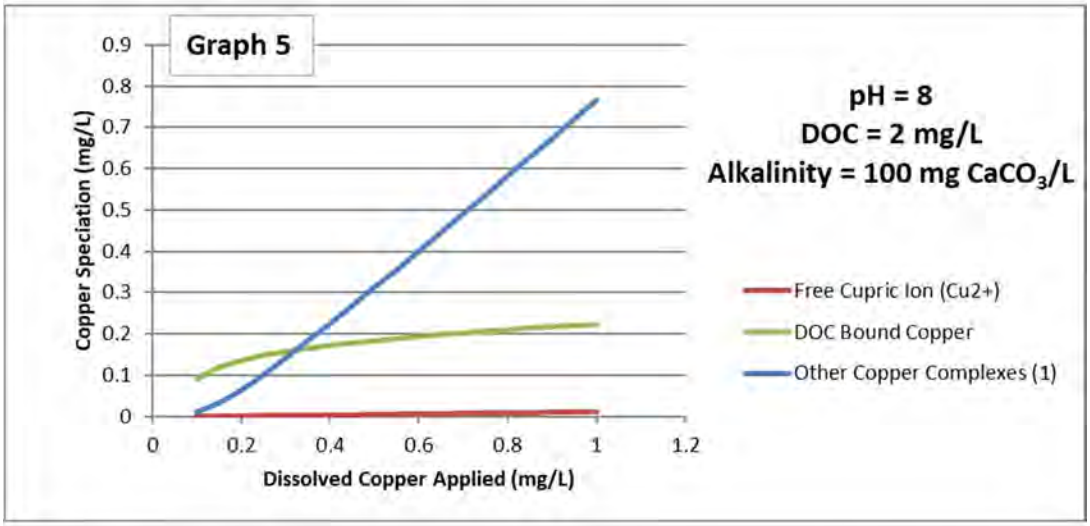


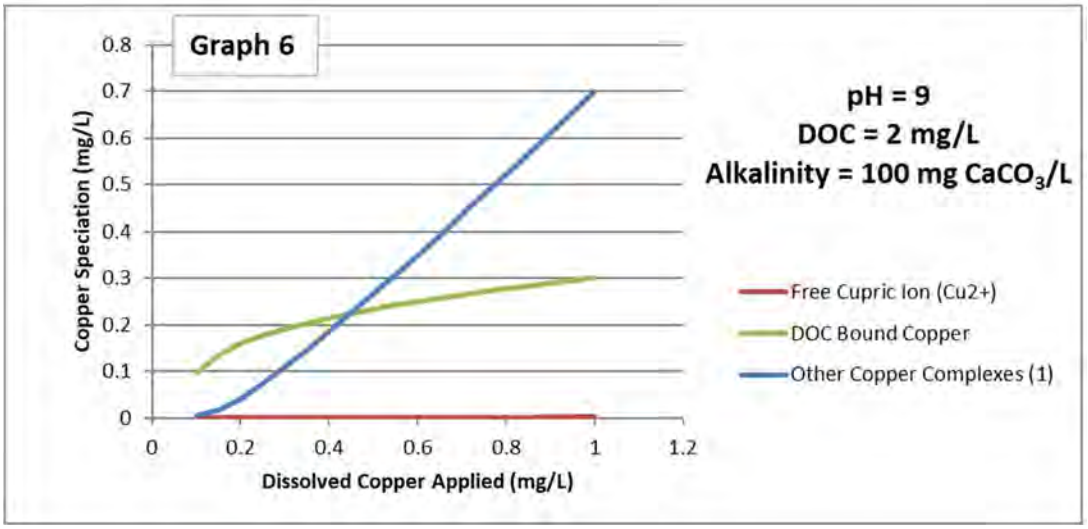


Notes:

1) "Other Copper Complexes" is the copper not accounted for by "Free Cupric Ion" and "DOC Bound Copper" species. It exists as various copper-ligands and/or copper salts, including but not limited to: $CuCO_3$, $CuHCO^{3+}$, and $Cu(OH)_2$.

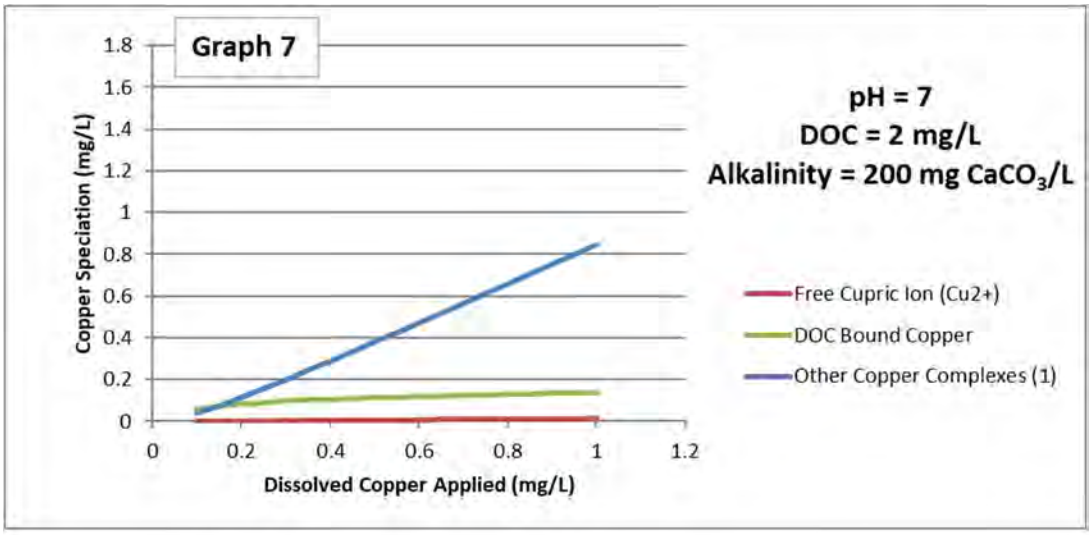


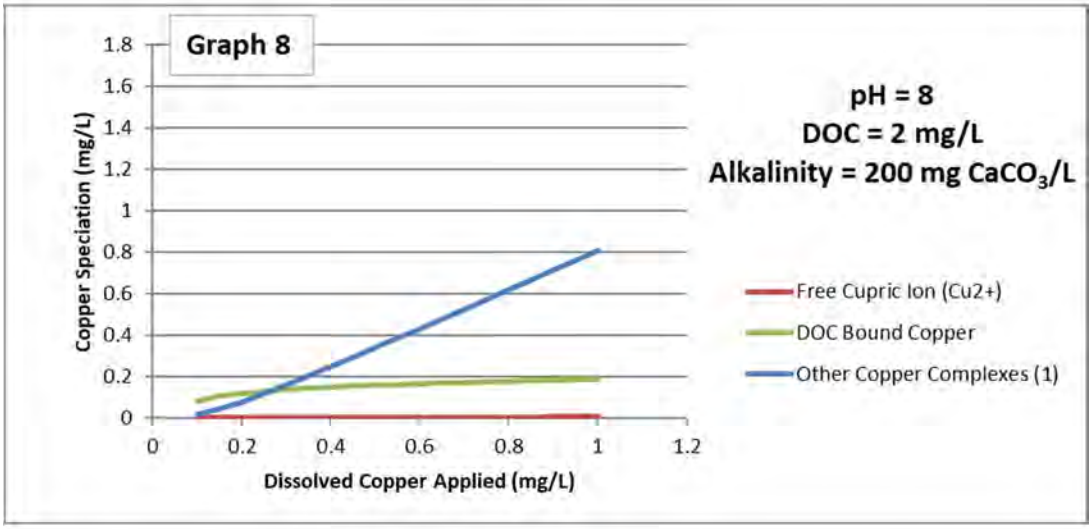


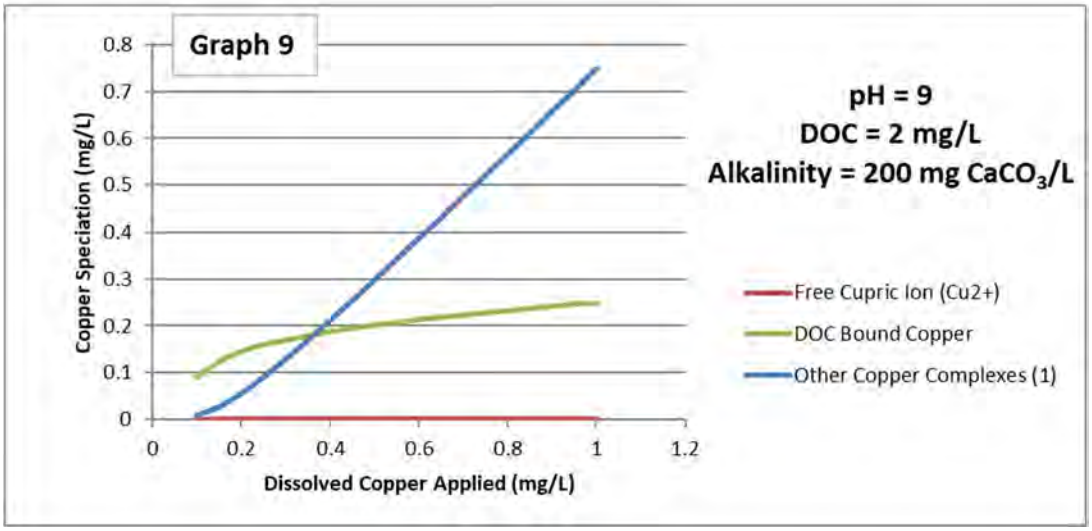


Notes:

1) "Other Copper Complexes" is the copper not accounted for by "Free Cupric Ion" and "DOC Bound Copper" species. It exists as various copper-ligands and/or copper salts, including but not limited to: $CuCO_3$, $CuHCO^{3+}$, and $Cu(OH)_2$.

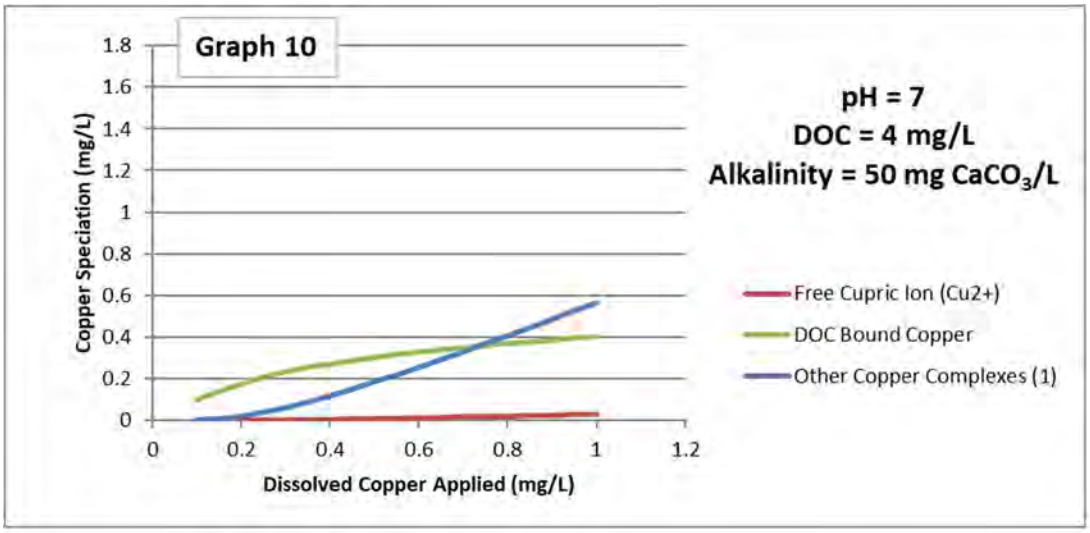


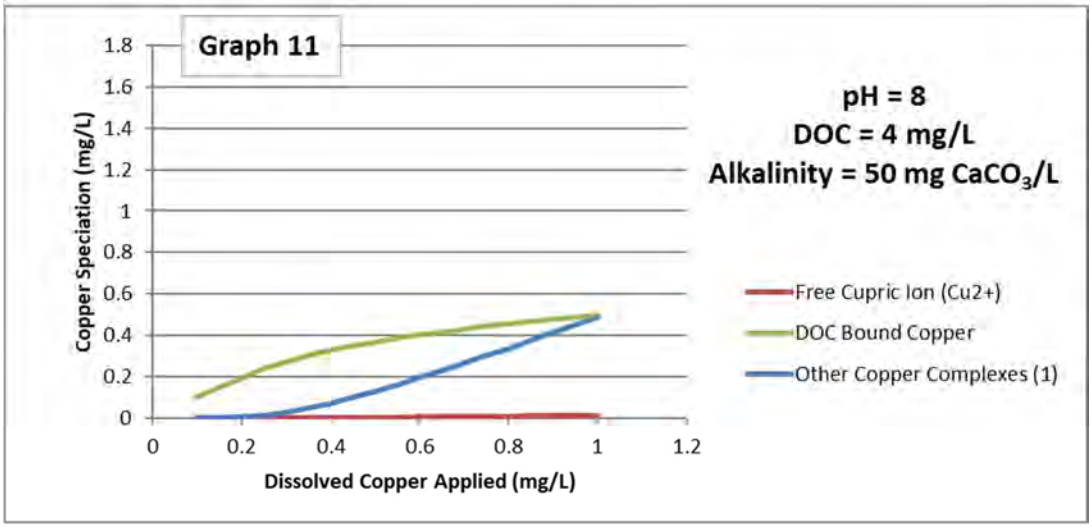


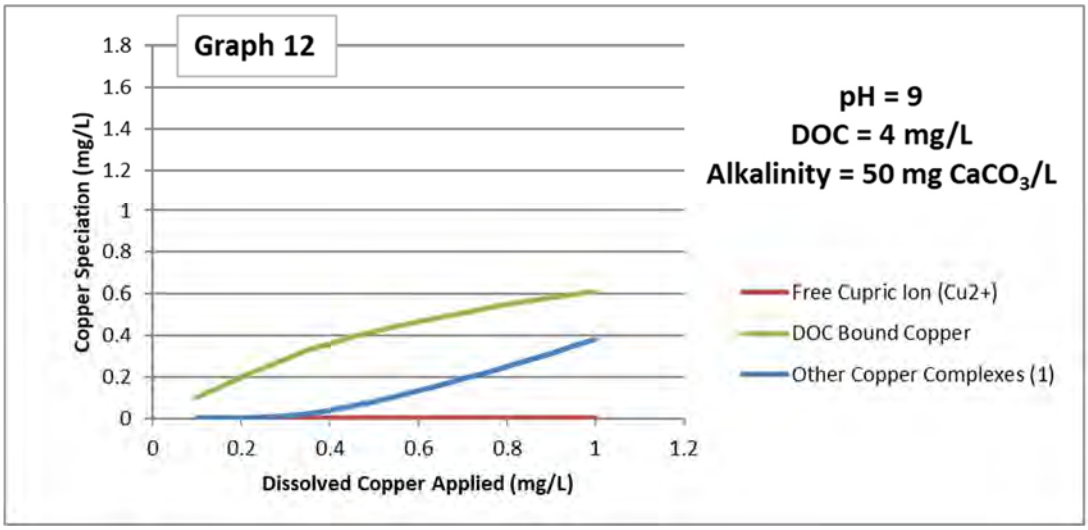


Notes:

1) "Other Copper Complexes" is the copper not accounted for by "Free Cupric Ion" and "DOC Bound Copper" species. It exists as various copper-ligands and/or copper salts, including but not limited to: $CuCO_3$, $CuHCO^{3+}$, and $Cu(OH)_2$.

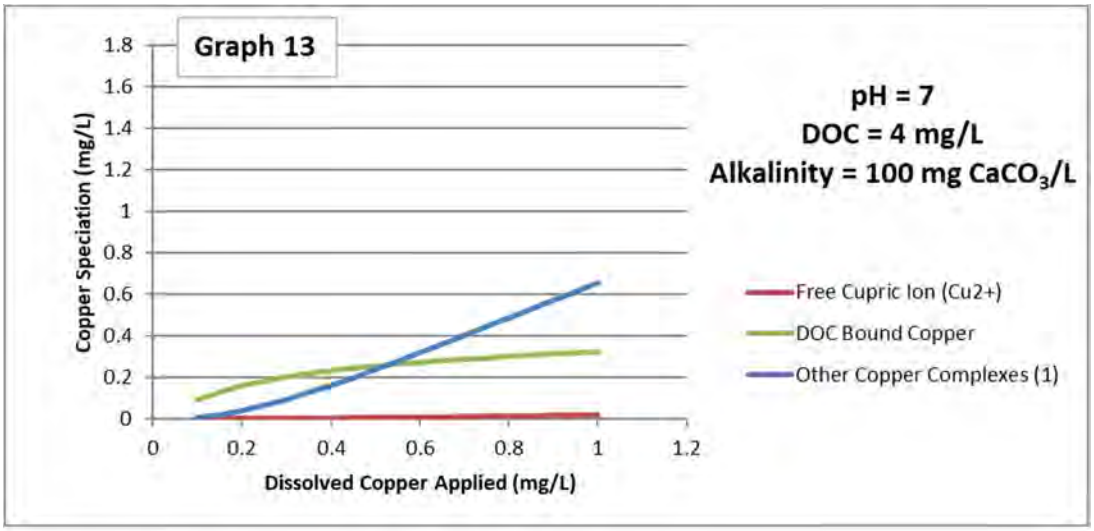


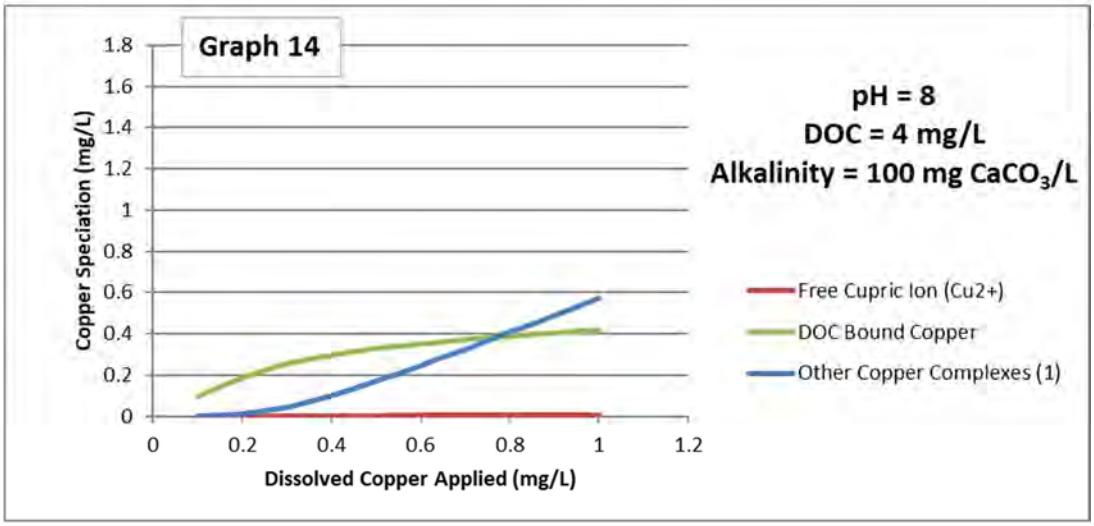


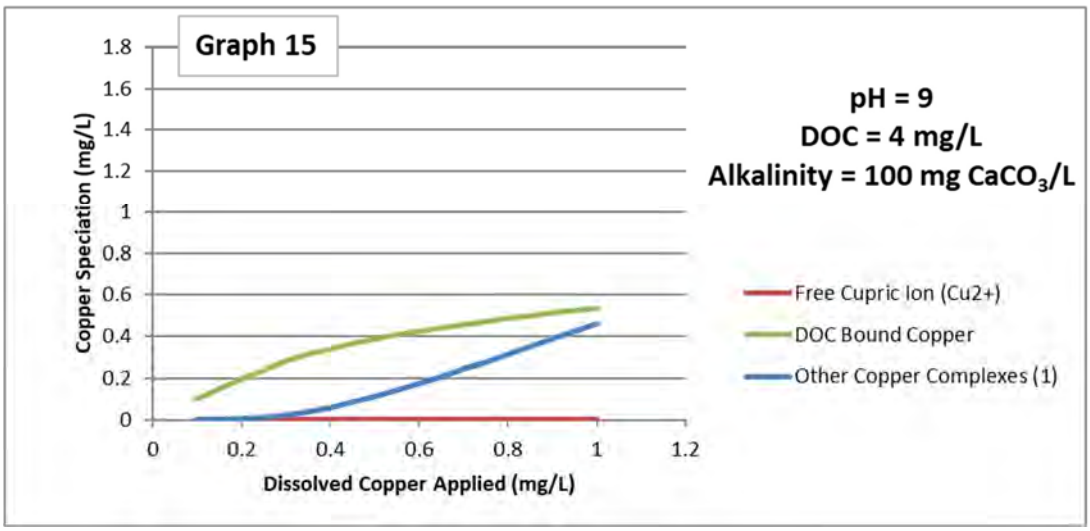


Notes:

1) "Other Copper Complexes" is the copper not accounted for by "Free Cupric Ion" and "DOC Bound Copper" species. It exists as various copper-ligands and/or copper salts, including but not limited to: $CuCO_3$, $CuHCO^{3+}$, and $Cu(OH)_2$.

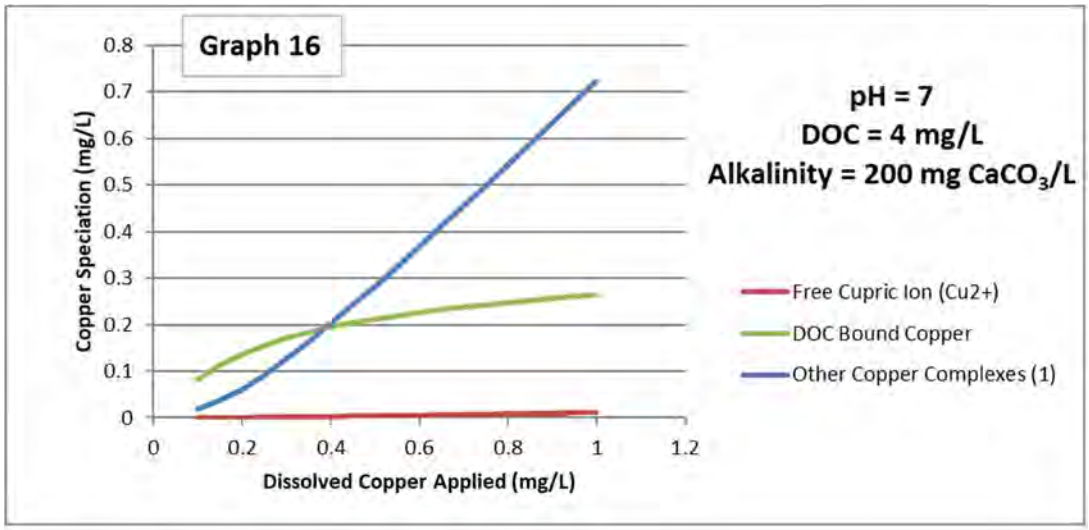


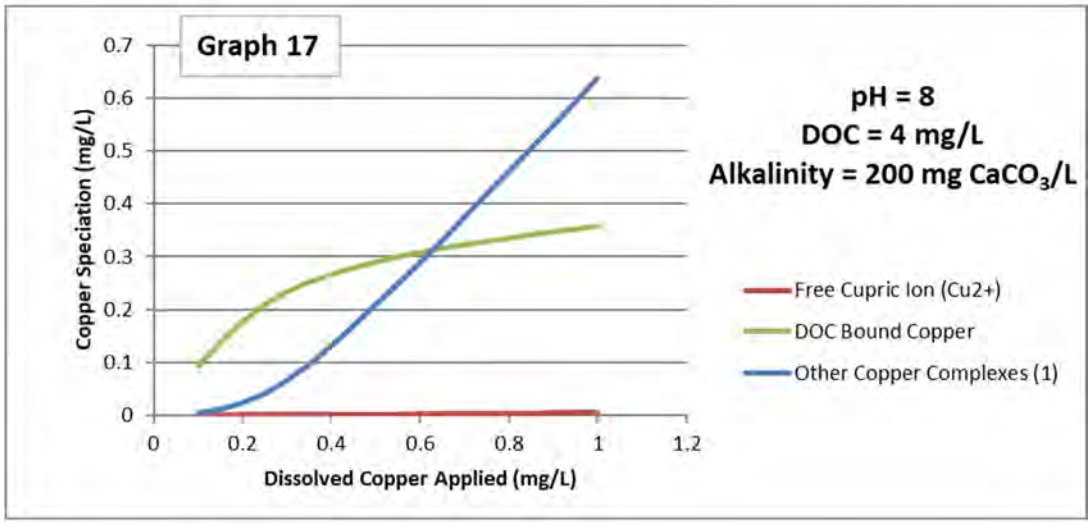


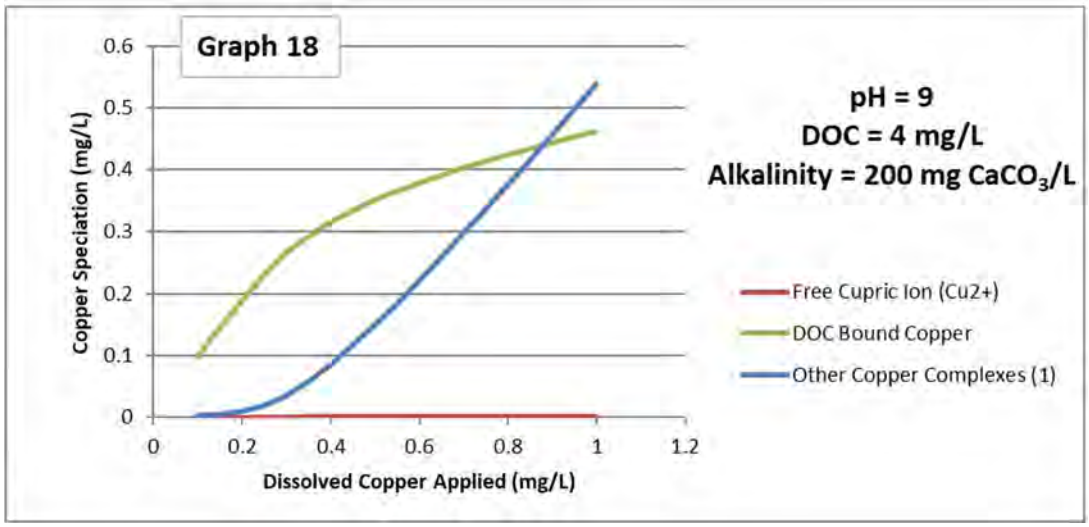


Notes:

1) "Other Copper Complexes" is the copper not accounted for by "Free Cupric Ion" and "DOC Bound Copper" species. It exists as various copper-ligands and/or copper salts, including but not limited to: $CuCO_3$, $CuHCO^{3+}$, and $Cu(OH)_2$.

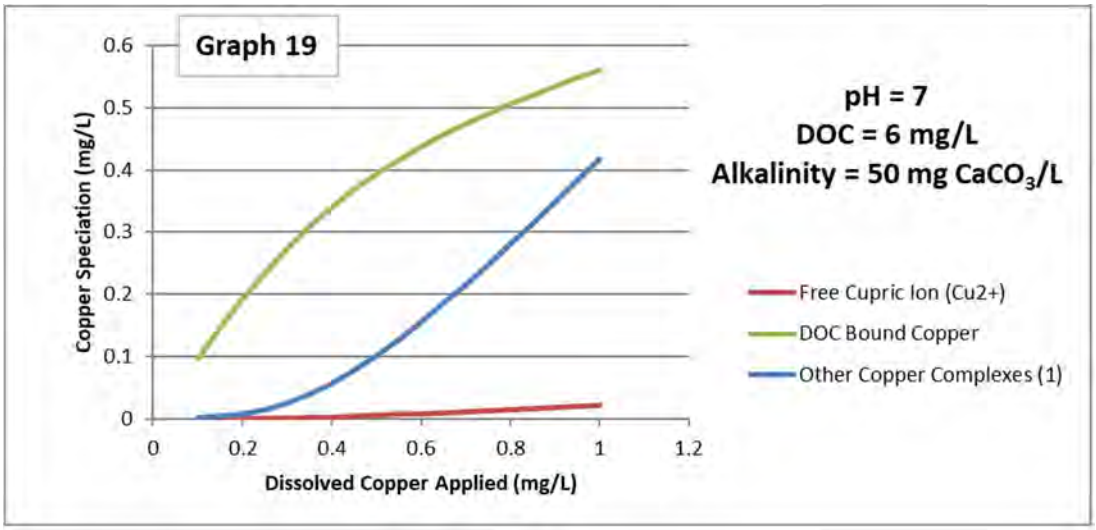


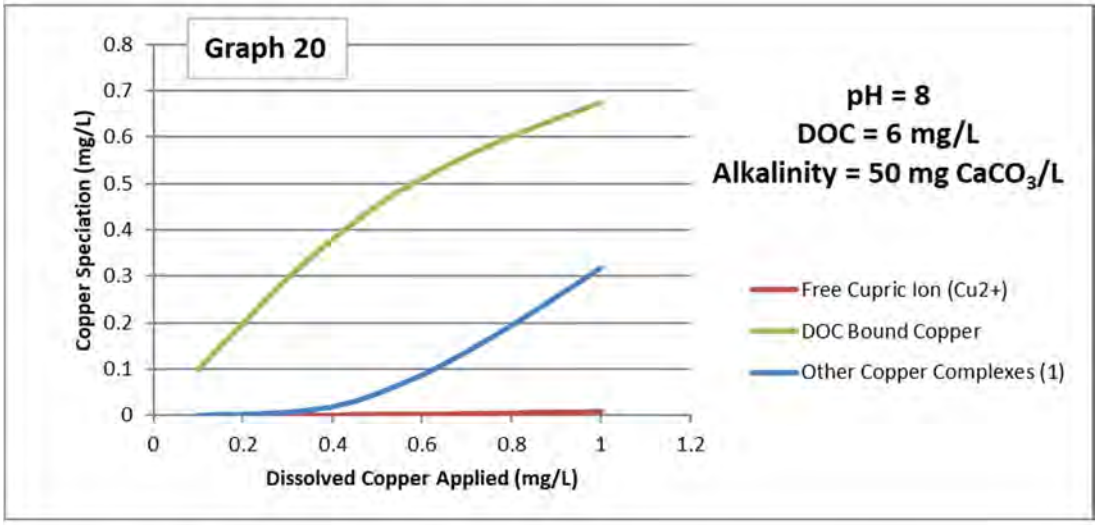


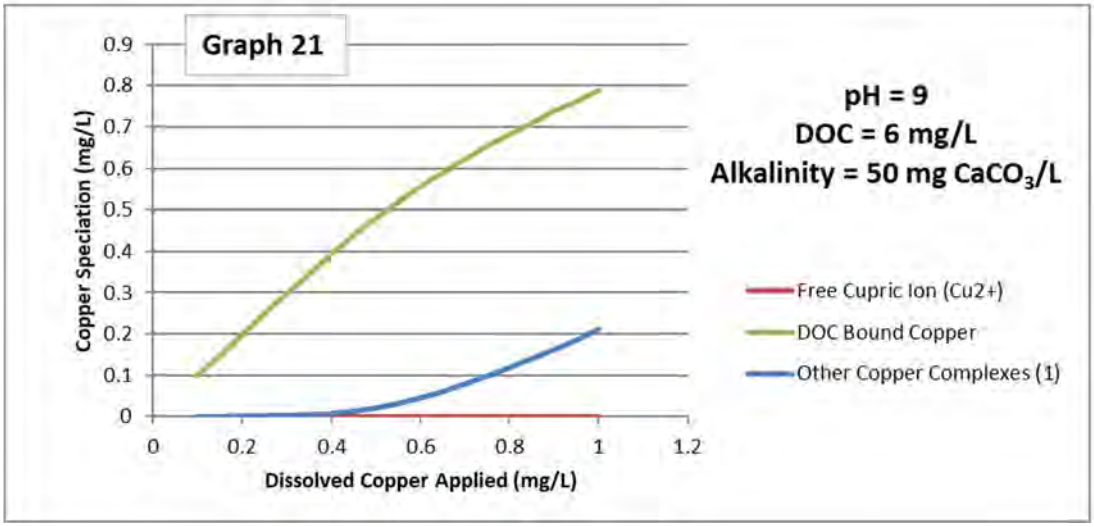


Notes:

1) "Other Copper Complexes" is the copper not accounted for by "Free Cupric Ion" and "DOC Bound Copper" species. It exists as various copper-ligands and/or copper salts, including but not limited to: $CuCO_3$, $CuHCO^{3+}$, and $Cu(OH)_2$.

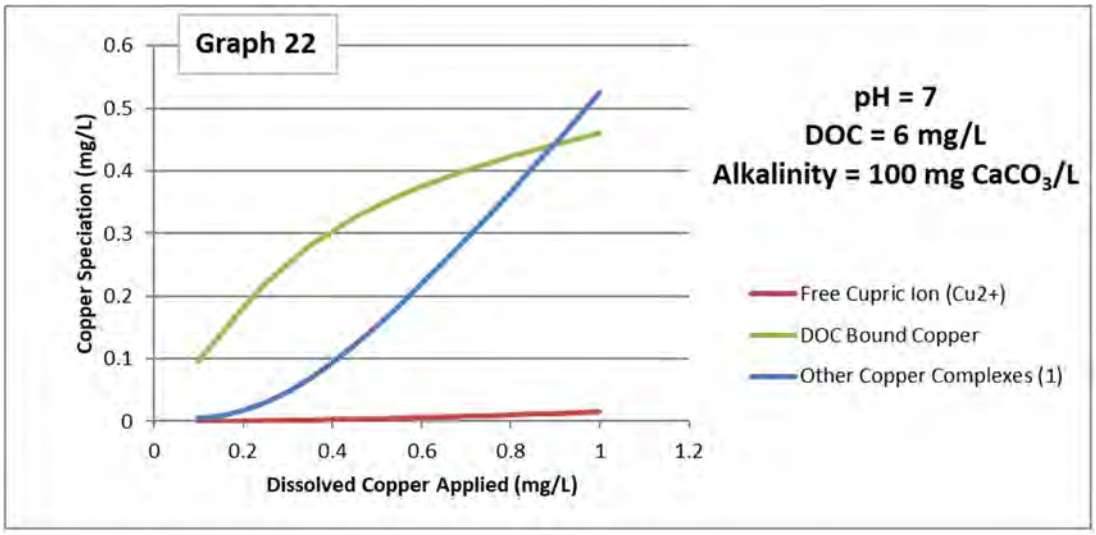


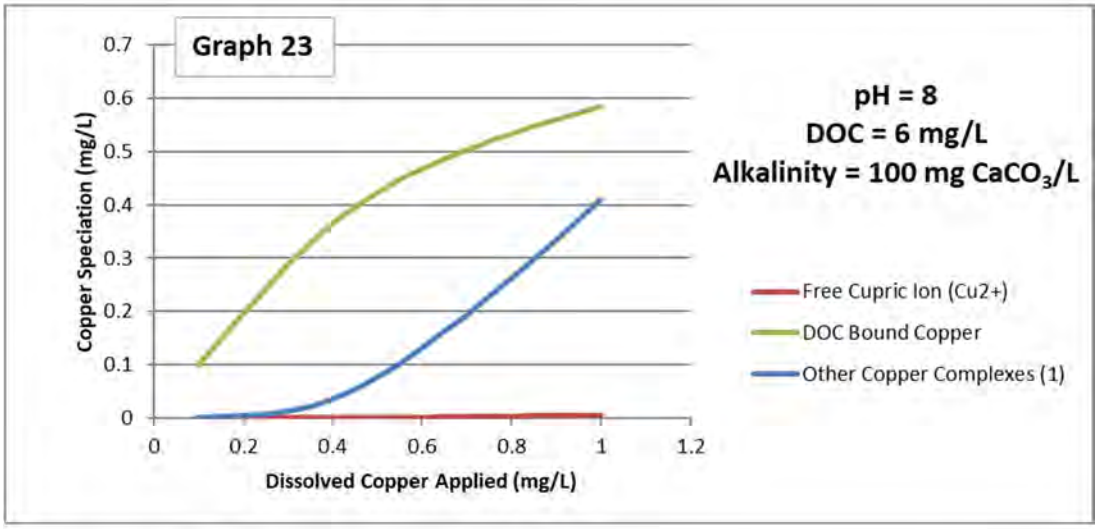


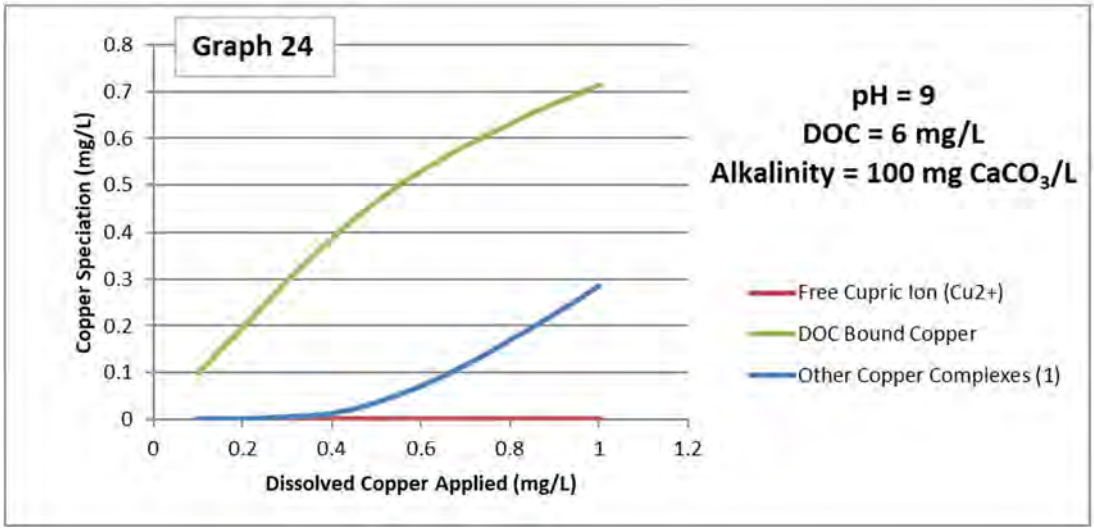


Notes:

1) "Other Copper Complexes" is the copper not accounted for by "Free Cupric Ion" and "DOC Bound Copper" species. It exists as various copper-ligands and/or copper salts, including but not limited to: $CuCO_3$, $CuHCO^{3+}$, and $Cu(OH)_2$.

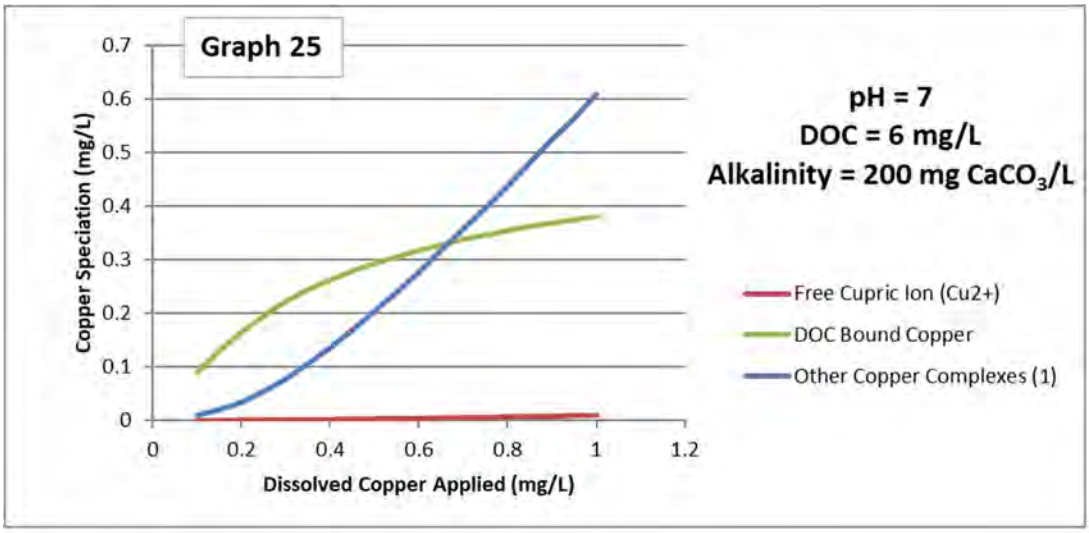


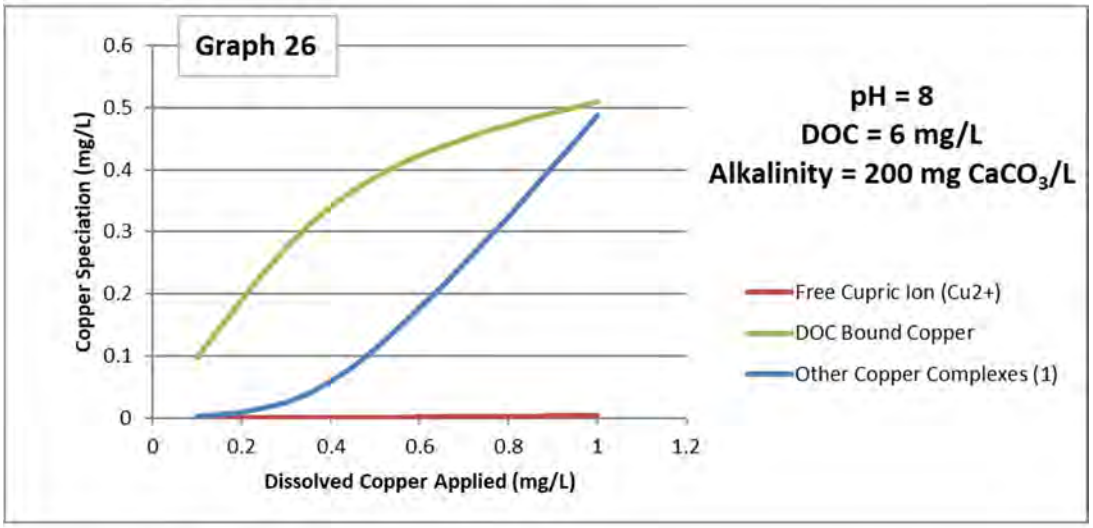


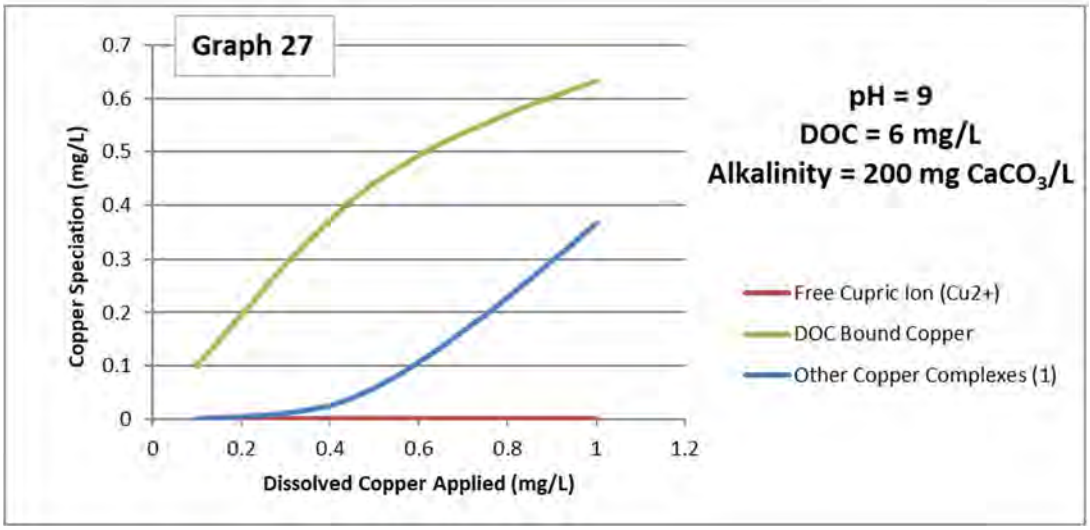


Notes:

1) "Other Copper Complexes" is the copper not accounted for by "Free Cupric Ion" and "DOC Bound Copper" species. It exists as various copper-ligands and/or copper salts, including but not limited to: $CuCO_3$, $CuHCO^{3+}$, and $Cu(OH)_2$.







Notes:

1) "Other Copper Complexes" is the copper not accounted for by "Free Cupric Ion" and "DOC Bound Copper" species. It exists as various copper-ligands and/or copper salts, including but not limited to: $CuCO_3$, $CuHCO^{3+}$, and $Cu(OH)_2$.

2. References

U.S. Environmental Protection Agency (USEPA). 2007. Aquatic Life Ambient Freshwater Quality Criteria – Copper. 2007 Revision. Office of Water. Washington D.C.

