KARUK TRIBE

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WATER QUALITY CONTROL PLAN

February 2014

Prepared By

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FORWARD

The need for comprehensive water quality planning is set forth in Karuk Tribe laws under Resolution 96-R-24. The Federal Water Pollution Control Act as amended by the Clean Water Act of 1977 requires water quality control plans for the waters of tribes as well as public review of the plans. The basic purpose of the Karuk Tribe's planning effort is to determine the future direction of water quality control for protection of Tribal waters.

The enclosed *Water Quality Control Plan* is comprehensive in scope. It contains a brief description of Tribal trust property located along the middle portion of the Klamath River, and describes the present and potential beneficial uses of the surface and ground waters. The water quality objectives contained in the report are prescribed for the purposes of protecting the beneficial uses. The implementation plans section describes the measures, which include specific prohibitions, action plans, and policies which form the basis for the control of water quality.

Tribal plans and enforcement mechanisms are included. The report contains provisions for public participation, complies with the requirements of CWA Section 303, and establishes a setting and the framework for the development of discharger regulations.

Integral to the Water Quality Control Plan implementation process is the provision for change. In that respect, the Water Quality Control Plan is reviewed triennially to determine the needed changes and to keep pace with technologies, policies, changes in the law, and physical changes within the lands held in trust. The Water Quality Control Plan was first developed in 2002 and then updated in 2014. The technical basis for the 2014 revisions is provided in a companion document titled *Justification for Revisions Proposed in the Karuk Tribe's 2014 Water Quality Control Plan* (Asarian and Kann 2014).

1.0 INTRODUCTION

1.1 Purpose

The primary responsibility for the protection and enhancement of water quality on trust property has been assigned to the Karuk Tribe's Department of Natural Resources. The Department of Natural Resources proposes water quality standards which recognize the unique characteristics of cultural uses, natural water quality conditions, and both actual and potential beneficial uses of tribal waters.

The purposes of the water quality standards for the trust lands are outlined below:

- To designate uses for which Tribal waterbodies of the trust lands shall be protected
- To prescribe water quality standards imposed to sustain designated uses of Tribal waterbodies
- To assure that degradation of existing water quality does not occur
- To promote the social welfare, cultural, and economic well-being of the Karuk Tribe

These purposes will be accomplished by incorporating the water quality standards established herein into the permitting and management process for point source dischargers and nonpoint source generators, by using these water quality standards to determine when a designated use is threatened, and by using (1) current treatment technologies to control point sources and (2) best management practices to control nonpoint sources of pollution.

Water quality standards for the trust lands are designed to meet the federal provisions of the Clean Water Act (CWA) as they relate to surface water sources. The water quality standards are consistent with Section 101(a)(2) of the CWA, which declares that "it is the national goal that, wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water to be achieved by July 1, 1983...."

The CWA requires tribes and states to develop water quality standards that include designated uses and criteria to support those uses for navigable waters. CWA Section 502(7) defines navigable waters as waters of the U.S. Waters of the U.S. are defined in federal regulations developed for the National Pollutant Discharge Elimination System (NPDES) (40 CFR § 122.2) and permits for the discharge of dredged or fill material (40 CFR §§ 230.3, 232.2). Waters of the U.S. include waters subject to the ebb and flow of the tide; intertribal waters (including intertribal wetlands) and intratribal waters (including wetlands), the use, destruction, or degradation of which could affect intertribal commerce; tributaries of the above; and wetlands adjacent to the above waters.

1.2 Location of the Karuk Trust Lands

The Tribal trust lands include properties situated along the middle portion of the Klamath River and its tributaries in Northern California (Figures 1 and 2). The Karuk tribe administers approximately 1,168 acres of tribal trust and private domain allotments. The northern most allotment is located on the Klamath River just north of the town of Happy Camp. The southernmost allotment is situated just south of the town of Orleans along the Klamath River. Karuk Tribe trust lands contain approximately 11.37 miles of perennial and intermittent rivers and streams.

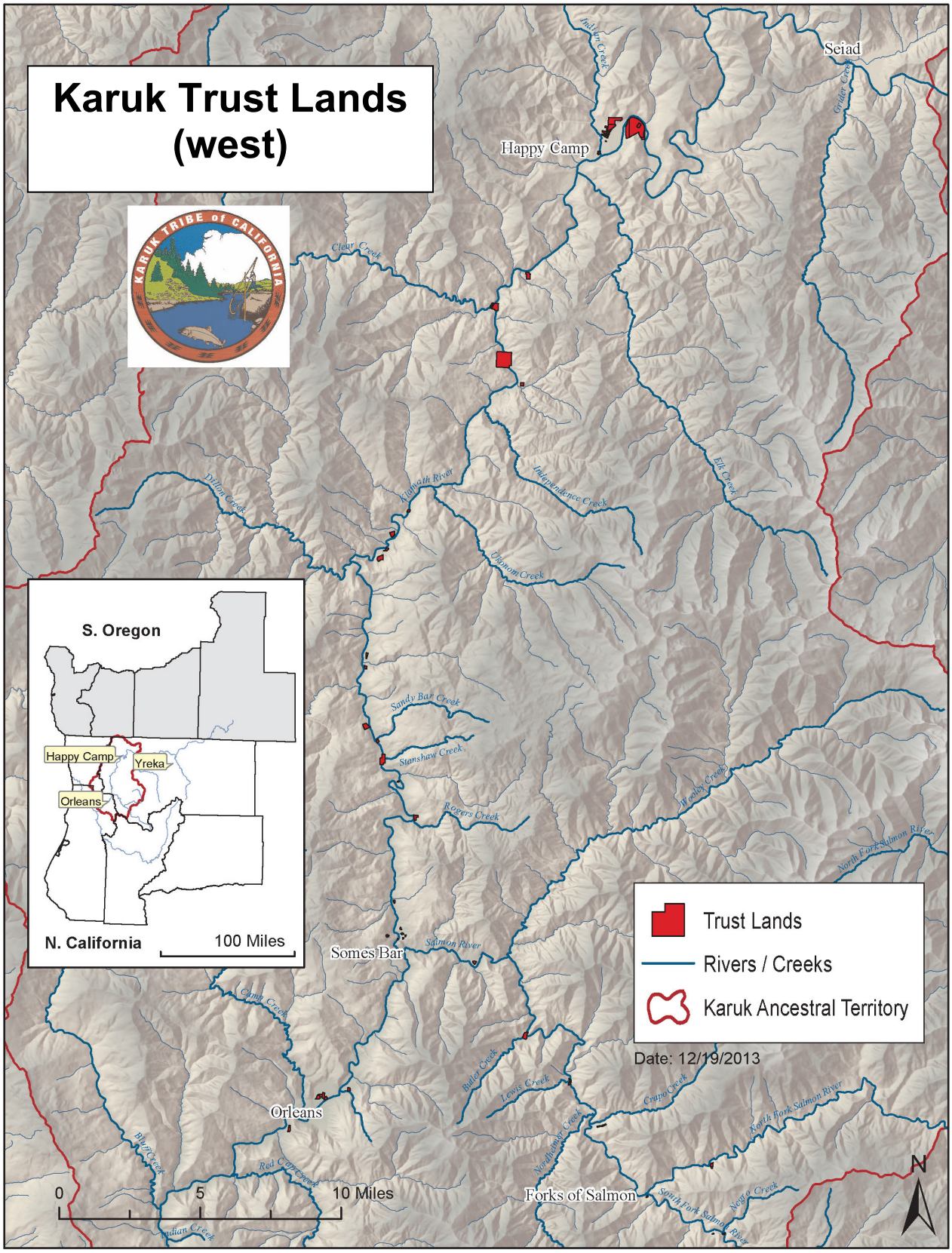

Figure 1. Map of Karuk tribal trust lands between Seiad and Orleans.

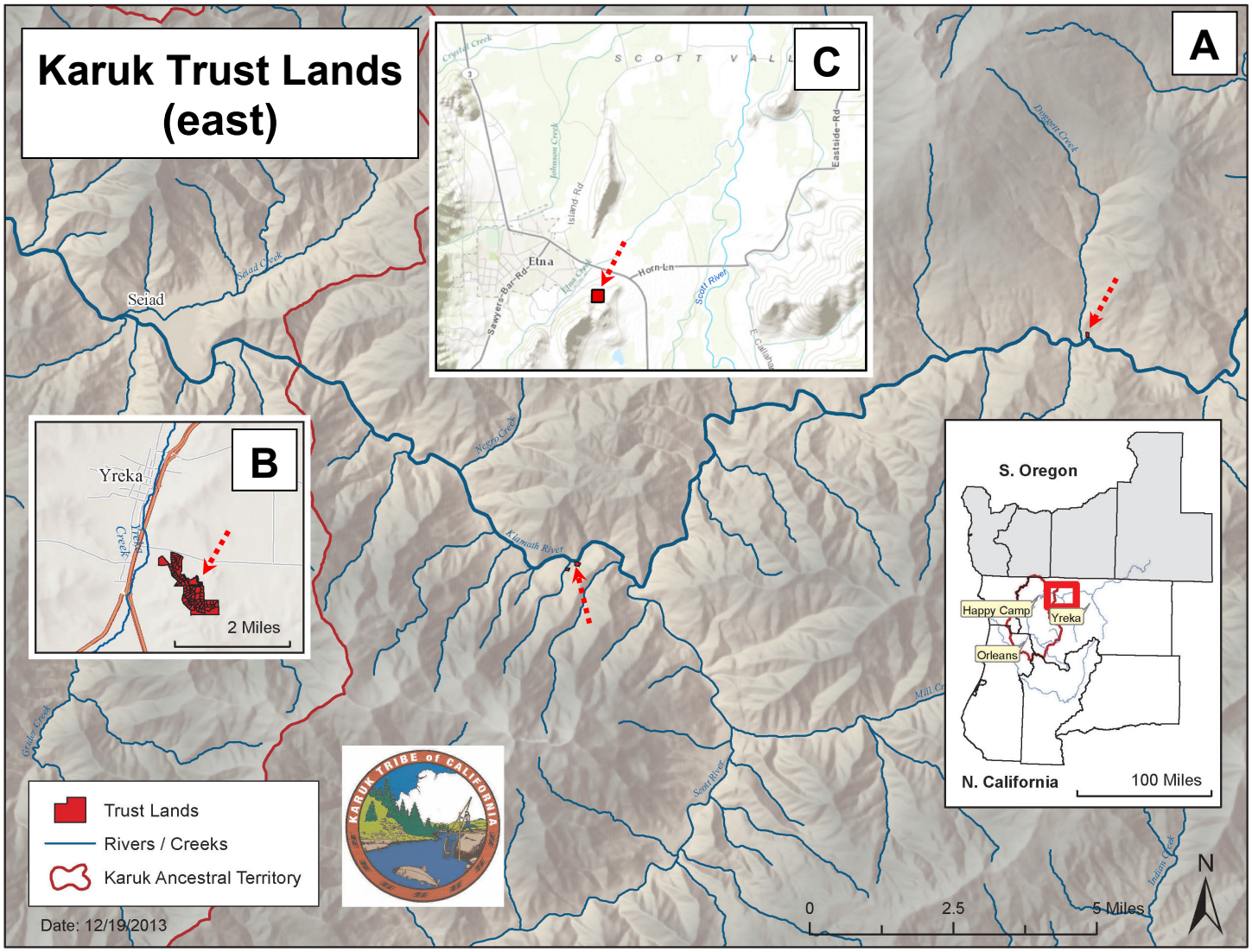

Figure 2. Map of Karuk tribal trust lands along the Klamath River east of Seiad (A), in the Shasta Valley near Yreka (B), and in the Scott Valley near Etna (C). Red arrows visually highlight trust lands.

1.3 Authority

Pursuant to Tribal Resolution No. 00-R-17 and Sections 518 and 303(c) of the federal Clean Water Act, the Karuk Tribe, organized pursuant to the Indian Reorganization Act of 1934, hereby adopt the water quality standards for the trust lands.

The federal Clean Water Act (Section 303, 33 U.S.C. § 1313) requires tribes and states to adopt water quality standards for navigable waters of the United States and to review and update those standards on a triennial basis under the oversight of the Region IX U.S. Environmental Protection Agency (EPA).

1.4 Applicability

These water quality standards apply to all Tribal waterbodies within the boundaries of the trust lands including both surface and ground waters.

1.5 Triennial Review and Public Participation

Pursuant to Section 303(c)(1) of the CWA 33 U.S.C. Section 1313[c]), the Karuk Tribe will hold public hearings at least once every 3 years to review and, as appropriate, amend the water quality standards. Revisions to the water quality standards will incorporate cultural concerns, updated EPA quality criteria for water, and relevant scientific and engineering advances.

The Department of Natural Resources is responsible for this triennial review, and is required to: 1) identify those portions of the trust lands which are in need of modification or new additions; 2) adopt standards as appropriate; and 3) recognize the portions of the water quality standards which are appropriate as written. The review includes a public hearing process, thus providing a forum for the public to raise issues for the Department of Natural Resources to consider for incorporation into the water quality standards for the trust lands.

Public participation is a key element in both tribal and federal planning requirements. Federal public participation requirements of 40 CFR Part 25 apply. The public participation requirements are intended to foster public awareness and the open processes of tribal governmental decision-making. The Department of Natural Resources seeks to implement public participation requirements by requesting the public's input, assimilating its viewpoints and preferences, and demonstrating that those viewpoints have been considered. A notice of proposed actions relating to water quality standards for the trust lands will be published in area newspapers and distributed to a list of interested persons or organizations.

The Water Quality Control Plan was first developed in 2002 and then updated in 2014.

SECTION 2.0 DEFINITIONS

The terms in this document associated with water quality standards shall have the following meanings:

7DADM - Seven-day average of the daily maximums.

Acute toxicity - Toxicity involving a stimulus severe enough to rapidly induce a response. In aquatic toxicity tests, an effect observed in 96 hours or less is considered acute.

Aesthetic Quality (ASQ) - Use of water that supports visual quality objectives including, but not limited to, the odor, taste and appearance (which includes stagnation and the presence of oil and foam) of the water.

Agricultural Supply (AGR) - Uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.

Ambient Stream Temperature- The stream temperature measured at a specific time and place. The selected location for measuring stream temperature must be representative of the stream in the vicinity of the point being measured.

Antidegradation Policy - The policy set forth in USEPA water quality standards regulations under the CWA whereby existing uses and the level of water quality necessary to maintain those uses is maintained and protected (see 40 CFR § 131.12).

Aquaculture (AQUA) - Uses of water for aquaculture or mariculture operations including, but not limited to, propagation, cultivation, maintenance, or harvesting of aquatic plants and animals for human consumption or bait purposes.

Best management practices (BMPs) - Practices undertaken to control, restrict, and diminish nonpoint sources of pollution that are consistent with the purposes of the water quality standards for the Tribal waterbodies. Included as a BMP is the practice of prevention through development provisions.

Chronic Toxicity - Toxicity involving a stimulus that lingers or continues for a relatively long period of time, often one-tenth of the life span or more. Chronic is considered a relative term depending on the lifespan of an organism. Measurements of chronic effect can include reduced growth, reduced reproduction, etc., in addition to lethality.

Clean Water Act (CWA) - The Federal Water Pollution Control Act, as amended by the Water Quality Act of 1987.

Cold Freshwater Habitat (COLD) - Uses of water that support cold water ecosystems including, but not limited to the preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

Cold Water Refugia - Those portions of a water body where or times during the diel temperature cycle when the water temperature is at least 2 degrees Celsius colder than the daily maximum temperature of the adjacent well-mixed flow of the water body.

Colony-Forming Units (CFU) - A direct count of bacteria colonies used in microbiological analyses.

Criteria - Elements of water quality standards that are expressed as pollutant concentrations, levels, or narrative statements representing a water quality that supports a designated use.

Cultural Contact Water (CUL-1) – Use of water by a member of the Karuk Tribe during a cultural or religious practice, where the human body will come into direct contact with the water. Complete

submergence into, and ingestion of the water is likely to occur. Sensitive body organs, such as eyes, ears, and nose, may be exposed to prolonged contact with the water. It includes sufficient water quantity as well as quality to carry out these acts.

Cultural Non-Contact Water (CUL-2) - Use of water by a member of the Karuk Tribe during a cultural or religious practice, including but not limited to subsistence fishing and collecting wetland and riparian plants, that may cause the human body to come into direct contact with the water, but normally not to the point of complete submergence. The use is such that ingestion of the water is not likely to occur, nor will sensitive body organs, such as eyes, ears, or nose, normally be exposed to prolonged contact with the water. It includes sufficient water quantity as well as quality to carry out these acts.

Designated Use - A beneficial use of water specified in the water quality standards for the Tribal waterbodies.

Environmental Protection Agency (EPA) - U.S. Environmental Protection Agency.

Existing Use - A use that has actually occurred in a surface water, or that the water quality of a surface water allowed, on or after November 28, 1975.

Fish Consumption (FC) - Uses of water for commercial, recreational or subsistence collection of fish, shellfish, or other organisms including, but not limited to, uses involving organisms intended for human consumption or bait purposes.

Freshwater Replenishment (FRSH) - Uses of water for natural or artificial maintenance of surface water quantity or quality (e.g., salinity).

Ground water - Subsurface waters (in a zone of saturation) that are or can be brought to the surface of the ground or to surface waters through wells, springs, seeps, or other discharge areas.

Ground Water Recharge (GWR) - Uses of water for natural or artificial recharge of groundwater for purposes of future extraction, maintenance of water quality, or halting of saltwater intrusion into freshwater aquifers.

Hydropower Generation (POW) - Uses of water for hydropower generation.

Industrial Process Supply (PROC) - Uses of water for industrial activities that depend primarily on water quality.

Industrial Service Supply (IND) - Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well repressurization.

Median – A value in an ordered set of values below and above which there is an equal number of values or which is the arithmetic mean of the two middle values if there is no single middle value.

Micrograms per liter (µg/L) - The concentration at which one microgram is contained in a volume of one liter; one microgram per liter is equivalent to one part per billion (ppb) at unit density.

Migration of Aquatic Organisms (MIGR) - Uses of water that support habitats necessary for migration or other temporary activities by aquatic organisms such as anadromous fish.

Milligrams per liter (mg/L) - The concentration at which one milligram is contained in a volume of one liter; one milligram per liter is equivalent to one part per million (ppm) at unit density.

Mixing zone - A prescribed area or volume of a surface water that is contiguous with a point source discharge where initial dilution of the discharge takes place.

Municipal and Domestic Supply (MUN) - Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply.

National Pollutant Discharge Elimination System (NPDES) - The point source discharge permit program established by § 402 of the CWA.

Navigation (NAV) - Uses of water for shipping, travel, or other transportation by private, military or commercial vessels.

Non-Contact Water Recreation (REC-2) - Uses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible. The use is such that ingestion of the water is not likely to occur, nor will sensitive body organs, such as eyes, ears, or nose, normally be exposed to direct contact with the water. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

Non-Point Source (NPS) - Sources of pollutants discharged into a waterbody that are diffuse in nature and are not regulated as a point source under section 402 of the CWA.

Numeric Standard: A standard or criterion expressed using quantifiable levels or concentrations of a water quality parameter.

Oil - Petroleum in any form including, but not limited to, crude oil, gasoline, fuel oil, diesel oil, lubricating oil, or sludge.

Office of Environmental Health Hazard Assessment (OEHHA): An agency of the State of California that assess environmental health hazards.

Outstanding water - A Tribal waterbody or portion of a waterbody that has been classified as an outstanding Tribal resource water by the Karuk Tribe.

Point source - Any discernible, confined, and discrete conveyance from which pollutants are or may be discharged into a water body.

Preservation of Areas of Special Biological Significance (BIOL) - Includes refuges, ecological reserves and designated areas of special biological significance, such as environmental hot spots where special protection is required in order to protect the diversity and integrity of the area.

Rare, Threatened, or Endangered Species (RARE) - Uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under federal law as rare, threatened or endangered.

Riparian areas – Areas located along the shores of a river or lake that are part of the hydrologic and ecological cycles and influence of the river or lake.

Shellfish Harvesting (SHELL) - Uses of water that support habitats suitable for the collection of filter feeding shellfish (e.g., clams, oysters, and mussels) for human consumption, commercial, or sports purposes.

Spawning, Reproduction, and/or Early Development (SPWN) - Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fishes.

Toxic - Pollutants (or combinations of pollutants) that may cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions in reproduction), or physical deformations in any organisms or their offspring after discharge and upon exposure, ingestion, inhalation, or assimilation into such organism, either directly from the environment or indirectly by ingestion through food chains.

Tribal waterbodies - Any and all surface and ground waters (including all rivers, streams, lakes, riparian areas, ponds, wetlands, aquifers, springs, seeps, canals, irrigation and drainage ditches) that meet one or more of the following criteria, pursuant to 40CFR131.8 (3)

1. Within or adjacent to the borders of Tribal Trust Property held by the Karuk Tribe.
2. Within or adjacent to the borders of Tribal Trust Property held by the United States in trust for Indians.
3. Within or adjacent to the borders of Tribal Trust Property held by a member of the Karuk Tribe.

Use attainability analysis (UAA) - A structured scientific assessment of the factors affecting the attainment of a designated use that may include physical, chemical, biological, cultural, and economic factors.

Warm Freshwater Habitat (WARM) - Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

Water Contact Recreation (REC-1) - Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, snorkeling, white-water activities, or fishing.

Wetlands - Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands include swamps, marshes, bogs, cienegas, tinajas, and similar areas.

Wildlife Habitat (WILD) - Uses of water that support terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

World Health Organization (WHO) – An agency of the United Nations that is concerned with international public health

SECTION 3.0 DESIGNATED USES

At a minimum, all Tribal waters must have designated uses that meet the goals of Section 101 (a) (2) of the CWA unless the results of a use attainability analysis (UAA) show that the CWA Section 101 (a) (2) goals cannot be achieved. These goals include providing for the protection and propagation of fish and wildlife, and for cultural, spiritual and recreational uses in and on the water. A UAA will be conducted prior to removing a designated use or adopting a subcategory of a designated use that requires less stringent water quality criteria. The Director of the Department of Natural Resources will adopt or remove designated uses and subcategories of designated uses for Tribal waters when appropriate.

Existing and potential designated uses of Tribal waterbodies, including wetlands, are listed below:

- Agricultural Supply (AGR)
- Aquaculture (AQUA)
- Aesthetic Quality (ASQ)
- Preservation of Areas of Special Biological Significance (BIOL)
- Cold Freshwater Habitat (COLD)
- Cultural Contact Water (CUL-1)
- Cultural Non-Contact Water (CUL-2)
- Fish Consumption (FC)

- Freshwater Replenishment (FRSH)
- Groundwater Recharge (GWR)
- Industrial Service Supply (IND)
- Migration of Aquatic Organisms (MIGR)
- Municipal and Domestic Supply (MUN)
- Navigation (NAV)
- Hydropower Generation (POW)
- Industrial Process Supply (PRO)
- Rare, Threatened, or Endangered Species (RARE)
- Water Contact Recreation (REC-1)
- Non-Contact Water Recreation (REC-2)
- Spawning, Reproduction, and/or Early Development (SPWN)
- Shellfish Harvesting (SHELL)
- Warm Freshwater Habitat (WARM)
- Wildlife Habitat (WILD)

If a Tribal water has more than one designated use, then the most stringent water quality criterion for a designated use applies. The Director of the Department of Natural Resources will revise, by rule, the designated uses of a Tribal waterbody if water quality improvements result in a level of water quality that permits a use that is not currently listed.

The Director of the Department of Natural Resources may, by rule, establish a mixing zone in a surface water. Mixing zones are prohibited in ephemeral waters or where there is no water for dilution.

In designating uses of a Tribal waterbody, and in establishing water quality criteria to protect those designated uses, the Director of the Department of Natural Resources will consider the applicable water quality standards for downstream or downgradient Tribal waters and will ensure that the water quality standards applicable to upstream or upgradient Tribal waters also provide for the attainment and maintenance of the water quality standards of downstream or downgradient waters. Table 1 identifies designated uses for all Tribal waterbodies. Protection will be afforded to the existing and potential designated uses of waters of the trust lands as shown in Table 1. The designated uses of any specifically identified waterbody generally apply to all its tributaries. For unidentified waterbodies, the designated uses will be evaluated on a case-by-case basis. Table 2 provides a monthly calendar of historic, existing, and potential beneficial uses, activities, and human exposure pathways for waterbodies on Karuk trust lands.

Table 1. Designated uses of Tribal waterbodies on Karuk trust land. Tributaries are listed according to the order they enter the Klamath River (downstream list first).

Waterbody	Designated Uses																				
	AGR	AQUA	ASQ	BIOL	COLD	CUL-1	CUL-2	FC	FRSH	GWR	IND	MIGR	MUN	NAV	POW	PRO	RARE	REC-1	REC-2	SPWN	SHELL	WARM	WILD
Klamath River	x		x	x	x	x	x	x	x	x		x		x			x	x	x	x	x		x
Tributaries to Klamath River:																							
Chimmekanee Gulch	x		x	x	x	x	x	x	x	x		x	x				x	x	x	x			x
Cheenitch Creek	x		x	x	x	x	x	x	x	x		x	x				x	x	x	x			x
Rogers Creek	x		x	x	x	x	x	x	x	x		x	x				x	x	x	x			x
Stanshaw Creek	x		x	x	x	x	x	x	x	x		x	x				x	x	x	x			x
Sandy Bar Creek	x		x	x	x	x	x	x	x	x		x	x	x			x	x	x	x			x
Clear Creek	x		x	x	x	x	x	x	x	x		x	x	x			x	x	x	x			x
Indian Creek	x		x	x	x	x	x	x	x	x		x	x	x			x	x	x	x			x
Ranch Gulch	x		x	x	x	x	x	x	x	x		x	x				x	x	x	x			x
Streams in Salmon River sub-basin:																							
Salmon River	x		x	x	x	x	x	x	x	x		x	x	x			x	x	x	x			x
Butler Creek	x		x	x	x	x	x	x	x	x		x	x	x			x	x	x	x			x
Lewis Creek	x		x	x	x	x	x	x	x	x		x	x				x	x	x	x			x
Crapo Creek	x		x	x	x	x	x	x	x	x		x	x				x	x	x	x			x
North Fork Salmon River	x		x	x	x	x	x	x	x	x		x	x	x			x	x	x	x			x
South Fork Salmon River	x		x	x	x	x	x	x	x	x		x	x	x			x	x	x	x			x
Negro Creek	x		x	x	x	x	x	x	x	x		x	x				x	x	x	x			x
Streams in Shasta River sub-basin:																							
un-named tributary to Yreka Creek	x		x	x	x		x	x		x		x	x				x	x	x				x
Ground Waters	x								x	x			x										
Wetlands			x	x	x		x		x	x							x					x	x

Table 2. Monthly calendar of Historic (H), Existing (E), and Potential (P) beneficial uses, activities and exposure pathways for Tribal waterbodies. Cells are shaded by location: Klamath River and tributaries (orange), or Klamath River only (green).

Beneficial Use	Activity Types	Activity Description	Exposure Pathway	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ceremonial (CUL-1, CUL-2)	Annual Ceremonies	wading, drinking, cooking, sweating, submersion/bathing, boating	Ingestion, inhalation, dermal absorption			H,E, P*	H,E, P*	H,E, P*	H,E, P*	H, E	H, E	H, E	H, E		
	Funerals	wading, drinking, cooking, sweating, submersion/bathing, boating		H, E	H, E	H,E	H,E	H,E	H,E	H, E	H, E	H, E	H, E	H, E	H, E
	Marriage	wading, drinking, cooking, sweating, submersion/bathing, boating		H, E	H, E	H,E	H,E	H,E	H,E	H, E	H, E	H, E	H, E	H, E	H, E
Subsistence (CUL-1, CUL-2, FC, SHELL)	Fishing	food, dip netting, wading water/ contact	Ingestion, inhalation, dermal absorption	H, E	H, E	H,E	H,E	H,E	H,E	H, E	H, E	H, E	H, E	H, E	H, E
	Mussels	food, hand gathering, wading/water contact				H,E	H,E	H,E	H,P	H, P	H, P	H, P	H, P		
	Hunting	food, trapping, archery, wading/water contact		H, E	H, E	H,E	H,E	H,E	H,E	H, E	H, E	H, E	H, E	H, E	H, E
	Plants	food, medicinal, hand gathering/ digging, wading/water contact					H,E	H,E	H,E			H, E	H, E		
Utilitarian (CUL-1, CUL-2)	Washing	personal hygene, dish and clothes washing, wading/water contact	Ingestion, inhalation, dermal absorption	H, E	H, E	H,E	H,E	H,E	H,E	H, E	H, E	H, E	H, E	H, E	H, E
	Plants	dyes, fish/hunt materials, basketry, wading/water contact		H, E	H, E	H,E	H,E	H,E	H,E	H, E	H, E	H, E	H, E	H, E	H, E
	Rocks	homes, art, weapons, cooking, wading/water contact		H, E	H, E	H,E	H,E	H,E	H,E	H, E	H, E	H, E	H, E	H, E	H, E
	Cooking	boiling/rinsing/drinking, wading/water contact		H, E	H, E	H,E	H,E	H,E	H,E	H, E	H, E	H, E	H, E	H, E	H, E
	Fish and Wildlife	regalia, clothing, tools, wading/water contact		H, E	H, E	H,E	H,E	H,E	H,E	H, E	H, E	H, E	H, E	H, E	H, E
Recreation (REC-1, REC-2, NAV)	Boating	travel, wading/water contact, drinking	Ingestion, dermal absorption	H, E	H, E	H,E	H,E	H,E	H,E	H, E	H, E	H, E	H, E	H, E	H, E
	Swimming	wading/water contact, submersion, drinking						H,E	H,E	H, E	H, E	H, E			
	Trails	travel, hunting/trapping/fishing, wading/water contact, drinking		H, E	H, E	H,E	H,E	H,E	H,E	H, E	H, E	H, E	H, E	H, E	H, E

*Some ceremonies do not occur every year. Additionally, some ceremonies or parts of ceremonies currently do not occur (but may again the future) because it is unsafe to drink water from the mainstem Klamath River and dams prevent salmon from migrating into the Upper Klamath Basin.

SECTION 4.0 WATER QUALITY OBJECTIVES

The federal Clean Water Act (33 U.S.C. § 303) requires authorized tribes to submit to the Administrator of the U.S. Environmental Protection Agency for approval all new or revised water quality standards. Under federal terminology, water quality standards consist of the designated uses enumerated in Table 1 for the trust lands and the water quality objectives contained in this section. The water quality objectives contained herein are designed to satisfy all tribal and federal requirements.

As new information becomes available, the Department of Natural Resources will review the appropriateness of the objectives contained herein, and revise them if warranted. These objectives will be subject to public hearing at least once during each three-year period following adoption of water quality standards to determine the need for review and modification as appropriate.

The water quality objectives contained herein are a compilation of objectives adopted by the Karuk Tribe. Other water quality objectives and policies within the Klamath basin may apply. Whenever several different objectives exist for the same water quality parameter, the most stringent objective applies.

Controllable water quality factors shall conform to the water quality objectives contained herein. When uncontrollable factors result in the degradation of water quality beyond the levels or limits established herein as water quality objectives, then controllable factors shall not cause further degradation of water quality. Controllable water quality factors are those actions, conditions, or circumstances resulting from man's activities that may influence the quality of the waterbodies of the tribe and that may be reasonably controlled.

Water quality objectives form the basis for establishment of waste discharge requirements, waste discharge prohibitions, or maximum acceptable cleanup standards for all individuals and dischargers. These water quality objectives are considered to be necessary to protect those existing and potential future designated uses listed in Table 1 for the trust lands and to protect existing high quality waters of the Tribal waterbodies. These objectives will be achieved primarily through the establishment of waste discharge requirements for national pollutant discharge elimination system (NPDES) discharges and best management practices (BMPs) for non-point source discharges. Included as a BMP is the use of prevention through prohibitions.

The EPA, in setting waste discharge requirements, will consider, among other things, the potential impact on designated uses within the area of influence of the discharge, the existing quality of receiving waters, and the appropriate water quality objectives. EPA will make a finding as to the designated uses to be protected within the area of influence of the discharge and establish waste discharge requirements to protect those uses and to meet water quality objectives.

4.1 General Objective for All Waterbodies

The following objective shall apply to all Tribal waterbodies: *Whenever the existing quality of water is better than the water quality objectives established herein, such existing quality shall be maintained unless otherwise provided by the provisions of tribal law*.

4.2 Objectives for Surface Waters

In addition to the General Objective, the specific objectives contained in Tables 3 through 11 and the following objectives shall apply for surface waters. These objectives apply to the maximum extent allowed by law. To the extent that the Karuk Tribe lacks jurisdiction, the objectives are extended as a recommendation to the applicable regulatory authority

Ammonia

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

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

Where salmonids in the genus *Oncorhynchus* are present:

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

Where salmonids in the genus *Oncorhynchus* are absent:

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

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

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

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

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

Bacteria

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

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

In waters designated for cultural contact water (CUL-1) and contact recreation (REC-1):
1. The geometric mean of *E. coli* or *enterococci* concentration shall not exceed 100 or 30 cfu/mL, respectively, in any 30 day period, nor shall the statistical threshold value (STV) of *E.coli* or *enterococci* concentration exceed 320 or 100 CFU/mL, respectively, in any 30 day period.
2. The median fecal coliform concentration based on a minimum of not less than five samples for any 30-day period shall not exceed 50/100 ml, nor shall more than ten percent of total samples during any 30-day period exceed 400/100 ml
At all areas where shellfish may be harvested for human consumption (SHELL), the fecal coliform concentration throughout the water column shall not exceed 43/100 ml for a 5-tube decimal dilution test or 49/100 ml when a three-tube decimal dilution test is used (National Shellfish Sanitation Program, Manual of Operation).

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

Biostimulatory Substances

Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses.

Copper

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

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

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

Cyanobacterial toxins and cyanobacteria cell density

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

Table 4 Cyanobacterial toxin and cell density criteria.

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

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

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

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

Chemical Constituents

Waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of chemical constituents in excess of the limits listed in Table 10 and Table 11.

Waters designated for use as agricultural supply (AGR) shall not contain concentrations of chemical constituents in amounts which adversely affect such beneficial use.

Numerical water quality objectives for individual waters are contained in Table 6.

Color

Waters shall be free of coloration that causes nuisance or adversely affects beneficial uses.

Dissolved Oxygen

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

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

Floating Material

Waters shall not contain floating material, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect beneficial uses.

Nutrients and Organic Matter

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

Oil and Grease

Waters shall not contain oils, greases, waxes, or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water, that cause nuisance, or that otherwise adversely affect beneficial uses.

Pesticides

No individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses. There shall be no bioaccumulation of pesticide concentrations found in bottom sediments or aquatic life.

Waters designated for use as domestic or municipal supply shall not contain concentrations of pesticides in excess of the limiting concentrations listed in Table 10. Waters designated Aquaculture (AQUA); Cold Freshwater Habitat (COLD); Rare, Threatened, or Endangered Species (RARE); Spawning, Reproduction, and/or Early Development (SPWN); and Warm Freshwater

Habitat (WARM) shall not contain concentrations of pesticides in excess of the limiting concentrations listed in Table 9.

pH

The pH shall conform to those limits listed in Table 6. For waters not listed in Table 6 and where pH objectives are not prescribed, the pH shall not be depressed below 6.5 nor raised above 8.5.Changes in normal ambient pH levels shall not exceed 0.5 units within the range specified above in fresh waters with designated COLD or WARM beneficial uses.

Radioactivity

Radionuclides shall not be present in concentrations which are deleterious to human, plant, animal or aquatic life nor which result in the accumulation of radionuclides in the food web to an extent which presents a hazard to human, plant, animal, or indigenous aquatic life.
Waters designated for use as municipal and domestic supply (MUN) shall not contain concentrations of radionuclides in excess of the limits listed in Table 11.

Riparian Area

Degradation shall not occur that adversely affects riparian areas which are critical to protecting the quality of a river, lake, or tributary.

Sediment

The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.

Settleable Material

Waters shall not contain substances in concentrations that result in deposition of material that causes nuisance or adversely affect beneficial uses.

Suspended Material

Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.

Tastes and Odors

Waters shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin, or that cause nuisance or adversely affect beneficial uses.

Numeric water quality objectives with regards to taste and odor thresholds have been developed by the EPA. These numeric objectives, as well as those available in the technical literature, are incorporated into waste discharge requirements and cleanup and abatement orders as appropriate.

Temperature

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

At no time or place shall the temperature of any cold freshwater habitat (COLD) water be increased by more than 2.8°C above natural receiving water temperature.

The seven-day average of daily maximum (7DADM) ambient water temperatures shall conform to the limits listed in Table 3, year-round. These objectives are for ambient water temperatures that represent the main portion of flow and therefore cannot be solely met by presence of localized cold water refugia.

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

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

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

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

Toxicity

All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life. Compliance with this objective will be determined by use of indicator organisms for acute and chronic toxicity testing, analyses of species diversity, population density, growth anomalies, bioassays of appropriate duration, or other appropriate methods as specified by the Department of Natural Resources.

The survival of aquatic life in surface waters subjected to a waste discharge, or other controllable water quality factors, shall not be less than that for the same water body in areas unaffected by the waste discharge, or when necessary for other control water that is consistent with the requirements for "experimental water" as described in *Standard Methods for the Examination of Water and Wastewater*, 20th Edition (1998). As a minimum, compliance with this objective as stated in the previous sentence shall be evaluated with a 96-hour bioassay.

In addition, effluent limits based upon acute bioassays of effluents will be prescribed. Where appropriate, additional numerical receiving water objectives for specific toxicants will be established as sufficient data become available, and source control of toxic substances will be encouraged.

Turbidity

Turbidity shall not be increased more than 20 percent above naturally occurring background levels. Allowable zones of dilution within which higher percentages can be tolerated may be defined for specific discharges upon the issuance of discharge permits or waiver thereof.

Table 6 Specific water quality objectives for Tribal waterbodies

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

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

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

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

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

Table 7 Dissolved oxygen objectives for the mainstem Klamath River

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

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

Table 8 Nutrient and organic Matter objectives for tribal waterbodies. TP = Total Phosphorus (units: mg/L as P), TN = Total Nitrogen (units: mg/L as N), $CBOD_5$ = Carbonaceous Biochemical Oxygen Demand.

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

Table 9 Water quality objectives for aquatic life & organism consumption.

#	Priority Pollutant	CAS Number	Freshwater:		Human Health for the consumption of:	
			CMC (chronic) (µg/L)	CMC (acute) (µg/L)	Water + Organism (µg/L)	Organism Only (µg/L)
1	Antimony	7440360			5.6 B	640 B
2	Arsenic	7440382	340 A,D,K	150 A,D,K	0.018 C,S	0.14 C, S
3	Beryllium	7440417			Z	
4	Cadmium	7440439	2 D,E,K	0.25 D,E,K	Z	
5a	Chromium (III)	16065831	570 D,E,K	74 D,E,K	Z Total	
5b	Chromium (VI)	18540299	16 D,K	11 D,K	Z Total	
6	Copper	7440508	See site-specific criteria above		1300 U	
7	Lead	7439921	65 D,E	2.5 D,E		
8a	Mercury	7439976	1.4 D,K	0.77 D,K		
8b	Methylmercury	22967926				0.3 mg/kg J
9	Nickel	7440020	470 D,E,K	52 D,E,K	610 B	4600 B
10	Selenium	7782492	L, T	5 T	170 Z	4200
11	Silver	7440224	3.2 D,E,G			
12	Thallium	7440280			0.24	0.47
13	Zinc	7440666	120 D,E,K	120 D,E,K	7400 U	26000 U
14	Cyanide	57125	22 K,Q	5.2 K,Q	140 jj	140 jj
15	Asbestos	1332214			7 million fibers/L I	
16	2,3,7,8-TCDD (Dioxin)	1746016			0.000000005 C	0.0000000051 C
17	Acrolein	107028	3	3	6 II	9 II
18	Acrylonitrile	107131			0.051 B,C	0.25 B,C
19	Benzene	71432			2.2 B,C	51 B,C
20	Bromoform	75252			4.3 B,C	140 B,C
21	Carbon Tetrachloride	56235			0.23 B,C	1.6 B,C
22	Chlorobenzene	108907			130 Z,U	1600 U
23	Chlorodibromomethane	124481			0.4 B,C	13 B,C
24	Chloroethane	75003				
25	2-Chloroethylvinyl Ether	110758				
26	Chloroform	67663			5.7 C	470 C
27	Dichlorobromomethane	75274			0.55 B,C	17 B,C
28	1,1-Dichloroethane	75343				
29	1,2-Dichloroethane	107062			0.38 B,C	37 B,C
30	1,1-Dichloroethylene	75354			330	7,100
31	1,2-Dichloropropane	78875			0.5 B,C	15 B,C
32	1,3-Dichloropropene	542756			0.34 C	21 C
33	Ethylbenzene	100414			530	2,100

#	Priority Pollutant	CAS Number	Freshwater:		Human Health for the consumption of:	
			CMC (chronic) (µg/L)	CMC (acute) (µg/L)	Water + Organism (µg/L)	Organism Only (µg/L)
34	Methyl Bromide	74839			47 B	1500 B
35	Methyl Chloride	74873				
36	Methylene Chloride	75092			4.6 B,C	590 B,C
37	1,1,2,2-Tetrachloroethane	79345			0.17 B,C	4 B,C
38	Tetrachloroethylene	127184			0.69 C	3.3 C
39	Toluene	108883			1,300 Z	15,000
40	1,2-Trans-Dichloroethylene	156605			140 Z	10,000
41	1,1,1-Trichloroethane	71556			Z	
42	1,1,2-Trichloroethane	79005			0.59 B,C	16 B,C
43	Trichloroethylene	79016			2.5 C	30 C
44	Vinyl Chloride	75014			0.025 C,kk	2.4 C,kk
45	2-Chlorophenol	95578			81 B,U	150 B,U
46	2,4-Dichlorophenol	120832			77 B,U	290 B,U
47	2,4-Dimethylphenol	105679			380 B	850 B,U
48	2-Methyl-4,6Dinitrophenol	534521			13	280
49	2,4-Dinitrophenol	51285			69 B	5,300 B
50	2-Nitrophenol	88755				
51	4-Nitrophenol	100027				
52	3-Methyl-4-Chlorophenol	59507			U	U
53	Pentachlorophenol	87865	19 F,K	15 F,K	0.27 B,C	3 B,C
54	Phenol	108952			10000 ll,U	860000 ll,U
55	2,4,6-Trichlorophenol	88062			1.4 B,C	2.4 B,C,U
56	Acenaphthene	83329			670 B,U	990 B,U
57	Acenaphthylene	208968				
58	Anthracene	120127			8300 B	40,000 B
59	Benzidine	92875			0.000086 B,C	0.0002 B,C
60	Benzo(a) Anthracene	56553			0.0038 B,C	0.018 B,C
61	Benzo(a) Pyrene	50328			0.0038 B,C	0.018 B,C
62	Benzo(b) Fluoranthene	205992			0.0038 B,C	0.018 B,C
63	Benzo(ghi) Perylene	191242				
64	Benzo(k) Fluoranthene	207089			0.0038 B,C	0.018 B,C
65	Bis(2-Chloroethoxy) Methane	111911				
66	Bis(2-Chloroethyl) Ether	111444			0.03 B,C	0.53 B,C
67	Bis(2-Chloroisopropyl) Ether	108601			1400 B	65000 B

#	Priority Pollutant	CAS Number	Freshwater:		Human Health for the consumption of:	
			CMC (chronic) (µg/L)	CMC (acute) (µg/L)	Water + Organism (µg/L)	Organism Only (µg/L)
68	Bis(2-Ethylhexyl) Phthalate	117817			1.2 B,C	2.2 B,C
69	4-Bromophenyl Phenyl Ether	101553				
70	Butylbenzyl Phthalate	85687			1500 B	1900 B
71	2-Chloronaphthalene	91587			1000 B	1600 B
72	4-Chlorophenyl Phenyl Ether	7005723				
73	Chrysene	218019			0.0038 B,C	0.018 B,C
74	Dibenzo(a,h)Anthracene	53703			0.0038 B,C	0.018 B,C
75	1,2-Dichlorobenzene	95501			420	1,300
76	1,3-Dichlorobenzene	541731			320	960
77	1,4-Dichlorobenzene	106467			63	190
78	3,3'-Dichlorobenzidine	91941			0.021 B,C	0.028 B,C
79	Diethyl Phthalate	84662			17000 B	44000 B
80	Dimethyl Phthalate	131113			270,000	1,100,000
81	Di-n-Butyl Phthalate	84742			2000 B	4500 B
82	2,4-Dinitrotoluene	121142			0.11 C	3.4 C
83	2,6-Dinitrotoluene	606202				
84	Di-n-Octyl Phthalate	117840				
85	1,2-Diphenylhydrazine	122667			0.036 B,C	0.2 B,C
86	Fluoranthene	206440			130 B	140 B
87	Fluorene	86737			1100 B	5300 B
88	Hexachlorobenzene	118741			0.00028 B,C	0.00029 B,C
89	Hexachlorobutadiene	87683			0.44 B,C	18 B,C
90	Hexachlorocyclopentadiene	77474			40 U	1100 U
91	Hexachloroethane	67721			1.4 B,C	3.3 B,C
92	Ideno(1,2,3-cd)Pyrene	193395			0.0038 B,C	0.018 B,C
93	Isophorone	78591			35 B,C	960 B,C
94	Naphthalene	91203				
95	Nitrobenzene	98953			17 B	690 B, U
96	N-Nitrosodimethylamine	62759			0.00069 B,C	3 B,C
97	N-Nitrosodi-n-Propylamine	621647			0.005 B,C	0.51 B,C
98	N-Nitrosodiphenylamine	86306			3.3 B,C	6 B,C
99	Phenanthrene	85018				
100	Pyrene	129000			830 B	4000 B
101	1,2,4-Trichlorobenzene	120821			35	70

#	Priority Pollutant	CAS Number	Freshwater:		Human Health for the consumption of:	
			CMC (chronic) (µg/L)	CMC (acute) (µg/L)	Water + Organism (µg/L)	Organism Only (µg/L)
102	Aldrin	309002	3 G		0.000049 B,C	0.00005 B,C
103	alpha-BHC	319846			0.0026 B,C	0.0049 B,C
104	beta-BHC	319857			0.0091 B,C	0.017 B,C
105	gamma-BHC (Lindane)	58899	0.95 K		0.98	1.8
106	delta-BHC	319868				
107	Chlordane	57749	2.4 G	0.0043 G,aa	0.0008 B,C	0.00081 B,C
108	4,4'-DDT	50293	1.1 G,ii	0.001 G,aa,ii	0.00022 B,C	0.00022 B,C
109	4,4'-DDE	72559			0.00022 B,C	0.00022 B,C
110	4,4'-DDD	72548			0.00031 B,C	0.00031 B,C
111	Dieldrin	60571	0.24 K	0.056 K	0.000052 B,C	0.000054 B,C
112	alpha-Endosulfan	959988	0.22 G,Y	0.056 G,Y	62 B	89 B
113	beta-Endosulfan	33213659	0.22 G,Y	0.056 G,Y	62 B	89 B
114	Endosulfan Sulfate	1031078			62 B	89 B
115	Endrin	72208	0.086 K	0.036 K	0.059	0.06
116	Endrin Aldehyde	7421934			0.29 B	0.3 B
117	Heptachlor	76448	0.52 G	0.0038 G,aa	0.000079 B,C	0.000079 B,C
118	Heptachlor Epoxide	1024573	0.52 G,V	0.0038 G,V,aa	0.000039 B,C	0.000039 B,C
119	Polychlorinated Biphenyls (PCBs)			0.014 N,aa	0.000064 B,C,N	0.000064 B,C,N
120	Toxaphene	8001352	0.73	0.0002 aa	0.00028 B,C	0.00028 B,C
	Carbaryl	63252	2.1	2.1		
	Alkalinity	—		20000		
	Aluminum pH 6.5 – 9.0	7429905	750 zz	87 zz		
	Barium	7440393			1,000	
	Carbaryl	63252	2.1	2.1		
	Chloride	16887006	860,000	230,000		
	Chlorine	7782505	19	11	yy	
	Chlorophenoxy Herbicide (2,4,5,-TP)	93721			10	
	Chlorophenoxy Herbicide (2,4-D)	94757			100 yy	
	Chloropyrifos	2921882	0.083	0.041		
	Demeton	8065483		0.1		
	Ether, Bis(Chloromethyl)	542881			0.0001	0.00029
	Guthion	86500		0.01		
	Hexachlorocyclo-hexane-Technical	608731			0.0123	0.0414
	Iron	7439896		1000	300	
	Malathion	121755		0.1		
	Manganese	7439965			50	100

#	Priority Pollutant	CAS Number	Freshwater:		Human Health for the consumption of:	
			CMC (chronic) (µg/L)	CMC (acute) (µg/L)	Water + Organism (µg/L)	Organism Only (µg/L)
	Methoxychlor	72435		0.03	100 yy	
	Mirex	2385855		0.001		
	Nitrates	14797558			10,000	
	Nitrosamines	—			0.0008	1.24
	Dinitrophenols	25550587			69	5300
	Nonylphenol	84852153	28	28		
	Nitrosodibutylamine	924163			0.0063	0.22
	Nitrosodiethylamine	55185			0.0008	1.24
	Nitrosopyrrolidine	930552			0.016	34
	Diazinon	333415	0.17	0.17		
	Parathion	56382	0.065	0.013		
	Pentachlorobenzene	608935			1.4	1.5
	Phosphorus Elemental	7723140				
	Solids Dissolved and Salinity	—	250,000			
	Sulfide-Hydrogen Sulfide	7783064		2		
	Tetrachlorobenzene,1,2,4,5	95943			0.97	1.1
	Tributyltin (TBT)	—	0.46	0.072		
	Trichlorophenol,2,4,5	95954			1800 xx	3600 xx

Footnotes to Table 9

A This water quality criterion was derived from data for arsenic (III), but is applied here to total arsenic, which might imply that arsenic (III) and arsenic (V) are equally toxic to aquatic life and that their toxicities are additive. No data are known to be available concerning whether the toxicities of the forms of arsenic to aquatic organisms are additive.

B This criterion has been revised to reflect The Environmental Protection Agency's q1* or RfD, as contained in the Integrated Risk Information System (IRIS) as of May 17, 2002. The fish tissue bioconcentration factor (BCF) from the 1980 Ambient Water Quality Criteria document was retained in each case.

C This criterion is based on carcinogenicity of 10^{-6} risk.

D Freshwater criteria for metals are expressed in terms of the dissolved metal in the water column. The water quality criteria value was calculated by using the previous 304(a) aquatic life criteria expressed in terms of total recoverable metal, and multiplying it by a conversion factor (CF). The term "Conversion Factor" (CF) represents the recommended conversion factor for converting a metal criterion expressed as the total recoverable fraction in the water column to a criterion expressed as the dissolved fraction in the water column. (Conversion Factors for saltwater CCCs are not currently available. Conversion factors derived for saltwater CMCs have been used for both saltwater CMCs and CCCs). See "Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic Life Metals Criteria," October 1, 1993, by Martha G. Prothro, Acting Assistant Administrator for Water, available from the Water Resource center and 40CFR§131.36(b)(1). Conversion Factors applied in the table can be found in Appendix A to the Preamble-Conversion Factors for Dissolved Metals.

E The freshwater criterion for this metal is expressed as a function of hardness (mg/L) in the water column. The value given here corresponds to a hardness of 100 mg/L. Criteria values for other hardness may be calculated from the following: CMC (dissolved) = $\exp\{m_A [\ln(\text{hardness})] + b_A\}$ (CF), or CCC (dissolved) = $\exp\{m_C [\ln(\text{hardness})] + b_C\}$ (CF)
and the parameters specified in Appendix B-Parameters for Calculating Freshwater Dissolved Metals Criteria That Are Hardness-Dependent.

F Freshwater aquatic life values for pentachlorophenol are expressed as a function of pH, and are calculated as follows: CMC = exp(1.005(pH)-4.869); CCC = exp(1.005(pH)-5.134). Values displayed in table correspond to a pH of 7.8.

G This Criterion is based on 304(a) aquatic life criterion issued in 1980, and was issued in one of the following documents: Aldrin/Dieldrin (EPA 440/5-80-019), Chlordane (EPA 440/5-80-027), DDT (EPA 440/5-80-038), Endosulfan (EPA 440/5-80-046), Endrin (EPA 440/5-80-047), Heptachlor (EPA 440/5-80-052), Hexachlorocyclohexane (EPA 440/5-80-054), Silver (EPA 440/5-80-071).

I This criterion for asbestos is the Maximum Contaminant Level (MCL) developed under the Safe Drinking Water Act (SDWA).

J This fish tissue residue criterion for methyl mercury is based on a total fish consumption rate of 0.0175 kg/day.

K This criterion is based on a 304(a) aquatic life criterion that was issued in the 1995 Updates: Water Quality Criteria Documents for the Protection of Aquatic Life in Ambient Water, (EPA 820-B-96-001, September 1996). This value was derived using the GLI Guidelines (60 FR 15393-15399, March 23, 1995; 40CFR132 Appendix A); the difference between the 1985 Guidelines and the GLI Guidelines are explained on page iv of the 1995 Updates. None of the decisions concerning the derivation of this criterion were affected by any considerations that are specific to the Great Lakes.

L The CMC = 1/[(f1/CMC1) + (f2/CMC2)] where f1 and f2 are the fractions of total selenium that are treated as selenite and selenate, respectively, and CMC1 and CMC2 are 185.9 g/l and 12.82 g/l, respectively.

N This criterion applies to total pcbs, (e.g., the sum of all congener or all isomer or homolog or Aroclor analyses.)

Q This water quality criterion is expressed as g free cyanide (as CN)/L.

S This water quality criterion for arsenic refers to the inorganic form only.

T This water quality criterion for selenium is expressed in terms of total recoverable metal in the water column. It is scientifically acceptable to use the conversion factor (0.996-CMC or 0.922-CCC) that was used in the GLI to convert this to a value that is expressed in terms of dissolved metal.

U The organoleptic effect criterion is more stringent than the value for priority toxic pollutants.

V This value was derived from data for heptachlor and the criteria document provides insufficient data to estimate the relative toxicities of heptachlor and heptachlor epoxide.

Y This value was derived from data for endosulfan and is most appropriately applied to the sum of alpha-endosulfan and beta-endosulfan.

Z A more stringent MCL has been issued by EPA. Refer to drinking water regulations (40 CFR 141) or Safe Drinking Water Hotline (1-800-426-4791) for values.

aa This criterion is based on a 304(a) aquatic life criterion issued in 1980 or 1986, and was issued in one of the following documents: Aldrin/Dieldrin (EPA 440/5-80-019), Chlordane (EPA 440/5-80027), DDT (EPA 440/5-80-038), Endrin (EPA 440/5-80-047), Heptachlor ((EPA 440/5-80-052), Polychlorinated biphenyls (EPA 440/5-80-068), Toxaphene (EPA 440/5-86-006). This CCC is currently based on the Final Residue Value (FRV) procedure.

ii This criterion applies to DDT and its metabolites (i.e., the total concentration of DDT and its metabolites should not exceed this value).

jj This water quality criterion is expressed as total cyanide, even though the IRIS RFD we used to derive the criterion is based on free cyanide.

kk This water quality criterion was derived using the cancer slope factor of 1.4 (LMS exposure from birth).

ll This criterion has been revised to reflect the Environmental Protection Agency's cancer slope factor (CSF) or reference dose (RfD), as contained in the Integrated Risk Information System (IRIS) as of (Final FR Notice June 10, 2009). The fish tissue bioconcentration factor (BCF) from the 1980 Ambient Water Quality Criteria document was retained in each case.

mm The available toxicity data, when evaluated using the procedures described in the "Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses" indicate that freshwater aquatic

life should be protected if the 24-hour average and four-day average concentrations do not respectively exceed the acute and chronic criteria concentrations calculated by the Biotic Ligand Model.

zz The organoleptic effect criterion is more stringent than the value presented in the non-priority pollutants table.

yy A more stringent Maximum Contaminant Level (MCL) has been issued by EPA under the Safe Drinking Water Act.

zz This value for aluminum is expressed in terms of total recoverable metal in the water column.

Additional Notes on Table 9

1. Table 6 is based largely on the 2009 version of the U.S. EPA's National Recommended Water Quality Criteria (available at: http://water.epa.gov/scitech/swguidance/standards/criteria/current/upload/nrwqc-2009.pdf), since the 2009 version is provided in a more condensed format than the most current version (available at http://water.epa.gov/scitech/swguidance/standards/criteria/current). For the sake of brevity, footnotes and additional notes that are not completely relevant are not included. For pollutants for which U.S. EPA has added or modified recommended criteria since 2009 (for example, carbaryl), then the EPA's current recommended criteria was used. In the Table 6, "Priority" pollutants are numbered 1 to 120 while "Non-priority" pollutants are not numbered

2. Criteria Maximum Concentration and Criterion Continuous Concentration
The Criteria Maximum Concentration (CMC) is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed briefly without resulting in an unacceptable effect. The Criterion Continuous Concentration (CCC) is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect.

3. Criteria Recommendations for Priority Pollutants, Non-Priority Pollutants and Organoleptic Effects
This compilation lists all priority toxic pollutants and some non-priority toxic pollutants, and both human health effect and organoleptic effect criteria issued pursuant to CWA §304(a). Blank spaces indicate that EPA has no CWA §304(a) criteria recommendations. For a number of non-priority toxic pollutants not listed, CWA §304(a) "water + organism" human health criteria are not available, but EPA has published MCLs under the SDWA that may be used in establishing water quality standards to protect water supply designated uses. Because of variations in chemical nomenclature systems, this listing of toxic pollutants does not duplicate the listing in Appendix A of 40 CFR Part 423. Also listed are the Chemical Abstracts Service CAS registry numbers, which provide a unique identification for each chemical.

4. Calculation of Dissolved Metals Criteria

The 304(a) criteria for metals, shown as dissolved metals, are calculated in one of two ways. For freshwater metals criteria that are hardness-dependent, the dissolved metal criteria were calculated using a hardness of 100 mg/l as CaCO3 for illustrative purposes only. Freshwater metals' criteria that are not hardness-dependent are calculated by multiplying the total recoverable criteria before rounding by the appropriate conversion factors. The final dissolved metals' criteria in the table are rounded to two significant figures. Information regarding the calculation of hardness dependent conversion factors is included in footnote E above.

4a. Conversion Factors for Dissolved Metals

	Conversion factor (CF) for freshwater acute criteria	Conversion factor (CF) for freshwater chronic criteria
Arsenic	1.000	1.000
Cadmium	1.136672-[(ln hardness)(0.041838)]	1.101672-[(ln hardness)(0.041838)]
Chromium III	0.316	0.860
Chromium VI	0.982	0.962
Lead	1.46203-[(ln hardness)(0.145712)]	1.46203-[(ln hardness)(0.145712)]
Mercury	0.85	0.85
Nickel	0.998	0.997
Selenium	—	—
Silver	0.85	—
Zinc	0.978	0.986

4b. Parameters for Calculating Freshwater Dissolved Metals Criteria That Are Hardness-Dependent

					Freshwater Conversion Factors (CF)	
Chemical	**mA**	**bA**	**mC**	**bC**	**CMC**	**CCC**
Cadmium	1.0166	-3.924	0.7409	-4.719	1.136672-[(*ln*hardness)(0.041838)]	1.101672-[(*ln*hardness)(0.041838)]
Chromium III	0.8190	3.7256	0.8190	0.6848	0.316	0.860
Lead	1.273	-1.460	1.273	-4.705	1.46203-[(*ln*hardness)(0.145712)]	1.46203-[(*ln*hardness)(0.145712)]
Nickel	0.8460	2.255	0.8460	0.0584	0.998	0.997
Silver	1.72	-6.59	—	—	0.85	—
Zinc	0.8473	0.884	0.8473	0.884	0.978	0.986

Hardness-dependant metals' criteria may be calculated from the following:

CMC (dissolved) = exp{mA [ln(hardness)]+ bA} (CF)

CCC (dissolved) = exp{mC [ln(hardness)]+ bC} (CF)

Table 10 Inorganic, organic, and fluoride concentrations not to be exceeded in domestic or municipal supply[1]

Constituent	Limiting Concentration (mg/L) Lower	Optimum	Upper	Maximum Contaminant Level, mg/L
Fluoride [2]				
53.7 and below	0.9	1.2	1.7	2.4
53.8 to 58.3	0.8	1.1	1.5	2.2
58.4 to 63.8	0.8	1.0	1.3	2.0
63.9 to 70.6	0.7	0.9	1.2	1.8
70.7 to 79.2	0.7	0.8	1.0	1.6
79.3 to 90.5	0.6	0.7	0.8	1.4
Inorganic Chemicals				
* Aluminum				1.0
Arsenic				0.05
Barium				1.0
Cadmium				0.01
Chromium				0.05
Lead				0.05
Mercury				0.002
Nitrate-N (as NO_3)				45
Selenium				0.01
Silver				0.05
Organic Chemicals				
(a) Chlorinated Hydrocarbons				
Endrin				0.0002
Lindane				0.004
Methoxychlor				0.1
Toxaphene				0.005
(b) Chlorophenoxys				
2,4-D				0.1
2,4,5-TP (Silvex)				0.01
(c) Synthetics				
Atrazine				0.003
Bentazon				0.018
Benzene				0.001
Carbon Tetrachloride				0.0005
Carbofuran				0.018
Chlordane				0.0001

Table 10 Inorganic, organic, and fluoride concentrations not to be exceeded in domestic or municipal supply[1] (continued)

Constituent	Limiting Concentration (mg/L) Lower	Optimum	Upper	Maximum Contaminant Level, mg/L
(c) Synthetics (continued)				
1,2-Dibromo-3-chloropropane				0.0002
1,4-Dichlorobenzene				0.005
1,1-Dichloroethane				0.005
1,2-Dichloroethane				0.0005
cis-1,2-Dichloroethylene				0.006
trans-1,2-Dichloroethylene				0.01
1,1-Dichloroethylene				0.006
1,2-Dichloropropane				0.005
1,3-Dichloropropene				0.0005
Di(2-ethylhexyl)phthalate				0.004
* Ethylbenzene				0.680
Ethylene Dibromide				0.00002
Glyphosate				0.7
Heptachlor				0.00001
Heptachlor epoxide				0.00001
Molinate				0.02
Monochlorobenzene				0.030
Simazine				0.010
1,1,2,2-Tetrachloroethane				0.001
Tetrachloroethylene				0.005
* Thiobencarb				0.07
1,1,1-Trichloroethane				0.200
1,1,2-Trichloroethane				0.032
Trichloroethylene				0.005
Trichlorofluoromethane				0.15
1,1,2-Trichloro-1,2,2-Trifluoroethane				1.2
Vinyl Chloride				0.0005
* Xylenes [3]				1.750

[1] The values included in this table are maximum contaminant levels for the purposes of ground water and surface water discharges and cleanup. Other water quality objectives (e.g., taste and odor thresholds or other secondary MCLs) that are more stringent may apply.

[2] Annual Average of Maximum Daily Air Temperature, °F Based on temperature data obtained for a minimum of five years. The average concentration of fluoride during any month, if added, shall not exceed the upper concentration. Naturally occurring fluoride concentration shall not exceed the maximum contaminant level.

[3] Maximum Contaminant Level is for either a single isomer or the sum of the isomers.

* Constituents marked with an * also have taste and odor thresholds that are more stringent than the MCL listed. Taste and odor thresholds have also been developed for other constituents not listed in this table.

Table 11. Radionuclide objectives for municipal and domestic supply (MUN)

Constituent	Units	Maximum Contaminant Level
Gross Alpha particle activity (including Radium-226 but excluding Radon and Uranium)	pCi/L	15
Gross Beta particle activity	pCi/L	50
Radium-226 plus Radium-228	pCi/L	5
Strontium-90	pCi/L	8
Tritium	pCi/L	20,000
Uranium	pCi/L	20

4.3 Water Quality Objectives for Ground Waters

In addition to the General Objective in Section 4.1, the following objectives shall apply for ground waters.

Tastes and Odors
Ground waters shall not contain taste- or odor-producing substances in concentrations that cause nuisance or adversely affect beneficial uses.

Numeric water quality objectives have been developed by the Karuk Tribe. These numeric objectives, as well as those available in the technical literature, are incorporated into waste discharge requirements and cleanup and abatement orders as appropriate.

Bacteria
In ground waters used for municipal and domestic supply (MUN), the median of the most probable number (MPN) of coliform organisms over any 7-day period shall be less than 1.1 MPN/100 mL, less than 1 CFU/100 mL, or absent.

Radioactivity
Ground waters used for municipal and domestic supply (MUN) shall not contain concentrations of radionuclides in excess of the limits listed in Table 11.

Chemical Constituents
Ground waters used for municipal and domestic supply (MUN) shall not contain concentrations of chemical constituents in excess of the limits listed in Table 10.

Ground waters used for agricultural supply (AGR) shall not contain concentrations of chemical constituents in amounts that adversely affect such beneficial use.

Numerical objectives for certain constituents for individual ground waters are contained in Table 6.

As part of the tribe's continuing planning process, data will be collected and numerical water quality objectives will be developed for those mineral and nutrient constituents where sufficient information is presently not available for the establishment of such objectives.

4.4 Procedures for Site Specific Modifications of the Numeric Criteria

The numeric criteria in sections 1 through 4 shall apply to all waters for which the Karuk Tribe determines that designated uses are attainable that provide for the protection and propagation of fish, shellfish, and wildlife, and for recreation in and on the water.

The Karuk Tribe's Director of Natural Resources may, at his discretion, modify the numeric water quality criteria in sections 4.1 through1 through 4.3 as they pertain to a specific waterbody or portion thereof.

(i) Any such modified criteria shall be based on sound scientific rationale, contain sufficient parameters or constituents, and shall protect the use that the Karuk Tribe determines is attainable.

(ii) Prior to modifying any numeric criteria in sections 4.1 through 4.3, the Karuk Tribe's Director of Natural Resources shall provide for public notice of and comment on such proposed modification. For any such proposed modification, the Karuk Tribe's Director of Natural Resources shall make available to the public an explanation of the basis for each proposed modification. This explanation shall be made available to the public not later than the date of public notice.

(iii) Nothing in this section shall limit the Karuk Tribe's Director of Natural Resources's authority to modify the numeric water quality criteria in sections 4.1 through1 through 4.3.

(iv) The Karuk Tribe's Director of Natural Resources shall maintain and make available to the public an updated list of modified criteria adopted pursuant to section 4.4.

4.5 Narrative Toxicity Criterion

The following statement is adopted as the narrative toxicity criterion:

Ground water, surface water, wetlands, and sediment shall be free from substances attributable to human-caused point source or nonpoint source discharges in amounts, concentrations, or combinations which are toxic to humans, animals, plants, or aquatic life.

4.6 Outstanding Waters

The Director of the Department of Natural Resources will use rulemaking to classify a Tribal waterbody as outstanding waters.

The Director of the Department of Natural Resources may adopt, by rule, site-specific water quality standards to maintain and protect existing water quality in outstanding waters.
Any Tribal member or reservation resident may nominate a Tribal water for classification as outstanding waters by filing a petition for rule adoption with the Department of Natural Resources. A petition for rule adoption to classify a Tribal waterbody as outstanding waters should include the following components:

- A map and a description of the Tribal waterbody
- A written statement in support of the nomination, including specific reference to the applicable criteria for outstanding waters classification

- Supporting evidence demonstrating that one or more of the applicable outstanding waters criteria has been met

- Available water quality data relevant to establishing baseline water quality of the proposed outstanding waters

The Director of the Department of Natural Resources may classify a Tribal waterbody as outstanding waters upon finding that the Tribal waterbody is an outstanding Tribal resource based upon one of the following criteria:

- The Tribal waterbody is of exceptional cultural, recreational or ecological significance because of its unique attributes including, but not limited to, those related to the cultural value, geology, flora, fauna, water quality, aesthetic value, or the wilderness characteristics of the Tribal waterbody.

- Threatened or endangered species are known to be associated with the Tribal waterbody. The existing water quality is essential to the maintenance and propagation of a threatened species and provides critical habitat for this species. Endangered or threatened species are identified in the Federally Listed Threatened and Endangered Species.

The following Tribal waterbody is classified as outstanding waters:

- Ishi Pishi Falls (Located on the Klamath River near the town of Somes Bar, California).

The specific locations of unlisted outstanding waters of cultural significance will be maintained as proprietary by the Director of the Department of Natural Resources.

The following water quality standards apply to listed and unlisted outstanding waters:

> *There shall be no degradation of water quality caused by a point or non-point source discharge. Public land managers are accountable for water quality protection. No exemption is allowed for logging or grazing as part of the accountability of public land managers for water quality protection.*

4.7 Antidegradation Policy

The purpose of the Karuk Tribe's Antidegradation Policy is to promote the maintance and protection of existing water quality. This policy is implemented through the Karuk Tribe's Forest Management Plan and Anti-Pollution Ordinance. The Karuk Tribe's Director of Natural Resources will determine whether there is any degradation of water quality on a pollutant by pollutant basis using the following tiered system:

Tier 1: The level of water quality necessary to protect existing uses of Tribal waterbodies, including wetlands, will be maintained and protected. No degradation of existing water quality is permitted where the existing water quality does not meet the applicable water quality standard.

Tier 2: Where existing water quality is better than the applicable water quality standard for Tribal waterbodies, including wetlands, the existing water quality will be maintained and protected. However, the Department of Natural Resources may allow limited degradation of existing water quality provided that (1) the Karuk Tribe have held a public hearing on whether degradation should be allowed pursuant to the general public hearing procedures, and (2) the Department of Natural Resources makes all of the following findings:

- The level of water quality necessary to protect existing uses is fully protected.
- The highest statutory and regulatory requirements for all new and existing point sources as set forth in the CWA are achieved.
- All cost-effective and reasonable best management practices for nonpoint source control are implemented.
- Allowing lower water quality is necessary to accommodate important cultural, economic, or social development in the area in which the Tribal water is located.

Tier 3: Existing water quality that is classified as outstanding waters or that the Department of Natural Resources has proposed for classification as outstanding waters will be maintained and protected. The Department of Natural Resources will not allow limited degradation of outstanding waters.

Outstanding waters will be classified in a manner consistent with Section 316 of the CWA where a potential water quality impairment associated with a thermal discharge is involved.

SECTION 5.0 SECTION 401 WATER QUALITY CERTIFICATION

CWA Section 401 water quality certification delegates the Karuk Tribe the authority to grant, deny, or condition certification of federal permits or licenses. The Karuk Tribe designates the Department of Natural Resources as the lead tribal agency responsible for implementation of Section 401 Water Quality Certification for the trust land properties. Participation by the Department of Natural Resources in the Section 401 water quality certification process must be early enough for the Department of Natural Resources to be included in the development of alternatives and mitigation possibilities.

Section 401 water quality certification authority includes Federal permits, licenses, and other actions requiring NEPA compliance. Violation of water quality standards provides the basis for the Department of Natural Resources to deny or condition licenses and permits that have the potential to impact Tribal waterbodies, including upstream and upgradient sources of water quality impairment, through Section 401 water quality certification. Biological criteria are included as a tribal right to grant, deny, or condition certification.

SECTION 6.0 LABORATORY SUPPORT AND QUALITY ASSURANCE

6.1 Laboratory Support

A test result from a sample taken to determine compliance with a water quality standard is valid only if the sample has been analyzed by a laboratory that is licensed by the California State Department of Health Services or approved by the Director of the Department of Natural Resources for the analysis performed. A person conducting an analysis of a sample taken to determine compliance with a water quality standard will use an analytical method

promulgated by the EPA in 40 CFR Part 136, *Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act,* or an alternative analytical method that is approved by the Director of the Department of Natural Resources.

6.2 Quality Assurance

In response to federal requirements, the Department of Natural Resources has developed a Quality Assurance Project Plan (QAPP) (Karuk Tribe 2011) to ensure that data generated from environmental measurement studies are technically sound and legally defensible. The QAPP summarizes procedures to be followed in administering federally funded programs that involve measurement of environmental parameters. The QAPP applies to special water quality studies involving surface and ground waterbodies, as well as to surveillance and compliance monitoring of discharges.

Briefly, the QAPP requires that (a) physical and professional capabilities be adequate to perform the analysis for all parameters in the sampling plan; (b) sample collection, handling, and preservation be conducted according to EPA manuals; (c) time-sensitive samples be transported and analyzed within specific holding times; (d) sample integrity be provided for a legal chain of custody of samples collected for support of enforcement actions; (e) analytical methods be in accordance with standardized methods; and (f) analytical quality control procedures be established for intra-laboratory checking of reference samples. Laboratory records, including reference sample results, are to be available for EPA review.

SECTION 7.0 IMPLEMENTATION AND ENFORCEMENT MECHANISMS

7.1 Implementation Mechanism

Implementing a Water Quality Control Plan will require a coordinated effort between the Karuk Tribe and the EPA. Water quality standards are the foundation for CWA Sections 305(b) water quality assessment reports, 401 water quality certification, and 319 nonpoint source control as described below.

Water Quality Control Plans provide the basis for conducting status and trend monitoring of Tribal waters, including wetlands. CWA Section 305(b) water quality assessment reports summarize water quality assessment information on the status and trends of Tribal waters, including wetlands.

Section 319 of the CWA requires the Karuk Tribe to complete assessments of nonpoint source (NPS) impacts to Tribal waterbodies, including wetlands, and to prepare management programs to control NPS impacts. Water Quality Control Plans form the basis for NPS assessments and management of Tribal waterbodies, including wetlands.

Section 401 water quality certification for federal permits, licenses, and other environmental actions requiring NEPA compliance. Water quality standards have the potential to be applied to other Tribal programs, including landfill sitings, game and fish management and acquisition decisions, and best management practices to control nonpoint sources of pollution.

7.2 Enforcement Mechanism

Enforcement of these water quality standards will be the duty and responsibility of the Director of the Department of Natural Resources. The Director of the Department of Natural Resources will work in cooperation with EPA, Tribal agencies, and Tribal personnel as needed to enforce the water quality standards.

To ensure compliance with the water quality standards, the Department of Natural Resources will routinely monitor and assess the quality of Tribal waterbodies. An annual water quality assessment report for Tribal waters will be prepared by April 30 for each previous calendar year. The annual water quality assessment report will be distributed to the Tribal Council, as well as other Tribal agencies as determined by the Director of the Department of Natural Resources. Copies will be made available without charge to tribal members. Copies also will be made available to the general public.

SECTION 8.0 REFERENCES CITED

Asarian, J.E. and J. Kann. 2014. Justification for Revisions Proposed for the Karuk Tribe of California's 2014 Water Quality Control Plan. Prepared by Riverbend Sciences and Aquatic Ecosystem Sciences, LLC for the Karuk Tribe of California Department of Natural Resources, Orleans, California.

Karuk Tribe. 2011. Quality Assurance Project Plan for Water Quality Sampling and Analysis. CWA 106 grant identification # BG-97991209. Prepared by Karuk Tribe Water Quality Program, Karuk Tribe Department of Natural Resources, Orleans, CA.

U.S. Environmental Protection Agency (USEPA). 2009. National Recommended Water Quality Criteria. Office of Water, Office of Science and Technology 4304T. U.S. Environmental Protection Agency, Washington, DC. 184 pp. Available online at: <http://water.epa.gov/scitech/swguidance/standards/criteria/current/upload/nrwqc-2009.pdf> accessed 12/31/2012.

APPPENDIX A: TABLES FOR AMMONIA OBJECTIVE

Based on the equations in Section 4.2, the tables on the following pages provide the temperature and pH-dependent values of the Criterion Maximum Concentration (CMC) and CCC (Criterion Continuous Concentration) for the ammonia objective.

Temperature and pH-Dependent Values of the CMC (Acute Criterion Magnitude): *Oncorhynchus* spp. Present

	Temperature °C																
	0-14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
6.5	33	33	32	29	27	25	23	21	19	18	16	15	14	13	12	11	9.9
6.6	31	31	30	28	26	24	22	20	18	17	16	14	13	12	11	10	9.5
6.7	30	30	29	27	24	22	21	19	18	16	15	14	13	12	11	9.8	9.0
6.8	28	28	27	25	23	21	20	18	17	15	14	13	12	11	10	9.2	8.5
6.9	26	26	25	23	21	20	18	17	15	14	13	12	11	10	9.4	8.6	7.9
7.0	24	24	23	21	20	18	17	15	14	13	12	11	10	9.4	8.6	8.0	7.3
7.1	22	22	21	20	18	17	15	14	13	12	11	10	9.3	8.5	7.9	7.2	6.7
7.2	20	20	19	18	16	15	14	13	12	11	9.8	9.1	8.3	7.7	7.1	6.5	6.0
7.3	18	18	17	16	14	13	12	11	10	9.5	8.7	8.0	7.4	6.8	6.3	5.8	5.3
7.4	15	15	15	14	13	12	11	9.8	9.0	8.3	7.7	7.0	6.5	6.0	5.5	5.1	4.7
7.5	13	13	13	12	11	10	9.2	8.5	7.8	7.2	6.6	6.1	5.6	5.2	4.8	4.4	4.0
7.6	11	11	11	10	9.3	8.6	7.9	7.3	6.7	6.2	5.7	5.2	4.8	4.4	4.1	3.8	3.5
pH 7.7	9.6	9.6	9.3	8.6	7.9	7.3	6.7	6.2	5.7	5.2	4.8	4.4	4.1	3.8	3.5	3.2	3.0
7.8	8.1	8.1	7.9	7.2	6.7	6.1	5.6	5.2	4.8	4.4	4.0	3.7	3.4	3.2	2.9	2.7	2.5
7.9	6.8	6.8	6.6	6.0	5.6	5.1	4.7	4.3	4.0	3.7	3.4	3.1	2.9	2.6	2.4	2.2	2.1
8.0	5.6	5.6	5.4	5.0	4.6	4.2	3.9	3.6	3.3	3.0	2.8	2.6	2.4	2.2	2.0	1.9	1.7
8.1	4.6	4.6	4.5	4.1	3.8	3.5	3.2	3.0	2.7	2.5	2.3	2.1	2.0	1.8	1.7	1.5	1.4
8.2	3.8	3.8	3.7	3.5	3.1	2.9	2.7	2.4	2.3	2.1	1.9	1.8	1.6	1.5	1.4	1.3	1.2
8.3	3.1	3.1	3.1	2.8	2.6	2.4	2.2	2.0	1.9	1.7	1.6	1.4	1.3	1.2	1.1	1.0	0.96
8.4	2.6	2.6	2.5	2.3	2.1	2.0	1.8	1.7	1.5	1.4	1.3	1.2	1.1	1.0	0.93	0.86	0.79
8.5	2.1	2.1	2.1	1.9	1.8	1.6	1.5	1.4	1.3	1.2	1.1	0.98	0.90	0.83	0.77	0.71	0.65
8.6	1.8	1.8	1.7	1.6	1.5	1.3	1.2	1.1	1.0	0.96	0.88	0.81	0.75	0.69	0.63	0.59	0.54
8.7	1.5	1.5	1.4	1.3	1.2	1.1	1.0	0.94	0.87	0.80	0.74	0.68	0.62	0.57	0.53	0.49	0.45
8.8	1.2	1.2	1.2	1.1	1.0	0.93	0.86	0.79	0.73	0.67	0.62	0.57	0.52	0.48	0.44	0.41	0.37
8.9	1.0	1.0	1.0	0.93	0.85	0.79	0.72	0.67	0.61	0.56	0.52	0.48	0.44	0.40	0.37	0.34	0.32
9.0	0.88	0.88	0.86	0.79	0.73	0.67	0.62	0.57	0.52	0.48	0.44	0.41	0.37	0.34	0.32	0.29	0.27

Temperature and pH-Dependent Values of the CMC (Acute Criterion Magnitude): *Oncorhynchus* spp. Absent

	Temperature °C																				
	0-10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
6.5	51	48	44	41	37	34	32	29	27	25	23	21	19	18	16	15	14	13	12	11	9.9
6.6	49	46	42	39	36	33	30	28	26	24	22	20	18	17	16	14	13	12	11	10	9.5
6.7	46	44	40	37	34	31	29	27	24	22	21	19	18	16	15	14	13	12	11	9.8	9.0
6.8	44	41	38	35	32	30	27	25	23	21	20	18	17	15	14	13	12	11	10	9.2	8.5
6.9	41	38	35	32	30	28	25	23	21	20	18	17	15	14	13	12	11	10	9.4	8.6	7.9
7.0	38	35	33	30	28	25	23	21	20	18	17	15	14	13	12	11	10	9.4	8.6	7.9	7.3
7.1	34	32	30	27	25	23	21	20	18	17	15	14	13	12	11	10	9.3	8.5	7.9	7.2	6.7
7.2	31	29	27	25	23	21	19	18	16	15	14	13	12	11	9.8	9.1	8.3	7.7	7.1	6.5	6.0
7.3	27	26	24	22	20	18	17	16	14	13	12	11	10	9.5	8.7	8.0	7.4	6.8	6.3	5.8	5.3
7.4	24	22	21	19	18	16	15	14	13	12	11	9.8	9.0	8.3	7.7	7.0	6.5	6.0	5.5	5.1	4.7
7.5	21	19	18	17	15	14	13	12	11	10	9.2	8.5	7.8	7.2	6.6	6.1	5.6	5.2	4.8	4.4	4.0
7.6	18	17	15	14	13	12	11	10	9.3	8.6	7.9	7.3	6.7	6.2	5.7	5.2	4.8	4.4	4.1	3.8	3.5
7.7	15	14	13	12	11	10	9.3	8.6	7.9	7.3	6.7	6.2	5.7	5.2	4.8	4.4	4.1	3.8	3.5	3.2	2.9
7.8	13	12	11	10	9.3	8.5	7.9	7.2	6.7	6.1	5.6	5.2	4.8	4.4	4.0	3.7	3.4	3.2	2.9	2.7	2.5
7.9	11	9.9	9.1	8.4	7.7	7.1	6.6	3.0	5.6	5.1	4.7	4.3	4.0	3.7	3.4	3.1	2.9	2.6	2.4	2.2	2.1
8.0	8.8	8.2	7.6	7.0	6.4	5.9	5.4	5.0	4.6	4.2	3.9	3.6	3.3	3.0	2.8	2.6	2.4	2.2	2.0	1.9	1.7
8.1	7.2	6.8	6.3	5.8	5.3	4.9	4.5	4.1	3.8	3.5	3.2	3.0	2.7	2.5	2.3	2.1	2.0	1.8	1.7	1.5	1.4
8.2	6.0	5.6	5.2	4.8	4.4	4.0	3.7	3.4	3.1	2.9	2.7	2.4	2.3	2.1	1.9	1.8	1.6	1.5	1.4	1.3	1.2
8.3	4.9	4.6	4.3	3.9	3.6	3.3	3.1	2.8	2.6	2.4	2.2	2.0	1.9	1.7	1.6	1.4	1.3	1.2	1.1	1.0	0.96
8.4	4.1	3.8	3.5	3.2	3.0	2.7	2.5	2.3	2.1	2.0	1.8	1.7	1.5	1.4	1.3	1.2	1.1	1.0	0.93	0.86	0.79
8.5	3.3	3.1	2.9	2.7	2.4	2.3	2.1	1.9	1.8	1.6	1.5	1.4	1.3	1.2	1.1	0.98	0.90	0.83	0.77	0.71	0.65
8.6	2.8	2.6	2.4	2.2	2.0	1.9	1.7	1.6	1.5	1.3	1.2	1.1	1.0	0.96	0.88	0.81	0.75	0.69	0.63	0.58	0.54
8.7	2.3	2.2	2.0	1.8	1.7	1.6	1.4	1.3	1.2	1.1	1.0	0.94	0.87	0.80	0.74	0.68	0.62	0.57	0.53	0.49	0.45
8.8	1.9	1.8	1.7	1.5	1.4	1.3	1.2	1.1	1.0	0.93	0.86	0.79	0.73	0.67	0.62	0.57	0.52	0.48	0.44	0.41	0.37
8.9	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.93	0.85	0.79	0.72	0.67	0.61	0.56	0.52	0.48	0.44	0.40	0.37	0.34	0.32
9.0	1.4	1.3	1.2	1.1	1.0	0.93	0.86	0.79	0.73	0.67	0.62	0.57	0.52	0.48	0.44	0.41	0.37	0.34	0.32	0.29	0.27

pH

Temperature and pH-Dependent Values of the CCC (Chronic Criterion Magnitude)

pH	Temperature °C																							
	0-7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
6.5	4.9	4.6	4.3	4.1	3.8	3.6	3.3	3.1	2.9	2.8	2.6	2.4	2.3	2.1	2.0	1.9	1.8	1.6	1.5	1.5	1.4	1.3	1.2	1.1
6.6	4.8	4.5	4.3	4.0	3.8	3.5	3.3	3.1	2.9	2.7	2.5	2.4	2.2	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2	1.1
6.7	4.8	4.5	4.2	3.9	3.7	3.5	3.2	3.0	2.8	2.7	2.5	2.3	2.2	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1
6.8	4.6	4.4	4.1	3.8	3.6	3.4	3.2	3.0	2.8	2.6	2.4	2.3	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.1
6.9	4.5	4.2	4.0	3.7	3.5	3.3	3.1	2.9	2.7	2.5	2.4	2.2	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.0
7.0	4.4	4.1	3.8	3.6	3.4	3.2	3.0	2.8	2.6	2.4	2.3	2.2	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.1	0.99
7.1	4.2	3.9	3.7	3.5	3.2	3.0	2.8	2.7	2.5	2.3	2.2	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.0	0.95
7.2	4.0	3.7	3.5	3.3	3.1	2.9	2.7	2.5	2.4	2.2	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2	1.1	1.0	0.96	0.90
7.3	3.8	3.5	3.3	3.1	2.9	2.7	2.6	2.4	2.2	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2	1.1	1.0	0.97	0.91	0.85
7.4	3.5	3.3	3.1	2.9	2.7	2.5	2.4	2.2	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2	1.1	1.0	0.96	0.90	0.85	0.79
7.5	3.2	3.0	2.8	2.7	2.5	2.3	2.2	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.0	0.95	0.89	0.83	0.78	0.73
7.6	2.9	2.8	2.6	2.4	2.3	2.1	2.0	1.9	1.8	1.6	1.5	1.4	1.4	1.3	1.2	1.1	1.1	0.98	0.92	0.86	0.81	0.76	0.71	0.67
7.7	2.6	2.4	2.3	2.2	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.1	1.0	0.94	0.88	0.83	0.78	0.73	0.68	0.64	0.60
7.8	2.3	2.2	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.0	0.95	0.89	0.84	0.79	0.74	0.69	0.65	0.61	0.57	0.53
7.9	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.0	0.95	0.89	0.84	0.79	0.74	0.69	0.65	0.61	0.57	0.53	0.50	0.47
8.0	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.1	1.0	0.94	0.88	0.83	0.78	0.73	0.68	0.64	0.60	0.56	0.53	0.50	0.44	0.44	0.41
8.1	1.5	1.5	1.4	1.3	1.2	1.1	1.1	0.99	0.92	0.87	0.81	0.76	0.71	0.67	0.63	0.59	0.55	0.52	0.49	0.46	0.43	0.40	0.38	0.35
8.2	1.3	1.2	1.2	1.1	1.0	0.96	0.90	0.84	0.79	0.74	0.70	0.65	0.61	0.57	0.54	0.50	0.47	0.44	0.42	0.39	0.37	0.34	0.32	0.30
8.3	1.1	1.1	0.99	0.93	0.87	0.82	0.76	0.72	0.67	0.63	0.59	0.55	0.52	0.49	0.46	0.43	0.40	0.38	0.35	0.33	0.31	0.29	0.27	0.26
8.4	0.95	0.89	0.84	0.79	0.74	0.69	0.65	0.61	0.57	0.53	0.50	0.47	0.44	0.41	0.39	0.36	0.34	0.32	0.30	0.28	0.26	0.25	0.23	0.22
8.5	0.80	0.75	0.71	0.67	0.62	0.58	0.55	0.51	0.48	0.45	0.42	0.40	0.37	0.35	0.33	0.31	0.29	0.27	0.25	0.24	0.22	0.21	0.20	0.18
8.6	0.68	0.64	0.60	0.56	0.53	0.49	0.46	0.43	0.41	0.38	0.36	0.33	0.31	0.29	0.28	0.26	0.24	0.23	0.21	0.20	0.19	0.18	0.16	0.15
8.7	0.57	0.54	0.51	0.47	0.44	0.42	0.39	0.37	0.34	0.32	0.30	0.28	0.27	0.25	0.23	0.22	0.21	0.19	0.18	0.17	0.16	0.15	0.14	0.13
8.8	0.49	0.46	0.43	0.40	0.38	0.35	0.33	0.31	0.29	0.27	0.26	0.24	0.23	0.21	0.20	0.19	0.17	0.16	0.15	0.14	0.13	0.13	0.12	0.11
8.9	0.42	0.39	0.37	0.34	0.32	0.30	0.28	0.27	0.25	0.23	0.22	0.21	0.19	0.18	0.17	0.16	0.15	0.14	0.13	0.12	0.12	0.11	0.10	0.09
9.0	0.36	0.34	0.32	0.30	0.28	0.26	0.24	0.23	0.21	0.20	0.19	0.18	0.17	0.16	0.15	0.14	0.13	0.12	0.11	0.11	0.10	0.09	0.09	0.08