KARUK TRIBE OF CALIFORNIA

DEPARTMENT OF NATURAL RESOURCES
P.O. Box 282 ? Orleans, California 95556

WATER QUALITY ASSESSMENT REPORT

(CWA Section 305(b) Reporting)

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Cover photograph: Traditional dip net fishing at Ishi Pishi Falls on the Klamath River.

Pictured are Ron Reed (fishing) and Scott Quinn (the clubber).

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1.0 EXECUTIVE SUMMARY/OVERVIEW

This Clean Water Act (CWA) Section 305(b) Tribal water quality assessment report constitutes the Karuk Tribe of California's (KTOC) first water quality assessment of Tribal waters on the Karuk Tribe of California's Trust Lands (KTOC Trust Lands) under the KTOC's Department of Natural Resources CWA Section 106 Water Pollution Control Program. It is the primary means by which the Karuk Tribe, the U.S. Environmental Protection Agency (USEPA), the U.S. Congress, and the public will evaluate Tribal waters on the KTOC Trust Lands with respect to (1) the quality of rivers and streams, lakes, wetlands, and ground water; (2) pollutants and pollutant sources causing water quality impairment; (3) the need for and success of water quality management programs; and (4) the need for comprehensive monitoring and assessment plans. This water quality assessment report is an important first step in the process of proactively monitoring, assessing, protecting, and restoring the quality of Tribal waters.

The Karuk Tribe of California (Karuk Tribe) is a federally recognized Indian Tribe (Federal Register, Vol. 51, No. 132, July 10, 1986) occupying tribal and individual trust lands along the middle course of the Klamath and Salmon rivers in northern California (**Figure 1-1**). The KTOC Trust Lands constitute disconnected land areas scattered along the Klamath River between Yreka and Orleans, California, with Tribal centers and administrative facilities located in Happy Camp, Orleans, and Yreka.

A map displaying the degree of beneficial use support for rivers and streams and lakes is provided in ***Figure 1-2***. Tribal rivers and streams, lakes, wetlands, and ground water are assessed in this report with respect to water quality impairment based on beneficial use support of each water resource. Overall use support is not supporting for rivers and streams and supporting but threatened for lakes, wetlands and ground water. Major causes/stressors contributing to impairment of Tribal waters include: pesticides, metals, nutrients, habitat alterations, and flow alterations. Major sources of impairment to Tribal waters are

hydromodification, agricultural crop-related (agricultural irrigation return flows), resource extraction, and septic releases. The predominant sources of use support impairment to Tribal waterbodies are located upstream or upgradient of the KTOC Trust Lands.

2.0 BACKGROUND

The objective of the CWA is to restore and maintain the chemical, physical, and biological integrity of the nation's waters. One goal of the CWA is to protect surface waters so that they may provide beneficial uses, such as fishing and swimming. Beneficial uses for fishing include aquatic life support and fish consumption. Beneficial uses for swimming include swimming, wading, boating, and other recreational uses on and in the water. An additional goal of KTOC is to protect cultural beneficial uses and the beneficial uses of ground water, especially drinking water and other domestic uses. The primary objective for water resources on the KTOC Trust Lands is to protect potential and existing beneficial uses of Tribal waters.

2.1 Resources Overview

A resource overview for the KTOC Trust Lands is provided in ***Table 2-1***. The 1,168 acres of KTOC Trust Lands are most often situated along water courses, especially the Klamath River and its tributary streams. The single lake on the KTOC Trust Lands is the Sacred Pond at Katimin, which is located at a spring source. The acreage of wetlands on the KTOC Trust Lands was estimated using streambed acreages combined with the following riparian widths for each side of the stream: Klamath River (150 foot), Salmon River (100 foot), and all other creeks and gulches (50 foot). For the Sacred Pond at Katimin, the riparian area was determined to be twice the acreage of the pond or twice 0.16 acres for a total wetlands area of 0.32 acres.

Much of the KTOC Trust Lands are located along the Klamath River. The main stem of the Klamath River and many of its tributary streams are used by spring and fall Chinook salmon,

Coho, and spring and fall steelhead. Pacific lamprey and green sturgeon also use the main stem Klamath River. The main stem Klamath River is a migration corridor between the ocean and tributary streams, though Chinook are known to spawn in the main stem. The overall temporal trend in anadromous fish for the Klamath River basin reflect long-term declines.

The KTOC Trust Lands are located in the central Klamath Mountains. In this area, the coastal climatic influence is moderated by the mountains to the west. Summers are warm and dry, winters are cool and wet. Summer high temperatures are approximately 90ºF, and low temperatures are approximately 55ºF. Winter high temperatures are approximately 40 to 55ºF while raining, and are cooler under clear skies. The annual precipitation during the period of record (1904 to present) at Orleans ranges from 26 to 84 inches. The average annual precipitation is approximately 50 inches. Approximately 90% of the precipitation occurs from October through May from north Pacific cyclonic storms. The distribution of precipitation over time influences the behavior of erosion and land sliding processes, water quality, and the structure of stream channels.

The majority of the Klamath River Basin lies in the older, geologically diverse Klamath Mountains. Rocks range from granites to metamorphics (including serpentine), and range in age from the pre-Silurian to late Jurassic periods. The geology of the area is complicated by multiple fold systems and numerous faults of varying magnitudes.

On steep slopes, the upland soils tend to be unstable, and slope stability hazards are common throughout the Klamath River Basin. Canyon lands along all major drainages contribute to the high incidence of mass wasting and subsequent potential for erosion. Mass wasting commonly occurs as debris slides but can occur as landslides, affecting large acreages and causing major destruction. These effects are increased by the high density of roads within the middle portion of the Klamath River basin. Regardless of the form, much of the displaced material often enters a stream course and can block streams, destroy riparian vegetation, degrade potential juvenile salmonid rearing habitat, and cover potential spawning

gravels. The west side of the Klamath Basin is more subject to mass wasting because of higher annual rainfalls and higher intensity precipitation.

2.2 Total Waters

Major Tribal waters on the KTOC Trust Lands are as follows:

- Ishi Pishi Falls
- Sacred Pond at Katimin
- Klamath River and tributary reaches
- Salmon River and tributary reaches
- Ground water underlying KTOC Trust Lands

The Karuk Tribe would like to maintain and protect the quality of ground water underlying the KTOC Trust Lands. The protection of recharge zones is a priority under the Karuk Tribe's Water Pollution Control Program.

Table 2-1. Atlas of Tribal Resources for the KTOC Trust Lands

Topic	Value
Trust lands population (enrolled Tribal members)	359
Trust lands surface area (acres)	1,168
Total miles of rivers and streams – Miles of perennial rivers/streams (subset) – Miles of intermittent (nonperennial) streams (subset) – Miles of ditches and canals (subset) – Border miles of shared rivers/streams (subset)	11.37 11.06 0.31 ? 8.68
Number of lakes/reservoirs/ponds	1
Number of significant tribally owned lakes/reservoirs/ponds (subset)	1
Acres of lakes/reservoirs/ponds	0.16
Acres of significant tribally owned lakes/reservoirs/ponds (subset)	0.16
Square miles of estuaries/harbors/bays	0
Miles of ocean coast	0
Miles of Great Lakes shore	0
Acres of freshwater wetlands	194.2
Acres of tidal wetlands	0

2.3 Water Pollution Control Program

The KTOC Department of Natural Resources administers the Karuk Tribe's Water Pollution Control Program (WPCP) and is responsible for protecting the environment and public health on the KTOC Trust Lands. Under the WPCP, the KTOC Department of Natural Resources is developing water quality standards, monitoring the quality of Tribal waters, and assessing water quality conditions.

2.3.1 Watershed Approach

The KTOC Trust Lands are located entirely within the Klamath River watershed. The approach used for watershed protection is to identify potential contaminant sources to waterbodies within the KTOC Trust Lands and develop strategies for the protection of Tribal waters. There are land uses outside of the KTOC Trust Lands that have the potential to adversely affect the quality of Tribal waters. These land uses have generally been tied to natural resource development, including fisheries, logging, mining, and agriculture. There are only two public water systems (PWS) (one at Happy Camp and the other at Orleans) located nearby the KTOC Trust Lands, so most residents rely on individual wells or surface water for domestic use. Most homes rely on septic systems for wastewater treatment; however, a non-discharging wastewater treatment plant has been constructed to serve the community of Happy Camp. The treatment plant uses constructed wetlands for passive treatment. It is located adjacent to the Klamath River floodplain and discharges to the ground water system as opposed to a point source discharge to the river.

2.3.2 Water Quality Standards Program

KTOC has developed proposed water quality standards for both surface and ground waters. The KTOC Department of Natural Resources is the lead Tribal agency responsible for developing and enforcing water quality standards on the KTOC Trust Lands. 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, shellfish, and wildlife and for recreation in and on the water.

Designated uses of Tribal waters, 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)
- Livestock Watering (LIV)
- Migration of Aquatic Organisms (MIGR)
- Municipal and Domestic Supply (MUN)
- Navigation (NAV)
- Hydropower Generation (POW)
- Industrial Process Supply (PROC)
- Rare, Threatened, or Endangered Species (RARE)
- Water Contact Recreation (REC-1)
- Non- Contact Water Recreation (REC-2)
- Spawning, Reproduction, and/or Early Development (SPWN)
- Warm Freshwater Habitat (WARM)
- Wildlife Habitat (WILD)

The following general water quality objective is proposed to apply to all Tribal waters of the KTOC Trust Lands:

> *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*.

The following proposed water quality standard would 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.*

The following two Tribal waters are proposed for classification as outstanding waters:

- Ishi Pishi Falls
- Sacred Pond at Katimin

2.3.3 Point Source Program

There are no NPDES (National Pollutant Discharge Elimination System) outfalls within the KTOC Trust Lands.

2.3.4 Nonpoint Source Program

The Karuk Tribe has a Section 319 Nonpoint Source Control Program. The pollutant sources of concern potentially affecting Tribal waters are entirely derived from nonpoint sources which are not quantifiable, but are related to water quality impairment conditions, such as road building and herbicide spraying on Forest Service lands, acid mine drainage from abandoned mines, damming and dam releases by the U.S. Bureau of Reclamation, and nutrient loading upstream and outside of the KTOC Trust Lands on the Klamath River.

When the only sources of water quality impairment to a waterbody are from nonpoint sources, these “pollutants” are more appropriately referred to as “indicators” of water quality impairment in need of best management practices (BMPs). BMP implementation can then be evaluated with respect to its effectiveness using nonpoint source “pollution reduction targets”, not waste loads or loads using the TMDL process. An example of a traditional BMP followed by the Karuk people is the practice of cleaning salmon in a side channel at Katimin, as opposed to the main river course in an effort to ensure that fish cleaning wastes do not contaminate the river water quality or alert downstream fish to the presence of upstream fishermen.

In response to nonpoint sources of pollution, the Department of Natural Resources has invested substantial resources in a state-of-the-art geographic information system (GIS) that is currently being used to compile existing data obtained from federal, state, and other sources to enable comprehensive assessment of the environmental conditions that currently affect its Tribal Trust Land resources.

2.3.5 Coordination with Other Agencies

A Memorandum of Understanding (MOU) exists between the USDA-Forest Service (Klamath National Forest and Six Rivers National Forest) and the Karuk Tribe of California in a government to government agreement. Klamath and Six Rivers National Forests have co-management responsibilities throughout the Karuk Tribe's Aboriginal Territory - a federally-recognized sovereign government. The Tribe feels that the MOU agreement recognizes the need for the two groups to "formalize the processes of communication for land and resource management decision making." It also believes that "improving our relationship is the best course in achieving our common goal of wisely managed and sustainable natural resources." In addition, the Karuk Tribe's Department of Natural Resources has also worked with federal, state, county, and other Tribal agencies in evaluating water quality degradation and fisheries decline in the Klamath River Basin, as well as the development of beneficial forest management practices.

2.4 Cost/Benefit Assessment

The cultural structure of the Karuk Tribe was developed around the once productive fishery and forest resources of the middle Klamath River Basin. The costs associated with these adversely affected natural resources are unknown, but of significant importance to the Karuk Tribe. A legitimate responsibility of the Karuk Tribe as a sovereign aboriginal government is to ensure that the natural resources within its ancestral territory are managed so that they will benefit Karuk people through employment, services, and preservation of traditional ways and lifestyles. The Klamath River Basin anadromous (salmon and steelhead trout) fishery has been declining steadily for many decades. Despite public and private efforts to understand or reverse this trend, the number of fish returning to the Klamath River system has diminished to the point that some native anadromous fish stocks now face extinction. While efforts are continuously underway to understand the causes of fishery decline and address the symptoms of fish habitat degradation, no one agency or organization has adequately represented the interests of the Karuk Tribe or the resources upon which the Karuk Tribe depends.

2.4.1 Socioeconomics

The Karuk Tribe places great cultural, social, and economic value on the subsistence and commercial fisheries associated with the Klamath River basin. As a result of declining fisheries and resultant declining recreational opportunities, the Karuk Tribe has been economically repressed and many Tribal members have left the KTOC Trust Lands for better employment opportunities. A majority of the natural resources upon which the tribe depends, such as land, timber, and water, are co-managed and controlled by the federal government. In addition, the State of California and the Karuk Tribe have concurrent jurisdiction with the federal government over water, game, and fisheries. Federal and state resource management decisions affecting the Klamath River Basin, both past and present, have had a profound effect on the Karuk Tribe and its members.

In an effort to address and effectively influence agency resource management decisions and policies, the Karuk Tribe developed an Ancestral Lands Forest (forestry and fisheries)

Management Plan in 1989. The Tribe has long recognized the need to directly and actively participate in resource decision making processes that affect it and its members. As a result of this recognition, the Tribe vigorously pursued and obtained the necessary resources to establish a Tribal Department of Natural Resources.

Currently, the Tribe's Department of Natural Resources is working cooperatively with various federal and state agencies to evaluate the causes of water quality degradation and fishery decline in the Klamath River Basin. The Karuk Tribe, through its Department of Natural Resources, has also actively participated in the development process for President Clinton's Forest Ecosystem Management Plan. Furthermore, the Karuk Tribe is currently represented on the Provincial Executive Committee which provides recommendations for implementing the Presidents forest plan throughout the entire Klamath River Basin. Potential environmental contamination that affect the Karuk Tribe, are past mining, forest management, abandoned mill sites, storage tanks, and septic systems, that need to be thoroughly evaluated.

2.4.2 Costs and Benefits Associated with Achieving CWA Actions

The benefits of implementing best management practices (BMPs) to enhance the water quality of waterbodies would include (1) improving and protecting fish, riparian, and wildlife habitats; (2) providing additional recreational opportunities; (3) improving Tribal accessibility to Tribal waters; (4) protecting drinking water supplies; and (5) reducing upstream nutrient loading to the Klamath River. Over the long-term, protecting water quality would be less expensive than remediating water quality problems. All of these benefits would translate into improving the quality of life for Tribal members.

2.5 Special Concerns and Recommendations

In 1990 the California State Water Resource Control Board found that the beneficial uses of water for cold water fish in the Klamath River and its Shasta, Scott, and Salmon river tributaries were not being adequately protected. In addition, the USEPA has requested the

State Water Resource Control Board (1992) to evaluate whether the Shasta, Scott, Salmon, and Klamath rivers should be listed as water bodies that cannot meet applicable water quality standards under Section 303(d) of the CWA. The Oregon Department of Environmental Quality has determined that levels for the following water quality constituents have resulted in the Klamath River (upstream of the California border) being included on the 303(d) list: toxics, dissolved oxygen, chlorophyll *a*, pH, and temperature. The Karuk Tribe realizes the importance of its involvement in evaluating water quality conditions that affect the long-term survival of Klamath River anadromous fish stocks.

The Tribe's Department of Natural Resources has previously monitored the water temperatures in the main stem Klamath River since 1995 and has come to realize that the agencies that have been responsible for protecting water quality conditions throughout the entire Klamath River Basin have not invested the time and resources necessary to scientifically evaluate past and present water resource conditions. Water temperatures in the main stem Klamath River constrain summer rearing and fall spawning and during the summer months, water temperatures often reach levels lethal to juveniles and eggs of most salmonid species (Balance Hydrologics, Inc. 1996). Since around 1962, instream flows for the Klamath River as it passes through the KTOC Trust Lands has been regulated by the minimum flow regime specified at Iron Gate Dam and all other dams upstream except Link River Dam under PacifiCorp's license issued by the Federal Energy Regulatory Commission (FERC). The FERC license does not consider the flow needs of aquatic resources in the main stem Klamath River in its minimum instream flow regime in which the flow regime predominately determines the water temperature regime. A study on the historical flow regime for the main stem Klamath River found that the persistence and reliability of historic flows sustained the instream anadromous fishery even during the summer month and during dry years (Balance Hydrologics, Inc. 1996). PacifiCorp's license will undergo a renewal process in 2006.

The Karuk Tribe would like the opportunity to develop the infrastructure necessary to conduct a thorough assessment of all environmental conditions that affect the Tribe and to increase the capability to implement comprehensive environmental protection programs. To accomplish this goal, the Karuk Tribe has focused its efforts on providing adequate staff for

its Department of Natural Resources and has applied and received Financial Assistance Application Packages for a CWA Section 106 Water Pollution Control Program. Following a review of the Tribe's existing environmental conditions, there will be a need for assistance in conducting environmental assessments in other key resource areas, as well as acquiring resource and legal assistance to develop and implement tribal environmental regulatory standards and ordinances.

Traditionally the principal organizational unit of Karuk society was the village, of which there were more than one hundred, each containing several households. Many of these villages are situated in relatively isolated areas along the Klamath, with more than ninety percent (90%) being located at or near mouths of lesser streams and tributaries. At certain sites there are clusters of villages which form larger settlements including Incm, Katimin, Ameckiyarum, and Panamnik--the greatest of which is Katimin, which once contained 40 or more houses. These settlements are the cultural and spiritual centers of the Karuk Tribe.

Prehistorically there was no one political organization within the villages or between the villages. Each village had Head Men who met at Ameckiyarum to make important decisions. Within each village, kinship ties were strong, family elders were the most revered members of a household and their influence extended over family members of neighboring villages. Wealth was regarded as a symbol of prestige, and the rich men of the village were accorded due respect. Wealth was measured by the amount of ceremonial regalia a person had and the amount of resources they controlled, such as fishing spots and their good luck. Despite the absence of a formal government structure, tribal members adhered to a set of unwritten tribal laws and shared a common set of values that governed the affairs of day-to-day life, as well as the conduct of business. People were expected to pay restitution when they wronged somebody. Restitution was usually in the form of Ishpuk (Indian money, small shells measured in strands).

The focal point of interaction between members of different villages and of different tribes, is the performance of religious ceremonies. The most important of these ceremonies is the pick-ya-wish, or world renewal ceremony, which the Karuk Tribal members continue to perform

annually at three different locations: Inam, Katimin, and Panamnik. The purpose of the world renewal ceremony is to ensure an abundance of food and freedom from sickness in the coming year. The ceremony, as performed by the Karuk, is somewhat similar to those performed by the Yurok and Hupa, with the major difference being the performance of esoteric rites by the Karuk priest or fot-i-wa-non, (commonly referred to as medicine man), the exact nature and sequence of which is known only to him and those who went before him. This knowledge is passed on verbally only to those who are chosen to be medicine man.

3.0 SURFACE WATER ASSESSMENT

3.1 Current Surface Water Monitoring Program

The surface water monitoring program currently being implemented by the KTOC Department of Natural Resources focuses on the collection of water quality data for Indian Creek and Elk Creek stream courses in addition to the main stem Klamath River. The monitoring plan was implemented in 1998 as a watershed study within the Karuk Aboriginal Territory. Water quality constituents include pH, dissolve oxygen (DO), and water temperature. Indian Creek and Elk Creek have also been measured for major anions and cations, metals, nutrients, total dissolved solids (TDS), total suspended solids (TSS), cyanide, and discharge. The current surface water monitoring program does not adequately cover Tribal waters within the KTOC Trust Lands. The Karuk Department of Natural Resources is in the process of developing a comprehensive surface water monitoring program. The comprehensive plan will be designed to adequately cover all Tribal waters and would generate a baseline water quality database for all rivers and streams, the lake, wetlands, and ground water within the KTOC Trust Lands.

3.2 Plan for Achieving Comprehensive Assessments

A long-term goal of the Karuk Tribe is to implement a comprehensive monitoring and assessment plan for Tribal waters. This plan is anticipated to incorporate the following:

- Identification of all potential contaminant sources, both within and outside of KTOC Trust Lands, that could adversely affect Tribal waters

- Surface water monitoring for both beneficial use support and temporal trend analysis for the lake and wetlands and at stream reaches, both upstream and downstream of KTOC Trust Lands

- Ground water monitoring of individual domestic supply wells

- A goal to implement the comprehensive monitoring plan by summer 2001

- All Tribal waters (rivers, streams, the lake, wetlands, and ground water) georeferenced by GIS (geographic information system) technology using ARC/INFO and ArcView Software

- Use of the Karuk Tribe's traditional indicator of good water quality, the presence of the Poof Poof or Pacific Giant Salamander (*Dicamptodon tenebrosus*) for surface water quality evaluations. The use of amphibians, such as the salamanders as indicators of water quality conditions is supported in the scientific literature (Mason 1991).

Water sampling techniques will consistently follow EPA-approved methods of water sample collection, preservation, and handling as described in the KTOC QAPP. Samples will consist of surface and ground waters. The sampling network will be designed to (1) determine the quality of surface waters both on and upstream of the KTOC Trust Lands, (2) determine the quality of the ground water used by KTOC Trust Land residents, and (3) determine the mechanisms for and extent of surface/ground water interactions.

3.3 Assessment Methodology and Summary Data

3.3.1 Assessment Methodology

Water quality assessments for determining use support status are based either on monitored waters or evaluated waters. The criteria for distinguishing between evaluated and monitored waters are provided below.

Monitored Waters - Waterbodies for which use support decisions are based on current data that accurately describe water quality conditions using the following information as a guide:

- Monitoring data less than 5 years old
  (unless data are from remote areas with no known pollutant sources)
- Fixed-station chemical/physical monitoring on at least a quarterly sampling frequency
- Short-term intensive water quality monitoring
- Toxicity testing conducted at least annually
- Biosurveys conducted at least annually

Evaluated Waters - Waterbodies for which use support decisions are based on data that are either not current but are useful or are useful but less reliable than if they met the criteria stated above for monitored waters using the following information as a guide:

- Monitoring data older than 5 years
- Sediment or fish tissue data compared to applicable criteria
- Reliable information on conditions causing impairment, such as algae blooms and fish kills
- Reliable information on non-compliance of narrative water quality standards
- Questionnaire surveys conducted by Fishery Biologists and other qualified staff

Assessments are based on monitored waters whenever possible to provide a more accurate description of Tribal water quality conditions; however, when available information on water quality does not meet the monitored waters criteria, then efforts are made to provide useful water quality determinations based on evaluated waters.

There are five categories of use support for designated uses of waterbodies: Fully Supporting, Fully Supporting but Threatened, Partially Supporting, Not Supporting, and Not Attainable. Definitions of each of these designated use support categories are provided below.

Fully Supporting - No impairment is indicated by all data types.

Fully Supporting but Threatened - No impairment is indicated by all data types, and there is an apparent decline in water quality over time or there are potential water quality problems requiring additional data or verification, or other information suggests a threatened determination.

Partially Supporting - Impairment is indicated by one or more, but not all, data types.

Not Supporting - Impairment is indicated by all data types.

Not Attainable - A UAA has been conducted providing reliable information that the designated use of a waterbody cannot be feasibly met because of natural, economic, physical, or hydrologic modification conditions.
Data types are levels of water quality information for a waterbody, such as habitat; toxicological, biological, or numeric criteria exceedances; MCL violations; or bathing, drinking, and fish consumption restrictions.

The following types and sources of water quality information were used to assess data for conducting use support determinations:

- Short-term intensive water quality monitoring
- Biosurveys conducted at least annually
- Monitoring data less than 5 years old
- Monitoring data more than 5 years old
- Sediment or fish tissue data compared to applicable criteria

- Reliable information on conditions causing impairment, such as algae blooms and fish kills
- Reliable information on non-compliance of narrative water quality standards

3.3.2 Maps

To improve the usefulness of water quality information, a map of waterbodies and associated use support determinations is provided using GIS technology (**Figure 1-2**). In addition, the following maps are planned for use by the KTOC Department of Natural Resources for assessment purposes and to illustrate the distribution of the following Tribal water resources:

- Individual domestic supply wells
- Ishi Pishi Falls
- Klamath River and its tributaries
- Sacred Pond at Katimin
- Salmon River and its tributaries
- Springs
- Watershed boundaries
- Wetlands

The computer software applications used to maintain and revise water resource information are ARC/INFO and ArcView.

3.3.3 Section 303(d) Waters

CWA Section 303(d) requires tribes and states to identify 303(d) waters and establish a priority ranking for waters that do not or are not expected to achieve or maintain water quality standards with existing or anticipated required controls.

Because the Karuk Tribe's water quality standards are proposed, an analysis evaluating whether Tribal waters meet water quality standards and whether they should be included on

the Section 303(d) list is not possible at this time. After Tribal and USEPA approval of the Karuk Tribe's water quality standards, a Section 303(d) analysis will be conducted, and TMDLs (total maximum daily loads) for water-quality-limited Tribal waters will be established and prioritized according to USEPA guidelines. Only potential nonpoint sources of pollutants are present within the KTOC Trust Lands. The Oregon Department of Environmental Quality is issuing TMDLs for the Upper Klamath River in response to low dissolve oxygen levels and high unionized ammonia concentrations. TMDLs for nutrients, dissolved oxygen, and water temperature are to be issued during 2004 for the main stem Klamath River in California.

At present, there are no NPDES outfalls within the KTOC Trust Lands. However, an unknown number of NPDES outfalls exists in upstream waters. One exists at the Iron Gate Dam Fish Hatchery. Considering this, the portion of pollutant loads from point sources (FWLA) for all Tribal waters is currently unknown. Pollutant loads from nonpoint sources and background sources (YLA) occur in waters upstream of the KTOC Trust Lands, but have not been determined; therefore, no Total Maximum Daily Loads have been calculated at this time. The Karuk Tribe will address Total Maximum Daily Load calculations following the promulgation of water quality standards for Tribal waters.

3.4 Rivers and Streams Water Quality Assessment

The degradation of riverine systems associated with the stream-riparian system are evident on the KTOC Trust Lands. Stream pollution and habitat degradation are issues that will be addressed to derive cause/source linkages. In general, as the Klamath River flows through areas containing KTOC Trust Lands there is a slight dilution of total dissolved solids and nutrients (nitrate and total phosphorus). The water quality in the main stem Klamath River improves in a downstream direction as its passes through the KTOC Trust Lands due to dilution by higher quality tributary inflows. Without these high quality tributary inflows the Klamath River would not have a salmon fishery. The Karuk children often avoid the main stem Klamath River in favor of tributary streams for swimming during the summer months

due to the extent of algal mats and other unsightly aquatic vegetation in the main stem Klamath River.

3.4.1 Designated Use Support

Information on the degree of use support for rivers and streams is presented in ***Table 3-1***. Individual use support for rivers and streams is summarized in ***Table 3-2.***

3.4.2 Causes/Stressors and Sources of Designated Use Impairment

Information on cause/stressor categories (***Table 3-3***) and source categories (***Table3-4***) is provided for Tribal waters that are not fully supporting their designated uses. Causes/stressor are pollutants or conditions that stress uses of Tribal waters, such as flow alterations. Source categories are facilities that include U.S. Forest Service road building, logging and herbicide spraying as well as upstream abandoned acid mine drainage (Grey Eagle Mine Superfund Site), wastewater discharges, or activities, such as agricultural irrigation return flows, that contribute pollutants or stressors to a water thereby causing impairment of use support.

It has been determined that the water quality of the Klamath River is affected more by dam releases, upstream nutrient loading in the Upper Klamath River basin (extending into Oregon), and poor management practices by the U.S. Forest Service than by any other land uses. Impacts include water quality and riparian habitat degradation, anthropogenic eutrophication, increased erosion, and potential herbicide residues.

In addition, de la Fuente and Haessig (1994) concluded that constructed roads in sensitive areas increased landslide production by a factor of approximately 100, and timber harvest by approximately five times undisturbed rates in the Salmon River sub-basin.

Table 3-1. Summary of Fully Supporting, Threatened, and Impaired Streams and Rivers
(Reported in Miles)

Degree of Use Support	Assessment Category		Total Assessed Size
	Evaluated	Monitored	
Fully supporting all *assessed* uses			
Size fully supporting all *assessed* uses but threatened for at least one use	1.29		1.29
Size impaired for one or more uses	1.4		1.4
Size not attainable for any use and not included in the line items above			
TOTAL ASSESSED	2.69		2.69

Table 3-3. Total Sizes of Rivers and Streams Impaired by Various Cause/Stressor Categories (Reported in Miles)

Cause/Stressor Category	Size of Waters by Contribution to Impairment	
	Major	Moderate/Minor
Cause Stressor unknown		
Unknown toxicity		0.16
Pesticides		1.29
Priority organics		
Nonpriority organics		
PCBs		
Dioxins		
Metals		1.4
Ammonia	1.4	
Cyanide		
Sulfates		
Chlorine		
Other inorganics		
Nutrients	1.4	
pH		1.4
Siltation		2.69
Organic enrichment/low DO	1.4	
Salinity/TDS/chlorides		
Thermal modifications		
Flow alterations	1.4	
Other habitat alterations		
Pathogen indicators		
Radiation		
Oil and grease		
Taste and odor		
Suspended solids		
Noxious aquatic plants (macrophytes)	1.4	
Excessive algal growth		
Total toxics		
Turbidity		
Exotic species		
Other (specify)		

Legend
asterisk (*) = category not applicable
dashes (---) = category applicable, no data available
zero (0) = category applicable, but size of waters in the category is zero

Table 3-4. Total Sizes of Rivers and Streams Impaired by Various Source Categories

(Reported in Miles)

Source Category	Contribution to Impairment	
	Major	Moderate/Minor
Industrial Point Sources	1.4	
Municipal Point Sources	1.4	
Combined Sewer Overflows		
Collection System Failure		
Domestic Wastewater Lagoon		
Agriculture		
Crop-related sources	1.4	
Grazing-related sources		
Intensive Animal Feeding Operations		
Silviculture		2.69
Construction		
Urban Runoff/Storm Sewers		
Resource Extraction		
Land Disposal		0.16
Hydromodification	1.4	
Habitat Modification (non-hydromod)		
Marinas and Recreational Boating		
Erosion from Derelict Land		
Atmospheric Deposition		
Waste Storage/Storage Tank Leaks		
Leaking Underground Storage Tanks		
Highway Maintenance and Runoff		
Spills (Accidental)		
Contaminated Sediments		
Debris and Bottom Deposits		
Internal Nutrient Cycling (primarily lakes)		
Sediment Resuspension		
Natural Sources		
Recreational and Tourism Activities		
Salt Storage Sites		
Groundwater Loadings		
Groundwater Withdrawal		
Other'		
Unknown Source		
Sources Outside Reservation Jurisdiction Borders		

Legend

asterisk (*)= category not applicable

dashes (---) = category applicable, no data available

zero (0) = category applicable, but size of waters in the category is zero

Relative Assessment of Causes/stressors - The following causes/stressors have been identified as contributing to the actual or threatened impairment of rivers and streams:

Unknown Toxicity – Leachate from the old USFS Oak Bottom Dump site is a toxicity concern based on Karuk Tribal personnel's verbal information on buried drums that contained herbicides. The old dump site, which is upgradient of a KTOC Trust Land, has since been covered with soil and replanted.

Pesticides – USFS and county herbicide spraying on clear cuts, road sides and other forest vegetation is a concern because stormwater runoff from these areas enters salmonid stream habitats and these forest service lands are often located in recharge zones for KTOC Trust Lands individual domestic supply wells.

Metals – The old Grey Eagle Mine tailings were discharging acid mine drainage into Indian Creek as recently as the Fall 2000 when a water quality survey was conducted by the KTOC Department of Natural Resources and Water Quality Technology, Inc. The Grey Eagle Mine's acid mine drainage flows of approximately 0.25 cfs to Indian Creek were found to contain elevated levels of arsenic (0.027 mg/L), iron (101 mg/L), nickel (0.15 mg/L), and zinc (0.91 mg/L), and had a pH of 2.8 standard units. The recent presence of acid mine drainage to Indian Creek is especially noteworthy since this site was a superfund site that has been "cleaned up". The engineering design for the Grey Eagle Mine Superfund Site appears to have been flawed in that a cap with a liner over the tailings and the establishment of vegetation on the regraded ground surface have done little to mitigate the subsurface contamination of ground water flows that discharge into Indian Creek. Metals from other old mines may continue to contaminate water resources.

Ammonia – Un-ionized ammonia is a toxic chemical in the main stem Klamath River, especially during the summer months when flows are low and both pH and water temperature are high resulting in elevated concentrations of this toxicant. Un-ionized ammonia has been implicated as one of many causes for fish kills of salmonids in the main stem Klamath river (Balance Hydrologics, Inc. 1996).

Nutrients – The nutrients, nitrogen and phosphorus, in the main stem Klamath River stimulate algal blooms, the formation of algal mats, and the growth of noxious aquatic plants. Photosynthetic activity during the day and the predominance of respiration at night results in fluctuations in pH and dissolved oxygen (DO), especially on warm days. These diel fluctuations, especially DO, often result in exceedances of acceptable ranges required for salmonid survival and direct mortality of salmonids may be expected and has been witnesses and documented by KTOC Fisheries Crews. The benthic macroinvertebrate population in the main stem Klamath River is characteristic of rivers with moderate to high levels of productivity (California Department of Water Resources 1986, 1987).

pH – Levels of pH are depressed below acceptable ranges in acid mine drainage at the Grey Eagle Mine's acid mine drainage and elevated above acceptable ranges as a result of diel fluctuations of nutrient-rich river water in the main stem Klamath River.

Siltation – Siltation of streambeds adversely affects the gravel spawning beds of salmonids. Siltation does not allow for adequate dissolved oxygen levels that are required for salmonid eggs.

Organic Enrichment/Low DO – Organic enrichment results in oxygen sags causing DO levels to dip below those necessary to support salmonids and physiological stress or mortality occurs, especially during early life stages.

Flow Alterations – Reductions in summer flows and increased fall and early-winter peak flows disrupt the natural flow regime of salmonid spawning and contribute to poorer water quality (DO, un-ionized ammonia, and water temperature) as discussed above.

Noxious Aquatic Plants (Macrophytes) and Excessive Algal Growth – Noxious aquatic plants and excessive algal growth occur in the main stem Klamath River as a result of upstream nutrient loading and diminished base flows during the warmer summer months. As discussed above, diel fluctuations in DO, water temperature, pH, and the increased un-

ionized ammonia production results in poorer water quality, stressed aquatic life, and oftentimes fish kills.

The Oregon water quality index (OWQI) level for the Upper Klamath River indicates that the Klamath River water upstream of the KTOC Trust Lands is of poor water quality throughout the year as a result of nutrients, BOD, total solids, and unionized ammonia. Although water temperature is most often considered the major water quality problem in the Klamath River, nutrient loading from upstream sources will continue to impair the fisheries and other aquatic life regardless of increased flows as a result of low dissolved oxygen levels during diel fluctuations.

Relative Assessment of Sources - The following sources have been identified as activities or pollutant sources contributing to the actual or threatened impairment of rivers and streams (Note: All sources are outside KTOC Trust Lands borders):

Industrial Point Sources – The California Department of Water Resources (California Department of Water Resources 1986, 1987) and the Oregon Department of Environmental Quality have identified wood products factories as a major contributor to water quality impairment due to organic matter loading to the main stem Klamath River.

Municipal Point Sources – The California Department of Water Resources (California Department of Water Resources 1986, 1987) and the Oregon Department of Environmental Quality have identified wastewater treatment plant discharges as a major contributor to water quality impairment due to nutrient and organic matter loading to the main stem Klamath River.

Agriculture (Crop-Related Sources) – The California Department of Water Resources (California Department of Water Resources 1986, 1987) and the Oregon Department of Environmental Quality have identified irrigation return flows as a major contributor to water quality impairment due to nutrient and organic matter loading to the main stem Klamath River.

Silviculture – Silt from eroded Forest Service areas results from clear cuts through tributary stream courses and catastrophic fires on steep slopes.

Land Disposal – Leachate from the old USFS Oak Bottom Dump site is a toxicity concern based on Karuk Tribal personnel's verbal information on buried drums that contained herbicides. The old dump site, which is upgradient of a KTOC Trust Land, has since been covered with soil and replanted. The old Grey Eagle Mine tailings were discharging acid mine drainage into Indian Creek as recently as the Fall 2000 when a water quality survey was conducted by the KTOC Department of Natural Resources and Water Quality Technology, Inc.

Hydromodification – Flow alterations occur due to the regulated main stem of the Klamath River from dam releases and agricultural drains.

3.4.3 Cause/Source Linkage

A cause/source linkage combines cause/stressor categories with their pollutant source or activity. A cause/source linkage is provided to answer questions such as *Which rivers are impaired because of pesticides from upstream off-reservation agricultural crop runoff?* The following cause/source linkages have been identified as contributing to the actual or threatened impairment of rivers and streams on the KTOC Trust Lands.

- **Unknown Toxicity and Metals** *linked with* **Land Disposal**

- **Siltation and Pesticides** *linked with* **Silviculture and Agriculture (Crop-Related Sources)**

- **Nutrients, pH, Noxious Aquatic Plants, Excessive Algal Growth, and Ammonia** *linked with* **Municipal Point Sources and Agriculture (Crop-Related Sources) and Hydromodification**

- **Oxygen Enrichment/Low DO** *linked with* **Municipal Point Sources, Agriculture (Crop-related sources), and Industrial Point Sources and Hydromodification**

- **Flow Alterations** *linked with* **Hydromodification**

3.5 Lakes Water Quality Assessment

3.5.1 Background

There is one lake on the KTOC Trust Lands. The lake is considered to be significant tribally owned lake because of its cultural significance. A description of the significant tribally owned lake is provided below.

> **Sacred Pond at Katimin** - This 0.16 acre lake is located at a spring source. The lake is an important cultural surface water that requires the greatest protection measures.

3.5.2 Designated Use Support

Use support decisions have been made for the significant tribally owned lake; these designated uses are presented in ***Table 3-5***. Use support decisions for the lake is based on evaluated waters using a biosurvey and water quality information collected during Fall and winter 2000 as part of a short-term intensive water quality survey.

A summary of individual use support for the lake is provided in ***Table 3-6***. The fishable goal of the Clean Water Act using water quality information from Tribal members and trophic status as an indicator is: fully supporting at the Sacred Pond at Katimin. The swimmable goal of the Clean Water Act using swimming and secondary contact as indicators is unassessed because there is currently no routine bacterial monitoring at this lake.

Table 3-5. Summary of Fully Supporting, Threatened, and Impaired Lakes (Reported in Acres)

Degree of Use Support	Assessment Category		Total Assessed Size
	Evaluated	Monitored	
Size Fully Supporting All *Assessed* Uses	0.16		0.16
Size Fully Supporting All *Assessed* Uses but Threatened for at Least One Use			
Size Impaired for One or More Uses			
Size Not Attainable for Any Use and Not Included in the Line Items Above			
TOTAL ASSESSED	0.16		0.16

3.5.3 Causes/Stressors and Sources of Impairment of Designated Uses

Information on cause/stressor categories (***Table 3-7***) and source categories (***Table 3-8***) is provided for Tribal waters that are not fully supporting their designated uses. Causes/stressors are pollutants or

Table 3-7. Total Sizes of Lakes Impaired by Various Cause/Stressor Categories

(Reported in Acres)

Cause/Stressor Category	Size of Waters by Contribution to Impairment	
	Major	**Moderate/Minor**
Cause stressor unknown	*	*
Unknown toxicity	*	*
Pesticides	*	*
Priority organics	*	*
Nonpriority organics	*	*
PCBs	*	*
Dioxins	*	*
Metals	*	*
Ammonia	*	*
Cyanide	*	*
Sulfates	*	*
Chlorine	*	*
Other inorganics	*	*
Nutrients	*	*
pH	*	*
Siltation	*	*
Organic enrichment/low DO	*	*
Salinity/TDS/chlorides	*	*
Thermal modifications	*	*
Flow alterations	*	*
Other habitat alterations	*	*
Pathogen indicators	*	*
Radiation	*	*
Oil and grease	*	*
Taste and odor	*	*
Suspended solids	*	*
Noxious aquatic plants (macrophytes)	*	*
Excessive algal growth	*	*
Total toxics	*	*
Turbidity	*	*
Exotic species	*	*
Other (specify)	*	*

Footnotes

asterisk (*) = category not applicable

dashes (---) = category applicable, no data available

zero (0) = category applicable, but size of waters in the category is zero.

Table 3-8. Total Sizes of Lakes Impaired by Various Source Categories

(Reported in Acres)

Source Category	Contribution to Impairment	
	Major	**Moderate/Minor**
Industrial point sources	*	*
Municipal point sources	*	*
Combined sewer overflows	*	*
Collection system failure	*	*
Domestic wastewater lagoon	*	*
Agriculture	*	*
Crop-related sources	*	*
Grazing-related sources	*	*
Intensive animal feeding operations	*	*
Silviculture	*	*
Construction	*	*
Urban runoff/storm sewers	*	*
Resource extraction	*	*
Land disposal	*	*
Hydromodification	*	*
Habitat modification (non-hydromod)	*	*
Marinas and recreational boating	*	*
Erosion from derelict land	*	*
Atmospheric deposition	*	*
Waste storage/storage tank leaks	*	*
Leaking underground storage tanks	*	*
Highway maintenance and runoff	*	*
Spills (accidental)	*	*
Contaminated sediments	*	*
Debris and bottom deposits	*	*
Internal nutrient cycling (primarily lakes)	*	*
Sediment resuspension	*	*
Natural sources	*	*
Recreational and tourism activities	*	*
Salt storage sites	*	*
Groundwater loadings	*	*
Groundwater withdrawal	*	*
Other (septic releases)	*	*
Unknown source	*	*
Sources outside reservation jurisdiction borders	*	*

Footnotes

asterisk (*) = category not applicable
dashes (---) = category applicable, no data available
zero (0) = category applicable, but size of waters in the category is zero.

conditions that stress uses of a waterbody, such as flow alterations or introduction of exotic fish that out-compete native fishes. Source categories are facilities, such as mining operations and wastewater discharges, or activities, such as impounded water fluctuations, and agricultural irrigation return flows, that contribute pollutants or stressors to a waterbody and cause impairment of use support.

Relative Assessment of Causes/Stressors – There are no identified causes or stressors contributing to the actual or threatened impairment of the Sacred Pond at Katimin.

Relative Assessment of Sources – There are no identified activities or pollutant sources contributing to the actual or threatened impairment of the Sacred Pond at Katimin.

3.5.4 Cause/Source Linkage

A cause/source linkage combines cause/stressor categories with their pollutant source or activity. A cause/source linkage is provided to answer questions such as *Which lakes are impaired because of metals loading from upstream off-reservation mine drainage?* No cause/source linkages have been identified as contributing to the actual or threatened impairment of the Sacred Pond at Katimin.

3.5.5 Trophic Status

Trophic status is a classification system for lakes that is based on the nutrient concentrations (especially phosphorus) and the level of biological productivity (especially algae) in a lake. A trophic status provides a means of comparing and communicating lake conditions and is the most commonly used characterization of lakes today. Those lakes with low nutrient concentrations and a low level of biological productivity are termed oligotrophic, those with high nutrient concentrations and a high level of biological productivity are termed eutrophic (or hypereutrophic in an advanced eutrophic state), those lakes between oligotrophic and eutrophic are termed mesotrophic.

Trophic status is an index of water quality to the extent that a trophic condition can limit the beneficial uses of a lake, such as swimming and aquatic life support. Generally, as a lake

becomes eutrophic, the negative effects of the eutrophication are considered to be especially accelerated by human activities. Negative effects include reduced dissolved oxygen to concentrations that can be lethal to most fish species. Eutrophication often leads to increased fish production but decreased species diversity, with a loss of species such as salmon.

A commonly used indicator of the nutrient status of lake water is the TP (total phosphorus) concentration because it is often considered the limiting nutrient controlling algal growth, though nitrogen species (nitrate, ammonia, and ammonium) also may be limiting nutrients. A commonly used indicator of biological productivity is water clarity as measured by a Secchi disc. Levels of algal growth are measured using chlorophyll *a* concentrations.

The most frequently used TSI (trophic state index) using only one variable is that of Carlson (1977). With this index, lakes can be classified on the basis of lake water surface TP, chlorophyll *a* concentration, or Secchi disc using the following equations:

$$TSI\ CHL = 8.23 \ln CHL + 33.3$$
$$TSI\ TP = 14.42 \ln TP + 4.15$$
$$TSI\ SD = 60 - 14.41 \ln SD$$

where:

TSI	=	trophic state index
ln	=	natural log
CHL	=	chlorophyll *a* (µg/L)
TP	=	total phosphorus (µg/L as P)
SD	=	Secchi disc depth transparency (meters)

The three variables provide three separate estimates of trophic state. The CHL TSI is given priority for classification because it is a biological variable indicating the amount of algae present in the water.

Data for the epilimnion (upper lake surface) is best collected during the mid-summer season (July and

August) for calculating the mean TP, CHL, and SD for lakes. Individual TSIs for each lake are compared to the categories presented below to determine an overall trophic status (Olem and Flock 1990).

TSI	TROPHIC STATUS
0-40	Oligotrophic
41-50	Mesotrophic
51-70	Eutrophic
>70	Hypereutrophic

When there were differences among individual TSIs (greater than 5 units) for a lake, they were averaged to obtain an overall TSI. Where SD equaled total lake depth (an indication of a shallow lake), or where TSIs were on a boundary between two trophic categories, the overall trophic category was selected by weighting in favor of the CHL TSI.

The Sacred Pond at Katimin on the KTOC Trust Lands has been assessed for trophic status (***Table 3-9***) using total phosphorus (200 ug/L as P) as the exclusive TSI indicator. The Sacred Pond at Katimin had a trophic status of eutrophic. A trophic status of eutrophic is considered to be indicative of unpolluted productive lakes in the Klamath River basin.

3.5.6 Control Methods

No control methods have been implemented for the lake on the KTOC Trust Lands. The assessment is intended to determine whether the lake is in need of control methods and which control methods are appropriate to restore and maintain good lake water quality. No water quality pollutants have been identified at this time.

Table 3-9. Trophic Status of Significant Publicly Owned Lakes

	Number of Lakes	Acreage of Lakes
Total	1	0.16
Assessed		
Oligotrophic		
Mesotrophic		
Eutrophic	1	0.16
Hypereutrophic		
Dystrophic		
Unknown		

3.5.7 Restoration/Protection Efforts

The development, implementation, and enforcement of BMPs would help to protect this waterbody form any potential bacterial or nutrient loading to the lake.

3.5.8 Lake Water Quality Standards

Water quality standards have been proposed for development for the KTOC Trust Lands which will apply to lakes. Lake designated uses, numeric and narrative water quality criteria, and an antidegradation provision are proposed for development in the water quality standards.

3.5.9 Acid Effects on Lakes

Acid sensitivity is primarily determined by the watershed bedrock geology and exposure to acid rain. The geologic materials underlying the KTOC Trust Lands appear to provide adequate acid neutralizing capacity to the lakes. Sources of atmospheric pollutants that could increase the acidity of rain are located outside the KTOC Trust Lands boundaries.

Information on the presence or extent of acid rain for the KTOC Trust Lands has not received much attention because it is not considered to be a problem. Alkalinity is a good indicator of the buffering or ANC (acid neutralizing capacity) of a lake and will be used as an index of acid sensitivity. Total alkalinity concentrations reported for lakes are converted from milligrams per liter as calcium carbonate (mg/L as $CaCO_3$) to ANC using the following equation (Hem 1985):

Total alkalinity (mg/L as $CaCO_3$) x 20 = ANC (µeq/L)

The following ANC classifications (Gibson *et al.* 1983) are used to assess the acid sensitivity of lakes:

Nonsensitive	:	ANC >= 200 µeq/L
Sensitive	:	ANC >= 100 and <200 µeq/L
Very sensitive	:	ANC >= 50 and <100 µeq/L
Extremely sensitive	:	ANC < 50 µeq/L

A water sample was collected from the Sacred Pond at Katimin on January 11, 2001, by Scott Quinn, and laboratory analyzed at a pH of 7.5 and a total alkalinity concentration of 185 mg/L as $CaCO_3$ or an ANC of 3,700 µeq/L. Based on these data, the lake is classified as nonsensitive, slightly alkaline, and has a high buffering capacity (***Table 3-10***).

Table 3-10. Acid Effects on Lakes

	Number of Lakes	Acreage of Lakes
Assessed for acidity	1	0.16
Impacted by high acidity	0	0
Vulnerable to acidity	0	0

3.5.10 Toxic Effects on Lakes

The lake on the KTOC Trust Lands has not been sampled for a full suite of toxic pollutants, such as metals and pesticides in fish tissue, sediment, and water.

3.5.11 Trends in Lake Water Quality

Because of a lack of long-term water quality data, a discussion of apparent trends in lake water quality is not possible at this time.

A lake water quality monitoring program is planned as part of the Water Pollution Control Program through USEPA Region IX. Trends in lake water quality would be detected through (1) changes in trophic status, (2) changes in the degree of designated use support, (3) changes in bacteria levels for lakes that are used for swimming (full body contact recreation) or wading

(partial contact recreation), and (4) changes in levels of toxic pollutants in sediment and fish tissue.

3.6 Estuary and Coastal Assessment

A water quality assessment of estuarine and near-coastal waters is not provided because no estuaries, coastal waters, or Great Lakes shorelines are found on the KTOC Trust Lands.

3.7 Wetlands Assessment

As a means of providing an initial estimate of the extent and types of wetlands within the KTOC Trust Lands, National Wetlands Inventory maps (which use the Cowardin identification system - Table 13) produced by the U.S. Fish and Wildlife Service (1991) will be obtained. These maps are available in hardcopy as well as digital format so they can be used in a GIS application. The National Wetlands Inventory maps show the locations, shapes, and types of wetlands and deepwater habitats on USGS 1:24,000 topographic maps. National Wetlands Inventory maps are produced on USGS topographic maps after completion of the following steps: (1) preliminary field investigations of wetlands, (2) interpretation of aerial photographs, (3) review of existing wetland information for the area, (4) quality control protocols for aerial photographic interpretations, (5) production of draft maps, (6) interagency review of draft maps, and (7) final map production. The KTOC Trust Lands contains a vast amount of diverse wetland resources. These wetlands are associated with streams, rivers, and the lake.

Primary wetland ecosystems found within the Territory are the riparian zones. Riparian ecosystems are the interface between the aquatic and terrestrial ecosystems and encompass a wide range of environmental factors, ecological processes, and biotic communities. Riparian communities occur along rivers and streams and around the lake within the KTOC Trust Lands. Local slope, aspect, elevation, soil type, and geology influence the width, density, and diversity of riparian vegetation. The most important features supporting a wetland is a source of hydrology during the growing season.

The general problems with wetlands protection and management on the KTOC Trust Lands are (1) the lack of Tribal mechanisms for educating KTOC Trust Lands residents about preserving

wetlands and the need for protecting wetlands; and (2) the lack of Tribal mechanisms for wetlands inventories, assessment, protection, and net gain in acreage, values, and functions over time.

3.7.1 Development of Wetland Water Quality Standards

In order to protect wetland resources, the Karuk Tribe proposes to develop wetland water quality standards. The purpose of the wetland water quality standards for the KTOC Trust Lands is to meet the federal provisions of the CWA as they relate to wetlands. Designated uses are determined for each wetland type: riverine, palustrine, or lacustrine.

One use of wetland water quality standards would be the CWA Section 401 water quality certification process, which would allow the Karuk Tribe to apply these standards as part of its review of federally licensed or permitted activities that may degrade water quality and aquatic habitat on the Aboriginal Territory, such as CWA Section 404 Dredge or Fill permits.

3.7.2 Integrity of Wetland Resources

A key beneficial use designated by the Karuk Tribe is the preservation of the cold-water fisheries. Riparian ecosystems play an important part in this area. Riparian vegetation is the benchmark criteria for ideal salmonid environments. Riparian vegetation is important to fish habitat in providing shade for temperature control, maintaining channel and bank stability, and providing cover through roots and overhangs. In addition, down woody debris accumulates in the riparian areas which provides for salmonid refuge and shade.

There is no current monitoring or assessment provision to evaluate whether Tribal wetland resources are jurisdictional and whether wetlands are being degraded or enhanced in function, value, or acreage. However, subjective information is available on probable causes and impairment of wetlands.

3.7.3 Causes/Stressors and Sources of Designated Use Impairment for Wetlands

Information on cause/stressor categories and source categories is provided for Tribal wetlands that are not fully supporting their designated uses.
Large woody debris, such as downed trees and limbs, is an important factor in influencing whether sediment inputs affect channel stability and aquatic habitat. A stream that is lacking in large woody debris tends to be more uniformly broad and shallow with fewer pools and spawning gravel accumulations, and is more prone to channel scour by flood flows. Riparian areas protect water quality by filtering sediment and providing vegetation needed to stabilize stream banks.

In addition to providing aquatic and wildlife habitats, riparian areas are also the focus of water-related recreation uses, such as fishing, hunting, camping, and hiking. Alteration of riparian areas has occurred from timber harvest, road construction, recreation, mining, and livestock grazing, as well as natural events, such as floods and landslides. As part of the Karuk's Wetland Protection Program, the Tribe will work with other agencies, such as the USDA-Forest Service, to identify and design protection plans for key riparian areas.

Relative Assessment of Causes/stressors - The following causes/stressors have been identified as contributing to the actual or threatened impairment of wetlands on the KTOC Trust Lands.

Flow Alterations - Flow alterations occur as a result of dam releases.

Pesticides – Herbicide spray drift is a potential contaminant source for wetland plants and is of important cultural significance for wetland plants used for basket material and medicine by Tribal members.

Other Habitat Alterations - Impairment of wetlands, including riparian and fish habitat, is widespread throughout the KTOC Trust Lands.

Relative Assessment of Sources - The following sources have been identified as activities or pollutant sources contributing to the actual or threatened impairment of wetlands.

Agriculture (Crop-Related Sources) - It appears that agricultural irrigation return flows have contributed to stream impairment through nutrient loading and resultant excessive algal growth in many areas.

Hydromodification - Dam building on the Klamath River and the resultant regulated flow of the main stem Klamath River results in a flow regime that adversely impacts riparian vegetation.

Cause/Source Linkage

A cause/source linkage combines cause/stressor categories with their pollutant source or activity. A cause/source linkage is provided to answer questions such as *Which wetlands are impaired because of habitat modification from grazing-related causes?* The following cause/source linkages have been identified as contributing to the actual or threatened impairment of rivers and streams:

- **Other Habitat Modification** *linked with* **Agriculture (Crop Related Sources)**
- **Flow Alterations** *linked with* **Hydromodification**
- **Herbicide applications** *linked with* **Wetland Plant Contamination (cultural)**

3.7.4 Extent of Wetland Resources

Wetlands on the KTOC Trust Lands are located largely within the riparian zones of rivers, streams and the lake shoreline. Because of the close association of wetlands and riparian areas the Karuk Tribe will consider riparian communities in its environmental conservation and restoration planning.

Inventory Methods

The wetland resources on the KTOC Trust Lands will be characterized by location, type, and acreage using the following available information.

U.S. Fish and Wildlife Service National Wetland Inventory Maps. NWI (National Wetland Inventory) maps produced by the USFWS are the current resource available for identifying

wetlands on the KTOC Trust Lands. NWI maps use the Cowardin Classification System (Coward *et al*. 1979). The Cowardin Classification System describes the ecological taxa, arranges them in a system useful to resource managers, furnishes units for mapping, and provides uniformity of concepts and terms.

GIS Mapping Service. Wetlands delineated on the NWI maps for the KTOC Trust Lands will be digitized into the GIS system.

Delineation Methods. Wetlands delineation methods incorporate the general diagnostic environmental characteristics outlined in the U.S. Army Corps of Engineers Wetlands Delineation Manual (COE 1987) to delineate jurisdictional wetlands regulated under Section 404 of the CWA. However, unlike the 1987 manual's wetland determination, the Karuk Tribe will delineate as wetlands areas that may not meet the vegetation, soils, or hydrology criteria.

Additional Wetlands Protection Activities

As part of the CWA Section 104(b)(3) State Wetlands Protection Program the Karuk Tribe is planning on developing a State Wetland Conservation Plan. A State Wetland Conservation Plan is the primary mechanism for protecting Tribal wetland resources (including riparian areas). Through the aid of USEPA Region IX, the Tribe will initiate an inventory and assessment of the extent and types of wetlands within the Aboriginal Territory. In addition, a commitment within the Karuk's constitutional framework to restore and maintain the integrity of wetland resources on the Territory, with the goal of no net loss and long-term gain of wetlands, may be proposed. The Karuk Tribe is considering pursuing CWA Section 401 water quality certification as an additional wetland and water quality protection strategy. Section 401 water quality certification would allow the Tribe to impose water quality-based requirements on federally licensed or permitted projects (or exercise veto power) to protect the quality of Tribal waters, including wetlands.

Regulatory Mechanisms. A list of regulatory mechanisms, both Tribal and federal, considered for protecting wetlands on the KTOC Trust Lands is presented in ***Table 3-11***.

The Karuk Tribe will commit within its administrative framework to restoring and maintaining the integrity of wetlands on the KTOC Trust Lands through a wetlands and riparian area ordinance. The ordinance will contain a consistent definition of wetlands and riparian areas. The Karuk Tribe will pursue the NNL (no net loss and long-term gain) goal by compensating for past and future wetland losses in a manner that results in a net increase in wetland acreage and function without adversely affecting economic development on the KTOC Trust Lands. NNL can be achieved by compensating for wetland losses in the following ways:

- In-kind (i.e., the same wetland types in the same hydrologic settings)
- With equivalent values, functions, and area
- On or near the location (e.g., watershed) of the losses

Table 3-11. Existing and Needed Wetlands Protection Mechanisms

Mechanism	Administering Agency	Existing or Needed
Wildlife Management Program	US Fish and Wildlife Service	Needed
CWA Section 404	U.S. Army Corps of Engineers	Existing
CWA Section 401 (Federal)	USEPA	Existing
CWA Section 401 (Tribal)	KTOC Department of Natural Resources	Needed
Tribal Water Pollution Control Program	KTOC Department of Natural Resources	Existing
Fishery Management Plan	USFWS	Needed
Tribal Wetlands Water Quality Standards	KTOC Department of Natural Resources	Needed
GIS Reservation Wetlands Location and Type Map	KTOC Department of Natural Resources	Needed

The KTOC Department of Natural Resources will be responsible for determining losses or gains of wetlands and their associated functions and values. The Wetlands Protection Program will help the KTOC Department of Natural Resources evaluate current methods used to determine wetland losses. Criteria for evaluating the cultural functions and values associated with wetlands will be developed and incorporated into the method determined to be the most appropriate for the KTOC Trust Lands. A permanent monitoring and assessment program will be developed and implemented to provide the KTOC Department of Natural Resources with the data necessary to determine whether a loss or gain of wetlands has occurred.

Non-regulatory Mechanisms. Use of non-regulatory protection methods has the most potential for addressing the need to protect critical wetland and riparian areas on the KTOC Trust Lands.

The potential mechanisms being considered for use with the Wetlands Protection Program may include developing the programs outlined below.

Community Outreach/Education. In order to solicit input from the Karuk Tribe, public participation programs will be established. The programs will provide information regarding the wetlands assessment and management plans and will help solicit questions, comments, and concerns regarding proposed wetlands protection measures.

Additional wetlands awareness measures may include the following:

- A brochure describing wetlands protection measures
- Wetlands awareness and protection presentations for Tribal employees, high school and grade school students, and U.S. Forest Service personnel
- Input solicitation from Tribal members on pilot projects, such as wetlands protection projects

Tribal Wetlands Creation/Restoration Program. The Karuk Tribe will select locations to conduct pilot projects for re-establishing native vegetation.

Monitoring. A wetlands assessment and monitoring plan will be designed to meet wetlands jurisdiction, function, value, and acreage information needs. A wetlands assessment and monitoring program will be tested and refined, as needed, after it is incorporated into the Karuk Tribe's Wetlands Protection Program under the CWA.

The following components will be incorporated into the Karuk Tribe's wetlands assessment and monitoring plan:

- Wetland hydrology source(s)
- Reference wetland characteristics
- Wetland functions
- Existing sources of wetland degradation
- Potential sources of wetland degradation

- Cultural and traditional uses of wetlands
- Determination as to whether a wetland is jurisdictional

Partnerships. Increased participation in federal, Tribal, state, and local management forums for the cooperative management of the KTOC Trust Lands and surrounding areas will be pursued. Attendance at work group meetings with other entities, such as those listed below, are planned whenever funding is available. This will promote the importance of including the ecological value of maintaining wetland and riparian areas in any development plans proposed for this region.

- U.S. Bureau of Reclamation
- USFWS
- USEPA
- USGS
- U.S. Department of Agriculture (Natural Resources Conservation Service)
- U.S. Bureau of Land Management
- Local conservation groups

Resource Management. The goal of NNL for identified wetlands resources and riparian areas will be supported by any long-term resource management planning undertaken on the KTOC Trust Lands.

Restoration/Preservation Plan. The Karuk Tribe will establish critical habitat areas and pursue cooperative efforts with federal and state agencies to protect and restore wetland resources. This will help the Karuk Tribe ensure that future Tribal generations will have continued access to and knowledge of the traditional function and values of wetland and riparian areas on the KTOC Trust Lands. These areas can be developed with interpretive guides or material and will be open to the public to foster interest in conserving critical wetland areas.

3.8 Public Health/Aquatic Life Concerns

The Karuk Tribe is concerned about toxic and nontoxic contamination, and the following issues will be addressed in future water quality monitoring programs:

- The possibility of waterborne diseases in individual domestic water supply wells.
- Elevated levels of coliform bacteria in streams and other surface waters.
- The proximity of septic systems to streams and individual domestic water supply wells
- Resource extraction practices that may have mobilized toxic metals in streams and stream sediments, specifically at the Siskon and Grey Eagle Mines.
- Silviculture and resource extraction practices that have led to increased erosion and sediment loading in streams.
- Agricultural practices that have lead to (1) anthropogenic eutrophication, (2) choked aquatic vegetation from nutrient loading in streams; and (3) degraded riparian habitat.
- Herbicide residues form spraying by USFS personnel in the hills above Oak Bottom Dump since the 1970's. According to Karuk Tribal members, the 1970's herbicide spraying coincided with numerous birth defects and still births for families living in the area of potential exposure. Also according to Karuk Tribal members, Tribal families experiencing these birthing problems have since moved away from the KTOC Trust Lands.
- Foam or surfactants in the main stem Klamath River is unsightly and may pose a toxicity problem due to molds and potential pathogens feeding on decaying algal mats.

3.8.1 Size of Waters Affected by Toxicants

The Karuk Tribe has not conducted any sampling for toxicants on the KTOC Trust Lands. In addition, no information on toxicant studies conducted by other state or federal agencies was found (See Table -19).

The term *elevated levels of toxicants* is defined as an exceedance of any of the following criteria:

- Numeric Tribal water quality standards

- FDA action levels (FDA 1982) for human consumption of fish tissue

- International Joint Commission (IJC) levels (Shacklette and Boerngen 1984) for sediment

- National Academy of Sciences, National Academy of Engineering (1973) freshwater aquatic life and wildlife criteria for survival and reproduction of most fish species

- USFWS hazards criteria (Eisler 1985, 1986, and 1987) for survival and reproduction of fish-eating birds

The following water quality constituents are considered to be toxicants:

- Pesticides
- Priority organics
- Metals
- Un-ionized ammonia
- Chlorine

None off the toxicants listed above were assessed in Tribal waters on the KTOC Trust Lands.

3.8.2 Public Health/Aquatic Life Impacts

Information on public health and aquatic life impacts is assessed using fish kills and algal blooms. Fish kills and algal blooms in the Klamath River occur persistently each year as a result of nutrient loading and reduced stream flows in the summer as a result of upstream point and nonpoint source discharges and dam releases/diversions, respectively.

3.8.3 Public Water Supply/Drinking Water Use Reporting

A summary of contaminants used in the drinking water use assessment is provided in ***Table 3-12***. No levels of nitrate were detected at concentrations greater than the federal nitrate drinking water standard of 10 mg/L as N. Drinking water use designations for rivers and streams and as well as

the lake are proposed for development in the Karuk Tribe's upcoming water quality standards for the KTOC Trust Lands.

Table-3-12. Summary of Contaminants Used in the Drinking Water Use Assessment

Rivers and Streams	Contaminants Included in the Assessment	Lakes and Reservoirs	Contaminants Included in the Assessment
Klamath River	nitrate	Sacred Pond at Katimin	nitrate
Salmon River	nitrate		

4.0 GROUND WATER ASSESSMENT

Ground water supplies almost all of the drinking water and other domestic water uses on the KTOC Trust Lands. Ground water occurs on the KTOC Trust Lands in two hydrogeologic units: (1) fractured granite and metamorphic bedrock, and (2) alluvial material along streams. According to the USEPA, a PWS (Public Water System) has 15 or more service connections, or regularly serves 25 people 60 or more days per year. USEPA currently has no record of PWSs on the KTOC Trust Lands. The majority of drinking water on the KTOC Trust Lands are provided through individual domestic supply wells and springs.

The KTOC would like to maintain and protect the quality of ground water underlying the KTOC Trust Lands. The protection of recharge zones is a top priority to pursue under the Water Pollution Control Program. Ground water quality concerns on the KTOC Trust Lands include herbicide spraying on adjacent Forest Service lands, septic system releases, and leachate from land-disposal areas.

4.1 Summary of Ground Water Contaminant Sources

Major potential sources of ground water contamination are presented in ***Table 4-1***. Potential contaminants in ground water on the KTOC Trust Lands are pesticides (especially herbicides), nitrate, and bacteria.

4.2 Summary of Ground Water Protection Programs

To protect ground water on the Reservation, the Tribe is developing a ground water quality monitoring plan under its Water Pollution Control Program. As part of this development plan, the Tribe will address the following issues:

- Inadequately mapped ground water aquifers for the Reservation and scattered or nonexistent ground water quality information

- Lack of a comprehensive KTOC Trust Lands-wide wellhead protection program that complies with the SDWA and ensures that the water being supplied by drinking supply wells is safe

Table 4-l. Major Potential Sources of Ground Water Contamination

Contaminant Source	Ten Highest-Priority Sources (✓)	Factors Considered in Selecting a Contaminant Source	Contaminants
Agricultural Activities			
Agricultural chemical facilities	✓	existing	unknown
Animal feedlots			
Drainage wells			
Fertilizer applications	✓	existing	nutrients
Irrigation practices	✓	existing	nutrients
Pesticide applications	✓	existing	herbicides
On-farm agricultural mixing and loading procedures			
Land application of manure (unregulated)			
Storage and Treatment Activities			
Land application (regulated or permitted)			
Material stockpiles	✓	existing	unknown
Storage tanks (above ground)			
Storage tanks (underground)			
Surface impoundments			
Waste piles	✓	existing	unknown
Waste tailings	✓	existing	unknown
Disposal Activities			
Deep injection wells			
Landfills	✓	existing	unknown
Septic systems	✓	existing	nitrate, bacteria
Shallow injection wells			
Other			
Hazardous waste generators			
Hazardous waste sites			
Large industrial facilities			
Material transfer operations			
Mining and mine drainage	✓	existing	pH, metals

Contaminant Source	Ten Highest-Priority Sources (✓)	Factors Considered in Selecting a Contaminant Source	Contaminants
Pipelines and sewer lines			
Salt storage and road salting			
Salt water intrusion			
Spills			
Transportation of materials			
Urban runoff			
Small-scale manufacturing and repair shops			
Other sources			

- Lack of a comprehensive ground water protection program (under the CWA) with the overall goal of preventing adverse effects on both human health and the environment

Table 4-2 summarizes Tribal ground water protection programs.

To protect ground water on the KTOC Trust Lands, the Karuk Tribe is planning to develop a ground water assessment program. This program will address the following issues:

- Inadequately mapped ground water aquifers for the KTOC Trust Lands and scattered or nonexistent ground water quality information

- Lack of the classification of ground water aquifers by use and quality to establish levels of protection and promulgation of ground water quality standards under the CWA

- Lack of a comprehensive wellhead protection program

- Lack of a comprehensive ground water protection program (under the CWA) with the overall goal of preventing adverse effects on both human health and the environment

Currently the Karuk Tribe does not have any ground water protection programs in place. As part of the ground water assessment program, a ground water sampling plan would be developed. A comprehensive ground water sampling program would involve sampling drinking water supply wells to characterize the ground water quality on the Aboriginal Territory and document any exceedances of federal primary and secondary maximum contaminant levels (MCLs). Primary MCLs are enforceable and are related to the protection of public health, but take into consideration technological and economic feasibilities. Secondary MCLs are not enforceable and are related to the protection of public welfare, such as the aesthetic qualities of taste and odor in drinking water. Ground water quality standards are proposed by the Karuk Tribe under the Water Pollution Control Program.

4.3 Summary of Ground Water Quality

Herbicides, nitrate, and bacteria are the major contaminants of concern. Herbicide spraying has been practiced by the U.S. Forest Service since the 1950's in areas that include drinking water recharge areas for Tribal domestic supply wells. Nitrate and bacteria are a concern for Tribal domestic supply wells located nearby septic systems.

4.4 Summary of Ground Water - Surface Water Interaction

The possibility exists that there may be some shallow drinking water supply wells located in the alluvium of the Klamath River or its tributaries. An effort to identify these wells will be made as part of the ground water assessment program.

Table 4-2 Summary of Tribal Ground Water Protection Programs

Programs or Activities	Check (✓)	Implementation Status	Responsible Tribal Agency
Active SARA Title III Program			
Ambient ground water monitoring system	✓	under development	Dept. of Nat. Res.
Aquifer vulnerability assessment			
Aquifer mapping			
Aquifer characterization			
Comprehensive data management system			
EPA-endorsed Core Comprehensive Tribal Ground Water Protection Program			
Ground water discharge permits			
Ground water Best Management Practices			
Ground water legislation	✓	proposed	Dept. of Nat. Res.
Ground water classification	✓	proposed	Dept. of Nat. Res.
Ground water quality standards	✓	proposed	Dept. of Nat. Res.
Interagency coordination for ground water protection initiatives			
Nonpoint source controls			
Pesticide Tribal Management Plan			
Pollution Prevention Program			
Resource Conservation and Recovery Act(RCRA) Primacy			
Source Water Assessment Program			
Tribal Superfund			
Tribal RCRA Program incorporating more stringent requirements than RCRA Primacy			
Tribal septic system regulations			
Underground storage tank installation requirements			
Underground Storage Tank Remediation Fund			
Underground Storage Tank Permit Program			
Underground Injection Control Program			
Vulnerability assessment for drinking water/wellhead protection			
Well abandonment regulations			
Wellhead Protection Program (EPA-approved)			
Well installation regulations			
Other programs or activities			

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