

Karuk Tribe of California



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February 28, 2007

Mr. Bruce Gwynne
North Coast Regional Water Quality Control Board
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bgwynne@waterboards.ca.gov

Dear Mr. Gwynne,

The Karuk Tribe appreciates all the staff time and hard work that the Klamath Basin has received from the North Coast Regional Water Quality Control Board (Regional Board) and State Water Resources Control Board (State Board). Staff has been dedicated to working on total maximum daily loads (TMDL's), 401 certification for the Klamath Hydroelectric Project (KHP) relicensing, toxic algae workgroups, and fish health issues. Currently in California, the Klamath River is listed for temperature, dissolved oxygen, and nutrients in the entire mainstem and sediment from Weitchpec to the mouth.

Since the last 303(d) listing update, new water quality impairments have been identified in the Klamath, are harming beneficial uses, and need to be added to the 303(d) list. These impairments are the toxigenic cyanobacteria *Microcystis aeruginosa* (MSAE) and its associated toxin microcystin. Copco and Iron Gate Reservoirs (Copco and Iron Gate) and the Klamath River from Iron Gate to the mouth need to be listed for both MSAE and microcystin. Toxic algae blooms are influenced by factors such as habitat, temperature, and nutrients. Therefore, the nutrient listing alone is inadequate to address MSAE blooms and an additional listing is needed. Also, in the Regional Board's Basin Plan, toxicity is forbidden, so an additional listing for microcystin is warranted.

MSAE and microcystin were first identified in Copco in 2004 from a sample taken by the Klamath Basin Tribal Water Quality Workgroup (Kann 2005). The sample taken in September from a cove in Copco had 1.9 million cells/ml MSAE and 482 µg/L microcystin. Subsequent sampling in 2005 and 2006 by the Karuk Tribal Water Quality Program in Copco and Iron Gate and the Klamath River showed that toxic blooms of MSAE dominated the reservoirs during the hot summer months and into the fall (Kann 2006b, Kann and Corum 2006). Duration of the blooms was similar in both 2005 and 2006, starting in July and tapering off by early November. In 2005 levels of MSAE and microcystin peaked in September with a sample by a boat ramp in Copco that had 163 million cells/ml MSAE and 1995 µg/L microcystin (Kann and Corum 2006). In 2006 maximum levels of toxic algae were higher and the bloom started off stronger in July than the previous year yielding a sample with 393 million cells/ml by a Copco boat ramp.

The bloom was still strong in August and September, including a microcystin concentration of 12,176 µg/L from Copco (Kann 2006b). MSAE is occasionally found in the lakes, reservoirs, and river in the upper basin (Kann 2006a), yet at much lower frequency and at lower levels than those in Copco and Iron Gate. It should also be noted that after 2 years of sampling by the Karuk Tribe, MSAE was never detected directly above Copco and microcystin was only detected in very low amounts (Kann 2006b, Kann and Corum 2006). However, MSAE and microcystin were found in the Klamath River below Iron Gate at levels lower than the reservoirs, but following the same seasonal trajectory. MSAE is visibly pulled into the intake at Iron Gate and discharged into the Klamath River below (Photo 1).

While the State of California has not established guidance (see attached Timeline for California Blue Green Algae Workgroup) or standards for MSAE and microcystin, various other agencies, states, and countries have. The World Health Organization (WHO) sets a moderate probability of adverse health effect (MPAHE) at 100,000 cells/ml MSAE and 20 µg/L of microcystin (Falconer et al. 1999). Nebraska has followed the WHO guidelines by posting signs to avoid water contact at 20 µg/L (pers. comm. J. Lund). Australia is also in the process of developing standards for MSAE. Oregon recommends avoiding contact with water when levels exceed 40,000 cells/ml MSAE or 8 µg/L microcystin (Stone and Bress 2006). The Klamath Blue Green Algae Posting Sub-Group follows Oregon's guidance for posting to avoid water contact.

Levels of MSAE and microcystin found in Copco and Iron Gate exceeded the WHO MPAHE by 10 to over 1,000 times in 2005 and 2006 (Kann 2006b, Kann and Corum 2006). A memo from the Office of Environmental Health and Hazard Assessment (Kaley 2005) states that:

The *Microcystis aeruginosa* cyanobacteria levels and resulting microcystin toxin concentrations detected in water samples collected from both shoreline and open water locations in the Copco and Iron Gate Reservoirs in California pose a significant potential threat of adverse health effects in human and animals exposed through direct ingestion of contaminated water as well as incidental ingestion during recreational water activities and bathing.

In the river below Iron Gate, levels of MSAE frequently exceeded 10,000 cells/ml. In 2005, a sample from an eddy near Coon Creek had an MSAE level of 1.3 million cells/ml (Kann 2006a). In 2006, a sample from Seiad Valley exceeded 40,000 cells/ml (Kann 2006b). Therefore, the toxic algae poses not only a health threat to beneficial uses associated with the reservoirs, but also in the river below Iron Gate (see attached EPA/Regional Board/Karuk Tribe press release).

Beneficial uses impaired due to the toxic algae include (but are not limited to): Native American cultural use, water contact recreation, non-contact water recreation, commercial and sport fishing, subsistence fishing, and wildlife habitat. The NCRWQCB's Basin Plan is clearly being violated for standards including: Toxicity, Color, Floating Material, Suspended Material, Biostimulatory Substances, and Tastes and

Odors. Throughout the Karuk Tribe's monitoring of the toxic algae bloom in 2005 and 2006, water contact recreation and non-contact water recreation was occurring in Copco, Iron Gate and the Klamath River below Iron Gate. Activities included swimming, waterskiing (see Photo 2), snorkeling, rafting, and birding. Sport fishing was observed, too (see Photo 3). Domestic animals, wildlife, and livestock are also contacting toxic algae blooms, thus affecting wildlife habitat. For example, dogs and cows were both observed drinking MSAE-laden water and according to Terry Barber, Siskiyou County health official, there have been animal deaths due to algae (see attached Siskiyou Daily article). Birds were observed swimming through toxic algae blooms (see Photo 4) and deer were observed consuming toxic algae (see Photo 5).

For the Karuk Tribe, the summer months are a critical time for ceremonies, cultural use and subsistence fishing. These beneficial uses are severely impacted by toxic algae in the River. During certain ceremonies, Tribal members are supposed to bathe and drink River water. Traditional dipnet fishing occurs in backwaters or eddies (see Photo 6) which, as discussed above, is where MSAE has been shown it can regrow to toxic levels (Kann 2006a). Further uses of river water in the summer time include gathering basketry materials, gathering ceremonial materials, and swimming. The Klamath River needs to be listed immediately for MSAE and microcystin and actions need to be taken to reduce and eliminate the blooms to protect all of these beneficial uses.

If you have any questions regarding this proposed listing, please contact:

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Sincerely,

Susan Corum

Water Resources Coordinator
Karuk Tribe of California

See Attached:

1. References
2. Timeline for California Blue Green Algae Workgroup
3. EPA/Regional Board/Karuk Tribe Press Release
4. Siskiyou Daily Article
5. Photos 1-6

References

Falconer et al. 1999. Safe levels and safe practices. Pages 155-177 in: I. Chorus and J. Bartram, editors. *Toxic Cyanobacteria in water: a guide to their public health consequences*. World Health Organization Report. E & FN Spon, London and New York.

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Kann, J. and S. Corum. 2006. Summary of 2005 Toxic *Microcystis aeruginosa* Trends in Copco and Iron Gate Reservoirs on the Klamath River, CA. Technical Memorandum Prepared for the Karuk Tribe of California, March, 2006.

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Timeline for California Blue Green Algae Workgroup

Summer 2005: Karuk Tribe samples Copco and Iron Gate and finds extremely high levels of toxic algae

Nov. 2005: Meeting is held in Sacramento on toxic algae findings. A state workgroup for Blue Green Algae (BGA) is formed. State BGA group consists of multiple stakeholders and agencies including Tribes, EPA, OEHHA, Counties, DHS, Water Quality, Municipal water districts, State Water Board staff, Regional Water Board staff, etc..

Nov. 2005-March 2006: State BGA meetings; BGA guidance is developed. Guidance is based off of Oregon's Guidance (why reinvent the wheel). State Water Board staff leading project is Russ Kanz. Russ is on-track with all of the comments and is planning for a guidance to be finalized by June in time for the bloom in summer of 2006.

March 2006: After March 15th State BGA Workgroup meeting, Russ is removed from leading the workgroup. No explanation is given why staff is removed.

April 2006: Workgroup meeting is cancelled

May 2006: Workgroup meeting is scheduled for May 24th. Bloom will be here in less than 2 months. New State Water Board staff is assigned: Kim Ward.

June 2006: Workgroup meeting is scheduled for June 28th. Karuk Tribe expresses great concern at meeting that the guidance will not be in place for the bloom season. Kim does not understand. When asked if she knows about what happened in the Klamath in 2005 (very high levels of MSAE and microcystin), Kim says that she is not aware of the issue. She says that the workgroup can't do a guidance and that it would have to be run through legal and the State Board.

Summer 2006: Another bloom occurs with no State Guidance in place w/ some of the highest levels ever recorded in the World.

January 2007: No word has been heard from Kim Ward re: State Guidance or State BGA workgroup since summer of 2006. She is invited to Klamath BGA meeting in Sacramento. Kim tells us that back in September, it was decided that staff was no longer pursuing finalizing a draft guidance and that we should all defer to the DHS website. Earlier in the meeting, DHS told us that their website says to refer to the State Guidance.

February 2007: Karuk Tribe, EJCW, and Riverkeeper testify to State Board about needing to finalize the State Guidance.

State Water Resources Control Board

FOR IMMEDIATE RELEASE
September 30, 2005
SWRCB 05-019

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Federal, Tribal and State Authorities Advise Caution on Dangerous Klamath River Algae

SAN FRANCISCO – In response to the emergence of dangerous algal blooms in the Klamath River in California, the Karuk Tribe, the North Coast Regional Water Board and the U.S. Environmental Protection Agency are joining other local, state and federal agencies in warning residents and recreational users of the river to use caution when near such blooms.

“This algae produces toxins that pose a significant potential public health concern. We advise people to avoid all direct contact with Klamath River water while the bloom is occurring,” said Alexis Strauss, Water Division director of the EPA’s regional office in San Francisco.

Water samples taken over the past two months from Copco and Iron Gate Reservoirs – located on the Klamath near the Oregon border – have revealed high levels of the toxic blue-green alga *Microcystis aeruginosa*. Blooms of *Microcystis aeruginosa*, which often occur between June and September, can look like green, blue-green, white or brown foam, scum or mats floating on the water. They have been found as far as 125 miles downstream of the reservoirs.

The Klamath River is rich in nutrients that support the growth of the blue-green algae. Warm and calm surface water created by Iron Gate and Copco Reservoirs provide an ideal environment for the growth of large algal blooms. The extent of the blooms, and their toxicity, were not known until studies were conducted this year by the Karuk Tribe.

“In August, we found levels of *Microcystis aeruginosa* as high as 46.8 million cells/ml along the shoreline and 8.9 millions cells/ml on the open water. These levels exceed the World Health Organization (WHO) standard for recreational use by 468 and 89 times, respectively,” explained Susan Corum, the Water Resources Coordinator for the Karuk Tribe’s Department of Natural Resources. “Microcystin toxin produced by the blooms in these locations was 1571.7 and 436.9 µg/L; exceeding the WHO Tolerable Daily Intake level by 217 and 60.3 times respectively. These levels are among the highest recorded in the United States.”

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2-2-2 Klamath

According to California's Office of Environmental Health Hazard Assessment (OEHHA), the U.S. EPA, the Karuk Tribe and Water Board, the *Microcystis aeruginosa* and resulting microcystin toxin pose a significant potential health threat to humans and animals exposed through direct ingestion of contaminated water or incidental ingestion during recreational water activities and bathing.

"The public needs to take the microcystin toxin in this algae seriously," said Catherine Kuhlman, Executive Officer of the North Coast Water Board. "The levels of algae and associated toxins measured in parts of the river are high enough to pose health risks to anyone drinking or bathing in the water, particularly children and animals."

Studies of the possible health effects of exposure to *Microcystis aeruginosa* and its microcystin toxin in the Klamath's waters range from mild, non-life threatening skin conditions to permanent organ impairment and death depending upon exposure time and intensity.

Symptoms could include mild to severe eye irritation, allergic skin rash, mouth ulcers, fever, cold and flu-like symptoms, vomiting, diarrhea, kidney damage, liver damage or complete failure, and death.

Children and animals are at the greatest risk of adverse effects, due to their smaller body size and higher water ingestion rates.

As pets and other domestic animals could drink contaminated water, pets and livestock should be kept away from the water.

There are three main ways to be exposed to *Microcystis aeruginosa* and subsequent microcystin toxins in contaminated waters:

- direct contact to exposed skin or to the highly sensitive membranes of the ear, eye, nose and throat;
- accidental or intentional swallowing; and;
- inhalation of contaminated water aerosols.

A full-grown adult ingesting 3.4 ounces of contaminated water in a given day would be exposed to levels 28 times greater than the accepted World Health Organization's Tolerable Daily Intake value. This calculation is based on a single one-hour "swimming event" per day. More swimming events or activities of longer duration could result in greater exposure.

For an average-size child who is 3-years-old, ingesting slightly more than a measuring cup of contaminated water in any one "swimming event" would be the equivalent of 278 times the accepted WHO Tolerable Daily Intake value. As with adults, more swimming events or activities of longer duration could result in greater exposure.

3-3-3 Klamath

Local, state, tribal and federal health and environmental agencies recommend that people not drink or cook with contaminated waters. You should avoid or minimize contact with contaminated waters. It is best of stay out of the water near algal blooms and to keep pets away. If you do come in contact with the water, wash thoroughly with clean water. Avoid eating fish caught during an algal bloom. If you do, fishermen should clean the fish with fresh water and dispose of the innards away from the river or where animals could eat them; Avoid irrigation with contaminated water; Report dead or distressed wildlife along the shoreline to local, state or tribal authorities.

For more information, visit: The 1999 World Health Organization, Toxic Cyanobacteria in Water: A guide to their public health consequences, monitoring and management at:

[www.who.int/water_sanitation_health/resourcesquality/toxicyanbact/en/](http://www.who.int/water_sanitation_health/resourcesquality/toxiccyanbact/en/) and, World Health Organization Guidelines for Drinking Water Quality, 3rd Edition at: www.who.int/water_sanitation_health/dwq/gdwq3/en/index.html

Health risks of blue-green algae were overstated

By JOHN DIEMM
Daily News Staff Writer

YREKA — A press release submitted by the Karuk Tribe of California and printed Wednesday in the Daily News with the headline "Toxic algae in Klamath River causing health risk" has caused a stir from the Klamath River community and a reprint from the Siskiyou County Public Health Department that the "other side of the story" needs to be told and the suggestion that the press release itself might be politically motivated.

Siskiyou County Public Health Director of Environmental Health Terry Barber said that the public health department has informational bulletins at the recreational sites where blue-green algae might be encountered. However, no cases of illness have ever been documented.

"The Siskiyou County Public Health Department has not documented any cases of illness associated with swimming, boating, fishing, skiing or other recreational use in any water body in Siskiyou County," Barber said.

The public health department reports that blue-green algae, technically known as cyanobacteria, are simple plants that are naturally present in lakes and streams in Siskiyou County. They usually are present in low numbers but can become very abundant in warm, shallow, undisturbed surface water that receives a lot of sunlight. In these conditions, it can form blooms that discolor the water or produce floating scum on the surface.

The information bulletin states that some algae can produce toxins but not all blue-green algae blooms do.

"Recreational contact, such as swimming, is not expected to cause health effects," Barber said. "People whose skin comes in contact with algae toxins through swimming or other water activities may experience itching, rash, irritated eyes, sore throat or other hay fever-like symptoms. This may be caused by a person's sensitivity to the components of algae rather than the toxin."

The public health department bulletin said if people accidentally swallow water from a bloom, they should consult a physician if they

experience any of the symptoms of stomach cramps, vomiting, diarrhea, or fever.

Barber said it should be noted that no such cases have been reported to the public health department, and blue-green algae has been a part of Siskiyou County's lakes and rivers for as long as anyone can remember.

She said it is unlikely that people will intentionally swim through or drink water from algae blooms. Livestock and domestic animals, however, are not as discriminating and sometimes do.

"Occasionally domestic animals and livestock have been poisoned by toxins in the algae bloom," she said. "The number of affected animals has been very small and spread out over many years."

Blue-green algae has been a part of the Klamath River ecosystem for many years with some people using it as a food supplement. An industry of harvesting blue-green algae and packaging it for human consumption is thriving in Siskiyou County.

The press release given to the Daily News by Craig Tucker, spokesperson for

the Karuk and Yurok tribes, provided a much more alarming report of the dangers and risks associated with blue-green algae. The release spoke of possible liver damage due to long term exposure to the toxins from blue-green algae blooms, cited cases of livestock and domestic animal deaths, and questioned why the public health department has not closed Capes and Iron Gate Reservoirs due to these risks.

Barber said that the risks cited by Tucker's press release are overstated and the public health department has acted appropriately to the situation through public education at the places people will most likely encounter the seasonal blooms of blue-green algae.

Others who live along the Klamath River and near the two mentioned reservoirs believe that the press release itself is politically motivated, seeking to establish environmental justification to support the environmental community's proposal to have all the dams on the Klamath River removed.

Previously PacificCorp and its subsidiary Pacific Power are in the process of removing its licenses with the Federal Energy Regulatory Commission (FERC) for its dams and hydroelectric production on the Klamath River.

The Siskiyou County Public Health Department's recommendation for the public is simply not to swim in the blue-green algae blooms and don't drink the water near the blooms. The information bulletin

should also take steps to avoid drinking water any for domestic animals.

The Siskiyou County Public Health Department in Yreka can be contacted at 941-2100. The number for contacting on Tucker with the Karuk Tribe of California is 462-4400, ext. 27.

national lake users should take special care during blooms and should treat any human blooms with caution. Humans should not drink water from bloom-infested lakes and reservoirs, nor should they swim or wade in water containing microcystin alga material. Children should be supervised very closely and people

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"Occasionally domestic animals and livestock have been poisoned by toxins in the algae bloom"



Photo 1. 7/19/2006. Photo is taken from Iron Gate Dam looking upstream at the intake on river left. The water pulled into the intake is discharged downstream into the Klamath River. The neon green algae that is being visibly pulled into the intake is MSAE.



Photo 2. 8/25/2005 (date on photo was incorrect, one day off). Photo is taken in Iron Gate Reservoir in open water near Jay Williams Boat Dock. The photo is of a child (approx. age 10) water skiing in green water with a MSAE bloom. A nearby sampling location (IROW in Kann and Corum 2006) had MSAE level of 8.9 million cells/ml and 437 $\mu\text{g/L}$ microcystin.



Photo 3. 10/18/2005. Photo is at upper end of Iron Gate Reservoir in the bottleneck section parked on the north side at a turnout looking south (see IRUS in Kann and Corum 2006). The photo is of an elderly couple fishing. A sample taken from shoreline where photo is being taken had MSAE level of 8.8 million cells/ml. No microcystin sample was taken.



Photo 4. 7/27/2006. Photo is at upper end of Iron Gate Reservoir. The photo is of a white pelican swimming through a bloom dominated by MSAE.



Photo 5. 10/18/2005. Photo is taken from a boat looking at shoreline in Copco Reservoir. Water levels in the reservoir had dropped recently, stranding algae on shoreline. Photo shows two deer near drying algae blooms that were dominated by MSAE. One deer is eating the dried algae. Toxins can still be present in the drying MSAE.



Photo 6. September 2006. Photo is of Karuk Tribal Member Ron Reed using traditional dipnet fishery methods at Ishi Pishi Falls. Tribal fishermen fish in eddies and other slackwater.