

Blue-Green Algae (Cyanobacteria) and Microcystin Monitoring Results in the Vicinity of the Klamath Hydroelectric Project: September 22-30, 2008

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Introduction

This technical memorandum summarizes the latest results of monitoring during 2008 of blue-green algae (BGA) species and the associated toxin microcystin above, below, and in the vicinity of PacifiCorp's Klamath Hydroelectric Project (Project). This monitoring is particularly focused on *Microcystis aeruginosa* (MSAE), a BGA species with a recent history of summertime blooms in Copco and Iron Gate reservoirs that is capable of producing microcystin. This monitoring also estimates the presence of other potentially-toxigenic BGA species, including *Anabaena spp.* (ANAB) and *Planktothrix (Oscillatoria) spp.* (PLKT). This monitoring is one of several water quality studies being conducted by PacifiCorp in the vicinity of the Project in 2008 in support of on-going assessment of water quality conditions and potential management actions (PacifiCorp 2008a and 2008b).

The results specifically addressed in this memorandum are for samples collected on September 22-30, 2008. Earlier results from sampling in April, May, June, July, August, and September 2008 are discussed in previous memoranda (Carlson and Raymond 2008a, 2008b, 2008c, 2008d, 2008e, 2008f, 2008g). PacifiCorp plans to prepare subsequent memoranda such as this on a rolling basis to summarize the results to date of BGA species and microcystin sample analysis. PacifiCorp plans to prepare a final report of the results and interpretation of the complete set of collected data after the conclusion of the sampling effort in winter 2008-09.

Methods

Phytoplankton sampling for laboratory analysis of potentially-toxigenic BGA species, notably MSAE, and microcystin is occurring routinely at 23 sites in the vicinity of the Project listed in Table 1, including:

- Eight river sites upstream, within, and downstream of the Project area that were sampled during PacifiCorp's 2008 water quality monitoring study (as further described in PacifiCorp 2008c and 2008d).

- Two open-water reservoir sites in the lower ends of Iron Gate and Copco reservoirs (near the log booms) that are associated with PacifiCorp's 2008 water quality monitoring study (as further described in PacifiCorp 2008c and 2008d). During the sampling of September 10, a new non-routine open water site was sampled in Iron Gate reservoir inside the log boom near the forebay (as explained further below).
- Four shoreline sites in coves in Copco and Iron Gate reservoir (i.e., two cove sites in each reservoir). These are similar to sites as monitored in previous years by the Karuk Tribe.
- Four shoreline sample locations in the lower basin of Upper Klamath Lake.
- Five open-water sample locations in the vicinity of solar-powered circulators deployed in the upper end of Copco reservoir during 2008 (in conjunction with PacifiCorp's testing of circulators in Copco reservoir).

Sampling has been and will be conducted at the routine river and open-water monitoring sites once per month in April, May, November, and December, and twice per month in June through October. Samples have been and will be taken at the shoreline locations in the reservoirs once per month in April, May, October, and November and twice per month in June through September. Samples from the four shoreline locations in UKL have been and will be obtained once in June and twice per month in July through September. Samples at the sites in the vicinity of solar-powered circulators in Copco reservoir have been and will be obtained once in May and twice per month from June through October.

A total of 30 samples from 21 sites were collected during September 22-30, 2008. One sample was taken from each of seven river sites as grab samples offshore in the current at approximately 0.5 meters (m) below the surface. One sample was taken from each of four shallow reservoir shoreline sites (e.g., cove sites) and three shoreline locations in UKL as a surface grab sample over the top 30 cm depth. Three samples were taken from each of the two open-water sites near the log booms in Copco and Iron Gate reservoir, including: (1) a surface grab sample over the top 30 cm depth; (2) an integrated vertical sample from the surface to a depth of 8 m (approximately the depth of the reservoir's photic zone), and (3) a horizontal integrated sample (over a distance of about 150 ft) at a depth of 0.5 m below the surface. Two samples are taken from each of the five open-water sample locations in the vicinity of solar-powered circulators deployed in the upper end of Copco reservoir. These two samples include: (1) a surface grab sample over the top 30 cm depth; and (2) an integrated vertical sample from the surface to a depth of up to 8 m (depending on the total depth of the location).

Samples for phytoplankton speciation, density, and biovolume are preserved in Lugol's solution and sent to Aquatic Analysts in White Salmon, Washington for analysis. The laboratory analysis of phytoplankton speciation and density is done on prepared microscope slides of filtered samples using phase contrast microscopy. Species are counted as algal units of cell, filament, or colony depending on the natural growth form of the species. BGA species are enumerated as individual cells. Algal forms are identified to species or otherwise to the lowest practicable taxonomic level. Biovolumes are estimated by multiplying the cell counts by the average geometric dimensions of the cells for a given phytoplankton taxa.

Table 1. Sites of Blue-Green Algae (Cyanobacteria) and Microcystin Monitoring in the Vicinity of the Klamath Hydroelectric Project During 2008.

| Location | Approximate River Mile | River Sites | Reservoir Open Water Sites | Reservoir Shoreline Sites | UKL Shoreline Sites | Test Circulator Monitoring Sites |
|---|------------------------|-------------|----------------------------|---------------------------|---------------------|----------------------------------|
| Upper Klamath Lake near Eagle Ridge ramp | UKL | | | | X | |
| Upper Klamath Lake near Hagelstein Park | UKL | | | | X | |
| Upper Klamath Lake at Wocus Bay | UKL | | | | X | |
| Upper Klamath Lake at Pelican Bay ramp | UKL | | | | X | |
| Link River below Upper Klamath Lake | 253.1 | X | | | | |
| Klamath R. below Keno dam | 233.4 | X | | | | |
| Klamath R. below J.C. Boyle powerhouse | 220.0 | X | | | | |
| Klamath R. above Copco reservoir | 206.4 | X | | | | |
| Copco reservoir upper end at Copco Village (SB 1) | 204.0 | | | | | X |
| Copco reservoir upper end near "narrows" (SB 2) | 203.0 | | | | | X |
| Copco reservoir middle above Mallard Cove (SB 3) | 202.0 | | | | | X |
| Copco reservoir at Mallard Cove ramp | 201.5 | | | X | | |
| Copco reservoir middle below Mallard Cove (SB 4) | 201.0 | | | | | X |
| Copco reservoir middle near Copco Cove (SB 5) | 200.0 | | | | | X |
| Copco reservoir at Copco Cove ramp | 200.0 | | | X | | |
| Copco reservoir lower end at log boom | 198.6 | | X | | | |
| Iron Gate reservoir at Camp Creek area | 192.8 | | | X | | |
| Iron Gate reservoir at Williams boat ramp | 192.4 | | | X | | |
| Iron Gate reservoir lower end above log boom | 190.2 | | X | | | |
| Iron Gate reservoir lower end near forebay ¹ | 190.1 | | X | | | |
| Iron Gate powerhouse tailwaters | 190.1 | X | | | | |
| Klamath R. at Iron Gate Hatchery bridge | 189.7 | X | | | | |
| Klamath R. at I-5 Rest Area | 176.7 | X | | | | |
| Klamath R. at Walker Bridge Road | 159.0 | X | | | | |

¹ This site in Iron Gate reservoir is not a routinely-sampled site. During the sampling of September 10, 2008, additional samples were collected at this site to acquire data to help assess the effectiveness of the barrier curtain installed at the log boom.

Samples for determination of microcystin toxin are placed in a cooler on ice and shipped to CH2M HILL Applied Sciences Laboratory in Corvallis, Oregon. The samples are analyzed using the competitive Enzyme-Linked ImmunoSorbent Assay (ELISA) method based on the EnviroLogix QuantiPlate Kit for Microcystins. The quantitation limit is 0.16 µg/L or parts per billion (ppb). This test method does not distinguish between the specific microcystin congeners, but detects their presence to differing degrees. That is, ELISA test results yield one value as the sum of all measurable microcystin variants.

Results of Samples of September 22-30, 2008

Microcystin

Microcystin concentrations were above the quantitation limit (i.e., greater than 0.16 µg/L) in 22 of 30 samples obtained during September 22-30, 2008. Of the 22 samples above the quantitation limit, none had concentrations above the SWRCB (2007) and ODHS (2005) guideline value of 8 µg/L² for posting advisories in recreation waters. One sample had a microcystin concentration above the WHO (2003) guideline value of 4 µg/L³ for low health risk associated with recreational use of waters. This sample was taken from the site at Copco reservoir in Copco Cove and had a microcystin concentration of 6 µg/L. Microcystin concentrations were less than 4 µg/L, and mostly less than 1 µg/L in the other samples obtained during September 22-30.

Phytoplankton Cell Densities

PacifiCorp did not order any expedited processing of phytoplankton samples taken during September 22-30, 2008. Due to the presence of visible algae accumulations on the surface of Iron Gate and Copco reservoirs, the California Regional Water Quality Control Board (North Coast Region) issued an advisory on July 29, 2008 urging caution by recreational users of the reservoirs. Because the advisory had already been issued, expedited processing of samples to assess phytoplankton counts for advisory purposes was not needed. Results are not yet available for BGA speciation and cell count data for non-expedited samples. These results will be reported in future memoranda as the results become available from the analytical laboratory.

² The California State Water Resources Control Board (SWRCB 2007) and Oregon Department of Health Services (ODHS 2005) provide guidelines for posting advisories in recreation waters. These guidelines were developed using information provided in WHO (2003). Both SWRCB (2007) and ODHS (2005) recommend posting advisories in recreation waters under three circumstances: (1) if "scum is present associated with toxigenic species"; (2) if scum is not present, but the density of *Microcystis* or *Planktothrix* is 40,000 cells/ml or greater; and (3) if scum is not present, but the density of all potentially toxigenic BGA is 100,000 cells/ml or greater. Based on WHO (2003) information, SWRCB (2007) and ODHS (2005) indicate that cell counts of 40,000 and 100,000 cells/ml equate to microcystin toxin concentrations of 8 µg/L and 20 µg/L, respectively.

³ The World Health Organization (WHO) has recommended guidelines for safe recreational water environments based on a low, moderate, or high probability of adverse health effects from exposure to concentrations of BGA (cyanobacteria) cells and microcystin toxins in recreational waters (WHO 2003). The WHO guideline values for low and moderate probability of adverse health in recreational waters are 20,000 and 100,000 BGA (cyanobacteria) cells/mL, respectively. WHO equates these cell count values to microcystin toxin concentrations of 4 µg/L and 20 µg/L, respectively (WHO 2003). The WHO guideline for high probability of adverse health effects is a narrative; i.e., "Cyanobacterial scum formation in areas where whole-body contact and/or risk of ingestion/aspiration occur". No specific BGA (cyanobacteria) cell or microcystin concentrations are provided by WHO for high probability of adverse health effects. The WHO (2003) guidance values were derived from calculations based on a 20 kg child that would swim for up to two hours (in a day) and would accidentally ingest 0.05 L of water per hour.

References

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Table 2. Blue-green algae cell count (cells/mL) and microcystin concentration (ug/L) in sites sampled to date during 2008 by PacifiCorp in Iron Gate, Copco, and J.C. Boyle reservoirs and other sites in the Klamath River.

Codes:

- R Regular grab sample (at surface)
- INT Integrated grab sample (from surface to 8 m)
- NA Results not available to date
- NT Sample not taken

| Date | Location | River Mile | Depth (m) | Sample Type | Microcystin (ug/L) | <i>Microcystis</i> (cells/mL) | <i>Anabaena</i> (cells/mL) | <i>Planktothrix</i> (cells/mL) | <i>Aphanizomenon</i> (cells/mL) |
|-----------|---|------------|-----------|-------------|--------------------|-------------------------------|----------------------------|--------------------------------|---------------------------------|
| NT | Upper Klamath Lake near Eagle Ridge ramp | UKL | 0.3 | R | | | | | |
| NT | Upper Klamath Lake near Hagelstein Park | UKL | 0.3 | R | | | | | |
| NT | Upper Klamath Lake at Wocus Bay | UKL | 0.3 | R | | | | | |
| NT | Upper Klamath Lake at Pelican Bay ramp | UKL | 0.3 | R | | | | | |
| 24-May-08 | Link River below Upper Klamath Lake | 253.1 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 24-May-08 | Klamath R. below Keno dam | 233.4 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 24-May-08 | Klamath R. below J.C. Boyle powerhouse | 220.0 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 23-May-08 | Klamath R. above Copco reservoir | 206.4 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 22-May-08 | Copco reservoir upper end at Copco Village (SB 1) | 204.0 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 22-May-08 | Copco reservoir upper end at Copco Village (SB 1) | 204.0 | 5.0 | INT | <0.16 | NA | NA | NA | NA |
| 22-May-08 | Copco reservoir upper end near "narrows" (SB 2) | 203.0 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| NT | Copco reservoir upper end near "narrows" (SB 2) | 203.0 | 6.0 | INT | | | | | |
| 22-May-08 | Copco reservoir middle above Mallard Cove (SB 3) | 202.0 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 22-May-08 | Copco reservoir middle above Mallard Cove (SB 3) | 202.0 | 8.0 | INT | <0.16 | NA | NA | NA | NA |
| 22-May-08 | Copco reservoir at Mallard Cove ramp | 201.5 | 0.3 | R | <0.16 | NA | NA | NA | NA |
| 22-May-08 | Copco reservoir middle below Mallard Cove (SB 4) | 201.0 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 22-May-08 | Copco reservoir middle below Mallard Cove (SB 4) | 201.0 | 8.0 | INT | <0.16 | NA | NA | NA | NA |
| NT | Copco reservoir middle near Copco Cove (SB 5) | 200.0 | 0.5 | R | | | | | |
| NT | Copco reservoir middle near Copco Cove (SB 5) | 200.0 | 8.0 | INT | | | | | |
| 22-May-08 | Copco reservoir at Copco Cove ramp | 200.0 | 0.3 | R | <0.16 | NA | NA | NA | NA |
| 22-May-08 | Copco reservoir lower end at log boom | 198.6 | 0.3 | R | <0.16 | NA | NA | NA | NA |
| 22-May-08 | Copco reservoir lower end at log boom | 198.6 | 8.0 | INT | <0.16 | NA | NA | NA | NA |
| 23-May-08 | Iron Gate reservoir at Camp Creek area | 192.8 | 0.3 | R | <0.16 | NA | NA | NA | NA |
| 23-May-08 | Iron Gate reservoir at Williams boat ramp | 192.4 | 0.3 | R | <0.16 | NA | NA | NA | NA |
| 23-May-08 | Iron Gate reservoir lower end above log boom | 190.2 | 0.3 | R | <0.16 | NA | NA | NA | NA |
| 23-May-08 | Iron Gate reservoir lower end above log boom | 190.2 | 8.0 | INT | <0.16 | NA | NA | NA | NA |
| 24-May-08 | Iron Gate powerhouse tailwaters | 190.1 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 23-May-08 | Klamath R. at Iron Gate Hatchery bridge | 189.7 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 22-May-08 | Klamath R. at I-5 Rest Area | 176.7 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 22-May-08 | Klamath R. at Walker Bridge Road | 159.0 | 0.5 | R | <0.16 | NA | NA | NA | NA |

Table 2. Blue-green algae cell count (cells/mL) and microcystin concentration (ug/L) in sites sampled to date during 2008 by PacifiCorp in Iron Gate, Copco, and J.C. Boyle reservoirs and other sites in the Klamath River.

Codes:

- R Regular grab sample (at surface)
- INT Integrated grab sample (from surface to 8 m)
- NA Results not available to date
- NT Sample not taken

| Date | Location | River Mile | Depth (m) | Sample Type | Microcystin (ug/L) | <i>Microcystis</i> (cells/mL) | <i>Anabaena</i> (cells/mL) | <i>Planktothrix</i> (cells/mL) | <i>Aphanizomenon</i> (cells/mL) |
|----------|---|------------|-----------|-------------|--------------------|-------------------------------|----------------------------|--------------------------------|---------------------------------|
| NT | Upper Klamath Lake near Eagle Ridge ramp | UKL | 0.3 | R | | | | | |
| NT | Upper Klamath Lake near Hagelstein Park | UKL | 0.3 | R | | | | | |
| NT | Upper Klamath Lake at Wocus Bay | UKL | 0.3 | R | | | | | |
| NT | Upper Klamath Lake at Pelican Bay ramp | UKL | 0.3 | R | | | | | |
| 3-Jun-08 | Link River below Upper Klamath Lake | 253.1 | 0.5 | R | 0.18 | NA | NA | NA | NA |
| 3-Jun-08 | Klamath R. below Keno dam | 233.4 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 5-Jun-08 | Klamath R. above Copco reservoir | 206.4 | 0.5 | R | 0.17 | NA | NA | NA | NA |
| NT | Copco reservoir upper end at Copco Village (SB 1) | 204.0 | 0.5 | R | | | | | |
| NT | Copco reservoir upper end at Copco Village (SB 1) | 204.0 | 5.0 | INT | | | | | |
| NT | Copco reservoir upper end near "narrows" (SB 2) | 203.0 | 0.5 | R | | | | | |
| NT | Copco reservoir upper end near "narrows" (SB 2) | 203.0 | 6.0 | INT | | | | | |
| NT | Copco reservoir middle above Mallard Cove (SB 3) | 202.0 | 0.5 | R | | | | | |
| NT | Copco reservoir middle above Mallard Cove (SB 3) | 202.0 | 8.0 | INT | | | | | |
| 4-Jun-08 | Copco reservoir at Mallard Cove ramp | 201.5 | 0.3 | R | 0.19 | NA | NA | NA | NA |
| 4-Jun-08 | Copco reservoir middle below Mallard Cove (SB 4) | 201.0 | 0.5 | R | 0.19 | NA | NA | NA | NA |
| 4-Jun-08 | Copco reservoir middle below Mallard Cove (SB 4) | 201.0 | 8.0 | INT | 0.26 | NA | NA | NA | NA |
| 4-Jun-08 | Copco reservoir middle near Copco Cove (SB 5) | 200.0 | 0.5 | R | 0.19 | NA | NA | NA | NA |
| 4-Jun-08 | Copco reservoir middle near Copco Cove (SB 5) | 200.0 | 8.0 | INT | 0.20 | NA | NA | NA | NA |
| 4-Jun-08 | Copco reservoir at Copco Cove ramp | 200.0 | 0.3 | R | <0.16 | NA | NA | NA | NA |
| 4-Jun-08 | Copco reservoir lower end at log boom | 198.6 | 0.3 | R | 0.19 | NA | NA | NA | NA |
| 4-Jun-08 | Copco reservoir lower end at log boom | 198.6 | 8.0 | INT | 0.19 | NA | NA | NA | NA |
| 3-Jun-08 | Iron Gate reservoir at Camp Creek area | 192.8 | 0.3 | R | 0.20 | NA | NA | NA | NA |
| 3-Jun-08 | Iron Gate reservoir at Williams boat ramp | 192.4 | 0.3 | R | 0.23 | NA | NA | NA | NA |
| 4-Jun-08 | Iron Gate reservoir lower end above log boom | 190.2 | 0.3 | R | 0.18 | NA | NA | NA | NA |
| 4-Jun-08 | Iron Gate reservoir lower end above log boom | 190.2 | 8.0 | INT | <0.16 | NA | NA | NA | NA |
| 5-Jun-08 | Iron Gate powerhouse tailwaters | 190.1 | 0.5 | R | 0.19 | NA | NA | NA | NA |
| 5-Jun-08 | Klamath R. at Iron Gate Hatchery bridge | 189.7 | 0.5 | R | 0.21 | NA | NA | NA | NA |
| 3-Jun-08 | Klamath R. at I-5 Rest Area | 176.7 | 0.5 | R | 0.17 | NA | NA | NA | NA |
| 3-Jun-08 | Klamath R. at Walker Bridge Road | 159.0 | 0.5 | R | <0.16 | NA | NA | NA | NA |

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Codes:

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| Date | Location | River Mile | Depth (m) | Sample Type | Microcystin (ug/L) | <i>Microcystis</i> (cells/mL) | <i>Anabaena</i> (cells/mL) | <i>Planktothrix</i> (cells/mL) | <i>Aphanizomenon</i> (cells/mL) |
|-----------|---|------------|-----------|-------------|--------------------|-------------------------------|----------------------------|--------------------------------|---------------------------------|
| 19-Jun-08 | Upper Klamath Lake near Eagle Ridge ramp | UKL | 0.3 | R | 0.42 | NA | NA | NA | NA |
| 19-Jun-08 | Upper Klamath Lake near Hagelstein Park | UKL | 0.3 | R | 0.34 | NA | NA | NA | NA |
| 19-Jun-08 | Upper Klamath Lake at Wocus Bay | UKL | 0.3 | R | 0.22 | NA | NA | NA | NA |
| NT | Upper Klamath Lake at Pelican Bay ramp | UKL | 0.3 | R | | | | | |
| 19-Jun-08 | Link River below Upper Klamath Lake | 253.1 | 0.5 | R | 0.65 | NA | NA | NA | NA |
| NT | Klamath R. below Keno dam | 233.4 | 0.5 | R | | | | | |
| 17-Jun-08 | Klamath R. above Copco reservoir | 206.4 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 24-Jun-08 | Copco reservoir upper end at Copco Village (SB 1) | 204.0 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 24-Jun-08 | Copco reservoir upper end at Copco Village (SB 1) | 204.0 | 5.0 | INT | <0.16 | NA | NA | NA | NA |
| 24-Jun-08 | Copco reservoir upper end near "narrows" (SB 2) | 203.0 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 24-Jun-08 | Copco reservoir upper end near "narrows" (SB 2) | 203.0 | 6.0 | INT | <0.16 | NA | NA | NA | NA |
| 24-Jun-08 | Copco reservoir middle above Mallard Cove (SB 3) | 202.0 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 24-Jun-08 | Copco reservoir middle above Mallard Cove (SB 3) | 202.0 | 8.0 | INT | <0.16 | NA | NA | NA | NA |
| 18-Jun-08 | Copco reservoir at Mallard Cove ramp | 201.5 | 0.3 | R | 0.45 | 0 | 0 | 0 | 0 |
| 24-Jun-08 | Copco reservoir middle below Mallard Cove (SB 4) | 201.0 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 24-Jun-08 | Copco reservoir middle below Mallard Cove (SB 4) | 201.0 | 8.0 | INT | <0.16 | NA | NA | NA | NA |
| 24-Jun-08 | Copco reservoir middle near Copco Cove (SB 5) | 200.0 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 24-Jun-08 | Copco reservoir middle near Copco Cove (SB 5) | 200.0 | 8.0 | INT | <0.16 | NA | NA | NA | NA |
| 18-Jun-08 | Copco reservoir at Copco Cove ramp | 200.0 | 0.3 | R | 0.46 | 0 | 0 | 0 | 0 |
| 18-Jun-08 | Copco reservoir lower end at log boom | 198.6 | 0.3 | R | <0.16 | 0 | 0 | 0 | 0 |
| 18-Jun-08 | Copco reservoir lower end at log boom | 198.6 | 8.0 | INT | <0.16 | NA | NA | NA | NA |
| 18-Jun-08 | Iron Gate reservoir at Camp Creek area | 192.8 | 0.3 | R | 0.42 | 0 | 0 | 0 | 271 |
| 18-Jun-08 | Iron Gate reservoir at Williams boat ramp | 192.4 | 0.3 | R | 0.32 | 0 | 0 | 0 | 0 |
| 18-Jun-08 | Iron Gate reservoir lower end above log boom | 190.2 | 0.3 | R | <0.16 | NA | NA | NA | NA |
| 18-Jun-08 | Iron Gate reservoir lower end above log boom | 190.2 | 8.0 | INT | <0.16 | NA | NA | NA | NA |
| 18-Jun-08 | Iron Gate powerhouse tailwaters | 190.1 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 17-Jun-08 | Klamath R. at Iron Gate Hatchery bridge | 189.7 | 0.5 | R | <0.16 | 0 | 0 | 0 | 0 |
| 17-Jun-08 | Klamath R. at I-5 Rest Area | 176.7 | 0.5 | R | <0.16 | 0 | 0 | 0 | 0 |
| 17-Jun-08 | Klamath R. at Walker Bridge Road | 159.0 | 0.5 | R | <0.16 | 0 | 0 | 0 | 0 |

Table 2. Blue-green algae cell count (cells/mL) and microcystin concentration (ug/L) in sites sampled to date during 2008 by PacifiCorp in Iron Gate, Copco, and J.C. Boyle reservoirs and other sites in the Klamath River.

Codes:

- R Regular grab sample (at surface)
- INT Integrated grab sample (from surface to 8 m)
- NA Results not available to date
- NT Sample not taken

| Date | Location | River Mile | Depth (m) | Sample Type | Microcystin (ug/L) | <i>Microcystis</i> (cells/mL) | <i>Anabaena</i> (cells/mL) | <i>Planktothrix</i> (cells/mL) | <i>Aphanizomenon</i> (cells/mL) |
|-----------|---|------------|-----------|-------------|--------------------|-------------------------------|----------------------------|--------------------------------|---------------------------------|
| 2-Jul-08 | Upper Klamath Lake near Eagle Ridge ramp | UKL | 0.3 | R | 0.20 | NA | NA | NA | NA |
| 2-Jul-08 | Upper Klamath Lake near Hagelstein Park | UKL | 0.3 | R | <0.16 | NA | NA | NA | NA |
| 2-Jul-08 | Upper Klamath Lake at Wocus Bay | UKL | 0.3 | R | 1.30 | NA | NA | NA | NA |
| 2-Jul-08 | Upper Klamath Lake at Pelican Bay ramp | UKL | 0.3 | R | <0.16 | NA | NA | NA | NA |
| 2-Jul-08 | Link River below Upper Klamath Lake | 253.1 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 2-Jul-08 | Klamath R. below Keno dam | 233.4 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 30-Jun-08 | Klamath R. above Copco reservoir | 206.4 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 9-Jul-08 | Copco reservoir upper end at Copco Village (SB 1) | 204.0 | 0.5 | R | 0.22 | NA | NA | NA | NA |
| 9-Jul-08 | Copco reservoir upper end at Copco Village (SB 1) | 204.0 | 5.0 | INT | 0.20 | NA | NA | NA | NA |
| 9-Jul-08 | Copco reservoir upper end near "narrows" (SB 2) | 203.0 | 0.5 | R | 0.25 | NA | NA | NA | NA |
| 9-Jul-08 | Copco reservoir upper end near "narrows" (SB 2) | 203.0 | 6.0 | INT | 0.21 | NA | NA | NA | NA |
| 9-Jul-08 | Copco reservoir middle above Mallard Cove (SB 3) | 202.0 | 0.5 | R | 0.21 | NA | NA | NA | NA |
| 9-Jul-08 | Copco reservoir middle above Mallard Cove (SB 3) | 202.0 | 8.0 | INT | 0.23 | NA | NA | NA | NA |
| 30-Jun-08 | Copco reservoir at Mallard Cove ramp | 201.5 | 0.3 | R | <0.16 | 0 | 0 | 0 | 2,064 |
| 9-Jul-08 | Copco reservoir middle below Mallard Cove (SB 4) | 201.0 | 0.5 | R | 0.23 | NA | NA | NA | NA |
| 9-Jul-08 | Copco reservoir middle below Mallard Cove (SB 4) | 201.0 | 8.0 | INT | 0.22 | NA | NA | NA | NA |
| 9-Jul-08 | Copco reservoir middle near Copco Cove (SB 5) | 200.0 | 0.5 | R | 0.31 | NA | NA | NA | NA |
| 9-Jul-08 | Copco reservoir middle near Copco Cove (SB 5) | 200.0 | 8.0 | INT | 0.24 | NA | NA | NA | NA |
| 30-Jun-08 | Copco reservoir at Copco Cove ramp | 200.0 | 0.3 | R | 0.46 | 861 | 964 | 0 | 516 |
| 1-Jul-08 | Copco reservoir lower end at log boom | 198.6 | 0.3 | R | <0.16 | 0 | 0 | 0 | 1,293 |
| 1-Jul-08 | Copco reservoir lower end at log boom | 198.6 | 8.0 | INT | <0.16 | NA | NA | NA | NA |
| 30-Jun-08 | Iron Gate reservoir at Camp Creek area | 192.8 | 0.3 | R | <0.16 | 0 | 0 | 0 | 0 |
| 30-Jun-08 | Iron Gate reservoir at Williams boat ramp | 192.4 | 0.3 | R | <0.16 | 0 | 0 | 0 | 0 |
| 1-Jul-08 | Iron Gate reservoir lower end above log boom | 190.2 | 0.3 | R | <0.16 | 0 | 1,513 | 0 | 0 |
| 1-Jul-08 | Iron Gate reservoir lower end above log boom | 190.2 | 8.0 | INT | <0.16 | NA | NA | NA | NA |
| 30-Jun-08 | Iron Gate powerhouse tailwaters | 190.1 | 0.5 | R | <0.16 | 0 | 0 | 0 | 605 |
| 30-Jun-08 | Klamath R. at Iron Gate Hatchery bridge | 189.7 | 0.5 | R | <0.16 | 0 | 0 | 0 | 0 |
| 30-Jun-08 | Klamath R. at I-5 Rest Area | 176.7 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 30-Jun-08 | Klamath R. at Walker Bridge Road | 159.0 | 0.5 | R | <0.16 | 0 | 0 | 0 | 0 |

Table 2. Blue-green algae cell count (cells/mL) and microcystin concentration (ug/L) in sites sampled to date during 2008 by PacifiCorp in Iron Gate, Copco, and J.C. Boyle reservoirs and other sites in the Klamath River.

Codes:

- R Regular grab sample (at surface)
- INT Integrated grab sample (from surface to 8 m)
- NA Results not available to date
- NT Sample not taken

| Date | Location | River Mile | Depth (m) | Sample Type | Microcystin (ug/L) | <i>Microcystis</i> (cells/mL) | <i>Anabaena</i> (cells/mL) | <i>Planktothrix</i> (cells/mL) | <i>Aphanizomenon</i> (cells/mL) |
|-----------|---|------------|-----------|-------------|--------------------|-------------------------------|----------------------------|--------------------------------|---------------------------------|
| 15-Jul-08 | Upper Klamath Lake near Eagle Ridge ramp | UKL | 0.3 | R | 1.57 | NA | NA | NA | NA |
| 15-Jul-08 | Upper Klamath Lake near Hagelstein Park | UKL | 0.3 | R | <0.16 | NA | NA | NA | NA |
| 15-Jul-08 | Upper Klamath Lake at Wocus Bay | UKL | 0.3 | R | 1.31 | NA | NA | NA | NA |
| 15-Jul-08 | Upper Klamath Lake at Pelican Bay ramp | UKL | 0.3 | R | <0.16 | NA | NA | NA | NA |
| 15-Jul-08 | Link River below Upper Klamath Lake | 253.1 | 0.5 | R | 0.33 | NA | NA | NA | NA |
| 15-Jul-08 | Klamath R. below Keno dam | 233.4 | 0.5 | R | 0.40 | NA | NA | NA | NA |
| 15-Jul-08 | Klamath R. above Copco reservoir | 206.4 | 0.5 | R | <0.16 | 0 | 0 | 0 | 391 |
| 22-Jul-08 | Copco reservoir upper end at Copco Village (SB 1) | 204.0 | 0.5 | R | 0.31 | NA | NA | NA | NA |
| 22-Jul-08 | Copco reservoir upper end at Copco Village (SB 1) | 204.0 | 5.0 | INT | <0.16 | NA | NA | NA | NA |
| 22-Jul-08 | Copco reservoir upper end near "narrows" (SB 2) | 203.0 | 0.5 | R | 0.83 | NA | NA | NA | NA |
| 22-Jul-08 | Copco reservoir upper end near "narrows" (SB 2) | 203.0 | 6.0 | INT | 0.51 | NA | NA | NA | NA |
| 22-Jul-08 | Copco reservoir middle above Mallard Cove (SB 3) | 202.0 | 0.5 | R | 0.62 | NA | NA | NA | NA |
| 22-Jul-08 | Copco reservoir middle above Mallard Cove (SB 3) | 202.0 | 8.0 | INT | 0.38 | NA | NA | NA | NA |
| 17-Jul-08 | Copco reservoir at Mallard Cove ramp | 201.5 | 0.3 | R | 0.20 | 3,191 | 0 | 0 | 0 |
| 22-Jul-08 | Copco reservoir middle below Mallard Cove (SB 4) | 201.0 | 0.5 | R | 2.00 | NA | NA | NA | NA |
| 22-Jul-08 | Copco reservoir middle below Mallard Cove (SB 4) | 201.0 | 8.0 | INT | 0.28 | NA | NA | NA | NA |
| 22-Jul-08 | Copco reservoir middle near Copco Cove (SB 5) | 200.0 | 0.5 | R | 0.66 | NA | NA | NA | NA |
| 22-Jul-08 | Copco reservoir middle near Copco Cove (SB 5) | 200.0 | 8.0 | INT | 1.11 | NA | NA | NA | NA |
| 17-Jul-08 | Copco reservoir at Copco Cove ramp | 200.0 | 0.3 | R | 0.45 | 3,806 | 0 | 0 | 3,654 |
| 16-Jul-08 | Copco reservoir lower end at log boom | 198.6 | 0.3 | R | 0.41 | 0 | 0 | 0 | 1,611 |
| 16-Jul-08 | Copco reservoir lower end at log boom | 198.6 | 8.0 | INT | 0.19 | NA | NA | NA | NA |
| 17-Jul-08 | Iron Gate reservoir at Camp Creek area | 192.8 | 0.3 | R | 1.11 | 0 | 0 | 0 | 0 |
| 17-Jul-08 | Iron Gate reservoir at Williams boat ramp | 192.4 | 0.3 | R | 0.73 | 8,607 | 0 | 0 | 0 |
| 16-Jul-08 | Iron Gate reservoir lower end above log boom | 190.2 | 0.3 | R | 0.92 | 11,664 | 0 | 0 | 369 |
| 16-Jul-08 | Iron Gate reservoir lower end above log boom | 190.2 | 8.0 | INT | NA | NA | NA | NA | NA |
| 17-Jul-08 | Iron Gate powerhouse tailwaters | 190.1 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 17-Jul-08 | Klamath R. at Iron Gate Hatchery bridge | 189.7 | 0.5 | R | 0.26 | 0 | 0 | 0 | 0 |
| 17-Jul-08 | Klamath R. at I-5 Rest Area | 176.7 | 0.5 | R | 0.18 | 861 | 0 | 0 | 0 |
| 17-Jul-08 | Klamath R. at Walker Bridge Road | 159.0 | 0.5 | R | <0.16 | NA | NA | NA | NA |

Table 2. Blue-green algae cell count (cells/mL) and microcystin concentration (ug/L) in sites sampled to date during 2008 by PacifiCorp in Iron Gate, Copco, and J.C. Boyle reservoirs and other sites in the Klamath River.

Codes:

- R Regular grab sample (at surface)
- INT Integrated grab sample (from surface to 8 m)
- NA Results not available to date
- NT Sample not taken

| Date | Location | River Mile | Depth (m) | Sample Type | Microcystin (ug/L) | <i>Microcystis</i> (cells/mL) | <i>Anabaena</i> (cells/mL) | <i>Planktothrix</i> (cells/mL) | <i>Aphanizomenon</i> (cells/mL) |
|-----------|---|------------|-----------|-------------|--------------------|-------------------------------|----------------------------|--------------------------------|---------------------------------|
| 29-Jul-08 | Upper Klamath Lake near Eagle Ridge ramp | UKL | 0.3 | R | 0.25 | NA | NA | NA | NA |
| 29-Jul-08 | Upper Klamath Lake near Hagelstein Park | UKL | 0.3 | R | <0.16 | NA | NA | NA | NA |
| 29-Jul-08 | Upper Klamath Lake at Wocus Bay | UKL | 0.3 | R | 0.50 | NA | NA | NA | NA |
| 29-Jul-08 | Upper Klamath Lake at Pelican Bay ramp | UKL | 0.3 | R | <0.16 | NA | NA | NA | NA |
| 28-Jul-08 | Link River below Upper Klamath Lake | 253.1 | 0.5 | R | 0.55 | NA | NA | NA | NA |
| 29-Jul-08 | Klamath R. below Keno dam | 233.4 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 30-Jul-08 | Klamath R. above Copco reservoir | 206.4 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 5-Aug-08 | Copco reservoir upper end at Copco Village (SB 1) | 204.0 | 0.5 | R | 0.21 | NA | NA | NA | NA |
| 5-Aug-08 | Copco reservoir upper end at Copco Village (SB 1) | 204.0 | 5.0 | INT | <0.16 | NA | NA | NA | NA |
| 5-Aug-08 | Copco reservoir upper end near "narrows" (SB 2) | 203.0 | 0.5 | R | 21.00 | NA | NA | NA | NA |
| 5-Aug-08 | Copco reservoir upper end near "narrows" (SB 2) | 203.0 | 6.0 | INT | 8.00 | NA | NA | NA | NA |
| 5-Aug-08 | Copco reservoir middle above Mallard Cove (SB 3) | 202.0 | 0.5 | R | 21.00 | NA | NA | NA | NA |
| 5-Aug-08 | Copco reservoir middle above Mallard Cove (SB 3) | 202.0 | 8.0 | INT | 4.10 | NA | NA | NA | NA |
| 30-Jul-08 | Copco reservoir at Mallard Cove ramp | 201.5 | 0.3 | R | 4.20 | NA | NA | NA | NA |
| 5-Aug-08 | Copco reservoir middle below Mallard Cove (SB 4) | 201.0 | 0.5 | R | 13.00 | NA | NA | NA | NA |
| 5-Aug-08 | Copco reservoir middle below Mallard Cove (SB 4) | 201.0 | 8.0 | INT | 2.40 | NA | NA | NA | NA |
| 5-Aug-08 | Copco reservoir middle near Copco Cove (SB 5) | 200.0 | 0.5 | R | 3.20 | NA | NA | NA | NA |
| 5-Aug-08 | Copco reservoir middle near Copco Cove (SB 5) | 200.0 | 8.0 | INT | 2.90 | NA | NA | NA | NA |
| 30-Jul-08 | Copco reservoir at Copco Cove ramp | 200.0 | 0.3 | R | 3.50 | NA | NA | NA | NA |
| 30-Jul-08 | Copco reservoir lower end at log boom | 198.6 | 0.3 | R | 9.40 | NA | NA | NA | NA |
| 30-Jul-08 | Copco reservoir lower end at log boom | 198.6 | 0.5 | R | 5.30 | NA | NA | NA | NA |
| 30-Jul-08 | Copco reservoir lower end at log boom | 198.6 | 8.0 | INT | 1.90 | NA | NA | NA | NA |
| 30-Jul-08 | Iron Gate reservoir at Camp Creek area | 192.8 | 0.3 | R | 22.00 | NA | NA | NA | NA |
| 30-Jul-08 | Iron Gate reservoir at Williams boat ramp | 192.4 | 0.3 | R | 17.00 | NA | NA | NA | NA |
| 30-Jul-08 | Iron Gate reservoir lower end above log boom | 190.2 | 0.3 | R | 13.00 | NA | NA | NA | NA |
| 30-Jul-08 | Iron Gate reservoir lower end above log boom | 190.2 | 0.5 | R | 57.00 | NA | NA | NA | NA |
| 30-Jul-08 | Iron Gate reservoir lower end above log boom | 190.2 | 8.0 | INT | 1.50 | NA | NA | NA | NA |
| 30-Jul-08 | Iron Gate powerhouse tailwaters | 190.1 | 0.5 | R | 1.40 | NA | NA | NA | NA |
| 30-Jul-08 | Klamath R. at Iron Gate Hatchery bridge | 189.7 | 0.5 | R | 1.40 | NA | NA | NA | NA |
| 31-Jul-08 | Klamath R. at I-5 Rest Area | 176.7 | 0.5 | R | 1.60 | NA | NA | NA | NA |
| 31-Jul-08 | Klamath R. at Walker Bridge Road | 159.0 | 0.5 | R | 1.30 | NA | NA | NA | NA |

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- R Regular grab sample (at surface)
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- NA Results not available to date
- NT Sample not taken

| Date | Location | River Mile | Depth (m) | Sample Type | Microcystin (ug/L) | <i>Microcystis</i> (cells/mL) | <i>Anabaena</i> (cells/mL) | <i>Planktothrix</i> (cells/mL) | <i>Aphanizomenon</i> (cells/mL) |
|-----------|---|------------|-----------|-------------|--------------------|-------------------------------|----------------------------|--------------------------------|---------------------------------|
| 12-Aug-08 | Upper Klamath Lake near Eagle Ridge ramp | UKL | 0.3 | R | 0.56 | NA | NA | NA | NA |
| 12-Aug-08 | Upper Klamath Lake near Hagelstein Park | UKL | 0.3 | R | <0.16 | NA | NA | NA | NA |
| 12-Aug-08 | Upper Klamath Lake at Wocus Bay | UKL | 0.3 | R | 1.47 | NA | NA | NA | NA |
| 12-Aug-08 | Upper Klamath Lake at Pelican Bay ramp | UKL | 0.3 | R | <0.16 | NA | NA | NA | NA |
| 11-Aug-08 | Link River below Upper Klamath Lake | 253.1 | 0.5 | R | 0.72 | NA | NA | NA | NA |
| 12-Aug-08 | Klamath R. below Keno dam | 233.4 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 12-Aug-08 | Klamath R. below J.C. Boyle powerhouse | 220.0 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 13-Aug-08 | Klamath R. above Copco reservoir | 206.4 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 20-Aug-08 | Copco reservoir upper end at Copco Village (SB 1) | 204.0 | 0.5 | R | 0.29 | NA | NA | NA | NA |
| 20-Aug-08 | Copco reservoir upper end at Copco Village (SB 1) | 204.0 | 5.0 | INT | <0.16 | NA | NA | NA | NA |
| 20-Aug-08 | Copco reservoir upper end near "narrows" (SB 2) | 203.0 | 0.5 | R | 19.80 | NA | NA | NA | NA |
| 20-Aug-08 | Copco reservoir upper end near "narrows" (SB 2) | 203.0 | 6.0 | INT | 20.40 | NA | NA | NA | NA |
| 20-Aug-08 | Copco reservoir middle above Mallard Cove (SB 3) | 202.0 | 0.5 | R | 11.50 | NA | NA | NA | NA |
| 20-Aug-08 | Copco reservoir middle above Mallard Cove (SB 3) | 202.0 | 8.0 | INT | 9.46 | NA | NA | NA | NA |
| 13-Aug-08 | Copco reservoir at Mallard Cove ramp | 201.5 | 0.3 | R | 58.00 | NA | NA | NA | NA |
| 20-Aug-08 | Copco reservoir middle below Mallard Cove (SB 4) | 201.0 | 0.5 | R | 1.94 | NA | NA | NA | NA |
| 20-Aug-08 | Copco reservoir middle below Mallard Cove (SB 4) | 201.0 | 8.0 | INT | 2.24 | NA | NA | NA | NA |
| 20-Aug-08 | Copco reservoir middle near Copco Cove (SB 5) | 200.0 | 0.5 | R | 2.01 | NA | NA | NA | NA |
| 20-Aug-08 | Copco reservoir middle near Copco Cove (SB 5) | 200.0 | 8.0 | INT | 1.26 | NA | NA | NA | NA |
| 13-Aug-08 | Copco reservoir at Copco Cove ramp | 200.0 | 0.3 | R | 48.00 | NA | NA | NA | NA |
| 13-Aug-08 | Copco reservoir lower end at log boom | 198.6 | 0.3 | R | 20.00 | NA | NA | NA | NA |
| 13-Aug-08 | Copco reservoir lower end at log boom | 198.6 | 0.5 | R | 15.00 | 75,726 | 7,080 | 0 | 19,264 |
| 13-Aug-08 | Copco reservoir lower end at log boom | 198.6 | 8.0 | INT | 2.50 | NA | NA | NA | NA |
| 13-Aug-08 | Iron Gate reservoir at Camp Creek area | 192.8 | 0.3 | R | 11.00 | NA | NA | NA | NA |
| 13-Aug-08 | Iron Gate reservoir at Williams boat ramp | 192.4 | 0.3 | R | 3.50 | NA | NA | NA | NA |
| 13-Aug-08 | Iron Gate reservoir lower end above log boom | 190.2 | 0.3 | R | 4.90 | NA | NA | NA | NA |
| 13-Aug-08 | Iron Gate reservoir lower end above log boom | 190.2 | 0.5 | R | 2.30 | 10,197 | 245 | 0 | 6,544 |
| 13-Aug-08 | Iron Gate reservoir lower end above log boom | 190.2 | 8.0 | INT | 2.40 | NA | NA | NA | NA |
| 13-Aug-08 | Iron Gate powerhouse tailwaters | 190.1 | 0.5 | R | 3.30 | NA | NA | NA | NA |
| 13-Aug-08 | Klamath R. at Iron Gate Hatchery bridge | 189.7 | 0.5 | R | 1.60 | NA | NA | NA | NA |
| 14-Aug-08 | Klamath R. at I-5 Rest Area | 176.7 | 0.5 | R | 2.50 | NA | NA | NA | NA |
| 14-Aug-08 | Klamath R. at Walker Bridge Road | 159.0 | 0.5 | R | 1.90 | NA | NA | NA | NA |

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Codes:

- R Regular grab sample (at surface)
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- NA Results not available to date
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| Date | Location | River Mile | Depth (m) | Sample Type | Microcystin (ug/L) | <i>Microcystis</i> (cells/mL) | <i>Anabaena</i> (cells/mL) | <i>Planktothrix</i> (cells/mL) | <i>Aphanizomenon</i> (cells/mL) |
|-----------|---|------------|-----------|-------------|--------------------|-------------------------------|----------------------------|--------------------------------|---------------------------------|
| 26-Aug-08 | Upper Klamath Lake near Eagle Ridge ramp | UKL | 0.3 | R | 3.26 | NA | NA | NA | NA |
| 26-Aug-08 | Upper Klamath Lake near Hagelstein Park | UKL | 0.3 | R | <0.16 | NA | NA | NA | NA |
| 26-Aug-08 | Upper Klamath Lake at Wocus Bay | UKL | 0.3 | R | 1.73 | NA | NA | NA | NA |
| 26-Aug-08 | Upper Klamath Lake at Pelican Bay ramp | UKL | 0.3 | R | <0.16 | NA | NA | NA | NA |
| 25-Aug-08 | Link River below Upper Klamath Lake | 253.1 | 0.5 | R | 0.65 | NA | NA | NA | NA |
| 26-Aug-08 | Klamath R. below Keno dam | 233.4 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 26-Aug-08 | Klamath R. below J.C. Boyle powerhouse | 220.0 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 27-Aug-08 | Klamath R. above Copco reservoir | 206.4 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 2-Sep-08 | Copco reservoir upper end at Copco Village (SB 1) | 204.0 | 0.5 | R | 0.40 | NA | NA | NA | NA |
| 2-Sep-08 | Copco reservoir upper end at Copco Village (SB 1) | 204.0 | 5.0 | INT | <0.16 | NA | NA | NA | NA |
| 2-Sep-08 | Copco reservoir upper end near "narrows" (SB 2) | 203.0 | 0.5 | R | 20.10 | NA | NA | NA | NA |
| 2-Sep-08 | Copco reservoir upper end near "narrows" (SB 2) | 203.0 | 6.0 | INT | 6.12 | NA | NA | NA | NA |
| 2-Sep-08 | Copco reservoir middle above Mallard Cove (SB 3) | 202.0 | 0.5 | R | 7.21 | NA | NA | NA | NA |
| 2-Sep-08 | Copco reservoir middle above Mallard Cove (SB 3) | 202.0 | 8.0 | INT | 4.81 | NA | NA | NA | NA |
| 27-Aug-08 | Copco reservoir at Mallard Cove ramp | 201.5 | 0.3 | R | 22.80 | NA | NA | NA | NA |
| 2-Sep-08 | Copco reservoir middle below Mallard Cove (SB 4) | 201.0 | 0.5 | R | 4.20 | NA | NA | NA | NA |
| 2-Sep-08 | Copco reservoir middle below Mallard Cove (SB 4) | 201.0 | 8.0 | INT | 2.35 | NA | NA | NA | NA |
| 2-Sep-08 | Copco reservoir middle near Copco Cove (SB 5) | 200.0 | 0.5 | R | 1.23 | NA | NA | NA | NA |
| 2-Sep-08 | Copco reservoir middle near Copco Cove (SB 5) | 200.0 | 8.0 | INT | 1.06 | NA | NA | NA | NA |
| 27-Aug-08 | Copco reservoir at Copco Cove ramp | 200.0 | 0.3 | R | 95.30 | NA | NA | NA | NA |
| 27-Aug-08 | Copco reservoir lower end at log boom | 198.6 | 0.3 | R | 19.50 | NA | NA | NA | NA |
| 27-Aug-08 | Copco reservoir lower end at log boom | 198.6 | 0.5 | R | 23.10 | 64,199 | 0 | 0 | 48,149 |
| 27-Aug-08 | Copco reservoir lower end at log boom | 198.6 | 8.0 | INT | 2.38 | NA | NA | NA | NA |
| 27-Aug-08 | Iron Gate reservoir at Camp Creek area | 192.8 | 0.3 | R | 4.19 | NA | NA | NA | NA |
| 27-Aug-08 | Iron Gate reservoir at Williams boat ramp | 192.4 | 0.3 | R | 9.28 | NA | NA | NA | NA |
| 27-Aug-08 | Iron Gate reservoir lower end above log boom | 190.2 | 0.3 | R | 5.39 | NA | NA | NA | NA |
| 27-Aug-08 | Iron Gate reservoir lower end above log boom | 190.2 | 0.5 | R | 22.20 | 47,492 | 0 | 0 | 21,911 |
| 27-Aug-08 | Iron Gate reservoir lower end above log boom | 190.2 | 8.0 | INT | 1.20 | NA | NA | NA | NA |
| 27-Aug-08 | Iron Gate powerhouse tailwaters | 190.1 | 0.5 | R | 1.57 | NA | NA | NA | NA |
| 28-Aug-08 | Klamath R. at Iron Gate Hatchery bridge | 189.7 | 0.5 | R | 4.90 | NA | NA | NA | NA |
| 28-Aug-08 | Klamath R. at I-5 Rest Area | 176.7 | 0.5 | R | 6.19 | NA | NA | NA | NA |
| 28-Aug-08 | Klamath R. at Walker Bridge Road | 159.0 | 0.5 | R | 0.43 | NA | NA | NA | NA |

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- R Regular grab sample (at surface)
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- NA Results not available to date
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| Date | Location | River Mile | Depth (m) | Sample Type | Microcystin (ug/L) | <i>Microcystis</i> (cells/mL) | <i>Anabaena</i> (cells/mL) | <i>Planktothrix</i> (cells/mL) | <i>Aphanizomenon</i> (cells/mL) |
|-----------|---|------------|-----------|-------------|--------------------|-------------------------------|----------------------------|--------------------------------|---------------------------------|
| 9-Sep-08 | Upper Klamath Lake near Eagle Ridge ramp | UKL | 0.3 | R | 1.75 | NA | NA | NA | NA |
| 9-Sep-08 | Upper Klamath Lake near Hagelstein Park | UKL | 0.3 | R | <0.16 | NA | NA | NA | NA |
| 9-Sep-08 | Upper Klamath Lake at Wocus Bay | UKL | 0.3 | R | 2.11 | NA | NA | NA | NA |
| 9-Sep-08 | Upper Klamath Lake at Pelican Bay ramp | UKL | 0.3 | R | <0.16 | NA | NA | NA | NA |
| 9-Sep-08 | Link River below Upper Klamath Lake | 253.1 | 0.5 | R | 1.48 | NA | NA | NA | NA |
| 9-Sep-08 | Klamath R. below Keno dam | 233.4 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 9-Sep-08 | Klamath R. below J.C. Boyle powerhouse | 220.0 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 10-Sep-08 | Klamath R. above Copco reservoir | 206.4 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 16-Sep-08 | Copco reservoir upper end at Copco Village (SB 1) | 204.0 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 16-Sep-08 | Copco reservoir upper end at Copco Village (SB 1) | 204.0 | 5.0 | INT | <0.16 | NA | NA | NA | NA |
| 16-Sep-08 | Copco reservoir upper end near "narrows" (SB 2) | 203.0 | 0.5 | R | 0.16 | NA | NA | NA | NA |
| 16-Sep-08 | Copco reservoir upper end near "narrows" (SB 2) | 203.0 | 6.0 | INT | 1.10 | NA | NA | NA | NA |
| 16-Sep-08 | Copco reservoir middle above Mallard Cove (SB 3) | 202.0 | 0.5 | R | 1.95 | NA | NA | NA | NA |
| 16-Sep-08 | Copco reservoir middle above Mallard Cove (SB 3) | 202.0 | 8.0 | INT | 2.28 | NA | NA | NA | NA |
| 10-Sep-08 | Copco reservoir at Mallard Cove ramp | 201.5 | 0.3 | R | 0.76 | NA | NA | NA | NA |
| 16-Sep-08 | Copco reservoir middle below Mallard Cove (SB 4) | 201.0 | 0.5 | R | 2.97 | NA | NA | NA | NA |
| 16-Sep-08 | Copco reservoir middle below Mallard Cove (SB 4) | 201.0 | 8.0 | INT | 0.35 | NA | NA | NA | NA |
| 16-Sep-08 | Copco reservoir middle near Copco Cove (SB 5) | 200.0 | 0.5 | R | 8.47 | NA | NA | NA | NA |
| 16-Sep-08 | Copco reservoir middle near Copco Cove (SB 5) | 200.0 | 8.0 | INT | 1.97 | NA | NA | NA | NA |
| 10-Sep-08 | Copco reservoir at Copco Cove ramp | 200.0 | 0.3 | R | 11.10 | NA | NA | NA | NA |
| 10-Sep-08 | Copco reservoir lower end at log boom | 198.6 | 0.3 | R | 1.66 | NA | NA | NA | NA |
| 10-Sep-08 | Copco reservoir lower end at log boom | 198.6 | 0.5 | R | 2.32 | NA | NA | NA | NA |
| 10-Sep-08 | Copco reservoir lower end at log boom | 198.6 | 8.0 | INT | 2.38 | NA | NA | NA | NA |
| 10-Sep-08 | Iron Gate reservoir at Camp Creek area | 192.8 | 0.3 | R | 2.12 | NA | NA | NA | NA |
| 10-Sep-08 | Iron Gate reservoir at Williams boat ramp | 192.4 | 0.3 | R | 0.29 | NA | NA | NA | NA |
| 10-Sep-08 | Iron Gate reservoir lower end above log boom | 190.2 | 0.3 | R | 4.46 | NA | NA | NA | NA |
| 10-Sep-08 | Iron Gate reservoir lower end above log boom | 190.2 | 0.5 | R | 7.73 | NA | NA | NA | NA |
| 10-Sep-08 | Iron Gate reservoir lower end above log boom | 190.2 | 8.0 | INT | 2.07 | NA | NA | NA | NA |
| 10-Sep-08 | Iron Gate reservoir lower end above log boom | 190.2 | 10.0 | R | <0.16 | NA | NA | NA | NA |
| 10-Sep-08 | Iron Gate reservoir lower end above log boom | 190.2 | 20.0 | R | 0.21 | NA | NA | NA | NA |
| 10-Sep-08 | Iron Gate reservoir lower end above log boom | 190.2 | 30.0 | R | <0.16 | NA | NA | NA | NA |
| 10-Sep-08 | Iron Gate reservoir lower end above log boom | 190.2 | 40.0 | R | <0.16 | NA | NA | NA | NA |
| 10-Sep-08 | Iron Gate reservoir forebay | 190.1 | 0.3 | R | 12.40 | NA | NA | NA | NA |
| 10-Sep-08 | Iron Gate reservoir forebay | 190.1 | 0.5 | R | 8.88 | NA | NA | NA | NA |
| 10-Sep-08 | Iron Gate reservoir forebay | 190.1 | 10.0 | R | <0.16 | NA | NA | NA | NA |
| 10-Sep-08 | Iron Gate reservoir forebay | 190.1 | 20.0 | R | <0.16 | NA | NA | NA | NA |
| 10-Sep-08 | Iron Gate reservoir forebay | 190.1 | 30.0 | R | <0.16 | NA | NA | NA | NA |
| 10-Sep-08 | Iron Gate powerhouse tailwaters | 190.1 | 0.5 | R | 1.86 | NA | NA | NA | NA |
| 10-Sep-08 | Klamath R. at Iron Gate Hatchery bridge | 189.7 | 0.5 | R | 2.05 | NA | NA | NA | NA |
| 11-Sep-08 | Klamath R. at I-5 Rest Area | 176.7 | 0.5 | R | 2.46 | NA | NA | NA | NA |
| 11-Sep-08 | Klamath R. at Walker Bridge Road | 159.0 | 0.5 | R | 2.49 | NA | NA | NA | NA |

Table 2. Blue-green algae cell count (cells/mL) and microcystin concentration (ug/L) in sites sampled to date during 2008 by PacifiCorp in Iron Gate, Copco, and J.C. Boyle reservoirs and other sites in the Klamath River.

Codes:

- R Regular grab sample (at surface)
- INT Integrated grab sample (from surface to 8 m)
- NA Results not available to date
- NT Sample not taken

| Date | Location | River Mile | Depth (m) | Sample Type | Microcystin (ug/L) | <i>Microcystis</i> (cells/mL) | <i>Anabaena</i> (cells/mL) | <i>Planktothrix</i> (cells/mL) | <i>Aphanizomenon</i> (cells/mL) |
|-----------|---|------------|-----------|-------------|--------------------|-------------------------------|----------------------------|--------------------------------|---------------------------------|
| 23-Sep-08 | Upper Klamath Lake near Eagle Ridge ramp | UKL | 0.3 | R | 1.38 | NA | NA | NA | NA |
| 23-Sep-08 | Upper Klamath Lake near Hagelstein Park | UKL | 0.3 | R | <0.16 | NA | NA | NA | NA |
| 23-Sep-08 | Upper Klamath Lake at Wocus Bay | UKL | 0.3 | R | <0.16 | NA | NA | NA | NA |
| NT | Upper Klamath Lake at Pelican Bay ramp | UKL | 0.3 | R | NA | | | | |
| 22-Sep-08 | Link River below Upper Klamath Lake | 253.1 | 0.5 | R | 0.65 | NA | NA | NA | NA |
| 23-Sep-08 | Klamath R. below Keno dam | 233.4 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 23-Sep-08 | Klamath R. below J.C. Boyle powerhouse | 220.0 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 24-Sep-08 | Klamath R. above Copco reservoir | 206.4 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 30-Sep-08 | Copco reservoir upper end at Copco Village (SB 1) | 204.0 | 0.5 | R | <0.16 | NA | NA | NA | NA |
| 30-Sep-08 | Copco reservoir upper end at Copco Village (SB 1) | 204.0 | 5.0 | INT | <0.16 | NA | NA | NA | NA |
| 30-Sep-08 | Copco reservoir upper end near "narrows" (SB 2) | 203.0 | 0.5 | R | 0.21 | NA | NA | NA | NA |
| 30-Sep-08 | Copco reservoir upper end near "narrows" (SB 2) | 203.0 | 6.0 | INT | 0.78 | NA | NA | NA | NA |
| 30-Sep-08 | Copco reservoir middle above Mallard Cove (SB 3) | 202.0 | 0.5 | R | 0.88 | NA | NA | NA | NA |
| 30-Sep-08 | Copco reservoir middle above Mallard Cove (SB 3) | 202.0 | 8.0 | INT | 0.39 | NA | NA | NA | NA |
| 24-Sep-08 | Copco reservoir at Mallard Cove ramp | 201.5 | 0.3 | R | 0.17 | NA | NA | NA | NA |
| 30-Sep-08 | Copco reservoir middle below Mallard Cove (SB 4) | 201.0 | 0.5 | R | 0.43 | NA | NA | NA | NA |
| 30-Sep-08 | Copco reservoir middle below Mallard Cove (SB 4) | 201.0 | 8.0 | INT | 0.45 | NA | NA | NA | NA |
| 30-Sep-08 | Copco reservoir middle near Copco Cove (SB 5) | 200.0 | 0.5 | R | 3.53 | NA | NA | NA | NA |
| 30-Sep-08 | Copco reservoir middle near Copco Cove (SB 5) | 200.0 | 8.0 | INT | 0.21 | NA | NA | NA | NA |
| 24-Sep-08 | Copco reservoir at Copco Cove ramp | 200.0 | 0.3 | R | 6.03 | NA | NA | NA | NA |
| 24-Sep-08 | Copco reservoir lower end at log boom | 198.6 | 0.3 | R | <0.16 | NA | NA | NA | NA |
| 24-Sep-08 | Copco reservoir lower end at log boom | 198.6 | 0.5 | R | 0.39 | NA | NA | NA | NA |
| 24-Sep-08 | Copco reservoir lower end at log boom | 198.6 | 8.0 | INT | 1.40 | NA | NA | NA | NA |
| 24-Sep-08 | Iron Gate reservoir at Camp Creek area | 192.8 | 0.3 | R | 0.18 | NA | NA | NA | NA |
| 24-Sep-08 | Iron Gate reservoir at Williams boat ramp | 192.4 | 0.3 | R | 1.45 | NA | NA | NA | NA |
| 24-Sep-08 | Iron Gate reservoir lower end above log boom | 190.2 | 0.3 | R | 1.14 | NA | NA | NA | NA |
| 24-Sep-08 | Iron Gate reservoir lower end above log boom | 190.2 | 0.5 | R | 1.14 | NA | NA | NA | NA |
| 24-Sep-08 | Iron Gate reservoir lower end above log boom | 190.2 | 8.0 | INT | 1.24 | NA | NA | NA | NA |
| NT | Iron Gate powerhouse tailwaters | 190.1 | 0.5 | R | NA | | | | |
| 24-Sep-08 | Klamath R. at Iron Gate Hatchery bridge | 189.7 | 0.5 | R | 0.29 | NA | NA | NA | NA |
| 25-Sep-08 | Klamath R. at I-5 Rest Area | 176.7 | 0.5 | R | 0.72 | NA | NA | NA | NA |
| 25-Sep-08 | Klamath R. at Walker Bridge Road | 159.0 | 0.5 | R | 0.16 | NA | NA | NA | NA |