

PORTLAND DISTRICT HARMFUL ALGAL BLOOMS

Sarah Burnet

Reservoir Regulation and Water Quality

USACE Portland District

17 March 2023



US Army Corps
of Engineers®

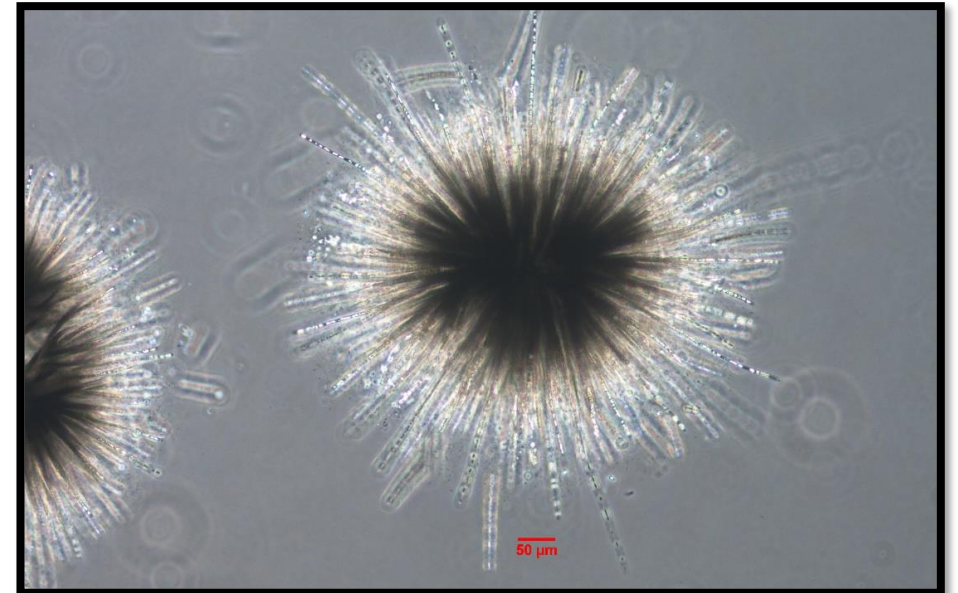
Willow Creek Reservoir, Heppner, OR 2022
Photo by Frank Wilhelm



2022 HABS



- Samples from Dorena and Fern Ridge reservoirs were collected on July 11th and shipped to Greenwater labs for analysis
- Both samples were ND for toxins
- Presence of species:
 - Fern Ridge: *Dolichospermum sp.* and *Aphanizomenon sp.*
 - Dorena: *Gloeotrichia sp.* and *Dolichospermum sp.*





2022 HABS - WILLOW CREEK RESERVOIR



Oct 2nd



Frank Wilhelm

Oct 2nd – 995 µg/L microcystin

Species present: *Woronchinia sp.*, *Microcystis sp.*,
Aphanizomenon sp.

Oct 30th – 55.3 µg/L microcystin

Species present: Same as Oct 2nd plus
Dolichospermum sp.

Dec 16th – ND (*Woronchinia sp.* present)

Oct 30th



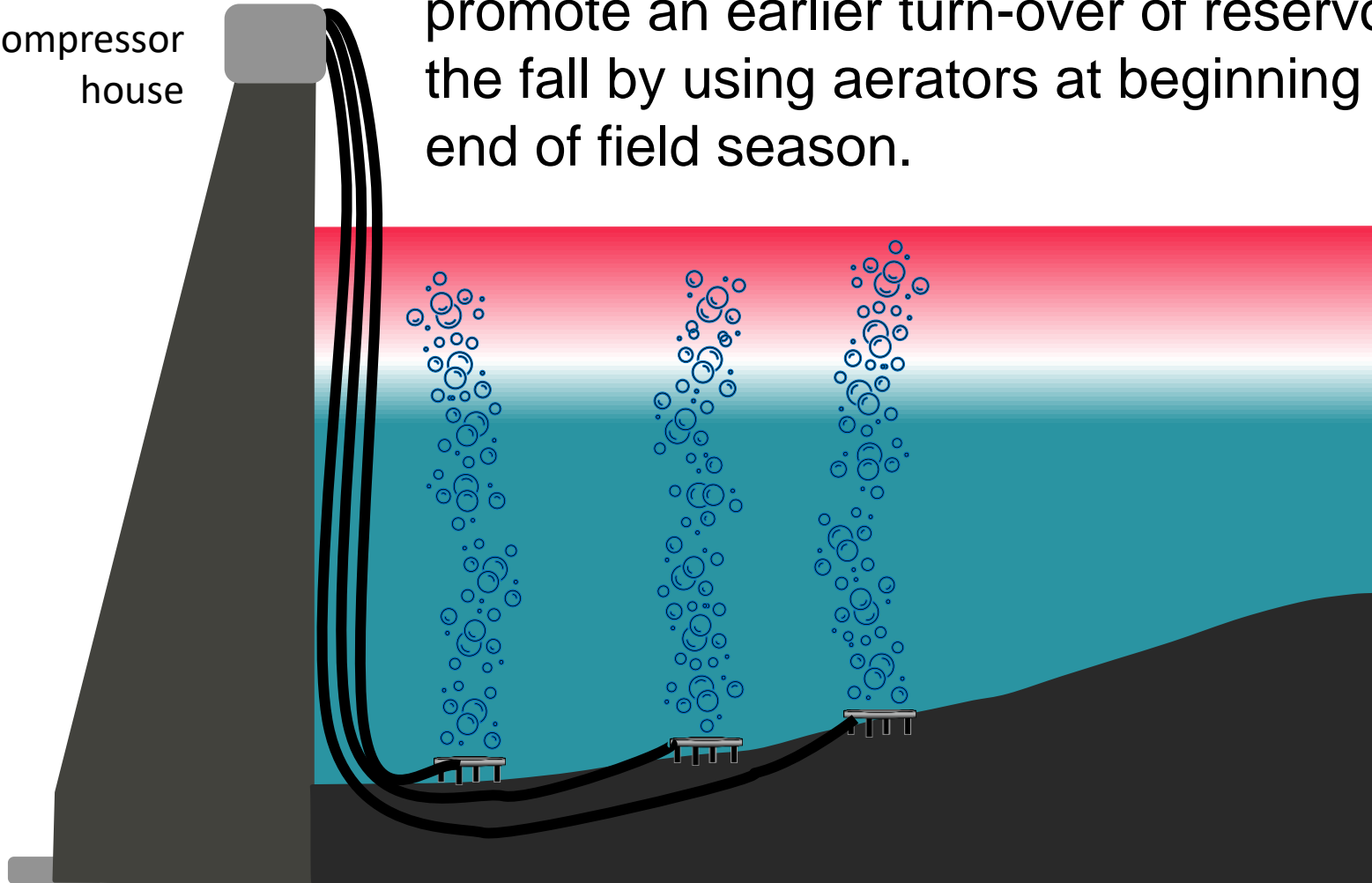
Frank Wilhelm



2022 HABS - WILLOW CREEK RESERVOIR

Hypolimnetic aeration: attempting to extend oxic conditions into spring and promote an earlier turn-over of reservoir in the fall by using aerators at beginning and end of field season.

Compressor house





WILLOW CREEK RESERVOIR – RELATED PUBLICATIONS



ELSEVIER

Contents lists available at [ScienceDirect](#)

Harmful Algae

journal homepage: www.elsevier.com/locate/hal



Genome sequence of freshwater nontoxigenic *Limnospira* associated with microcystin-producing blooms.

[Theo W. Dreher](#)^{a,*}, [Edward W. Davis](#)^b, [Frank M. Wilhelm](#)^c, [Sarah H. Burnet](#)^c, [Ryan S. Mueller](#)^a

LIMNOLOGY AND OCEANOGRAPHY

Letters



Open Access

© 2023 The Authors. *Limnology and Oceanography Letters* published by Wiley Periodicals LLC on behalf of Association for the Sciences of Limnology and Oceanography. doi: 10.1002/lol2.10316

LAKE AND RESERVOIR MANAGEMENT
2021, VOL. 37, NO. 3, 261–274
<https://doi.org/10.1080/10402381.2021.1923590>

CURRENT EVIDENCE

Blooms also like it cold

[Kaitlin L. Reinl](#)^{1,2*}, [Ted D. Harris](#)³, [Rebecca L. North](#)⁴, [Pablo Almela](#)⁵, [Stella A. Berger](#)⁶, [Mina Bizic](#)⁶, [Sarah H. Burnet](#)⁷, [Hans-Peter Grossart](#)^{6,8*}, [Bastiaan W Ibelings](#)⁹, [Ellinor Jakobsson](#)¹⁰, [Lesley B. Knoll](#)^{11,12}, [Brenda M. Lafrancois](#)¹³, [Yvonne McElarney](#)¹⁴, [Ana M. Morales-Williams](#)¹⁵, [Ulrike Obertegger](#)¹⁶, [Igor Ogashawara](#)⁶, [Ma Cristina Paule-Mercado](#)¹⁷, [Benjamin L. Peierls](#)¹⁸, [James A. Rusak](#)^{19,20}, [Siddhartha Sarkar](#)²¹, [Sapna Sharma](#)²², [Jessica V. Trout-Haney](#)²³, [Pablo Urrutia-Cordero](#)²⁴, [Jason J. Venkiteswaran](#)²⁵, [Danielle J. Wain](#)²⁶, [Katelynn Warner](#)¹⁵, [Gesa A. Weyhenmeyer](#)¹⁰, [Kiyoko Yokota](#)²⁷

Estimates of internal loading of phosphorus in a western US reservoir using 3 methods

[Sarah H. Burnet](#) and [Frank M. Wilhelm](#)

Department of Fish and Wildlife Sciences, College of Natural Resources, University of Idaho, Moscow, ID, USA



CONTINUED RESEARCH



- 2022 buoy platform with vertical profiling system installed at Blue River reservoir (to be deployed in 2023 too)
- Lake monitoring efforts with USGS, EWEB, and City of Salem also includes a buoy platform
- Multi-parameter data sondes and satellite uplink
 - Temperature, conductivity, DO, turbidity, pH, Chla, phycocyanin, fDOM
- Additional USGS research at Blue River will quantify a nutrient budget for the lake
 - Comparing inflows from burned and unburned drainages



Photos: Kurt Carpenter USGS



CONTINUED RESEARCH

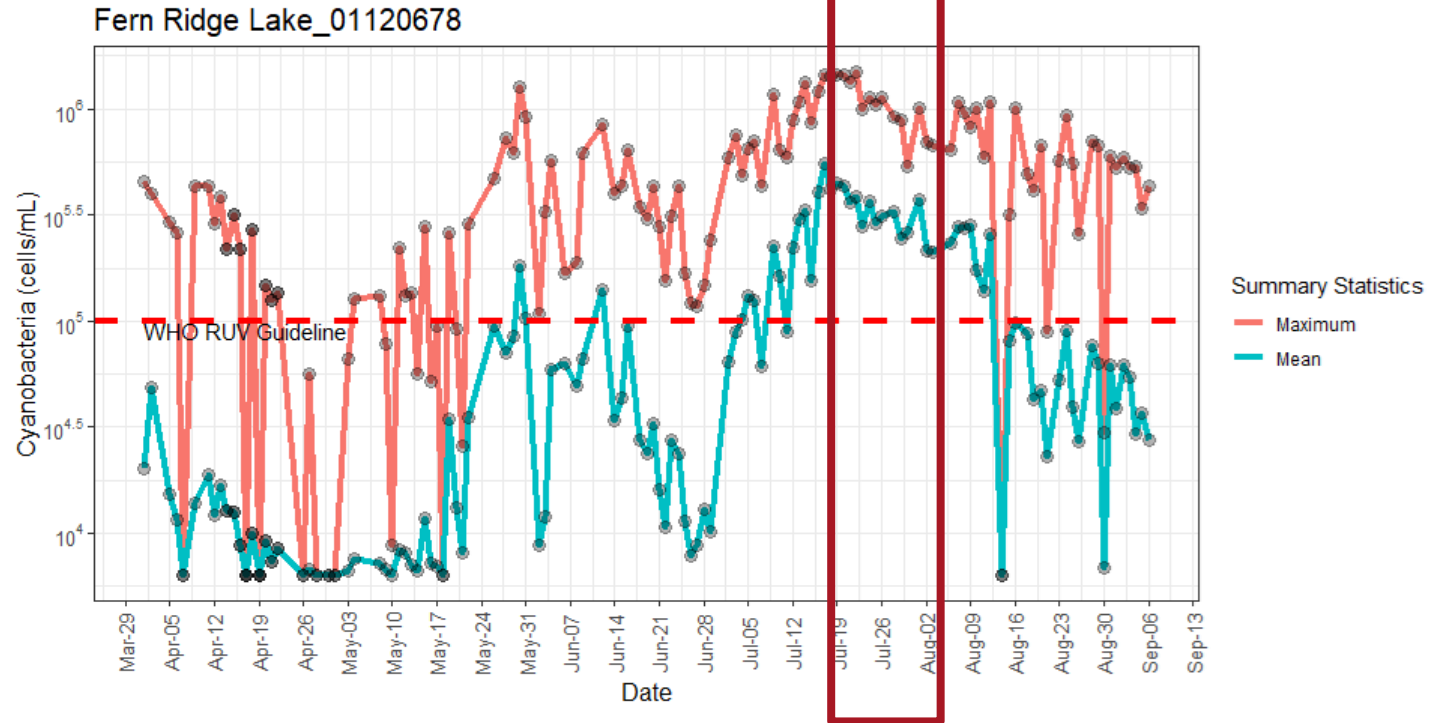


OR DEQ provides cyanobacteria counts estimated from satellite imagery

- Estimates derived from the Cyanobacteria Assessment Network (CyAN) project
- Categorized into 3 levels of cell abundance corresponding to WHO exposure guideline values



Sentinel-2 Satellite image processing by U.S. Army Corps of Engineers, Portland District



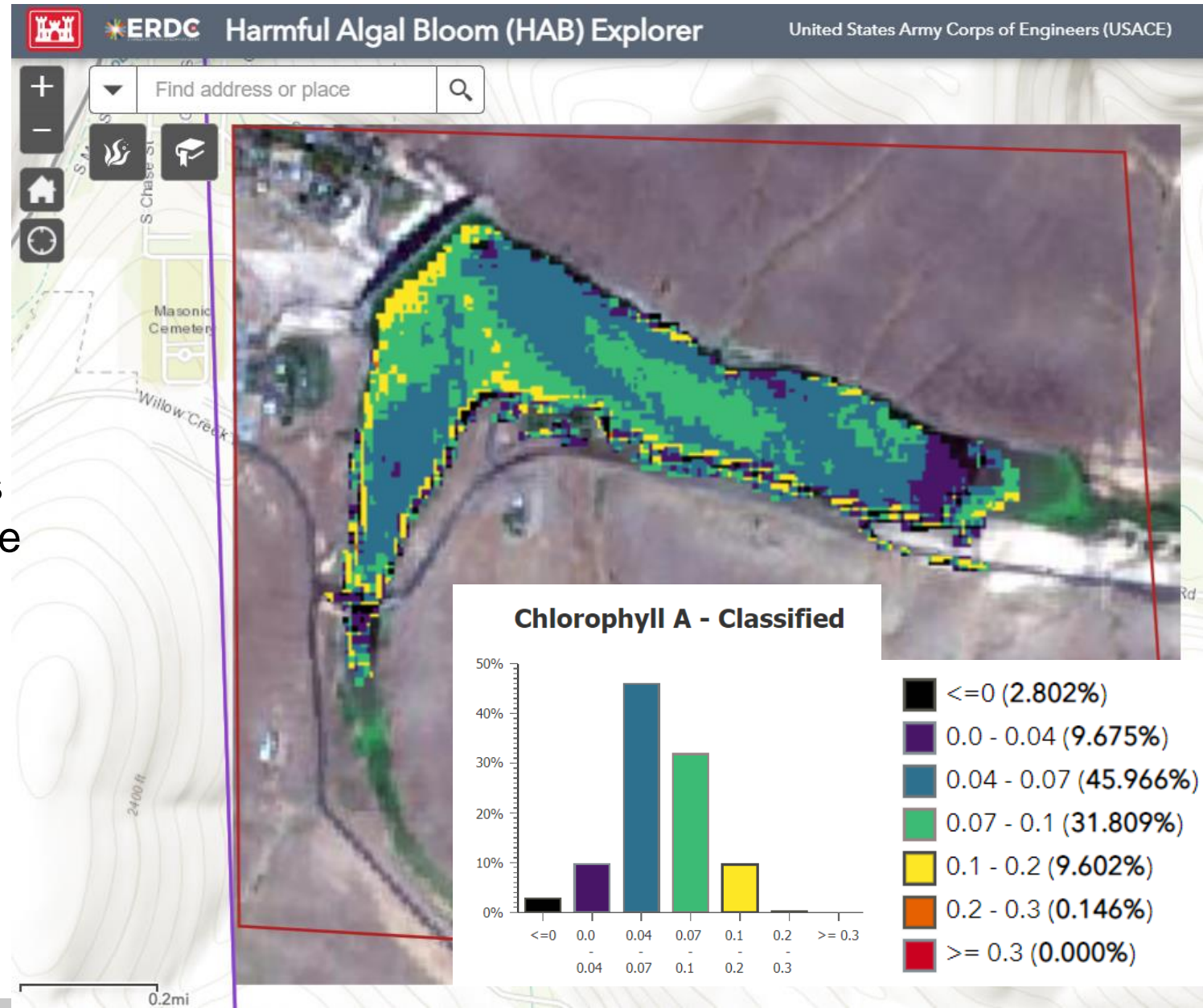


CONTINUED RESEARCH



ERDC HAB Explorer website

- Generate estimations of chl_a using the Normalized Difference Chlorophyll Index (NDCI)
 - Two options for visualization
 - 1) Continuous greyscale option
 - 2) Classified option using discrete class breaks into a histogram displaying the percentage of lake surface in each class (shown in screenshots)
- Less than 0: no algae (black)
 - 0 - 0.04: very low potential (dark blue)
 - 0.04 - 0.07: low potential (blue)
 - 0.07 - 0.1: potential may be possible (green)
 - 0.1 - 0.2: potential watch (yellow)
 - 0.2 - 0.3: potential warning (orange)
 - Greater than 0.3: potential hazard (red)





THANKS!



Fern Ridge, OR



Dorena Reservoir, OR

Willow Creek Reservoir, OR



Contact:
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PORTLAND DISTRICT CYANOHAB ADVISORIES & SAMPLING EFFORT



Duration in days of Harmful Algae Bloom advisories by OHA (blank if none) & sampling effort

Reservoir	2022	2021	2020	2019*	2018	2017	2016	2015	2014*	2013	2012*	2011	2010	2009	2008*	2007	2006	2005	2004
Detroit				ND	50	14	TBL	6	HCC	HCC						14			HCC
Big Cliff					21														
Foster			BNS					BNS											
Green Peter																			
Fern Ridge	ND	ND	ND						TBL	125	54								
Blue River				ND					HCC				25						
Cougar									HCC			35							
Fall Creek						BNS	ND	BNS	ND			101							
Dexter		ND		ND				ND	ND	78	95	56	40	46	34				
Lookout Point									BNS										52
Hills Creek								BNS	BNS					58	62	26	20	65	
Cottage Grove				ND	ND		ND	ND											
Dorena	ND		ND	ND	9		BNS	BNS	TBL	61	84	35	24	71	33				
Lost Creek			ND		BNS	BNS	BNS	ND	106	124	128	131	124	39	134	28	25		
Applegate																			
Willow Creek	75	ND	89	15	54	82	?*	14	39	144	104	91	113	38	153	117	48		

***Notes:**

2019 New recreational guidelines

2012-2018 APHA excluded from "toxic species" list

2014 NWP cyanoHABs policy changed

2008 Initial NWP cyanoHABs policy established

ND = Not detected (n=21)

TBL = Toxins below OHA limit (n=2)

BNS = Bloom not sampled (n=12)

HCC = High cell count (n=4)