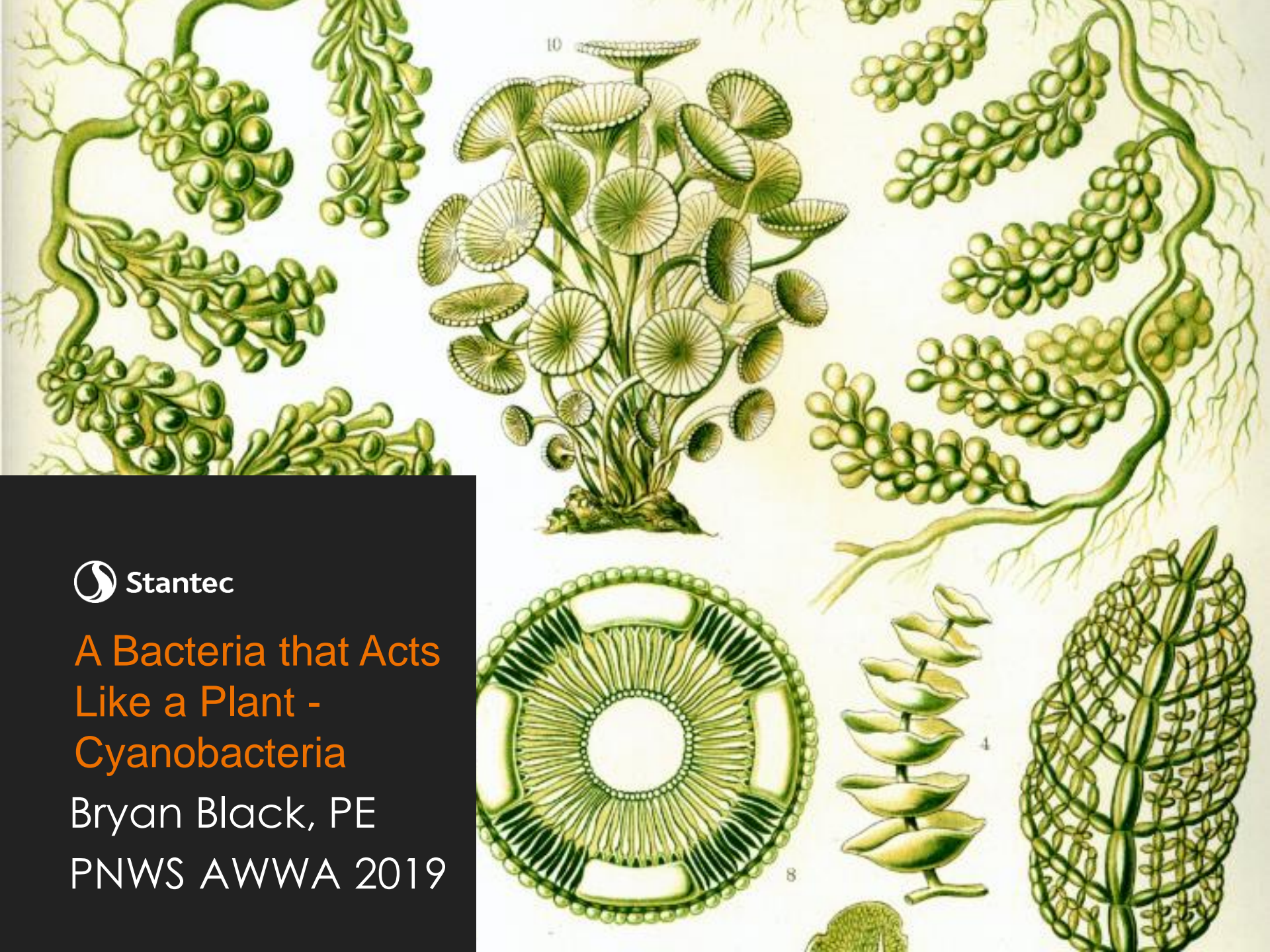




A Bacteria that Acts Like a Plant - Cyanobacteria

Bryan Black, PE
PNWS AWWA 2019



ALGAE BLOOMS IN OREGON

What is this stuff?

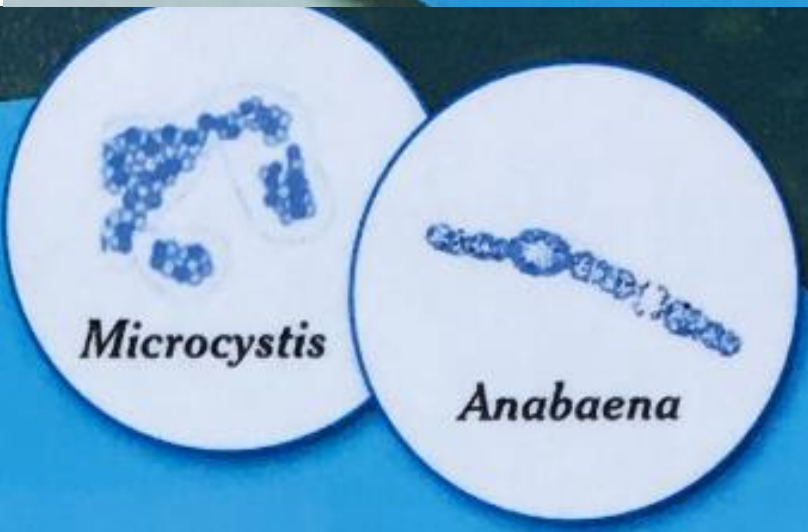


Know the signs of an algae bloom. Don't go in water that is foamy, scummy, thick like paint, pea-green, blue-green or brownish red.

So, what's the problem?

HABs can:

- Create toxins that can cause illness in humans and animals
- Pollute Oregon lakes and other fresh waters with scums
- Limit recreational activities in lakes, reservoirs and rivers
- Cause challenges for public water suppliers including taste and odor problems and water filtration difficulties



Plant or Bacteria?

Blue green algae?

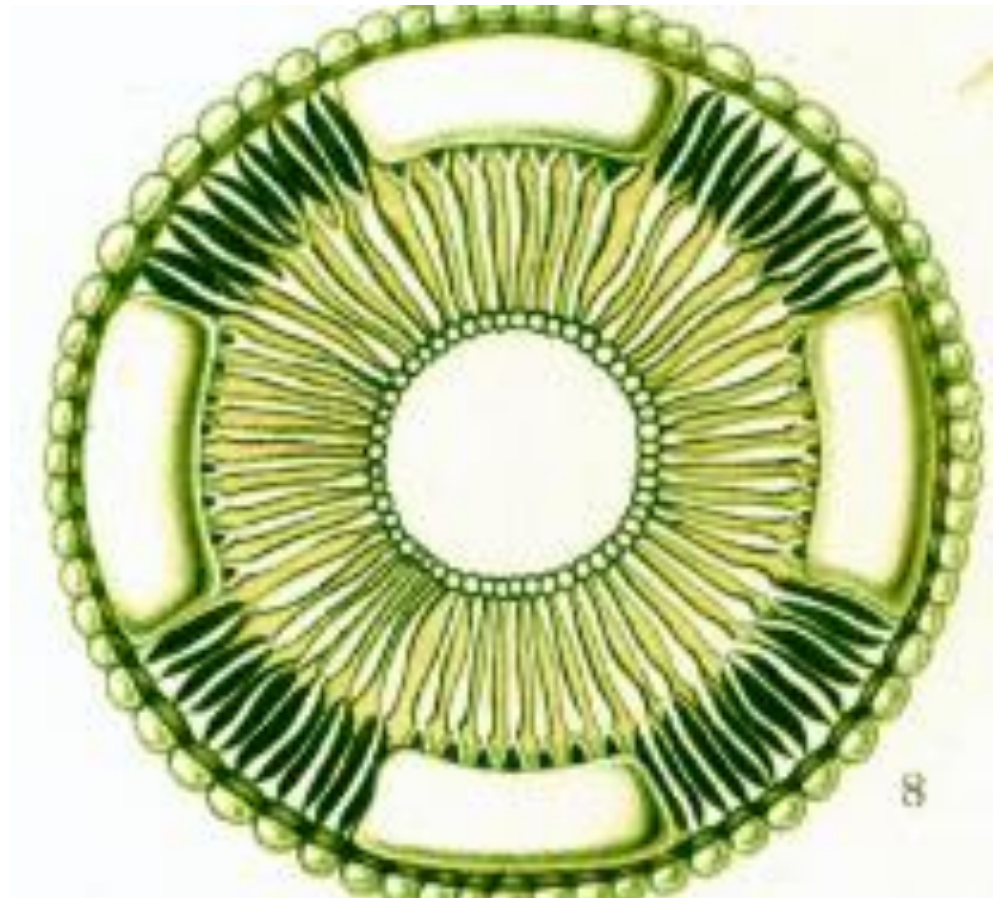
Cyanobacteria?

A photosynthesizing bacteria

Light + water + CO₂ =
carbohydrates to grow

- Waste = oxygen

Key nutrients: nitrogen and
phosphorus



Buoyancy Regulation

Regulate air in the gas vesicle in response to light and nutrients.

Daily vertical migration

Toxins

Intracellular (particulate)

Extracellular or free (dissolved)

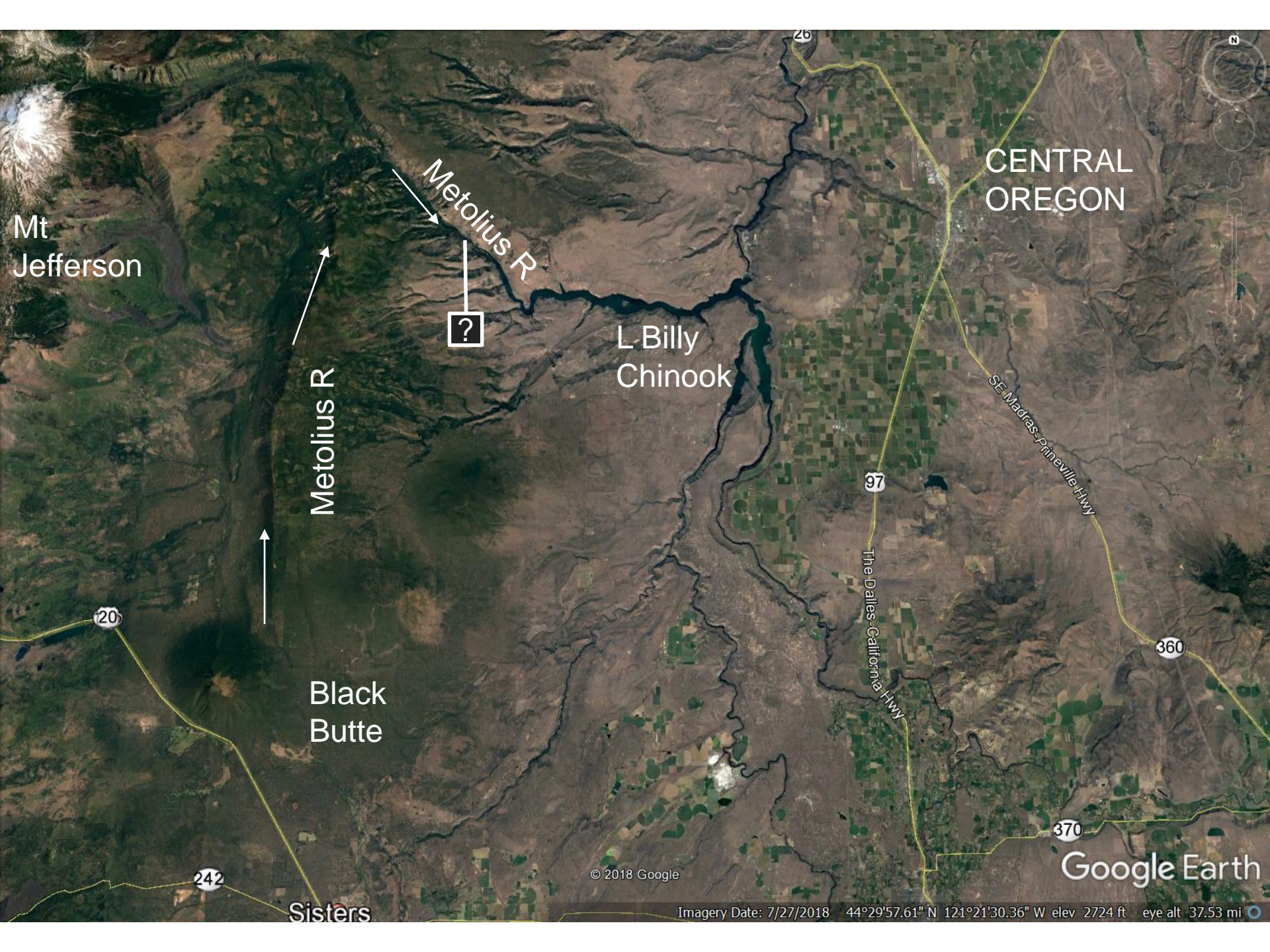
Microcystis

Anatoxin-a

Cylindrospermopsin

Saxitoxin





Mt
Jefferson

CENTRAL
OREGON

Metolius R

L Billy
Chinook

Metolius R

Black
Butte

20

242

Sisters

97

The Dalles-California Hwy

SE Madras-Prineville Hwy

360

370

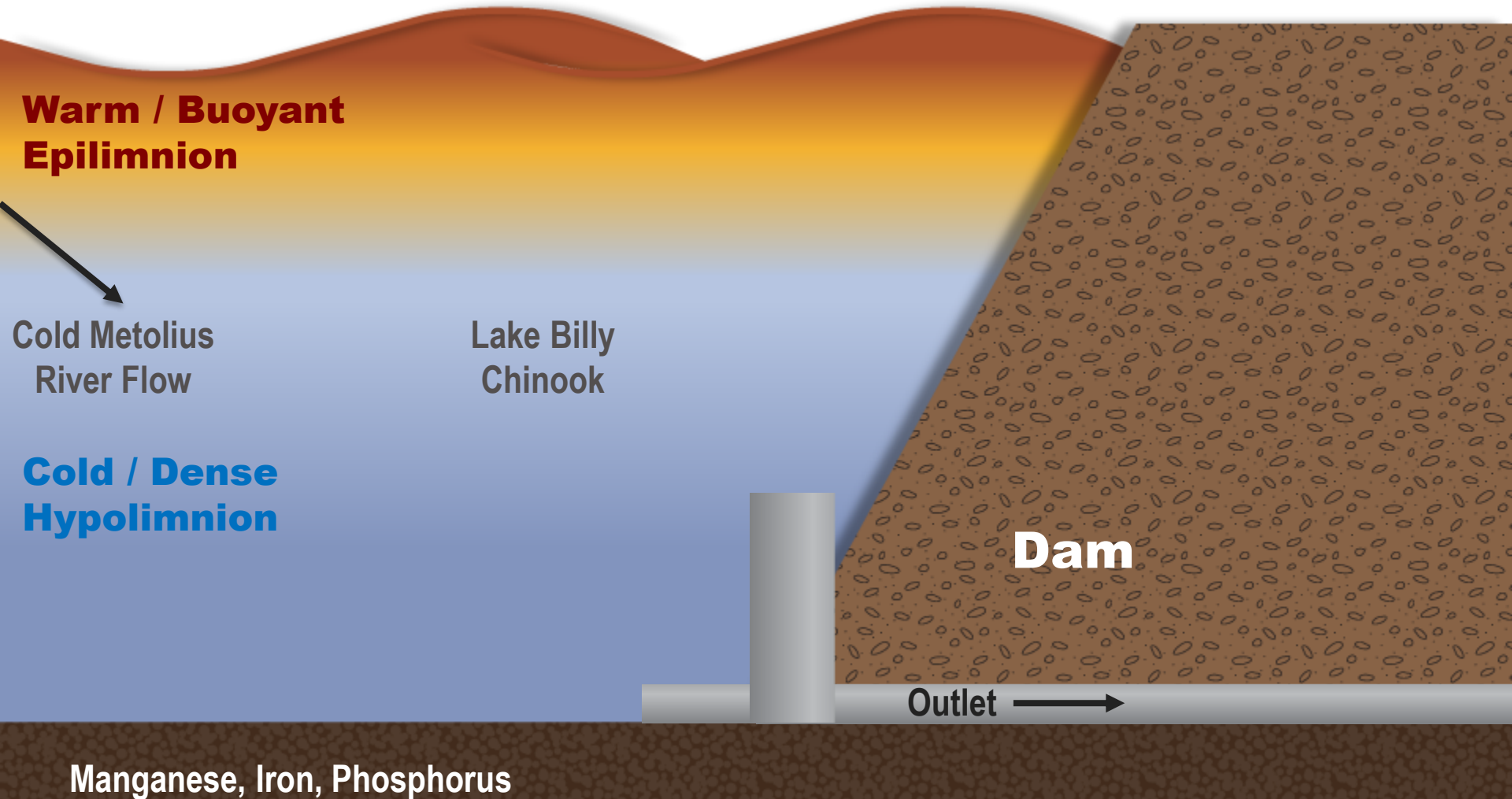
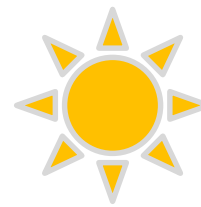
Google Earth

© 2018 Google

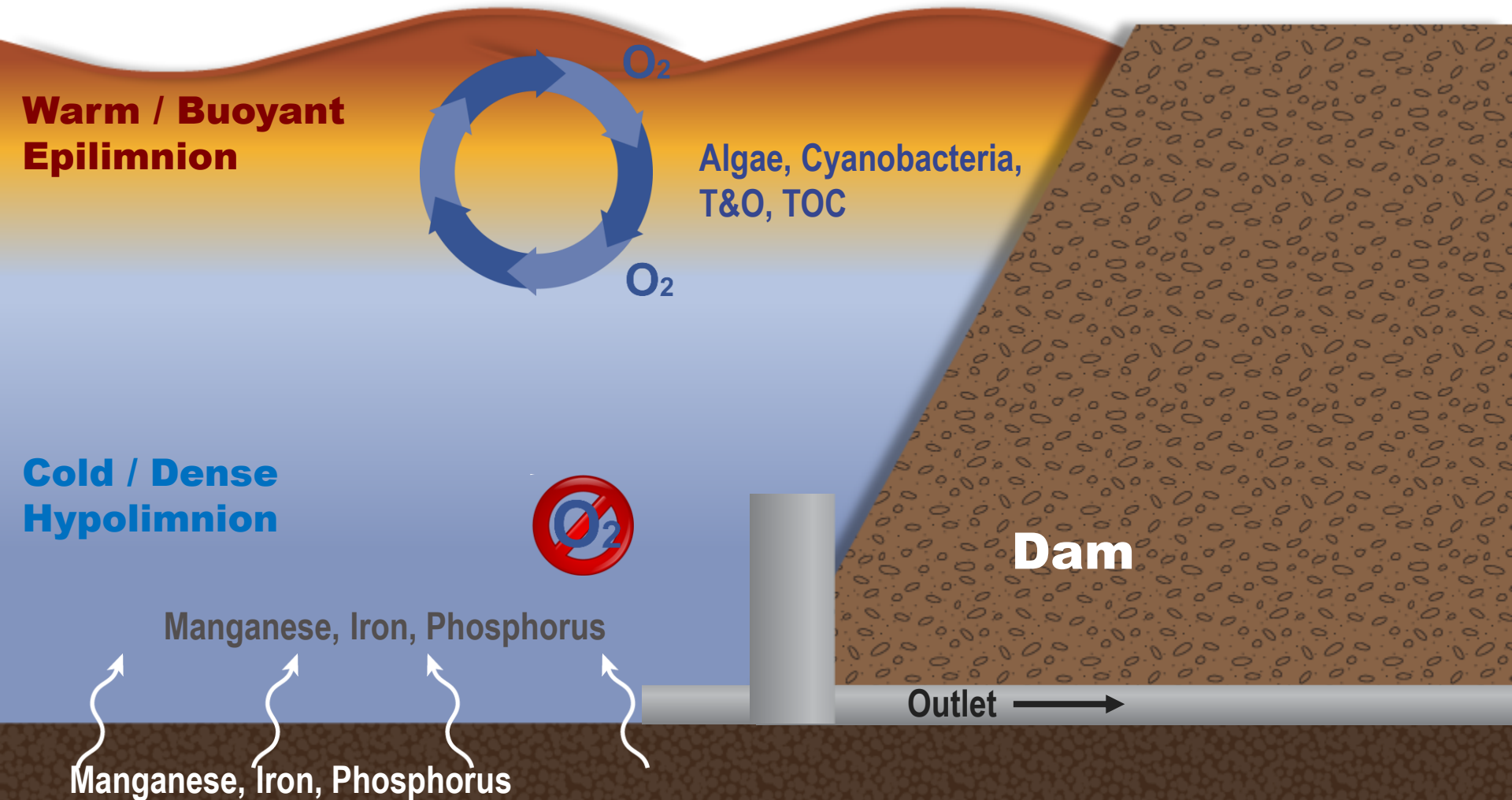
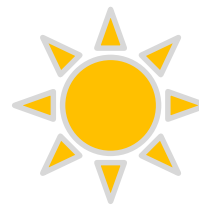
Imagery Date: 7/27/2018 44°29'57.61" N 121°21'30.36" W elev 2724 ft eye alt 37.53 mi



Summer Thermal Stratification



Oxygen Depletion at Sediments Releases Contaminants





Res 1: Shallower

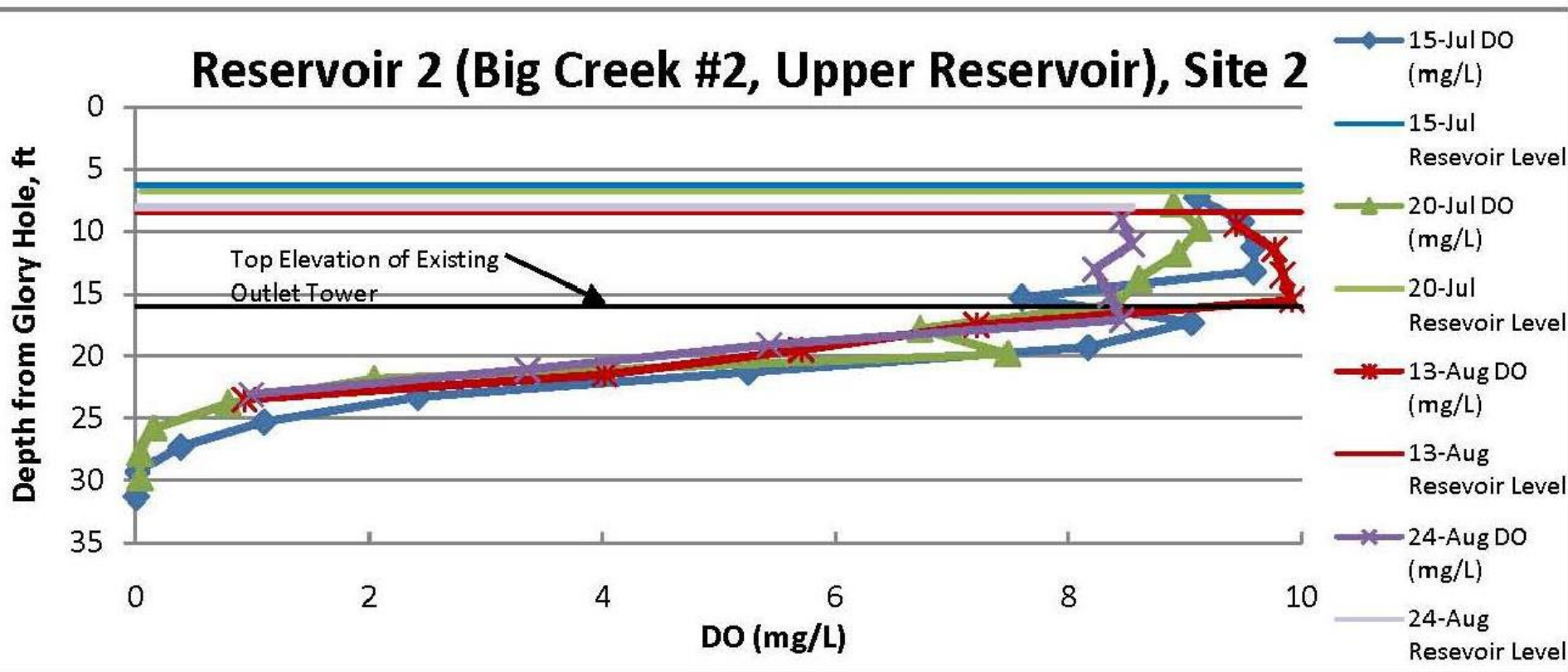
Supplement from Siletz R
Res 2: Deeper

New WTP: Pressure Membrane Filtration + GAC

Newport, OR, USA

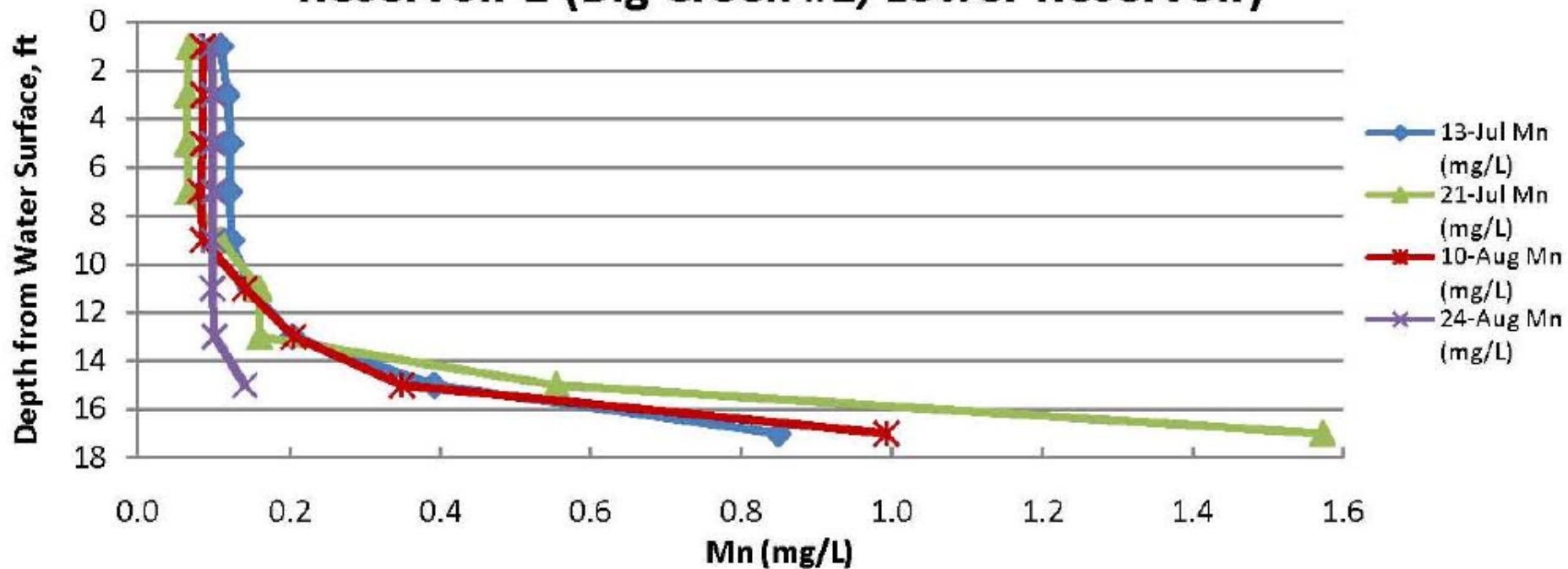
Dissolved Oxygen is Zero at Bottom

Reservoir 2 (Big Creek #2, Upper Reservoir), Site 2



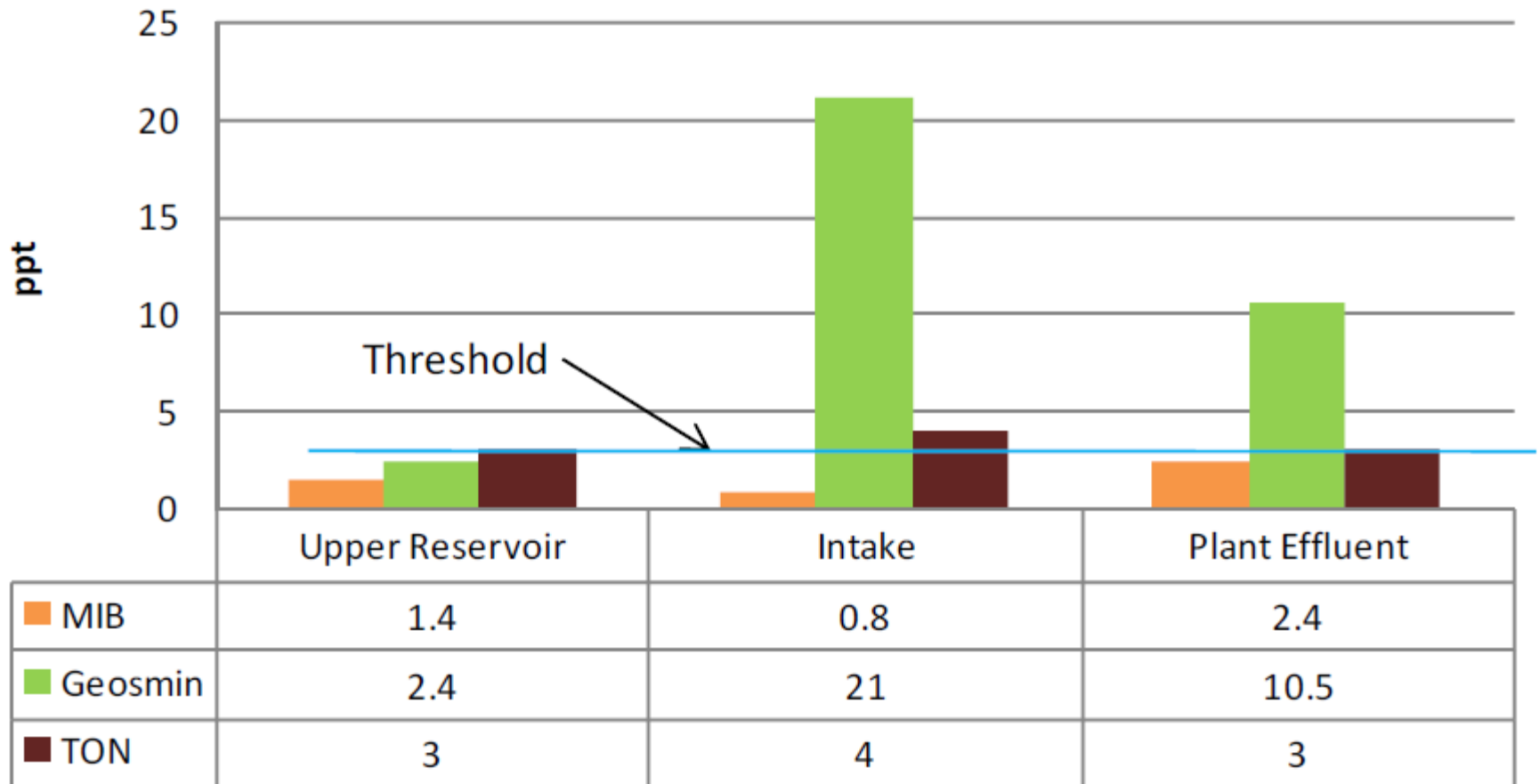
Manganese Excessive at Depth

Reservoir 1 (Big Creek #1, Lower Reservoir)



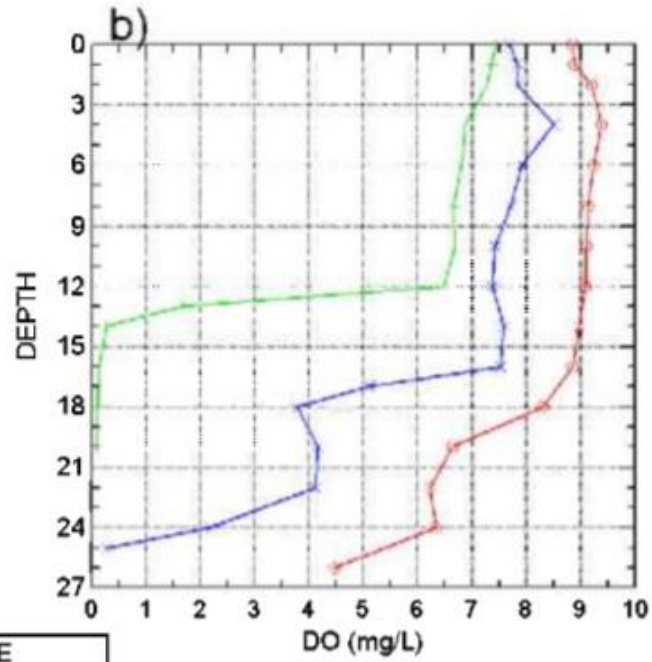
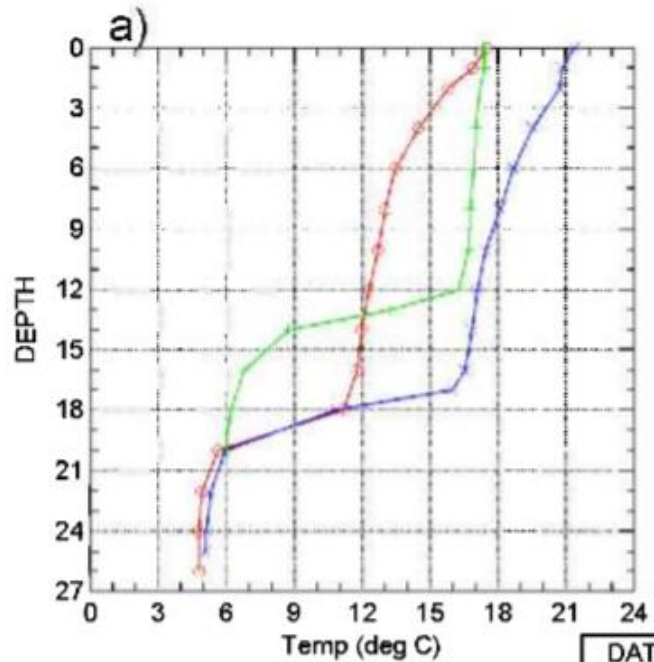
Algal Byproducts Cause Taste / Odor

T&O Sampling Round 1 (July 24th 09)



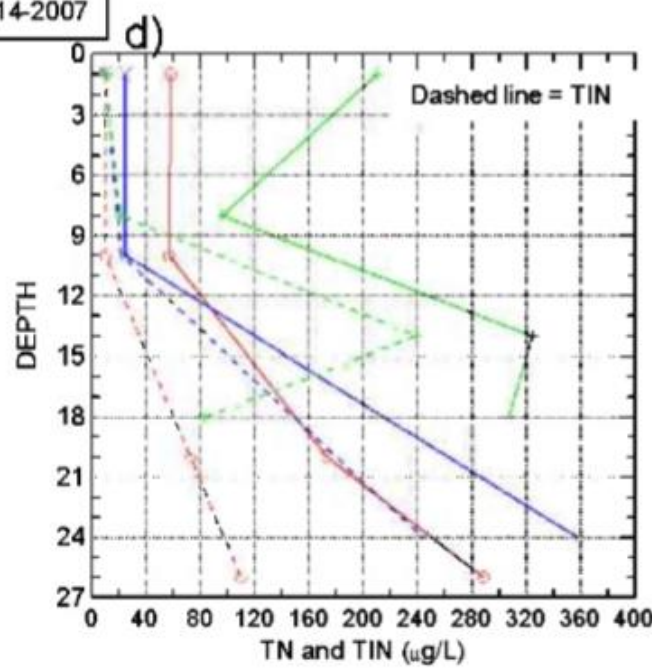
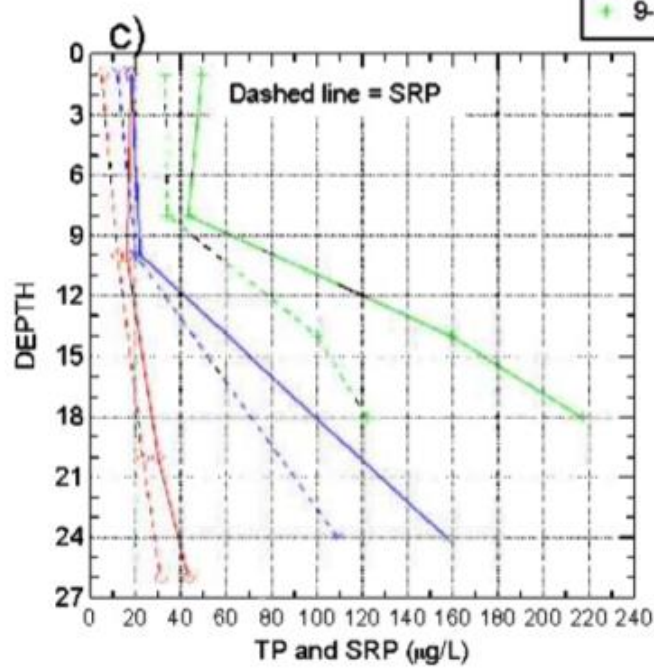


Ashland's Reeder Reservoir



DATE

- 6-27-2007
- × 7-31-2007
- ◇ 9-14-2007



Source:
Jacob
Kahn,
2008

Water quality issues

Algal toxins

Manganese, iron

Taste & odor / Algae

Organic matter, DBP presursors

Color

Disinfection by-products

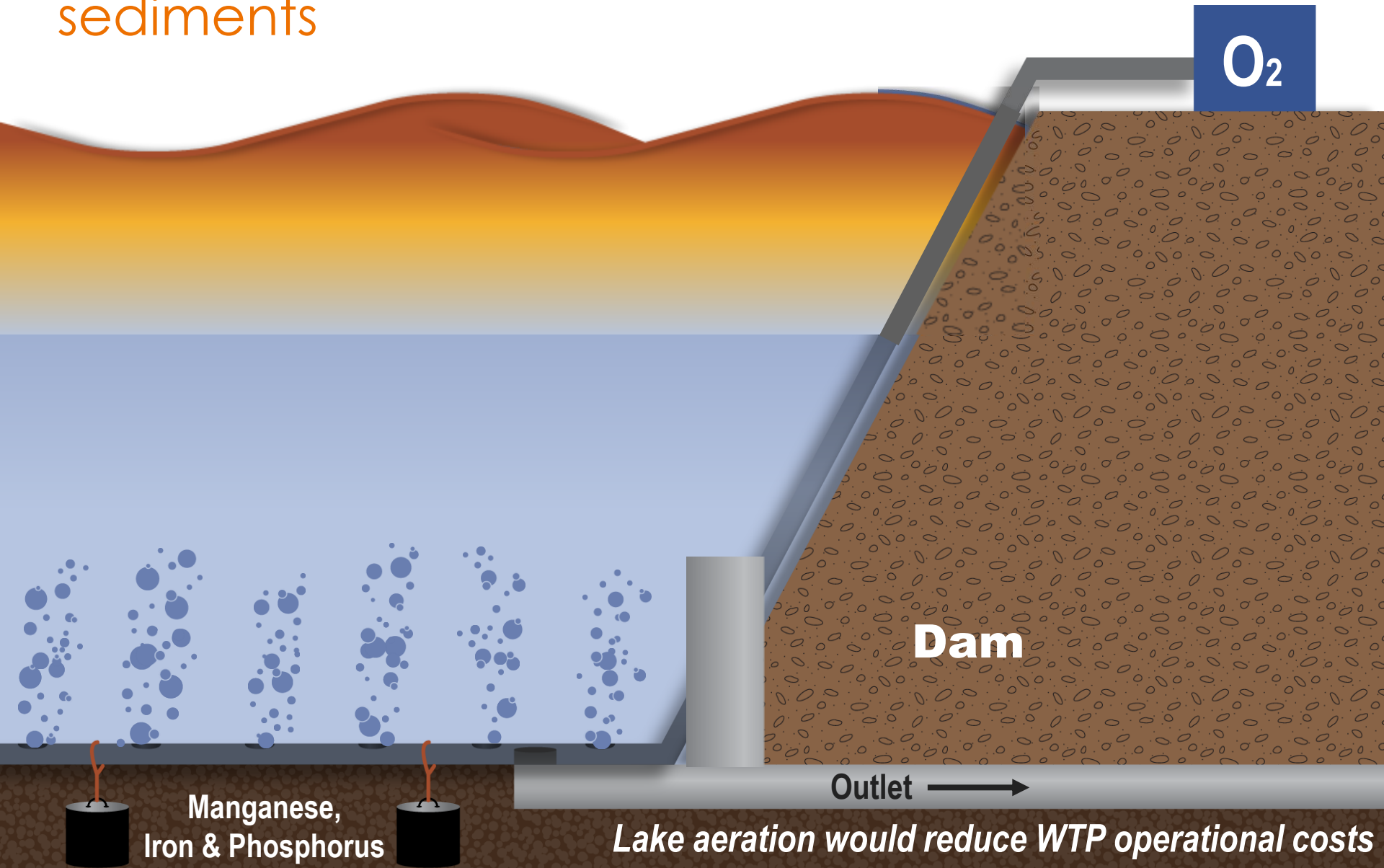
Corrosion, low alkalinity

Achieve

- Customer satisfaction, Reg compliance



Oxygen keeps manganese, iron, phosphorus in sediments



Newport Treatment Approach





RAW



BWW

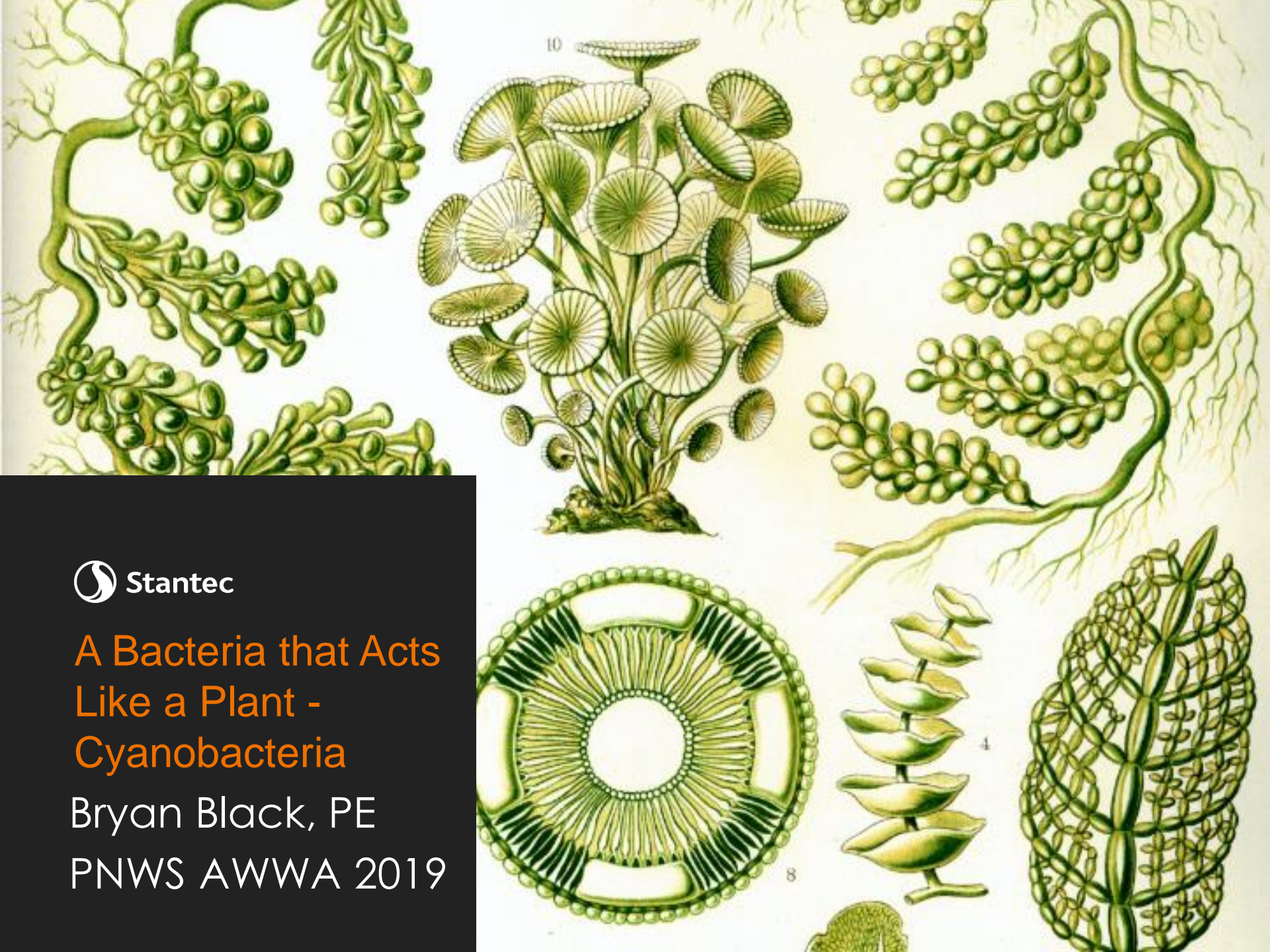


Finished

Recommendations

- Monitor your raw water source
- Implement reservoir management
- Treat as required for particulate cyanobacterial cells
- Treat as required to destroy dissolved toxins





Stantec

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