Lakes & Raw Water Reservoirs

Medora Corporation

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GridBee® SolarBee®

Problems in Lakes & Reservoirs

1. **Blue-green algae (cyanobacteria)**
   - Public health issues due to **Cyanotoxins**
   - Aesthetic, loss of property value, loss of recreational areas
   - Taste & odor problems when used as source of drinking water

2. **Invasive aquatic weeds**
   - Eurasian water milfoil, curly leaf, pond weed, hydrilla
   - Aesthetic, loss of property value, loss of recreational areas
   - Public safety issues

Problems in Lakes & Reservoirs

3. **Inorganic chemical release from lake sediments**
   - Iron (Fe), manganese (Mn), hydrogen sulfide (H2S), phosphorus (P), nitrogen

4. **Impaired fisheries**
   - Low dissolved oxygen levels
   - Chronic fish kills
   - Loss of spawning areas

US EPA and Public Attention

"Harmful algal blooms [HABs] are among America's **most serious and growing environmental challenges**,"
-Administrator of the U.S. Environmental Protection Agency (EPA, 2015)

Microcystin, cylindrospermopsin, anatoxin-A, saxitoxins and many other **cyanotoxins** are associated with multiple acute and chronic health effects, including liver damage, auto-immune problems, and possibly other serious diseases.

You don't have to go into the water to have exposure, illnesses extend to people just living near the lake!

Harmful Algal Blooms

Drive most lake projects

Blue-Green Algae

Competitive Advantages

Blue-green algae (cyanobacteria) have evolved competitive advantages to ensure their success:

1. Can regulate their buoyancy
   - Move up during day for sunlight, down at night for nutrients
   - Competitive advantage for light and carbon dioxide
2. Some species can “fix” atmospheric nitrogen
3. Can cause taste and odor, and emit toxins
   - Increase treatment plants costs
   - Toxins may be getting through plant, long term health problems

Prevent blue-green algae blooms

Nutrient Reduction:

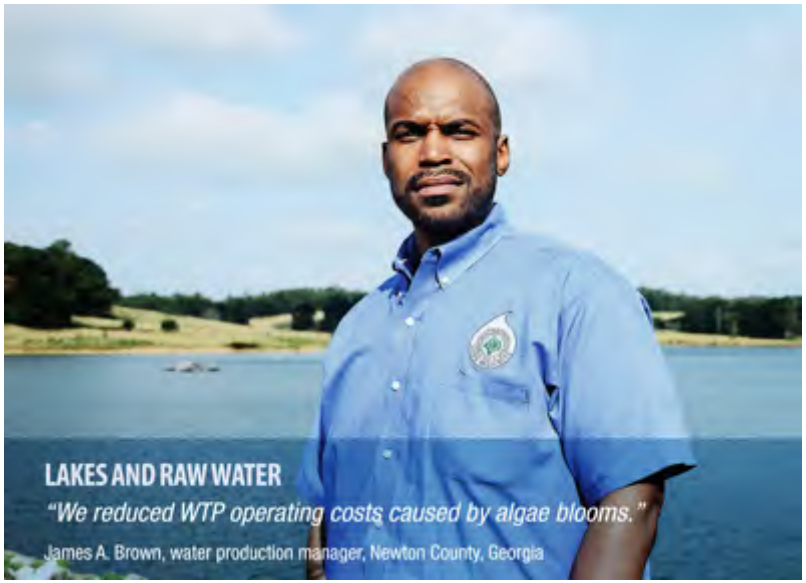
- Control External Loading: But is difficult and costly for non-point sources
- Control Internal loading: But aeration/ oxygenation, and alum, have not worked well.

Chemical applications:

- Kills many non-target, beneficial organisms as well and offers only short term relief; copper herbicides creates toxicity in lake, peroxide kills bacteria and prompts a worse bloom in several weeks.

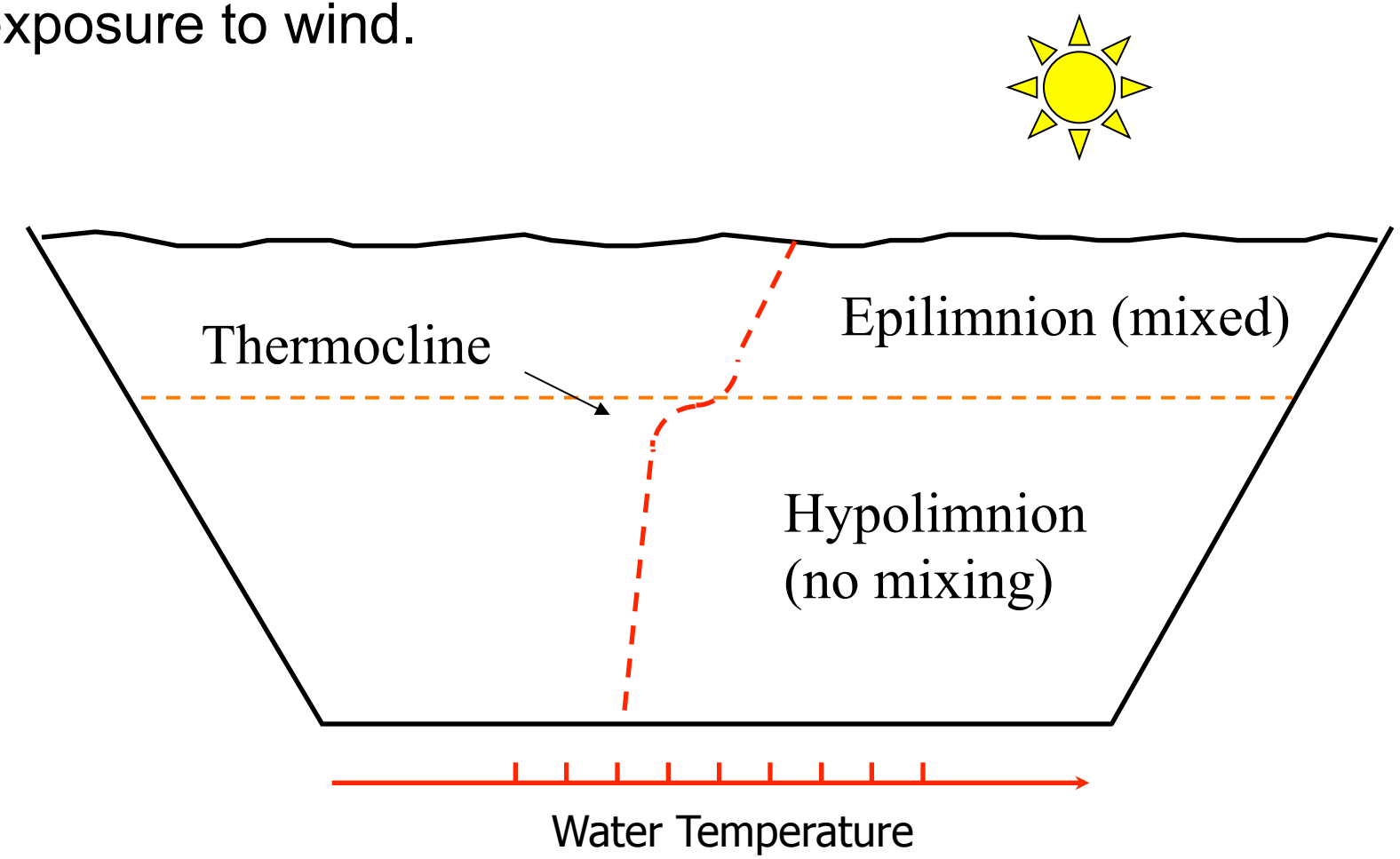
Habitat disturbance through circulation:

- Effective; but has been difficult to achieve over 1-3 acres of influence per machine until SolarBee developed the long-distance circulator.

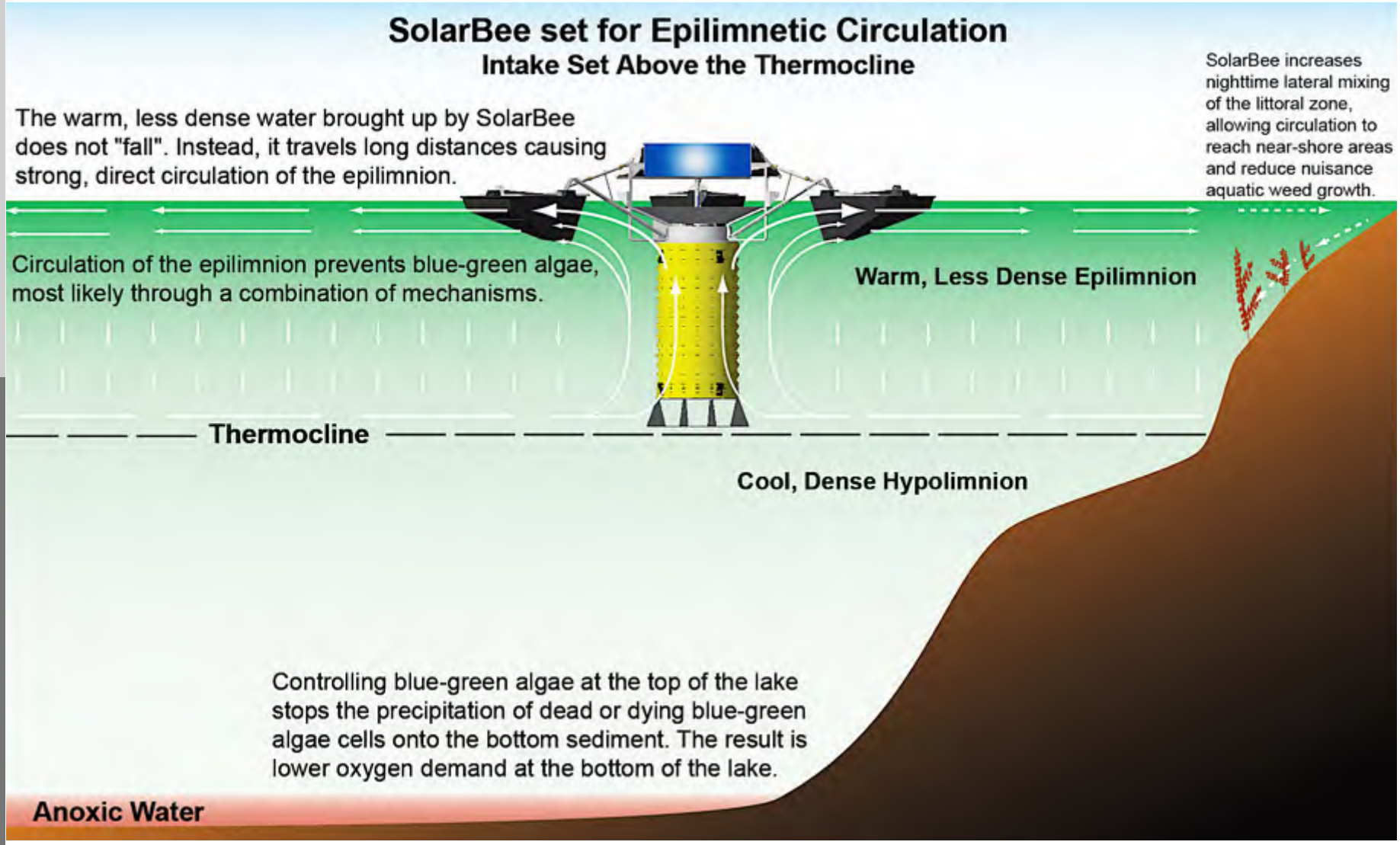


Thermal Stratification

Depth of thermocline is a function of lake surface area and exposure to wind.

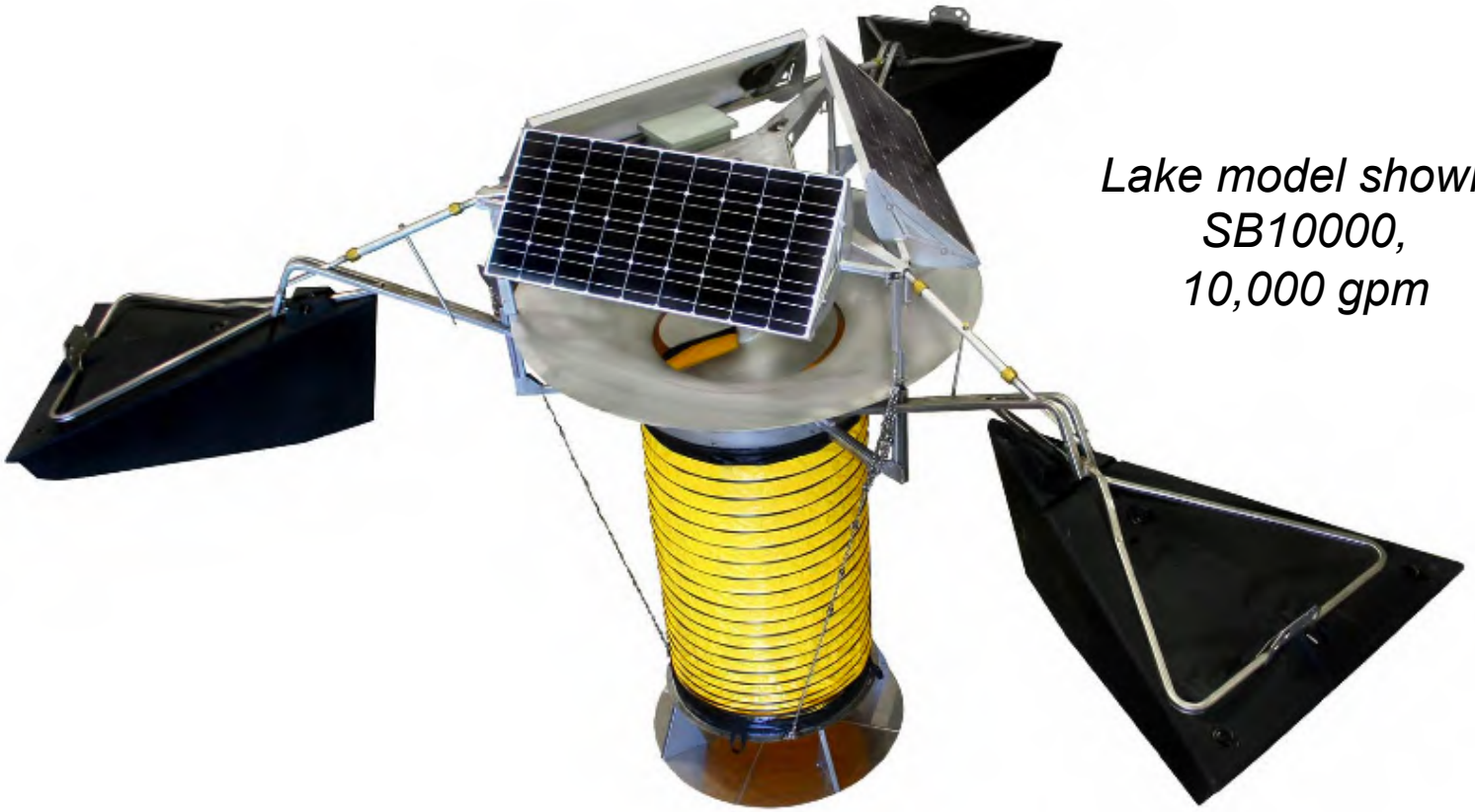


SB10000 set for Epilimnetic Circulation



SolarBee® Technology

SolarBee® is an updraft, low head, high volume axial pump, designed to circulate large volumes of water in reservoirs



Lake model shown:
SB10000,
10,000 gpm

SolarBee® Features

- Near-laminar, non-turbulent flow technology achieves high flow rates with minimal power
- Adjustable draft hose promoting horizontal, near-laminar flow to machine
- 316 stainless steel frame and distribution dish; US made
- SCADA capability
- Coverage up to 35 acres per circulator (~700 foot circle radius)
- Self-adjusting to varying water levels
- Solar-powered, day/night operation with battery, renewable energy machine

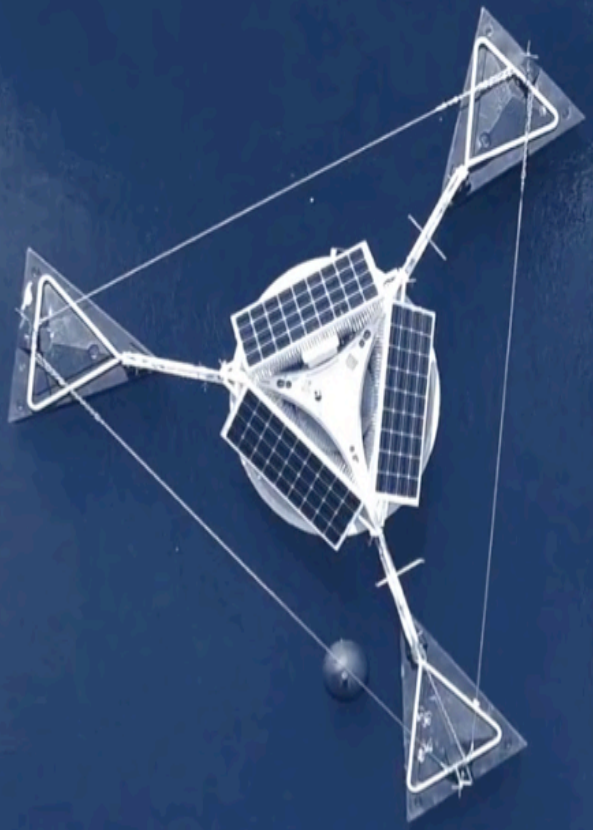
Distribution dish makes the near-laminar flow possible.

Brushless direct-drive motor (no gear box) provides low-power operation and a 25-year life expectancy

SolarBee®: As seen above water

Medora Corporation GridBee® SolarBee®

SolarBee®: As seen from the top.



Medora Corporation GridBee® SolarBee®

SolarBee® ~0.25 mile spacing

SolarBee® High Wave Machine

for lakes typically over 100 acres or heavy boat traffic.

Medora Corporation GridBee® SolarBee®

Medora Transport Corporation

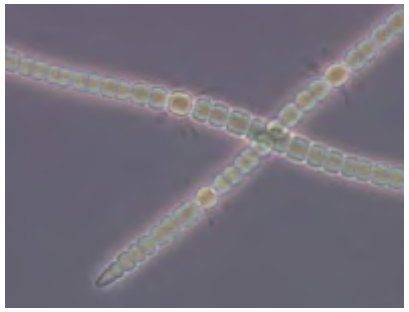
Delivery & Service Crews

Medora Corporation GridBee® SolarBee®

Long-Distance Circulation

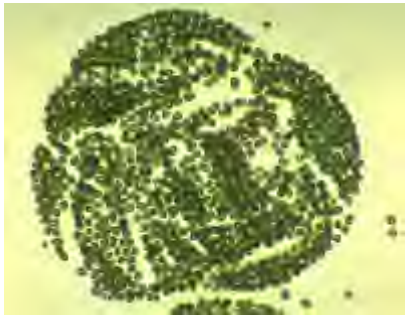
Effectively Controlled Blooms of the Following Species:

Anabaena sp.


Aphanizomenon sp.


Microcystis sp.




Case Study: Hamilton Reservoir, CO

Size: 500 acres x 65 ft deep

Main use: Power plant cooling, 300,000 gpm flow rate

Problem: Microcystis top to bottom, like green paint.

The high 9.5 pH caused scaling, lots of acid needed.

Solution: Installed 14 SolarBees in 2009.

Typical 6 ft clarity now, pH 8.7

Platte River Power, CO

Platte River Power, CO

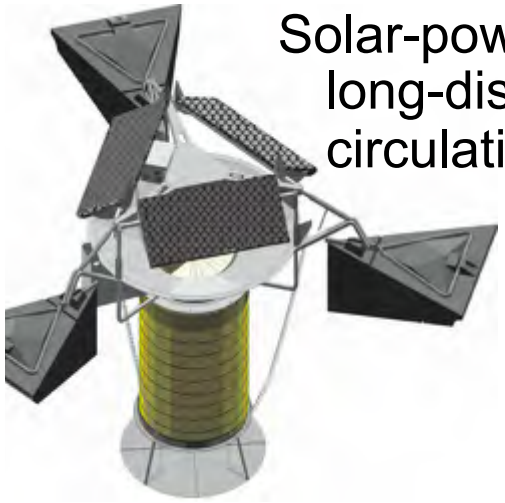
Fourteen (14) SolarBees® installed

July 2005 in 500 ac, maximum of 60 ft deep -- Hamilton Reservoir, a cooling lake that receives wastewater effluent from Ft Collins Muni WWTP

Problems for many years with blue-green algae and high pH

Results: replaced the 300hp diffuser system, clarity improved from 0’ to 9-10’, lowered pH, important to cooling tower operations.

Blue-green Algae Control

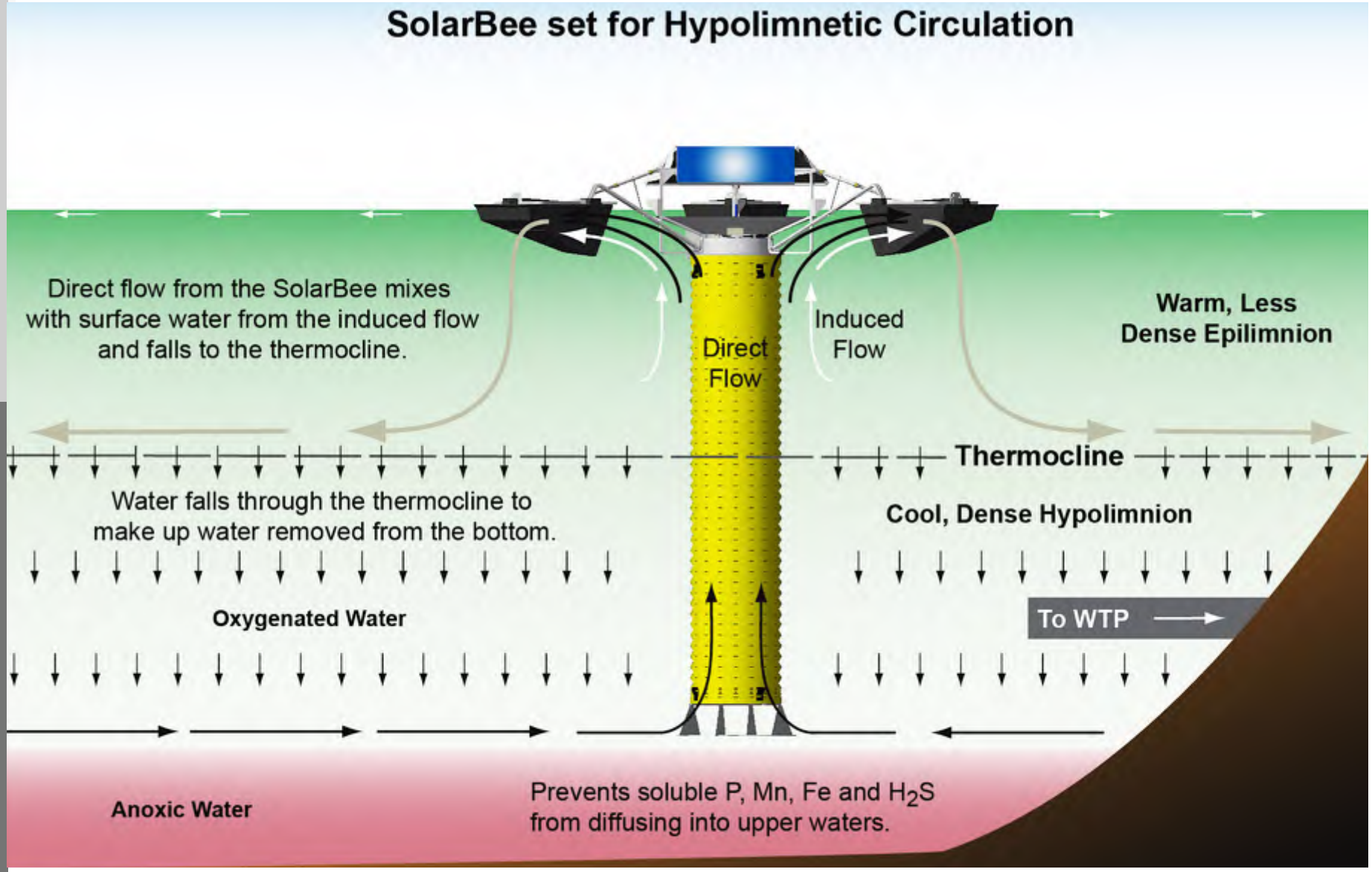


Solar-powered, long-distance circulation

Before

After

SB10000 for Hypolimnetic Circulation



Hypolimnetic Oxygenation
(Reduction of MN, Iron and H2S)

Salt Lake City, UT

Mountain Dell Reservoir

Medora Corporation GridBee® SolarBee®

Hypolimnetic Circulation:

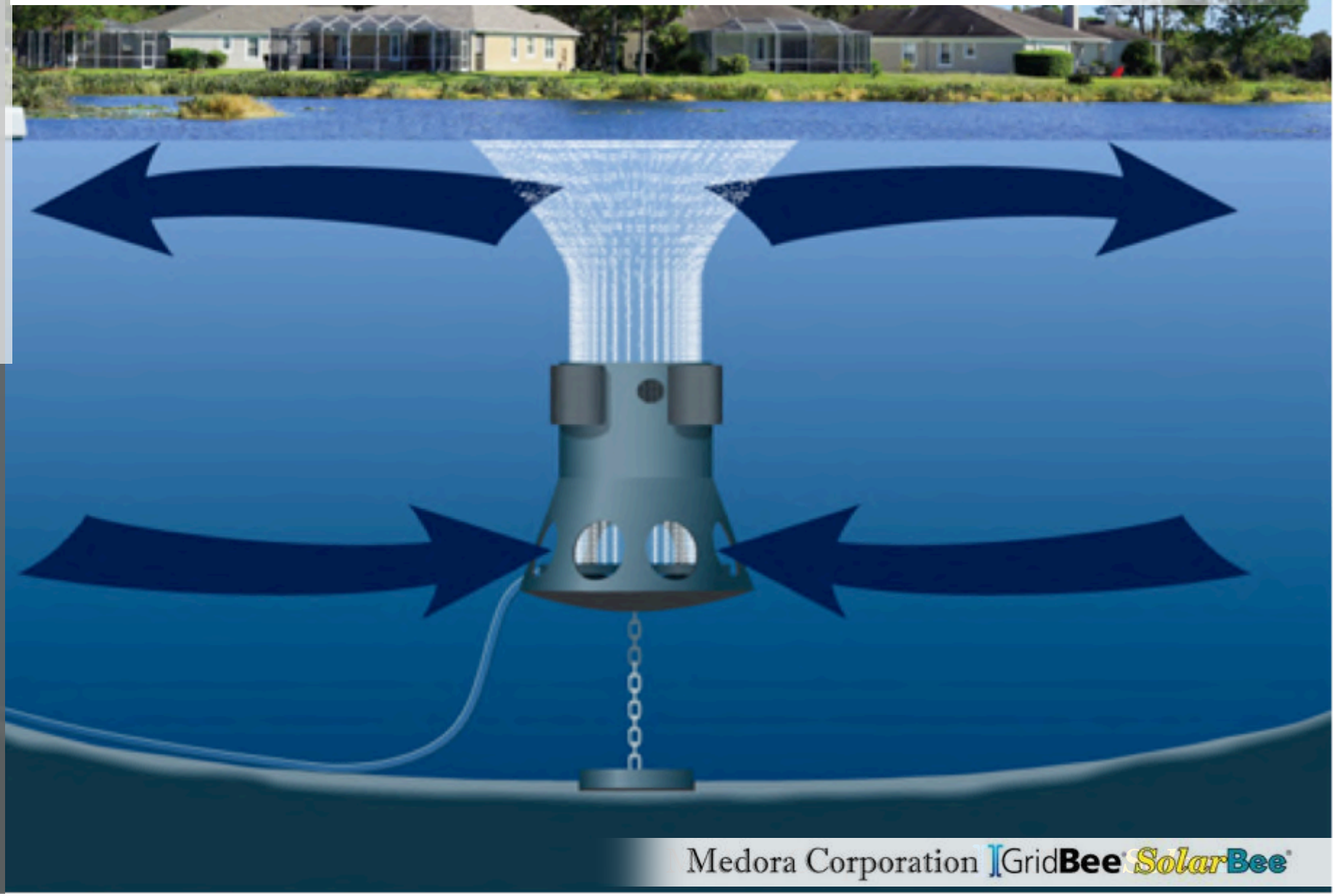
- Creates deep circulation down to depth of SolarBee intake hose
- SolarBee intake hose typically set about 2 ft below WTP intake gate
- Does not disturb anoxic, nutrient-rich hypolimnetic waters beneath depth of SolarBee intake hose
- Causes oxygen-rich epilimnetic water to move down the water column via hydraulic displacement

Hypolimnetic Circulation:

- Hypolimnetic turnover rates typically designed for 20-40 days
- Maintains sufficiently high oxidation-reduction potentials to prevent soluble Mn, Fe, P, H_2S, and methyl-Hg from diffusing into waters above SolarBee intake hose
- Reduces or eliminates temporary Mn spike at fall turnover
- Reduces potential for fish kills

AerationPlus AP1800 / AP2800

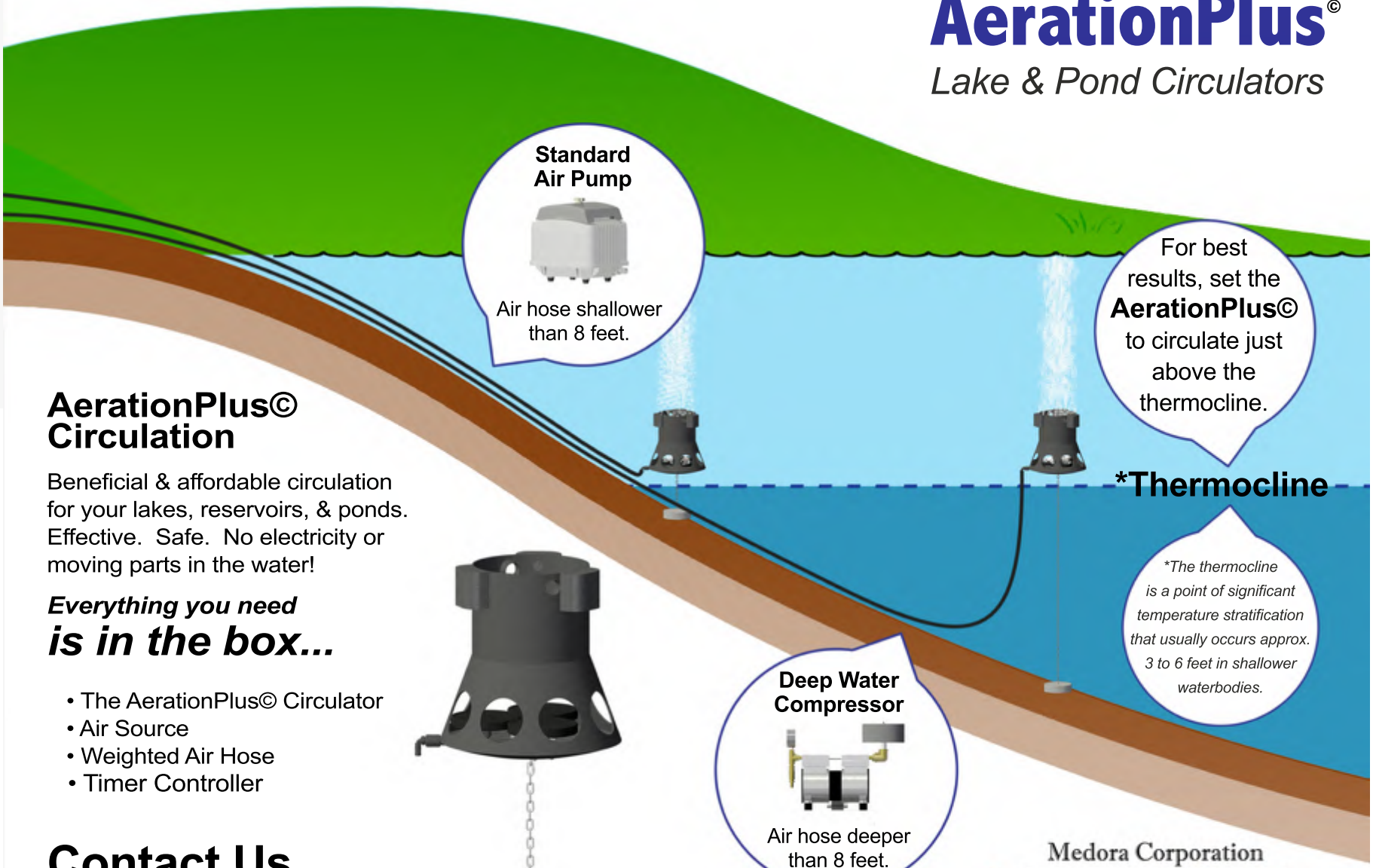
For Ponds, Small Lakes & Marinas



Aeration Plus AP1800 / AP2800 Circulation Systems

AerationPlus©

Lake & Pond Circulators



AerationPlus© Circulation

Beneficial & affordable circulation for your lakes, reservoirs, & ponds. Effective. Safe. No electricity or moving parts in the water!

Everything you need
is in the box...

- The AerationPlus© Circulator
- Air Source
- Weighted Air Hose
- Timer Controller

Contact Us

for more information!

Medora Corporation

GridBee SolarBee

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AerationPlus AP1800 / AP2800 Systems

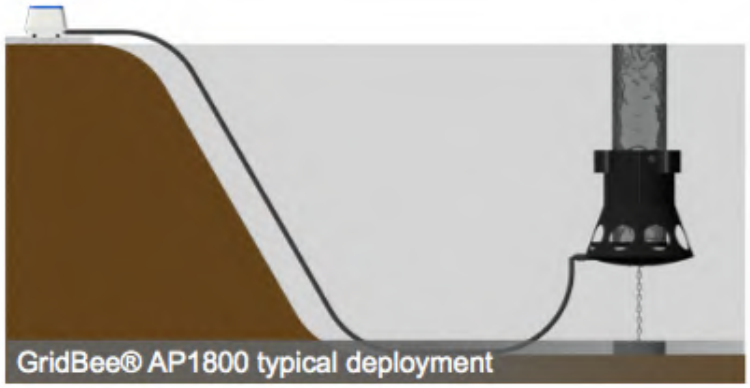
AP1800

Air Hose

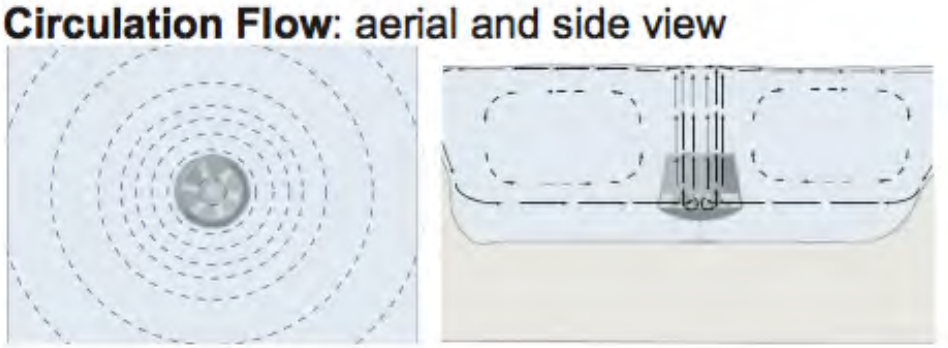
Air Unit

For Ponds, Small Lakes & Marinas AerationPlus air powered submersible circulation systems provide a cost effective solution for improving water quality, aesthetics, and biodiversity.

AP1800 / AP2800 Circulation Systems: Include air-powered circulator, air unit, air hose, timer, anchor and SS chain. The system is easy to install and maintain. The mixing unit is not visible from the surface, but the impact is visible.



GridBee® AP1800 typical deployment

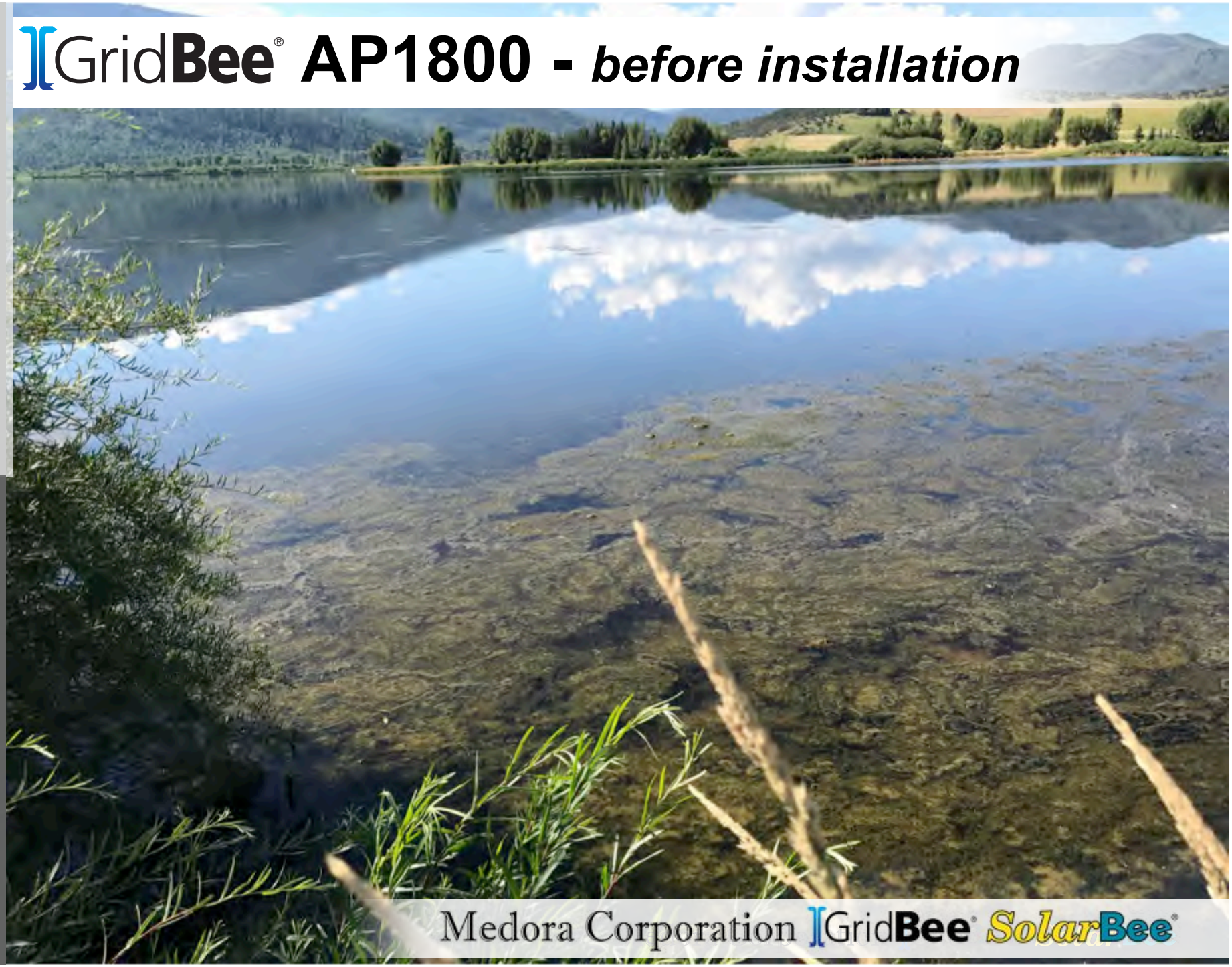


Medora Corporation GridBee® SolarBee®

AerationPlus
Air-Powered Mixers / Circulators

Medora Corporation GridBee® SolarBee®

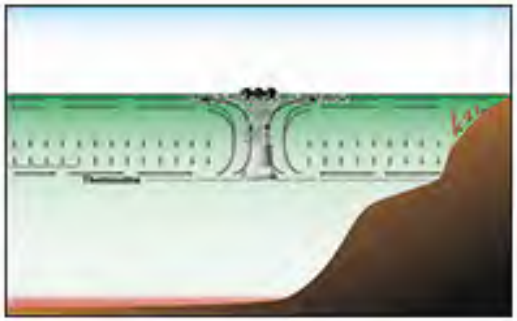
GridBee® AP1800 - *before installation*



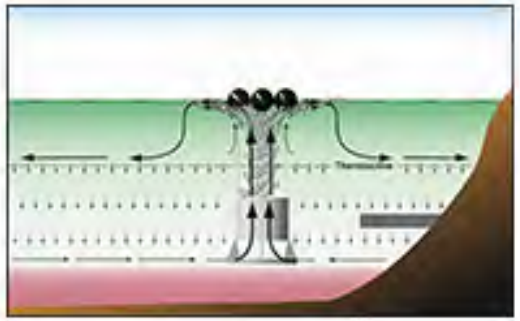
GridBee®

AP1800 – *2 weeks after installation*

GridBee® Air-Powered Mixers and Circulators



Epilimnetic Circulation for Algae Control In Lakes



Hypolimnetic Circulation for Iron and Manganese Control In Lakes

Lakes, Raw Water Reservoirs, and Estuaries

- Can be deployed for blue-green algae (BGA) control or hypolimnetic oxygenation
- Low-profile; easily disguised with artificial plants or rocks
- Small footprint (6 feet diameter or less) reduces boating interference
- No electricity in water for swimmers; safer for humans and pets
- Easy to mount on the end of docks
- Excellent for de-icing marinas

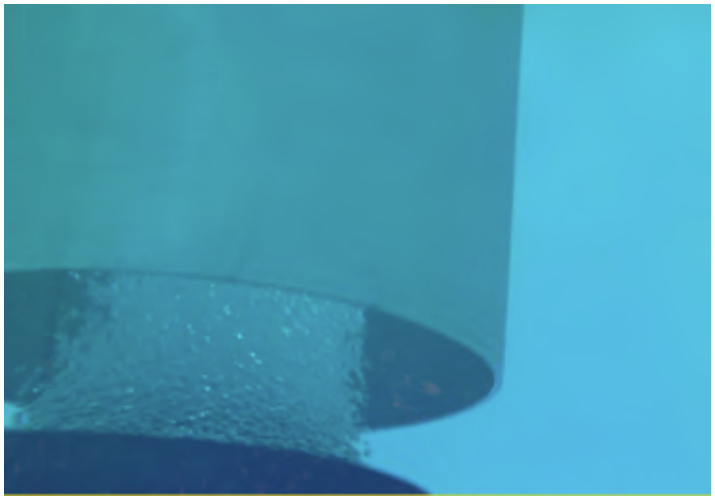
Stormwater

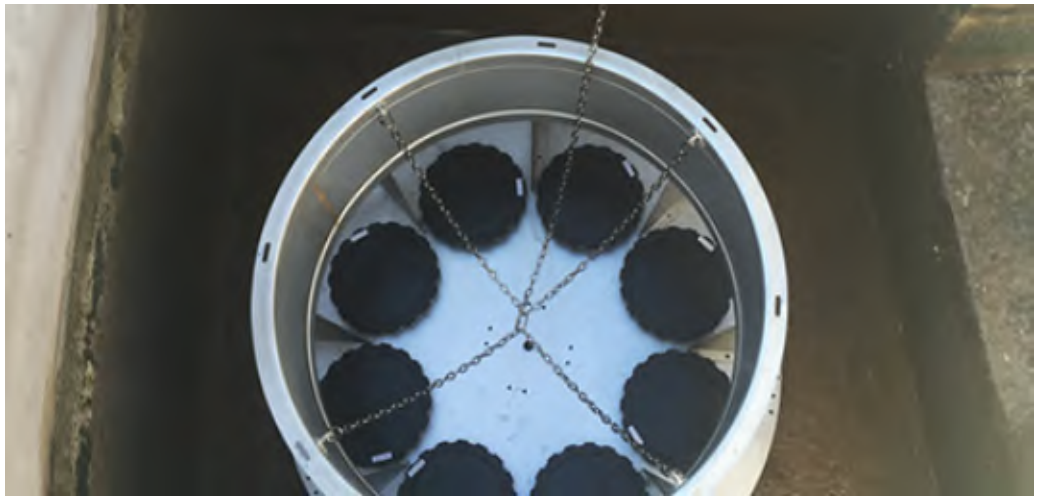
- Thorough mixing provides increased detention and improved nutrient reduction
- Effective control of blue-green algae and odors
- No electricity in the water; safer for humans and pets
- Low lifecycle cost when compared to fountains

GridBee® Air-Powered Mixers

Ask for our Budget Estimates

Videos and more information available at:
https://www.medoraco.com/video





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