Evaporation Enhancement with SolarBee®

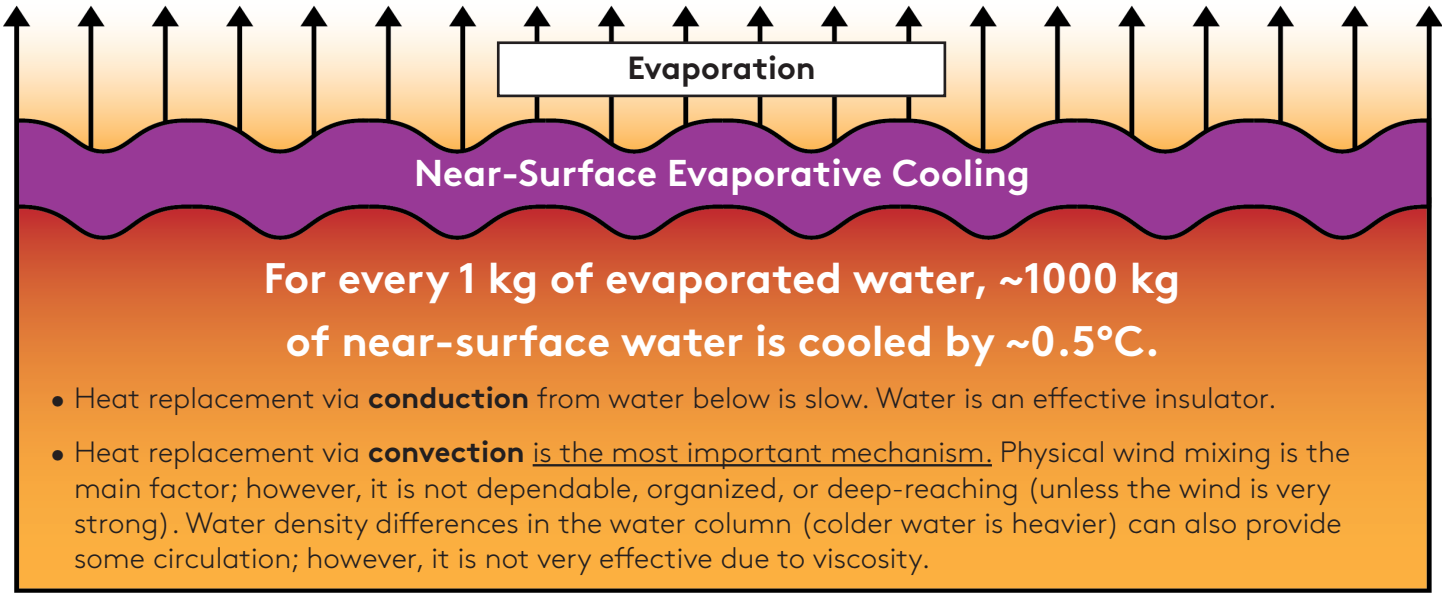
Evaporation is generally driven by heat inputs; however, the act of evaporation also works to actively cool the near-surface water at the same time. Replacing lost heat via natural mechanisms is not usually efficient or fast. Without adequate heat replacement to counteract evaporative cooling, overall evaporation slows down.

Heat Replacement

- Heat replacement via **radiation** during the day is slow. It takes a long time to heat up a pan of water in the sun.
- Heat replacement via **conduction** from air is slow. Air is an insulator and has a light mass.

Depending on time of day and season, there can be significant heat losses into the atmosphere through **radiation**, **conduction**, and **convection**.

Heat Loss



For every 1 kg of evaporated water, ~1000 kg of near-surface water is cooled by ~0.5°C.

- Heat replacement via **conduction** from water below is slow. Water is an effective insulator.
- Heat replacement via **convection** is the most important mechanism. Physical wind mixing is the main factor; however, it is not dependable, organized, or deep-reaching (unless the wind is very strong). Water density differences in the water column (colder water is heavier) can also provide some circulation; however, it is not very effective due to viscosity.

Common Factors With A Large Effect On Evaporation Rates

- The average energy level in the top few layers of surface water molecules.
- The rate of surface heat replacement following escape via evaporation.
- Surface film, debris, precipitated crystals, floating organic matter, dirt, and oils all reduce evaporative surface area at the top of the pond. Flocculation adds to the problem.
- The degree to which air above the pond surface is already saturated with humidity (this is generally not a large factor except in very humid climates).

Likely Mechanisms SolarBee®Mixing Can Increase Evaporation Rates

- SolarBee® mixing set shallow continually renews the surface with warm water that has a higher energy level than the near-surface water.
- Near-surface heat replacement occurs in an organized manner. SolarBee® utilizes near-laminar flow which also produces a large area of influence.
- Surface films and debris are continually washed away and surface tension is reduced. Water becomes visibly "looser" after a short period of time.
- SolarBee® mixing of both of water and algae may increase BTUs absorbed by the pond from the sun.

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