

The background of the slide is a close-up of the American flag, showing the stars and stripes. In the lower right quadrant, there is a faint, golden silhouette of a castle or fortification with two prominent towers.

*PRESENTATION
TO THE*

*UPPER MISSISSIPPI RIVER BASIN
ENVIRONMENTAL MANAGEMENT PROGRAM
WORKSHOP*

BY

JEFF MCCRERY

ENVIRONMENTAL ENGINEER

US ARMY CORPS OF ENGINEERS, ROCK ISLAND DISTRICT

AUGUST 18, 2005



**US Army Corps
of Engineers®**



Engineering Design Handbook

Aeration

One Team: Relevant, Ready, Responsive and Reliable



US Army Corps
of Engineers®

Agenda



- Resource Problem
- Aeration Techniques
- Aerators
- Gravity Flow Aeration
- Questions
- Lessons Learned

One Team: Relevant, Ready, Responsive and Reliable



US Army Corps
of Engineers®

Resource Problem



- Water can hold limited oxygen
- Oxygen is one of the most significant water parameters.
- Oxygen depletion reduces the quantity and quality of aquatic habitat.



US Army Corps
of Engineers®

Oxygen Depletion Causes



- Hot cloudy still weather (summer)
- Sudden death of phytoplankton or algae bloom
- Pond stratification or turnover
- Organic waste decomposition



US Army Corps
of Engineers®

Environmental Impacts



- Oxygen is vital to all metabolic processes of aquatic life.
- Adverse effects-
 - Temperature
 - Sediment resuspension
 - Physical hazards to humans



US Army Corps
of Engineers®

Aeration Techniques



- Destratification (whole lake aeration)
- Aeration of anoxic lower stratum (hypolimnetic aeration)
- Supplemental stream aeration



US Army Corps
of Engineers®

Destratification



- **Techniques**
 - Air Lift circulation
 - Pumping
- **Treatment of winterkill**
 - Before ice formation
 - Following ice formation
- **Diffused air mixing**

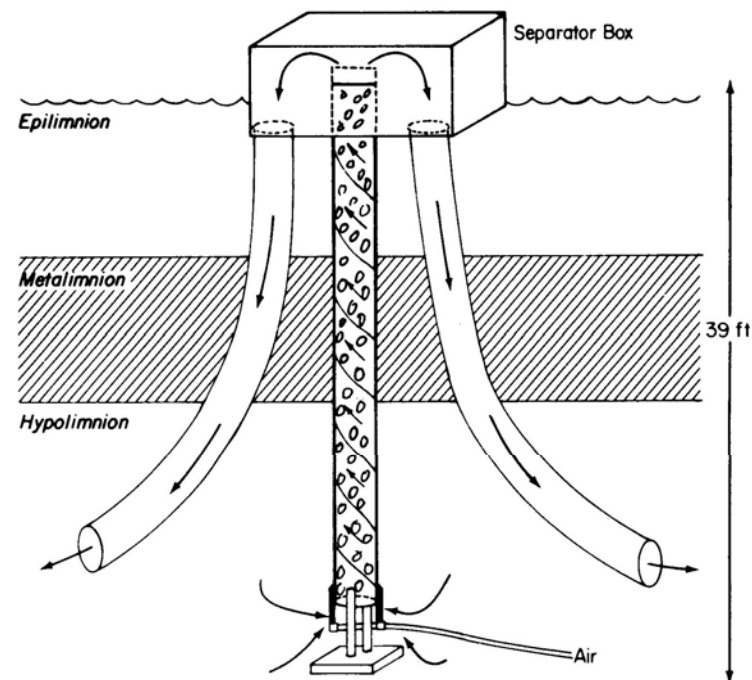


US Army Corps
of Engineers®

Hypolimnetic Aeration



- Adds dissolved air and oxygen to hypolimnion of water body without disturbing the thermal stratification
- Air injection systems



On

reliable



US Army Corps
of Engineers®

Supplemental In-stream Aeration



- Addition of air to a flowing stream
- Mechanical aerators
- Diffuser aerators

One Team: Relevant, Ready, Responsive and Reliable



US Army Corps
of Engineers®

Aerators



- Surface spray or vertical pump aerators
- Pump sprayer aerators
- Fountain type aerators
- Paddlewheel aerators
- Diffuser aerators
- Wind powered aerators



US Army Corps
of Engineers®



Aerators



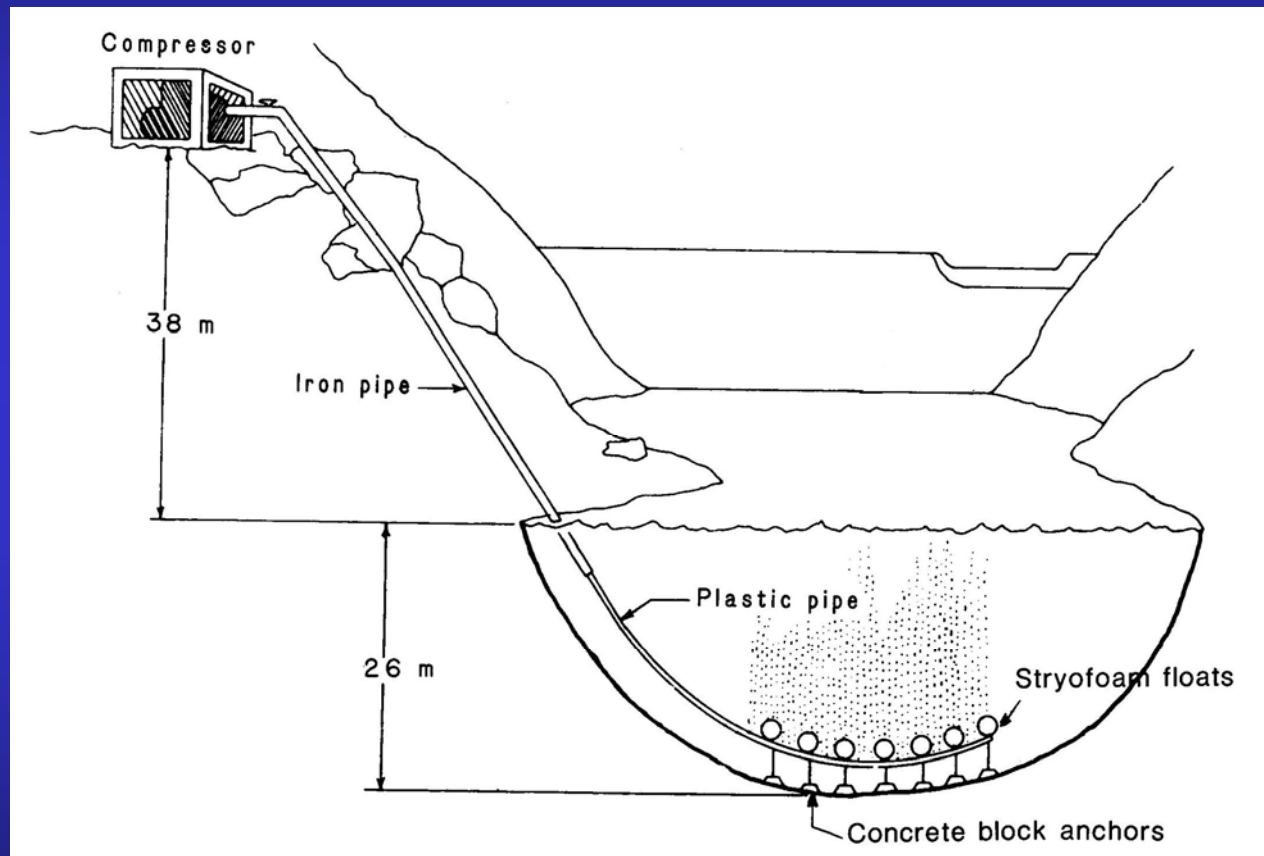
Fountain aerator

— One Team: Relevant, Ready, Responsive and Reliable —



US Army Corps
of Engineers®

Aerators



Diffuser aerator design

— One Team: Relevant, Ready, Responsive and Reliable —



US Army Corps
of Engineers®

Gravity Flow Aeration



- Provide aeration to downstream water bodies.
- Regulated control structure.
- May cause sediment problems.



US Army Corps
of Engineers®

Questions



- Who has used/is using aeration methods.
- What are some aeration techniques used by other Districts or agencies?
- Successful?

- Lessons Learned?



US Army Corps
of Engineers®

Lessons Learned



- **Blackhawk Park (St. Paul District)**
 - Sediment deposition
 - Debris and ice blockage

- **Finger Lakes (St. Paul District)**
 - Proper capacity of water control structure

- **Spring Lake (Rock Island District)**
 - Levee breach

One Team: Relevant, Ready, Responsive and Reliable