

# Water Conservation at the Minnesota Zoo

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**UNIVERSITY OF MINNESOTA**  
**Driven to Discover<sup>SM</sup>**

# Company Background

- 41-year old Association of Zoos and Aquariums accredited zoo in Apple Valley, MN
- 290+ employees, 1000 volunteers, 4990 animals
- Mission Statement: To connect people, animals and the natural world to save wildlife



MINNESOTA ZOO



# Project Overview

- **2017 total water usage: 72,000,000 gallons**
- **Minnesota Zoo Sustainability Plan**
  - Reduce water usage by 15% by 2025
  - 10,800,000 gallons of water



MN Zoo Gibbons, Tia and Bailey

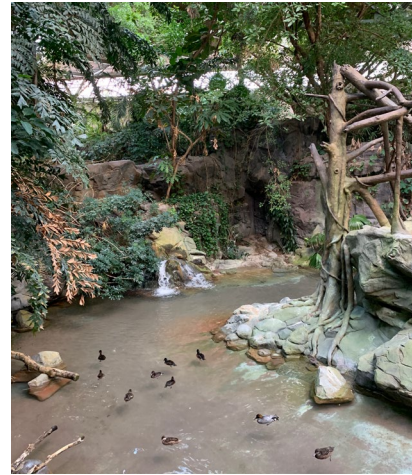
# Approach

- Find areas of unique water usage
- Investigate these areas
- Determine route of best action
- Conclude and present to company

# Recommendations

## Gibbon Pond: Investigation

- 48,000 gallon duck pond
  - Water change 1x/week
  - 10 GPM constant overflow
- Annual water usage: 8,000,000 gallons
  - 11% of water usage zoo wide
- No circulation



Gibbon Pond

# Recommendations

## Gibbon Pond: Investigation

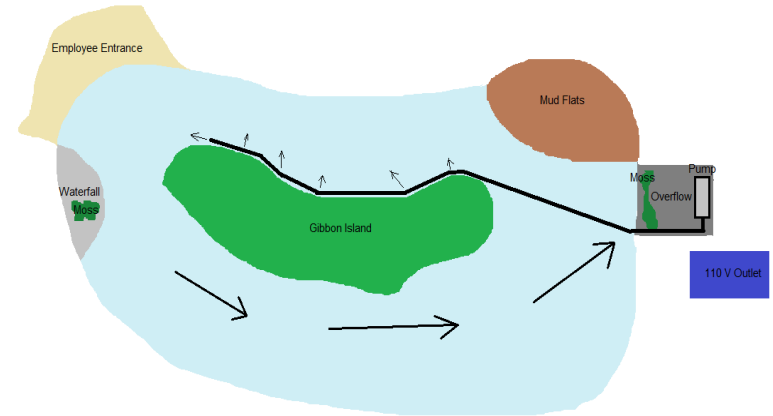
### Water Quality Data from Gibbon Pond

Water Parameter	Average Value 1 day after Refill	Average Value 6 days after Refill
Ammonia	0.25 ppm	0.25 ppm
Nitrites	0 ppm	0 ppm
Nitrates	2.5 ppm	5 ppm
Turbidity	3 NTU	1.2 NTU

# Recommendations

## Gibbon Pond: Circulation

- **Introduce circulation**
  - Pipeline with jet fittings
  - Completed by painters and plumbers
- **Circulation benefits**
  - Reduces bad smell
  - Accelerates breakdown of organic matter
  - Creates more contact opportunities for possible filtration



# Recommendations

## Gibbon Pond: ProMoss Water Filtration

- Implement filtration system
- **ProMoss Filtration System**
  - Used in spas and pools
  - Reduces turbidity and nutrients
- **Sand Media Filters and Ozone**
  - Used in other zoo exhibits
  - Completely cleanses water



ProMoss Filtration Device



# Recommendations

## Gibbon Pond: Filtration Systems Comparison

Comparison	ProMoss + Circulation	Sand Filter & Ozone
Capital Cost	\$4,000	TBD
Annual Water Savings	1,300,000 Gallons	7,000,000 Gallons
Annual Savings	\$3,000	\$50,000
Payback	1.2 Years	TBD

# Recommendations

## Gibbon Pond: Future Goals

- **Recommendation Goal**
  - Reduce dump and fill frequency in half
  - Improve water quality for animals
  - Save employee labor time
- **Annual Savings**
  - Water: 1,300,000 gallons
  - Labor: 24 Hours
  - Cost: \$3,000

# Solution Summary

Recommendation	Annual reduction	Total cost	Annual savings	Payback period	Status
Implement partial filtration system to Gibbon Pond	1,300,000 gallons of water	\$4,000	\$4,000	1 Yr.	In Progress
Install geo-exchange cooling loop	950,000 gallons of water	\$14,000	\$4,800	2.9 Yrs.	Recommended
Install auto-fill systems to dump and fill pools	190,000 gallons of water	\$2,400	\$3,000	10 mo.	In Progress
Install motion sensors to Northern Trail showers	100,000 gallons of water	\$2,200	\$600	3.6 Yrs.	Recommended
Reduce backwash frequency on Grizzly Bear sand filters: Screen Filter	1,600,000 gallons of water	\$200,000	\$10,000	20 Yrs.	Recommended
Reduce backwash frequency: Media Change	1,600,000 gallons of water	\$10,000	\$10,000	1 Yr.	Recommended

# Personal Statement

- **Learned project management**
  - Plan project approach
  - Gather data
  - Compile into recommendation involving cost analysis
- **Importance of communication**
- **Independent working**
  - Choosing what route to take
  - Finding information