Lake Projects – The Engineer's Perspective

Wisconsin Lakes Convention

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Montgomery Associates
Resource Solutions, LLC

In this business, it's not the water, it's the people.

Social Perspective

- Lakes (and all water resources) are a unique project canvas
- Historical value
  - Power
  - Commerce
  - Transit
  - Commodity

Social Perspective

- Present Day Value
  - Commerce
  - Recreation
  - Commodity
  - Property
  - Therapy

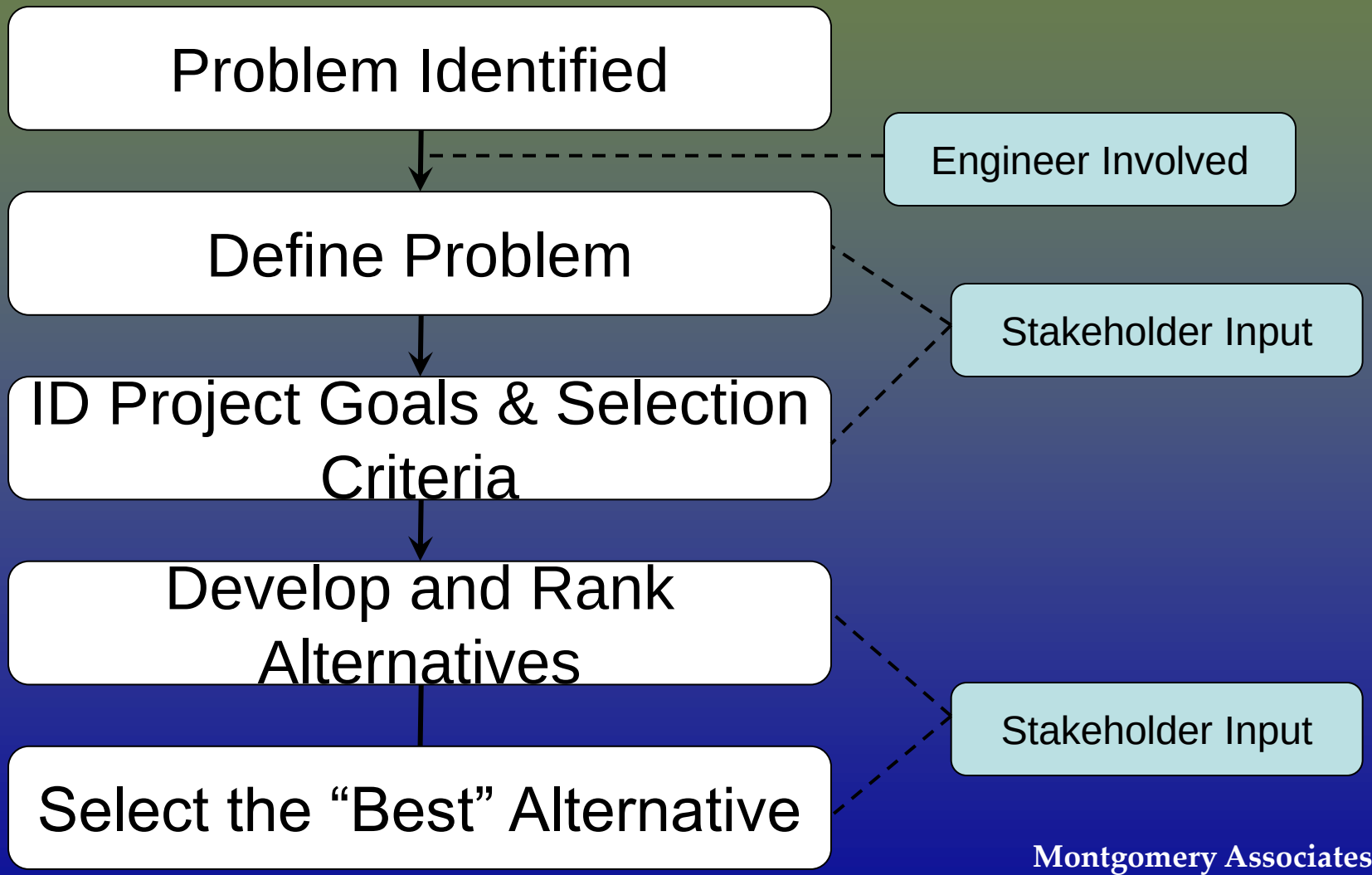
- Centerpiece to a Community
  - Fosters widespread “ownership”

The Engineer's Mindset

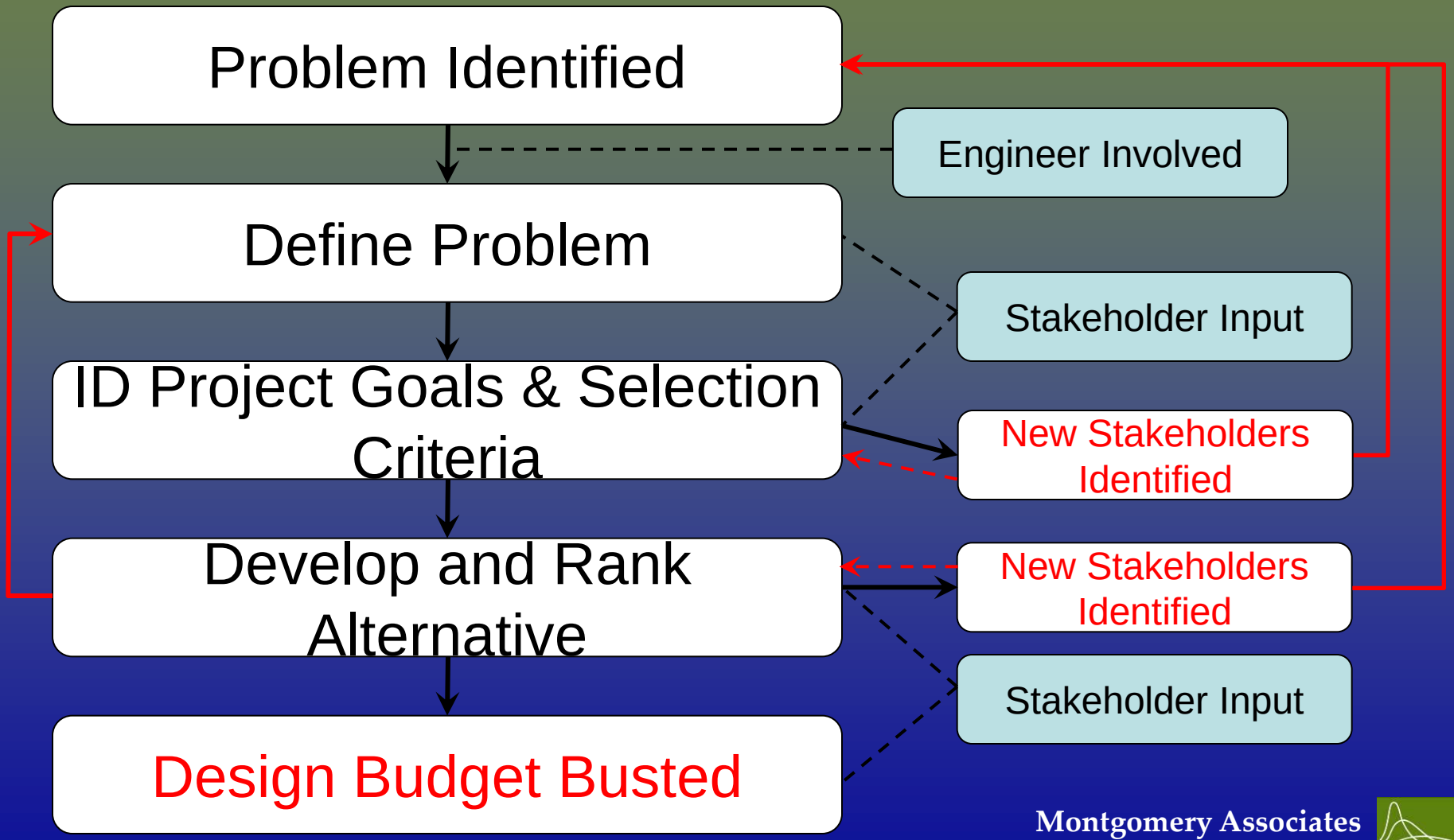
- Engineers are (usually) logical.
- Engineers are goal oriented.
- Engineers are trained to evaluate options against goals.
- Criteria need to be established to define if goals are achieved.

Engineering design *is the process of devising a system, component, or process to meet desired needs. It is a decision-making process (often iterative), in which the basic science and mathematics and engineering sciences are applied to convert resources optimally to meet a stated objective.* (Accreditation Board for Engineering Technology)

“Classic” Engineering Project

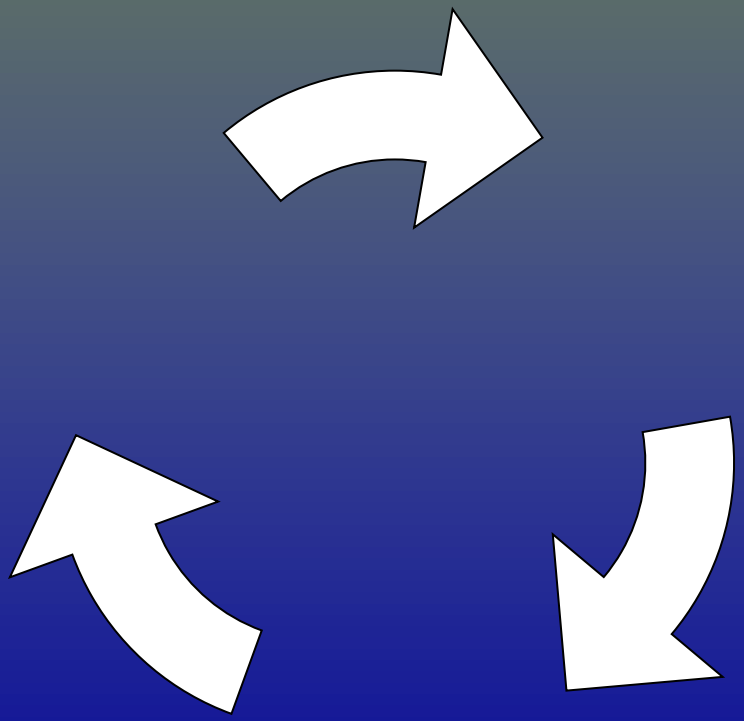


Lake Engineering Project



Complications

- Definition of the “problem”
  - Living System + People = An Evolving Problem
  - Anecdotal vs. Scientific



Complications

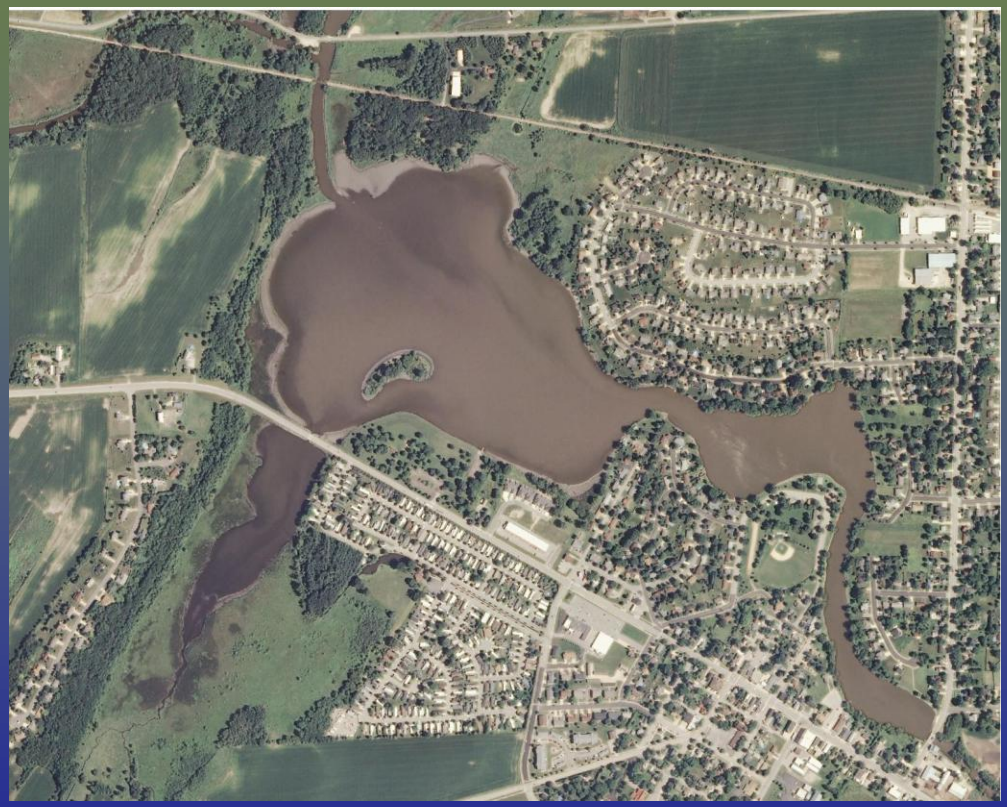
- Project Goals & Selection Criteria
  - Living System + People = Evolving Goals
  - Evolving Goals are NOT the Classic Design Problem
  - "Once in a Lifetime" Project
  - Different Stakeholders have Different Goals
  - Unrealistic Definitions of Success
  - Limited Capabilities
  - Project Fatigue

Complications

- Alternative Development
  - Public Perception of Alternative Development
  - Pre-Determined "Solutions"
  - Narrow Scope Definition
  - Mistaking Alternative Development with Final Design
- Alternative Selection
  - You can please some of the people…
  - Definition of Success

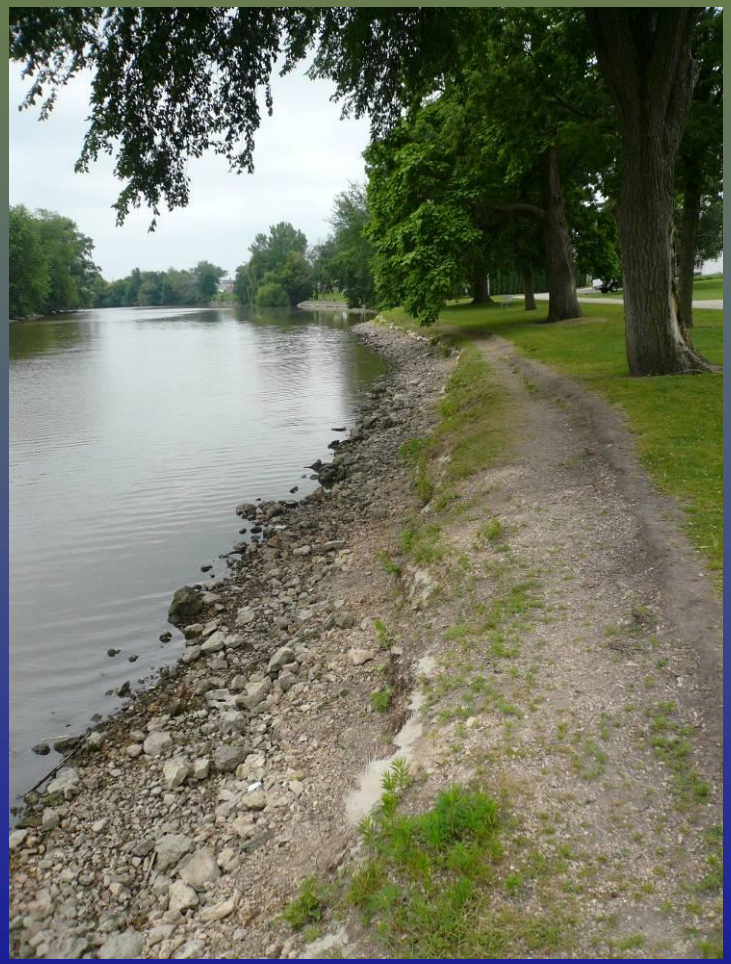
Case Study #1

- Millpond
  - Shallow
  - Poor Water Quality
  - Poor Fishery
  - Minimal Project History/Public Involvement
  - Limited Financial Resources



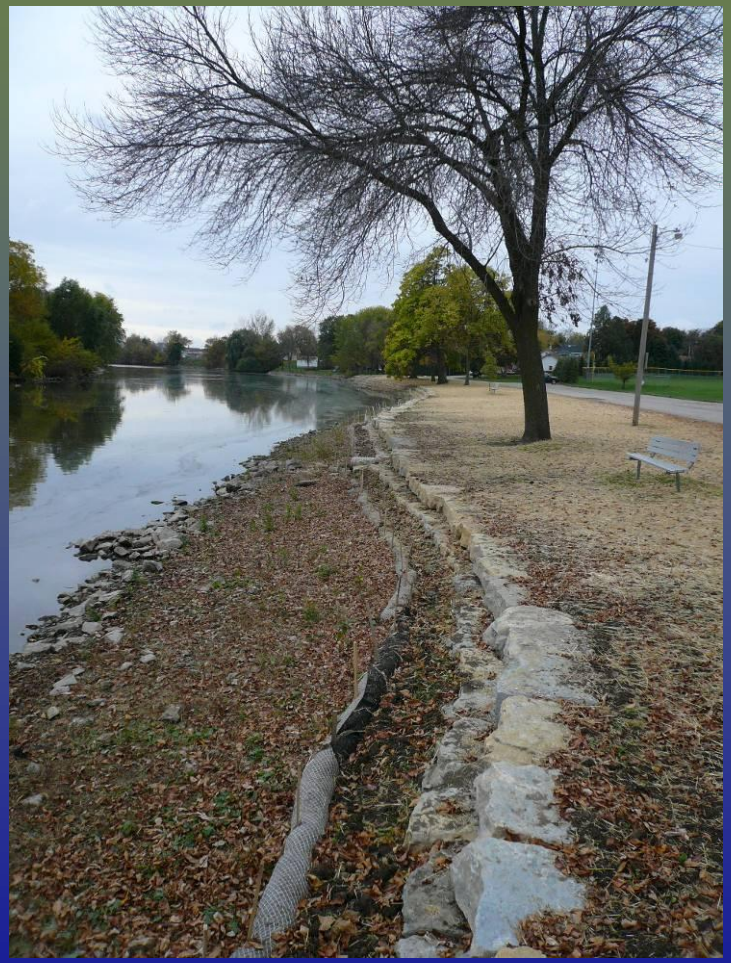
Case Study #1

- Project 1 – Bank Stabilization in Park
  - Problem
    - Bank Erosion
  - Multiple Stakeholders
  - Goals
    - Reduce Erosion
    - Shoreline Restoration
    - Accessibility
    - Aesthetics



Case Study #1

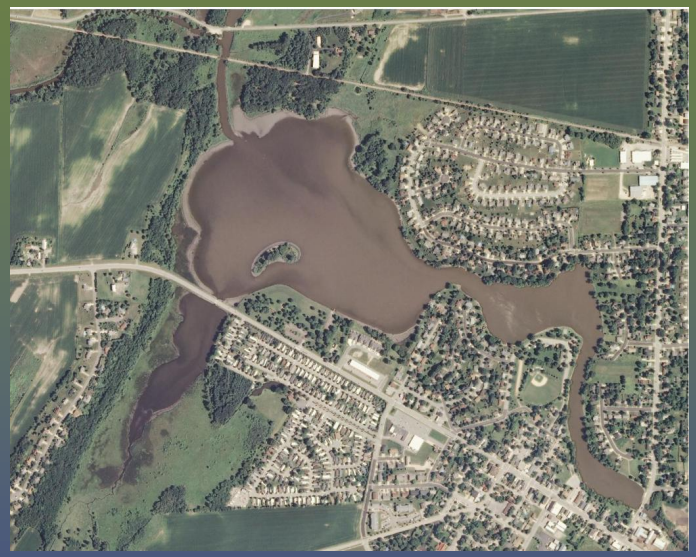
- Project 1 – Bank Stabilization in Park
  - Alternatives
    - Do Nothing
    - Natural Look
    - Structural Measures
  - Selected Alternative
    - Hybrid - Structural Measures and Vegetated Strip at Waterline

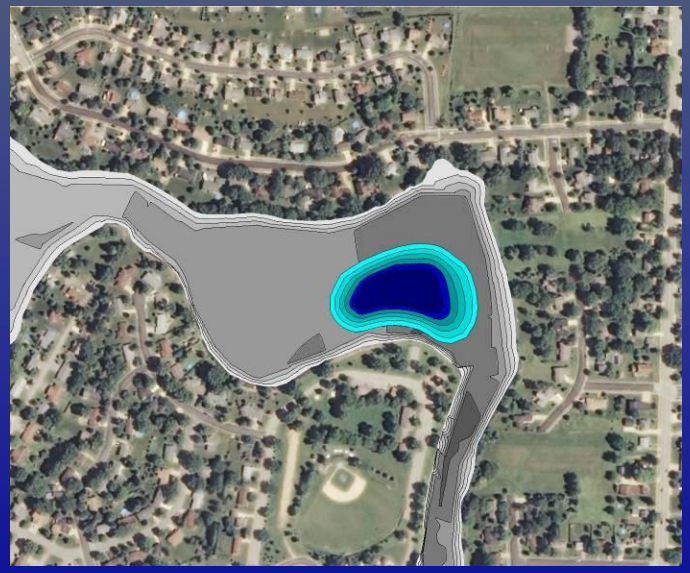


Case Study #1

- Project 1 – Bank Stabilization in Park
  - Success?

Case Study #1





- Project 2 – Targeted Dredging and Rough Fish Removal
  - Problem
    - Degraded Resource
  - Goals
    - Gain Experience
    - Integrate with Future Phases

Case Study #1

- Project 2 – Dredging and Rough Fish Removal
  - Alternatives
    - Large Scale Dredging
    - Targeted Dredging
    - Community Sponsored Events for Carp Removal
    - Commercial Harvesting
  - Selected Alternative
    - Targeted Dredging
    - Commercial Harvesting

Case Study #1

- Project 2 – Dredging and Rough Fish Removal
  - Success?

Case Study #2

- Millpond
  - Shallow
  - Poor Water Quality
  - Poor Fishery
  - Long Project History
  - Significant Resources/Community Involvement

Case Study #2

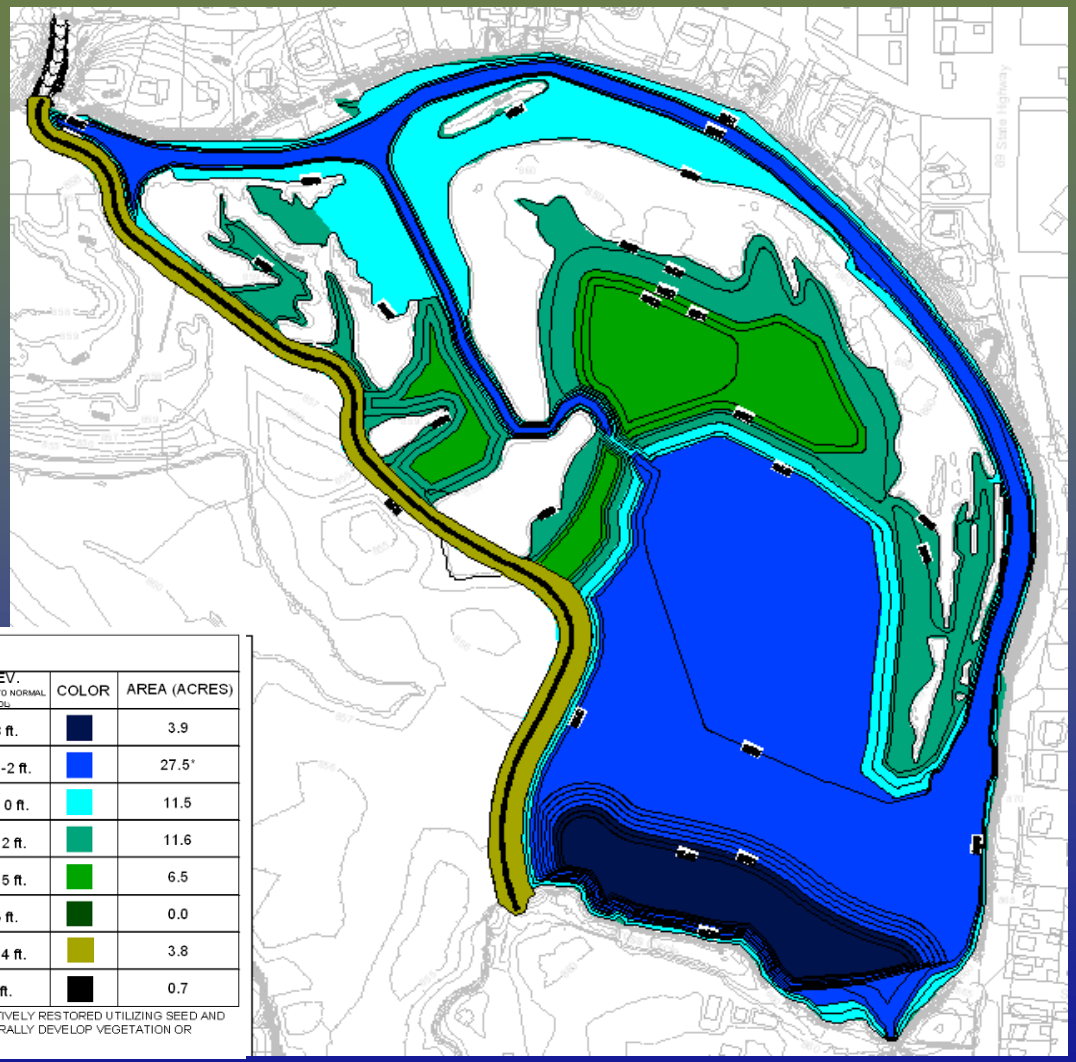
- Project – Lake Restoration
  - Problem
    - Degraded Resource
  - Multiple Stakeholders
  - Goals
    - Restore the Public Asset
    - Improve Fishery
    - Sustainable
    - Maintain Views
    - Maintain/Improve Specific Area of the Lake
    - Project Cost Must Respect Funding Reality

Case Study #2

- Project – Lake Restoration
  - Alternatives
    - Do Nothing
    - Varying Levels of Dredging
    - River Separation (Two Options)
    - Dam Removal
  - Selected Alternative
    - River Separation, Dredging, In-Lake Habitat Creation

Case Study #2

- Project – Lake Restoration
  - Success?



HABITAT ZONES			
	ELEV. (RELATIVE TO NORMAL POOL)	COLOR	AREA (ACRES)
DEEP WATER	>-8 ft.		3.9
SUBMERGENT AND FLOATING LEAF AQUATIC BEDS	-8 to -2 ft.		27.5*
EMERGENT AQUATIC BEDS	-2 to 0 ft.		11.5
WET MEADOW/FLOODPLAIN FOREST	0 to 2 ft.		11.6
WET-MESIC PRAIRIE/FLOODPLAIN FOREST	2 to 5 ft.		6.5
MESIC PRAIRIE/FOREST	> 5 ft.		0.0
NO-MOW FESCUE (BERM)	0 to 4 ft.		3.8
BIKE PATH SURFACE	4 ft.		0.7

*APPROXIMATELY 14 ACRES OF THE SUBMERGENT ZONE WILL BE ACTIVELY RESTORED UTILIZING SEED AND PLANTS. THE REMAINDER OF THIS ZONE WILL BE MANAGED TO NATURALLY DEVELOP VEGETATION OR PROVIDE OTHER HABITAT TYPES.

Lessons Learned

- An engineer's training focuses on accomplishing an objective – testing multiple solutions to develop an approach or design
- Most resist specified-in-advance solutions

Lessons Learned

- Assemble your full team early in the process
- Clearly communicate your goals, not just the expected approach
- Prepare the Project Team for Evolving Goals
- Prompt for ideas!
- Be prepared to consider other solutions to the problem (and again, and again…)

Lessons Learned

- Interaction and brainstorming is important
- You and your consultant may both need to step out of your comfort zones to solve the problem

Parting Thought

"Papa, Phia has more water than I do… And her side is warmer." – Ava - My 4-yr old

We're all in the same bathtub.