

Design of a Sediment Mitigation System

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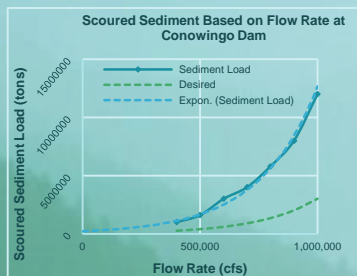
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Context

- Asymptotic deposition of sediments
- Expected capacity reached by 2030



- Sediment scour exponential increases as flow rate increases
- Max Recorded Flow Rates:
- (1972) Hurricane Agnes: 1,120,000 cfs
 - (2011) Tropical Storm Lee: 709,000 cfs

Stakeholder Tension: Sediment needs to be managed. Dam owners do not want to take responsibility. Relicensing may result in payment for system.

Need & Alternatives

Need to create a system to reduce the environmental impact of scouring events while facilitating current ecological regulations.

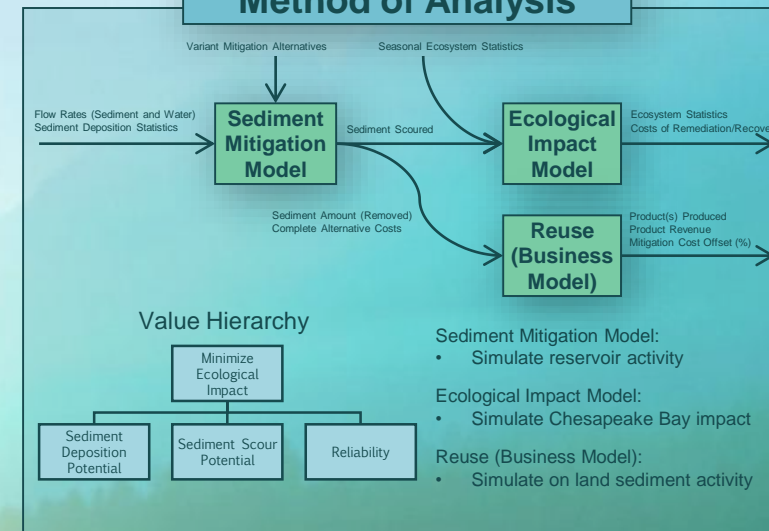
Alternatives

- No mitigation techniques
 - No action will be taken and reservoir will continue to reach capacity
- Hydraulic Dredging
 - Mechanical removal of sediment via pipeline deposited on land
 - Possible treatment: Rotary kiln, low-temperature washing, plasma arc vitrification
- Dredging & Artificial Island
 - Island made using dredged sediment
 - Flow velocity increases, which decreases Rouse number

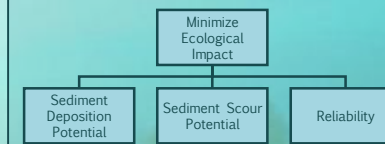
Rouse Number (particle fall velocity divided by bed shear stress) for Medium Silt Particle at 30,000 cfs



Method of Analysis



Value Hierarchy



- Sediment Mitigation Model:
- Simulate reservoir activity
- Ecological Impact Model:
- Simulate Chesapeake Bay impact
- Reuse (Business Model):
- Simulate on land sediment activity

Results

- State-space showing location of alternatives
- Utility vs. cost chart
- Sensitivity analysis

Recommendation

- Describe the implications of these results
- Link back to the context and need statement
- Show how this solution closes the gap
- Show how it creates a win-win