USACE THIN LAYER PLACEMENT GUIDANCE

Overview and Planning Considerations

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Prepared for WEDA Virtual Dredging Summit 2021

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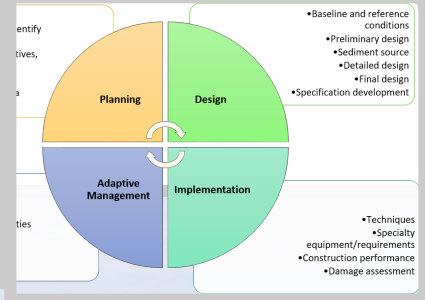
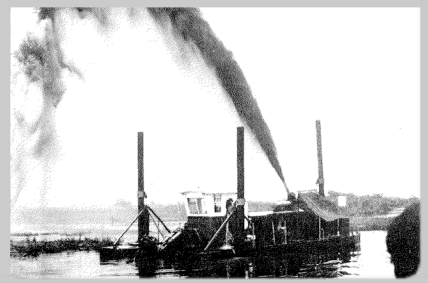
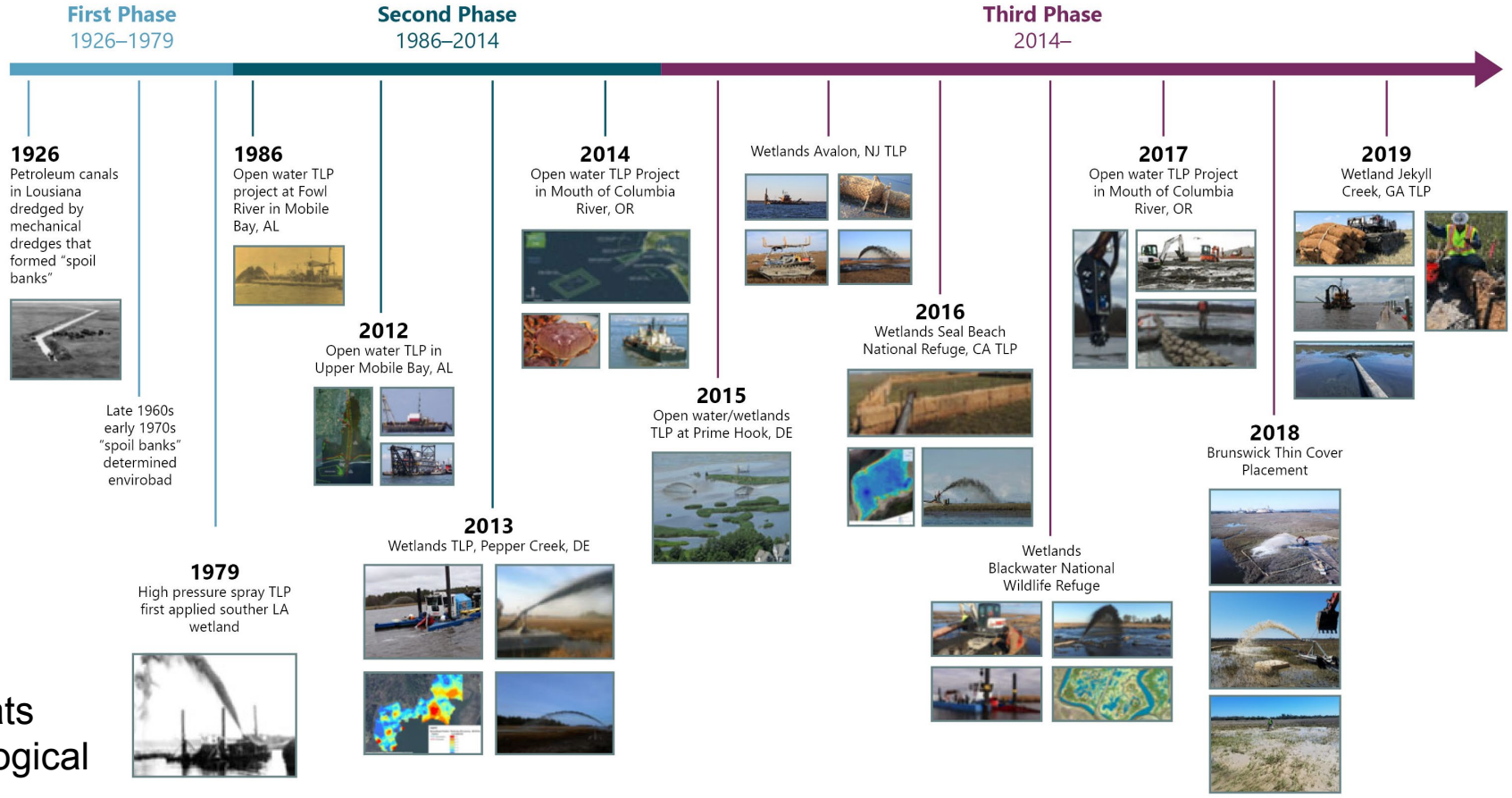




Thin layer placement: definitions and history

TLP is "***purposeful*** *placement of thin layers of sediment (e.g., dredged material) in an* ***environmentally acceptable*** *manner to achieve a* ***target elevation*** *or* ***thickness***"



Applications

- Open water
- Wetlands
- Capping

Goals

- Support infrastructure
- Create habitats
- Restore ecological function
- Promote resilience to sea level rise

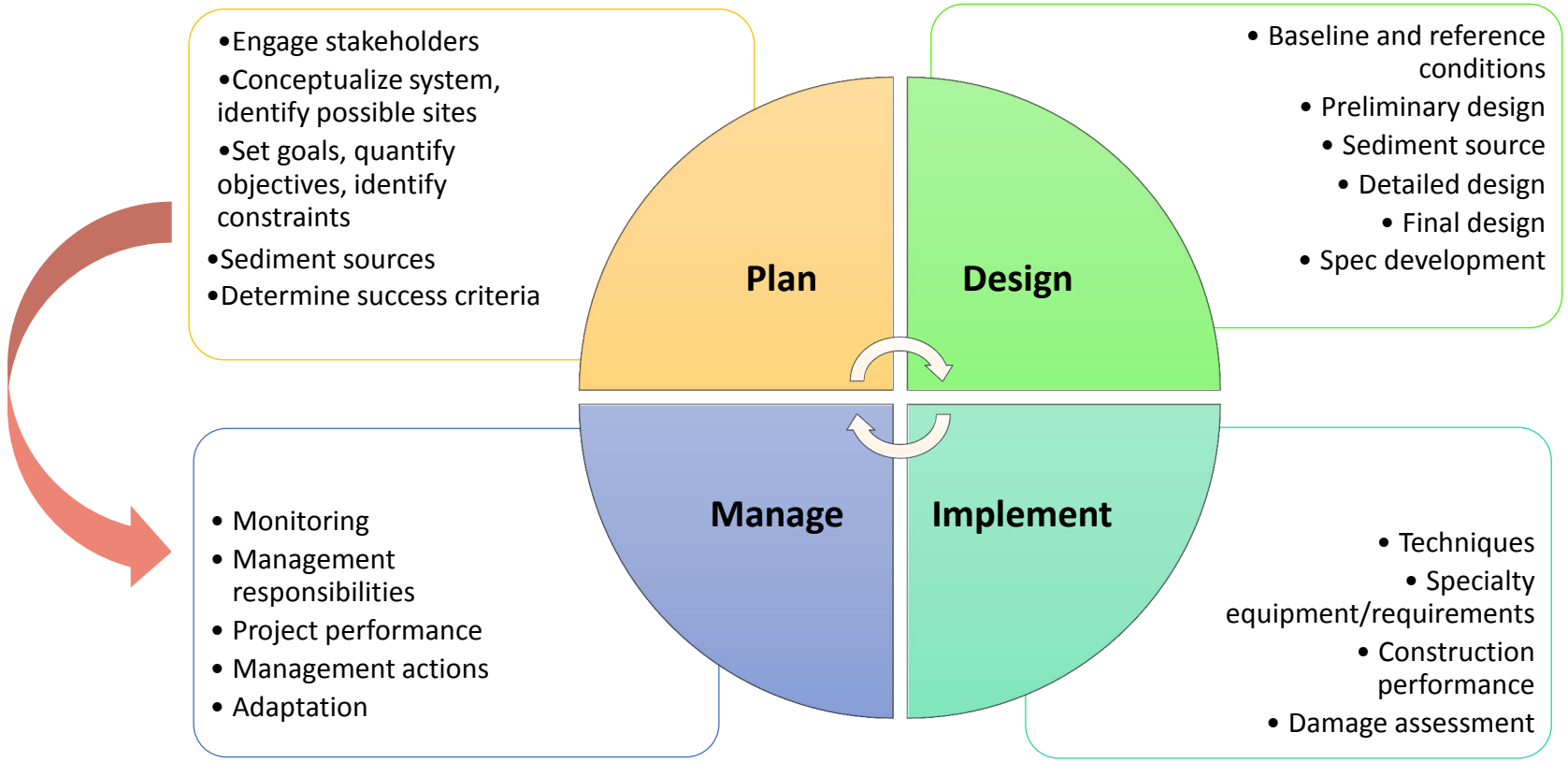
State-of-practice and a need for guidance

- Recent interest in TLP as an adaptation technique for coastal ecosystems
- Mostly viewed as “pilot projects”
- Cited need for more formal guidance

- 2018 TLP Practitioner Workshop
  - EA Engineering, Science, and Technology Inc. Hunt Valley MD
  - Federal employees, NGOs, consultants, dredging contractors
- Workshop outcomes, scientific literature, project reports, and personal communications combined into TLP Guidance document – expected end of 2021

TLP project overview

- Process is similar to routine restoration and dredging projects
- BUT synchronizing two major projects is not easy
- Identified aspects of project management process that are critical to TLP project success



Planning: stakeholder engagement

- TLP projects involve large and diverse groups of stakeholders
- Engage EARLY and OFTEN
- Establish common vocabulary
- Communication and education – diverse stakeholders mean diverse backgrounds
- Bring in regulators early too!

Mobile Bay Interagency Working Group Members

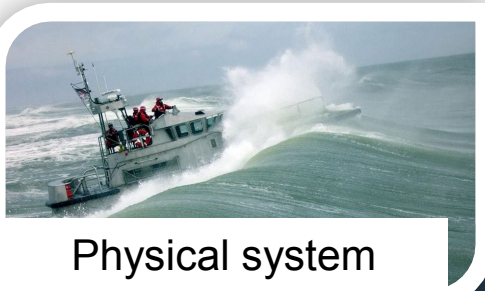
- Alabama State Port Authority (ASPA)
- USACE, Mobile District
- USACE, Engineering Research and Development Center (ERDC)
- Alabama Department of Conservation and Natural Resources (ADCNR), State Lands Division
- ADCNR, Marine Resources Division (MRD)
- ADCNR, Wildlife and Freshwater Fisheries Division (WAFF)
- Alabama Department of Environmental Management (ADEM)
- Geological Survey of Alabama (GSA)
- U.S. Fish and Wildlife Service (USFWS)
- National Marine Fisheries Service (NMFS), Habitat Conservation
- Mobile Bay National Estuary Program (NEP)
- U.S. Environmental Protection Agency (EPA)
- Dauphin Island Sea Lab (DISL)
- The Nature Conservancy (TNC)
- Mobile County Environmental Department
- Mobile Bay Keeper

Lower Columbia Solutions Group

- National Oceanic and Atmosphere Administration (NOAA)
- U.S. Environmental Protection Agency (EPA)
- Oregon Governor's Office
- Washington Governor's Office
- WA Department of Ecology (WDOE)
- Columbia River Crab Fishers Association (CRCFA)
- Washington Department of Natural Resources (WDNR)
- Oregon Department of Land Conservation and Development
- Oregon Sea Grant
- Portland State University
- Oregon State University
- Oregon Health Sciences University
- National Policy Consensus Center
- National Policy Consensus Center
- Oregon Department of Environmental Quality (ODEQ)
- Port of Astoria
- Port of Ilwaco
- Port of Chinook
- Pacific County, Washington
- Clatsop County, Oregon
- Oregon Department of State Lands (ODSL)
- USFWS
- Oregon Department of Fish and Wildlife (ODFW)
- Washington Department of Fish & Wildlife (WDFW)
- Lower Columbia Solutions Group
- Institute for Natural Resources
- Center for Public Service

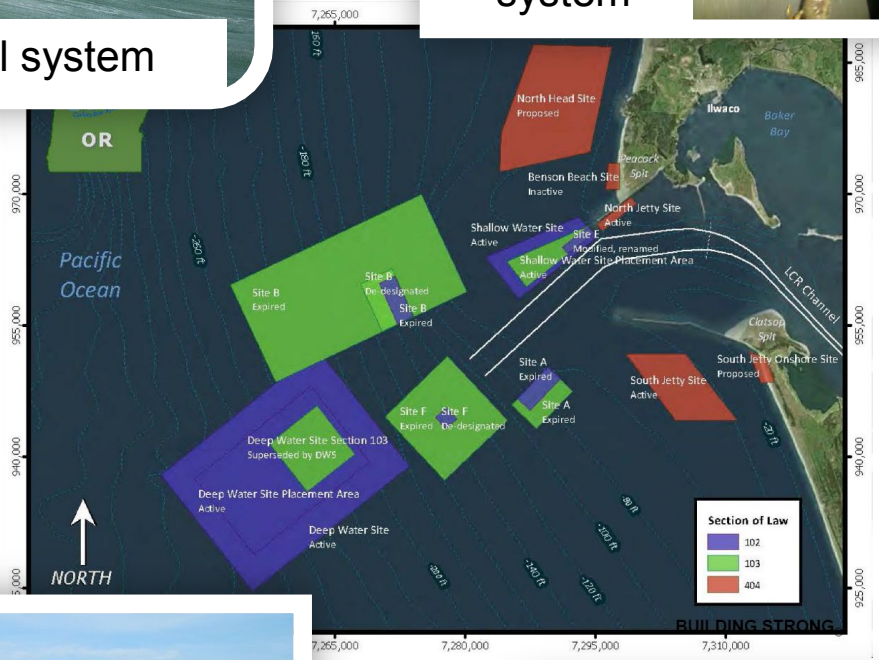
Planning: understand the system

- **Physical system:** Geomorphology of the sites, water levels, currents, tides, and sediment transport
- **Ecological system:** Biophysical feedbacks between vegetation and water levels and faunal use (especially benthic fauna)
- **Socioeconomic system:** Ecosystem goods and services provided by wetlands and marine and estuarine waters
- **Engineered system:** Alterations in site hydrodynamics from structures or stormwater inflows from adjacent developed lands
- **Regulatory and governance system:** The special laws and policies that protect and regulate activities occurring on wetlands and in aquatic habitats.

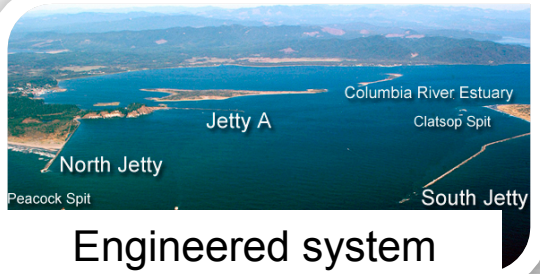


Physical system

Ecological system



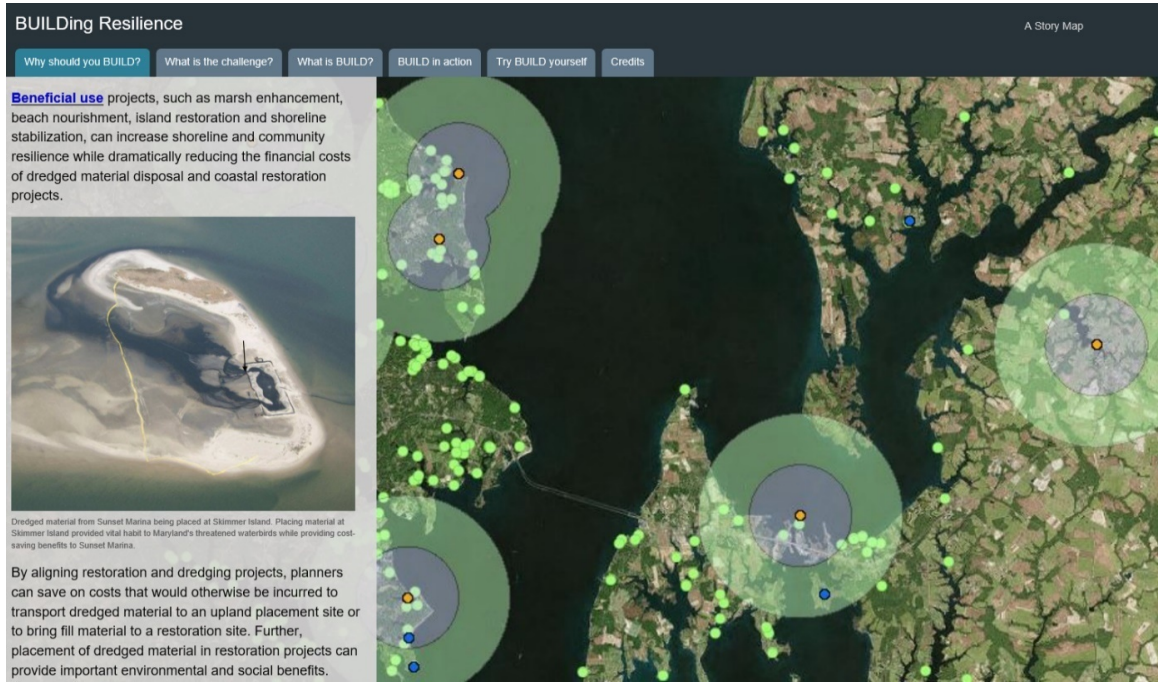
Socioeconomic system



Engineered system

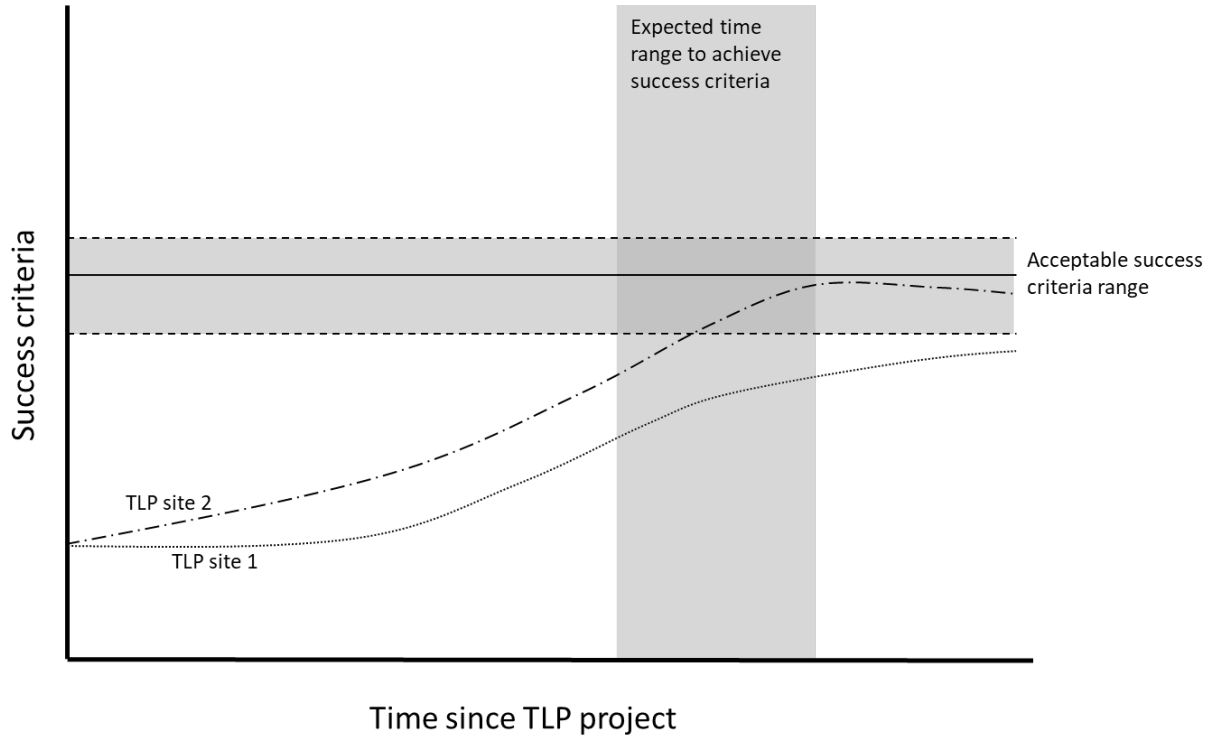
Planning: identify sediment sources

- Sources:
  - navigation channels (maintenance dredging or new work),
  - confined disposal facilities,
  - borrow areas
- Transport distance and method
  - Small hydraulic pipeline dredges most commonly used
  - Hopper dredges (common on west coast) may require additional equipment and rehandling
- Sediment grain size – not as critical as you might think!
- Do dredging and placement windows align?
- Background contaminant levels at site and in sediment



Planning: setting goals and objectives

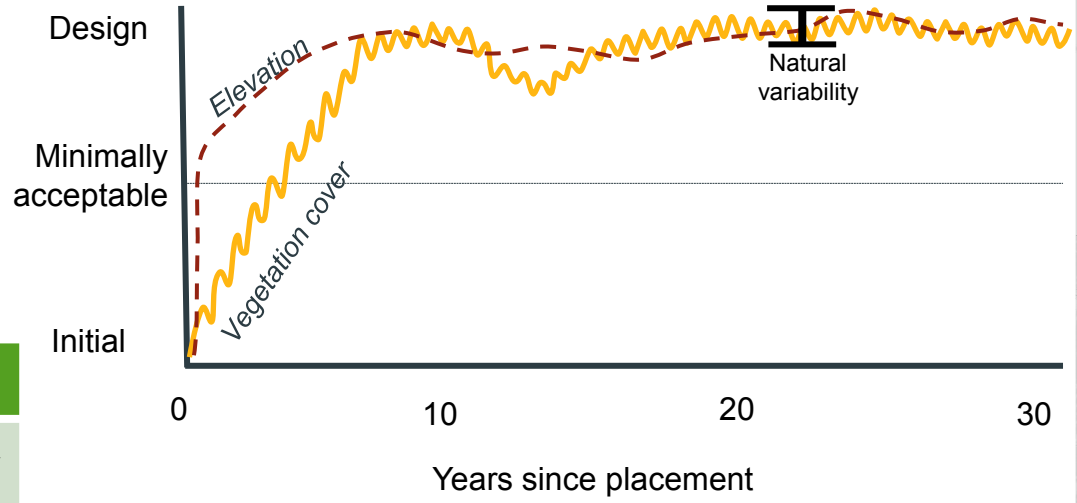
- **Project goal:** restore a degraded marsh to a state that provides nesting and grazing habitat for migratory birds
- **Project objectives:** 75% high marsh and less than 10% open water based on optimal habitat requirements for a nesting bird
- **Methods:** Determine if TLP is appropriate method to achieve objectives, are other techniques required too?
- **Project constraints:** site and project-specific; budgetary, regulatory, equipment access, for example
- **Success metrics:**
  - As-built metrics
  - Site function metrics
- **Time to recovery** – dependent on site, project scope and scale; be realistic!



Management: quantify success and monitoring

Example monitoring metrics for wetland TLP project

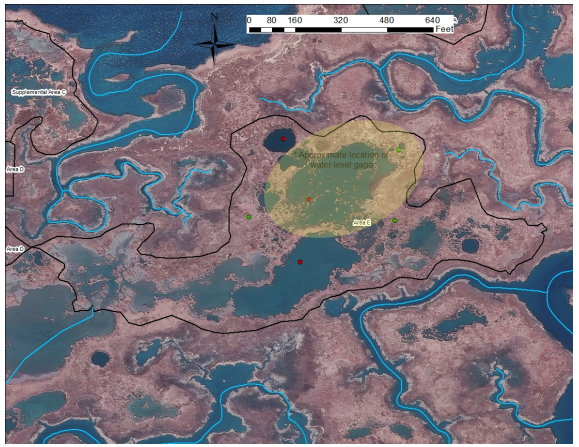
Metric Type	Metric	Method	Purpose
Geometry	Elevation	RTK survey Ground-based LiDAR Surface elevation table	Determine rate of elevation change after TLP
Hydro-dynamic properties	Wave conditions	Wave gages	Determine if wave conditions have changed due to TLP
	Water levels	Water level loggers	Determine if inundation duration of marsh surface has decreased
Sediment/ soil properties	Salinity	Conductivity probe	Determine if porewater salinity levels allow planting
	Bulk density	Soil cores	Determine if sediment has consolidated enough to support plant roots
	pH	pH/EC probe of soil/sediment slurry	Detect reduction in porewater pH from acid sulfide production
Ecological properties	Vegetation abundance	Percent cover Aboveground biomass Belowground biomass	Determine if vegetation recovery is occurring, determine if planting is necessary
	Macroinvertebrate abundance	Benthic invertebrate sampling Acoustic tagging	Determine if TLP caused invertebrate mortality, determine if benthic community is recovering

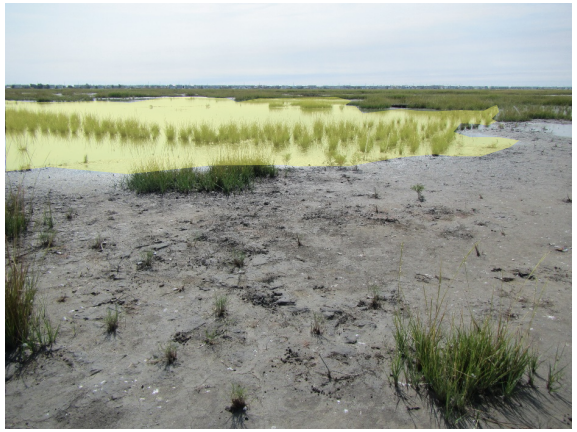


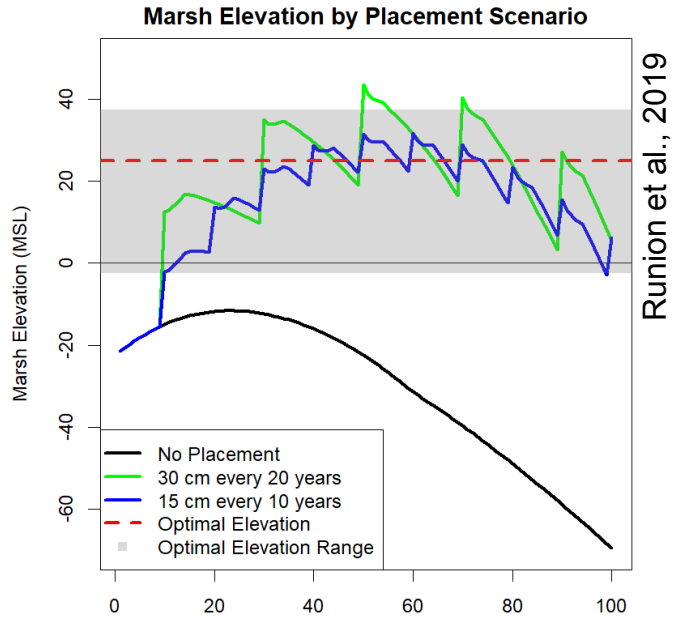
- Monitoring plans should reflect the site expected development timeline
- Ecological functions will take longer to reach acceptable levels than physical
- Some reduction in function is expected after TLP
- First year after TLP should be considered Year 0 even if placement occurs in winter

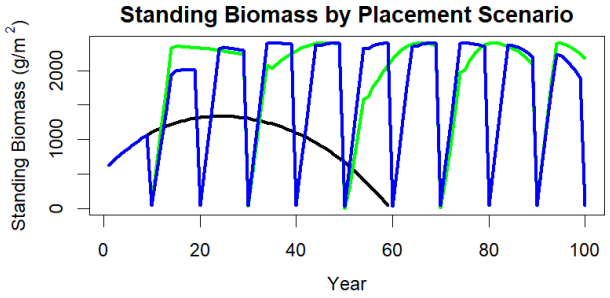
Management: maintenance and adaptation

- For many projects, TLP is not one and done!
- For thicker lifts, may need to return to add additional sediment due to consolidation effects
  - Plan for multi-year projects
  - May not be realistic for areas requiring thicker lifts to reach thickness or elevation targets after one placement
- For intertidal habitats, plan for sea level rise
- Determine relative elevation that would require planning for the next TLP event
- For wetlands, degradation can take many trajectories
  - High marsh → Low marsh → Open water
  - Fragmentation: open water areas increase in area



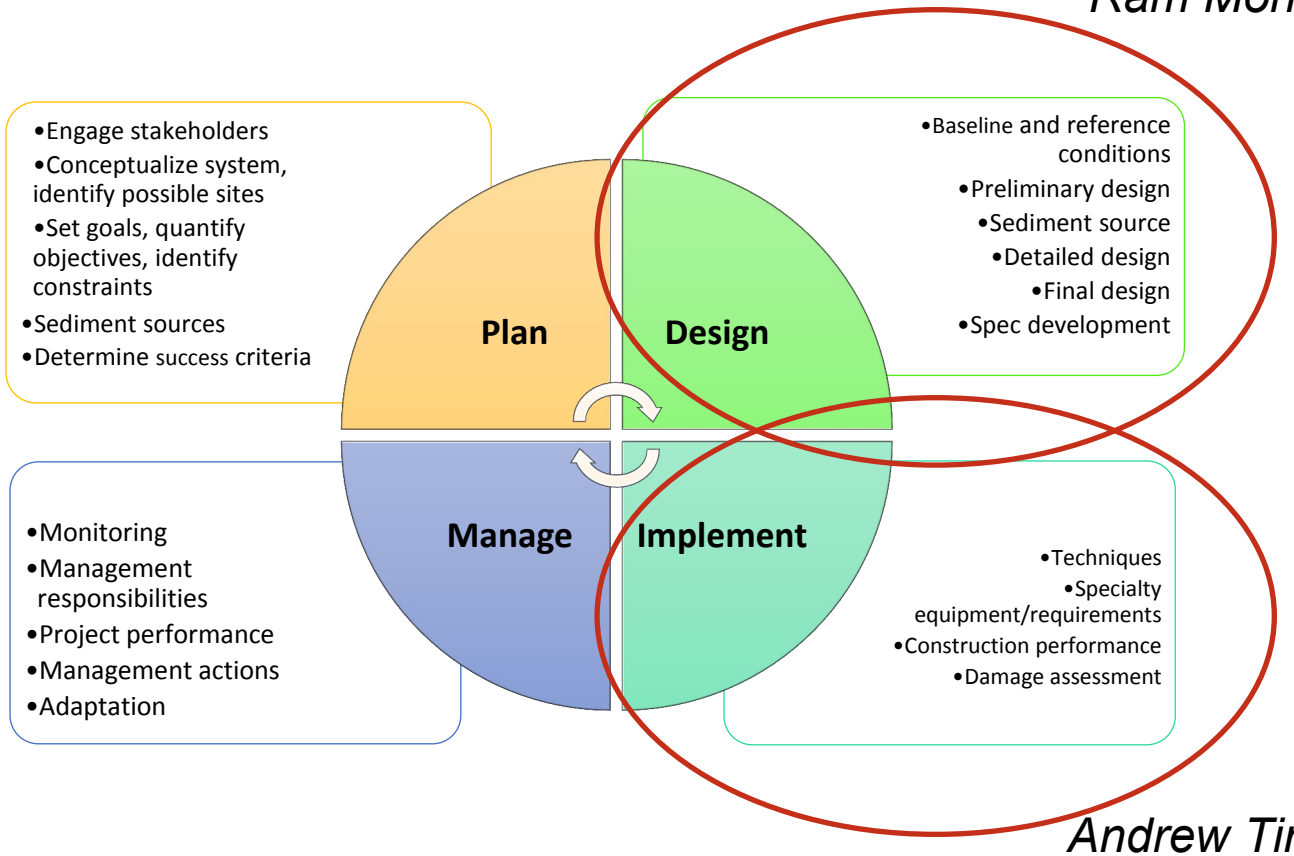






Questions?

Ram Mohan



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