Connecticut – Status of the Feasibility Assessment Wetlands and Wetlands Island Creation Using Dredged Material

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Beneficial Use of Dredged Materials for Resilient
Tidal Marsh Restoration and Creation
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Scoping of Dredge Material Islands and Wetlands for Green Infrastructure Resiliency Projects Along the Connecticut Shoreline in Fairfield and New Haven Counties

- Community Development Block Grant Disaster Recovery (CDBG-DR) Planning Application
- Funded through State of Connecticut Department of Housing

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Motivations

-dredge disposal option
-shoreline stability
-nutrient management
-carbon storage
-habitat, endangered species
-food webs / fin/shellfish

Technical Challenges

-clean dredge, how clean is clean?, grain size
-siting, wave energy, habitat conversion
-competing management agendas (SAV, shellfish, etc)
-post restoration maintenance, leaching, mortality
-quantifying 'success' / meeting restoration goals

Social Challenges

-the stigma of dredge
-perceived mosquito-borne illness
-NIMBY, exacerbated by high population density
-historical disconnection from coastal wetlands

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Remedy / Outcome

Outreach/education. Construct/design includes social benefits– boardwalks, water access, etc. Community engagement in design, implementation, monitoring. Public buy-in treated as a success metric; on par with ecosystem services or elevation. (see *LSU Coastal Sustainability Studio*)

The success of coastal wetland restoration in CT is likely not a physical science or engineering question. It hinges on making the case that this is worth doing to an often skeptical public.

Project Elements

- Review of marsh ecosystems services
- Literature review of physical, biochemical and engineering aspects marsh restoration/creation using dredged material
- Evaluation of design alternatives
- Review of regulatory and permitting needs
- Outreach to state and federal agencies
- Evaluation of impact on health and safety of vulnerable populations
- Guidelines developed for state and municipalities

Ecosystem Services

Erosion Control

Storm Surge Protection

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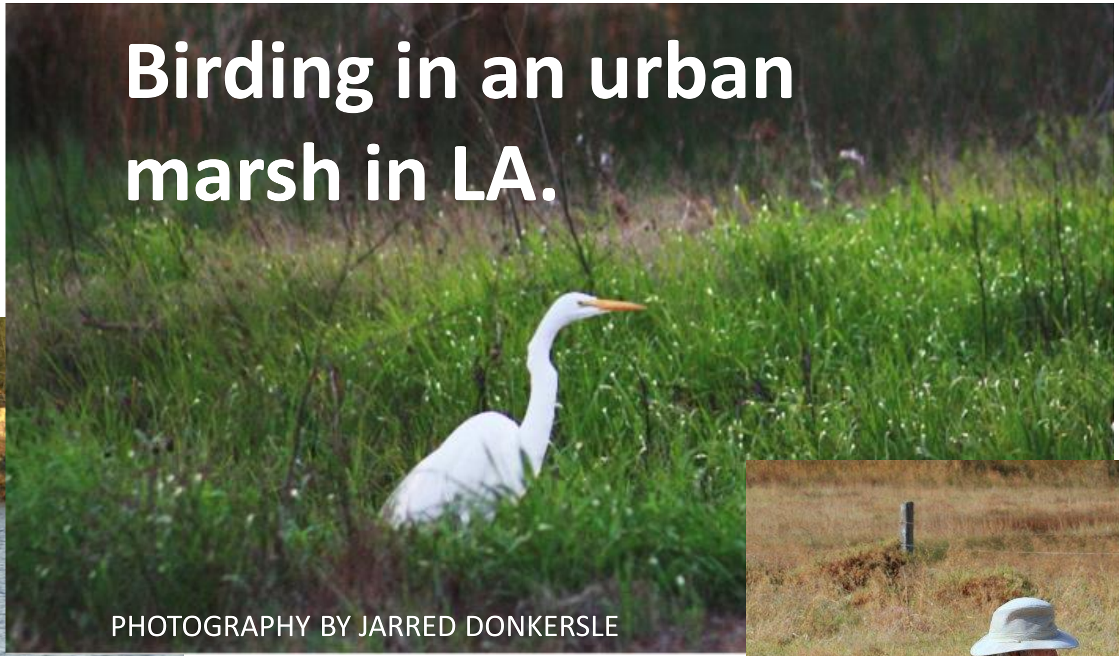
Photograph by Patty Bodwell, My Shot

Photograph by B. Burton

Ecosystem Services

- Recreation
- Aesthetics
- Educational



Birding in an urban marsh in LA.

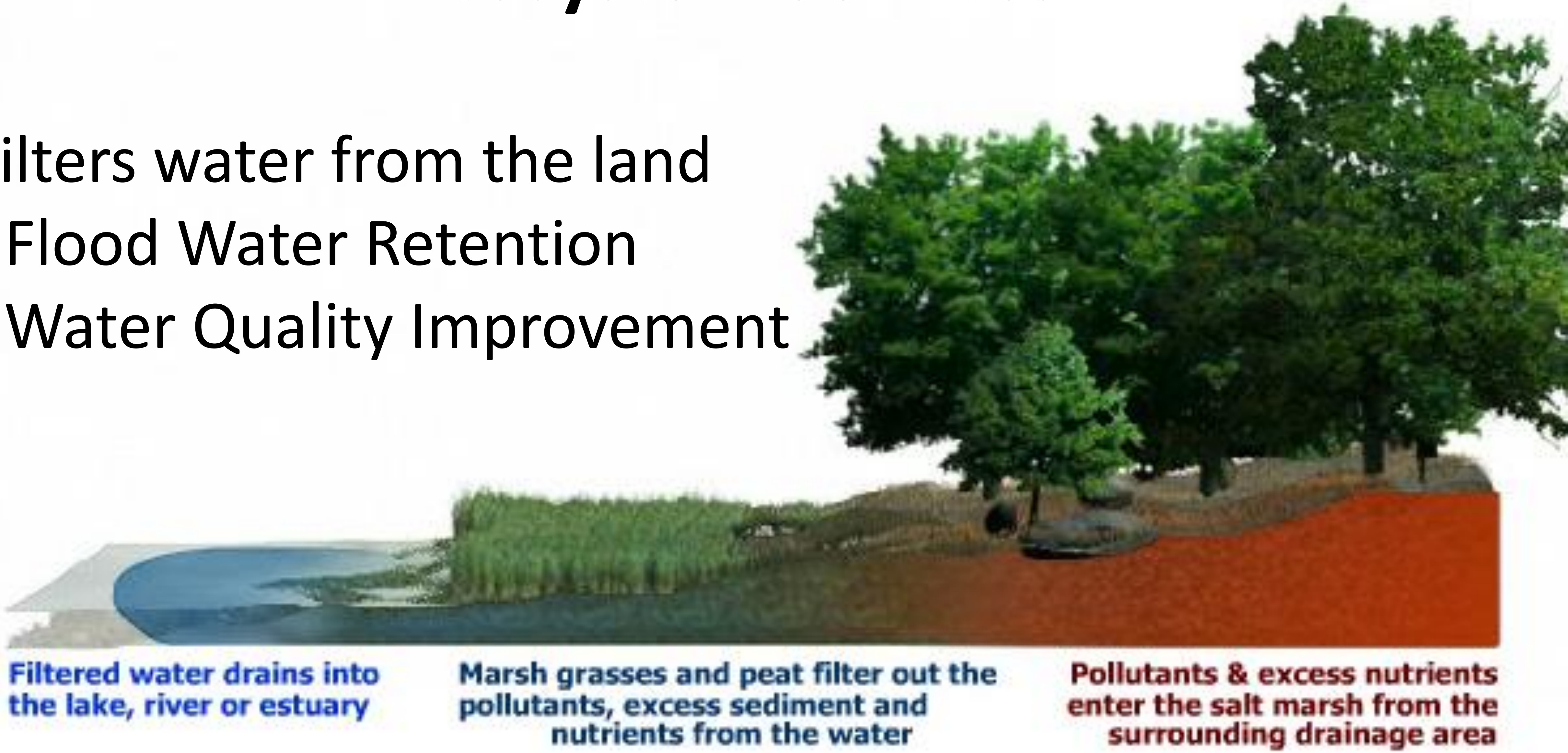
PHOTOGRAPHY BY JARRED DONKERSLE

Educational opportunities

Fishing and crabbing.

Ecosystem Services

Filters water from the land
- Flood Water Retention
- Water Quality Improvement



from NOAA, Ocean Service Education

Wetland/urban interface at the Colma Creek Marsh, *San Francisco Bay/Delta Region*

Wetland/urban interface of restored marsh at Waterfront Park, *Charleston, SC*

Two different types of projects

Dredging project seeking a site for disposal

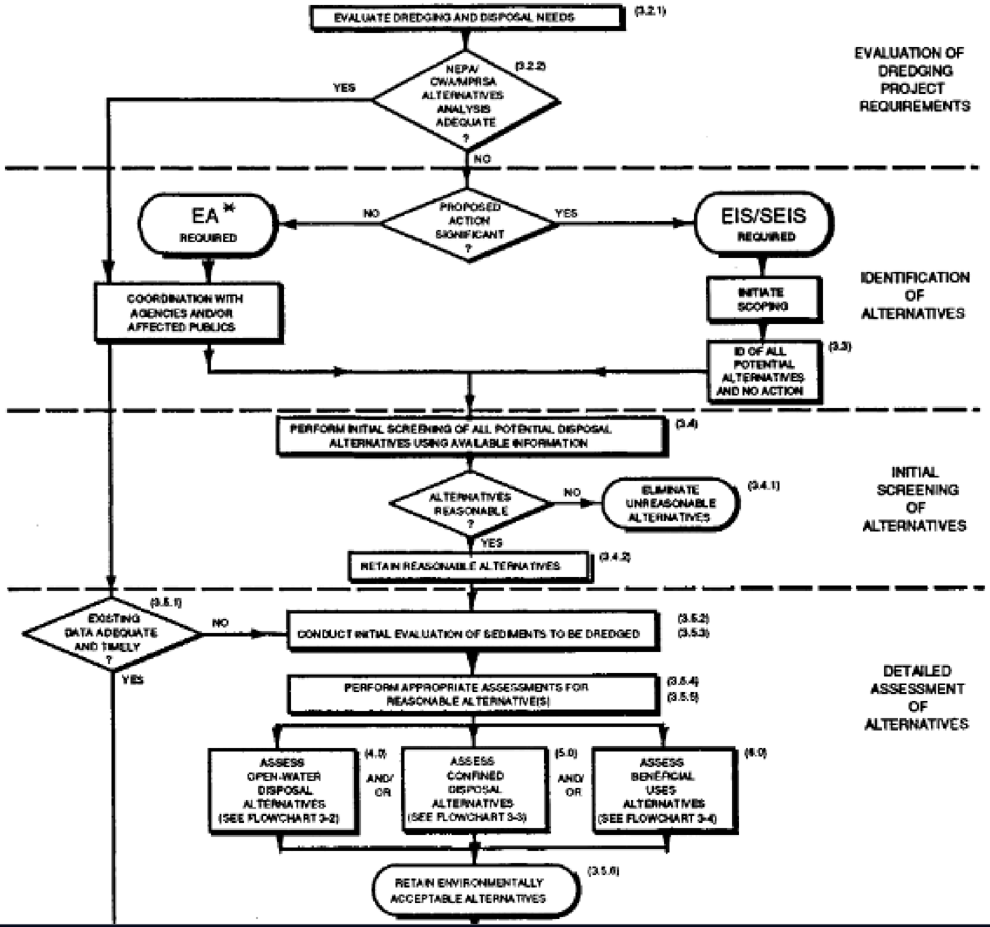
Restoration project seeking sediment source

In either case, the choice of alternatives may be limited and less than optimum

The Challenge

- This distinction greatly impacts the remainder of the design process.
- Projects designed for a specific site must fit within the constraints and limitations of the site itself.
- Many wetland projects are associated with a specific site; seldom is there the luxury to locate the most compatible site for already established project objectives.

Assessment of Dredged Material Disposal



EPA/USACE technical framework for determining environmental acceptability of dredged material disposal

- Evaluation of dredging project requirements
- Identification of dredged material disposal alternatives
- Initial screening of alternatives
- Detailed assessment of alternatives.
- Alternative selection

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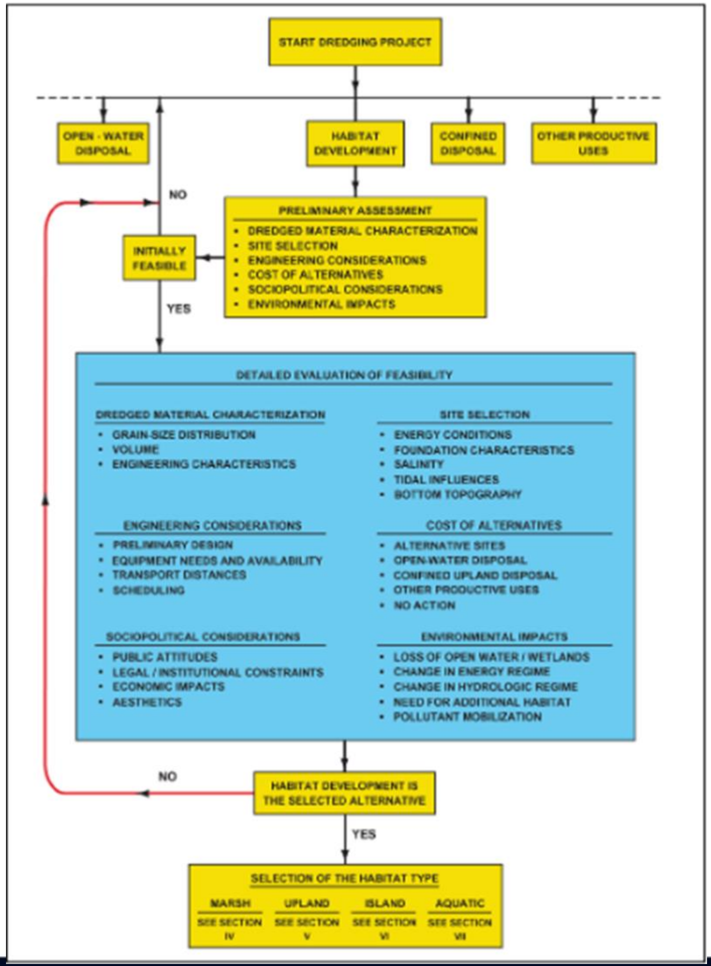
Assessment of Beneficial Use

- Public/agency opinion strongly opposes other alternatives;
- Recognized habitat needs exist;
- Enhancement measures on existing placement sites are identified;
- Feasibility has been demonstrated locally;
- Stability of dredged material deposits is desired;
- Habitat development is economically feasible;
- Extensive quantities of dredged material are available



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Selection of Beneficial Use Alternative

- Human Benefits
- Ecological Benefits
- Compatibility with goals
- Feasibility
- Cost
- Funding
- Environmental Impacts
- Regulatory/Permitting
- Public Support
- Risk

Suitability of Dredged Material for Beneficial Use

Assess dredged material characteristics

- Physical
- Chemical
- Engineering

Site Assessment

- Site Selection Criteria
- Site Investigation Stages
- Determination of Environmental Suitability
- Retention of Environmental Acceptable Alternatives

Critical Aspects of Site Selection

Geotechnical Considerations
- Existing soil chemical properties
- Soil physical properties
- Sediment supply and littoral drift
- Foundation characteristics

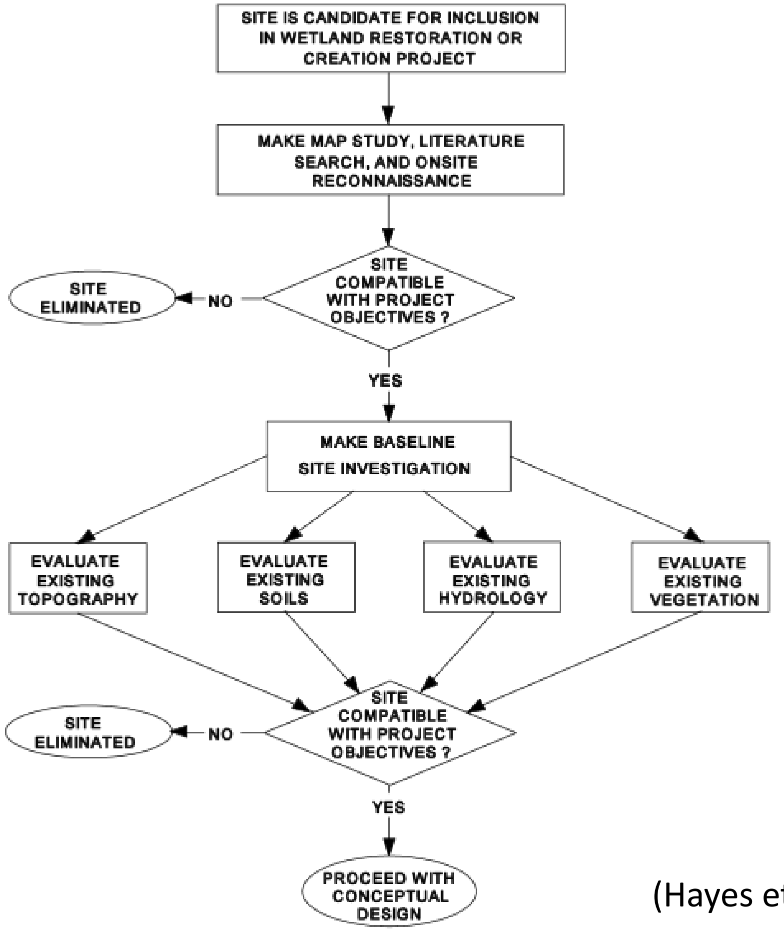
Physical Considerations
- Topography
- Shape and orientation
- Salinity
- Wave climate, currents, boat wakes and storm surge
- Slope, tidal range and water depth
- Hydrology

Logistical Considerations
- Availability for marsh restoration/creation
- capacity to meet dredge disposal requirements
- Jurisdiction concerns
- Proximity to dredging area
- Site accessibility
- Equipment compatibility
- Scheduling of dredging operations with marsh construction
- Public acceptability
- Costs
- Presence of cultural or archeological resources

Environmental impact on existing habitat
- Potential impacts on water quality,
- Presence of contaminants at the site
- Relative value of existing and proposed habitats
- Presence of animals and wildlife and foot or vehicular traffic

Habitat Development Potential

Site Assessment



(Hayes et al. 2000)

- Site Selection Criteria
- Site Investigation Stages
  - Map study, literature search and onsite reconnaissance
  - Baseline site investigation
  - Detailed subsurface investigations
- Determination of Environmental Suitability
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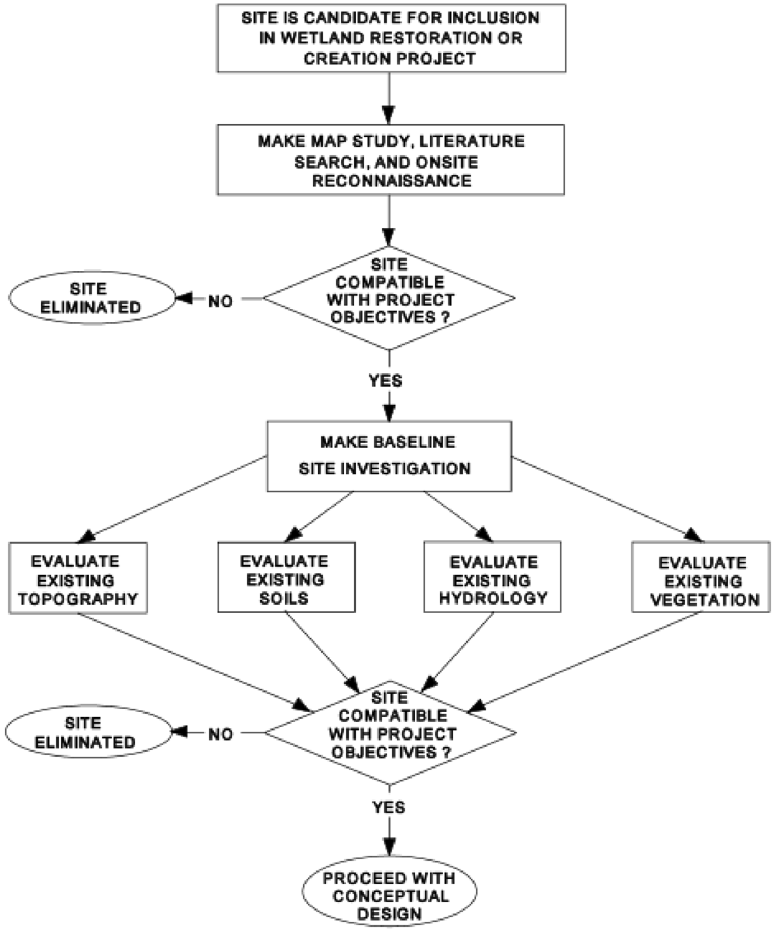
Site Assessment



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Design Challenges

Successful design

- Satisfies project objectives
- Provides desired wetland functions
- Fit seamlessly into landscape
- Remains viable for the expected life
- Achieves ecosystem services

- **All in very short period!**

Common features of well-conceived projects:

- Site assessment, for planning and goal setting
- Development of detailed plans and specifications with appropriate review and stakeholder participation
- Project implementation, including construction and operations and maintenance
- Post-construction monitoring and evaluation

Techniques for Beneficial Use

Blackwater National Wildlife Refuge – *Dredge America*

- Thin layers - bring degraded wetlands up to an inter-tidal elevation
- Restore width of inter-tidal zone, and stabilize eroding shorelines
- Sub-tidal placement of sediment
- Inter-tidal foreshore placement - mitigate wave energy and/or increase sediment supply
- Use dewatered material for dikes/berms

Developing Site Designs

1. Establish design criteria
2. Brainstorm
3. Assess containment options and develop design criteria
4. Determine site capacity and operational life
5. Develop biologic and vegetation design criteria
6. Formalize conceptual designs
7. Analyze design
8. Refine best designs
9. Develop final project design
10. Prepare final design

Design Criteria

Location ♦ Elevation ♦ Orientation and Shape ♦ Size

Configuration ♦ Elevation ♦ Protection ♦ Retention

Biologic Criteria

- Water depth
- Inundation
- Frequency
- Nutrient requirement
- Shoreline slope

Hydrologic Criteria

- Hydrologic setting
- Flooding duration and timing
- Hydraulic retention time (HRT)
- Flow resistance
- Storage capacity
- Surface area
- Wave conditions
- Flooding depth
- Flow velocities

Geotechnical Criteria

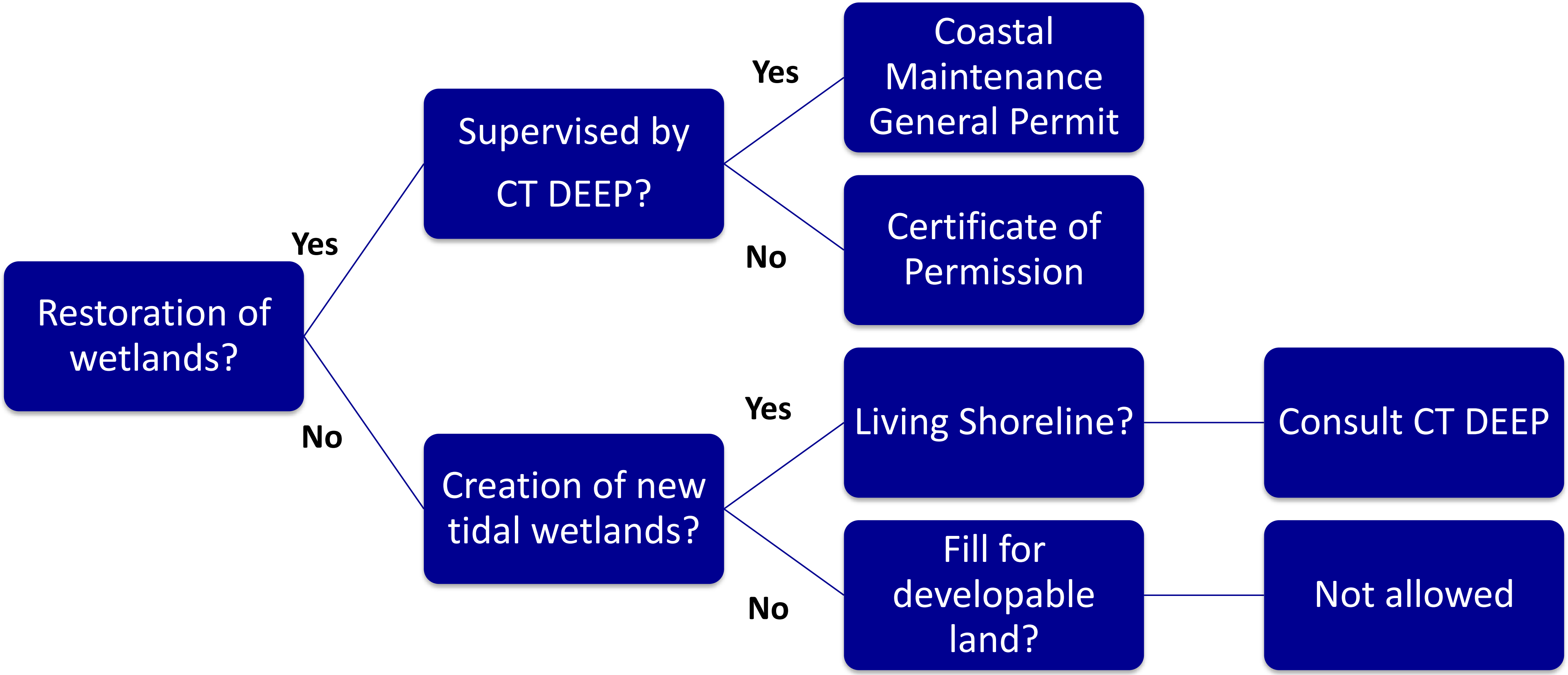
- Geologic setting
- Geomorphic setting
- wetland form and size
- Soil composition and texture
- Hydrogeologic processes
- Geomorphic processes
- Geomorphic trends

Final Design Selection

Additional Project Considerations

- Project constraints
  - Construction timing
  - Costs
  - Environmental safety
  - Aesthetics
- Construction methods
- Retention and protections

CT Permitting Decision Tree



Connecticut Policy Recommendations

- Projects should be wetlands restoration with for flood and erosion control to ensure focus on habitat enhancement and conservation and for ease of permitting within the current regulatory framework.
- Connecticut Water Quality permit decisions should evaluate benefits for flood and erosion control as grounds for exception to lowering water quality due to project. However, projects should not degrade wetlands below state water quality standards.
- Utilize tools to evaluate future habitat and water quality conditions under sea level rise when evaluating project permits, not just impacts of the project relative to current conditions.
- Creation of wetlands where no evidence that wetlands existed historically should be evaluated as a living shoreline technique for floodplain management. Habitat tradeoff should be explicitly evaluated in this situation.

State and Federal Interviews: Questions

- Definition of wetlands creation vs. wetlands restoration
- Useful tools for distinguishing between restoration vs. creation
- Policies or practices distinguishing fill or dredge disposal from wetlands creation or restoration
- Describing habitat exchange or habitat tradeoffs related to projects
- Evaluating flood and erosion control benefits for projects, including constructing projects for this sole purpose
- Consideration of sea level rise in projects
- Water and soil quality standards
- Sharing engagement stories

Initial Interview Findings

- Clear consensus marsh restoration using dredged sediments is positive. Less confidence about marsh creation
- Few examples of marsh restoration /creation used primarily as a flood and erosion control project, although acknowledgement that this is a co-benefit
- Sea level rise is being considered and can be driver of the project*

*interviewees working on projects in Sandy-impacted region and sea level rise resilience was a factor in funding of projects

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A public health perspective

- Coastal resiliency efforts afford an opportunity to improve the communities' health and well-being
  - Long term gains for health
  - Utilization of post-disaster resources,
  - Opportunity for community "transformation"
  - Coastline sustainability
    - Protection against severe weather; less threat to housing, interruption of medical care
    - Enhanced recreational opportunity/public health value
    - Other infrastructure improvement

- Public health considerations can be a mesh among silo permitting and planning efforts
  - Community engagement in recovery and planning
  - Planning and decision making around resources and priorities
  - Workforce development opportunities

- Public health planning that identifies possible unintended consequences, provide a focus for prevention
  - Marshland and disease carrying vectors
  - Changed coastal resource access
  - Other

Conclusions?

- Two problems – one solution?
- Multiple interrelated challenges
- Success depends on interdisciplinary cooperative approach
- Project is ongoing

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