Goals for Regional Sediment Management

• Provide science-based rationale for placement of dredged sediment to maximize beneficial use of sediments
• Understand sediment processes as basis for dredge planning and restoration
• Understand movement of contaminated sediments
• Provide a plan that is adaptable to changing conditions and knowledge
• Develop the support needed to implement the plan – regulatory, scientific, community, legal, etc.
Phase 1 of Sediment Planning builds a foundation

- Identify the policy and technical issues regarding development of a sediment budget
- Assemble available literature on physical, biological and chemical processes with sediment
- Produce a physical conditions and processes chapter for the plan
- Analyze historical dredge material disposal records
- Produce interim analysis of regulatory framework for sediment management
- At one site, develop and test criteria for placing non-contaminated dredge materials for maximum beneficial use
Phase 1 Sediment Management Plan Development

- First phase in continuing process
  - Estuary Partnership request to Congress to support continuation

- First phase concentrating on Bonneville Dam to mouth
  - 8 River Reaches
Phase 1 Sediment Management Plan Development

1. A) Identify policy/technical questions to support planning goals
   B) define parameters & steps needed to develop sediment budget

2. A) Identify and assemble pertinent literature and other data needed for plan development
   B) identify data gaps and determine options for addressing gaps

3. Produce an initial sediment-related physical conditions and processes chapter for plan

4. Produce an interim dredged material regulations and project “critical path” chapter for plan
Estimated Total Material Removed by Reach, 1986 - 2007
(total material for all reaches = 139,850,224 cy)

Phase 1 Sediment Management Plan Development

5. Compile historical dredged material disposal volumes and locations; characterize in terms of use categories (e.g., beach nourishment, upland, in-water)

Disposal data provided by USACE
Phase 1 Sediment Management Plan Development

Estimated Material Removed by River Reach and Year

Volume removed (cy)

Hydrogeomorphic Reach

Year

Phase 1 Sediment Management Plan
Development

Disposal data provided by USACE
6. Develop and apply criteria for locating dredged material placement sites (non-contaminated materials)
   - Develop criteria for locating dredged material disposal sites
   - Test draft criteria by examining a reach of the lower river for potential sites
   - Criteria will incorporate ecosystem and economic considerations
   - Refine criteria and ultimately use in other 7 reaches of LCRE in 2-3 year planning horizon
Dataset 1: Digital Shoreline Mapping and Inventory

Location and categorization of the following shoreline features:

- **General shoreline condition**
  (modified vs. natural)
- **Modified shoreline condition**
  (armor, residential, commercial)
- **Natural shoreline condition**
  (riparian, tidal marsh, tidal swamp)
- **In-Water structures**
  (Pile dikes, jetties, boat ramps, debris)
- **Over-Water structures**
  (docks, log rafts/booms)
- **Discharge locations**
  (tidegates, point source outfalls)
Digital Shoreline Mapping and Inventory: Methods

- **Step 1:** Shoreline Field Recording using video camera with GPS
- **Step 2:** Import data to ArcGIS
- **Step 3:** Geodatabase Creation
Digital Shoreline Mapping and Inventory: Results

- 605 miles shoreline surveyed:
- Modified Shoreline: 277 miles
- Natural Shoreline: 250 miles
Dataset 2: Habitat Restoration Prioritization Strategy

- Two-tiered approach - Scales from system-wide to project specific
  - Tier 1 uses model
    - provides defensible method for comparing site function and structure at larger scales
    - Focuses on existing data
    - can refine by updating/adding new data
  - Tier 2 provides scientific method of comparing specific projects using change in function and likelihood of success
Habitat Restoration Prioritization Strategy

Evaluation of 9 controlling factor metrics:

- Hydrology @ 3 scales:
  - River, Management Area & Site
- Sediment Quality
- Water Quality
- Light
- Sediment Dynamics
- Depth/Slope
- Physical Disturbance

Primary Data Sources for Evaluation:

- Diked areas
- Tide gates and other flow-restricting structures
- Land cover derived from Landsat imagery
- Shoreline modifications (e.g., marinas, overwater structures, pile dikes)
- Toxic contaminants
- Proximity to Bonneville Dam
Habitat Restoration Prioritization Strategy

- **Scale—Management Areas**

Defined by USGS level 6 HUC
Habitat Restoration Prioritization Strategy

- **Scale — Sites**

Limited to floodplain

![Map of habitat restoration sites](image_url)
Habitat Restoration Prioritization Strategy

Results:
Habitat Restoration Prioritization Strategy

Results:

Management Area Scale
• University of Washington with USGS

• Provides hierarchical classification of habitats across different scales
  – 6 Hierarchies
  – Large-scale to finer scales

• Useful in selecting monitoring sites and in habitat restoration prioritization

• Uses hydrogeomorphology as foundation to characterize variation in ecosystem processes
Columbia River Estuarine Ecosystem Classification Level 1

ECOSYSTEM PROVINCE

[Based on US EPA Level II: Ecoregions]
Columbia River Estuarine Ecosystem Classification Levels 2 and 3

ECOREGION (top)

HYDROGEOMORPHIC REACH (bottom)

[Modified from US EPA Levels III and IV Ecoregions]
Columbia River Estuarine Ecosystem Classification
Level 4: Ecosystem Complex

Legend
- Complex Boundaries
- Deep Channel

Landsat TM Cover Classes
- Background
- Clouds/Shadows
- Coniferous Forest Upland
- Coniferous Forest Wetland - Diked
- Coniferous Forest Wetland - Non-tidal
- Coniferous Forest Wetland - Tidal
- Deciduous Forest Upland
- Deciduous Forest Wetland - Diked
- Deciduous Forest Wetland - Non-tidal
- Deciduous Forest Wetland - Tidal
- Herbaceous Upland
- Herbaceous Wetland - Diked
- Herbaceous Wetland - Non-tidal
- Herbaceous Wetland - Tidal
- Mixed Forest Upland
- Mixed Forest Wetland - Diked
- Mixed Forest Wetland - Non-tidal
- Mixed Forest Wetland - Tidal
- Mud
- Other
- Sand
- Shrub Scrub Upland
- Shrub Scrub Wetland - Diked
- Shrub Scrub Wetland - Non-tidal
- Shrub Scrub Wetland - Tidal
- Urban
- Water

Bathymetry - background
High: 2
Low: -55
Columbia River Estuarine Ecosystem Classification
Level 5: Geomorphic Catena

Map created by J. L. Burke
Columbia River Estuarine Ecosystem Classification
Level 6: Primary Cover Class

Map created by J. L. Burke
Phase 1 Sediment Management Plan Development

- Task 6 - Develop and apply criteria for locating dredged material placement sites
  - Develop criteria for locating dredged material disposal sites
  - Test draft criteria by examining a reach of the lower river for potential sites

Proposed Pilot Reaches
Proposed Pilot Reaches

- Pile Structure Program
- Working with US ACE, BPA and others
- Have compiled extensive related dataset for these reaches
Proposed Pilot Reaches

- Pile Structure Program
- Site visits
- Field data
- Aerial images
- Historical photos in comparison to current
- Landowner information (for subset of pilings)
Estuary Partnership Pile Evaluation & Removal Program:
Site Map for Structures Adjacent to Port of Kalama, WA

Legend:
EP Pile Inventory
- High Density Piling Field
- Medium Density Piling Field
- Other Pile Structure

ACOE Pile Dike, VE Recommended Action
- None Listed
- Abandon-develop method
- Abandon-silted in or off repair list
- Maintain
- No action
- Study
- City Limits

Port of Kalama Slough #2, ID 039: High Density Pilling Row
Port of Kalama Slough #1, ACOE Pile Dike # 71.69
Goble Creek, ID 013: High Density Pilling Field
Lower Deer Island, ID 029: High Density Pilling Row
Estuary Partnership Pile Evaluation & Removal Program:
Site Map for Structures Adjacent to St. Helens, OR

Legend:
EP Pile Inventory

High Density Piling Field
High Density Piling Row
Medium Density Piling Field
Medium Density Piling Row
Other Pile Structure
Pile Dike, Not in VE Report
Log Rafting

ACOE Pile Dike, VE Recommended Action

None Listed
Abandon-develop method
Abandon-silted in or off repair list
Maintain
No action
Study

Group C Sites, River Mile 84 - 89
Phase 1 Sediment Management Plan Development

- River Reach E
Phase 1 Sediment Management Plan
Development

- Smaller Area within Reach E
  - (Deer, Goat, Martin Islands area)
- + Bathymetry Criteria
Phase 1 Sediment Management Plan Development

- Smaller Area within Reach E
  - (Deer, Goat, Martin Islands area)

- Bathymetry Criteria

- + LiDar Elevation Criteria
Phase 1 Sediment Management Plan Development

- Smaller Area within Reach E
- Bathymetry Criteria
- LiDar Elevation Criteria
- + Shoaling Criteria
Phase 1 Sediment Management Plan Development

- Smaller Area within Reach E
- Bathymetry Criteria
- LiDAR Elevation Criteria
- Shoaling Criteria
- + Navigation Channel
Phase 1 Sediment Management Plan Development

- Smaller Area within Reach E
- Bathymetry Criteria
- LiDAR Elevation Criteria
- Shoaling Criteria
- Navigation Channel
- + Dredge Material Placement Site Criteria
Phase 1 Sediment Management Plan
Development

- Smaller Area within Reach E
- Bathymetry Criteria
- LiDAR Elevation Criteria
- Shoaling Criteria
- Navigation Channel
- Dredge Material Placement Site Criteria
- + Pile Dike Criteria
Phase 1 Sediment Management Plan Development

- Bathymetry Criteria
- LiDar Elevation Criteria
- Shoaling Criteria
- Navigation Channel
- Dredge Material Placement Site Criteria
- Pile Dike Criteria
- +Restoration Prioritization Strategy
- Management Area Level Criteria
Phase 1 Sediment Management Plan Development

- Bathymetry Criteria
- LiDar Elevation Criteria
- Shoaling Criteria
- Navigation Channel
- Dredge Material Placement Site Criteria
- Pile Dike Criteria
- Restoration Strategy Management Area Level Criteria
- + Restoration Prioritization Strategy Site Level Criteria
Phase 1 Sediment Management Plan Development

- Model allows river-wide and sitewide evaluation for dredge material placement
- Can be used by USACE, Ports, regulatory community
- Can be combined with other screening factors

Phase 1 Sediment Management Plan Development

- Bathymetry Criteria
- LiDAR Elevation Criteria
- Shoaling Criteria
- Navigation Channel
- Dredge Material Placement Site Criteria
- Pile Dike Criteria
- Restoration Strategy Management Area Level Criteria
- + Site Level Prioritization Disturbance Level Criteria