

# Lower Columbia River Pile Dike Assessment

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**AECOM**

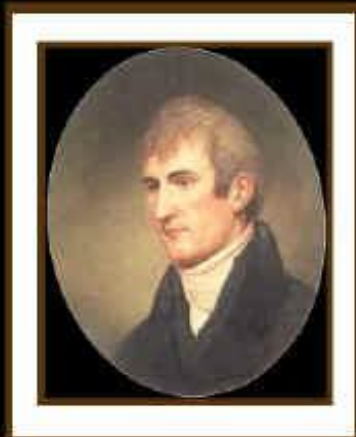
# Credits

- Hans R. Moritz, US Army Corps of Engineers Portland District
- Carl Kassebaum, AECOM Project Manager
- AECOM Coastal and Rivers Section Staff
- Pete Grace, Megabites Fishing Guide Service
- Lower Columbia River Estuary Partnership

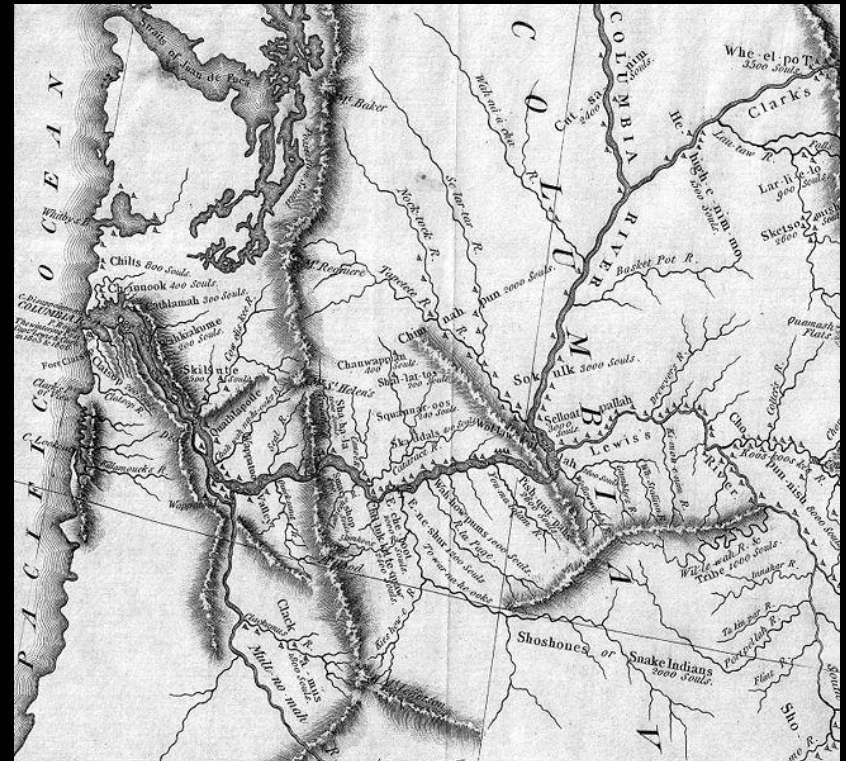


# Columbia River Basin – Early 1800's

## Lewis and Clark



## Lewis and Clark Basin Map



# Columbia River Basin

## Basin Map



## Basin Statistics

- Basin Area is 258,000 Sq. Miles
- Drains 7 States and BC
- 1243 Miles Long
- Largest River Flowing to Pacific Ocean from North America
- Supports Many Species of Anadromous Fish

# Nineteenth Century Basin Changes Impacting Anadromous Fish Populations

**Dredging – Starting 1864**



**Canneries – Starting 1867**



# Twentieth Century Basin Changes Impacting Anadromous Fish Populations

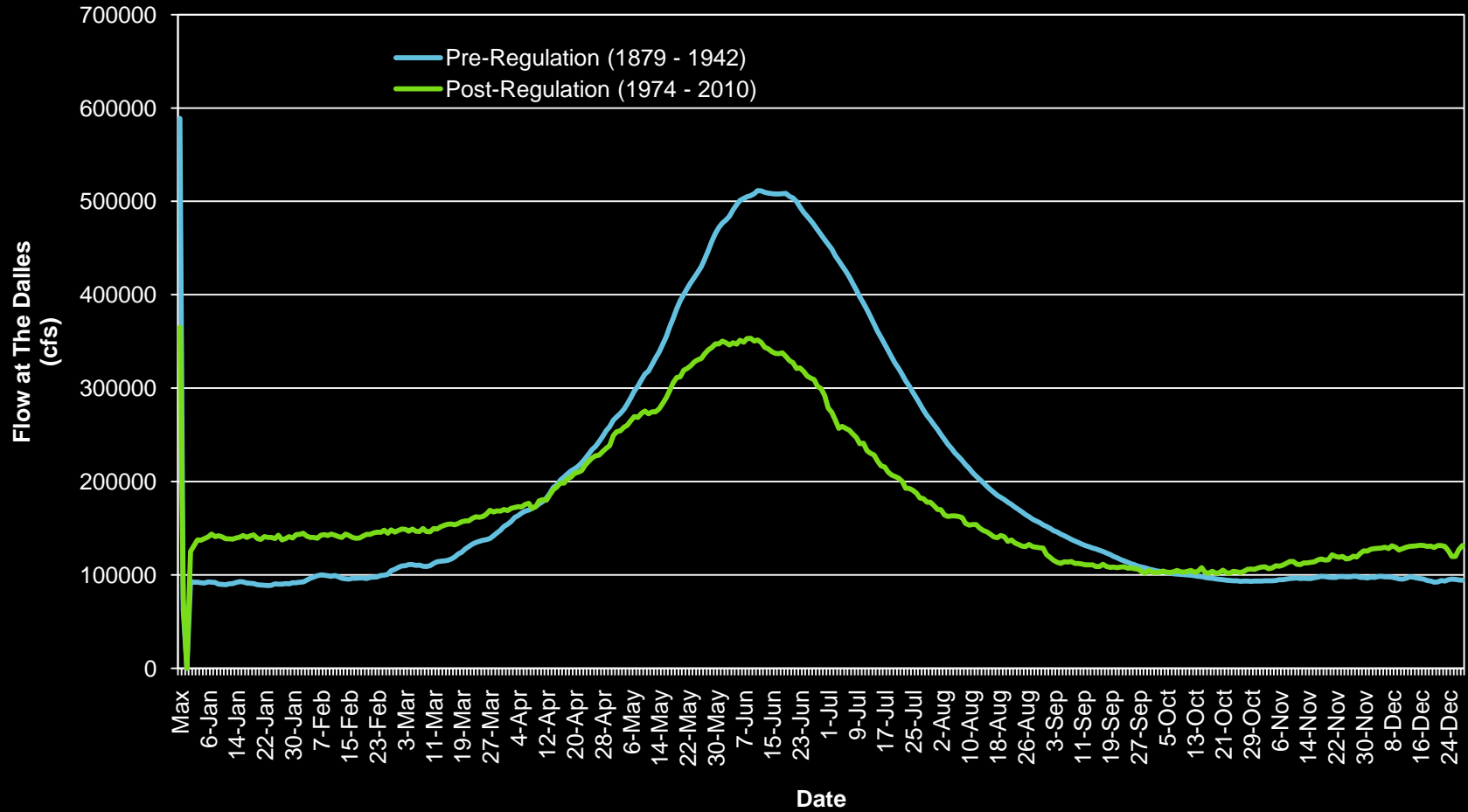
## Pile Dikes?



## Dams



# Columbia River Average Daily Flow at The Dalles, Oregon



# Federal Columbia River Power System



- USBR and USACE Own and Operate 31 Dams
- Built and Operated by the Federal Government
- System Provides:
  - Hydropower
  - Navigation
  - Flood Control
  - Irrigation
- Has impacted 13 Federally Listed ESA Fish Species



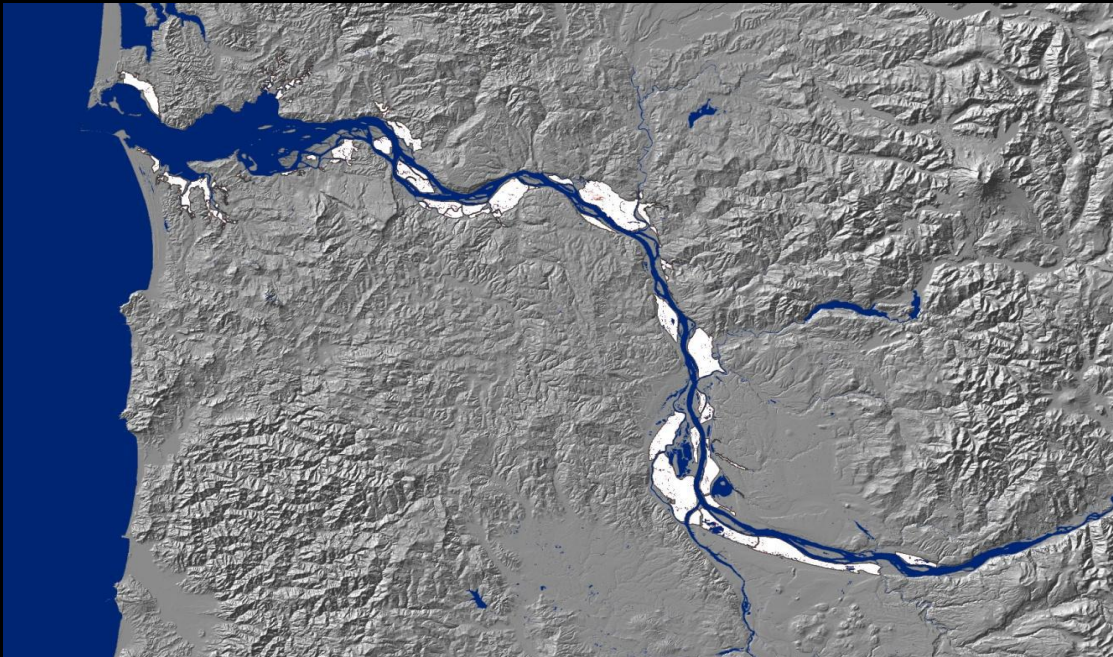
# Cumulative Impacts to Columbia River Fish Has Led To Multiple Listings Under the ESA

- Harvest
- Dams
  - Migration Obstacle
    - Upstream Passage
    - Downstream Passage
    - Increased predation
  - Flow Regulation
    - Reduced Peak Flows
    - Increased Low Flows
- Habitat Loss
  - Diking, Draining, Development
- Hatcheries



# Historic Ecosystem Losses in the Lower Columbia River Estuary – Last 150 Years

- 52,000 acres wetland/marsh habitats
- 3,800 acres of riparian forest habitat
- 27,000 acres of forested wetland



# Percentage Change in Columbia River Estuary Aquatic Habitat Types

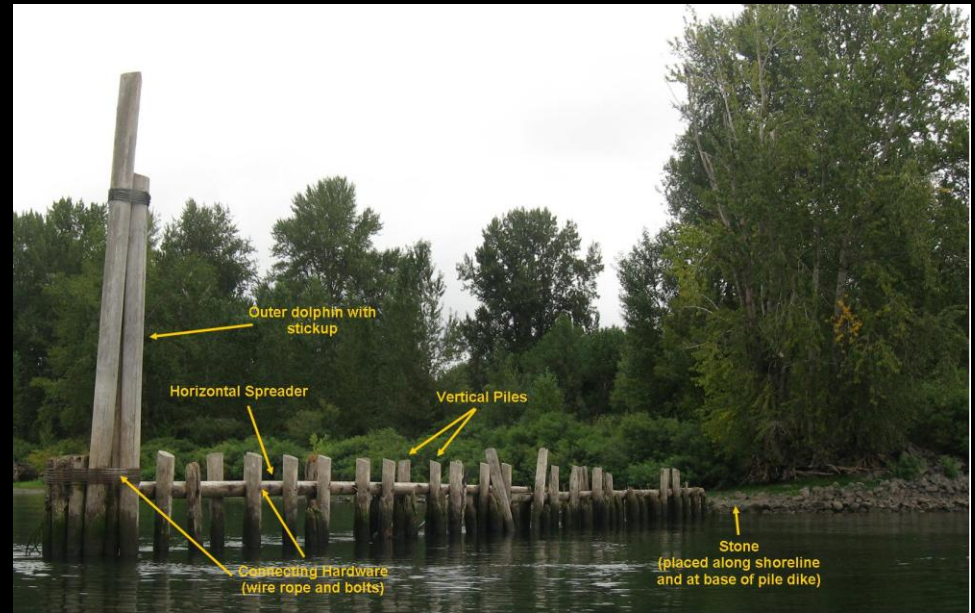
Habitat Type	Change
• Shallow Tidal Flats	+10%
• Deep Water	-7%
• Medium Depth Water	-25%
• Tidal Marsh	-43%
• Tidal Swamp	-77%

# FCRPS Biological Opinion

- FCRPS Action Agencies Include USACE, BPA, and USBR
- FCRPS Consultation With NOAA Fisheries on ESA Listed Species
- Biological Opinion Issued by NOAA Fisheries 2008
- **Action Agencies Concluded That Operation of These Projects Without Further Mitigation, Would Jeopardize Listed Species**
- Mitigation Measures Include 73 Detailed Reasonable and Prudent Alternatives (RPA)
- RPA 38:
  - Increase access to productive habitat
  - Reduce avian predation of juvenile salmonids
    - Piling and Pile Dike Removal Program

# Columbia River Pile Dikes

- Construction Initiated 1885
- Construction Ended in 1960's
- Over 233 Constructed
- River Mouth to RM 138
- Reduce Dredging
- Protect Dredge Material
- Provide Bank Protection
- Stabilize Shipping Channel



# Potential Pile Dike Modifications That May Improve Salmonid Habitat In the Estuary (BiOp AMP)

- Complete or partial removal of pile dikes
- Reconstruction of pile dikes
- Remove creosote-containing piles
- Placement/removal of dredged material
- Placement of LWD
- Replacement of lost habitat types

# Columbia River Pile Dike and Pile Field Examples



**Spur Pile Dike**



**Training Pile Dike**

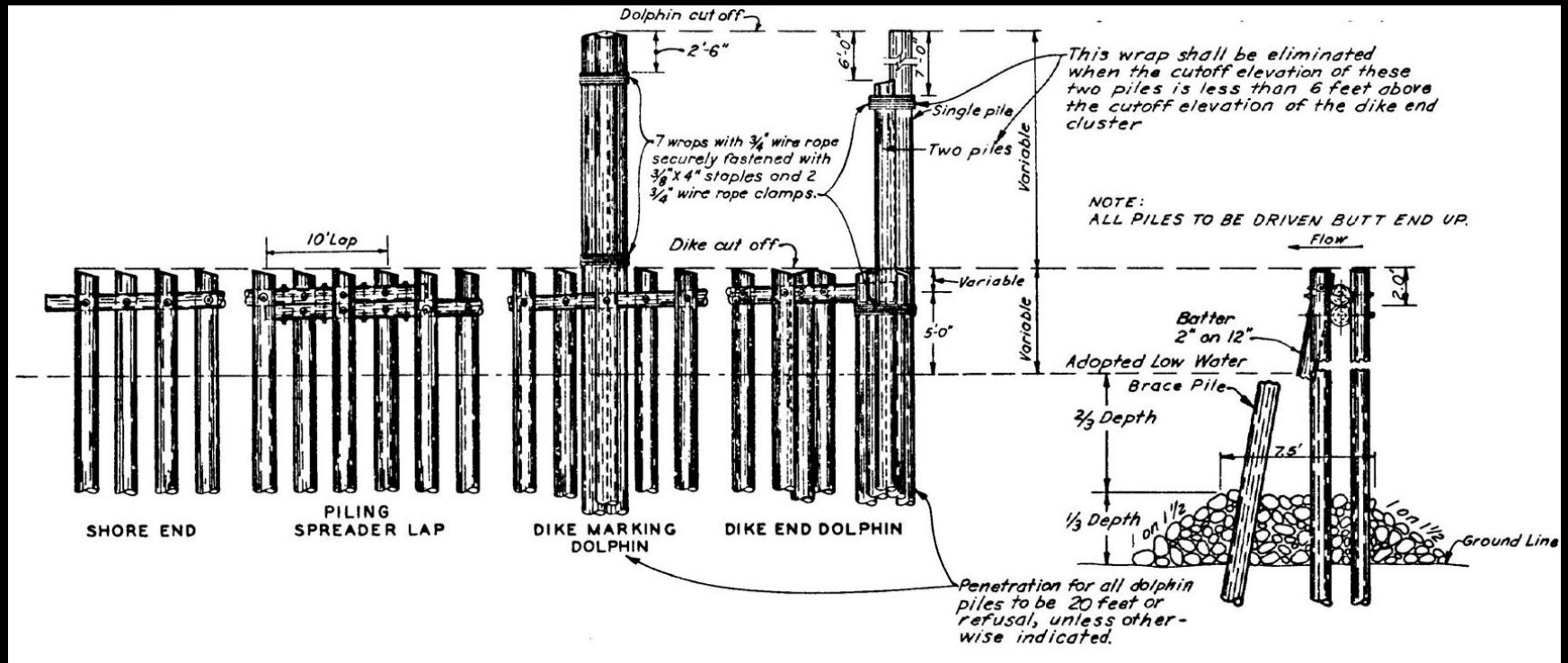


**Transverse Pile Dike**



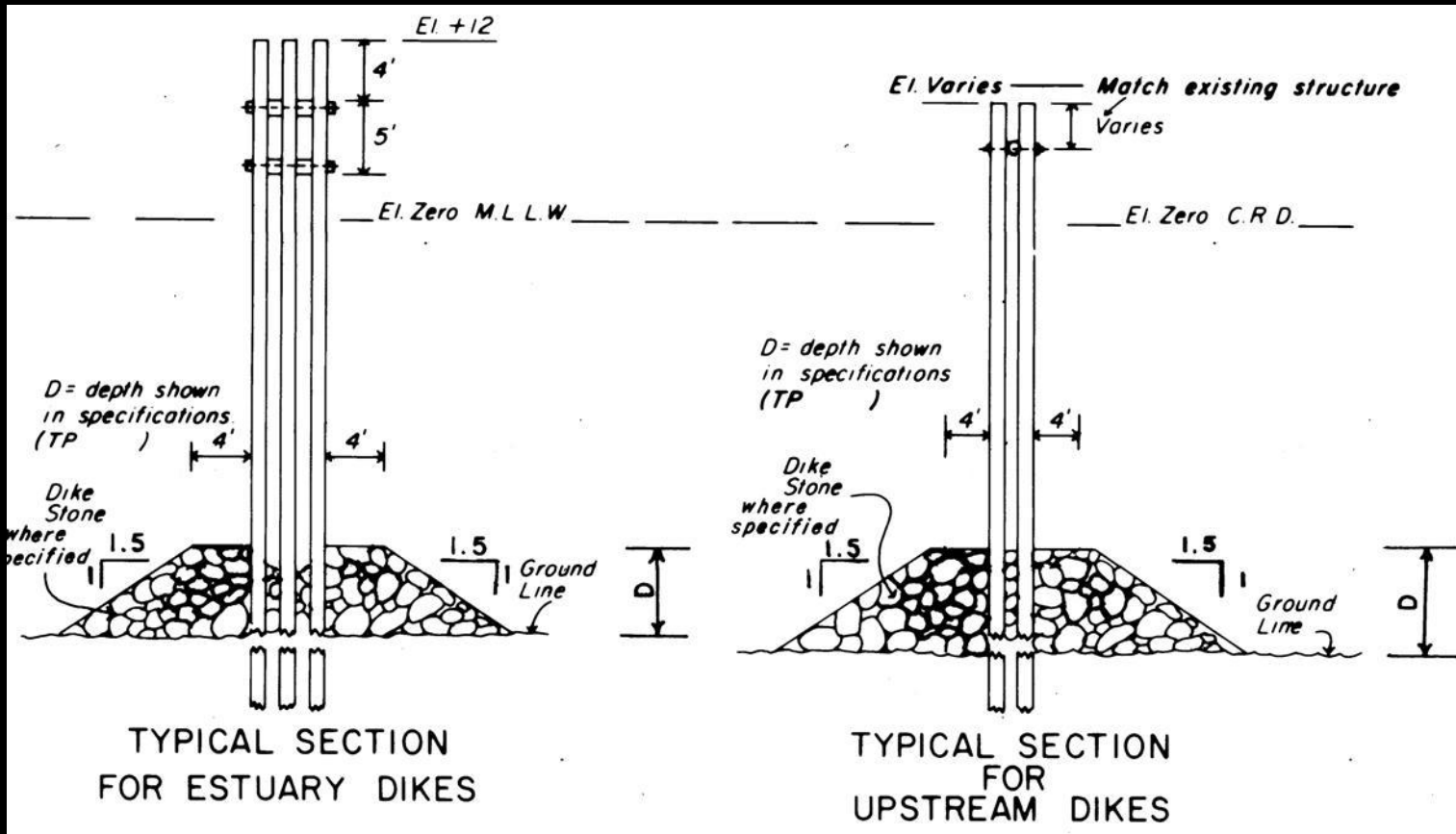
**Pile Field**

# Pile Dike Design and Construction - Elevation





# Pile Dike Design and Construction - Section



# USACE Portland District Pile Dike Assessment

- BiOp Obligation and O&M
- AECOM Assessed Each of 233 Pile Dikes For:
  - Structural Integrity
  - Functional Integrity
  - Potential Impact On Juvenile Salmonids



# Suspected Pile Dike Impacts to Juvenile Salmonids

- Contaminants Leaching From Treated Piling
- Cover For Piscivorous Fish
- Perches For Avian Predators
- Shallow Water Habitat

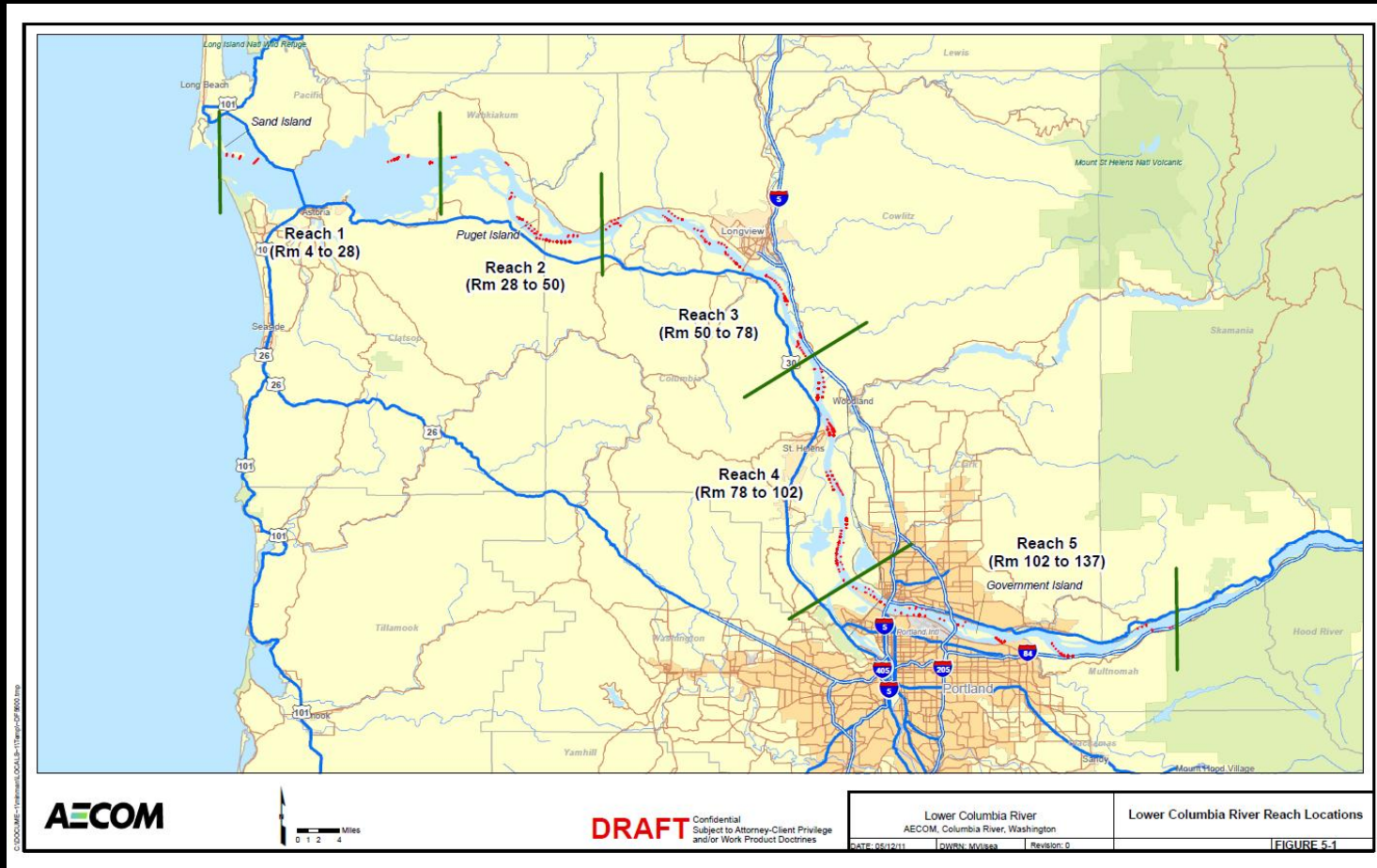


# East Sand Island – Lower Columbia River

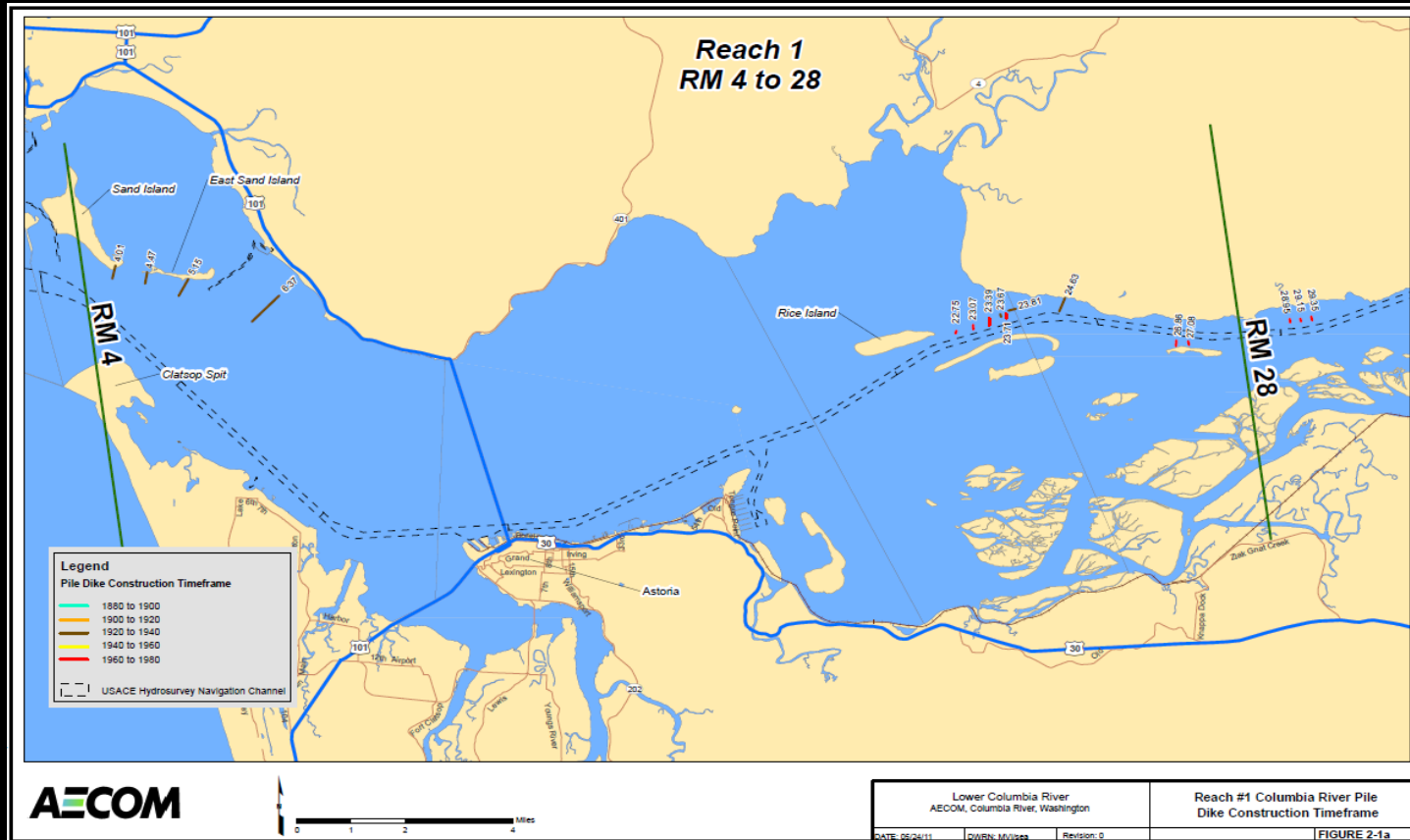
- World's Largest Tern and Cormorant Colonies
- Tern Average Annual Juvenile Salmonid Consumption = 5.3 Million
- Cormorant Consumption Likely Similar
- Island Constructed Of Dredge Material Protected By a Pile Dike System



# Pile Dike Assessment Reach Locations



# Lower Estuary Reach of Assessment



# Habitat Components of the Pile Dike Assessment – Field Work

- Presence/Absence of Shallow Water Habitat
- Presence of Aquatic Vegetation
- Adjacent Wetland Areas
- Presence/Absence of Bank Erosion
- Access to Adjacent Shallow Water Habitat
- Presence of Avian Predators

# Habitat Improvement Opportunities Evaluated

- Removal of Pile Dike (reduce erosion)
- Removal of Individual Piles (improve access)
- Extend Pile Dike (increase shallow water)
- Remove Creosote Treated Piles (improve water quality)
- Place Large Woody Debris (increase cover)
- Place Fill (increase shallow water/decrease bank slopes)



# Pile Dike Assessment Habitat Impact Findings



- Very Few Treated Piling – Not a Contaminant Threat
- Piscivorous Fish Activity Unobservable – Impact Inconclusive
- Avian Perching Observed (Primarily Cormorants) – Impact Inconclusive

# Pile Dike Assessment Habitat Impact Findings

- Juvenile Salmonid Rearing Habitat
  - Creation of Shallow Water Habitat (SWH)
  - Protection of 3800 Acres SWH
  - Bed Erosion Not Noted
  - Adjacent Areas Will Support Creation of SWH
  - Addition of LWD Not Warranted In Main Channel
  - Additional Studies Recommended



# East Sand Island – Lower Columbia River

- Island Constructed Of Dredge Material Protected By a Pile Dike System
- Removal of Pile Dikes May Allow Natural Reworking of Dredge Material
- Role of Large Predators
- 2011 Bald Eagle Harassment of Nesting Colonies: 90-100% Reproductive Loss



# Thank You



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