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Seahurst Park Ecosystem Restoration: Green Infrastructure Components

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Seahurst Park Ecosystem Restoration Project: Restoring the Bluff to Beach Sediment Regime

Presented by Peter Hummel, ASLA, LEED AP
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Acknowledgements

Project Partners

• City of Burien (Owner)
• US Army Corps of Engineers

Anchor QEA Personnel

• Kathy Ketteridge, Coastal Engineer
• John Laplante, Geotechnical Engineer
• David Rice, Civil/Hydraulic Engineer
• Betsy Bermingham, Landscape Architect
• John Small, Phase 1 Landscape Architect/Wetland Ecologist
• Paul Schlenger, Fisheries Scientist (Now at Confluence Environmental)

Subconsultants

• Jim Johannessen, Coastal Geologist, CGS
• Bill Laprade, Hillside Geologist, Shannon & Wilson

Other Monitoring

• Jason Toft, Invertebrate and Salmon Monitoring, University of Washington

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• Washington State
  - RCO: SRFB, ALEA, LWCF
  - Puget Sound Partnership
  - ESRP
• King County/WRIA 9: King Conservation District
Presentation Overview

1. Project Location, Sediment Supply and Transport Context
2. Purpose and Need, Goals, and Challenges
3. Conceptual Approach
4. Sediment Budget, Sustainability, and Monitoring
5. Conclusions
Context: Puget Sound Bluff Habitats

Adapted from a figure by King County Department of Natural Resources and Parks

Source: King County WRIA 9
Context: Bluff to Beach Sediment Supply Processes

Adapted from a figure by King County Department of Natural Resources and Parks
Context: Drift Cell and Feeder Bluffs

Sources: Johannessen et al. 2005
Process-based Restoration Approach

Conceptual Model: The role of Puget Sound nearshore beaches in sustaining forage fish

- Wave energy
- Sediment delivery
- Sediment transport

- Beach profile
- Sediment grain size
- Beach temperature

- Forage fish spawning and production
- Food web support

Project Purpose, Need, and Constraints

• Extensive park armoring has degraded nearshore habitat
• Significant restoration benefits on site and downdrift
• Rare opportunity, landscape position, size of park’s shoreline
• Significant recreational and educational use is constraint/opportunity
Ecosystem Restoration Goals

- Preserve existing high-functioning nearshore habitats
- Restore and protect the natural bluff to beach sediment process
- Restore beach slopes and substrates
- Restore forage fish spawning, juvenile salmon rearing, and migration intertidal habitats
- Restore upland and shallow intertidal habitat connectivity
- Diversify habitat in the freshwater/saltwater interface
Summary Diagram: Pre-project

- Steep Unstable Bluffs
- Landslide Material
- Power Water
- Park Upland Fill & Utilities
- Seawall Toe & Perched Beach Armoring
- Beach Lowering
- Wave Refraction
- Sediment Scour

landslide
Summary Diagram: Completed Project

- Landslide Material
- Restored Beach & Riparian Zone
- Puget Sound
- Projected Sea Level Rise
- Beach Nourishment
- Relocate Park Facilities & Utilities Landward

**Restoration Approach:**
Remove Most Stressors/Relocate Utilities
Sediment Budget

- Estimated Site Annual Bluff Supply Rate\(^1\):
  - Low Estimate: 13.5 cubic yards (CY)
  - High Estimate: 47 CY

- Estimated Annual Beach Sediment Transport Rates:
  - 180 C.Y.: All\(^2\)
  - 200 C.Y.: Phase 1\(^3\)
  - 270 C.Y.: Phase 2

- Imported Beach Substrate, Phase 1:
  - 8,100 CY

- Imported Beach Substrate Phase 2:
  - 24,900 CY

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1. Composition: 25% gravel; 30% silt/clay; 45% sand
2. Richey 1970
3. Johannessen 2009
Sustainability and Monitoring

- Design Life (Phase 2): 50 years
- Potential SLR Effects: Landward shift
- Phase 1 monitoring 2004-2009

Results:
- Beach is relatively stable, localized increases and decreases in sediment
- Lowering of upper beach backshore (updrift project limit)
- Most of beach now suitable sediment size for forage fish spawning (primary goal)
- High utilization by juvenile salmon
- No negative impacts to eelgrass habitat

Source: Coastal Geologic Services

Source: Jason Toft, University of Washington
Summary and Conclusions

• Natural Sediment Supply Key to Restoring Processes
• Imported Sediment Necessary to Repair Bulkhead Impacts
• Research Needs
• Resiliency to Sea Level Rise
• Balancing Restoration and Public Use
• Interagency Cooperation and Funding Support
Thank You!

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Example 2, Phase 2 Restoration
Example 2, Suburban Setting: Summary

- Infrastructure Impacts Addressed: Seawall/Rock Armoring, Park Facilities, Emergency and Maintenance Access, Utilities
- Resiliency to Sea Level Rise: Moderate
- Design Life: 50 years
- Implementation Cost: $12,000,000
- Year Implemented:
  - Phase 1: 2005-2008
  - Phase 2: 2013-2014