

Green Stormwater in the Shoreline



WA/OR APA Conference
October 20, 2011

Presented by
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Our Presentation

- So What's the Problem?
- What are the Building Blocks?
- Fresh Approaches
 - Case Study: Juanita Beach Park, Fresh Water
 - Case Study: Coupeville, Marine Water
- Looking Into the Future




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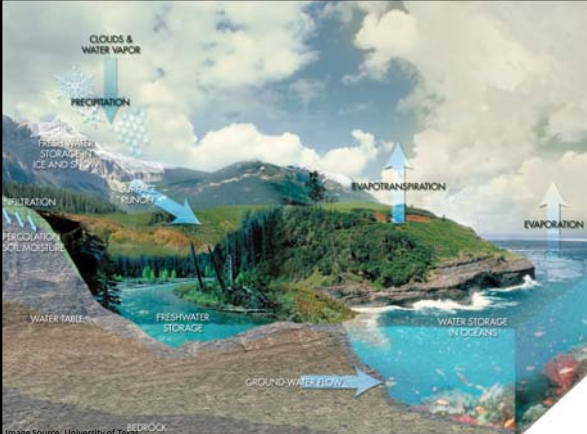
The Story of Water



The Story Of Water



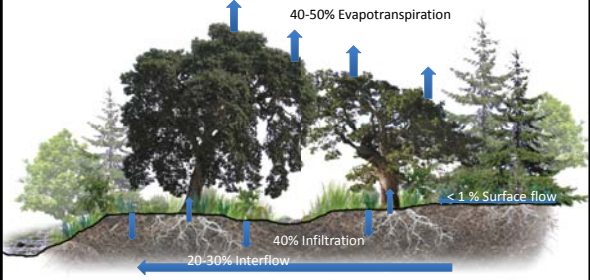
Puget Sound Watershed



CLOUDS & WATER VAPOR
PRECIPITATION
FRESHWATER STORAGE: ICE AND SNOW
EVAPOTRANSPIRATION
EVAPORATION
SURFACE FLOW
PERCOLATION: SOIL MOISTURE
WATER TABLE
FRESHWATER STORAGE
GROUND-WATER FLOW
WATER STORAGE IN OCEANS

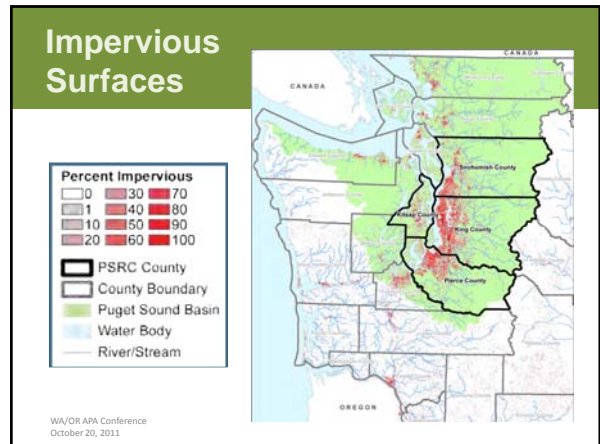
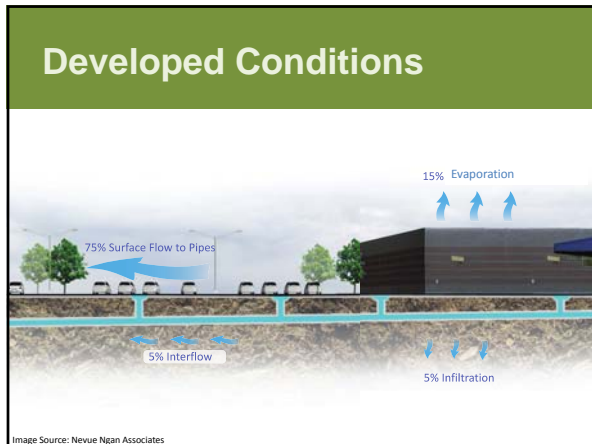
Image Source: University of Texas A&M

Predevelopment



40-50% Evapotranspiration
< 1% Surface flow
40% Infiltration
20-30% Interflow

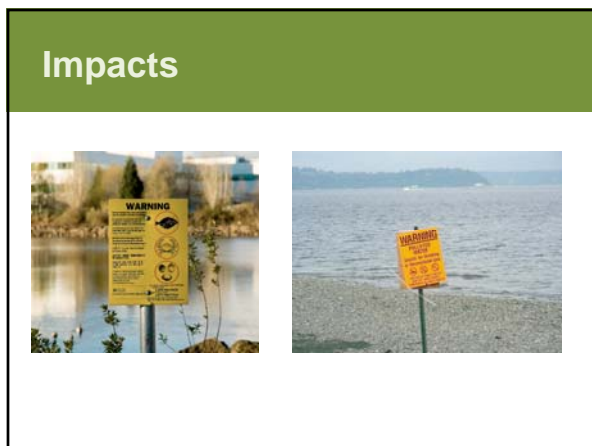
Image Source: Nevue Ngan Associates



Stormwater Outfalls

- **4,529** public manmade outfalls
- **2,123** Natural Outfalls
- **93** Combined Sewer Overflow Outfalls
- **297** WSDOT Outfalls
- **70** WSDOT Bridges

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National Recognition

FRONTLINE

POISONED WATERS

A far-reaching investigation into America's great waterways. They are in peril. There's a new wave of pollution that's killing fish, causing mutations in frogs — and threatening human health.

Watch the full program

Join the Discussion
So What's Safe to Eat & Drink?
Weren't Our Waters Supposed to Be Cleaned Up Years Ago?
I Want to Get Involved...

Introduction



Regulatory Landscape

- Usual Suspects:
 - Local, State and Federal Governments
- Key Shoreline Provisions
 - NPDES
 - US Corps of Engineers
 - WA- Shoreline Master Programs
 - Floodplain

Federal Government:
 Clean Water Act
 Endangered Species Act (ESA)
 Compliance
 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

State Government:
 NPDES



Local Planning:
 Comprehensive Plans
 Critical Area Ordinances
 Shoreline Master Programs
 Tribal Relations

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Introduction

- Personal passion for the shore and water resources
- Pressure to improve water quality
- Intense shoreline use pressures
- Multi-benefit ecological solutions
- Science based design

Jim Brennan, Principal
J.A. Brennan Associates, PLLC

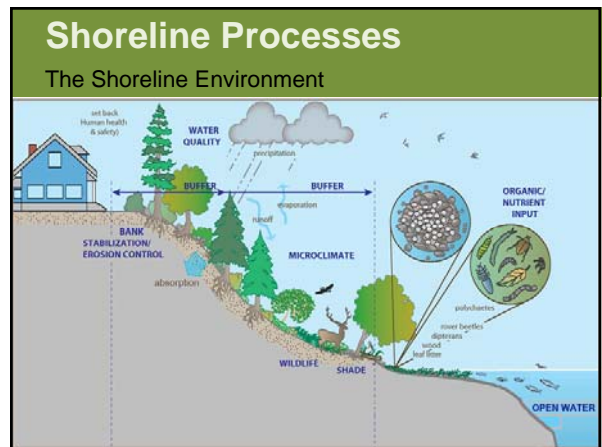


Shoreline Processes & Systems

The Shoreline Environment

- Vegetation, fish, wildlife
- Lake level changes
- Human use / structures





Shoreline Processes & Systems

Multi-benefit green shore elements

- Can people use areas that have ecological function?
- Can wildlife or fish use it?
- Is it beautiful?
- Do people learn from the experience of the site?
- What compromises are made?

Design for Shorelines & Riparian

Juanita Beach Park, Kirkland, WA
 City of Kirkland Parks & Community Services
 Michael Cogle Project Manager

J.A. Brennan Associates, PLLC
 Landscape Architects



Green Stormwater in the Shoreline

- Sediment deposition (40,000 tons/year)
- Pollutants from parking lot – drained to swimming beach




Pollutants

Pollutants from parking areas include

- Oil
- Grease
- Sediment
- Heavy metals
- Phosphorus





Green Stormwater in the Shoreline

Problems:

- Pollution from lawn run-off (goose droppings, nutrients)
- Reduced mixing of lake water (breakwater)
- Swimming beach often closed




Goal Oriented Design

Project Goals

- Passive recreation
- Community building
- Water quality / summer swimming
- Habitat enhancement
- Education

Process

- Extensive public involvement
- City decision making process
- Regulatory input
- Grant criteria




Science / Specialist Guided Design

- Landscape Architect lead
- Limnology
- Water quality science
- Wetlands science
- Soils / geotechnical
- Fisheries biology
- Wildlife biology
- Geomorphology
- Hydrology
- Archaeological




Project Overview

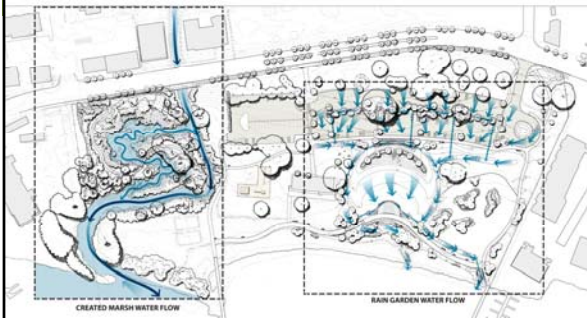
- Regulatory input
- Change in wetland criteria during project design



Juanita Beach Park



Water Quality Treatment Marsh



Before

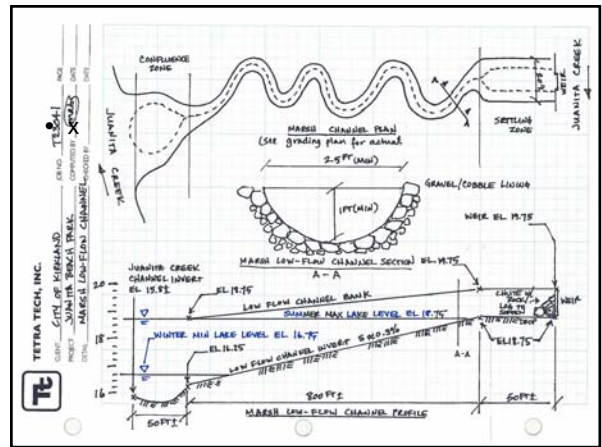


Flood Conditions



Water Quality Treatment Marsh





Water Quality Treatment Marsh

Lessons Learned

- Narrow project goals – avoid sediment control
- Consider maintenance requirements
- Target time of year for treatment
- Accommodate fish and wildlife
- Communicate w/ regulators through process



Commons and Parking Design



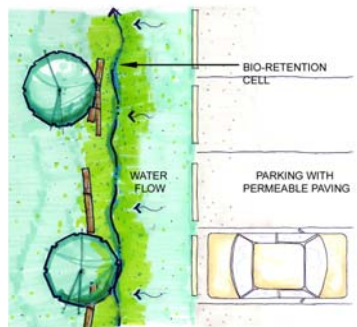
Raingardens / Bio-retention



Treating Stormwater at the Source

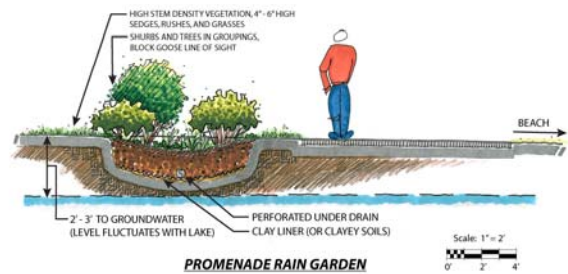
Rain gardens / bio-retention areas intercept and infiltrate stormwater on the site.

- Mimic natural hydrologic cycle
- Soils and plants filter pollutants
- Infiltration
- Evaporation
- Transpiration
- Ground water recharge



What makes a rain garden?

Landscape area with amended soils where water is directed by sheet-flow, pipes, or swales



Treating Stormwater at the Source

- Groundwater / soil aeration
- Overflow for peak events
- Native plants
- Maintenance considerations
- Work around existing trees



Swale Construction








Bioswale and Shoreline Wetland Restoration

Lessons Learned

- Remain flexible in design process
- Consider alternatives to lawn (native meadows)
- Carefully consider groundwater levels
- Plan for temporary and permanent erosion control in swales
- Consider timing and sequencing of construction



Design for Shorelines & Riparian

Conclusion

- Park Acreage +/- 14 Acres
- Eliminated +/-111,651 S.F. (2.5 Acres) acres of lawn
- Oxbow Marsh Created Mitigation 18,992 S.F. (.43 Ac)
- Wetland Mitigation Enhancement 8,715 S.F. (0.2 Ac)
- LID stormwater facilities rain garden and biofiltration (20,464 S.F.) (.47)
- Improved fish riparian habitat (+/- 63,480sf) (1.45 ac)
- Removed 60 trees
- Planted 877 trees
- Improved wildlife habitat
- Better water quality
- Recreational benefit

Waterfront Stormwater Solutions Town of Coupeville



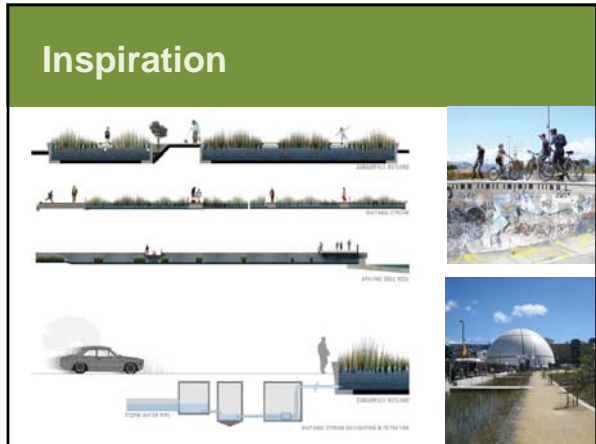
GREEN FUTURES LAB

Leslie Batten, Nancy Rottler, Leann Andrews, Abbin Estiri
 Advisory Committee: Dr. Richard Horner (UW), Dr. Sally Brown (UW),
 Curtis Hinman (WSU), Peter Hummel (Anchor QEA, LLC), Dr. Chris May
 (Kitsap Co), Heather Trimm (People for Puget Sound)


Inspiration



Inspiration

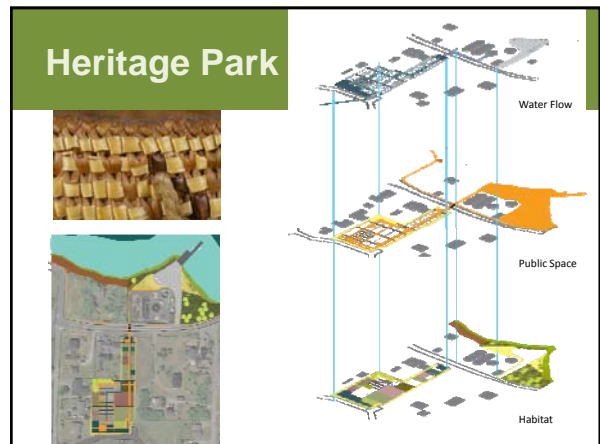
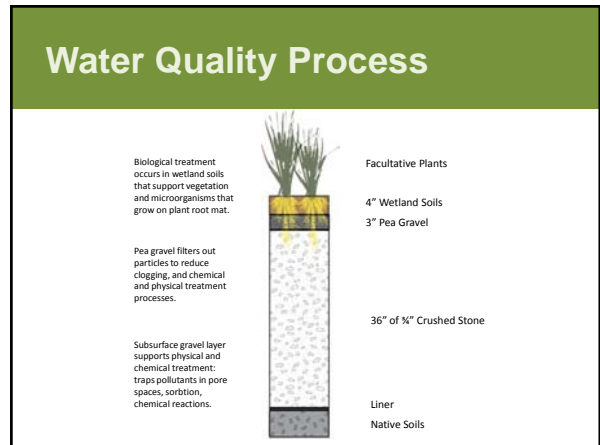
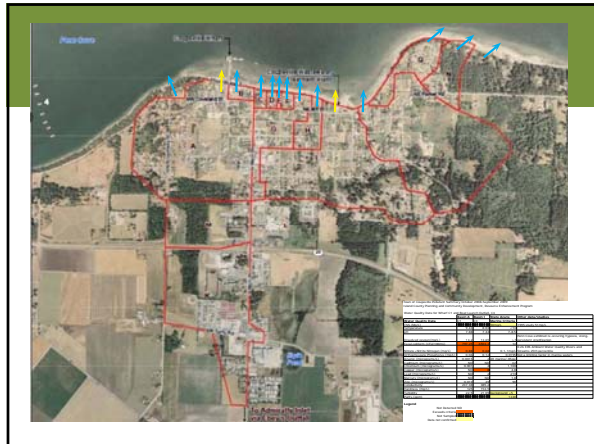


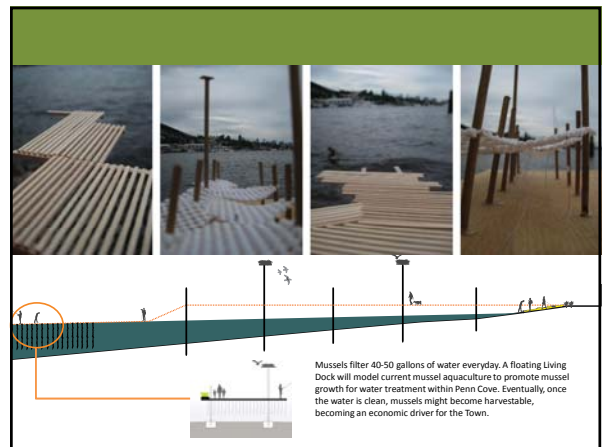
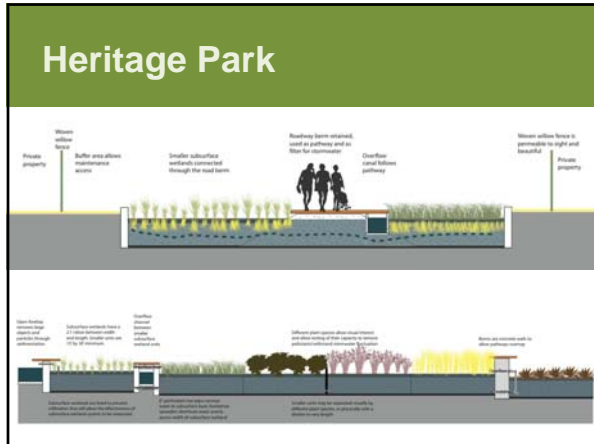
Coupeville



Oldest and largest shellfish industry in Wa State, and the country.
 Photo credit: Penn Cove Shellfish

Historic District protects heritage and attracts tourists.
 Photo credit: Leslie Batten





Framework for Expansion

The diagrams show various urban planning approaches for stormwater management expansion, including waterfront integration, grid-based systems, water flow optimization, outfall placement, transport infrastructure, and overall expansion strategies.

Subsurface Wetlands

Target Pollutants: Suspended solids, metals (Zn), bacteria, nitrogen, minimal phosphorus

Key features

- pre-filtering to prevent clogging
- anaerobic zone addresses nitrogen
- wide inlet to evenly disperse influent
- smaller area than wetland
- closed system, not exposed to air
- insect vectors and smells reduced
- simple construction
- require maintenance
- flow patterns adaptable to space constraints
- horizontal flow reduces clogging

Sizing

- width more important than depth
- 2:1 width to length ratio
- aspect ratio, slope, infiltration rate of media

Sandec/ewag

Thoughts from an Engineer...

A photograph showing a green stormwater infrastructure site with a circular pipe opening in the foreground, surrounded by grass and trees.

On our way forward....

A photograph of a rocky shoreline with driftwood and a view of the ocean under a clear blue sky.

Solutions are multifunctional Create spaces that support wildlife and people

A collage of six images showing various green infrastructure projects and waterfront developments, including a boardwalk, a park area, a waterfront walkway, a green roof, a wetland area, and a modern building.

Tabor to the RIVER: Brooklyn Creek Basin Program Active Project Areas

Tabor to the River

- Tabor to the River integrates hundreds of sewer, green stormwater management, tree planting and other watershed projects to improve sewer system reliability, stop sewer backups in basements and street flooding, control combined sewer overflows (CSOs) to the Willamette River, and restore watershed health.

<http://www.portlandonline.com/bes/index.cfm?c=47591&a=358466>

Take Aways....

- Education Green Futures Lab
- Funding sources En
- Land use codes CAO and SMs
- Creative land ownership and Covenants Yesler Terrace
- plant selections



What are your ideas