Kelley Creek Confluence Restoration

Holly Walla, PE, City of Portland
Janet Corsale, PE, Inter-Fluve, Inc.

Risk in Restoration

Portland Watersheds

Kelley Creek
Design Goals

- Reduce downstream flooding
- Improve water quality
- Provide fish and wildlife habitat

Funding Partners

- City of Portland
- FEMA
- OWEB ($655K grant)
- NOAA ($75K grant)
- DEQ (state revolving fund loan)
**Project Cost**

- Design $323k
- Construction $960
- Monitoring $62k
- Total $1.345 million

**Background**

- 1930's

Works Progress Administration straightened, deepened and rock lined Kelley Creek and Johnson Creek to prevent flooding
Background

- Stream gradient
- Flooding
- Floodplain disconnection
- Stream temperature
- Urban neighborhood

Existing Conditions
(2-year flood)

Risks/Constraints in Urban Area

- Property ownership
- Flooding and property damage
- FEMA regulation
Risks/Constraints in Urban Area

- Large wood placement
- Pollution from street runoff
- Neighborhood children/safety
- Attractive nuisance during construction
- Public access/disturbance
Channel Design

• Identify risk
  ➢ flooding
  ➢ avulsion
  ➢ incision
  ➢ large wood

• Develop design criteria
  ➢ describe risk and uncertainty
  ➢ define acceptable level of risk
  ➢ resolve conflicting goals
  ➢ establish shared expectations
  ➢ evaluate project success

Criteria for Natural Channels

• Aquatic habitat
• Channel form
• Floodplain
• Revegetation
• Vertical Stability
• Lateral Stability
• Construction
Criteria for Natural Channels

• Deformable Channel Boundaries
  - 0.5 to 5 Year Recurrence Interval Between Boundary Adjustments
  - Deformation supplies critical habitat components

Criteria for Other Channels

• Defining Appropriate Limits for Deformation
  - 25 to 100 year intervals between boundary adjustments
  - Imposition of geology to reduce risk to Infrastructure
Design criteria for discharge

- 9-month flood (channel design)
- 100-year flood (FEMA)

<table>
<thead>
<tr>
<th>Storm Event</th>
<th>Design Flows (cfs)</th>
<th>Kelley Creek</th>
<th>Johnson Creek (above confluence)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9-month</td>
<td>210</td>
<td>480</td>
<td></td>
</tr>
<tr>
<td>2-year</td>
<td>380</td>
<td>850</td>
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</tr>
<tr>
<td>10-year</td>
<td>650</td>
<td>1,500</td>
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<tr>
<td>100-year</td>
<td>960</td>
<td>2,100</td>
<td></td>
</tr>
</tbody>
</table>

Floodplain Reconnection

Before Construction 2-year flood
summer low flow

winter low flow
winter low flow
Avulsion

Avulsion Pathways
Floodplain Roughness
Lateral Stability

- Short-term
  - wood
  - fabric
- Long-term
  - vegetation
Lateral Stability

Large Wood Bank Treatment

1

2

3

4
Anchoring
Vertical Stability

Riffles 1-4
$D_{50} = 3$ inches

Riffle 5
$D_{50} = 14$ inches