Session 4:
Engineering with Nature

A Federal Agency Perspective

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Presented March 28, 2019
Protecting Infrastructure: Gray vs Green
Changing the Mindset of standard engineering practices
Engineering with Nature

> Just search:
  “engineering with nature FEMA”
Engineered Log Jams

Source: USFS Soil
Bioengineering Guide, 2002
Log Jam with Geolift example (King County)
An erosive event and the desired outcome???

Proposed FEMA Project - Hoh River
The Federal Effort
National Environmental Policy Act (NEPA)

• Identify Alternatives incl avoidance
• Assessment of impacts and identification of mitigation
• Public involvement
• Disclosure of final determination
EO 11988: Floodplain Management

EO 11988 Floodplain Management **goals** are to:

- **Reduce risks** of flood loss to minimize impact of floods on human safety, health, and welfare
- **Restore and preserve** the natural and beneficial values of floodplains
- **Avoid direct and indirect support** for floodplain development when there is a practicable alternative
ESA: Federal Agency Requirements (Section 7)

- Requires all Federal agencies to evaluate the effects of their actions on listed species and their critical habitats.
- Requires consultation prior to project approval if affects
- **Must** minimize Take (Kill, injure, harm, harass, etc)
Action Categories

1. Transportation related
   (4 Categories)
2. Habitat Restoration related
   (6 Categories)
3. In-water and Over-water Structures
   (4 Categories)

- Each Action Category has Project Design Criteria (PDC)
Transportation-Related Actions

• Road, Culvert, Bridge repair, rehabilitation, and replacement

• Stormwater facilities

• Utilities

• Streambank & Channel stabilization
Project Design Criteria: **42. Streambank and channel stabilization**

e. **Alluvium placement** can be used as a method for providing bank stabilization using imported gravel/cobble/boulder-sized material of the same composition and size as that in the channel bed and banks, to halt or attenuate streambank erosion, and stabilize riffles.

vii. Spawning gravels will constitute at least one-third of the total alluvial material used in the design.
Habitat Restoration-Related Actions

• Streambank Restoration
• Boulder Placement
• Large Wood Placement
• Off-and Side-Channel Habitat Restoration
• Set-back Existing Berms, Dikes, and Levees
• Water Control Structure Removal
Project Design Criteria: 45. Large Wood Placement

d. Anchoring alternatives may be used in preferential order: 1) use of adequate sized wood sufficient for stability; 2) orient and place wood in such a way that movement is limited; 3) ballast (gravel and/or rock) to increase the mass of the structure to resist movement; 4) use large boulders as anchor points for the large wood.
In-Water and Over-Water - Related Actions

• In-Water or Over-Water Structures
• Dredging to Maintain Vessel Access
• Dredging to Maintain Functionality of previously authorized channels, culverts, water intakes or outfalls
• Debris Removal
Project Design Criteria: **27. Broken or Intractable Pile**

a. If a pile breaks above the surface of uncontaminated sediment, or less than 2 feet below the surface, make every attempt short of excavation to remove it entirely. If the pile cannot be removed without excavation, drive the pile deeper if possible.
So now that the stage is set, are we getting desired outcomes?
Coal Creek Bank Stabilization

• View of the completed Coal Creek project looking downstream. Length of bank stabilization work is approximately 600 linear feet.

Picture taken on September 12, 2018 by D. Spicer, WA EMD

Pictures of the Coal Creek Drive Long Term Bank Protection Project DR4253 Public Assistance Project
Coal Creek Bank Stabilization

“The Coal Creek Drive Washout repair project in Lewis County won the American Public Works Association (APWA) Project of the Year Award in the under $5M category...”

“Also of note is how quickly this project was completed—this is a 2016 declaration and the project required extensive in-water work.”
Questions?

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