Oregon Floodplain Attenuation Impact Mitigation Tool

OFAIM: A Decision Aid Tool for Regulating and Restoring Floodplain Function

Columbia River Estuary Conference

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Overview

- Tool Context & Need
  - Physical Basis (Flood Resiliency on the Landscape)
  - Legal Basis (NMFS & FEMA)
- Tool Concept & Development
- Applications

Physical Basis

Developed vs. Resilient Floodplain

Concentrated Stream Power
- Incision
- Flood Risk
- Pollution

Diffused Stream Power
- Storage
- Attenuation
- Habitat
- Water Quality

Physical Basis

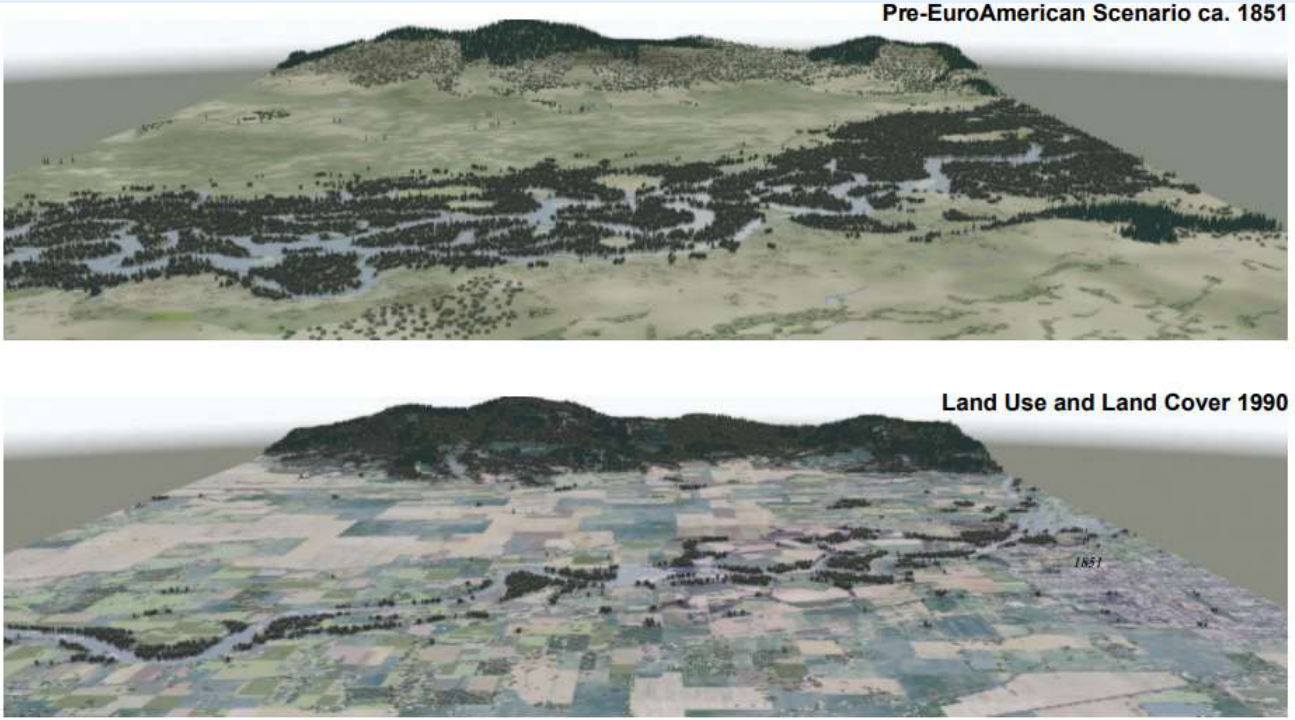


Figure 4. Computer simulation of the upper Willamette River and floodplain between Harrisburg and Eugene-Springfield, ca. 1850 and ca. 1990.

(EPA, 2002) Willamette Basin Alternatives Future Analysis

Legal Basis

NMFS-FEMA BiOP – Compensatory Mitigation

"no net loss or beneficial gain" of natural floodplain functions

a. The **addition of fill**, structures, levees, and dikes, which reduces flood storage and fish refugia, impedes habitat forming processes, increases flow volume and velocity thereby eroding stream banks and beds, and alters peak flow timing thereby increasing risk of injury to redds, fry, and alevin;

b. The **addition of impervious surfaces**, which reduces hyporheic function and stream recharge, increases storm water, pollutant loading, water temperature, velocity, and scour, and modifies peak and base flows;

c. **Vegetation removal**, which reduces shade, detrital input, velocity refuge, and habitat complexity and increases storm water and erosion; and

d. **Bank armoring**, which reduces instream habitat values and impedes habitat forming processes.

Wait… What does NOAA really want?*

- Steer new development away from the 100-year floodplain and avoid new development whenever possible within “core” floodplain
- Minimize impacts of new development and redevelopment that does occur
- Effective compensatory mitigation of impacts to flood storage, riparian vegetation, and stormwater infiltration

*Sara’s interpretation

Tool Development - Objectives

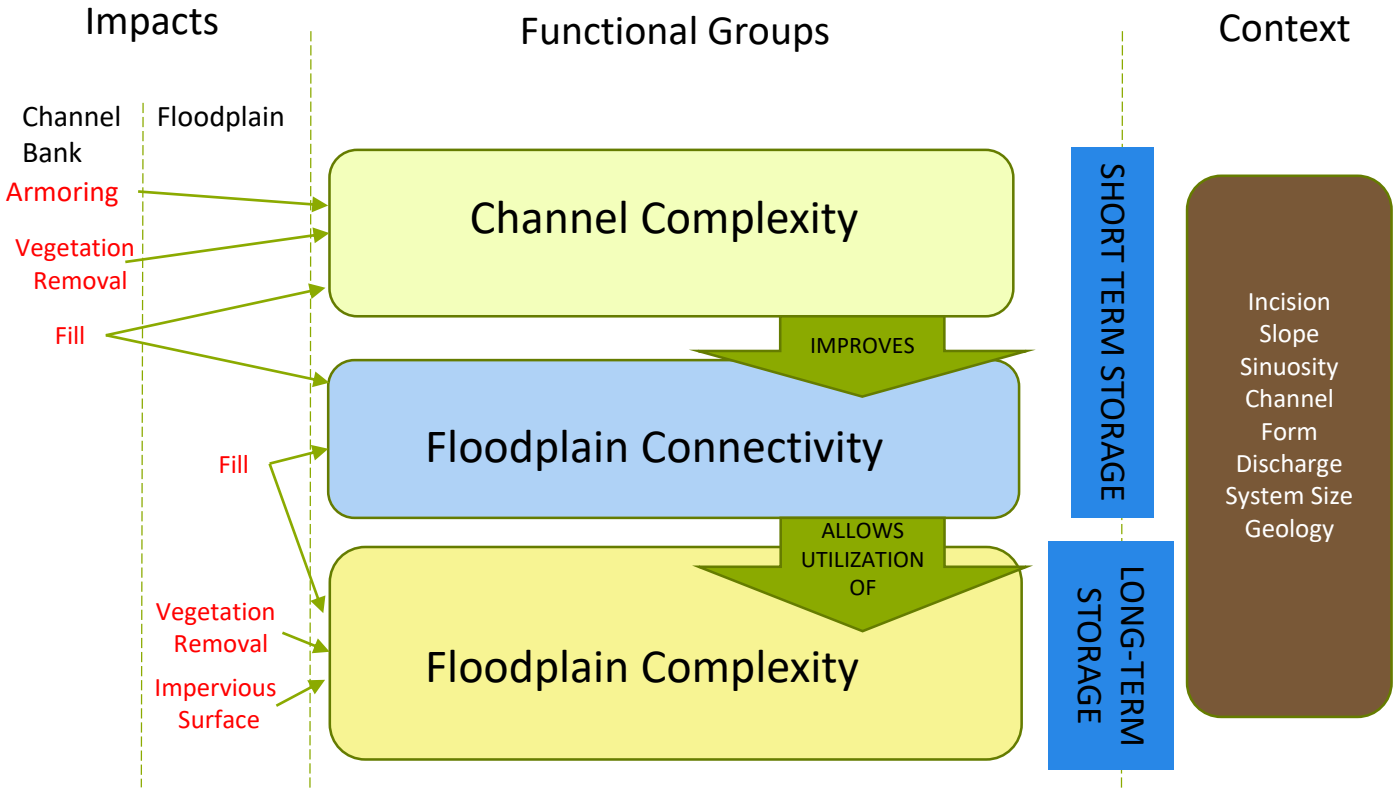
Develop a tool that,

- Enables effective compensatory mitigation for floodplain development impact
- Uses inputs that are available or cheap to develop
- Addresses cumulative small scale impacts
- Avoids foreseeable misuse

Tool Development – Challenges/Constraints

- Systems not sensitive to small scale impacts
- Floodplain Storage and Attenuation occurs on
    - multiple timescales
    - variable magnitudes
    - varying levels of importance
- Desire to compare out of kind impacts and mitigations

Tool Development – Conceptual Model



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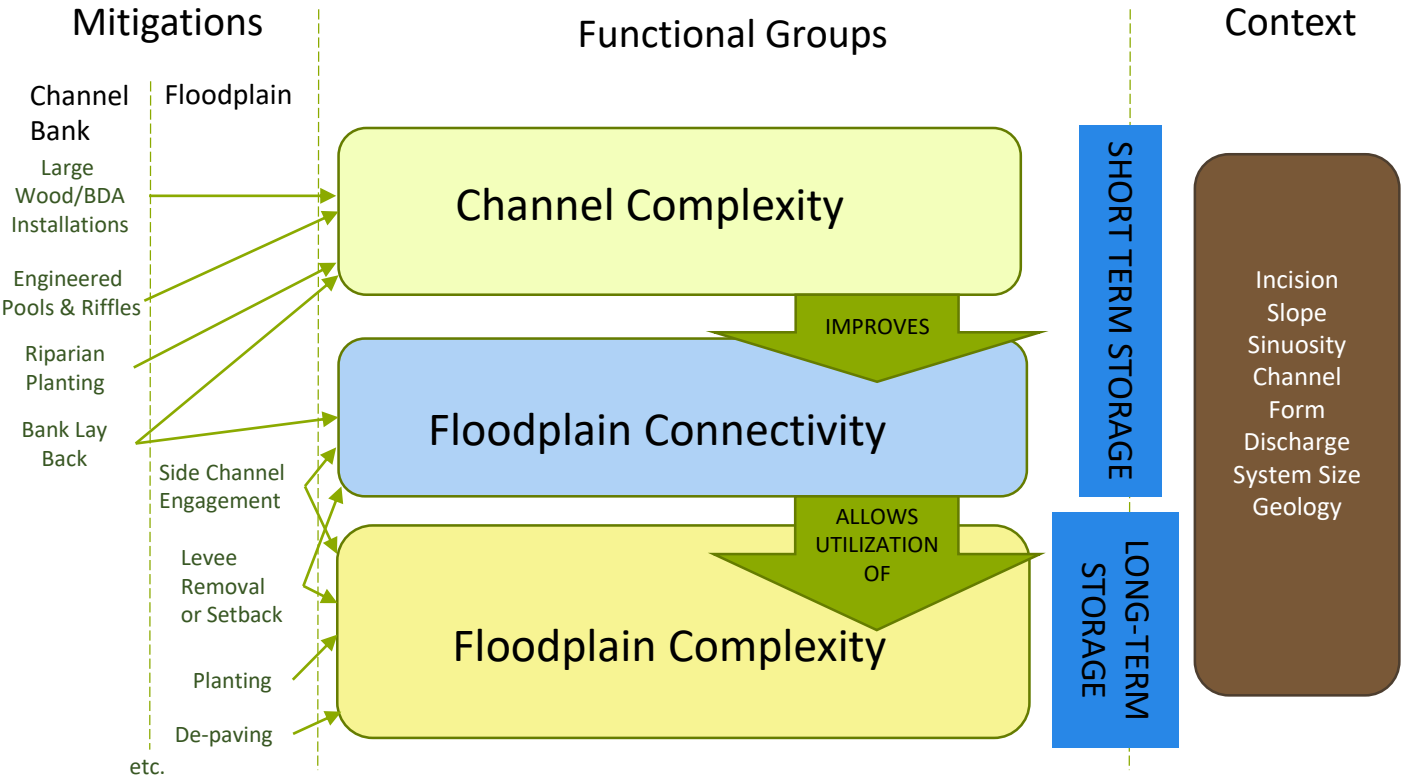


Tool Development – Architecture

Impacts:
Fill
Vegetation Removal
Impervious Area
Armoring

Site Context

Quantify **scale** of impacts on the landscape by relative size and **quality** of those impacts by interaction with

- Connectivity (proximity to ordinary high water)
- Complexity (roughness change)

Mitigation:
Fill removal
Revegetation
De-paving
Armor Removal
Large Wood
Beaver Dam analog
Levee setbacks/removal
Layback Streambanks

Cumulative Impacts addressed by per unit impact and mitigation values

Floodplain Function Score for Storage/attenuation

Tool Development – Parameterization

A - Action area

B - Action length (see Special Cases)

C - Action (Fill) width

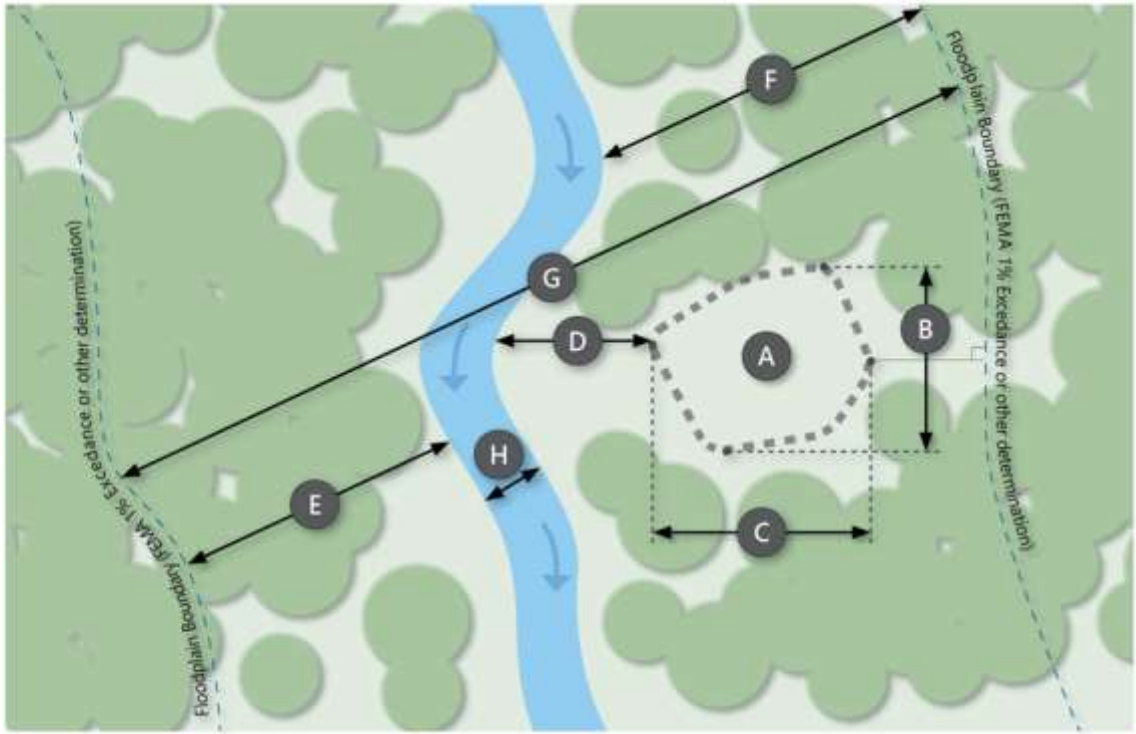
D - Horizontal distance from OHW

E - Left specific floodplain width

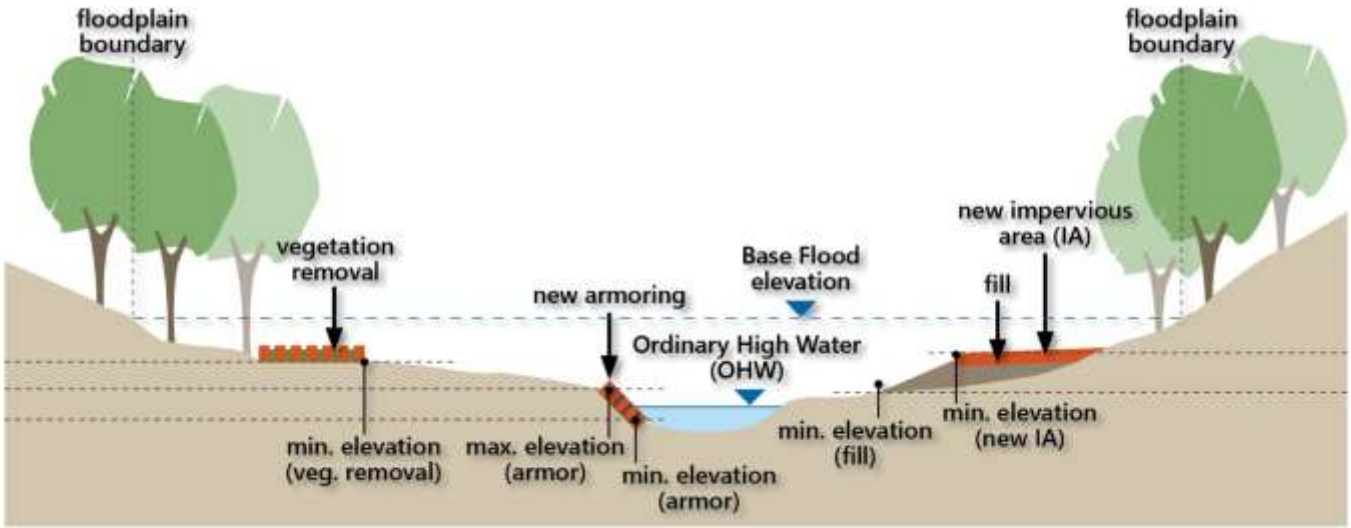
F - Right specific floodplain width

G - Floodplain width

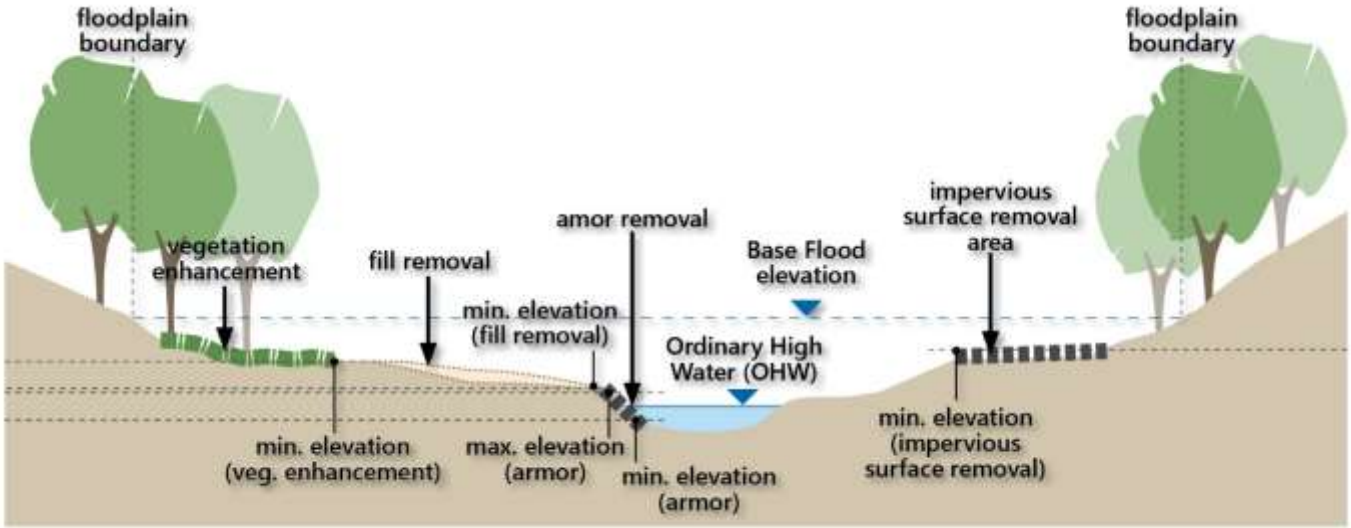
H - Ordinary High Water (OHW)



Tool Development – Parameterization



Tool Development – Parameterization



Tool Application

Uses for the tool include

- Assessing mitigation options for development
- Prioritizing development land use
- Prioritizing restoration/enhancement
- Anything else?

Questions?

Contributors:

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[1]:*Wolf Water Resources, Inc.* [2]:*The Willamette Partnership*