

Bridge Design

Design Constraints

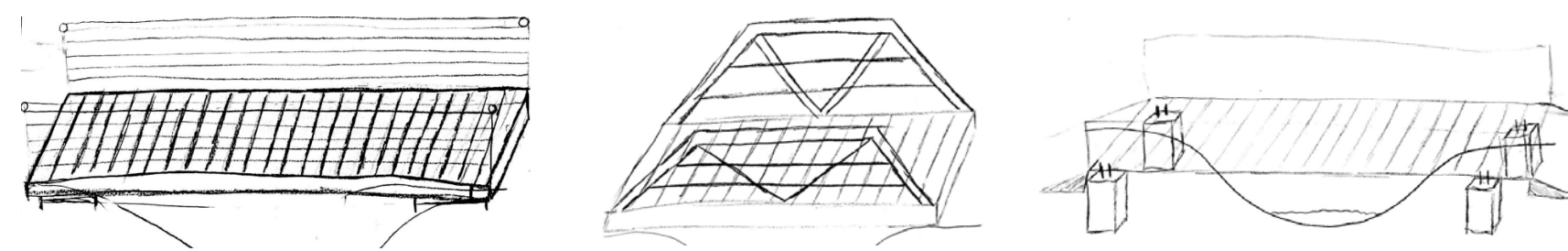
- ADA accessible
- Engineering focal point
- Promote pedestrian access

Geometry Constraints

- 20 ft wide stream channel
- Existing concrete supports on east bank

Conceptual Solutions

- 8 ft wide x 30 ft long



Selected Design

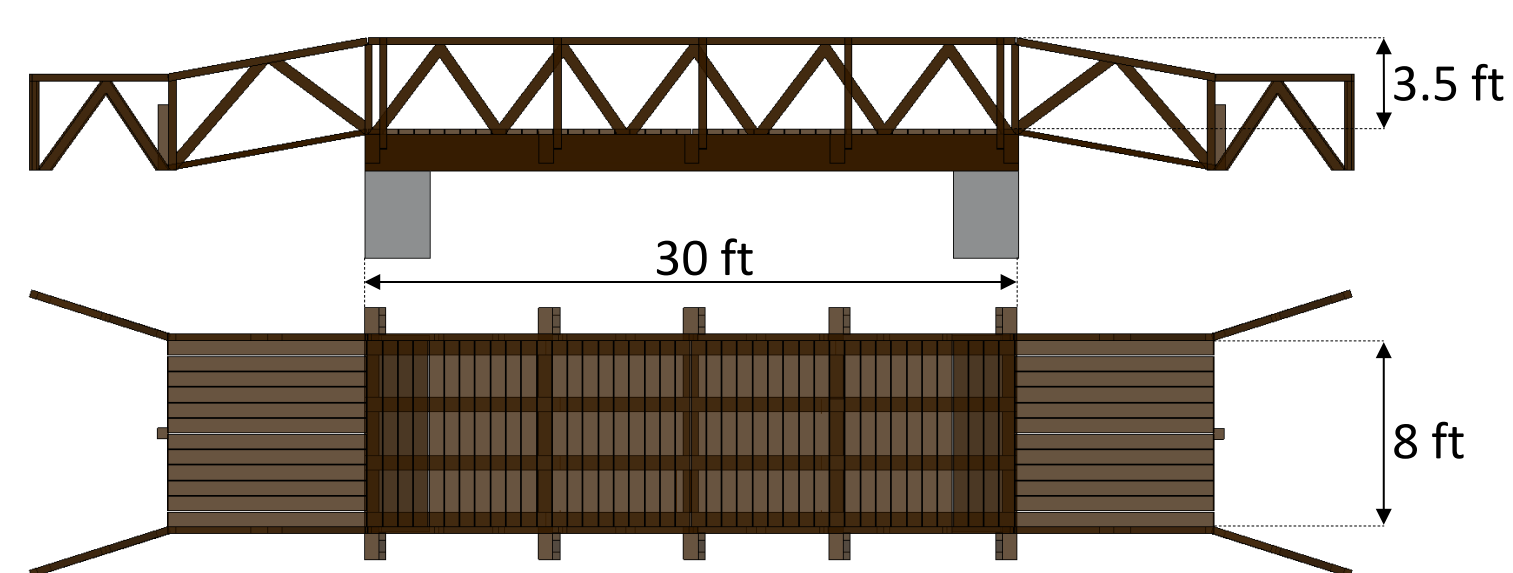
- Douglas-fir
- Simply supported
- Half-through truss type aesthetic

Structural Analysis

- Performed using RISA 3D

Load Category	Description
Dead Load	Self-weight of bridge
Live Load	Equestrian load, 1000 lb
	Pedestrian load, 100 psf
	Pedestrian railing load, 50 lb/ft
Site Effect Load	Wind load, 46.3 psf
	Wind uplift load, 20 psf
	Snow load, 37.6 psf
	Earthquake load, N/A

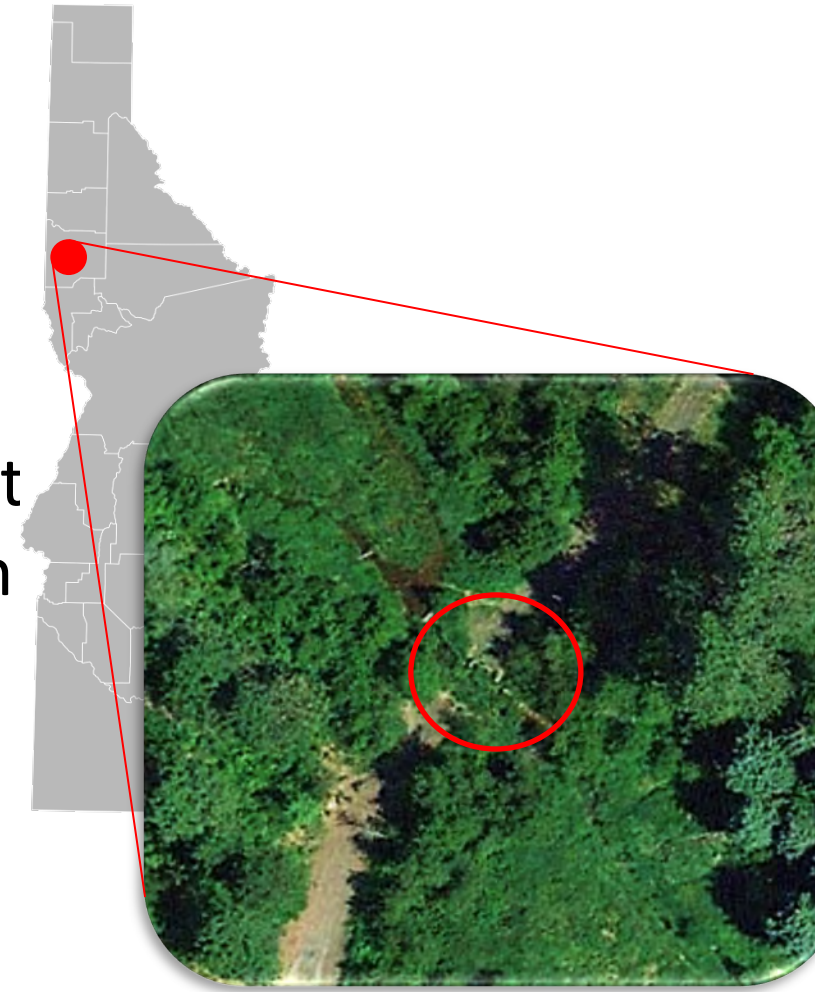
Recommended Design



Member Description	Nominal Size (in)
Deck Plank	3x8
Stringer	10x20
Truss	4x6
Railing	4x4
Blocking	8x16
Truss Bracing	4x4

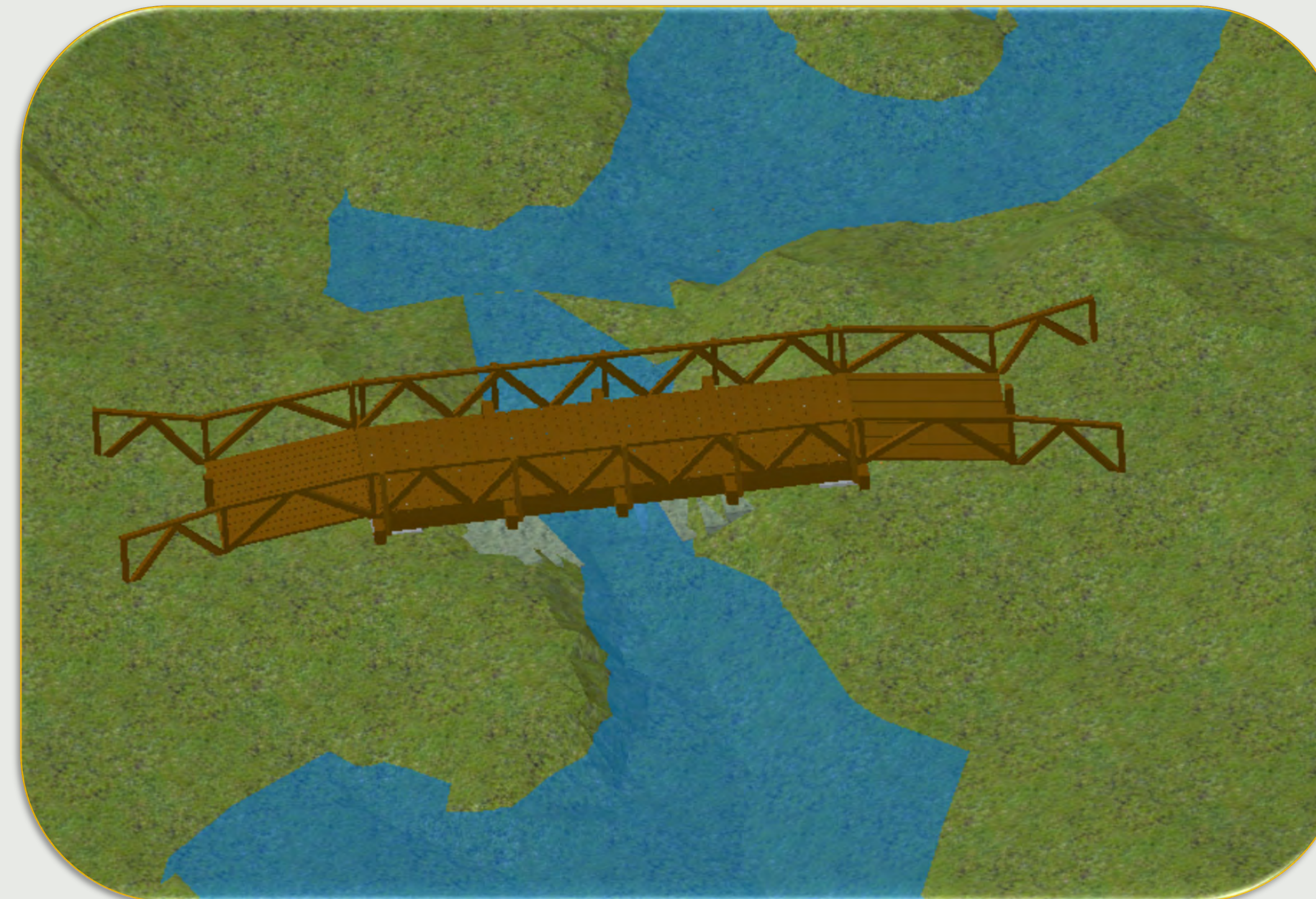
Background

Anadromous steelhead have been blocked from reaching the headwaters of Big Meadow Creek, outside Troy, ID, for over 100 years. In the early 2000s, a flood washed out the culvert at the project site. As part of the goal to return steelhead to upstream habitat, the Design Team has been tasked with designing a new timber bridge to cross Big Meadow Creek and developing a stream restoration plan.



Objectives

- Conduct hydrologic and hydraulic analyses to determine depth and velocity of a 25-year flood
- Design a timber pedestrian bridge to promote non-motorized recreation on the UIEF
- Develop a stream restoration plan to stabilize stream banks and remove debris from the old culvert



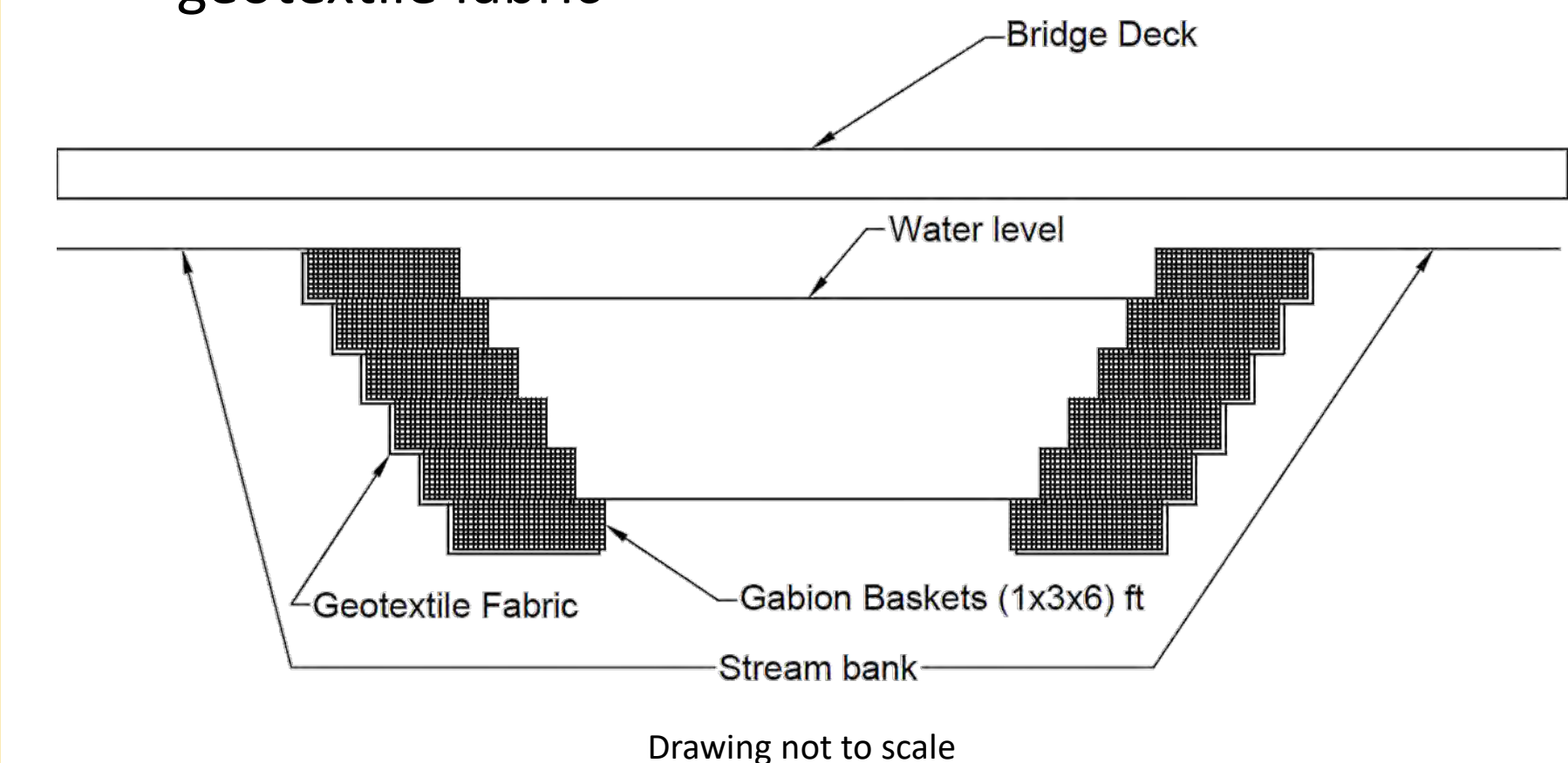
Stream Restoration

Promote Steelhead Passage

- Reduce erosion and sediment deposition
- Remove blockages to stream flow

Bank Stabilization (Erosion Control)

- Withstand a 25-year flood event with an estimated velocity of 8.4 ft/s
- Placement of 24 gabion baskets on top of geotextile fabric



Site Clean up

- Removal of old culvert, rebar clusters, metal pipe, and concrete supports from old crossing

Project Permitting

- Joint permit through the U.S. Army Corps of Engineers and Idaho Department of Water Resources

Cost Analysis

Category	Cost
Timber	\$ 14,500
Connections	\$ 4,600
Foundations	\$ 1,400
Bank Stabilization	\$ 1,000
Labor	\$ 3,500
Total	\$ 25,000

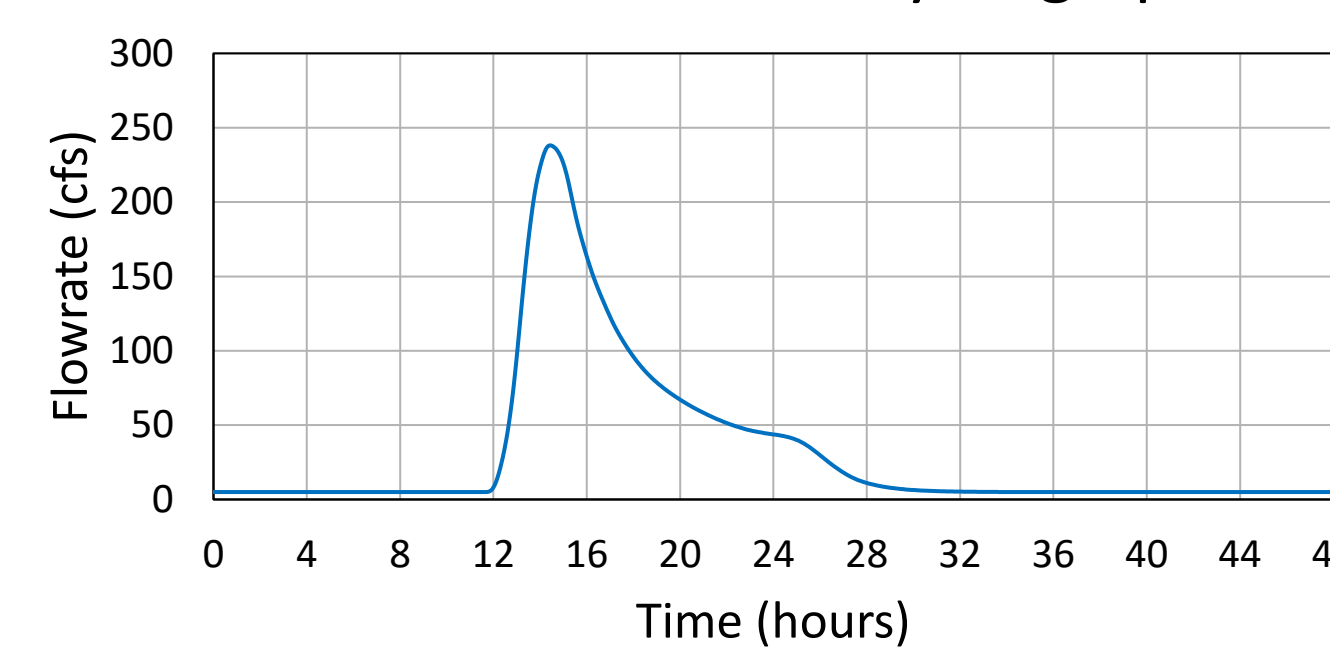
- Performed using cost estimates from RS Means 2020
- Timber from the UI Experimental Forest will be used for the bridge and may cost less than shown

Hydrology & Hydraulic Analysis

HEC-HMS Design Storms

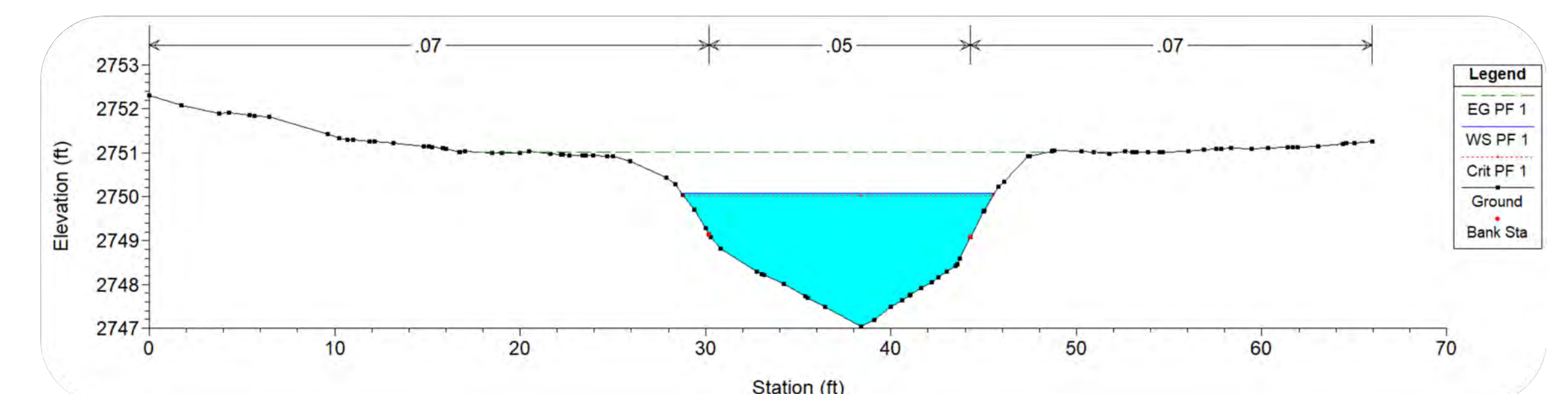
- Rain-on-snow event modelled after storm on March 10th, 2017
- 25-year NOAA Atlas 2 data used for alternative storm model

NOAA Atlas 2 Outflow Hydrograph



25-year Flood Design Values

- Watershed area = 3.06 mi²
- Peak flow = 238 cfs
- T_c = 130 minutes
- Curve Number = 70
- Channel Manning's number = 0.05
- Overbank Manning's number = 0.07



Special Thanks to:

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