Floodplain Functions and Benefits: Using ecosystem services to advance floodplain restoration

ACES 2016

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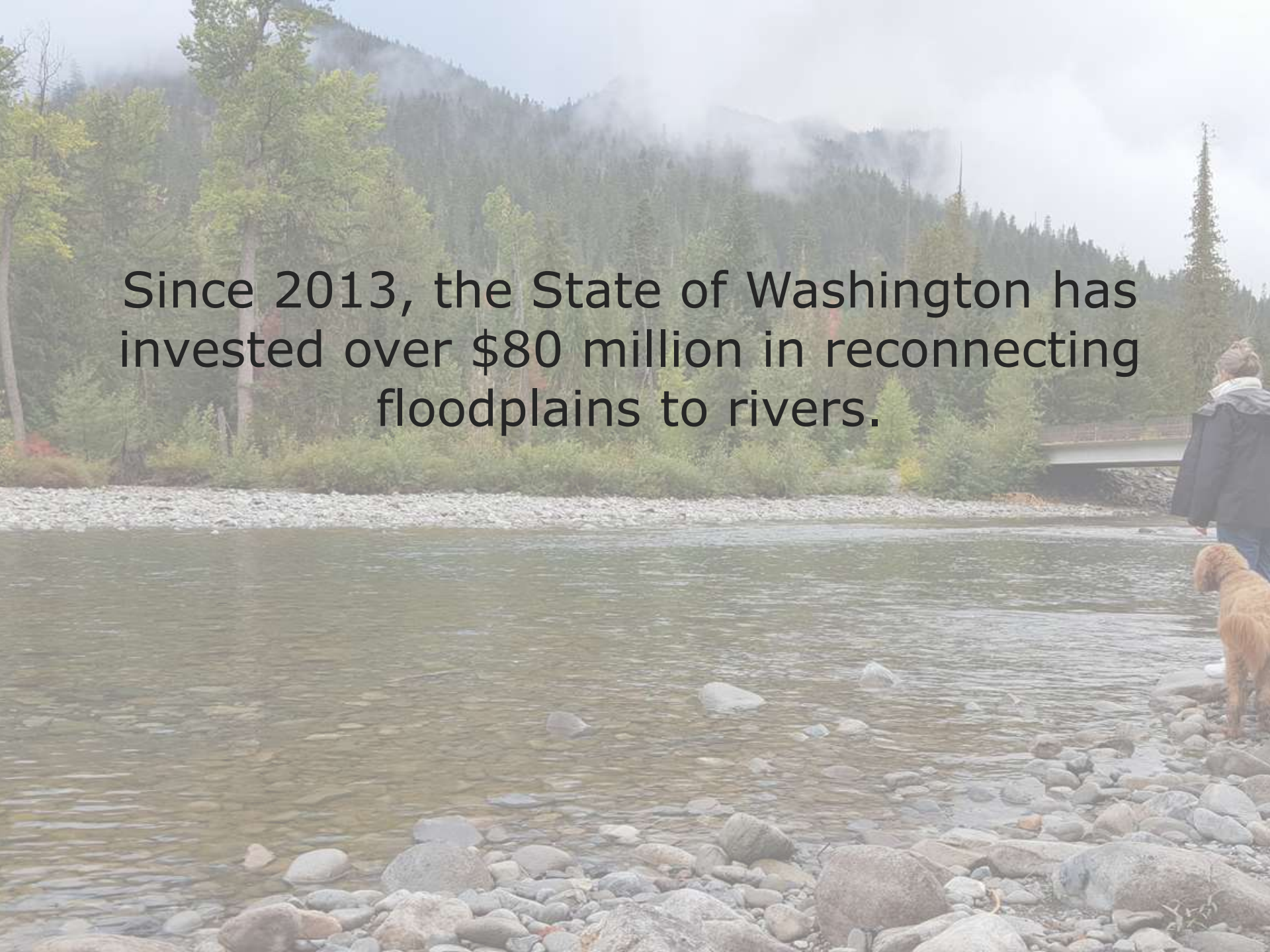

Since 2013, the State of Washington has invested over $80 million in reconnecting floodplains to rivers.

Overview

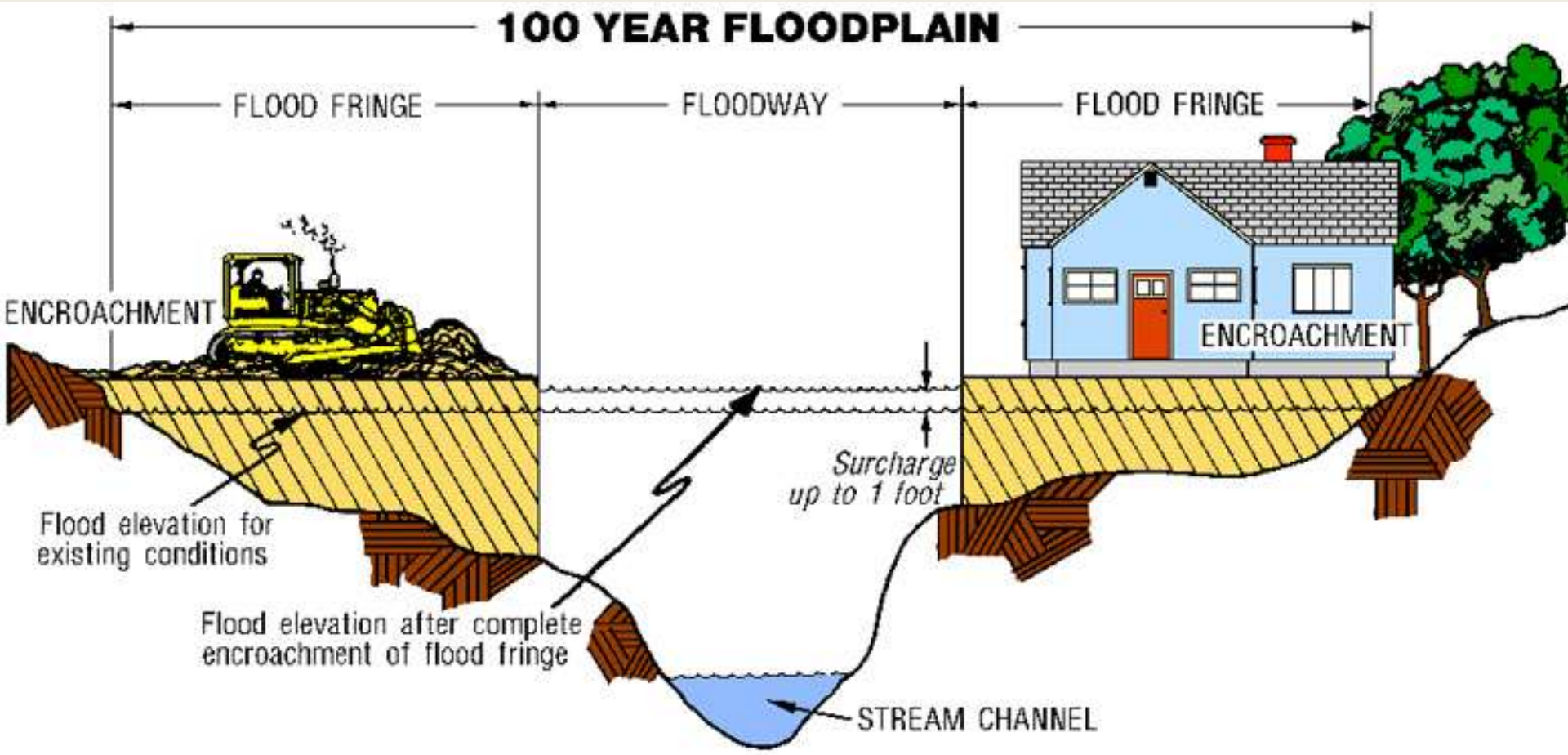
1. Linking floodplain functions with ecosystem services

2. Identifying our ecosystem service toolbox

3. Applying the toolbox to restoration projects

4. What's still needed?

Not your Mother's floodplain…

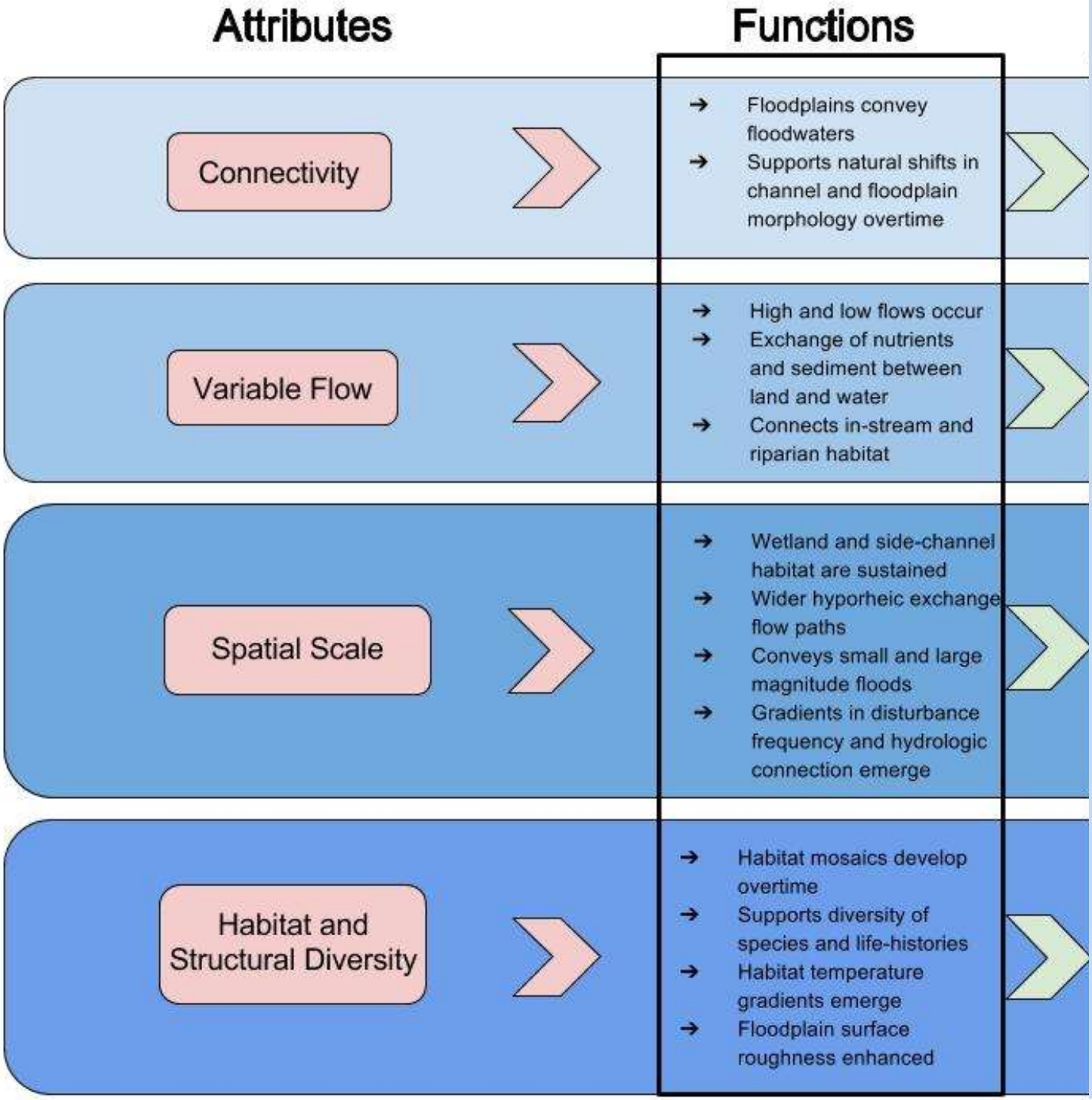


Natural floodplain functions

- Support complex habitat
- Regulate water quality
- Recharge groundwater flows
- Convey floodwaters

Floodplain Disconnection and Modification

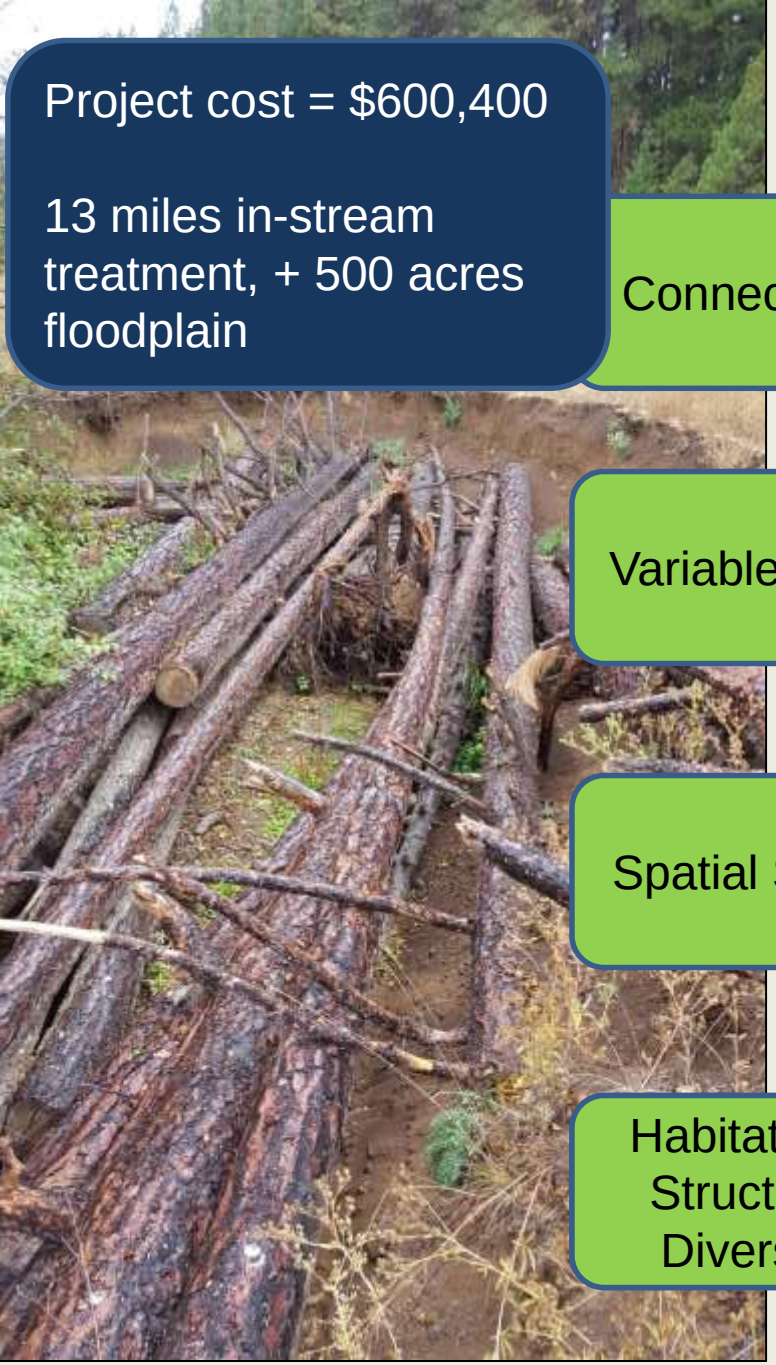
What attributes drive floodplain functions?



Ecosystem Service Flows

Using an Ecosystem Service Toolbox to Advance Restoration

- Identify which services are applicable to the socio-economic and ecological landscape
- Clearly link restoration actions to ecosystem services
- Articulate multiple-benefit outcomes



Project cost = $600,400

13 miles in-stream treatment, + 500 acres floodplain

Target Ecosystem Services

Connectivity

- Surface water and groundwater supply

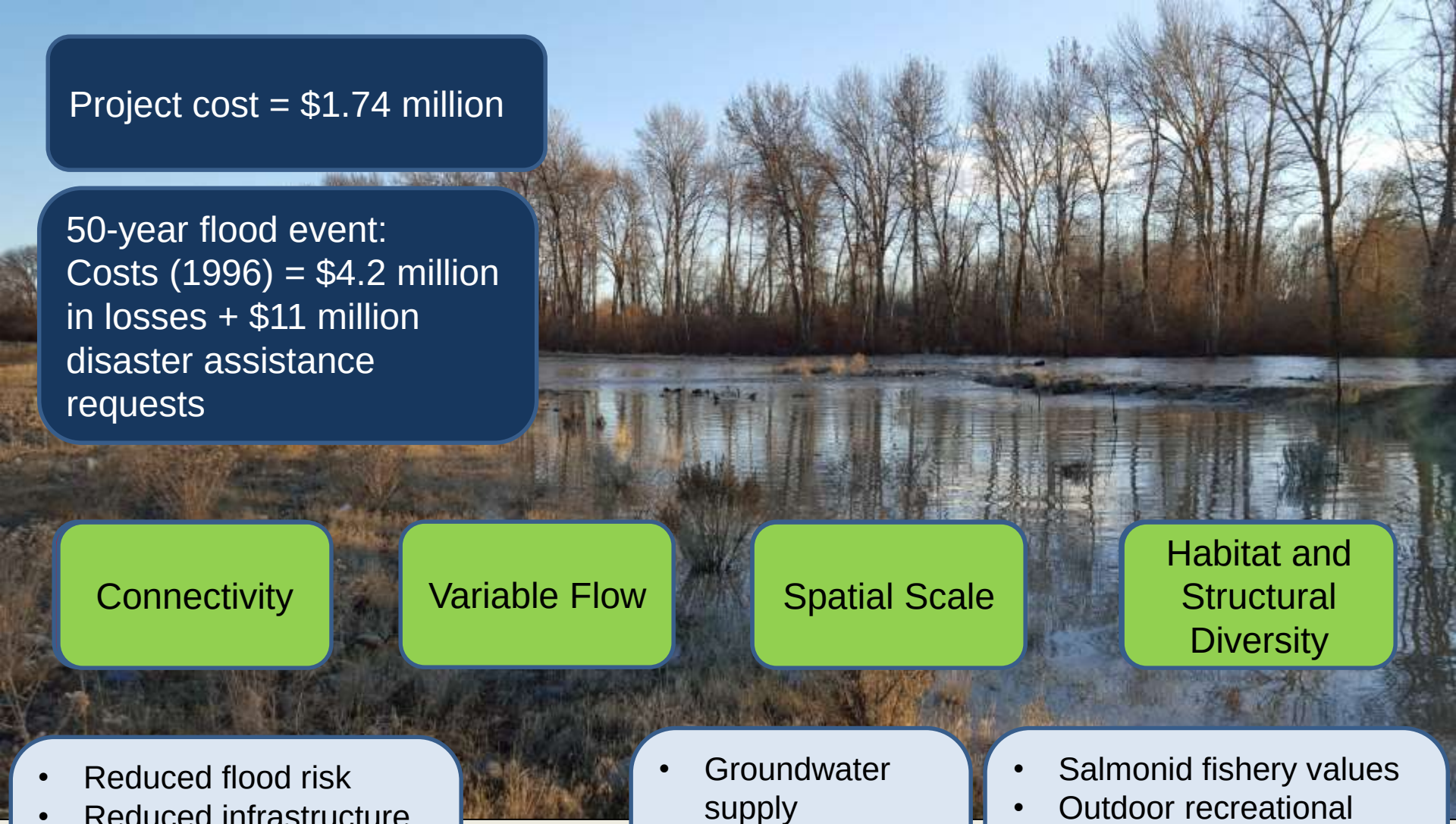
Variable Flow

Spatial Scale

Habitat and Structural Diversity

- Salmonid fishery values
- Outdoor recreational values
- Aesthetic and spiritual values

Floodplains in Headwaters and Open Lands



Project cost = $1.74 million

50-year flood event:
Costs (1996) = $4.2 million in losses + $11 million disaster assistance requests

Connectivity

Variable Flow

Spatial Scale

Habitat and Structural Diversity

- Reduced flood risk
- Reduced infrastructure repair costs
- Reduced disaster assistance costs

- Groundwater supply
- Sediment management
- Improved irrigation supply

- Salmonid fishery values
- Outdoor recreational values
- Aesthetic and spiritual values

Partially Developed Floodplains

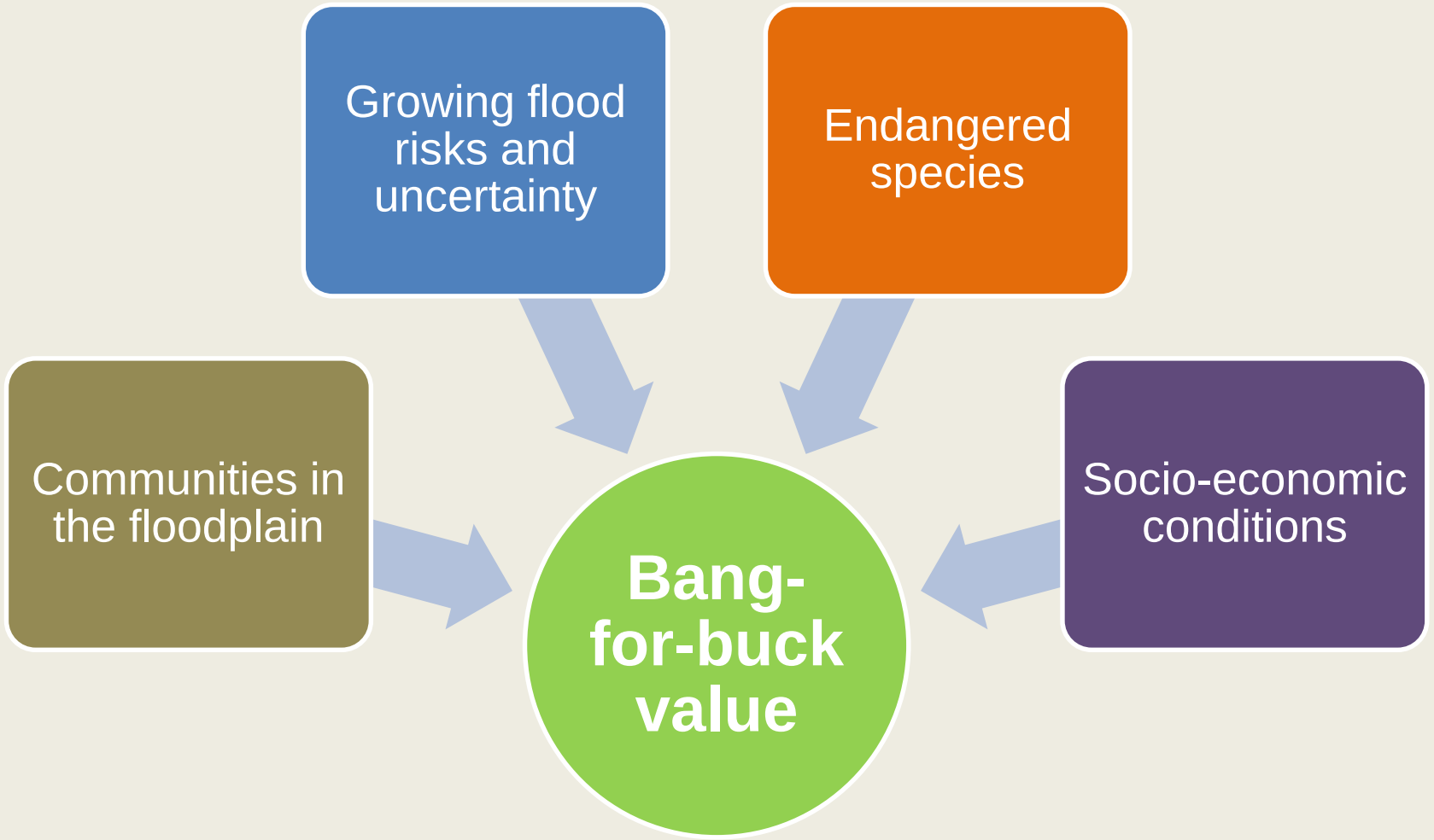
Target Ecosystem Services

- Water quality maintenance

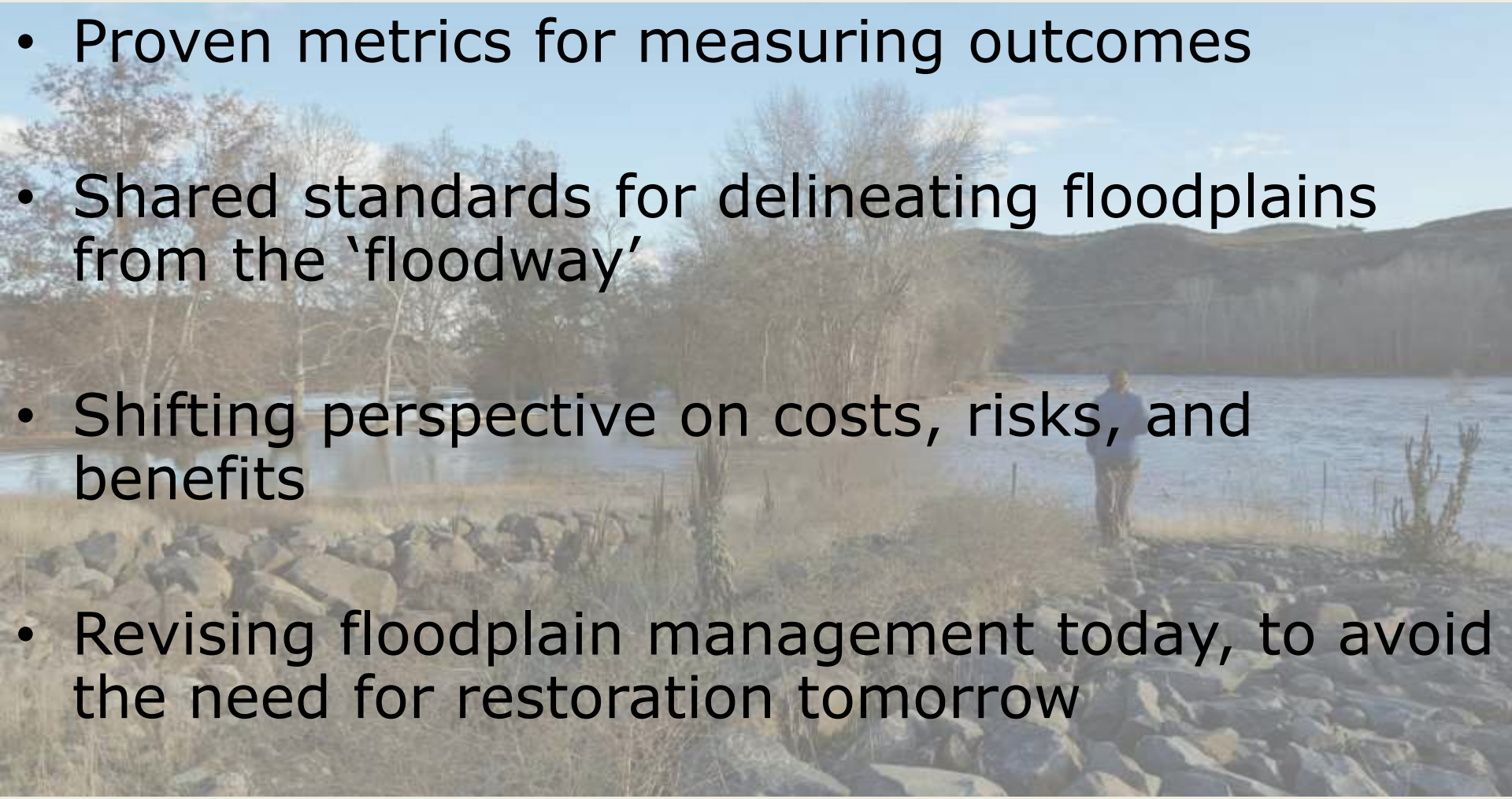
- Salmonid fishery values
- Climate resiliency and adaptation
- Aesthetic and spiritual values

Urban Floodplains

Recognizing the Right Ingredients



What's Needed Moving Forward



- Proven metrics for measuring outcomes
- Shared standards for delineating floodplains from the 'floodway'
- Shifting perspective on costs, risks, and benefits
- Revising floodplain management today, to avoid the need for restoration tomorrow

Questions?

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References

1. Loos, J. and E. Shader. 2016. Reconnecting Rivers to Floodplains; Returning natural functions to restore rivers and benefit communities. American Rivers. Available online: http://s3.amazonaws.com/american-rivers-website/wp-content/uploads/2016/06/17194413/ReconnectingFloodplains_WP_Final.pdf
2. Washington State funding through Floodplains by Design: Floodhttp://www.floodplainsbydesign.org/funded-projects/
3. Yakima County Flood Management Projects: http://www.yakimacounty.us/317/Comprehensive-Flood-Hazard-Management-Pl

Functional Attribute	Justification	References
Connectivity	A functional floodplain is physically accessible by water from its adjacent river or stream to allow an exchange of water, nutrients, sediment and organisms.	Ward et al. 1999, Rohde et al. 2006, Opperman et al. 2010, Matella and Merenlender 2014
Variable Flow	A functional floodplain is connected to a river capable of producing flows with magnitudes large enough to inundate the floodplain. Additionally, a river must produce such flows at specific times of the year, for adequate spans of time, and at variable return frequencies to maximize a full range of ecological functions. Together, variable flow describes the necessary timing, duration, magnitude, and frequency (TMDF) of flows that support local biota.	Poff et al. 1997, Galat et al. 1998, Rohde et al. 2006, William et al. 2009, Cain et al. 2010, Opperman et al. 2010, Matella and Merenlender 2014, Dixon et al. 2015, Yarnell et al. 2015
Spatial Scale	A floodplain must have the space to accommodate inundation and the resulting habitat and landscape forming processes that occur.	Tockner and Stanford 2002, Opperman et al. 2010
Habitat and structural diversity	A diversity of sediment erosion and deposition conditions, gradients of hydrologic connectivity, ecological succession and naturally accumulated debris generate habitat supportive of terrestrial and aquatic organisms. Ideally, these features emerge from co-occurrence of the previous three attributes.	Galat et al. 1998, Ward et al. 1999, Stanford et al. 2005, Whited et al. 2007, Jeffres et al. 2008, Opperman et al. 2010, Tockner et al. 2010, Gunerlap and Rhoades 2011