

# LTPBR WORKSHOP



## Scope of Problem





# OUTLINE: Workshop Background & Purpose

I. Building resilience of riverscapes & working lands

II. Need for **low-tech restoration**

I. Scope of Degradation

II. Cost of traditional approach





# Problem is Simple to State...

## Scope of riverscape degradation is massive

- ~ \$10 Billion spent annually, but **barely scratching surface**
- We spend disproportionate \$\$\$\$ on **too few miles** of streams and rivers
- Leaving millions of miles **neglected...**

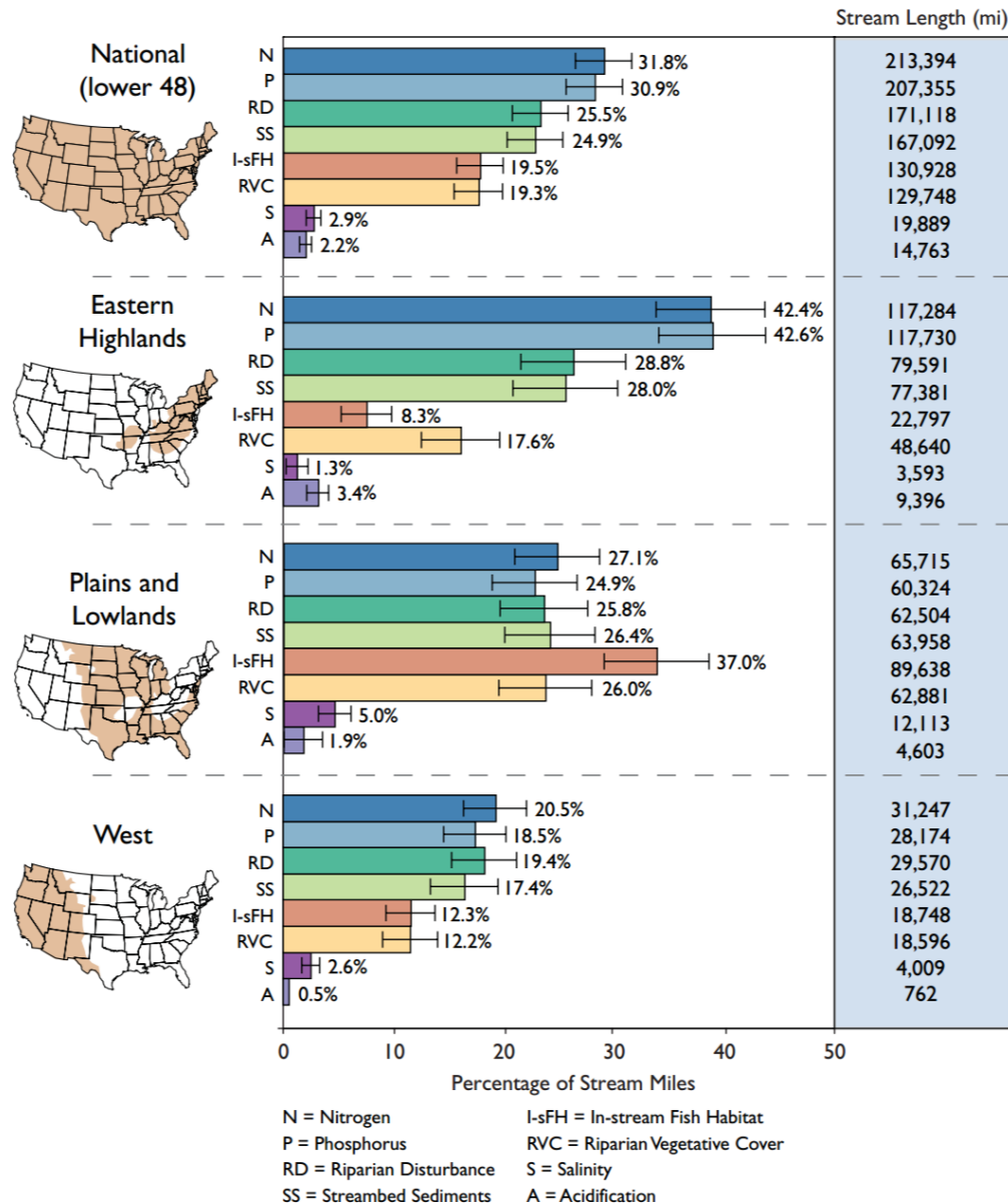
[Agricultural Stream Ecosystem \(PDF\)](#)



[Urban Stream Ecosystem \(PDF\)](#)



USGS



# No Matter How You Slice It...

- 1-2 orders of magnitude more miles of riverscapes in need of help than we currently pour our money and effort into
- “Rivers are the **most impacted ecosystems worldwide** (Best, 2019; Sabater et al., 2018; Tickner et al., 2020; Vörösmarty et al., 2010) and freshwater ecosystems are experiencing the **stronger rate of biodiversity loss than ever** (Tickner et al., 2020).” – Herve Piegay

**Figure 23. Extent of stressors** (i.e., proportion of stream length ranked in poorest category for each stressor) (U.S. EPA/WSA).



A grayscale topographic map of a mountainous region, with a network of blue lines representing rivers and streams. The lines follow the valleys and ridges of the terrain. A semi-transparent dark gray rectangular box is positioned in the upper left quadrant, containing the title text.

# What's a **Riverscape** ?

We know that our rivers and streams are critically important to our fresh-water ecosystems



A topographic map of a watershed, showing a network of rivers and streams. The rivers are highlighted in blue, and the floodplains are highlighted in green. The map is overlaid with a semi-transparent dark grey box containing text.

# **Riverscapes** span the network across a watershed

Riverscapes are the part of the landscape that could plausibly flood by their rivers & streams in the natural flow regime.



# Scope of Riverscapes Problem We Have Lots of This

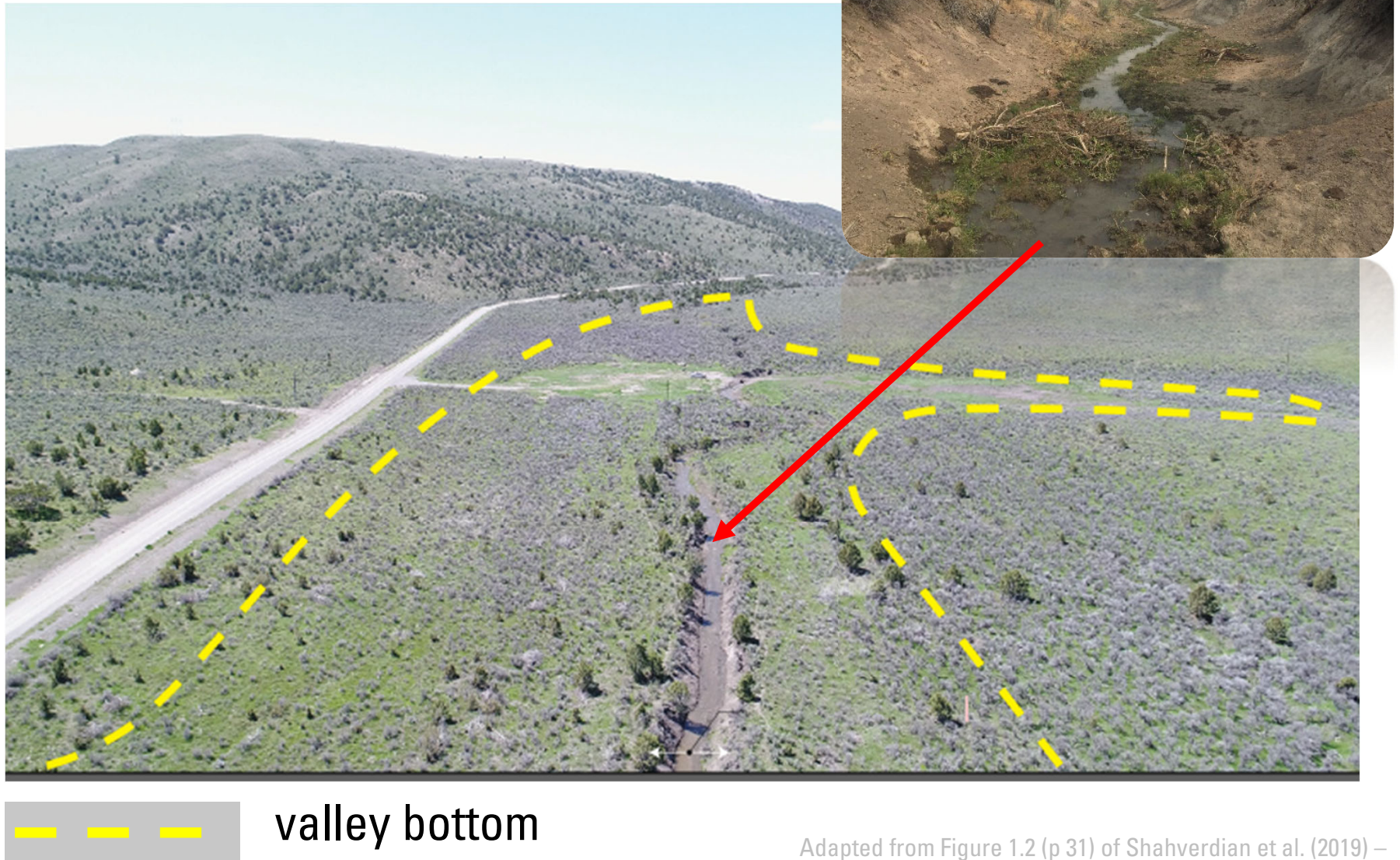


Adapted from Figure 1.2 (p 31) of Shahverdian et al. (2019) –  
Chapter 1 LTPBR Manual DOI: [10.13140/RG.2.2.14138.03529](https://doi.org/10.13140/RG.2.2.14138.03529)

Any Old Forgotten Creek, Western US



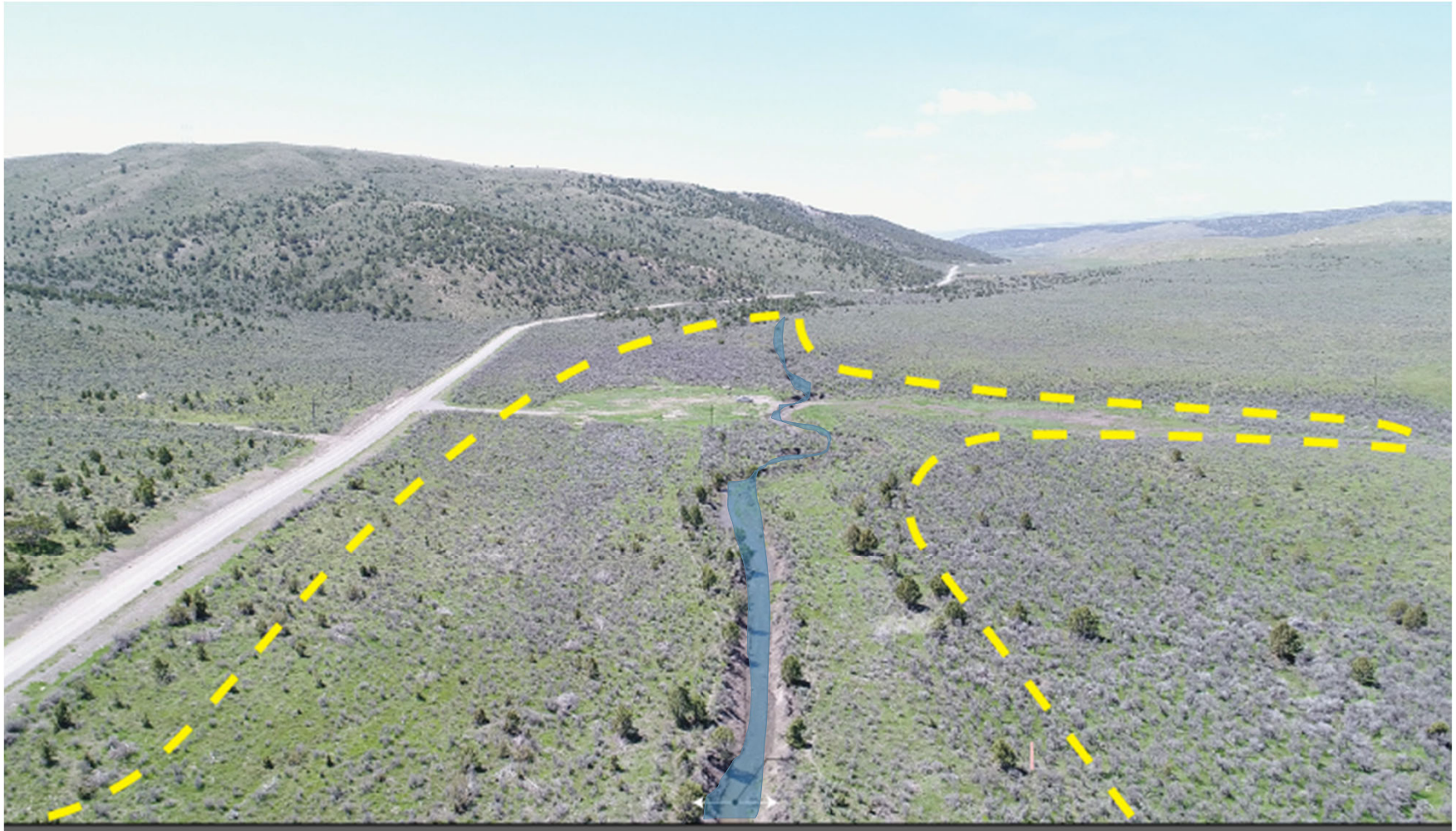
# What's been lost



Adapted from Figure 1.2 (p 31) of Shahverdian et al. (2019) –  
Chapter 1 LTPBR Manual DOI: [10.13140/RG.2.2.14138.03529](https://doi.org/10.13140/RG.2.2.14138.03529)



# What's been lost



valley bottom

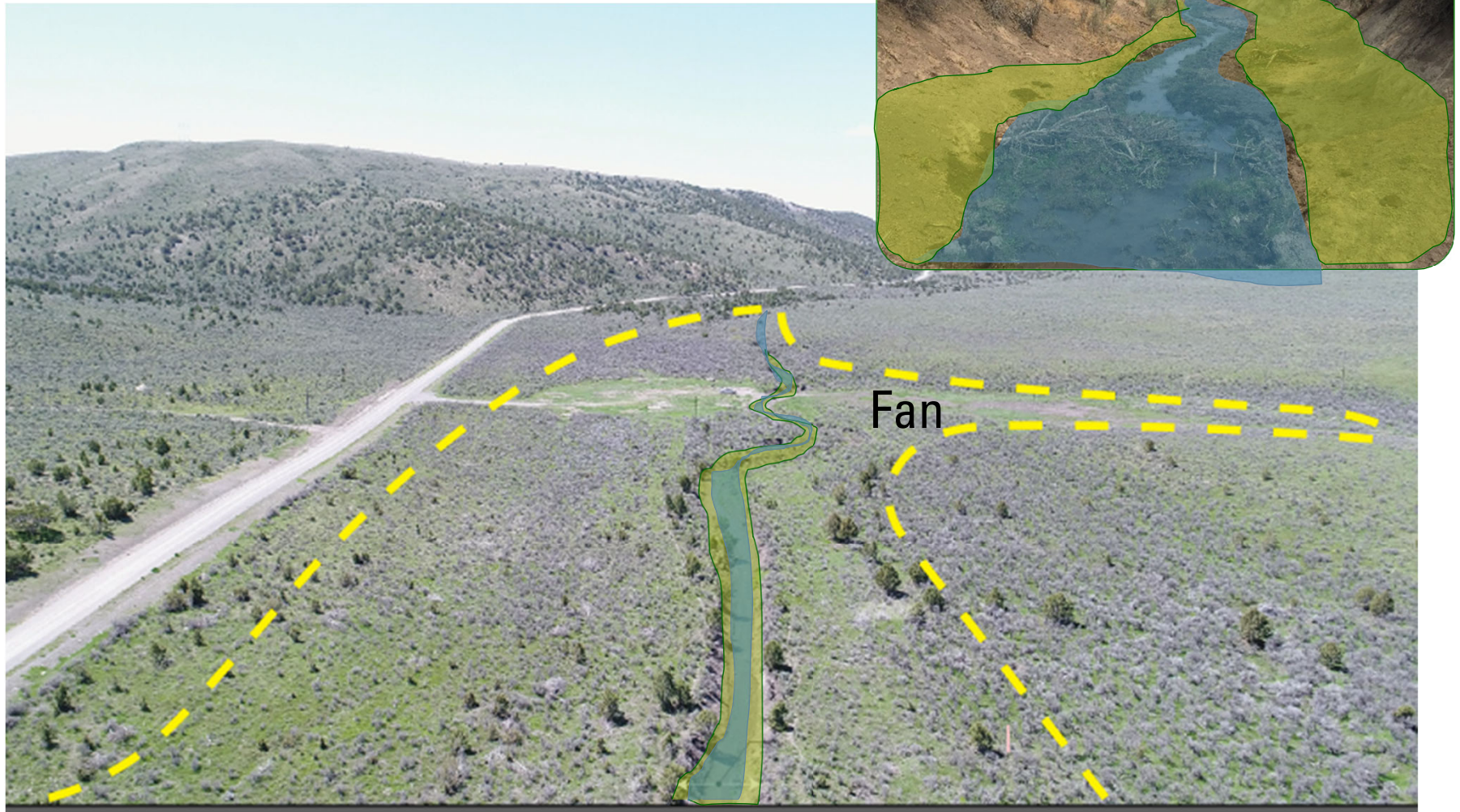


Active channel

Adapted from Figure 1.2 (p 31) of Shahverdian et al. (2019) –  
Chapter 1 LTPBR Manual DOI: [10.13140/RG.2.2.14138.03529](https://doi.org/10.13140/RG.2.2.14138.03529)



# What's been lost



Valley bottom



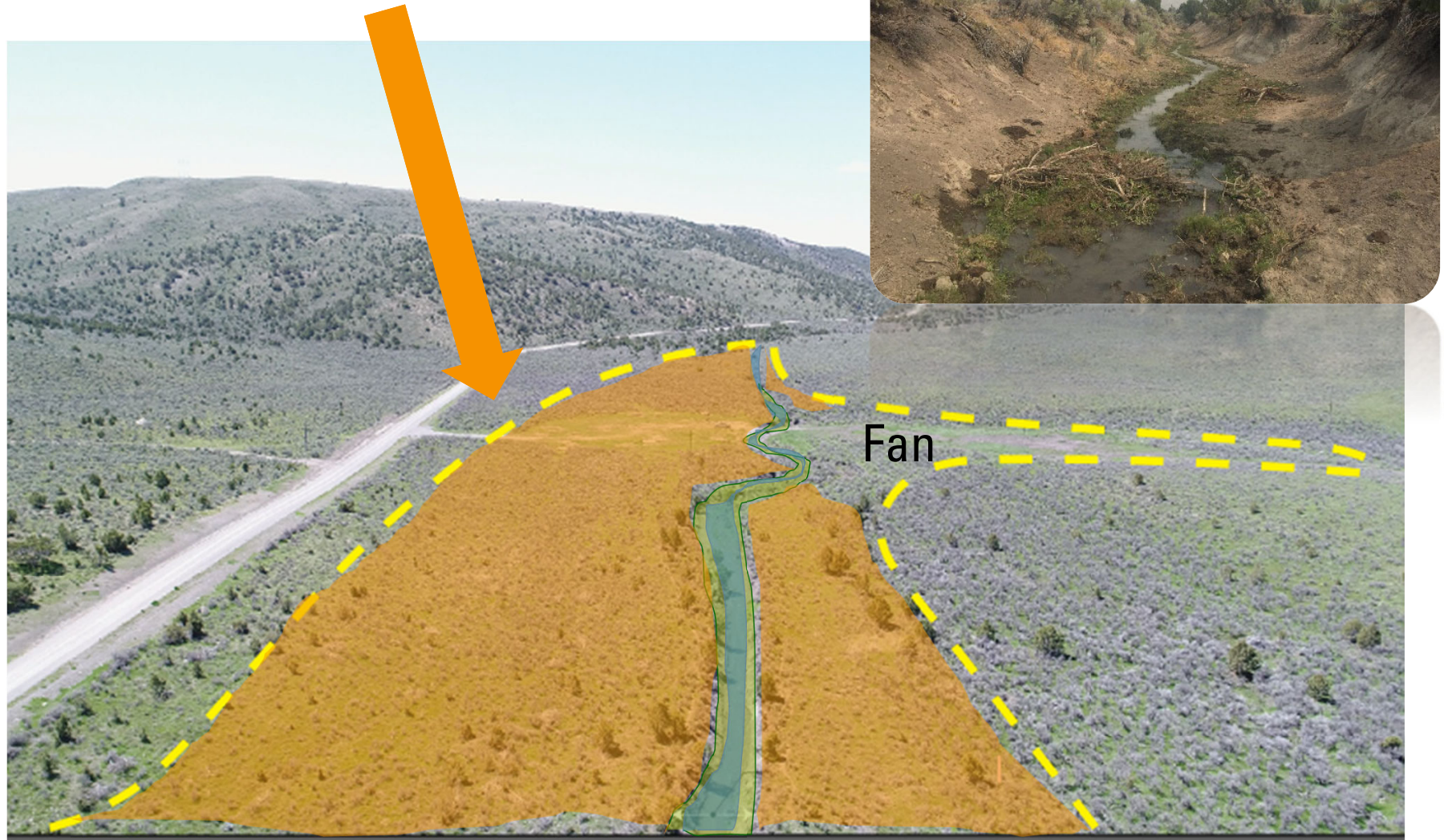
Active channel



Active floodplain



# What's been lost



Valley bottom



Active channel



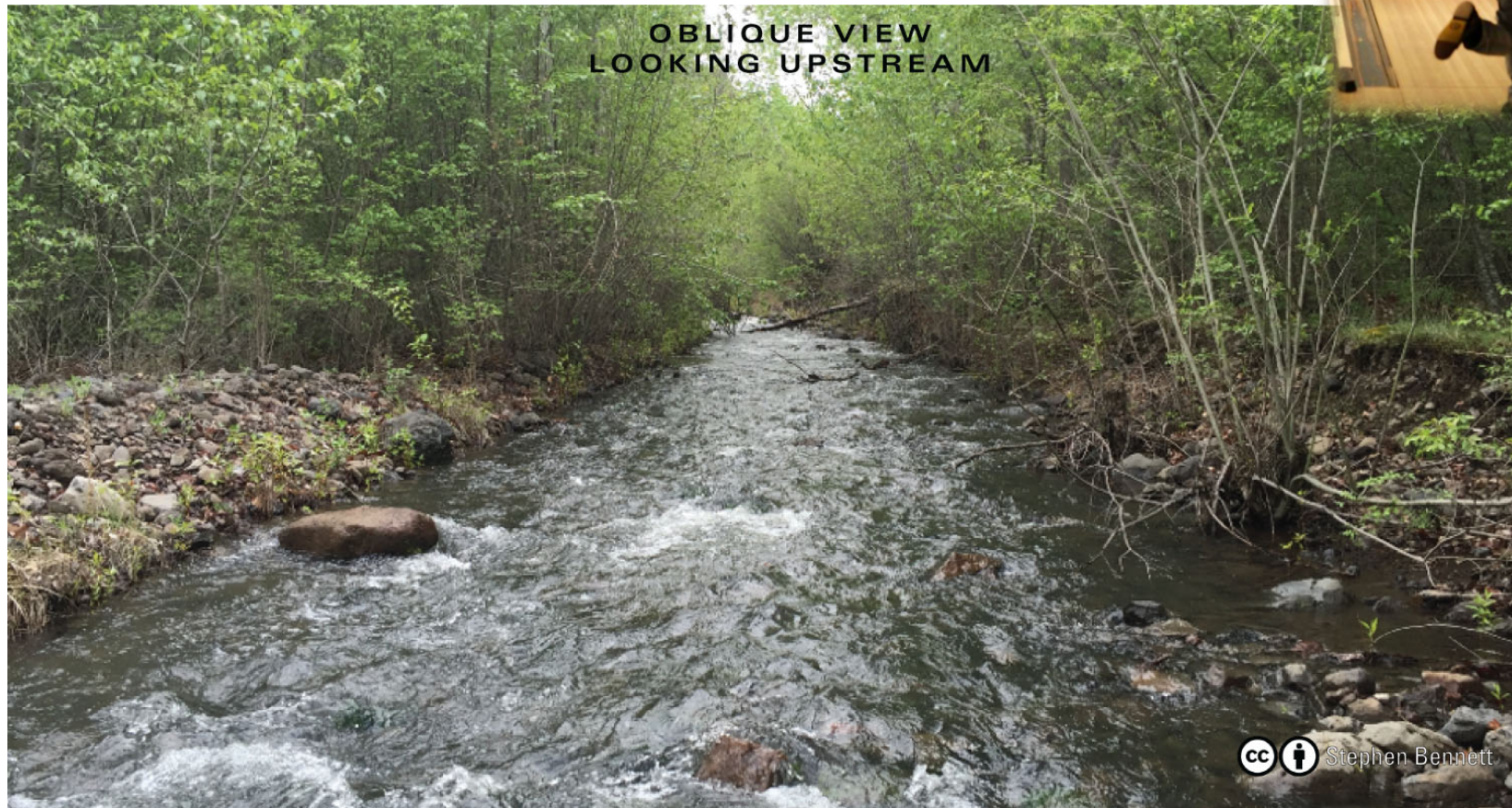
Active floodplain



Inactive floodplain



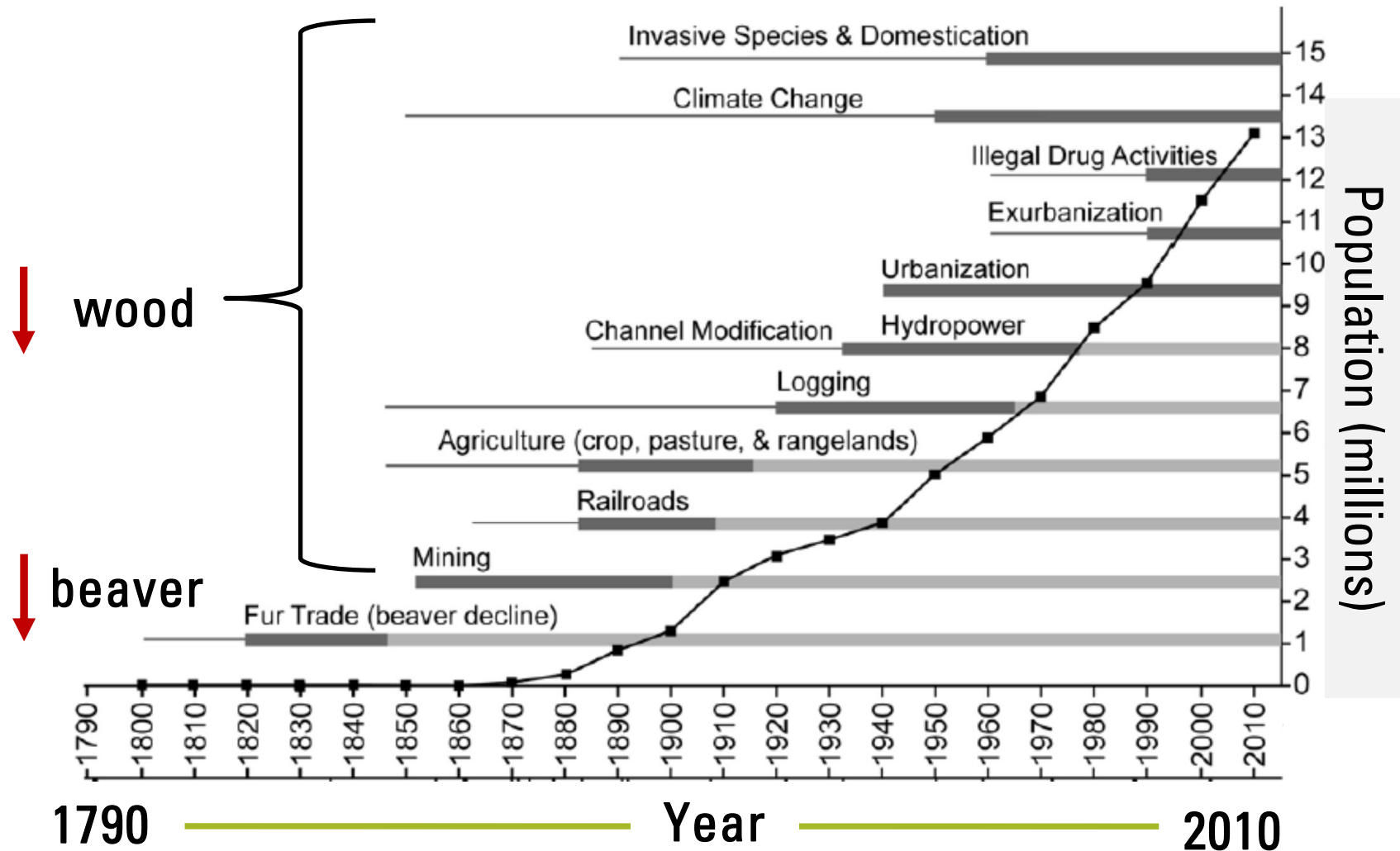
# Structurally-Starved Bowling Alleys



Deceptive.... Young forest, low wood input, locked in, & efficient transport system.



# Underlying Low-Tech PBR is **Structural Starvation** Hypothesis



Development (bars) and population change (line) in the Columbia River Basin. Dark bars = peak development; light bars = continued effects (Rieman et al. 2015).



# Typical Restoration Procedure

## Surgery (channel realignment/grading)

1. *Shaving* and clearing the surface (remove vegetation)
2. *Opening* the system up with (i.e. cutting an access route in)
3. Rearranging what's inside or *operating* (i.e. the grading)
4. *Stitching* the cut back up (e.g. re-seeding, erosion control, planting)
5. Over fortify channel with preservatives (rip rap) over fear it might *exercise*



- Detailed designs
  - Stability
  - Low density
  - Constructed habitats
  - Prevent erosion
- = High cost/mile**





# **Traditional Restoration Hard Engineering – Where it Makes Sense!**





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**II. Need for low-tech restoration**

I. Scope of Degradation

**II. Cost of traditional approach**

III. Reimagining what is possible





# Traditional Restoration

## *Why always Tonka Toys?*

Google

stream restoration

All

News

Images





# Restoration Economy In United States

In US:

- 126,000 employees
- \$9.5 billion/yr
- Overall economic impact closer to \$24.8 billion/yr
- Oil and gas industry produce something like 5.2 jobs per \$1 million invested, restoration is closer to 20-30 jobs per \$1 million invested

## RESEARCH ARTICLE

### Estimating the Size and Impact of the Ecological Restoration Economy

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## OPEN ACCESS

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**Data Availability Statement:** Ethical restrictions prevented public data sharing. Partial data are contained in File S4. Further requests for data may be sent to the corresponding author.

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## Abstract

Domestic public debate continues over the economic impacts of environmental regulations that require environmental restoration. This debate has occurred in the absence of broad-scale empirical research on economic output and employment resulting from environmental restoration, restoration-related conservation, and mitigation actions—the activities that are part of what we term the “restoration economy.” In this article, we provide a high-level accounting of the size and scope of the restoration economy in terms of employment, value added, and overall economic output on a national scale. We conducted a national survey of businesses that participate in restoration work in order to estimate the total sales and number of jobs directly associated with the restoration economy, and to provide a profile of this nascent sector in terms of type of restoration work, industrial classification, workforce needs, and growth potential. We use survey results as inputs into a national input-output model (IMPLAN 3.1) in order to estimate the indirect and induced economic impacts of restoration activities. Based on this analysis we conclude that the domestic ecological restoration sector directly employs ~ 126,000 workers and generates ~ \$9.5 billion in economic output (sales) annually. This activity supports an additional 95,000 jobs and \$15 billion in economic output through indirect (business-to-business) linkages and increased household spending.

## Introduction

A powerful narrative now permeates efforts to regulate environmental impacts and require restoration of damaged ecosystem functions in the wake of development: restoration is expensive, bad for business, and bad for our economy [1, 2]. For example, the U.S. Chamber of Commerce [3] has cautioned against the “corrosive” economic impacts of environmental regulation and permitting processes, which often include requirements for ecological restoration. The authors of this report argue that permitting processes could endanger jobs and earnings. Polls now demonstrate that the American public widely accepts this idea [4] and arguments against job-killing environmental “Green Tape” are common.



# Big Price Tags... Miniscule Footprint

- \$150K median project cost
- 915 m (0.56 miles) median length
- Average Restoration Price Tag ~ \$270K per mile

**Table 5.** Comparison of projects that met NRRSS criteria for success versus the full interview database.

|                                      | <i>High-Ranking Projects<br/>in Ecological<br/>Success Categories</i> | <i>Projects Following<br/>Idealized<br/>Restoration Process</i> | <i>Projects that<br/>Followed Idealized<br/>Process and Received<br/>a Top 10 Score<br/>in at least<br/>One Ecological<br/>Success Category</i> | <i>Interview<br/>Database—All Projects</i> |
|--------------------------------------|---|---|---|--|
| Number of projects                   | 23  | 31  | 8   | 317  |
| Range in costs                       | \$2,460–\$41.5 million  | \$140–\$34 million  | \$10,000–\$3.9 million  | \$140–\$116 million                        |
| Median cost                          | \$403,050   | \$250,000   | \$580,000   | \$150,000                                  |
| Median length (m)                    | 907   | 1,510   | 1,066   | 914  |
| Mean # of funders                    | 4.4   | 4.4   | 3.9   | 3.6  |
| Mean # of partners/agencies/entities | 8.8   | 8.4   | 8.6   | 7.1  |
| % with advisory committee            | 70  | 60  | 80  | 40   |
| % public involvement*                | 64  | 68  | 79  | 49   |

\* For this metric, we averaged participation across the three project phases (design, implementation, and evaluation).

From: Bernhardt et al. (2007) DOI:  
[10.1111/j.1526-100X.2007.00244.x](https://doi.org/10.1111/j.1526-100X.2007.00244.x)



# Another Estimate: **\$65K to \$350K per mile**

S3 | Stream Restoration Cost Estimates | BRIAN BAIR

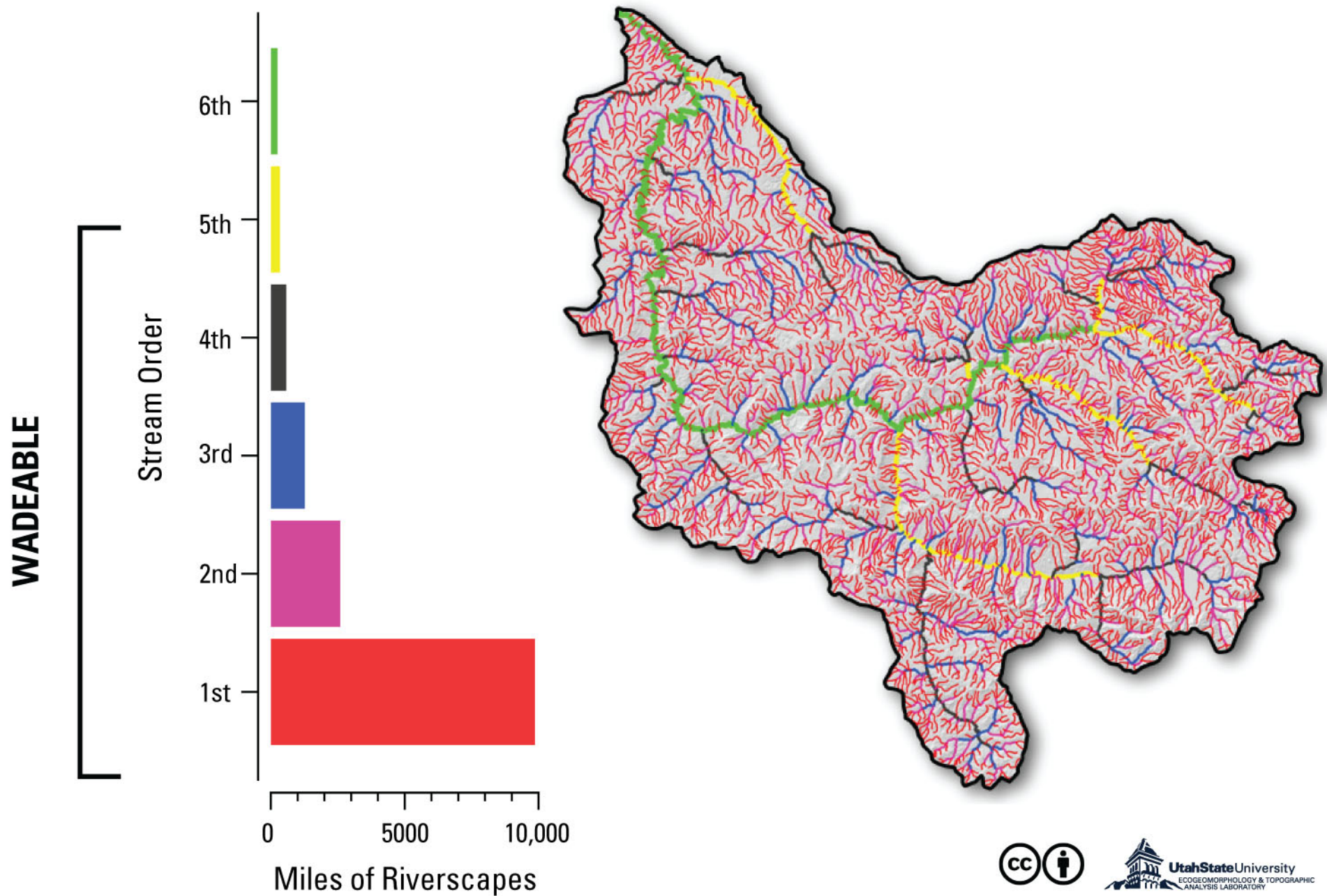
Table 1. Typical restoration costs

| Item                              | High end<br>(cost/river mile) | Low end<br>(cost/river mile) | Reasonable mean<br>(cost/river mile) |
|-----------------------------------|-------------------------------|------------------------------|--------------------------------------|
| Plan, design & NEPA               | \$110,040                     | \$21,833                     | \$68,880                             |
| Materials (trees)                 | \$64,900                      | \$14,747                     | \$20,566                             |
| Mobilization                      | \$8,200                       | \$1,333                      | \$2,777                              |
| Equipment                         | \$122,000                     | \$17,333                     | \$20,800                             |
| Labor                             | \$17,167                      | \$112                        | \$5,000                              |
| Riparian planting/<br>maintenance | \$7,646                       | \$3,893                      | \$5,512                              |
| Instream structure<br>maintenance | \$24,640                      | \$4,760                      | \$5,600                              |
| <b>Total</b>                      | <b>\$354,593</b>              | <b>\$64,011</b>              | <b>\$129,135</b>                     |

From: Bair B. (2004). Stream Restoration Cost Estimates.



# We need scalable solutions... URGENTLY





# Desired Attributes of Low-Tech Restoration

- Simple, cost-effective
- Efficiently scaled up to scope of degradation
- Structures (if needed) are hand-built, natural materials
- Relies on the system do the work
- Allows more people to participate
- Encouraging taking calculated risks

*In planning? In permitting? In design? In implementation? In monitoring & evaluation?*





## Low-tech process-based restoration

*noun*

1. A practice of using simple, low unit-cost, structural additions (e.g., wood and beaver dams) to [riverscapes](#) to mimic functions and promote specific processes. Hallmarks of this approach include an explicit focus on the promoting geomorphic and [fluvial](#) processes, a conscious effort to use cost-effective, low-tech treatments (e.g., hand-built, natural materials, non-engineered, short-term design life-spans) because of the need to efficiently scale-up application, and ‘Letting the [system](#) do the work’, which defers critical decision making to riverscapes and beaver.

