

Prepared for:  
Boulder County, Colorado



# Flood Planning & Preliminary Design Services for South St. Vrain Creek Restoration at Hall Ranch

## St. Vrain Coalition Meeting: Design Alternatives

June 30, 2016



Meeting with  
St. Vrain Coalition





# Introduction

## Introduction

- Purpose of meeting: Design Alternatives

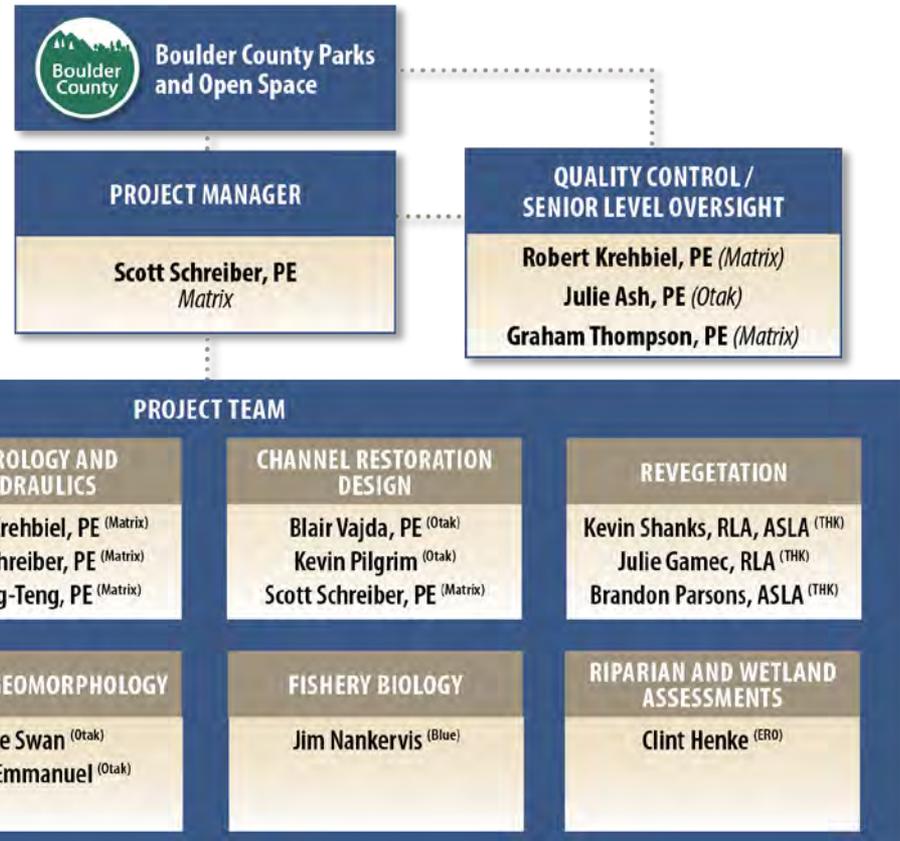
## Project website

- [www.BoulderCountyOpenSpace.org/ssv](http://www.BoulderCountyOpenSpace.org/ssv)





# Matrix Team





# Project Area

## South St. Vrain Creek Restoration Planning Area





# Project Schedule

## Design schedule

- Notice to Proceed: May 2016
- Alternatives Compiled: June 2016
- Preferred Alternative: July 2016
- 30% Draft Design: August 2016
- Final Deliverable: September 2016





## Work to Date

- 🏠 Riparian and Wetland Assessment
- 🏠 Aquatics and Terrestrial Concerns
- 🏠 Sediment Sampling
- 🏠 Homeowner Meetings
- 🏠 Existing/Ongoing Project Coordination





# Project Goals Statement

- Provide a conceptual design for the entire South Saint Vrain Creek project area that restores and improves the channel and surrounding floodplain areas to a safe, natural, resilient, functioning, and ecologically rich habitat. This project will use qualitative research, quantitative data, and community input to inform resilient design that shall utilize natural system principles and onsite materials to expedite recovery from the 2013 floods and set up for better performance in future flood events. Components to meet goals include incorporating natural channel diversity and character, re-establishing floodplain benches for lateral connectivity, reducing longitudinal connectivity constraints, improving flow conveyance and sediment transport to maintain environmental values, promote naturally functioning stream processes, protect public and private infrastructure, improve public safety, repair unstable erosion scars in high-risk areas, and revegetate denuded areas.





# Decision Making Process

South St. Vrain Creek Restoration at Hall Ranch Decision Making Process:

## Project Goals



### Parks & Open Space

Provide a conceptual design for the entire South Saint Vrain Creek project area that restores and improves the channel and surrounding floodplain areas to a safe, natural, resilient, functioning, and ecologically rich habitat. Provide a preliminary design for the EWP project reaches. This project will use qualitative research, quantitative data, and community input to inform resilient design that shall utilize natural system principles and onsite materials to expedite recovery from the 2013 floods and set up for better performance in future flood events. Components to meet goals include incorporating natural channel diversity and character, re-establishing floodplain benches for lateral connectivity, reducing longitudinal connectivity constraints, improving flow conveyance and sediment transport to maintain environmental values, promote naturally functioning stream processes, protect public and private infrastructure, improve public safety, repair unstable erosion scars in high-risk areas, and revegetate denuded areas.

## Core Values

### Community

- Communicates with the residents
- Incorporate residents needs in alternative analysis
- Be mindful of impact of property value
- Consider the affects work will have downstream
- Consider recreational opportunities
- Increase aesthetic appeal
- Consider existing water rights
- Minimize impact to cultural and historic features

### Resiliency

- Improve "Creek Conveyance"
- Provide smarter infrastructure solutions
- Improve creek stability
- Reduce risk to critical infrastructure
- Restore natural ecosystem process
- Reconnect the floodplain

### Safety

- Reduce the impacts to private property
- Reduce potential flood risk
- Make public safety top priority

### Environment

- Assess existing environmental conditions
- Reduce sedimentation in general
- Improve wildlife habitat (banking opportunities)
- Increased channel capacity to accommodate future flooding
- Work with natural systems
- Improve fish passage and habitat
- Remove and recycle onsite materials
- Avoid highly-engineered solutions
- Re-establish natural condition of the channel and adjacent stream bank
- Increase revegetation efforts
- Concerned about movement of potential debris both short and long term
- Concerned about ground water and the rise in the creek bed elevation
- Concerned about interim berm condition along creek
- Consider new 100 year hydrologic volumes

### Implementation

- Work with existing project initiatives and ongoing projects
- Find funding for future implementation
- Include fiscally responsible costs
- Continue longterm planning for future projects
- Meet the goals for EWP funding
- Consider elements of the master plan
- Be consistent with land use regulations and management
- Consider phasing

### Schedule

- Prioritize strategies as critical, necessary or desired

## Prioritization Criteria

1. Protect critical public and private infrastructure?
2. Avoids negative impacts to downstream infrastructure, channel and stormwater systems?
3. Improves aesthetics to the creek corridor?
4. Consider recreation where allowed?

5. Benefits larger area of creek corridor?
6. Re-establishes floodplain connectivity?
7. Restores affected areas of the South St. Vrain Creek channel and surrounding areas to stable, resilient and ecologically rich habitats?
8. Reduces future recovery time?
9. Improves conveyance of sediment?

10. Reduce flood risk to the public and residents by providing long term solutions that increase resiliency?

11. Natural ecosystem processes restored?
12. Protects or improves existing habitat and significant ecological resources?
13. Incorporates locally available materials and environmentally friendly processes?
14. Protects and improves water quality and the geomorphology of the creek?

15. Creates infrastructure investments that are reasonable to construct and provides the best value for their life-cycle, function and purpose?
16. Can be supported by current land use regulations or revised land use regulations?
17. Provides funding, partnering and collaboration opportunities by meeting multiple stakeholder objectives?





# Prioritization Criteria

South St. Vrain Creek Restoration at Hall Ranch Decision Matrix

ID	Critical Issues	Criteria	Alternatives Evaluation			
			Floodplain Connectivity	Channel Complexity	Revegetation	Infrastructure Protection
<b>Prioritization Criteria</b>						
1	Community	Protect critical public and private infrastructure?				
2	Community	Avoids negative impacts to downstream infrastructure, channel and storm water systems?				
3	Community	Improves aesthetics to the creek corridor?				
4	Community	Consider recreation where allowed?				
5	Resiliency	Benefits larger area of creek corridor?				
6	Resiliency	Re-establishes floodplain connectivity?				
7	Resiliency	Restores affected areas of the South St. Vrain Creek channel and surrounding areas to stable, resilient and ecologically rich habitats?				
8	Resiliency	Reduces future recovery time?				
9	Resiliency	Improves conveyance of sediment?				
10	Safety	Reduce flood risk to the public and residents by providing long term solutions that increase resiliency?				
11	Environment	Natural ecosystem processes restored?				
12	Environment	Protects or improves existing habitat and significant ecological resources?				
13	Environment	Incorporates locally available materials and environmentally friendly processes?				
14	Environment	Protects and improves water quality and the geomorphology of the creek?				
15	Implementation	Creates infrastructure investments that are reasonable to construct and provides the best value for their life-cycle, function and purpose?				
16	Implementation	Can be supported by current land use regulations or revised land use regulations?				
17	Implementation	Provides funding, partnering and collaboration opportunities by meeting multiple stakeholder objectives?				
ID	Critical Issues	Criteria	Alternatives Evaluation			
			Floodplain Connectivity	Channel Complexity	Revegetation	Infrastructure Protection
<b>Issue Specific Criteria</b>						
1						
2						
3						
4						
Identification of Preferred Option:						





# Alternatives: Issue & Reach Based

## Alternatives and Strategies:

- Floodplain Connectivity
- Channel Complexity
- Revegetation
- Infrastructure Protection

 **Master Plan:** *The purpose of this alternative is to implement a channel alignment that will optimize the interaction with completed, ongoing, and funded projects while being sensitive to the constraints presented by the presence of numerous private residences throughout this river corridor. The implementation of this alternative will expedite the maturation of this reach by re-establishing a natural channel, repairing erosion scars, re-establishing floodplain benches, building point-bars and excavating pools, revegetating denuded areas, and stabilizing channel banks.*





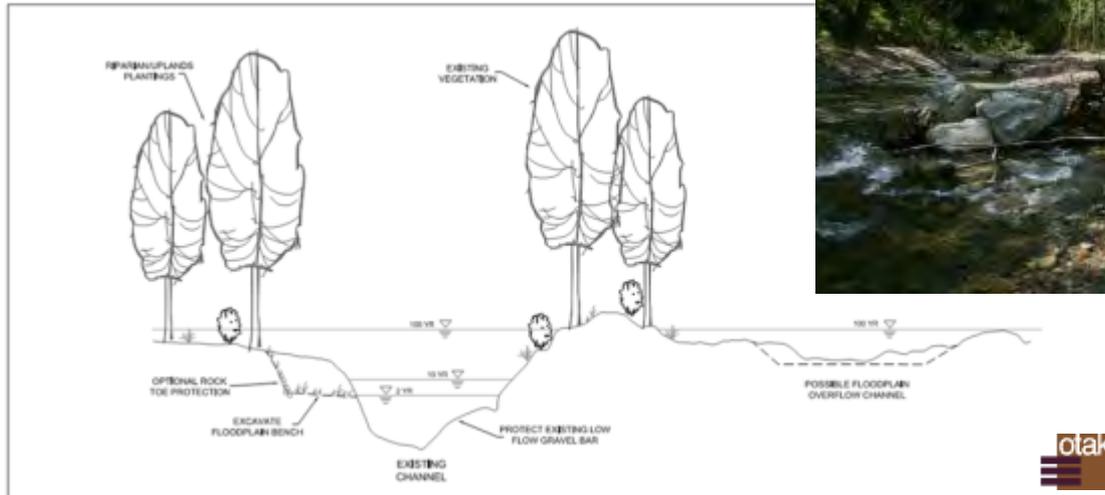
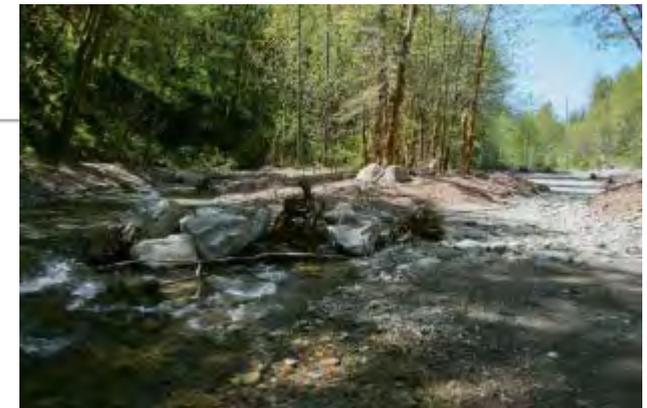
# Alternative: Floodplain Connectivity

- 🏠 Floodplain connectivity involves activating the floodplain at frequent intervals to enable critical floodplain functions, including:
  - Sediment storage
  - Reduction of erosive forces in main channel
  - Nutrient transfer
  - Healthy riparian/wetland ecosystem
- 🏠 Strategies to establish floodplain connectivity include:
  - Activating overflow channels
  - Incorporating channel/floodplain benching (sediment removal)





# Alternative: Floodplain Connectivity





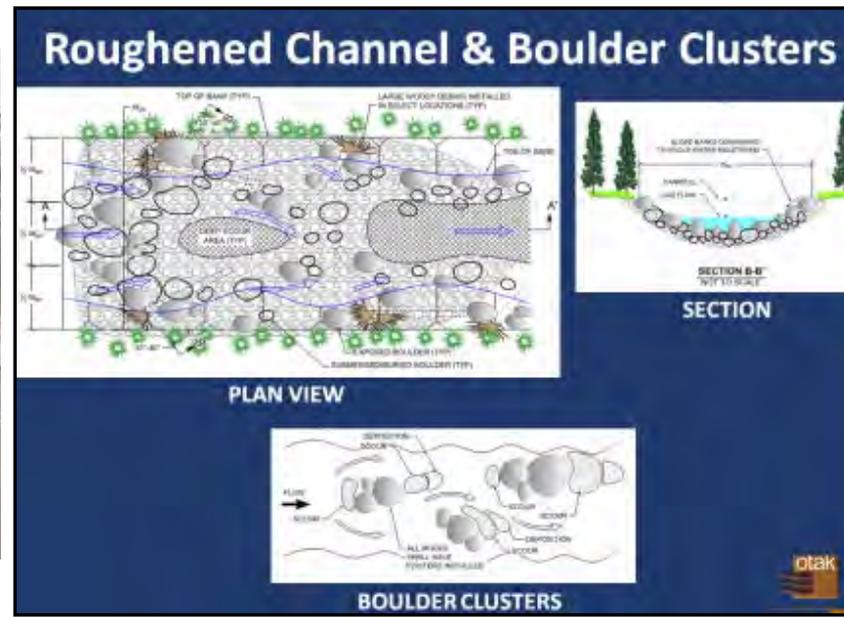
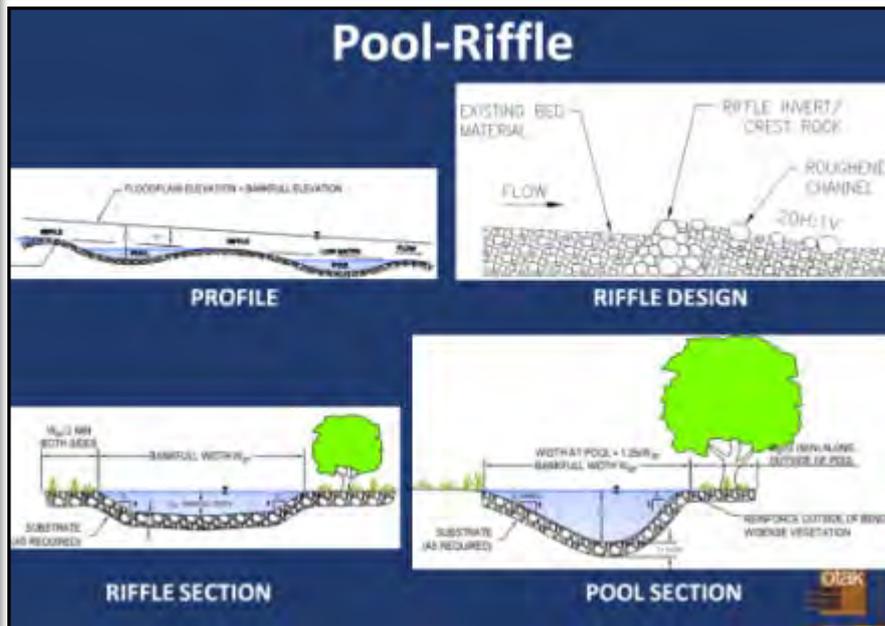
## Alternative: Channel Complexity

- Channel complexity refers to channel features that contribute to geomorphically effective bedforms, as well as habitat quality and diversity
  - Low Flow Channel
  - Pools, riffles, steps
  - Bars (point, lateral, mid-channel)
  - Large woody material (bank protection/habitat enhancement)
  - Roughened channels/boulder clusters



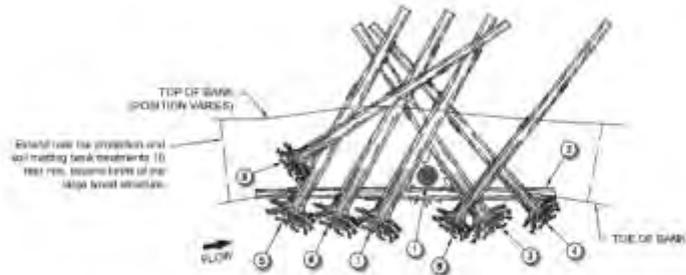


# Alternative: Channel Complexity

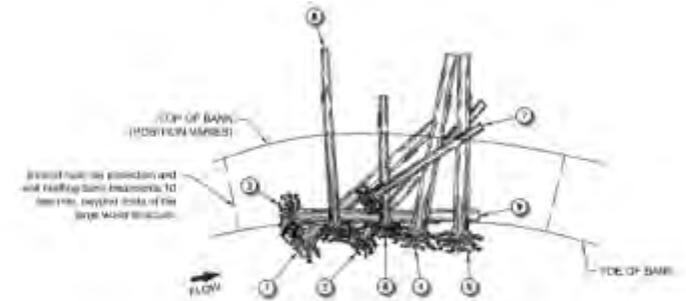




# Alternative: Channel Complexity



PLAN VIEW  
**Type A Large Wood Structure Detail**  
NOT TO SCALE



PLAN VIEW  
**Type B Large Wood Structure Detail**  
NOT TO SCALE





## Alternative: Revegetation

-  Revegetation will provide the framework for increased ecosystem function and aesthetic appeal along the corridor. Our team will:
- Protect and preserve existing stands of vegetation
  - Incorporate bioengineering measures to increase habitat maturation and resiliency
  - Plant a diverse palette of native plant species
    - Willow clusters
    - Cottonwood galleries
    - Wetlands (perennials)
    - Riparian benches (perennials and woody plants)
    - Upland meadows (grasses, wildflowers and trees)





# Alternative: Revegetation

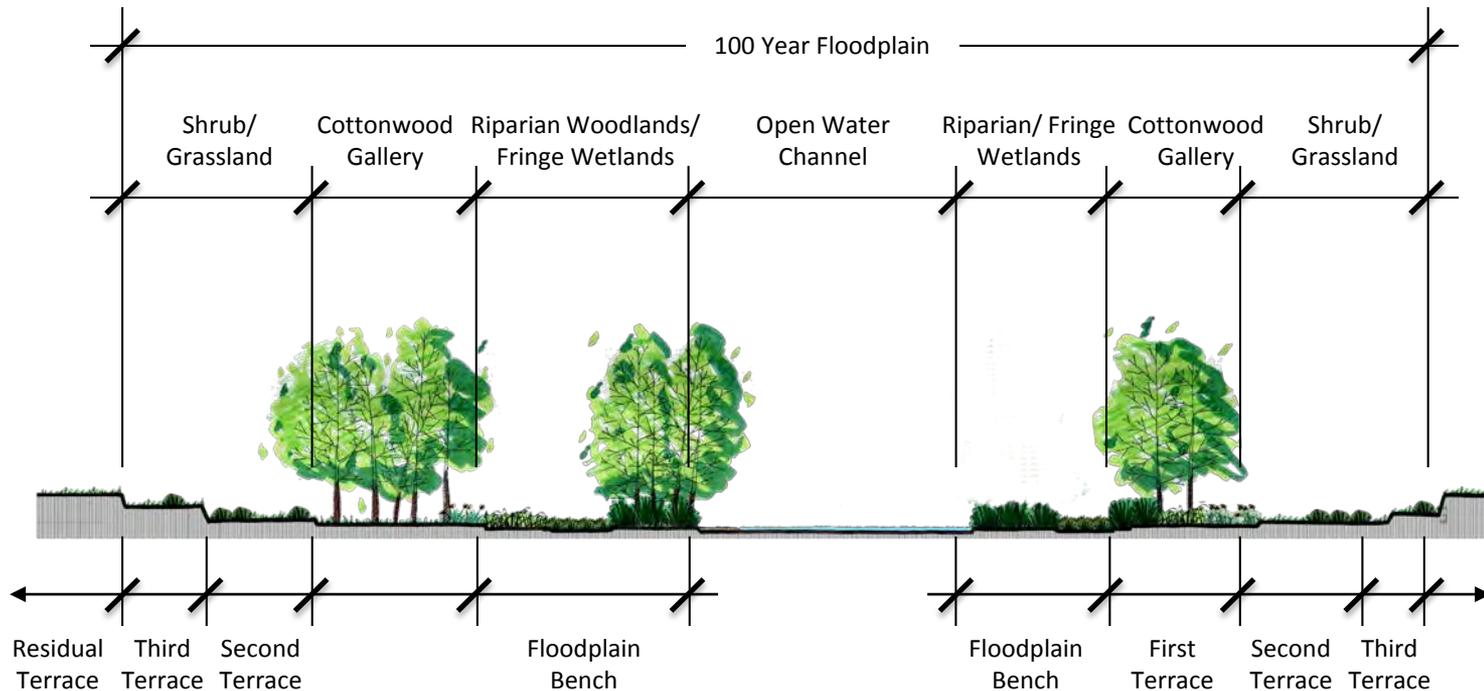
Cotton Wood Gallery



Wetland/Riparian Bench



Grassland Meadow





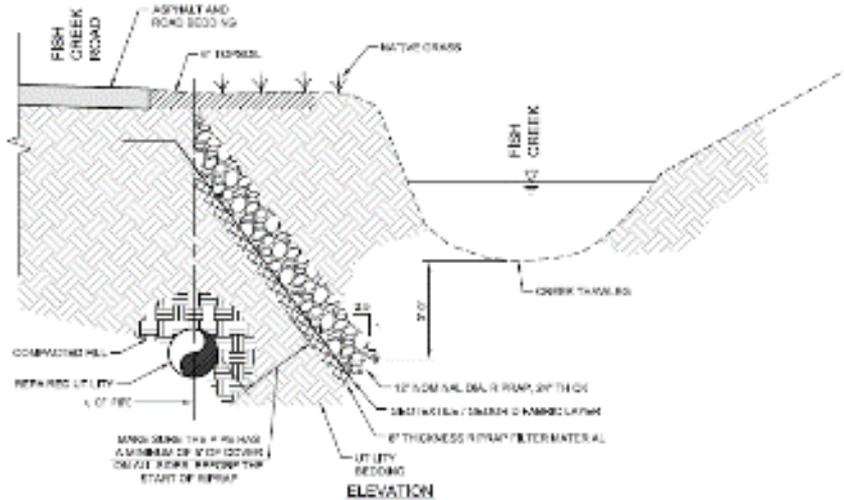
# Alternative: Infrastructure

- 🏗️ Infrastructure: Roads, Bridges, Houses, Ditches
- 🏗️ Bank Stabilization
  - Bioengineering
  - Buried Rootwads
- 🏗️ Offset Buried Natural/Structural Aspects
  - Buried Riprap Revetment
  - Buried Boulders
  - Structural Walls
- 🏗️ Channel Alignment: In-depth Analysis Required
  - Slope, Sinuosity, Wavelength, Belt Width
- 🏗️ Detention
- 🏗️ Cost

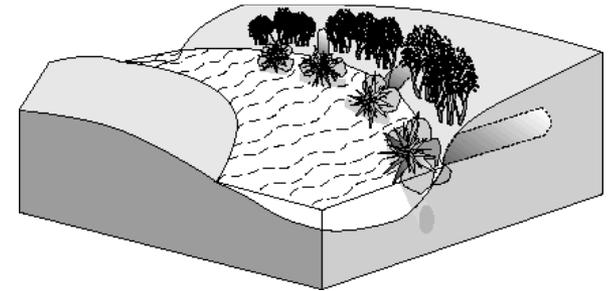




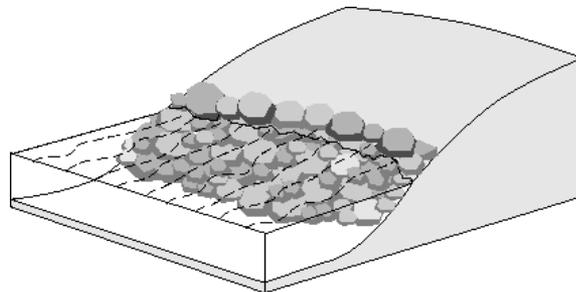
# Alternative: Infrastructure Protection



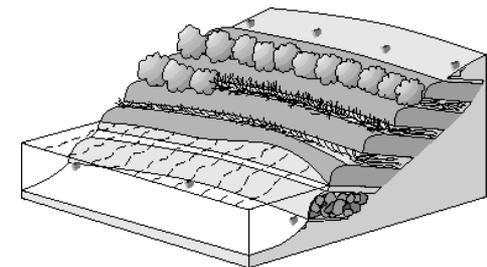
### Utility Armoring



### Root Wad Stabilization



### Boulder Toe Protection



### Vegetated Geogrid





# Emergency Watershed Protection (EWP)

## Colorado Emergency Watershed Protection (EWP) Program, Phase II





# Emergency Watershed Protection (EWP)

- 🏠 **Purpose:** Implement emergency recovery measures to protect life and property in watersheds impaired by a natural disaster
- 🏠 **Funding:** \$63.2 mil. total/ \$47.4 mil. federal
- 🏠 **State Sponsor:** Colorado Water Conservation Board
- 🏠 **Local Sponsors:** Counties, cities/towns, watershed coalitions, others
- 🏠 **Timeline:** April 1, 2018 technical assistance agreement ends





# EWP: Benefits Landowners

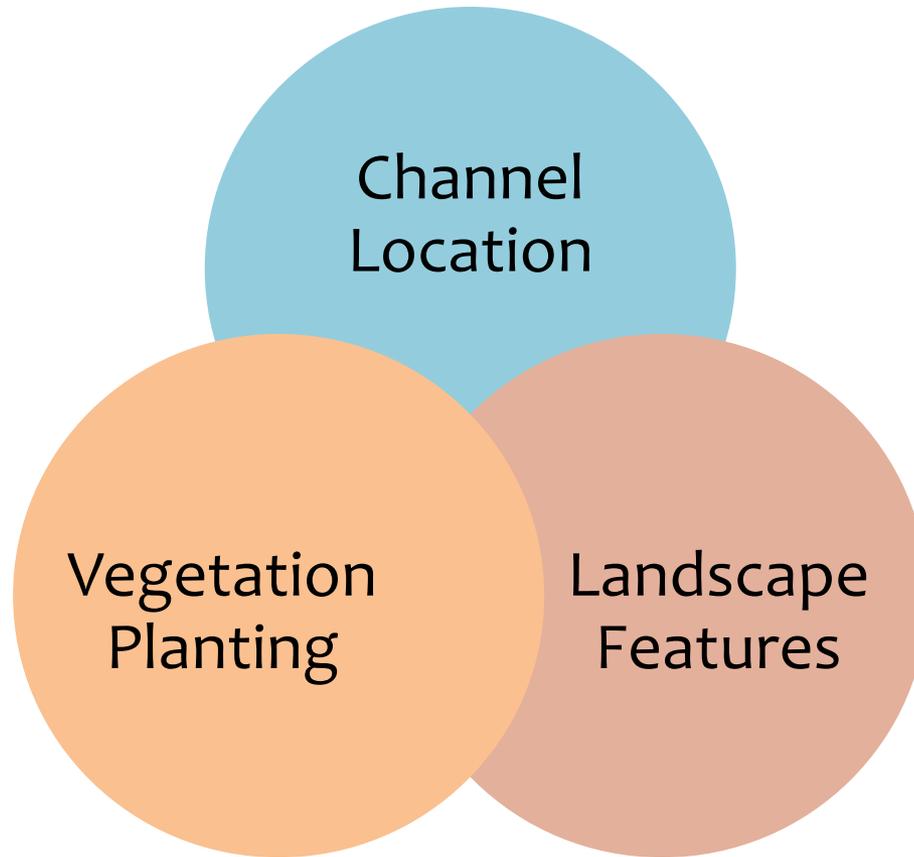
- 🏠 **Safety** - Purpose of projects: protect life safety and property from future flooding and erosion
- 🏠 **No Cost to Landowner**- Projects funded through federal, state, and local sponsors without capital cost to landowners, can opt out at any time before final design
- 🏠 **Holistic Approach** - Opportunity to:
  - *Design projects as a system and minimize impacts to downstream properties*
  - *Address some reach-wide water and sediment management issues*
- 🏠 **Stream and Habitat Health** - Improve overall ecological health and resiliency of your property
- 🏠 **Opportunities for Multiple Benefits:**
  - *Stabilize stream channels*
  - *Reconnect floodplains with streams*
  - *Manage sediment*
  - *Reduce hazards and improve flood conveyance*
  - *Improve habitat*
  - *Enhance recreational opportunities*





# EWP: Benefits Landowners

## 🏠 Key Topics for Collaboration and Agreement





# Preferred Alternative

- 🏗️ Combination of Alternatives
- 🏗️ Decision Matrix
- 🏗️ Engineering/Science Based Judgements
- 🏗️ Consensus and Buyoff from Stakeholders
- 🏗️ Understanding Construction Project Goals and Funding





# Site Visit with Stakeholders

- 🏠 Opportunity to walk sites with team to understand alternatives and preferred alternative
- 🏠 Week of July 18<sup>th</sup>





# What's Next?

-  Evaluate Alternatives with Decision Making Matrix
-  Prioritize Alternatives
-  Sediment Transport Analysis
-  Geomorphic Site Survey
-  Draft 30% Designs
-  Final 30% Designs

