# ELEVATING THE ROLE OF GREEN INFRASTRUCTURE (RESTORED WATERSHEDS/STREAMS) FOR IMPROVING WATER QUALITY – LESSONS LEARNED FROM OTHER STATES

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# PRESENTATION OVERVIEW

- Evolution of river restoration (RR) – science is leading the way
- Why RR is so important to Cherry Creek & all Colorado watersheds
- Stories from other States re policy & funding changes that have led to amplifying RR

# RIVER RESTORATION – BRIEF HISTORY

- Over the past 150+ years, 1000s of miles of rivers in Colorado were altered from their natural state.
- Common causes:
  - riparian veg removal
  - removal of beavers
  - moved and channelized for agriculture and development
  - overgrazing
  - mining
  - altered flows

# WHY ARE DEGRADED RIVERS A PROBLEM?

River restoration is needed to restore the benefits of a healthy river system:

- **Reduce flood damage**
- **Improve water quality** including temperature regulation, nutrient processing, filtering pollutants, carbon sequestration.
- **Sediment retention in floodplain** reduces downstream burden on ag diversions, reservoir longevity, and municipal drinking water systems.
- **Habitat** for numerous species of fish, amphibians, birds and mammals. About **75% of CO wildlife depends on riparian/wetland habitat.**

***In sum, healthy watersheds provide ecosystem services including flood control, groundwater recharge, water purification, dilution/removal of contaminants, sediment storage, vegetative bank stabilization, and habitat.***

# RR RESEARCH – LEADS TO EVOLUTION OF RR METHODS

In the mid 90s, agency and university scientists began focusing research on the results of “form-based” hard engineering RR questioning whether it was money well spent as it wasn’t leading to significant ecological benefits.

# TRADITIONAL APPROACH

Hard engineering, ***form-based***, focused on stabilizing a single thread channel

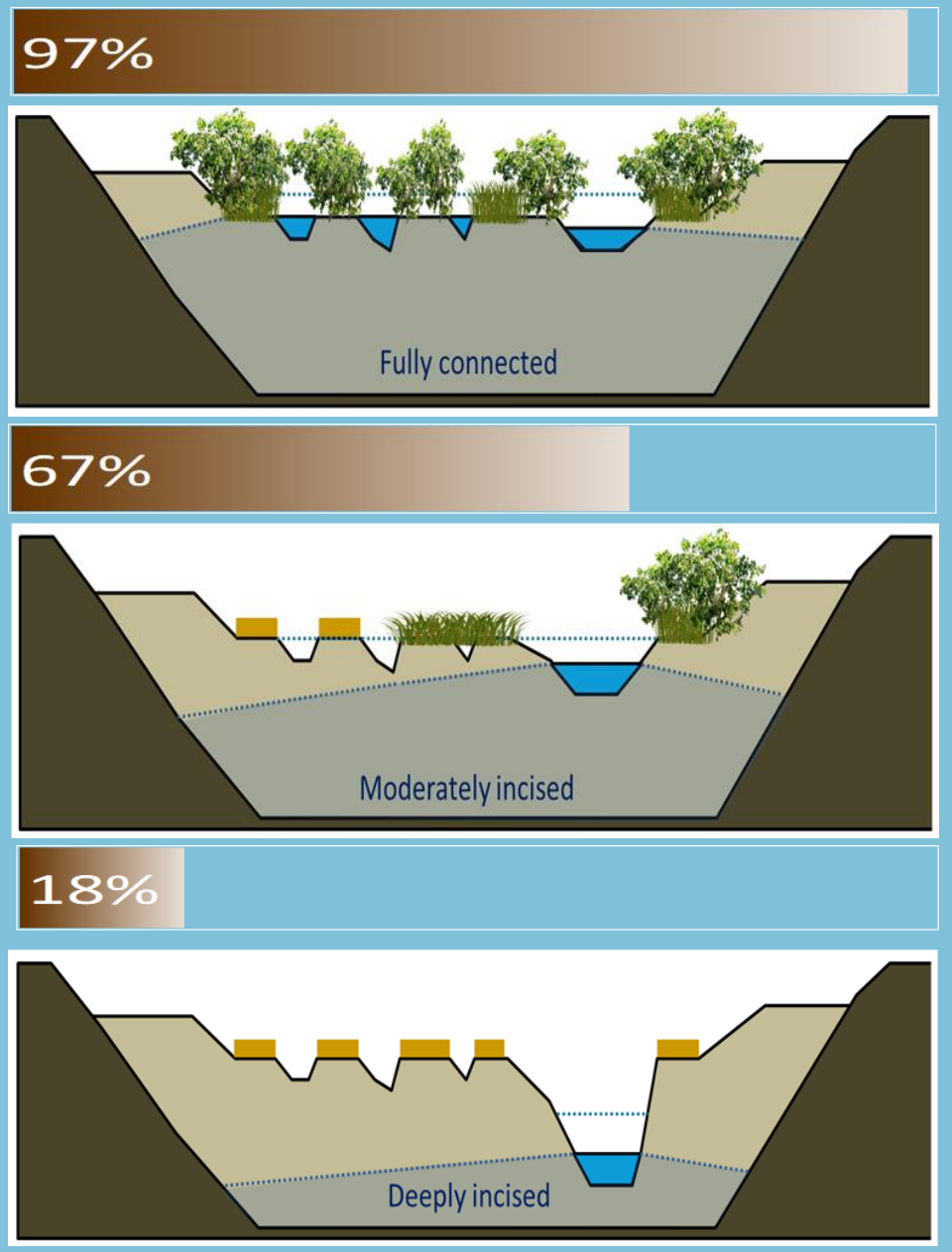

# EVOLVING METHODS

Floodplain reconnection, ***process-based***, focused on resilient systems

| Form-based | | Process-based |
|---|---|---|
| Channel treatments | → | System treatments |
| Static systems | → | Dynamic systems |
| Resistance | → | Resilience |
| Transport | → | Retention |
| Dry/mesic floodplain | → | Hydric floodplain |
| Enhancement treatments | → | Address causes |
| Immediate | → | Develop over time |

* *Slide created by Mark Beardsley, EcoMatrix*

# HABITAT AND ECOSYSTEM BENEFITS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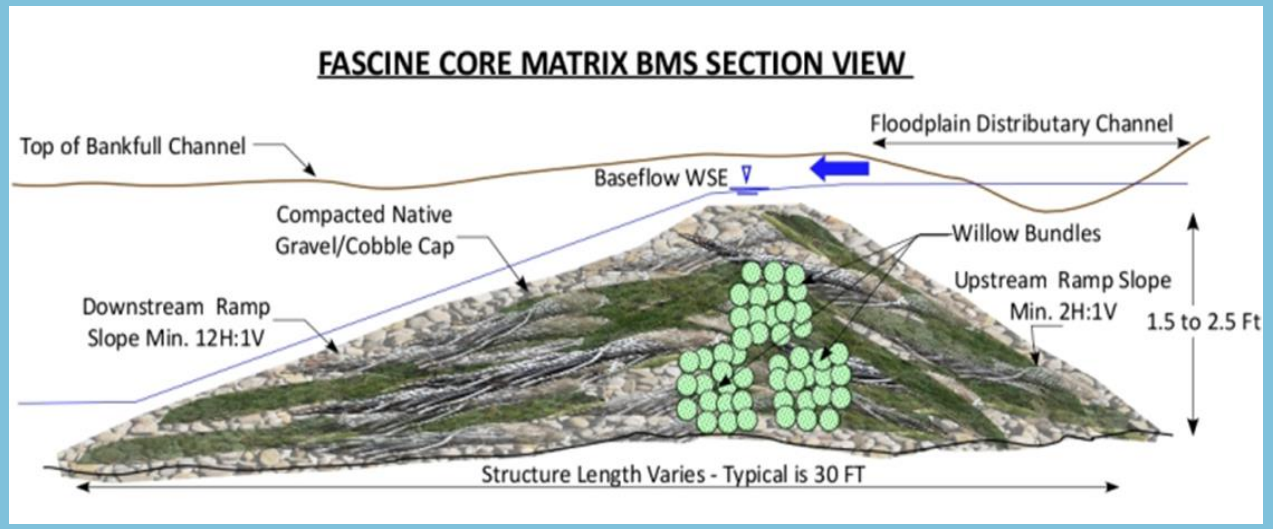


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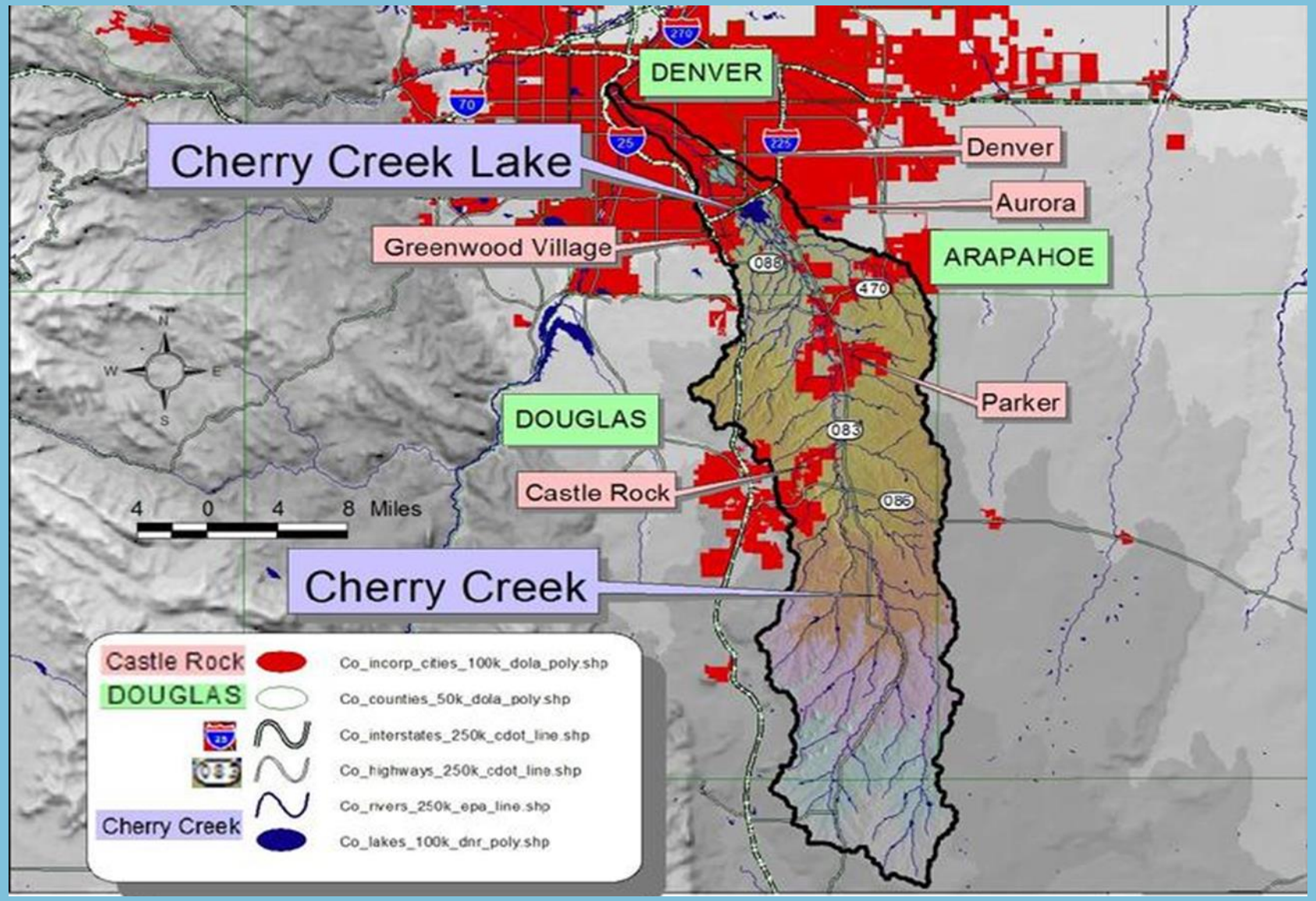
# CHERRY CREEK WATERSHED

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# CHERRY CREEK WATERSHED PLAN CHAPTER 5: POTENTIAL MANAGEMENT STRATEGIES

- ***Channel or Stream Stabilization*** means the activities used to minimize erosion and sedimentation.
  - Stabilization activities include, but are not limited to, excavation and grading; placement of fill; construction of check structures, drop structures, and channel bed and bank protection measures.

- ***Channel or Stream Reclamation*** means additional measures or enhancements that typically includes riparian and floodplain vegetation planting and ***a channel cross section that results in more frequent connection and flooding of the overbank area***. Riparian vegetation promotes filtration of fine particles with attached nutrients, and overbank flooding promotes additional filtration . . . *which reduces nutrient loads and concentrations*.

- Therefore, the benefits from stream reclamation include the reduction in sediment and nutrients (i.e., phosphorus and nitrogen) transport from the main channel, but also reduction in nutrient loads from riparian and floodplain vegetation through more frequent floodplain inundation.

# CHAPTER 5 CONTINUED:
## STREAM RECLAMATION WATER QUALITY BENEFIT EVALUATION REPORT

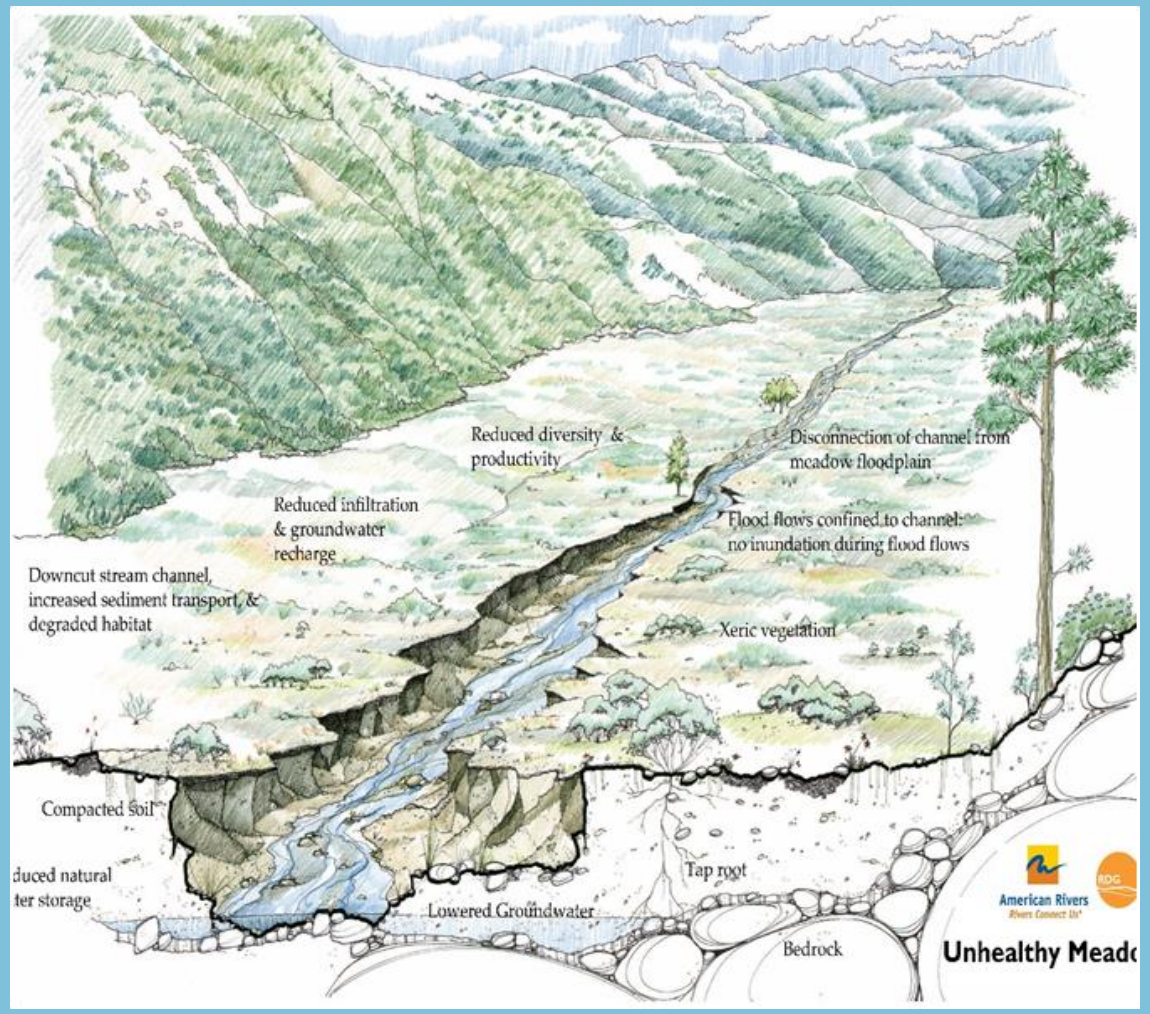
**Report conclusion**:

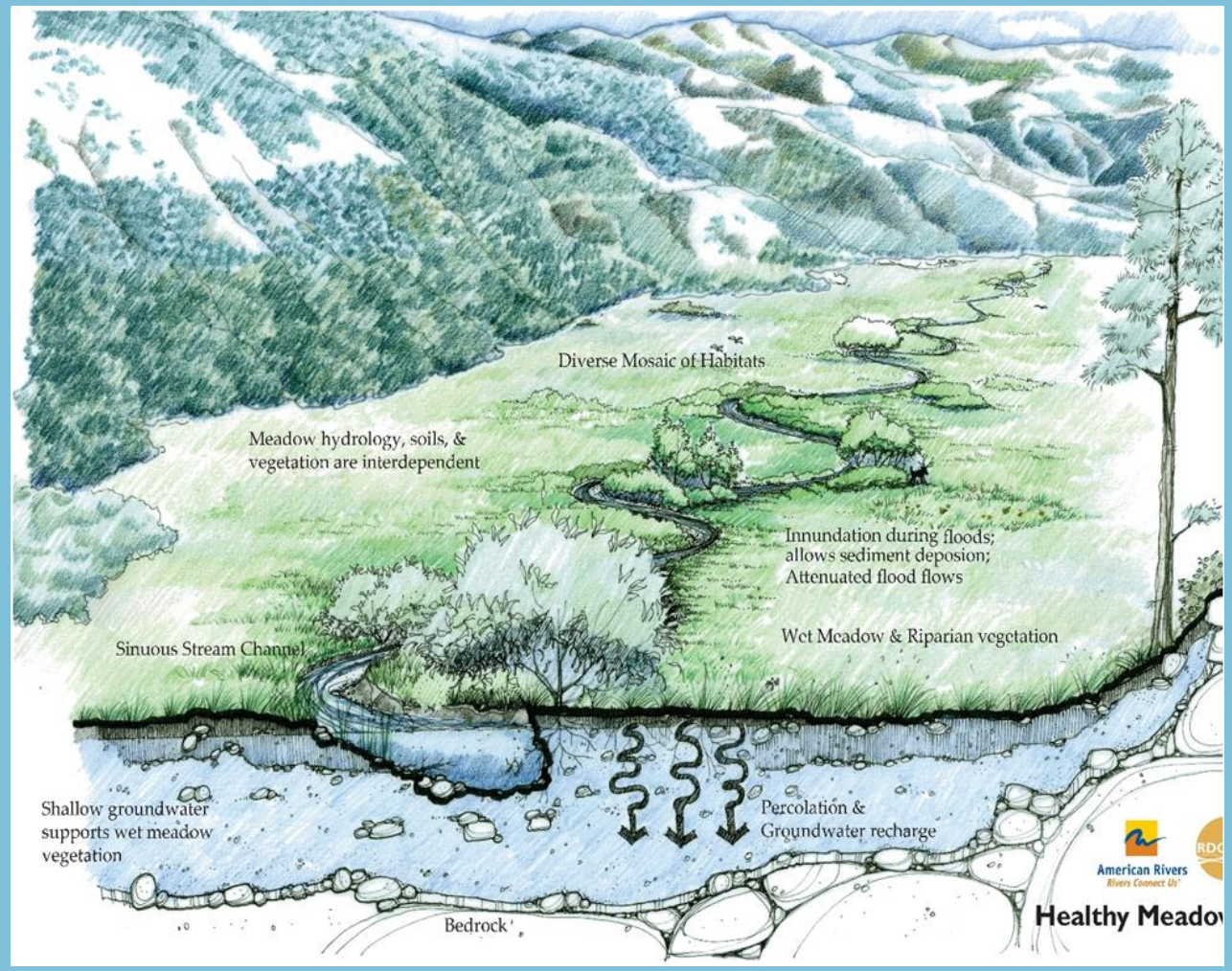
Stream reclamation is beneficial to water quality in both the steam and reservoir.

**Other research has shown**:

Process based restoration of reconnecting the floodplain will increase water quality benefits vs form based restoration method because of the increased filtration surface area

# MEADOW/STREAM RESTORATION IN THE HIGH SIERRA NEVADAS



# IMPORTANCE OF MEADOW RESTORATION

*Before and After Meadow Restoration Photos*

# BUILDING THE SIERRA MEADOWS PARTNERSHIP:
## RELATIONSHIP, RECONNECTION, RESTORATION

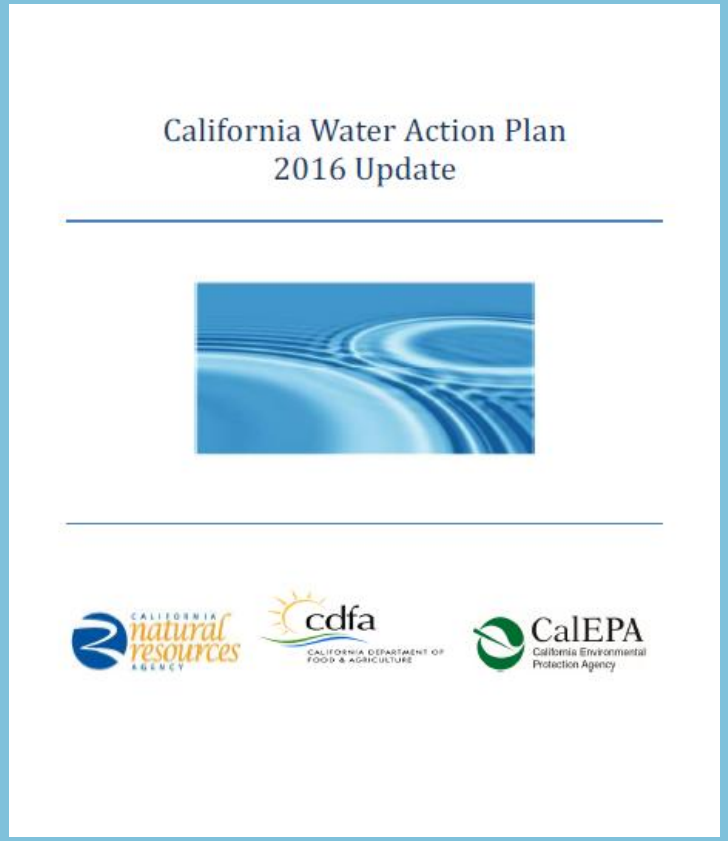
Dr. Rene Henery, PhD., Science Director for
Trout Unlimited; University of Nevada, Reno

# PARTNERSHIPS ELEVATED RESTORTION OF GREEN INFRASTRUCTURE

- American Rivers
- CA Dept. of Fish and Wildlife
- CA Trout
- CA Tahoe Conservancy
- CA Dept. of Water Resources
- Feather River Land Trust
- Forest Creek Restoration
- The Institute for Bird Populations
- National Forest Foundation
- The Nature Conservancy
- National Fish and Wildlife Foundation
- Plumas Corporation
- Point Blue
- The Sierra Fund
- Stillwater Sciences
- The Trust for Public Land
- Trout Unlimited
- Sierra Foothill Conservancy
- UC Davis
- UC Merced
- USGS
- U.S. Forest Service
- U.S. Fish & Wildlife Service
- Water Institute

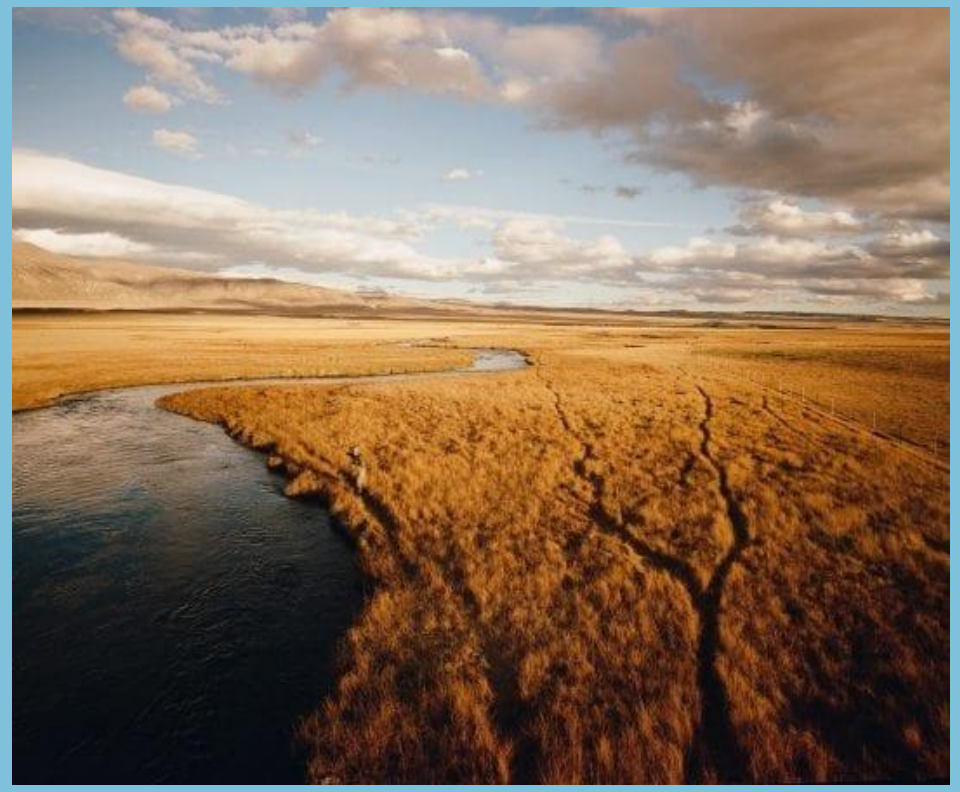
# CALIFORNIA 2016 WATER PLAN

- ***"Protect and restore degraded stream and meadow ecosystems*** to assist in natural water management and improved habitat. Meadows provide a natural storage opportunity, critically important with a changing climate, while properly functioning stream systems reduce downstream sedimentation and enhance critical aquatic habitat."
- "***Restore Key Mountain Meadow Habitat***: The Department of Fish and Wildlife, in coordination with other state resource agencies, will restore 10,000 acres of mountain meadow habitat in strategic locations in the Sierra Nevada and Cascade mountain ranges, which can increase groundwater storage and provide habitat for more than 100 native species, many of which are at risk as threatened or endangered.

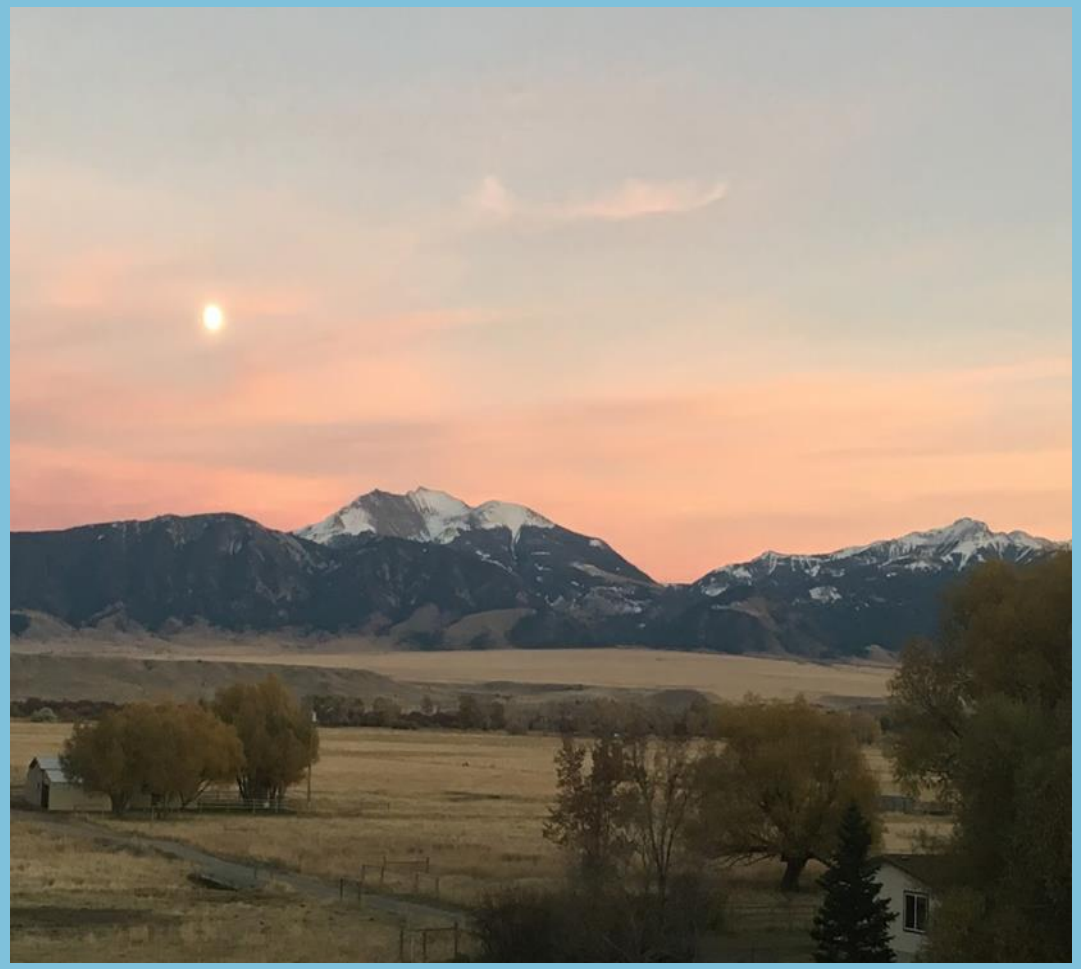


# CALIFORNIA: ASSEMBLY BILL 2480 (2016)

- 108.5.
- (a) It is hereby declared to be the established ***policy of the state that source watersheds are recognized and defined as integral components of California's water infrastructure.***
- (b)
  - (1) As climate change advances, source watersheds that provide the majority of the state's drinking and irrigated agricultural water are of particular importance to maintaining the reliability, quantity, timing, and quality of California's environmental, drinking, and agricultural water supply.
  - (2) Recognizing the critical role of source watersheds in enhancing water supply reliability, ***the maintenance and repair of source watersheds is eligible for the same forms of financing as other water collection and treatment infrastructure.***



# MONTANA: HOUSE BILL 424 (2017)



*MONTANA BORROWS LANGUAGE FROM CALIFORNIA WATER PLAN AND LEGISLATION*

- ***Source* watersheds** are an integral component of Montana's water resources…and are eligible for the renewable resource grant and loan program.

- ***Soil and range health*** play a vital role in protecting and sustaining Montana's renewable natural resources by retaining water, soil, and nutrients in place on the landscape

# SUMMARY

When and where possible, consider stream restoration designs that reconnect the floodplain to allow for frequent inundation

- to increase water quality,
- flood water retention/risk reduction,
- and ecological benefits.