

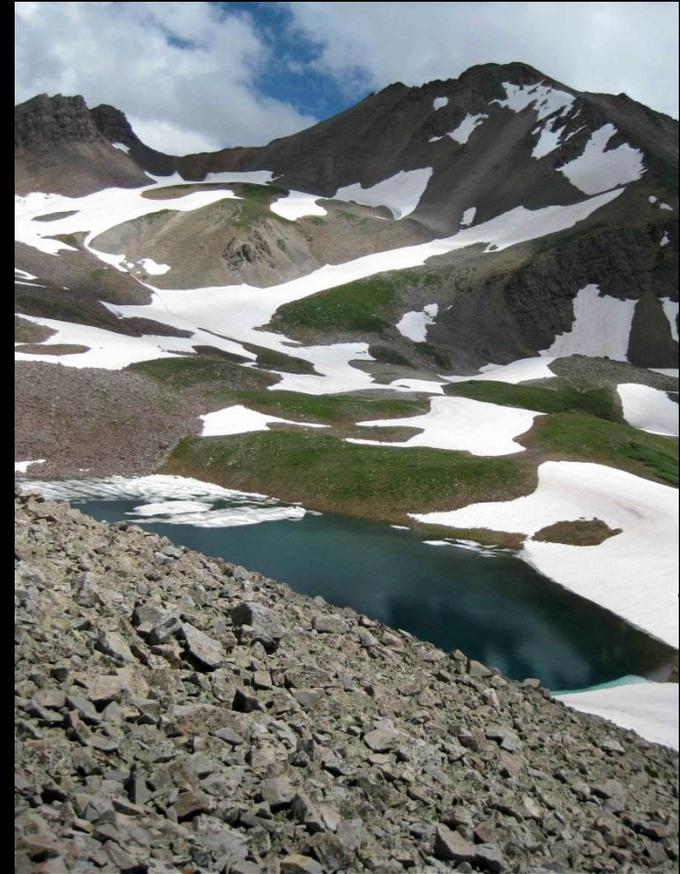
# Enhancing the Resilience of Riparian/Wetland Ecosystems in the Upper Gunnison Basin

2014 Sustaining Colorado Watersheds  
Conference  
October 8, 2014

Andrew Breibart, BLM  
Betsy Neely, TNC  
Gunnison Climate Working Group

# Projections by Climate Scientists

- **Warming will continue; warmer summers**
- **Earlier spring runoff; declines in spring snowpack**
- **Decreases in annual stream flow; decreasing late-summer flows**
- **Increase in droughts, heatwaves, & wildfires**



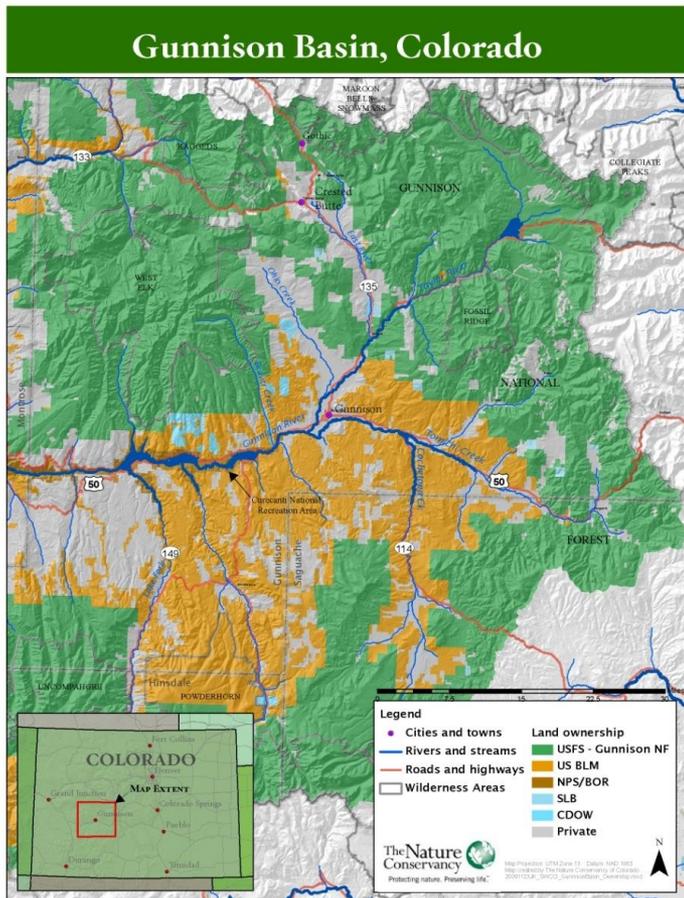
Barsugli & Mearns 2010  
Overpeck et al. 2013  
Lukas et al. 2014

# Gunnison Climate Working Group Goals

1. Increase understanding of threats of climate change
2. Identify & prioritize strategies to reduce impacts
3. Promote coordinated action across boundaries



# 2009 Climate Adaptation Workshop for Natural Resource Managers

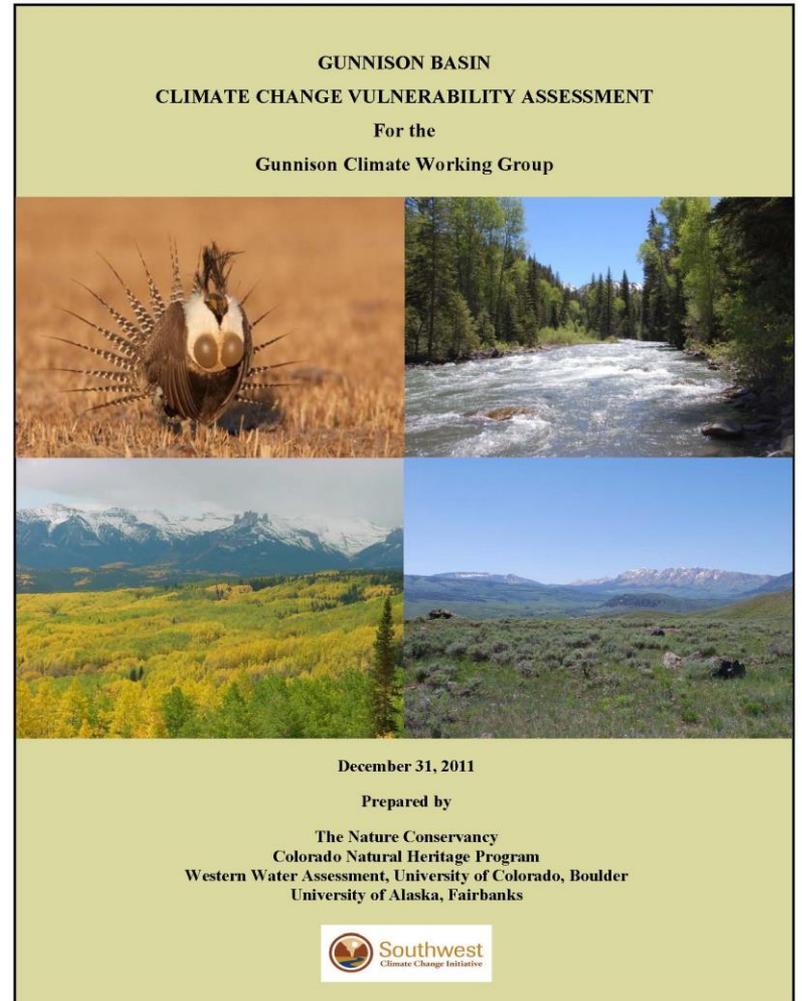


# Ecological Vulnerability Assessment

- 14/24 ecosystems
- 53/74 species

## Rated highly vulnerable:

- Groundwater dependent montane wetlands
- Riparian ecosystems
- Gunnison Sage-grouse



# Riparian/Wetland Ecosystems: Gunnison Sage-grouse Brood-Rearing Habitat



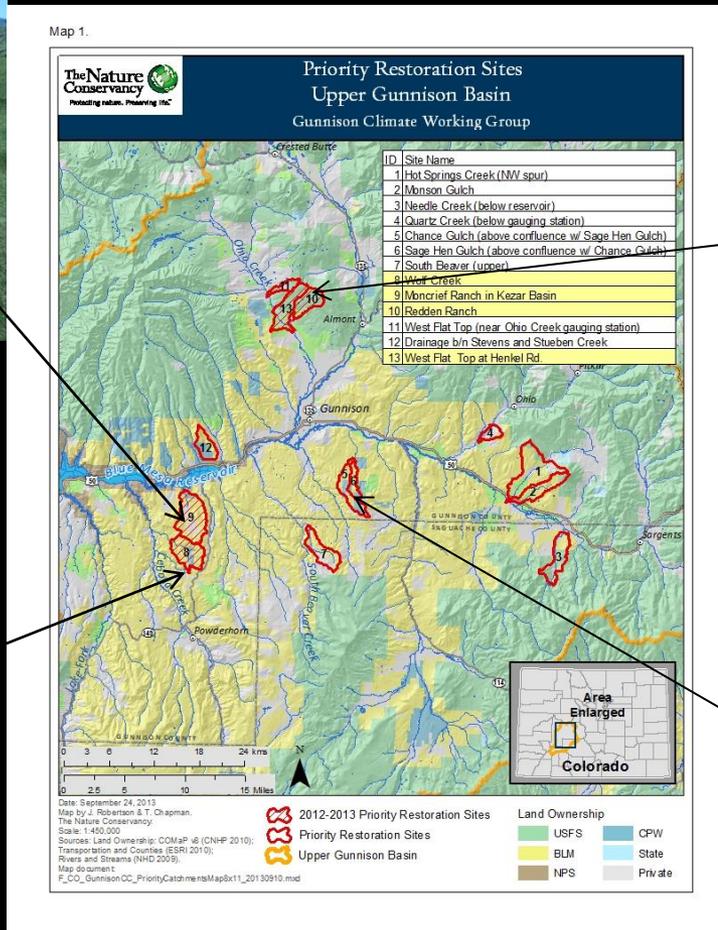
# 2012-2014 Priority Restoration Sites Upper Gunnison Basin, Colorado



Kezar Basin Private



Wolf Creek BLM & Private



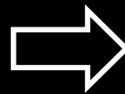
West Flat Top USFS & Private



Chance Gulch BLM & Private

# Project Goal

Enhance resilience of riparian & wetland habitats to help Gunnison Sage-grouse & other wildlife species adapt to climate change



# Defining Resilience

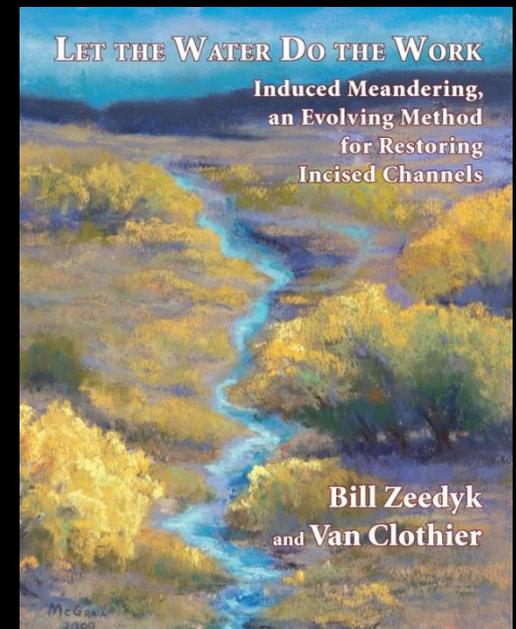
Functioning hydrology/ecology:

- Stream channel connected to floodplain
- Stream banks hold moisture & reduce erosion during floods
- Stabilize head-cuts
- Native & diverse wetland species



# Techniques

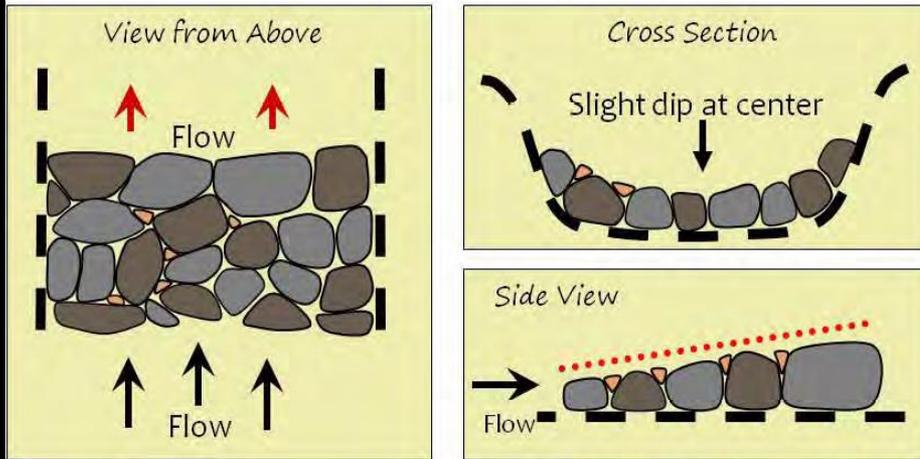
- **Rock and log structures:**
  - One Rock Dam (ORD)
  - Media Luna
  - Sod Dam
  - Lay Back
  - Zuni Bowl
  - Log and Fabric Step Falls
- **Plug and Spread**
- **Drift Fences**



# One Rock Dam

## One Rock Dam

= 1 rock high + uniform surface

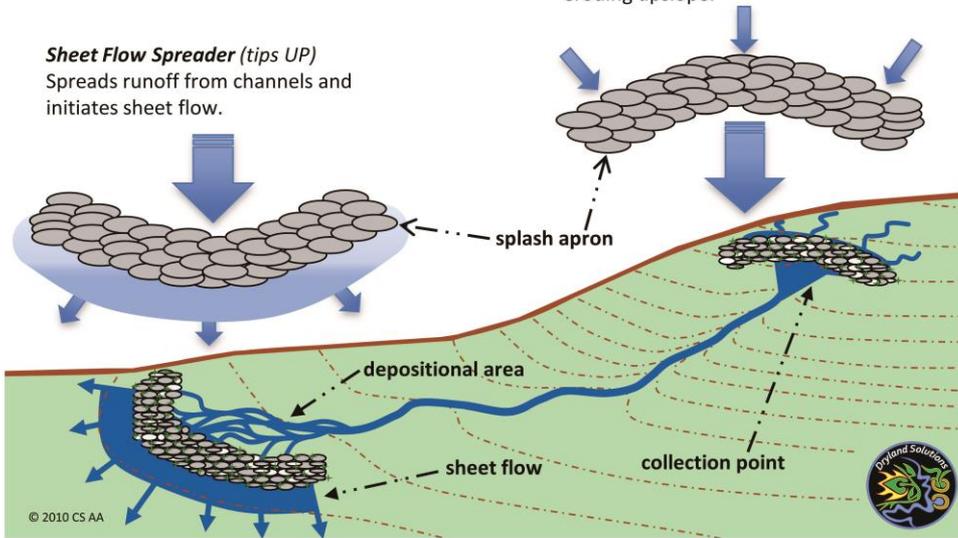


# Media Luna

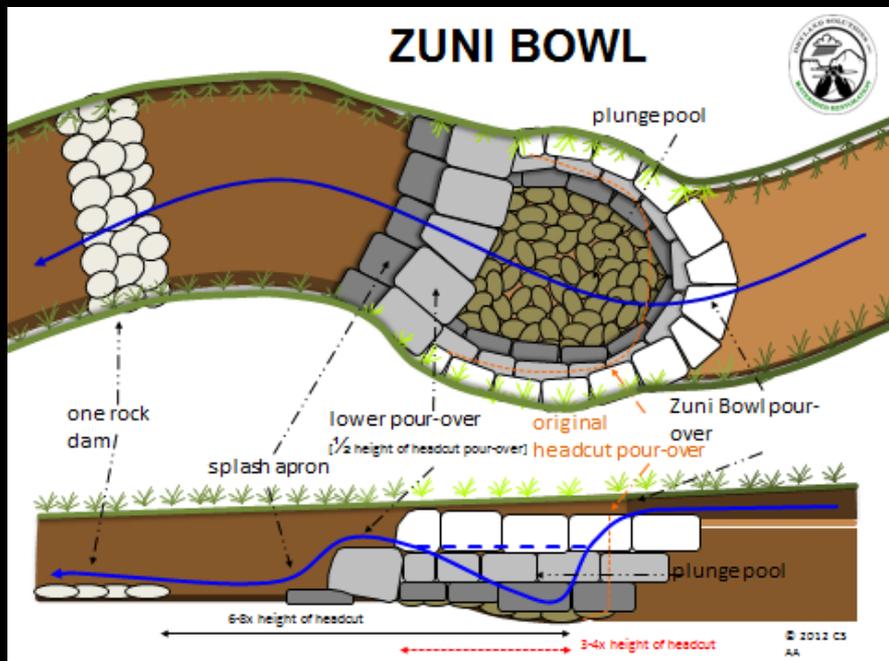
## MEDIA LUNA

**Sheet Flow Spreader (tips UP)**  
Spreads runoff from channels and initiates sheet flow.

**Sheet Flow Collector (tips DOWN)**  
Prevents developing rills and gullies from eroding upslope.



# Zuni Bowl



# Log and Fabric Step Falls



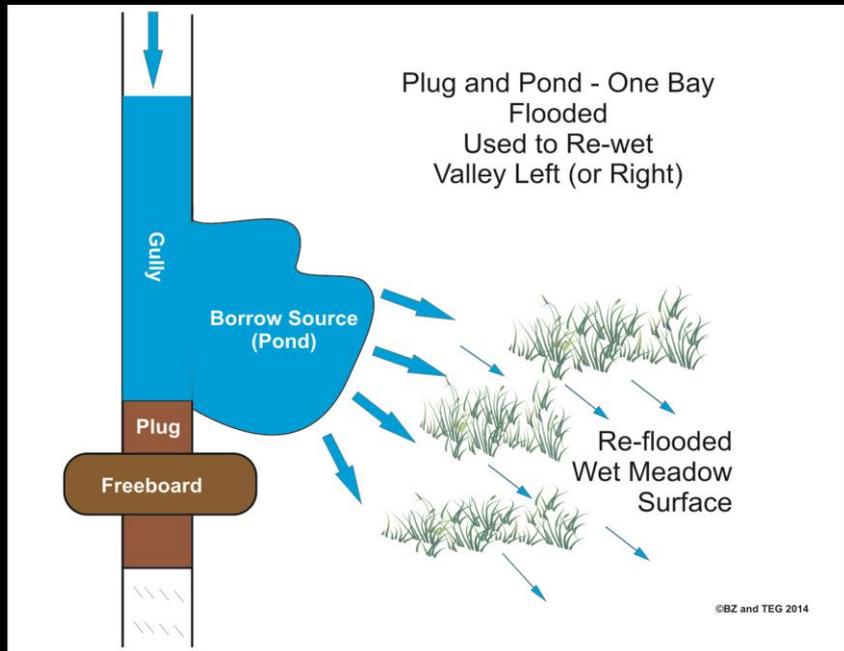
Gully system on West Flat Top, Gunnison National Forest

# Lay Back



Lower Wolf Creek, 2013  
A. Breibart & B. Neely

# Plug and Spread



# Drift Fence



# Monitoring

- Soil moisture & temperature
- Groundwater wells & temperature sensors
- Geomorphology
- Vegetation

# NRCS-soil moisture monitoring

## Questions

- Does the project result in the retention of soil moisture throughout the growing season in floodplain?
- Does the project affect the shallow water table (<20")?
- Can temperature be used as a proxy for detecting a saturated water table?
- Will this method allow one to detect changes in the water table and soil moisture as result of precipitation event?

## Approach

- Paired site approach: treated and untreated.
- 2 moisture and 2 temp sensors were placed in the treated area and 2 in the untreated area upstream of work.
- Readings occur every 2 hours.

# Soil Moisture



# Groundwater Monitoring

- 8 piezometers installed in 2013 at Wolf Creek.
- Depths are 5 ft.
- Along horizontal gradient away from channel.
- Paired with vegetation monitoring.
- 4 weeks of measurements in 2013
- Plan to install temperature sensors at 1 ft. below surface (Soles, 2012 in Cebolla Canyon Closed Basin).



Lower Wolf Creek Meadow  
A. Breibart 2013

# Geomorphological Monitoring



- Longitudinal profile
- Cross section

# Vegetation Monitoring & Permanent Photo-Points

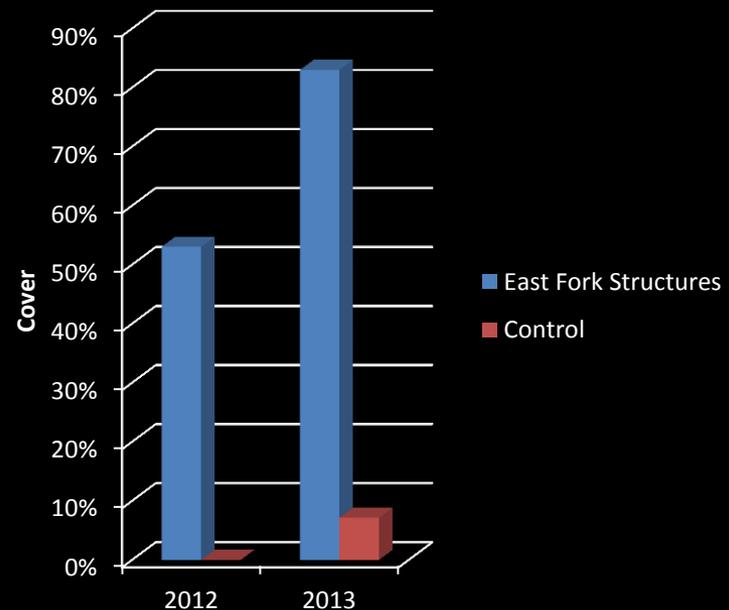


**Objectives:** *Increase* average cover of sedges, rushes, willows, and wetland forbs; *Decrease* upland species

# Wetland Species Positively Responded to Structures

- Canopy cover of wetland species significantly increased ( $P \leq 0.05$ ) between 2012 & 2013
- The canopy cover slightly increased in the control (not restored).

East Fork Wolf Creek Wetland Species



# Media Luna 2012-2014



Wolf Creek Ranch  
R. Rondeau & B. Neely

# Drift Fence

August 2013



August 2014



# Scaling-Up Resilience Project

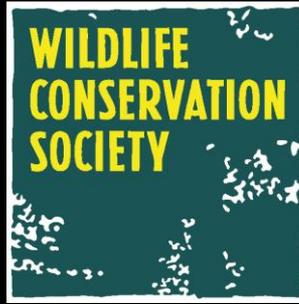
1. Restore hydrologic/ecologic function
2. Build sustainable & enduring program w/ local capacity
3. Ensure scientific rigor
4. Develop & evaluate new cost-effective tools
5. Share best practices & lessons learned



# Thanks to all Funders, Supporters & Partners!



Ranchers



Terra Foundation  
Michael Banks

