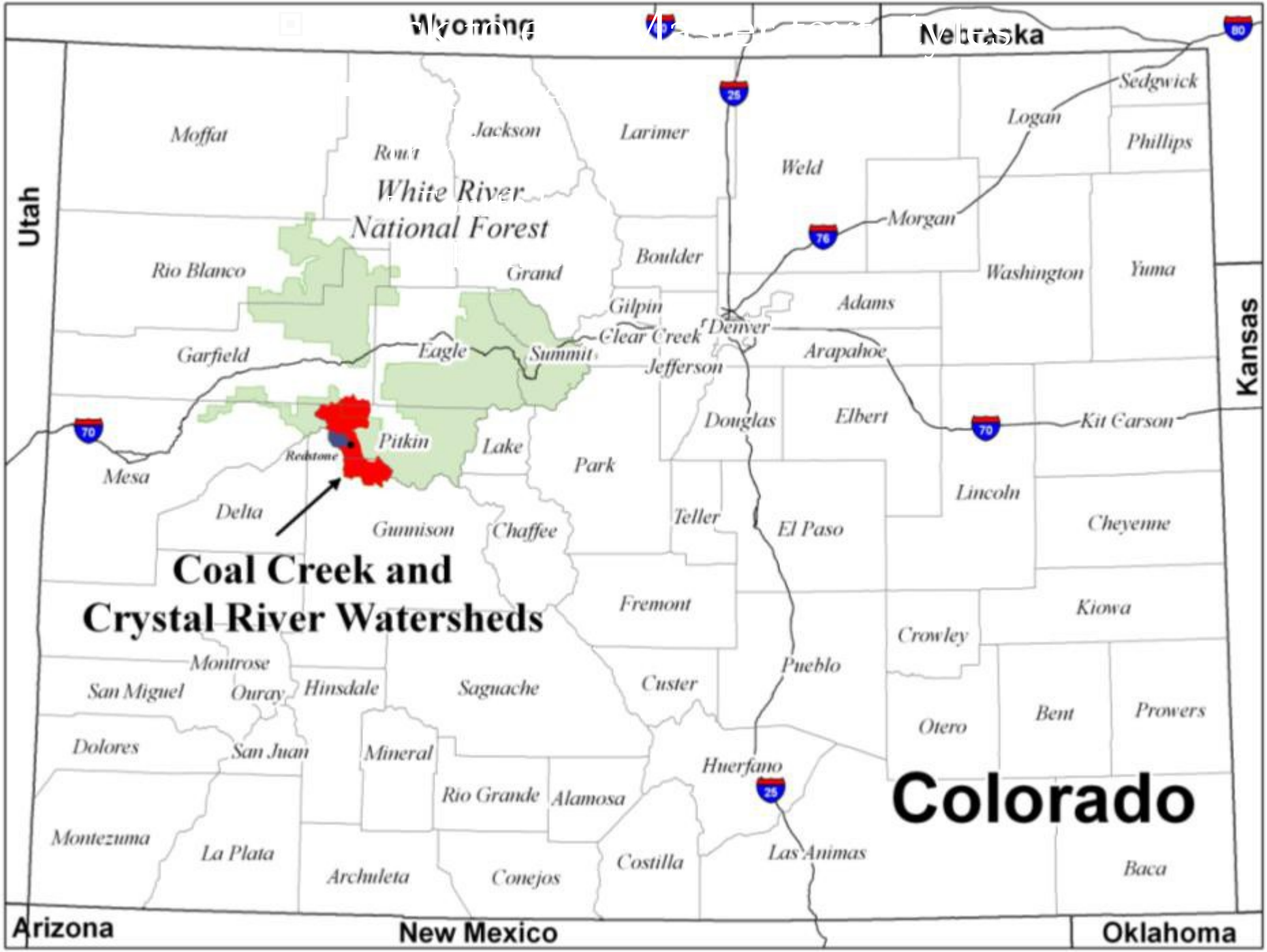
Coal Basin and Crystal River Confluence Area Project

Sharon CLARKE
ROARING FORK CONSERVANCY
OCTOBER 10, 2012


Wyoming
Nebraska
Utah
Kansas
Arizona
New Mexico
Oklahoma
Colorado
Moffat
Routt
Jackson
Larimer
Weld
Logan
Sedgwick
Phillips
White River
National Forest
Morgan
Rio Blanco
Grand
Boulder
Washington
Yuma
Gilpin
Adams
Clear Creek
Denver
Garfield
Eagle
Summit
Jefferson
Arapahoe
Douglas
Elbert
Kit Carson
Pitkin
Lake
Park
Mesa
Redstone
Lincoln
Delta
Gunnison
Chaffee
Teller
El Paso
Cheyenne
Coal Creek and
Crystal River Watersheds
Fremont
Kiowa
Crowley
Montrose
Pueblo
San Miguel
Ouray
Hinsdale
Saguache
Custer
Otero
Bent
Prowers
Dolores
San Juan
Mineral
Huerfano
Rio Grande
Alamosa
Montezuma
La Plata
Archuleta
Conejos
Costilla
Las Animas
Baca

Thank You

Colorado Division of Reclamation Mining & Safety

Partners

Federal Agencies,

- US Forest Service, US Environmental Protection Agency, US Fish and Wildlife Service, Federal Highway Administration, US Army Corps of Engineers

Colorado State Agencies

- Department of Public Health and Environment, Division of Mining, Reclamation, and Safety, Department of Transportation, Division of Water Resources, Division of Parks and Wildlife, Colorado Water Conservation Board , Colorado Mesa University

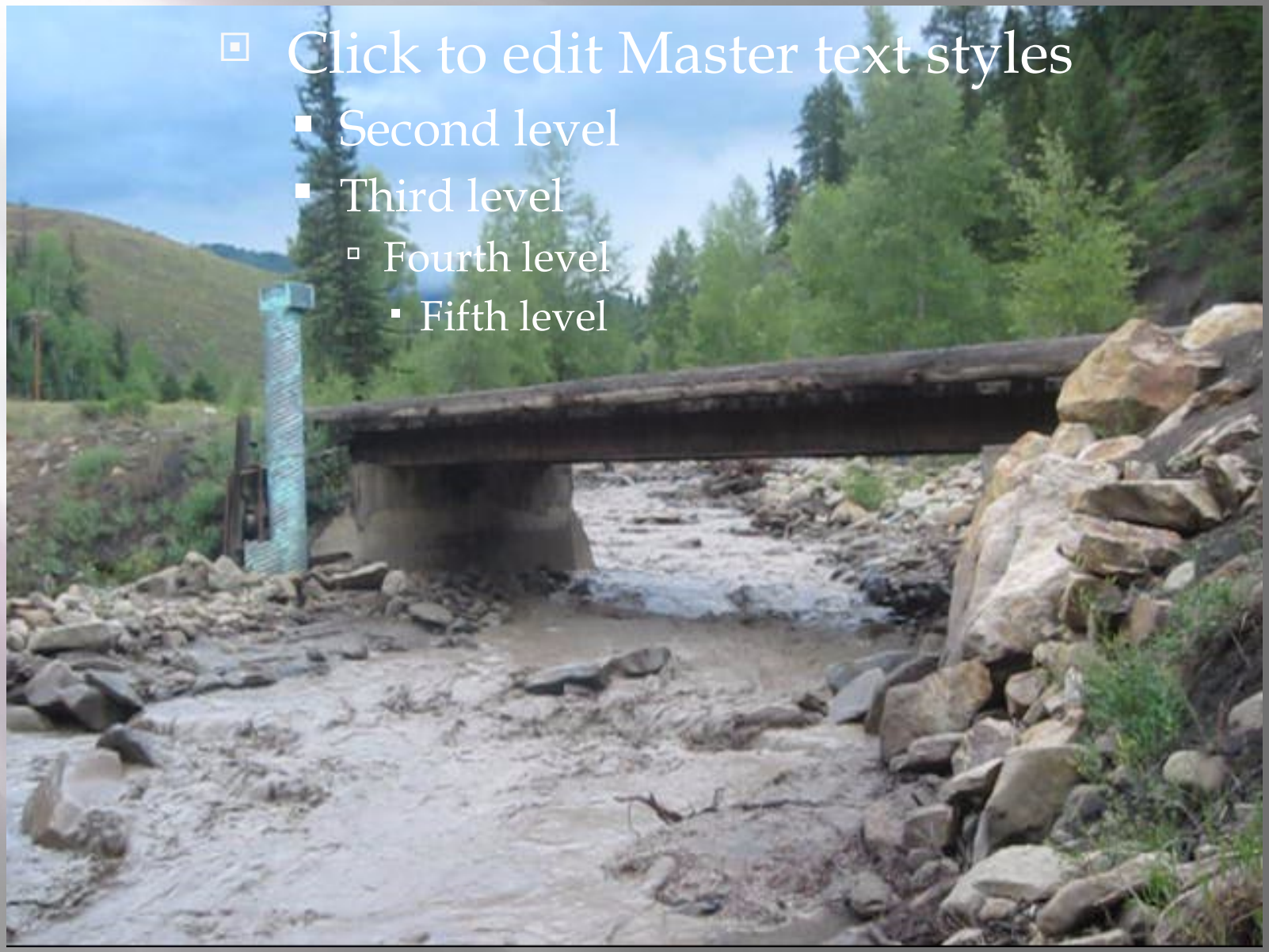
Local governments

- Pitkin County and Crystal River Caucus

Other entities such as

- Redstone Community Association; private landowners; Roaring Fork Conservancy; Colorado Trout Unlimited; Coal Basin Cattleman Association; National Forest Foundation; Redstone Historical Society; Crystal Valley Environmental Protection Association; and West Elk Scenic and Historic Byway

Summer Monsoon
July 16, 2012



Coal Creek entering the Crystal River at Redstone May 15, 2008

TOPOGRAPHICAL MAP
OF
PROPERTY OF J.C. OSGOOD
AND ADJACENT
TOWN OF REDSTONE

T. 10, S. R. 88 W., PITKIN CO., COLO.
August 1903 Scale [illegible] F. Young

J.C. Osgood
The Crystal River R.R.
The Colo. Fuel & Iron Co.
The Crystal River Land & Imp. Co.
The Redstone Imp. Co.

© ROBERT AND SALLY OSGOOD LAWRENCE COLLECTION

CRYSTAL RIVER

TOWN OF REDSTONE

IN THIS VIEW, [illegible] washing plant [illegible] dual-gauge tra[illegible] alongside the [illegible] gauge locomo[illegible] that the contra[illegible] wheeled narro[illegible] the line to Coa[illegible]

Location of streams at confluence?

From: Marble: A Town Built on Dreams. Oscar McCollum, Jr. 1992.

"Alluvial Hot Spots"

- Natural wide spots along a rivers course
  - Scarcity in a steep mountain valley increases significance
- High Biological significance
  - Food, refugia, high quality terrestrial and aquatic habitat
- Relief valve for high flows; slows velocity
- Crystal River Examples
  - Placita, Redstone, Janeway, BRB, Thompson Creek

t Master text styles

el

el

Fifth level

Placita Area

Complex meandering channel with wide belt width

Better width to depth ratio (narrow and deeper)

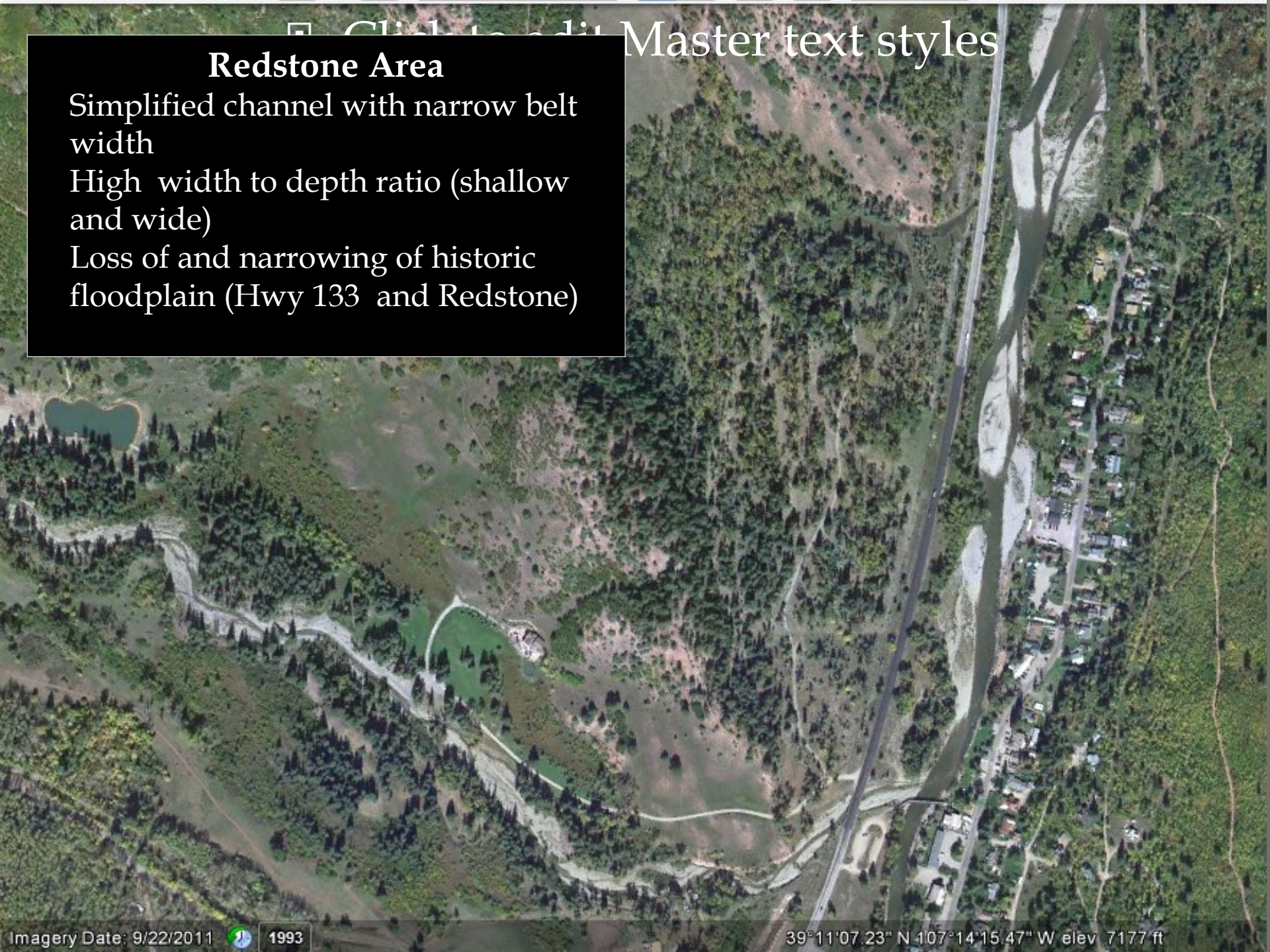
Wider Floodplain

Redstone Area

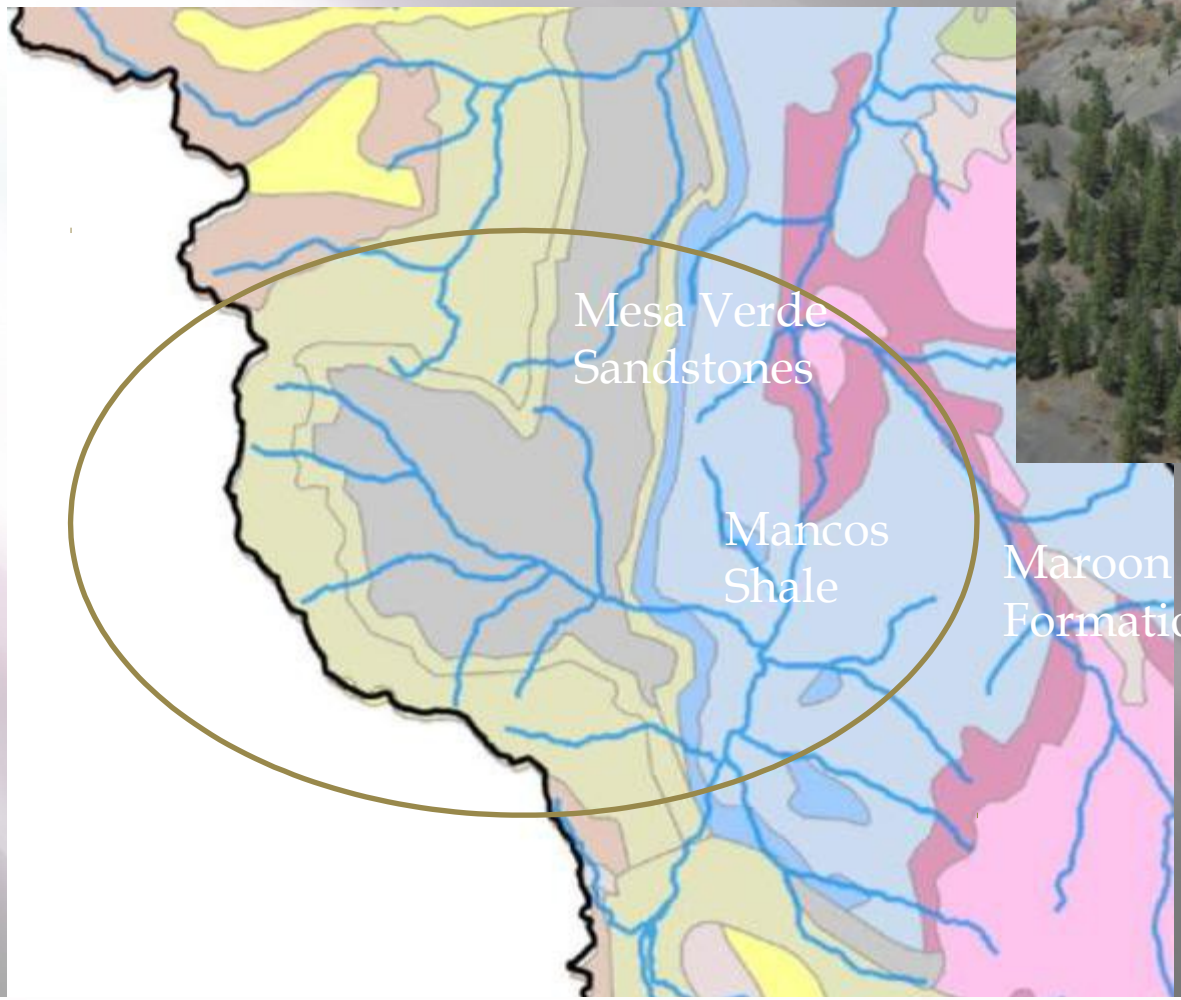
Simplified channel with narrow belt width

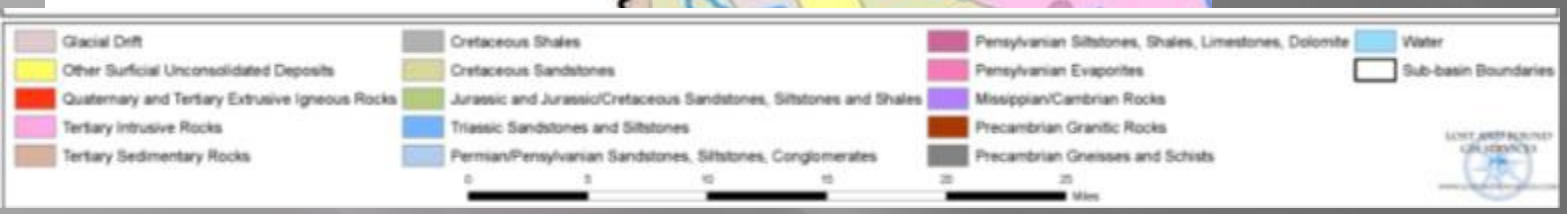
High width to depth ratio (shallow and wide)

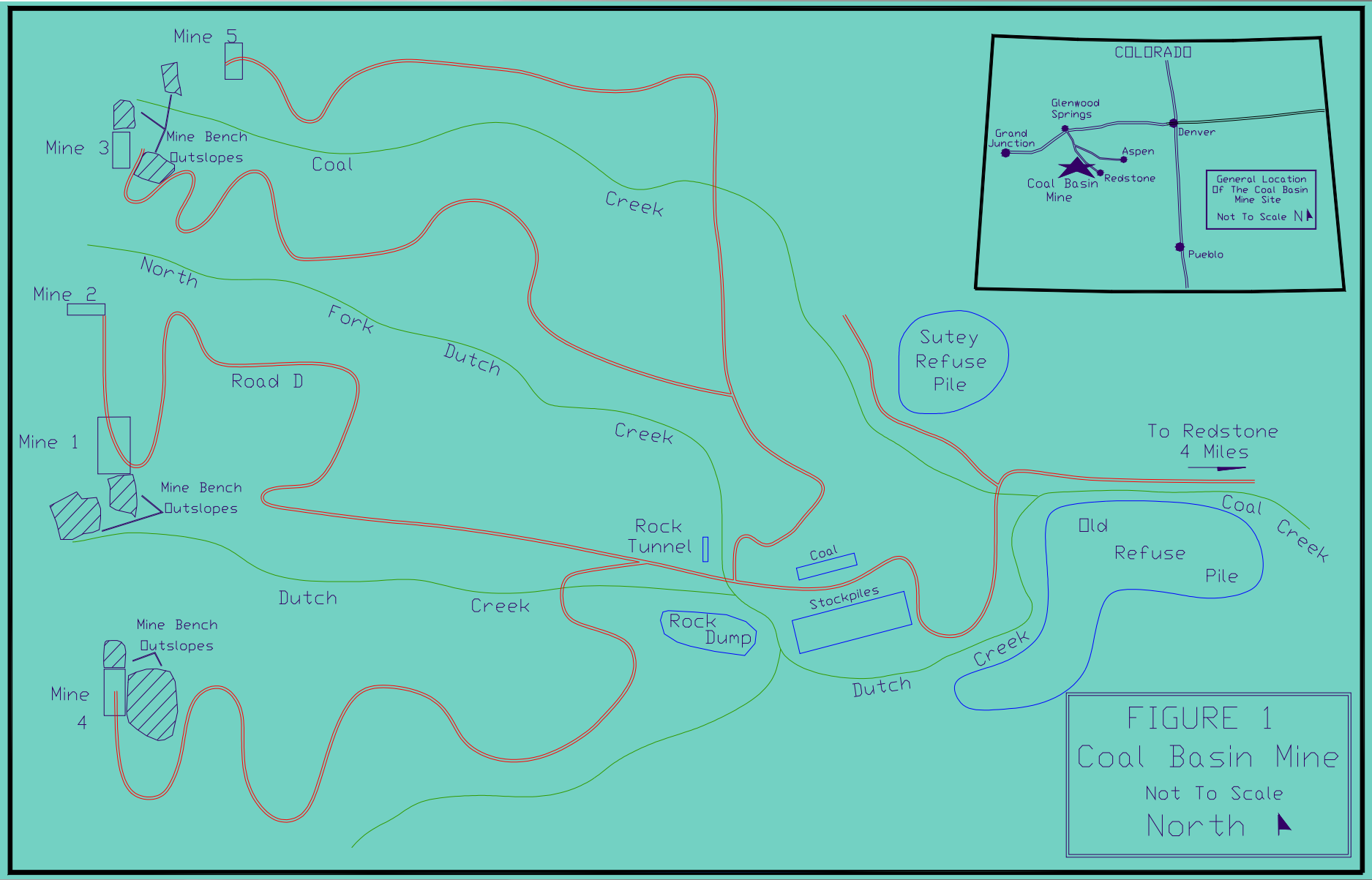
Loss of and narrowing of historic floodplain (Hwy 133 and Redstone)



Surface Geology







Source: Steve Renner, Division of Reclamation Mining and Safety

Click to edit Master text styles

- Second level
- Third level
  - Fourth level
    - Fifth level

Source: Steve Renner, Division of Reclamation Mining and Safety

Environmental Issues Driving Reclamation

- Sedimentation from Mining Related Facilities
  - Road System
  - Mine Bench Outslopes
  - Facilities Area (Confluence Coal and Dutch Creeks)
  - Coal Basin Town Refuse

Road Reclamation

Source: Steve Renner, Division of Reclamation Mining and Safety

Source: Steve Renner, Division of Reclamation Mining and Safety

Mine Entry and Bench Outslope Reclamation

Source: Steve Renner, Division of Reclamation Mining and Safety

Facilities Area and Dutch Creek Diversion Reclamation-Before

- Click to edit Master text styles
  - Second level
  - Third level
    - Fourth level
      - Fifth level

Source: Steve Renner, Division of Reclamation Mining and Safety

Facilities Area and Dutch Creek Diversion Reclamation-After

Source: Steve Renner, Division of Reclamation Mining and Safety

Refuge Piles and Other Sediment Control Projects

Source: Steve Renner, Division of Reclamation Mining and Safety

Refuge Piles and Other Sediment Control Projects

Source: Steve Renner, Division of Reclamation Mining and Safety

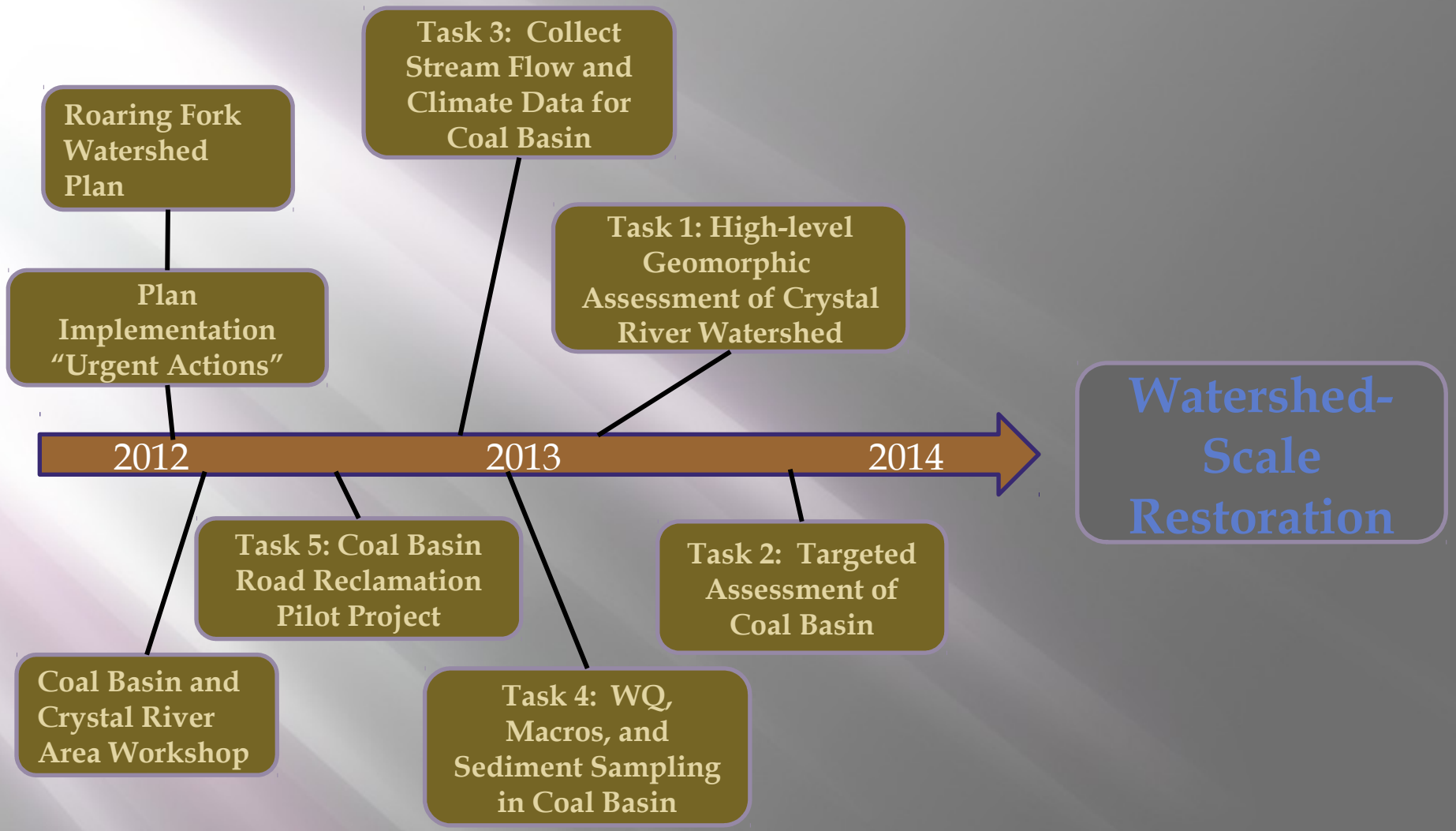
Coal Basin Environmental History

Steve Renner (What I've Learned):

- Understand the Environment at Coal Basin and Work With its Unique Character;
- Exceptionally Dynamic and Mobile System;
- Graze Only After Substantial Maturity and Diversity Established;
- Build Micro Climates;
- Disperse Water at Every Opportunity;
- "Soils" and Remnant Refuse Respond to Addition of Organic Matter;

2-day Workshop (May 2012 Redstone Inn)

Goal: Bring technical experts together to develop a coordinated, innovative, science-based and effective plan to continue restoration efforts in Coal Basin and the Crystal River confluence area. Brought together 50 resource experts.

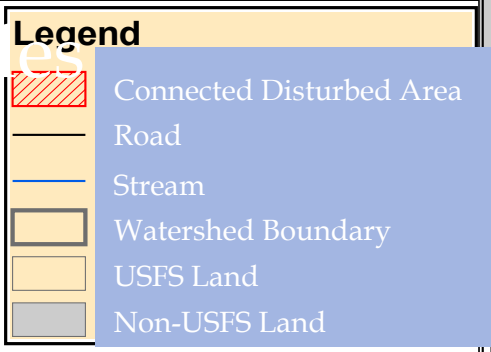

Roaring Fork Watershed Plan
Task 3: Collect Stream Flow and Climate Data for Coal Basin
Plan Implementation "Urgent Actions"
Task 1: High-level Geomorphic Assessment of Crystal River Watershed
2012
2013
2014
Watershed-Scale Restoration
Task 5: Coal Basin Road Reclamation Pilot Project
Task 2: Targeted Assessment of Coal Basin
Coal Basin and Crystal River Area Workshop
Task 4: WQ, Macros, and Sediment Sampling in Coal Basin

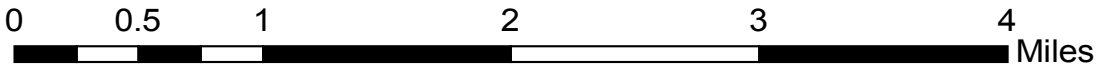
Upland, Riparian, Instream Restoration Project

Overall project goal is to integrate and complete projects to:

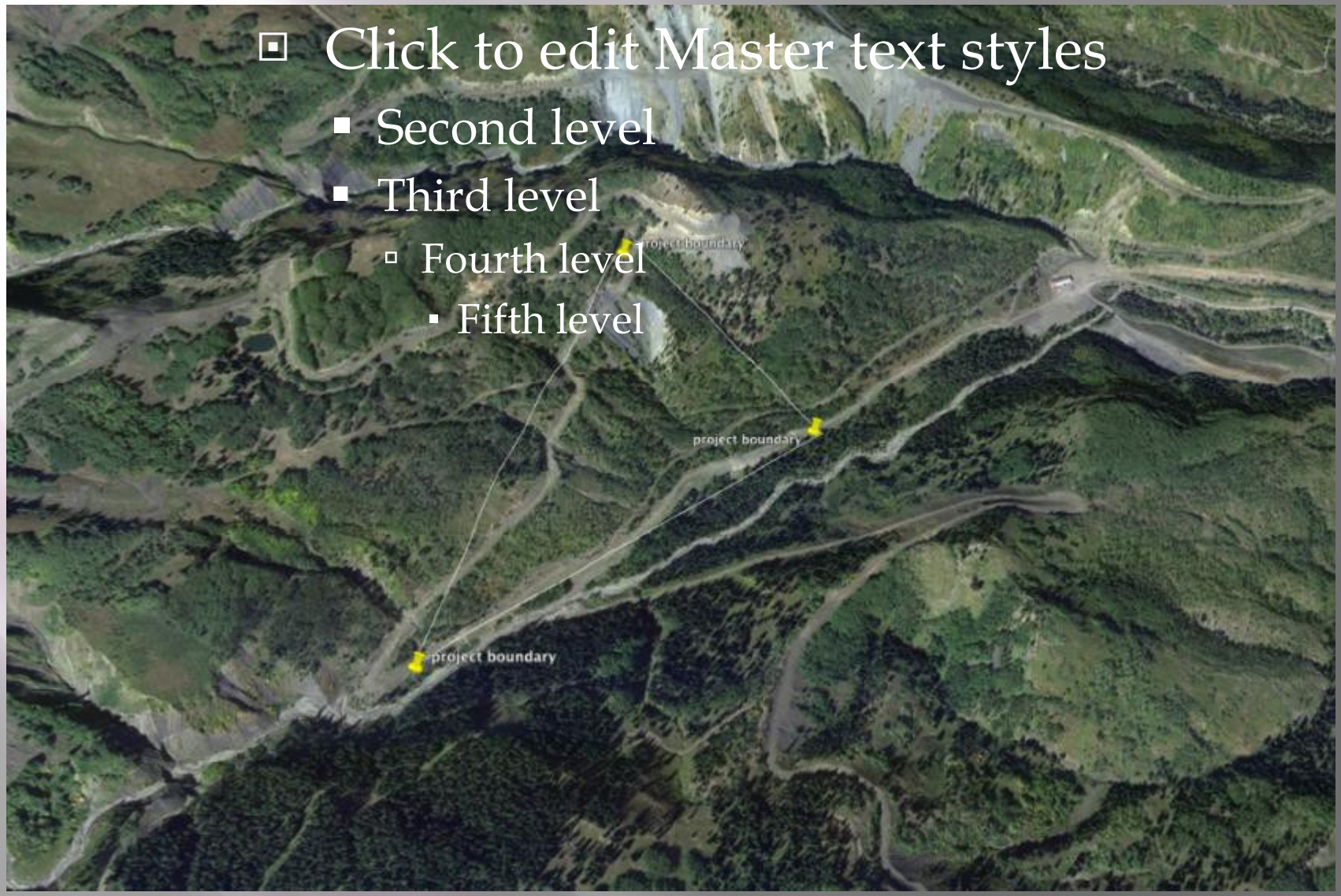
- Improve riparian area function/wildlife value
- Balance sediment budget
- Improve upland vegetation to stabilize soils
- Improve instream habitat and fisheries
- Address water quality issues
- Protect Redstone from flood flow damages
- Increase late summer flows

Coal Basin Connected Disturbed Area





*Connected Disturbed Areas are disturbed clearings and roads with direct connections to streams



- Click to edit Master text styles
  - Second level
  - Third level
    - Fourth level
      - Fifth level

Fall, 2012 Pilot Project Work

Building on previous restoration efforts

continue to address the impacts in Coal Basin:

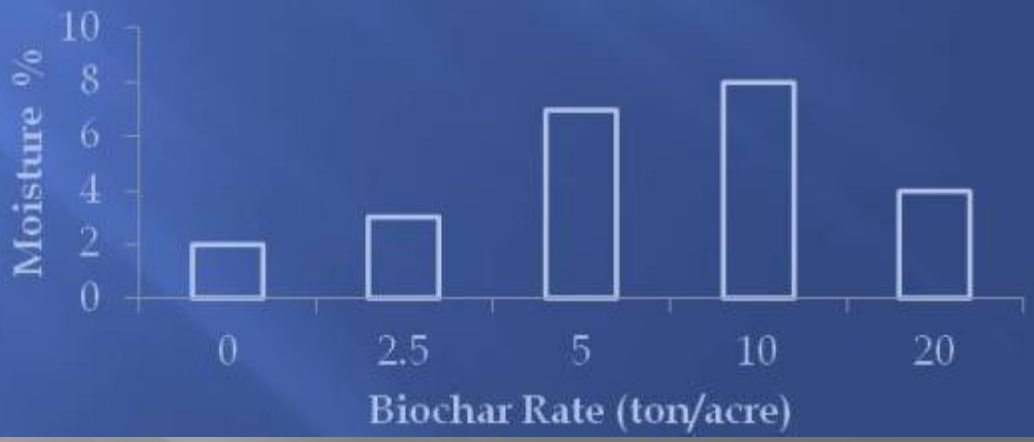
- Construct alluvial fans to store sediment within Coal Basin in appropriate locations,
- Amend soils on the exterior of the alluvial fans for vegetation recovery and soil moisture,
- Assess the effectiveness and utility of using biochar using a control, compost/biochar blend, and compost
- Revegetate treatment areas,
- Test vegetation (grasses and forbs) study plots, and
- Conduct grazing study

Reconstruction of Alluvial Fan

Erosion Control on Upper Bench

Soil Amendment Application

HOPE MINE RECLAMATION



BIOCHAR SOLUTIONS

Confluence of Dutch and Coal Creeks

Bruce Gordon, EcoFlight May, 2012