Colorado Springs Utilities

It's how we're all connected

Fountain Creek Watershed 101 and Water Quality

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Fountain Creek Watershed Project Manager

Colorado Springs Utilities

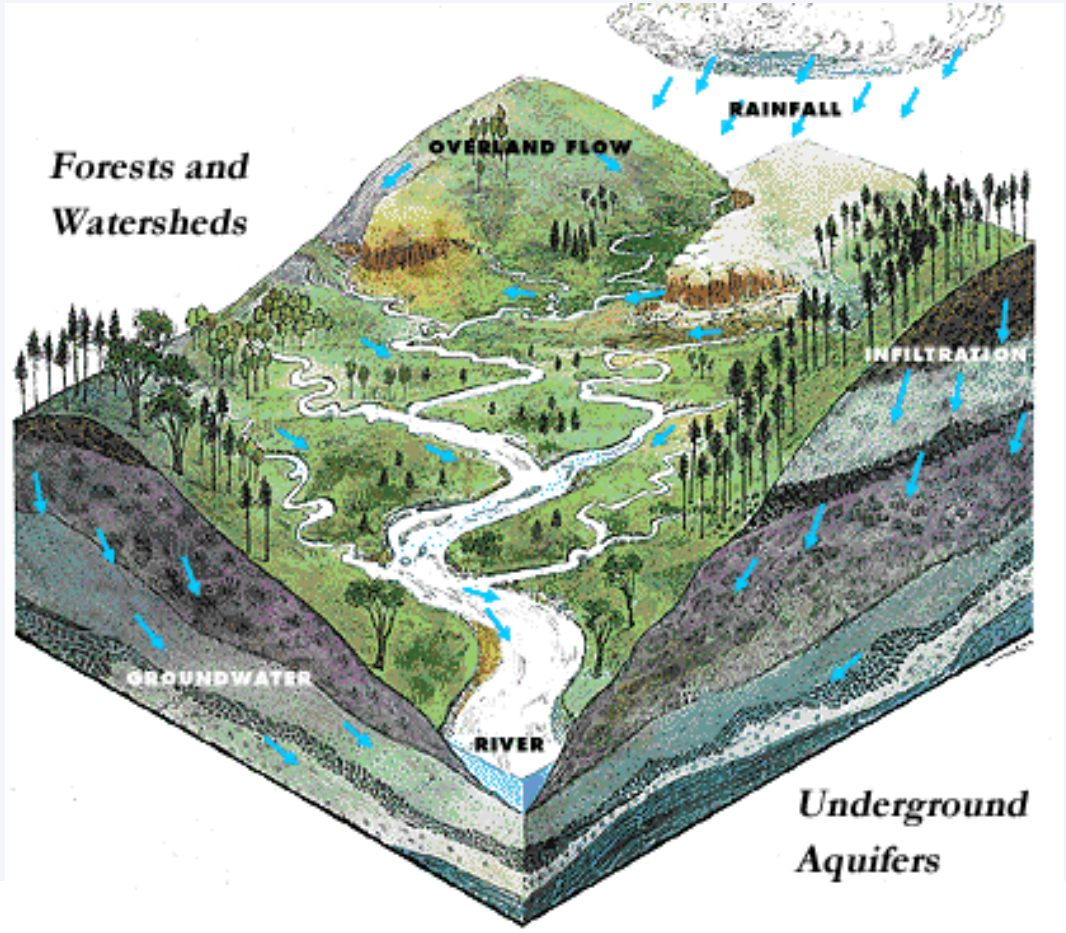
2025

Agenda

1. What is a Watershed
2. History of Fountain Creek Watershed
3. Watershed Operations Overview
4. Water Quality
5. Water Quantity (Flow)
6. Aquatic Life
7. Geomorphology
8. Low Tech Processed Based Restoration
9. Closing

Watershed Basics

A watershed is a region or area divided and draining ultimately to a pedicular watercourse or body of water.



Watershed Basics

Arkansas River Basin

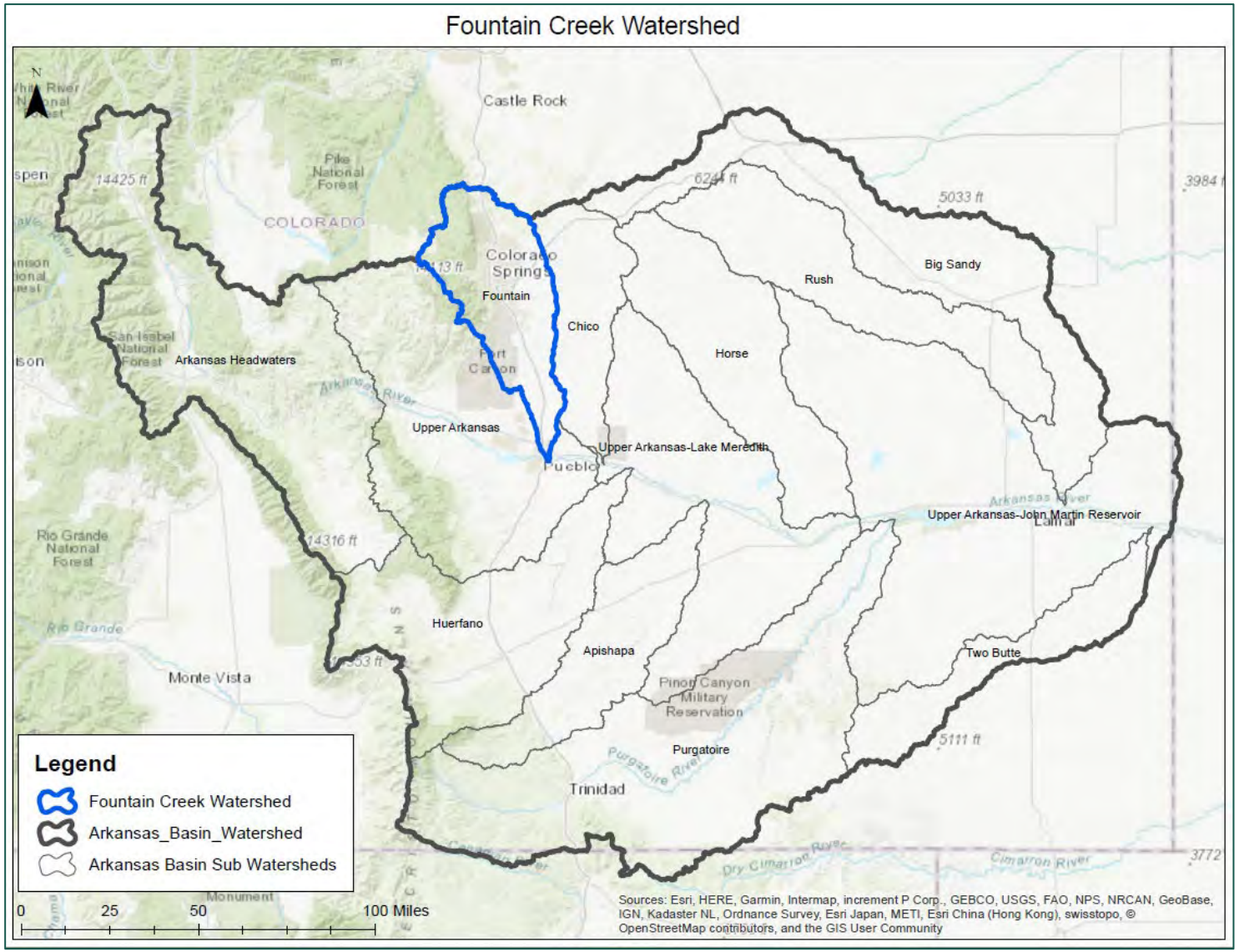
Headwaters near Leadville Colorado and ends at the CO/KS boarder

Drains 28,268 square miles

One of four main tributaries of the Mississippi River.

Elevation: 14,110 feet near Leadville CO to 3,392 feet near Holly CO, which has the lowest elevation town in Colorado.

- Change in Elevation of 10,718 feet over 300 miles



Watershed Basics

Fountain Creek Watershed

Drains 927 square miles

15” average annual precipitation

2 Major Creeks: Monument Creek and Fountain Creek

Home to 13% of the total population of Colorado

Headwaters at Pikes Peak 14,114 feet elevation to Arkansas River at 4,640 feet elevation.

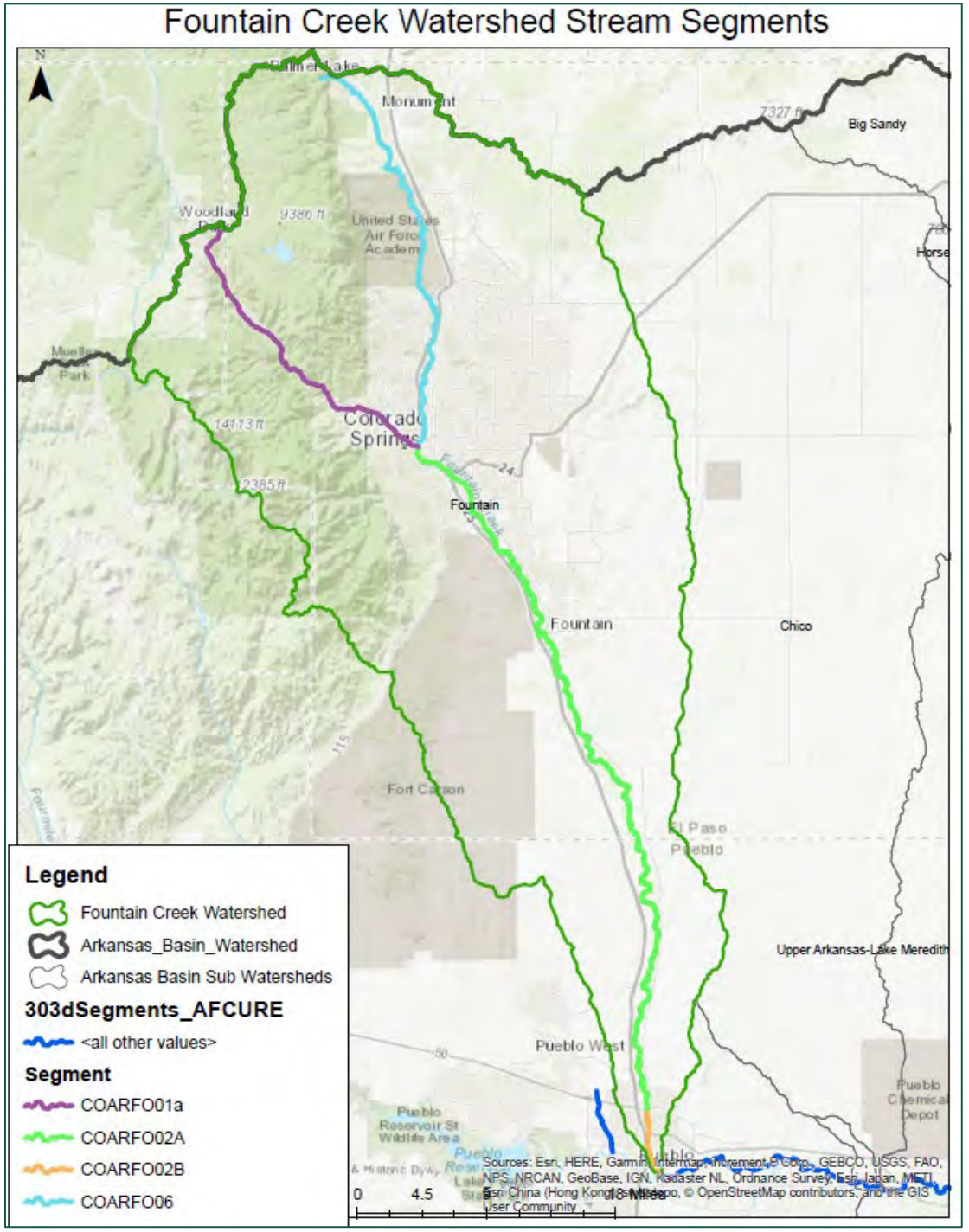
Change in elevation of 9474 feet over 50 miles

Waldo Canyon Fire 2012

Black Forest Fire 2013

Major Flooding 2013 & 2015

Four Creek Segments



History of Fountain Creek Watershed

- History of Floods
  - June 1864
    - 20-30 ft rise in Fountain Creek
  - June 1921
    - Fountain and Arkansas Flood and inundate Pueblo

1921 Pueblo flood. Photo credit: University of Southern Colorado **https://scalar.usc.edu/works/1921-the-great-flood/home**

History of Fountain Creek Watershed

- History of Floods
  - MAY 31, 1935
    - Monument Creek flooded within one hour
    - $1.2 million in property damage (equal to $16.1 million, today)
    - 200 square blocks of the city and southern Colorado Springs was under water.
    - Damages were estimated at $1.769 million.
    - Peak flow of 50,000 cubic feet per second (CFS) into Fountain Creek.

History of Fountain Creek Watershed

- History of Floods
  - July-August 2013
    - Flash Flooding in Manitou Springs destroying several houses. Highway 24 closed. Cheyenne Creek Flooding, residents pre-evacuated due to danger, roads closed, thousands without power.
  - Miracle May 2015
    - Wettest May on record.
    - Eliminated drought in one month.
  - Spring 2023
    - Near 100-year precipitation events

History of Fountain Creek Watershed

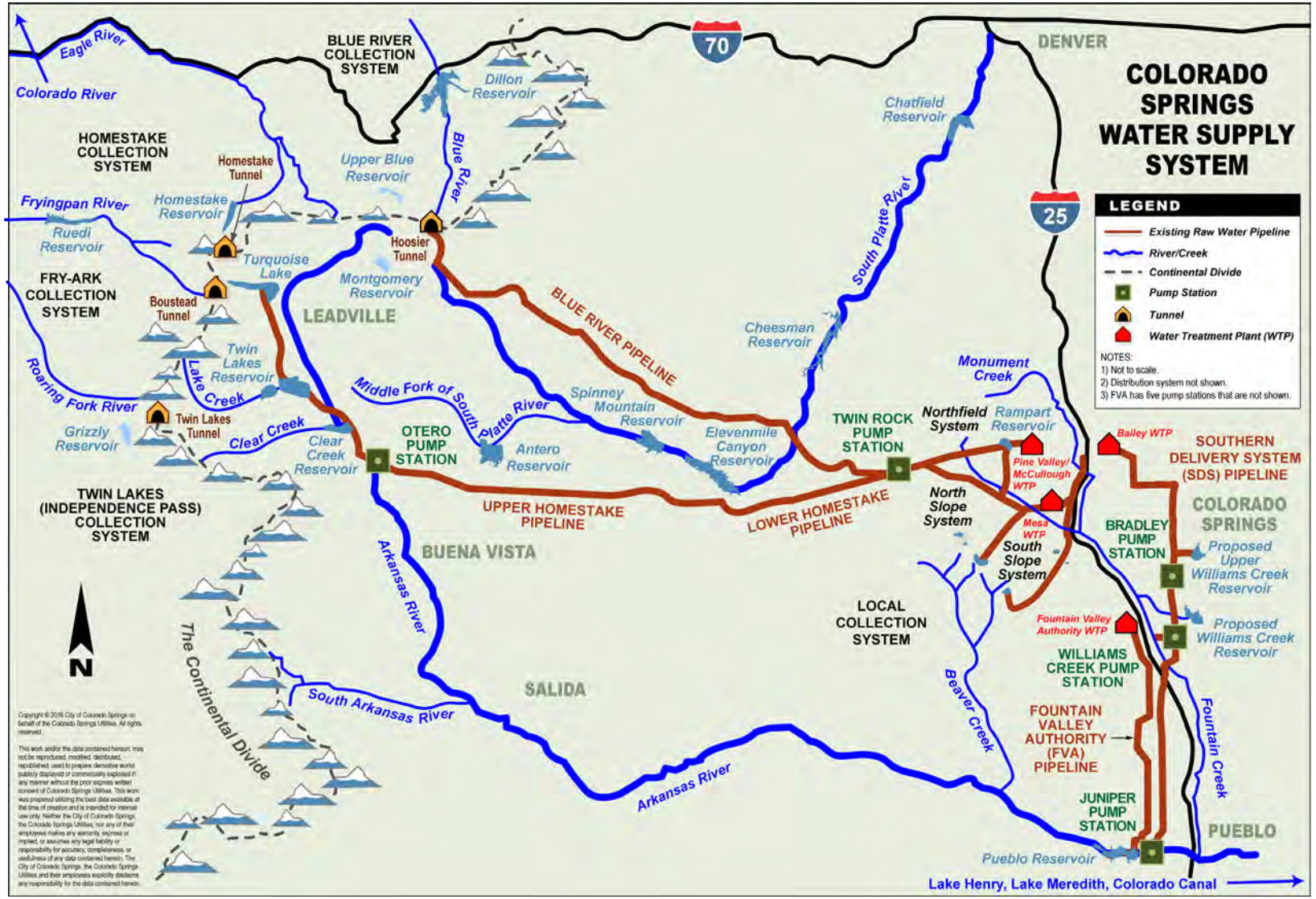
- History of Fires
  - Waldo Canyon Fire June 2012
    - 18,247 acres
    - Evacuation of over 32,000
    - 346 homes destroyed
    - U.S. Highway 24was closed in both directions
    - Insurance claims totaling more than US $453.7 million
    - It was the most destructive fire in Colorado state history, as (measured by the number of homes destroyed) until…

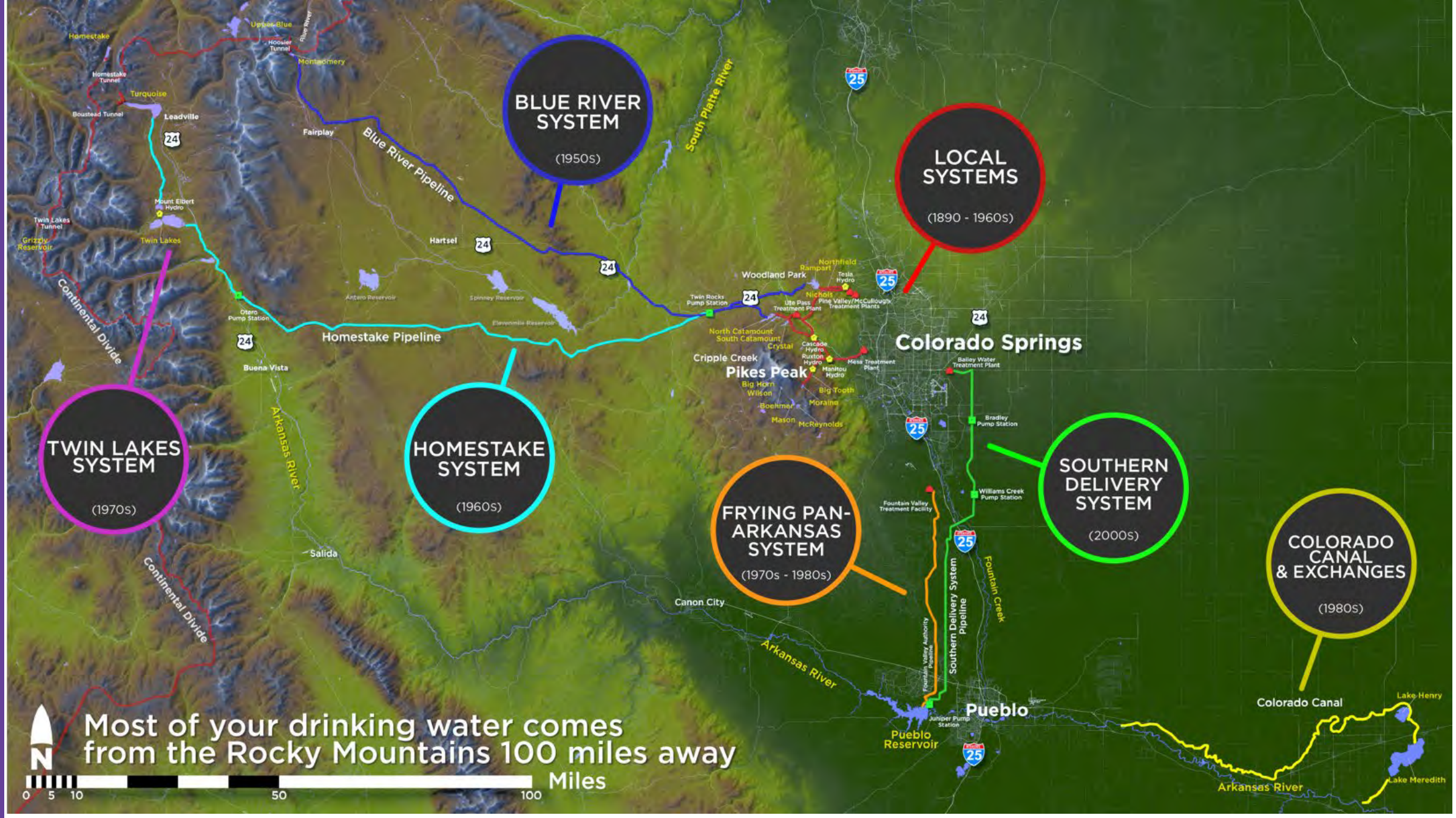
History of Fountain Creek Watershed

- History of Fires
  - Black Forest Fire June 2013
    - 14,280 acres were burned,
    - 509 homes were destroyed
    - two people died
    - This was the most destructive fire in the state's history at the time, surpassing the 2012 Waldo Canyon Fire which also began near Colorado Springs. It was surpassed in 2021, when the Marshall Fire destroyed over 1000 homes in Boulder County

System Overview

- 7 Collection Systems
- 4 Trans-mountain Diversion Tunnels
- 4 Major Pipelines
- 3 years of water demand storage in 25 reservoirs
- 6 Water Treatment Plants
  - Deliver 233 million gallons a day
  - 2,140 miles of distribution pipe
- 2 Water Resource Recover Facilities, 1 Solid Handling Facility
  - Reclaim 38 million gallons a day
- Oldest non-potable system in Colorado
  - Non-potable water is 11% of our portfolio




BLUE RIVER SYSTEM
(1950s)
LOCAL SYSTEMS
(1890 - 1960s)
TWIN LAKES SYSTEM
(1970s)
HOMESTAKE SYSTEM
(1960s)
FRYING PAN-ARKANSAS SYSTEM
(1970s - 1980s)
SOUTHERN DELIVERY SYSTEM
(2000s)
COLORADO CANAL & EXCHANGES
(1980s)
Most of your drinking water comes from the Rocky Mountains 100 miles away
Miles
0 5 10 50 100
Homestake
Upper Blue
Hoosier Tunnel
Blue River
Montadmery
Homestake Tunnel
Turquoise
Boustead Tunnel
Leadville
Fairplay
Blue River Pipeline
South Platte River
Mount Elbert Hydro
Twin Lakes Tunnel
Grizzly Reservoir
Twin Lakes
Hartsel
Continental Divide
Antero Reservoir
Spinney Reservoir
Otero Pump Station
Homestake Pipeline
Buena Vista
Arkansas River
Salida
Continental Divide
Canon City
Arkansas River
Twin Rocks Pump Station
Woodland Park
Northfield
Rampart
Tesla Hydro
Nichols
Ute Pass Treatment Plant
Pine Valley/McCullough Treatment Plants
North Catamount
South Catamount
Crystal
Cripple Creek
Pikes Peak
Cascade Hydro
Ruxton Hydro
Manitou Hydro
Mesa Treatment Plant
Big Horn
Wilson
Boehmer
Mason
McReynolds
Big Tooth
Moraine
Colorado Springs
Bailey Water Treatment Plant
Bradley Pump Station
Williams Creek Pump Station
Fountain Valley Treatment Facility
Fountain Valley Authority Pipeline
Southern Delivery System Pipeline
Fountain Creek
Pueblo
Juniper Pump Station
Pueblo Reservoir
Colorado Canal
Lake Henry
Arkansas River
Lake Meredith

Fountain Creek Watershed Monitoring Program

Water Quality

Water Quantity

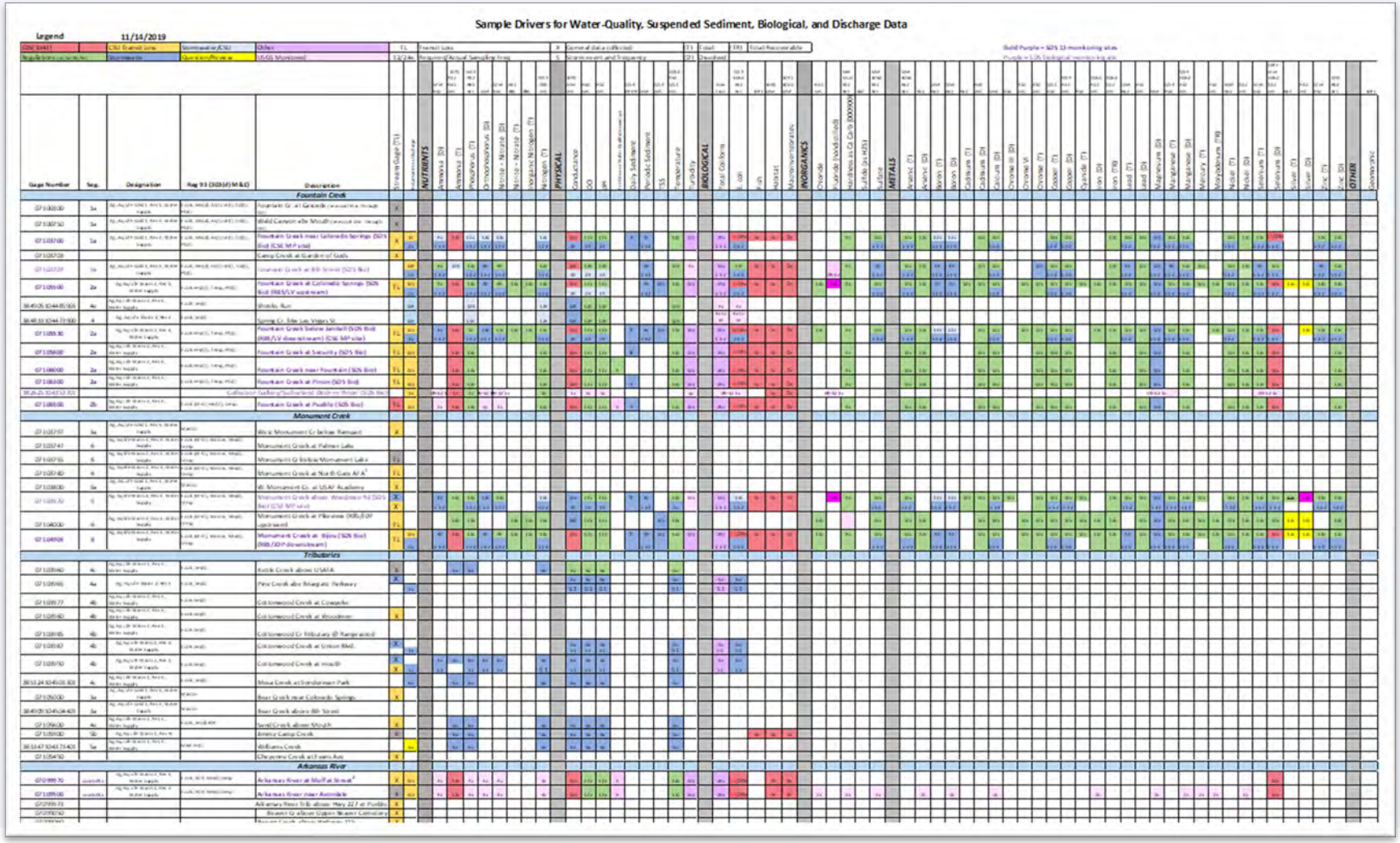
Aquatic Life

Geomorphology

Fountain Creek Watershed Monitoring Program

USGS JFA

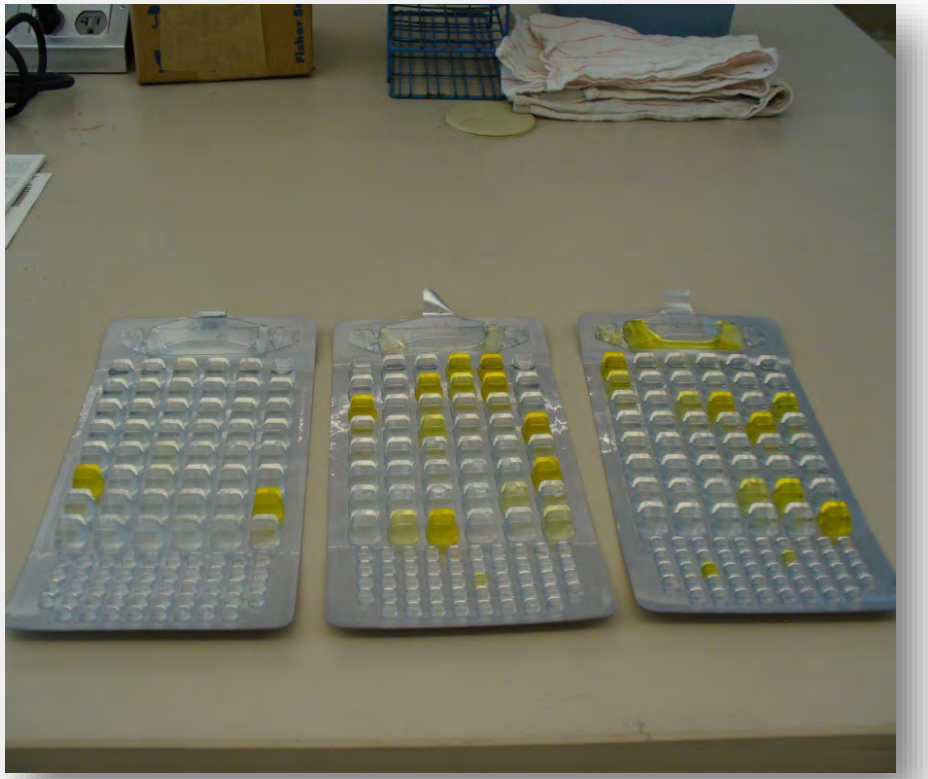
- $1.3M annually
- 68 Sample Sites
  - Fountain Cr
  - Monument Cr
  - Arkansas River
  - Tributaries
- 60 Parameters
  - Physical/Transit
  - Nutrient
  - Biological
  - Inorganics
  - Metals
  - Geomorphology



E. coli 101

Escherichia coli (E. coli)

- Inhabitants of the gastrointestinal tracts of warm-blooded animals.
- *Escherichia* species provide a portion of the microbial-derived vitamin K for their host.
- Cause of urinary tract infections, significant sources of gastrointestinal disease, ranging from simple diarrhea to dysentery-like conditions, as well as a wide-range of other pathogenic states.
- E. coli is used as an indicator for fecal contamination.



E. Coli – Regulations and Standards

Regulation 31: Basic Standards

- Identifies stream standards and goals
- E. coli standard of 126 cfu/100mL
  - Protects primary contact

Regulation 32: Numeric Standards of Arkansas

- Implements statewide surface water standards for Reg 32
- Arkansas Basin

Regulation 93: The 303(d) List

- Identifies water bodies that exceed water quality standards
- Informs Total Maximum Daily Loads (TMDLs)

Fountain Creek Watershed E.coli TMDL

- Total Maximum Daily Load
- Tool to manage a pollutant
- Expected to be completed in 2028

EPA 9-Element E. coli Watershed Plan

Methods:

- Flow Duration Curve
- Flow Regimes
- Loads determined by multiplies the mean daily flow and E. coli concentrations.
- Allowable loads at each flow regime
  - Uses the 126 cfu/100mL standard
- Percent Reductions

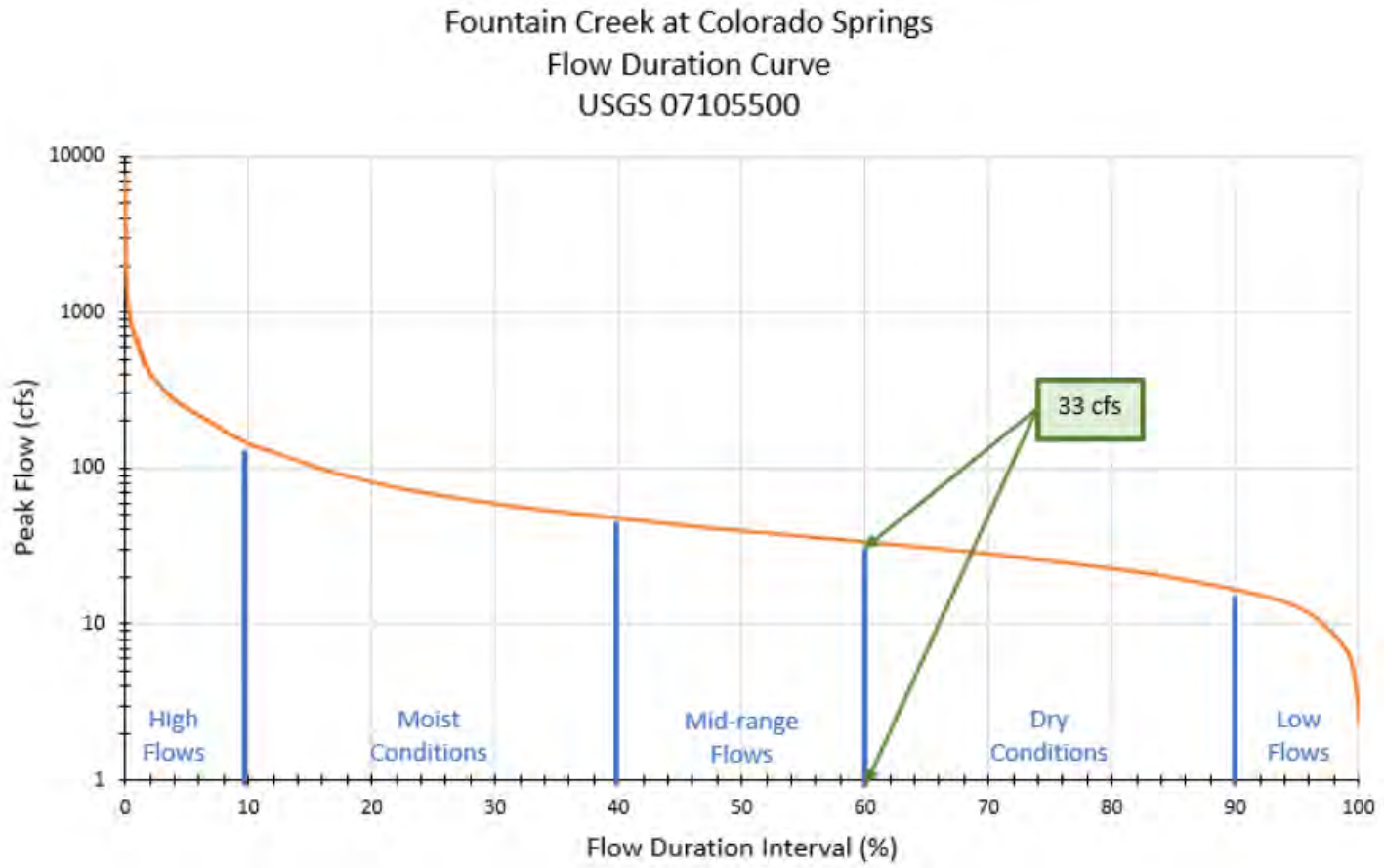
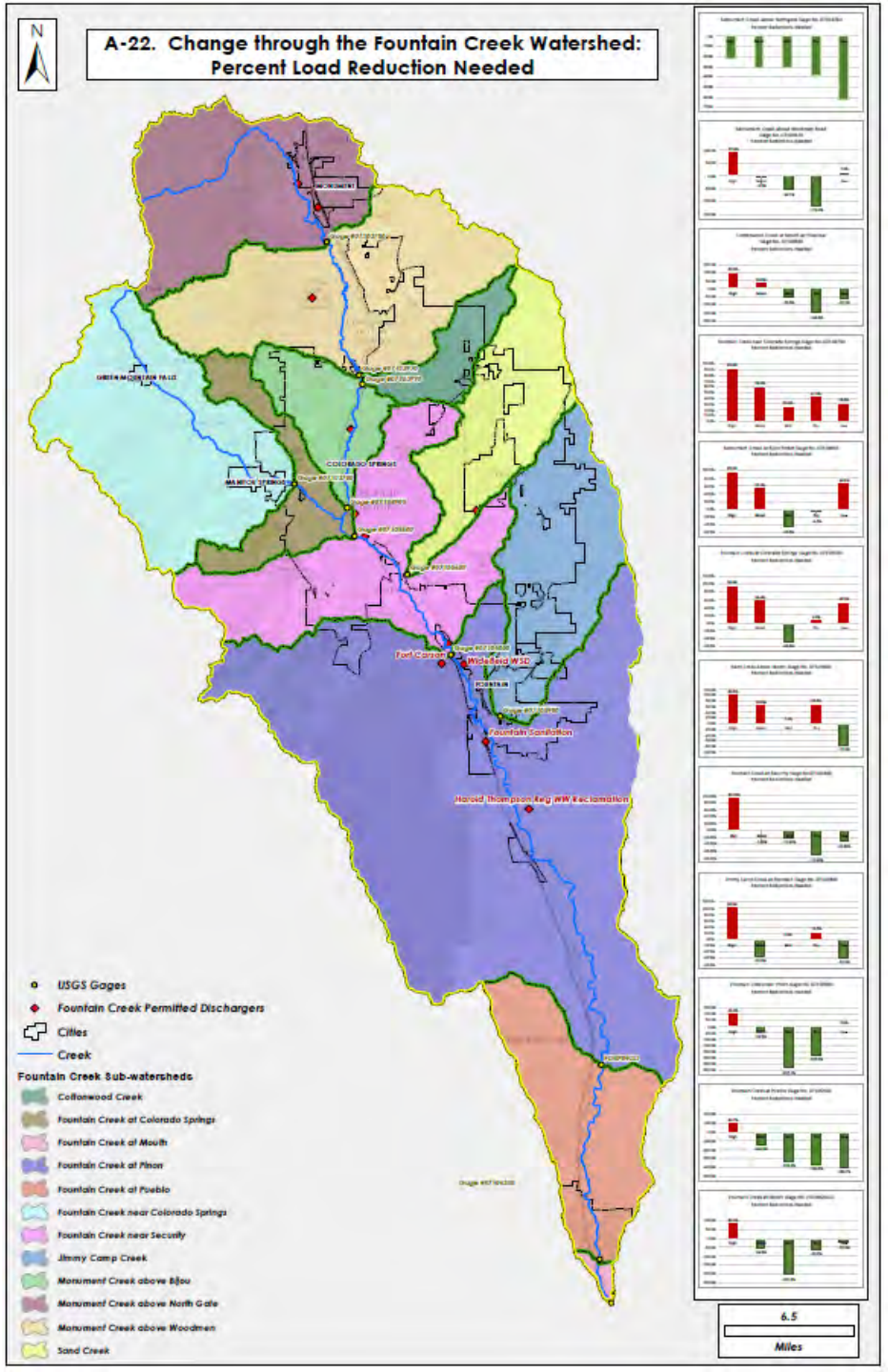


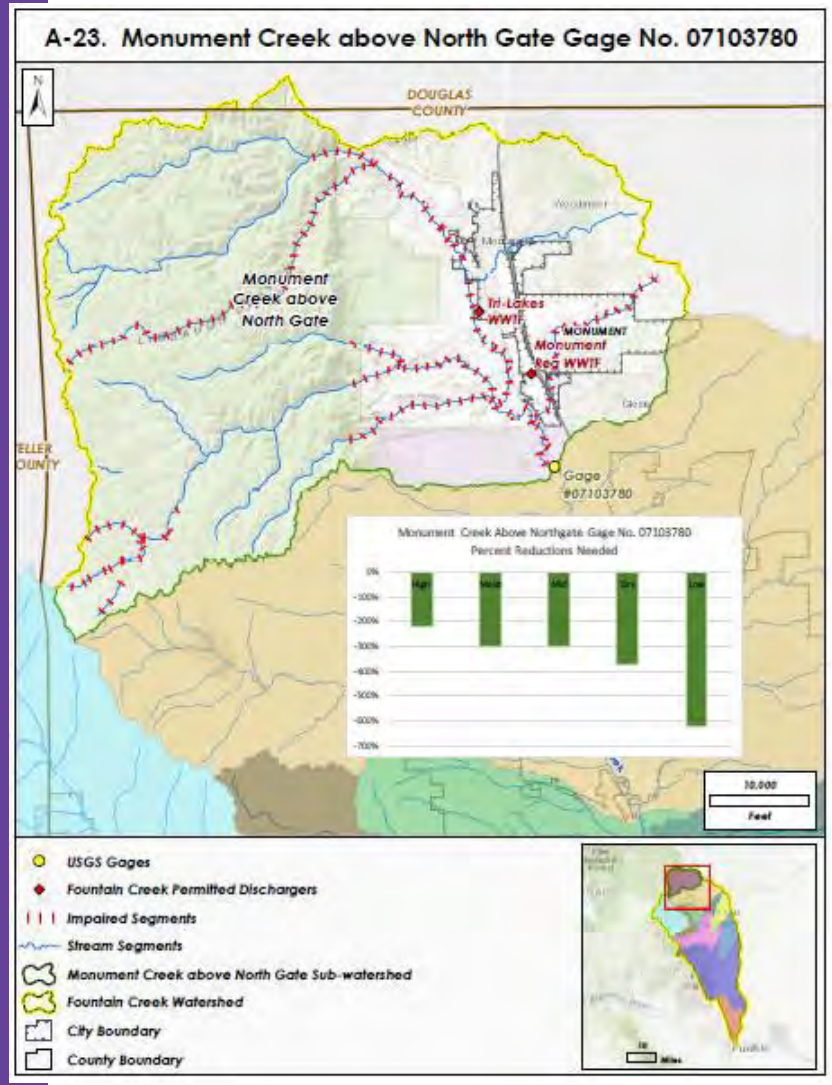
Table 5-8: Load Reduction Results for Fountain Creek at Colorado Springs (Gage 07105500).

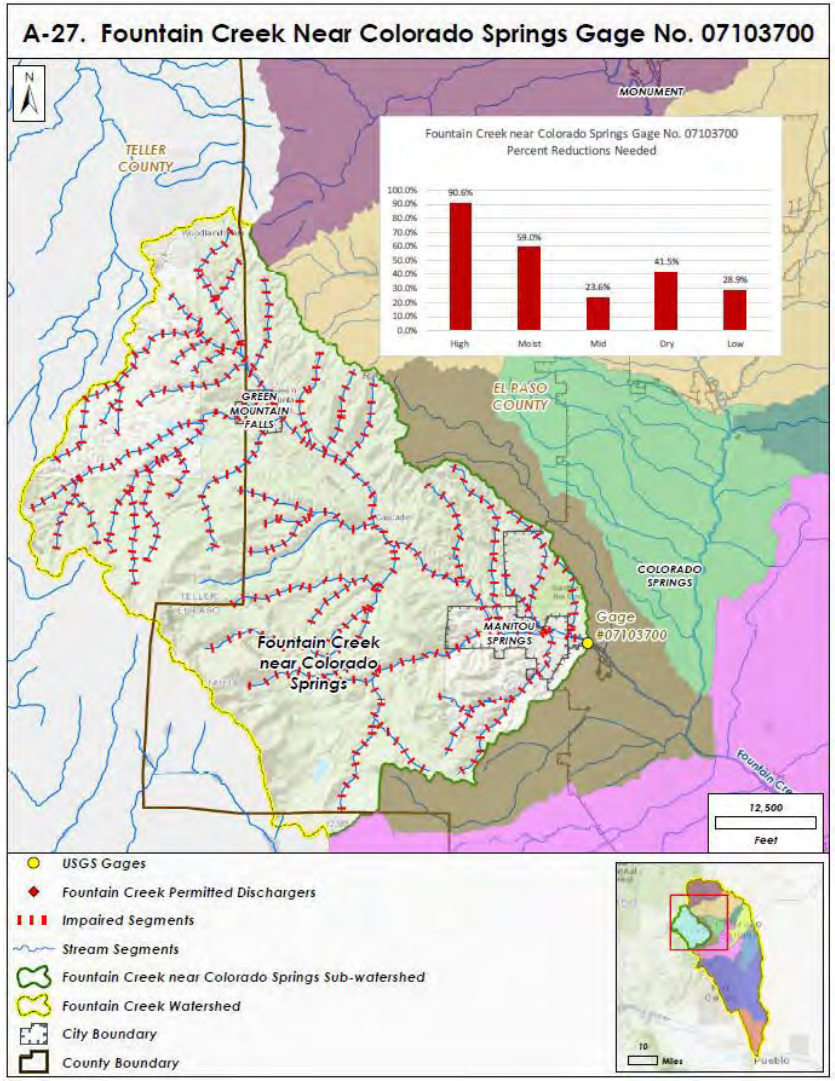
Loading Calculations	High Flows	Moist-Conditions	Mid-Range	Dry Conditions	Low Flow
Median Flows in Cubic Feet per Second (cfs)	267	74.7	48.7	37.2	26
Water Quality Standard (WQS) (CFU/100 ml)	126	126	126	126	126
Load at WQS (CFU/day)	83.05E+10	23.23E+10	15.15E+10	11.57E+10	8.087E+10
Existing Load at FC at COS[13]	1301E+10	53.27E+10	10.10E+10	12.16E+10	15.83E+10
Difference	1218E+10	30.03E+10	-5.043E+10	0.5905E+10	7.739E+10
Percent Reduction	93.6%	56.4%	-49.9%	4.9%	48.9%

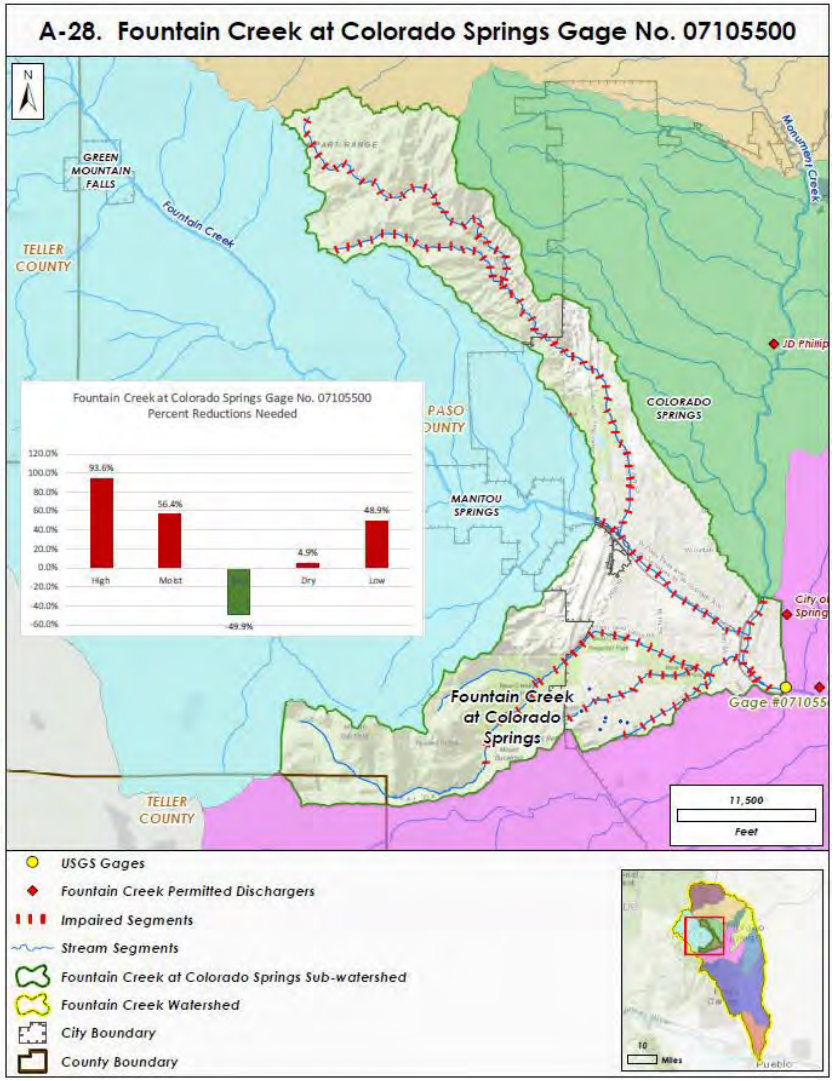
EPA 9-Element Watershed E. coil - Results



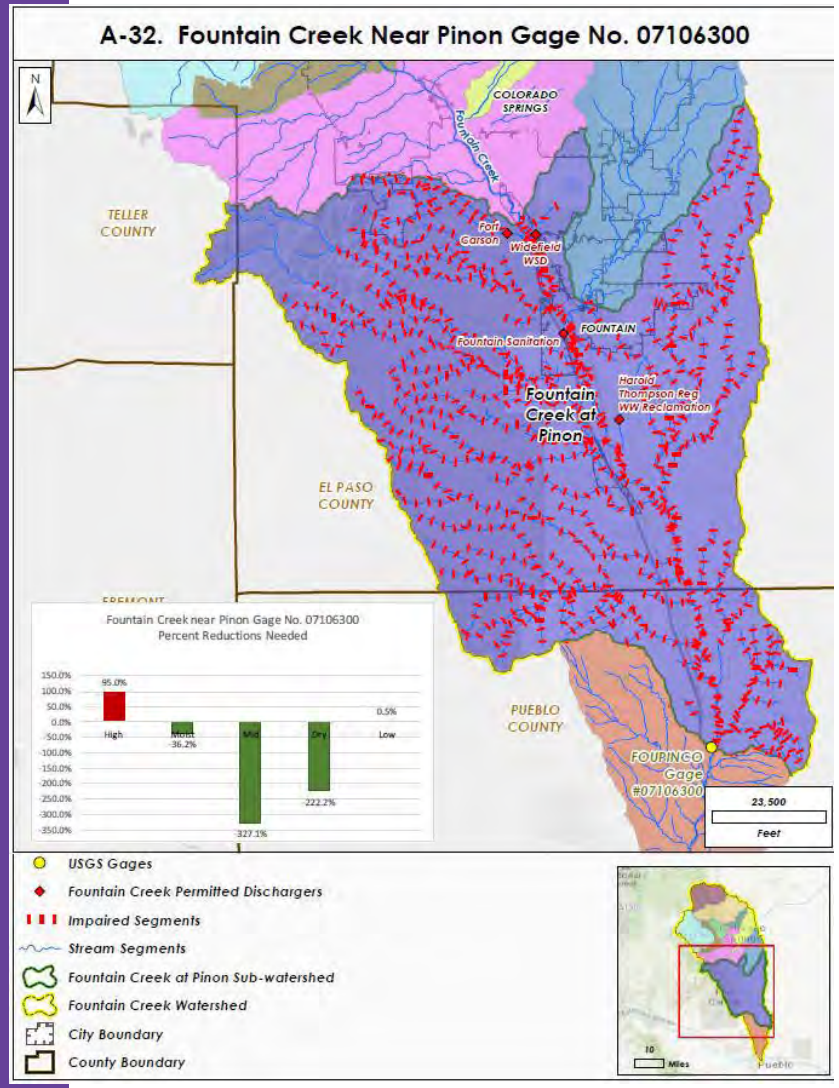
Data Findings

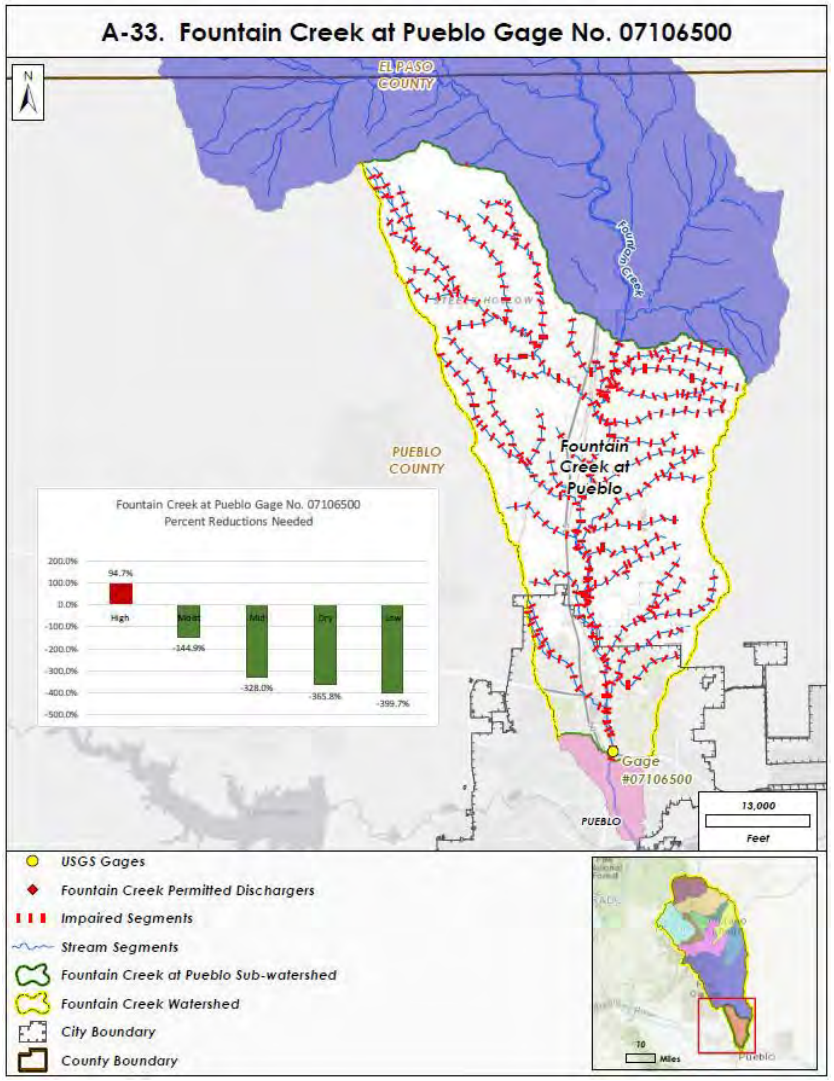


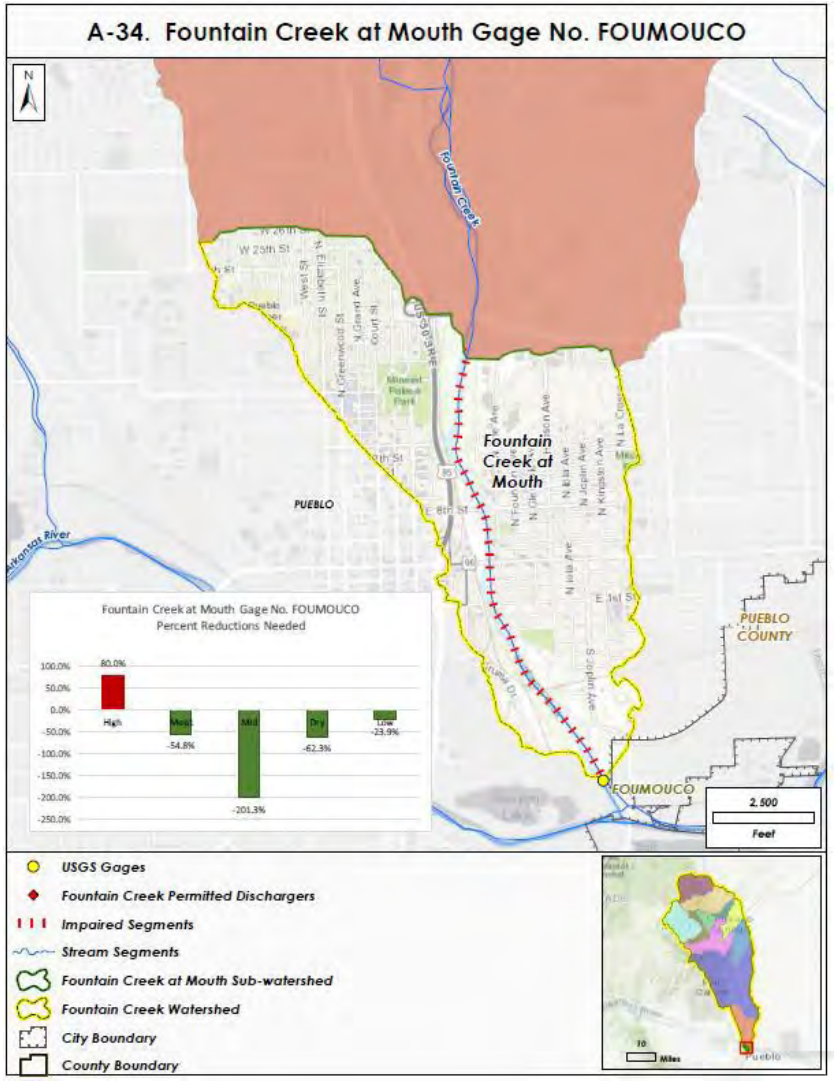




Data Findings



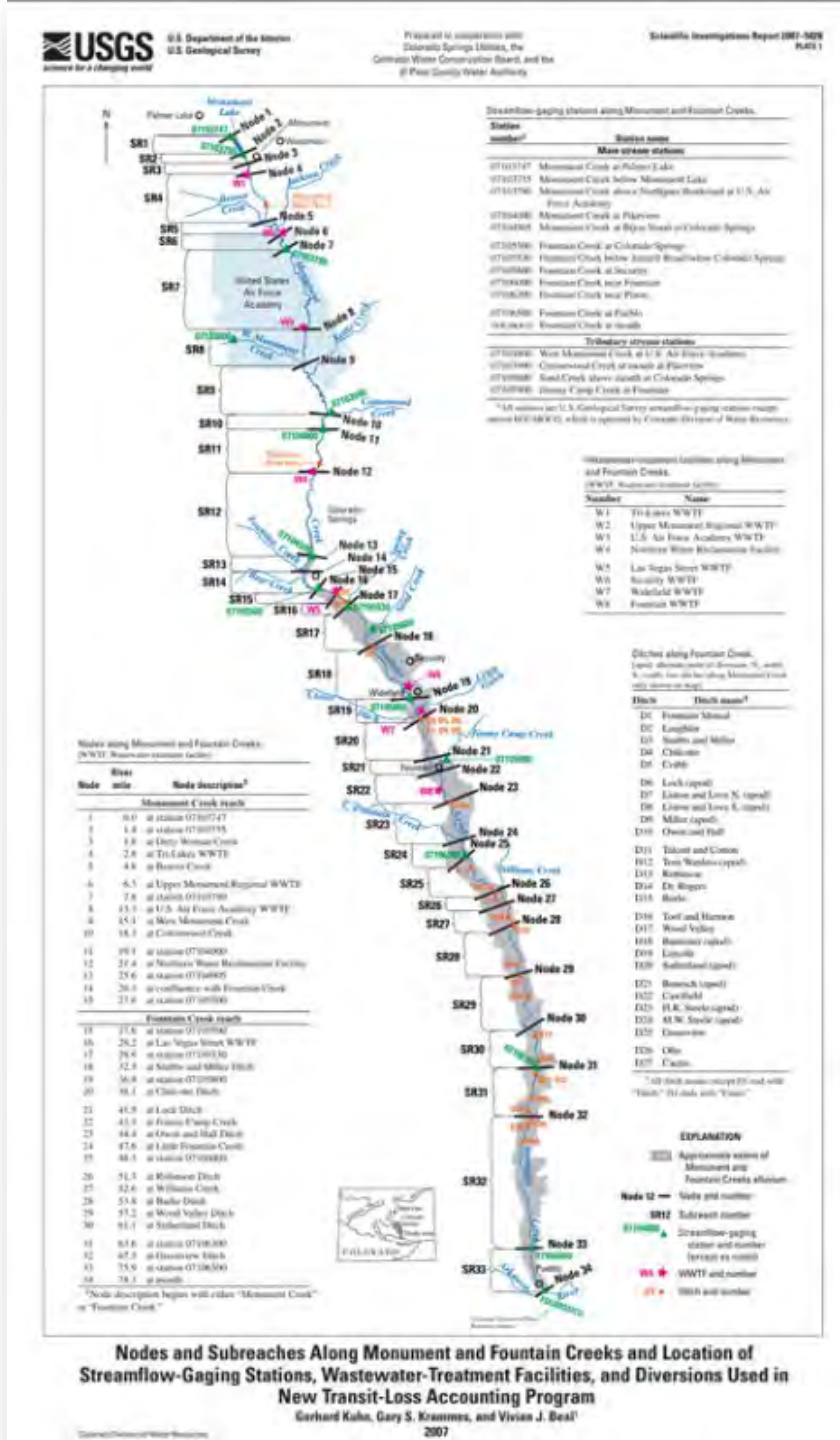




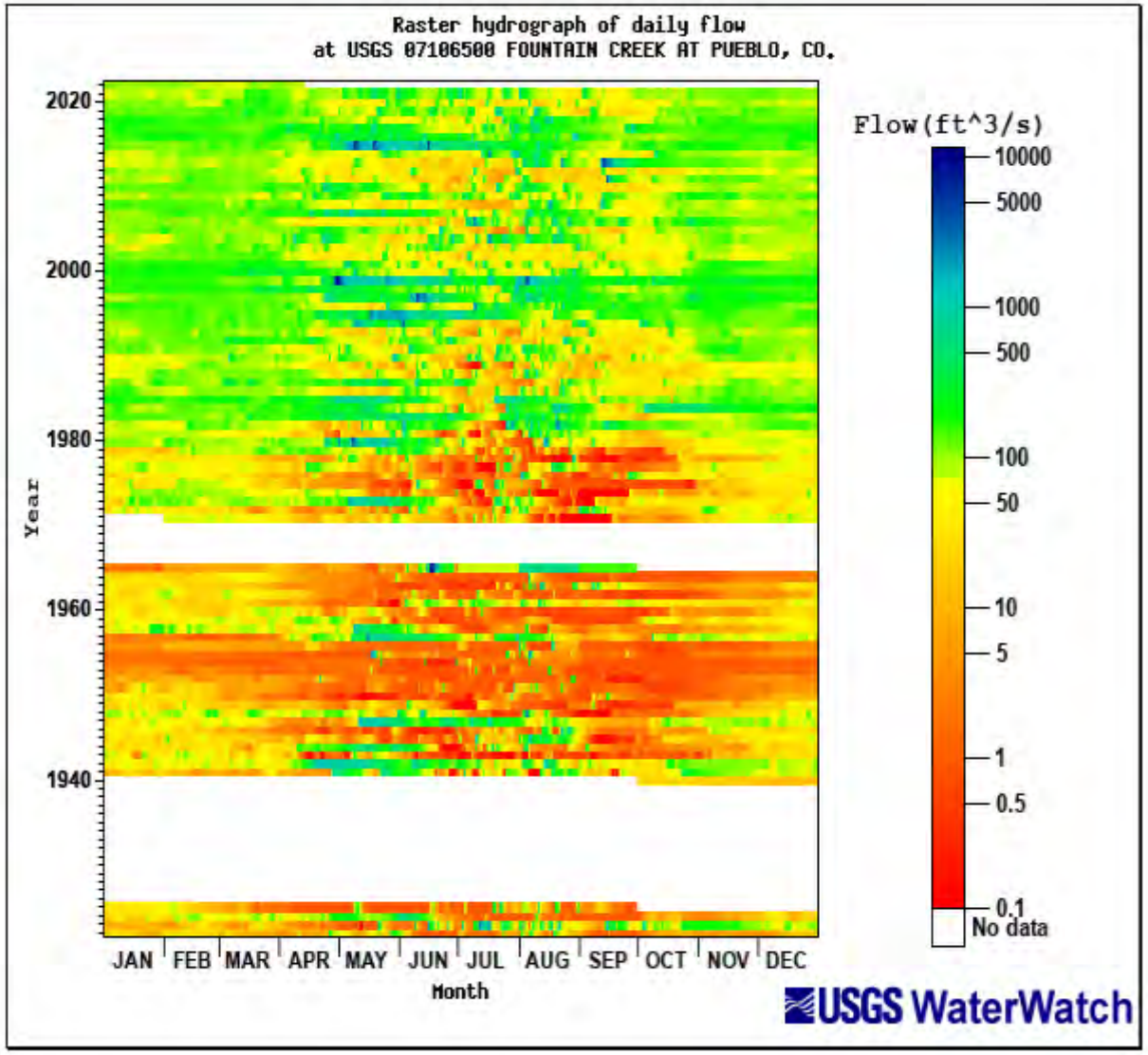
Fountain Creek Watershed

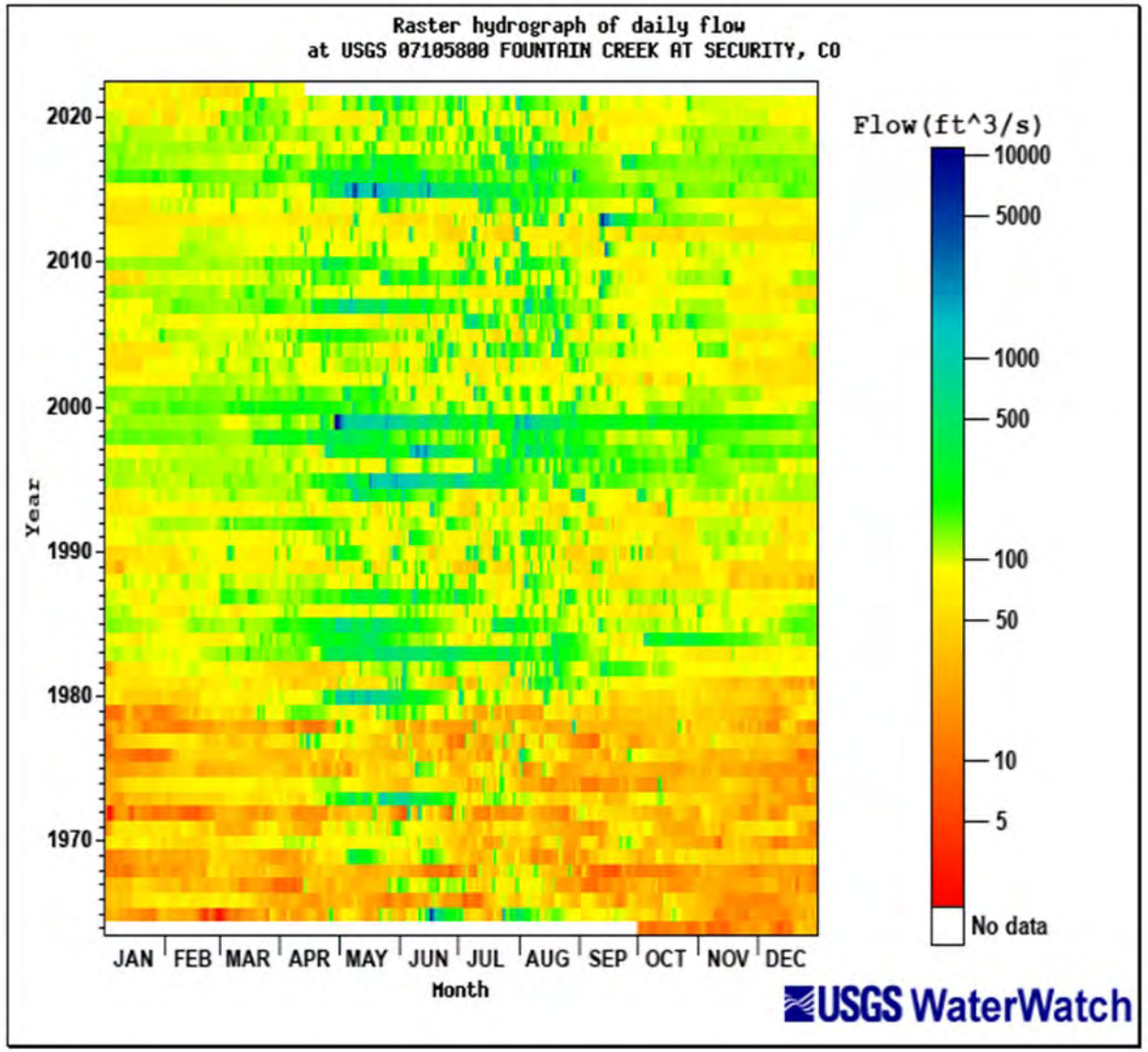
Water Quantity

- Monthly Average Flow (Fountain Creek at Pueblo)
- Storage, Diversion and Delivery
- Return Flows
- Exchanges (Fountain Creek and Pueblo Reservoir)
- Pueblo Flow Management Program
- Water Conveyance
  - Transit Loss Model



Fountain Creek Flows





Fountain Creek Watershed Program

Aquatic Life

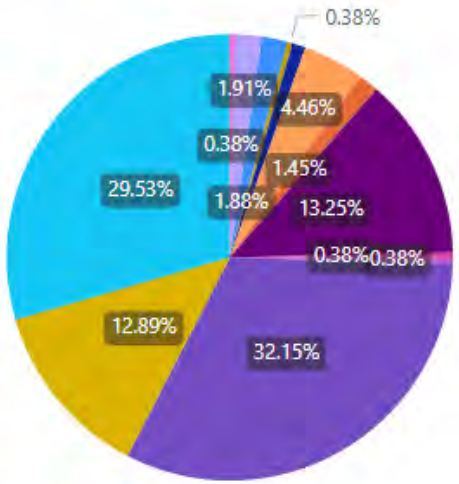
- 10 Sites
- Fish Survey
- Macroinvertebrates
- Habitat

Aquatic Life Trends

SiteName

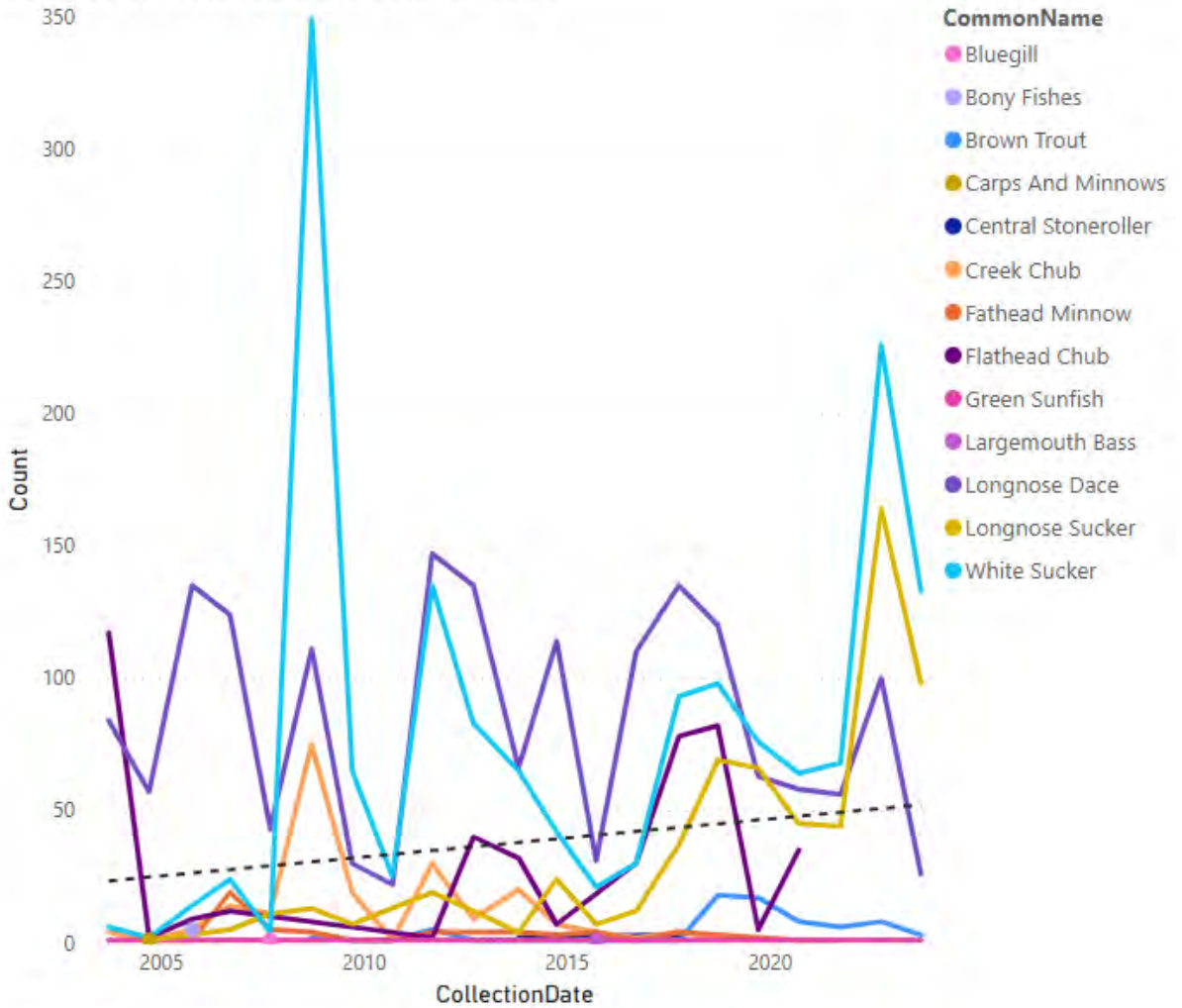
- [x] FOUNTAIN CR BLW JANITELL RD BLW COLO. SPRINGS, CO
- [ ] FOUNTAIN CREEK AT COLORADO SPRINGS, CO
- [ ] FOUNTAIN CREEK AT PUEBLO, CO.
- [ ] FOUNTAIN CREEK AT SECURITY, CO
- [ ] FOUNTAIN CREEK BL 8TH ST., AT COLO. SPRINGS, CO.
- [ ] FOUNTAIN CREEK NEAR COLORADO SPRINGS, CO.
- [ ] FOUNTAIN CREEK NEAR FOUNTAIN, CO.
- [ ] FOUNTAIN CREEK NEAR PINON, CO
- [ ] JIMMY CAMP CREEK AT FOUNTAIN, CO.
- [ ] MONUMENT CR ABV WOODMEN RD AT COLORADO SPRINGS, CO
- [ ] MONUMENT CREEK AT BIJOU ST. AT COLO. SPRINGS, CO
- [ ] MONUMENT CREEK AT PALMER LAKE, CO

Average of Count by CommonName



CommonName
- Bluegill
- Bony Fishes
- Brown Trout
- Carps And Minnows
- Central Stoneroller
- Creek Chub
- Fathead Minnow
- Flathead Chub
- Green Sunfish
- Largemouth Bass
- Longnose Dace
- Longnose Sucker
- White Sucker

Count by CollectionDate and CommonName



CollectionDate

9/22/2003 — 11/1/2023

Fountain Creek Watershed Program

Fluvial Geomorphology

- The interactions between the physical shapes of river and the water and sediment transport process
- Geomorphology at 10 sites
- Annual with change detection maps to measure erosion and deposition

Fountain Creek Watershed Program

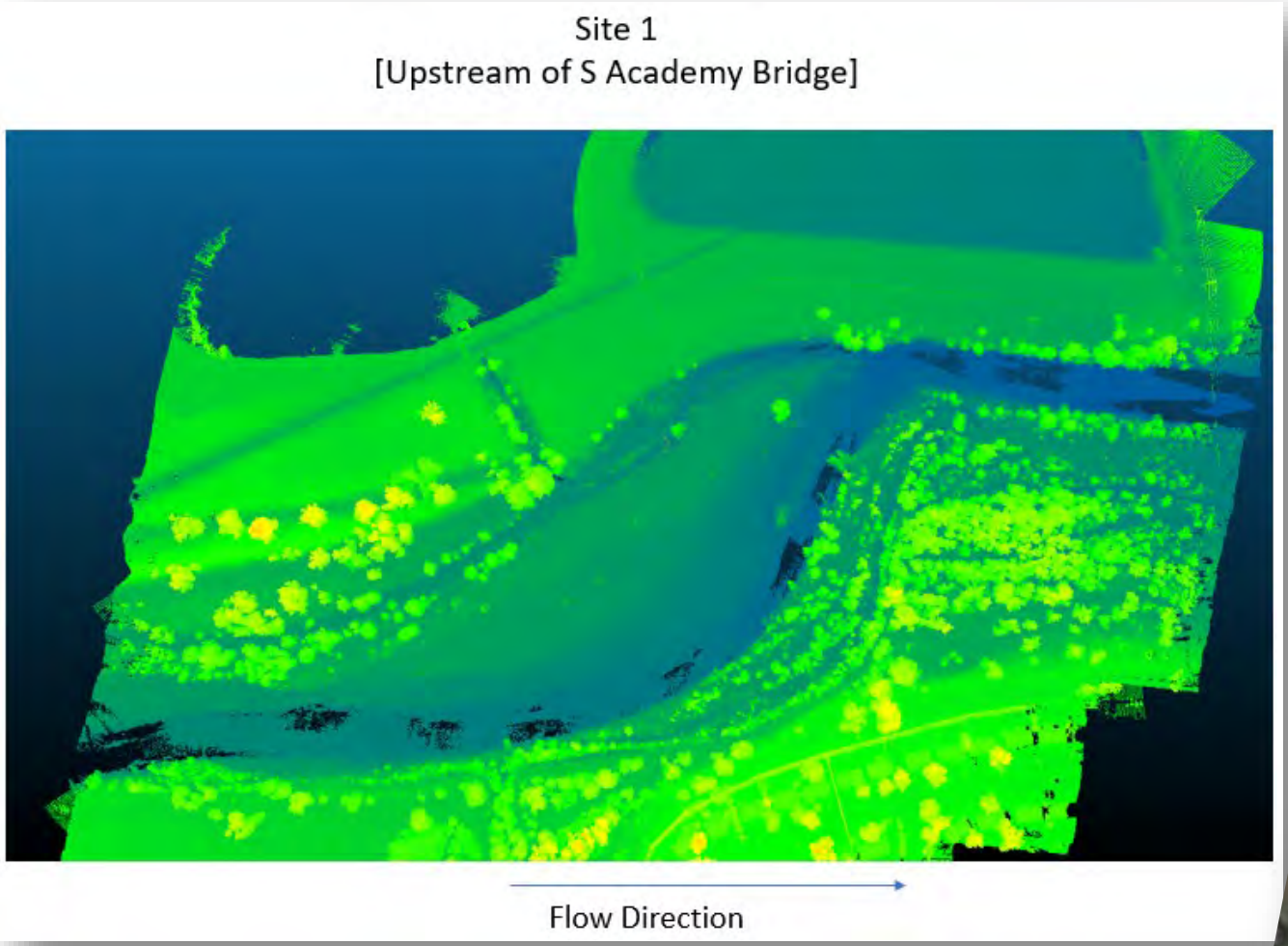
Methods

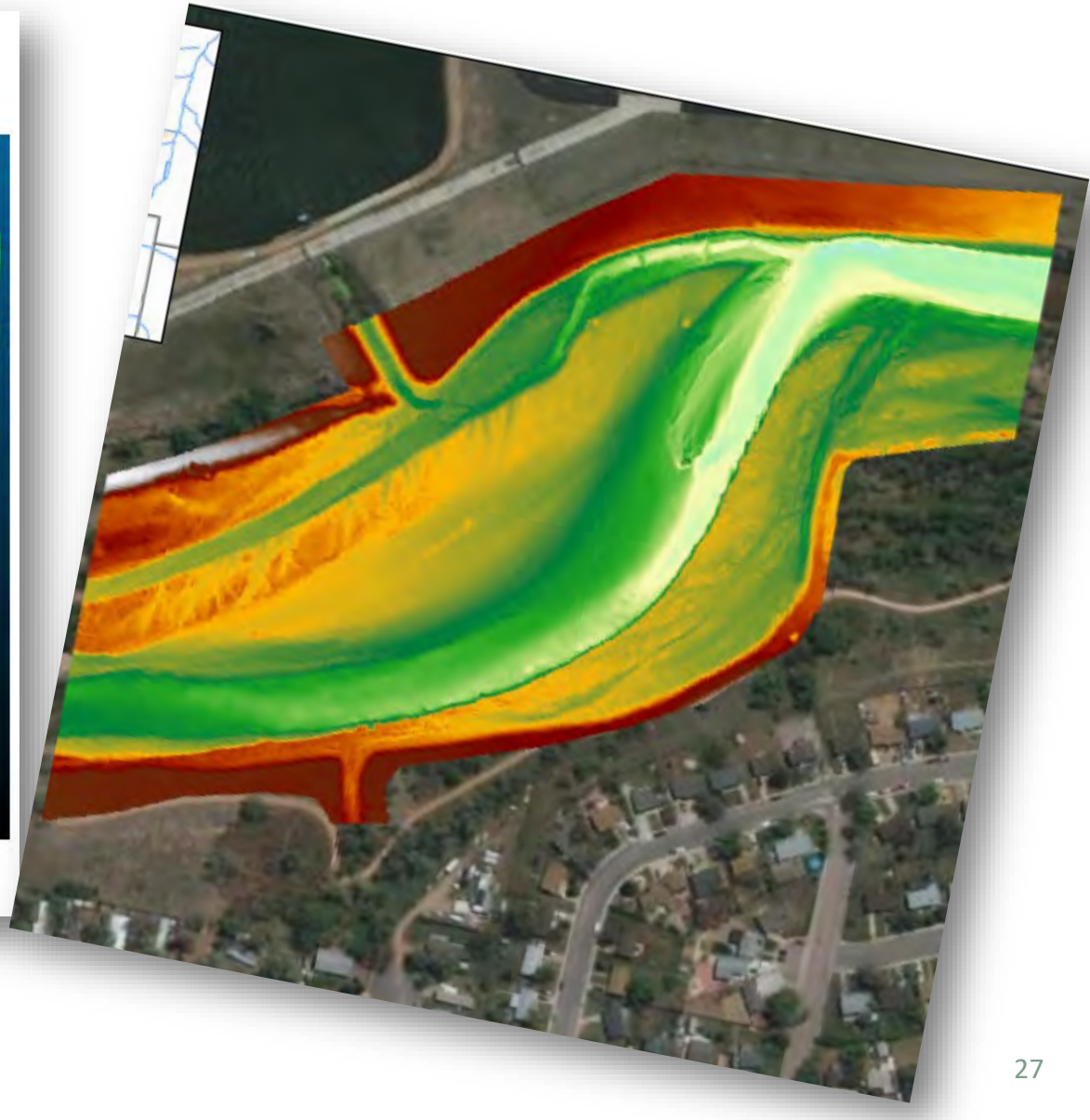
- RTK-GNSS: real time kinematic positioning surveying to correct for satellite navigation system
- LiDAR: Light Detection and Ranging

El Paso County LiDAR (De-trended)

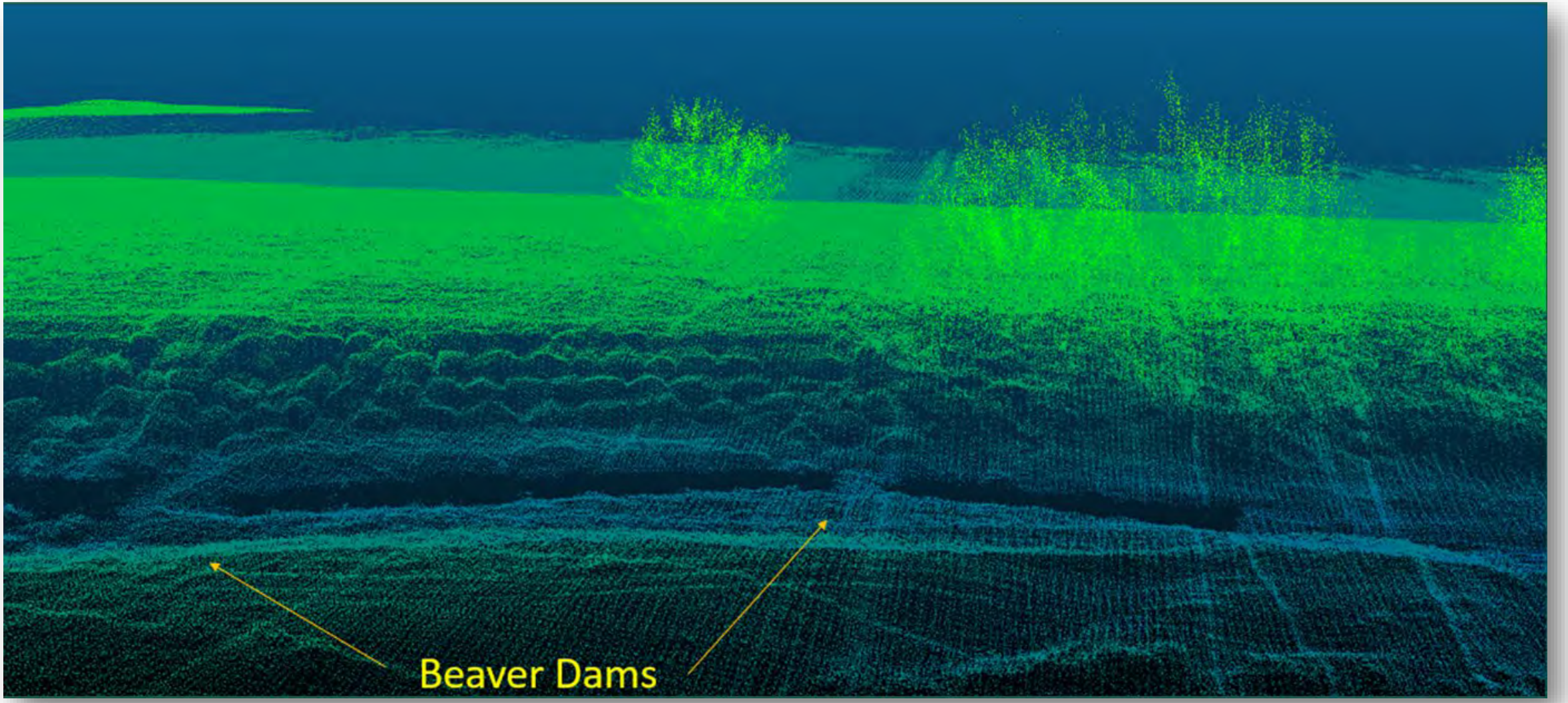
Google Earth Imagery

Geomorphology Site 1 - LiDAR

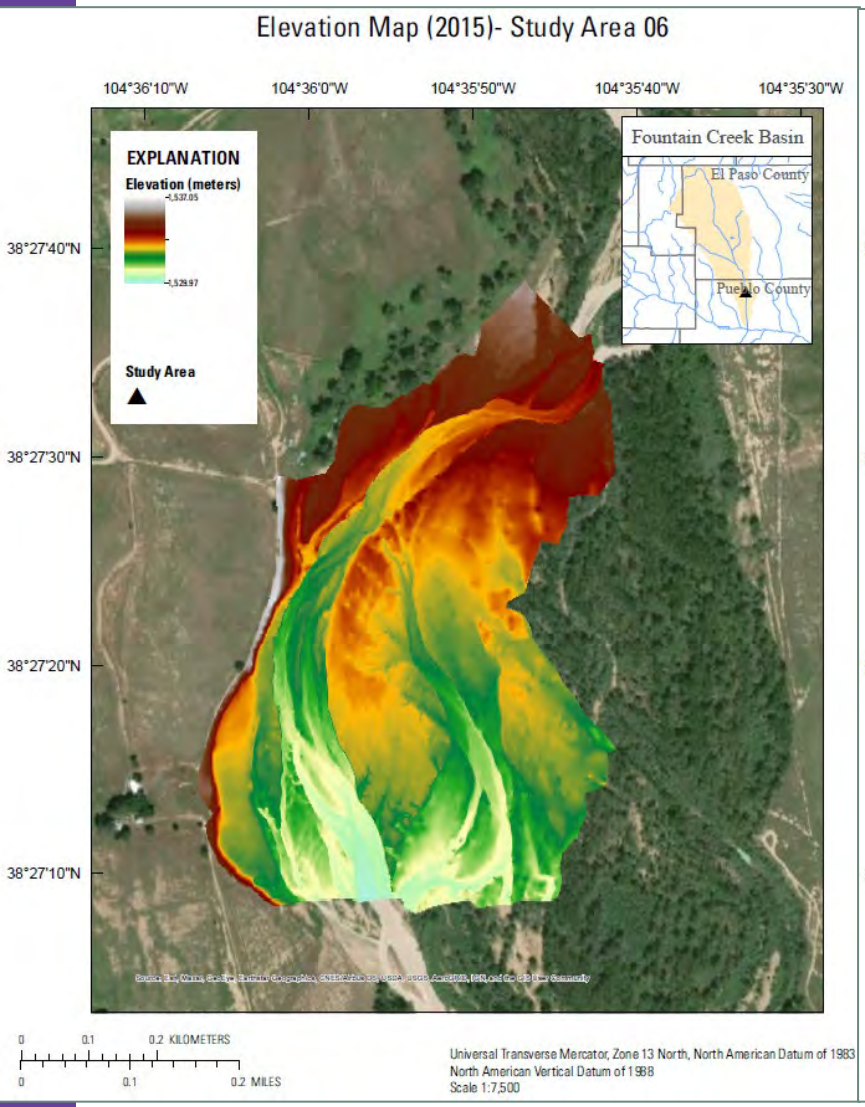


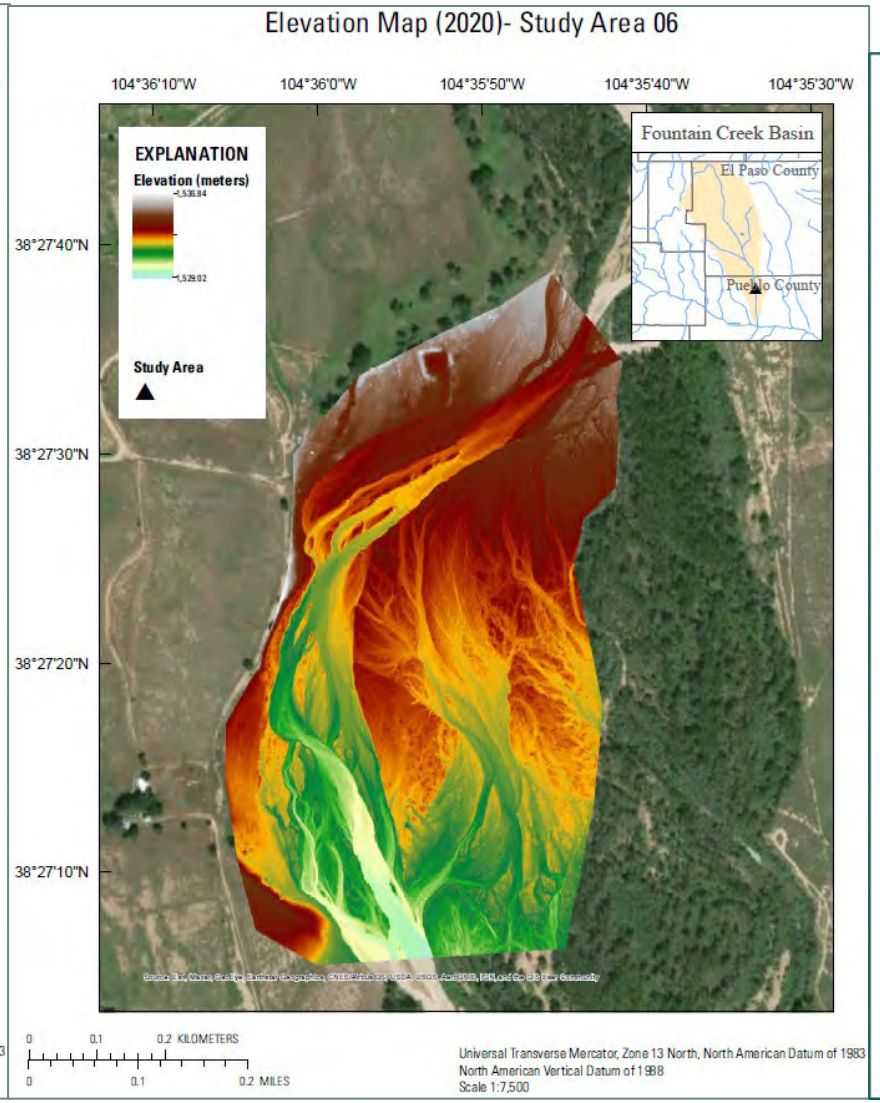


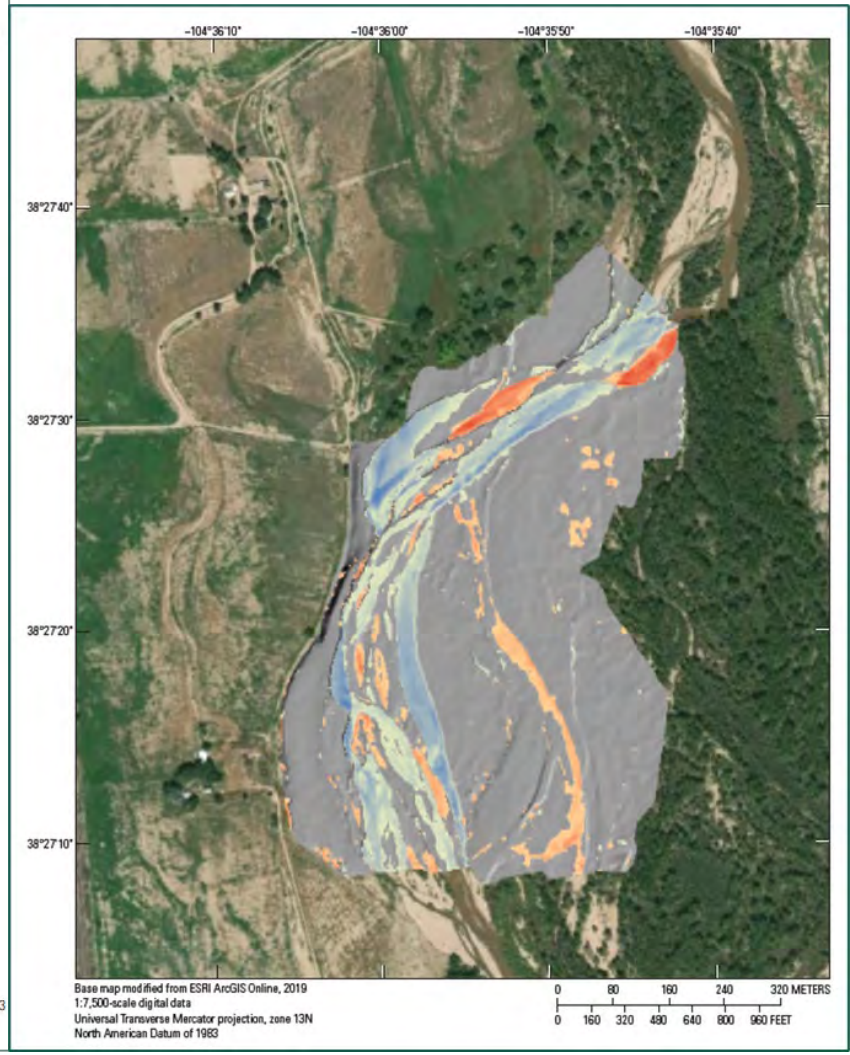
Geomorphology - LiDAR



Fluvial Geomorphology







Wildfire Ready Watersheds Implementation Grant

Colorado Springs Utilities

- $1.37M awarded, $1.4M match

Forestry Management Projects

- Conifer Removal from Riparian Corridor
- Upland Forestry Management

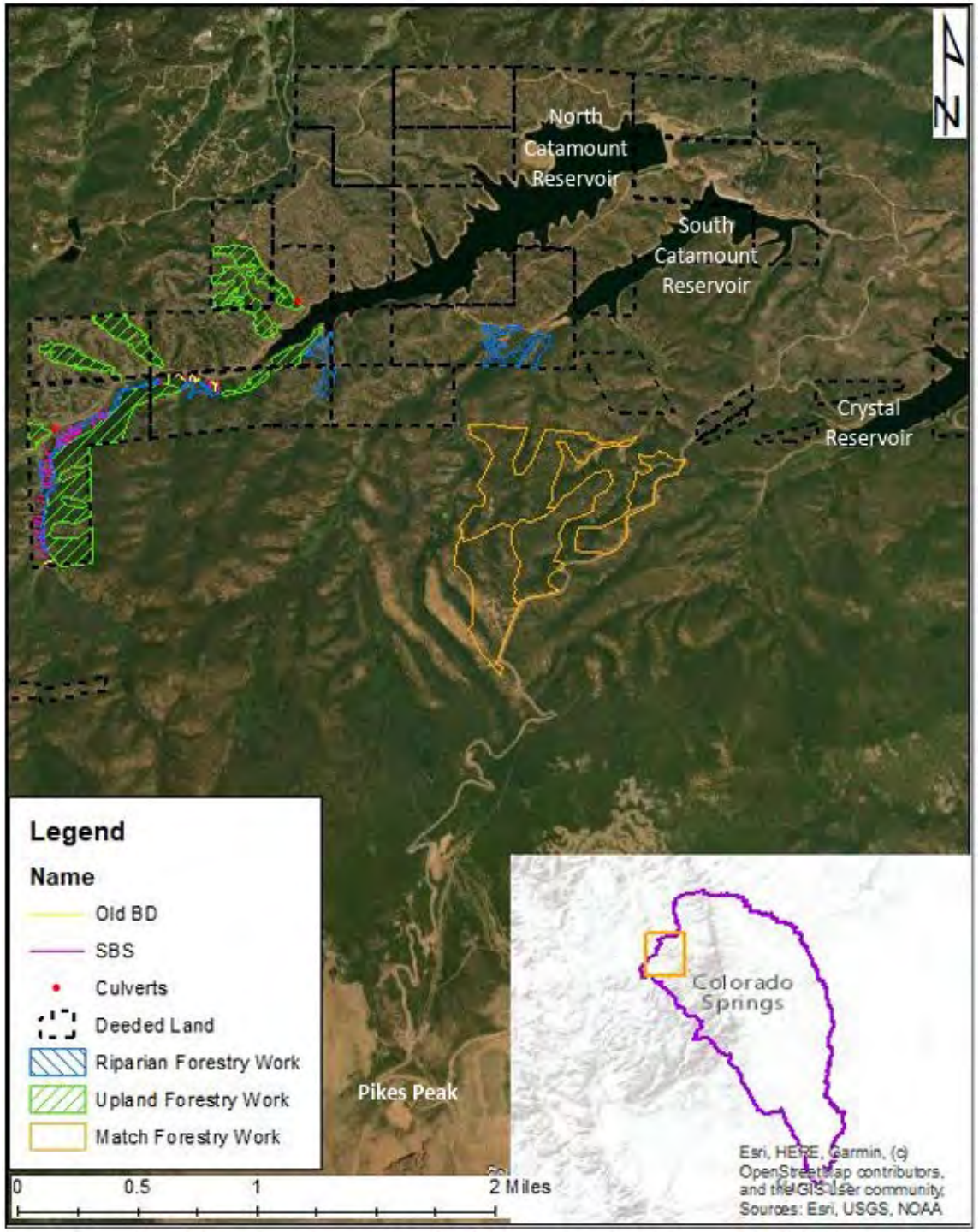
Beaver Meadow Restoration (LTBR)

- adaptive management

Culvert Replacement South Catamount

Reservoir Infrastructure Protection

Fire-Scape Forestry Management Match - $1,193,000



WRW Implementation Grant Goals and Objectives

Low-Tech Processed Based Restoration (LTPBR)

- Reestablish riparian corridor
  - 1.5-mile Fuels Break
  - Improved Water Quality
  - Resilient Ecosystem
    - Beaver – keystone species
  - Adaptive Management

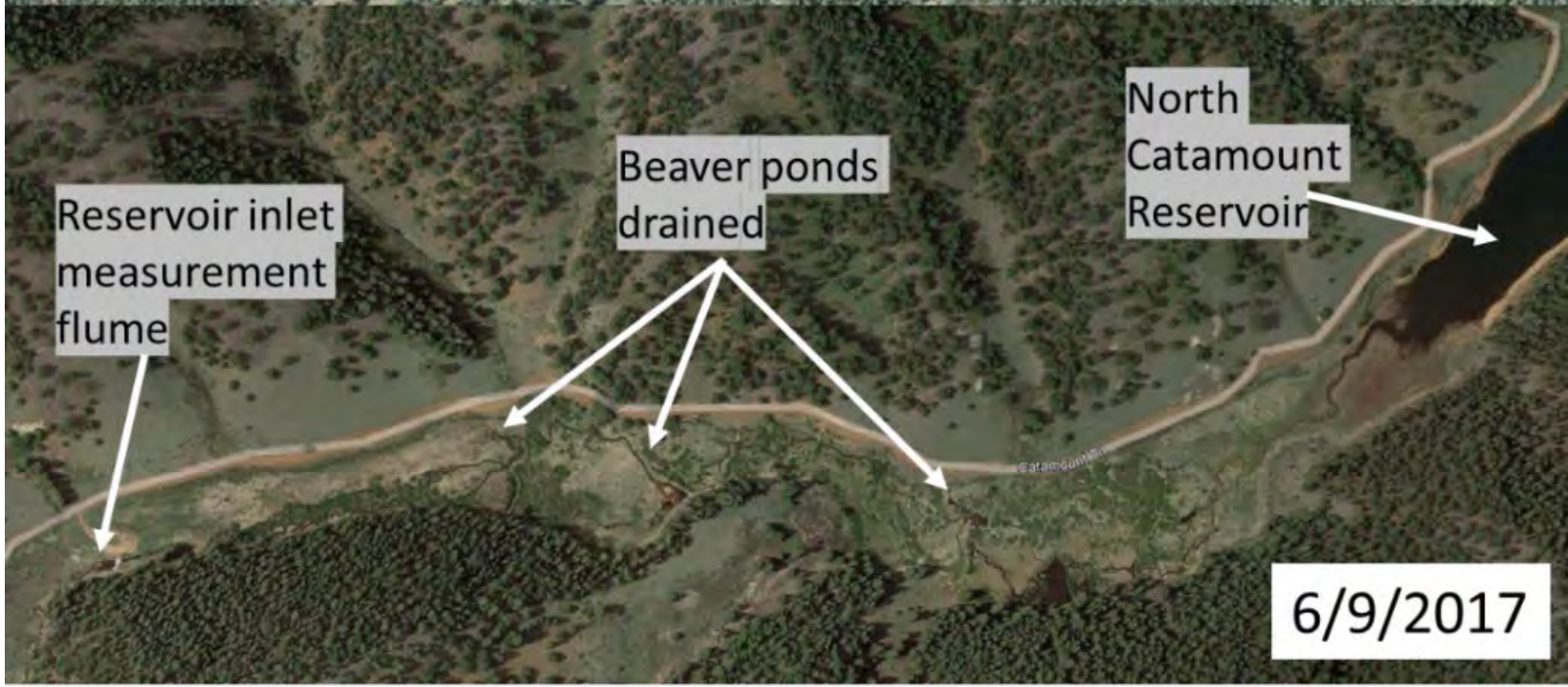
Forestry Management

- Remove conifers from the riparian corridor
- Fuels reduction in the upland regions
- Build on current treatment efforts

Culvert remediation

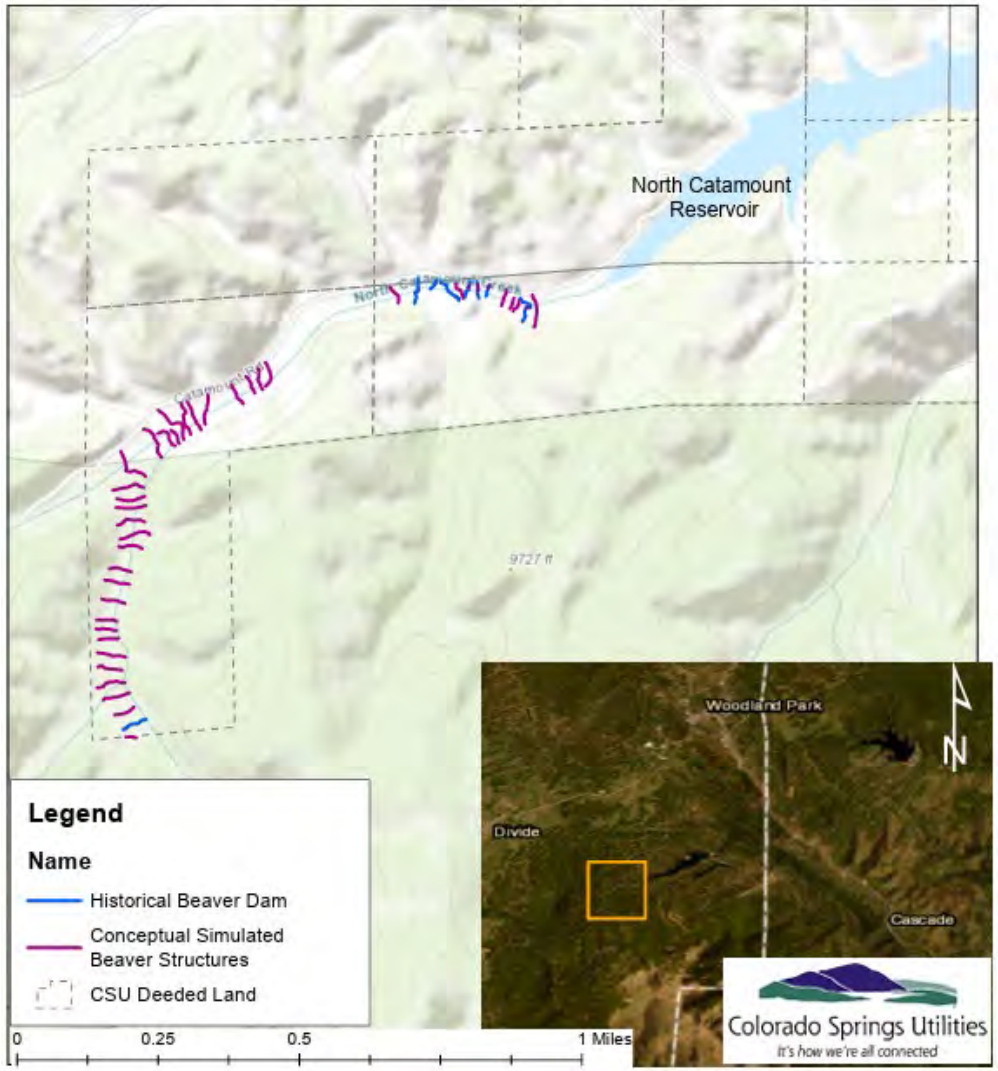
Infrastructure Protection on South Catamount Reservoir

North Catamount

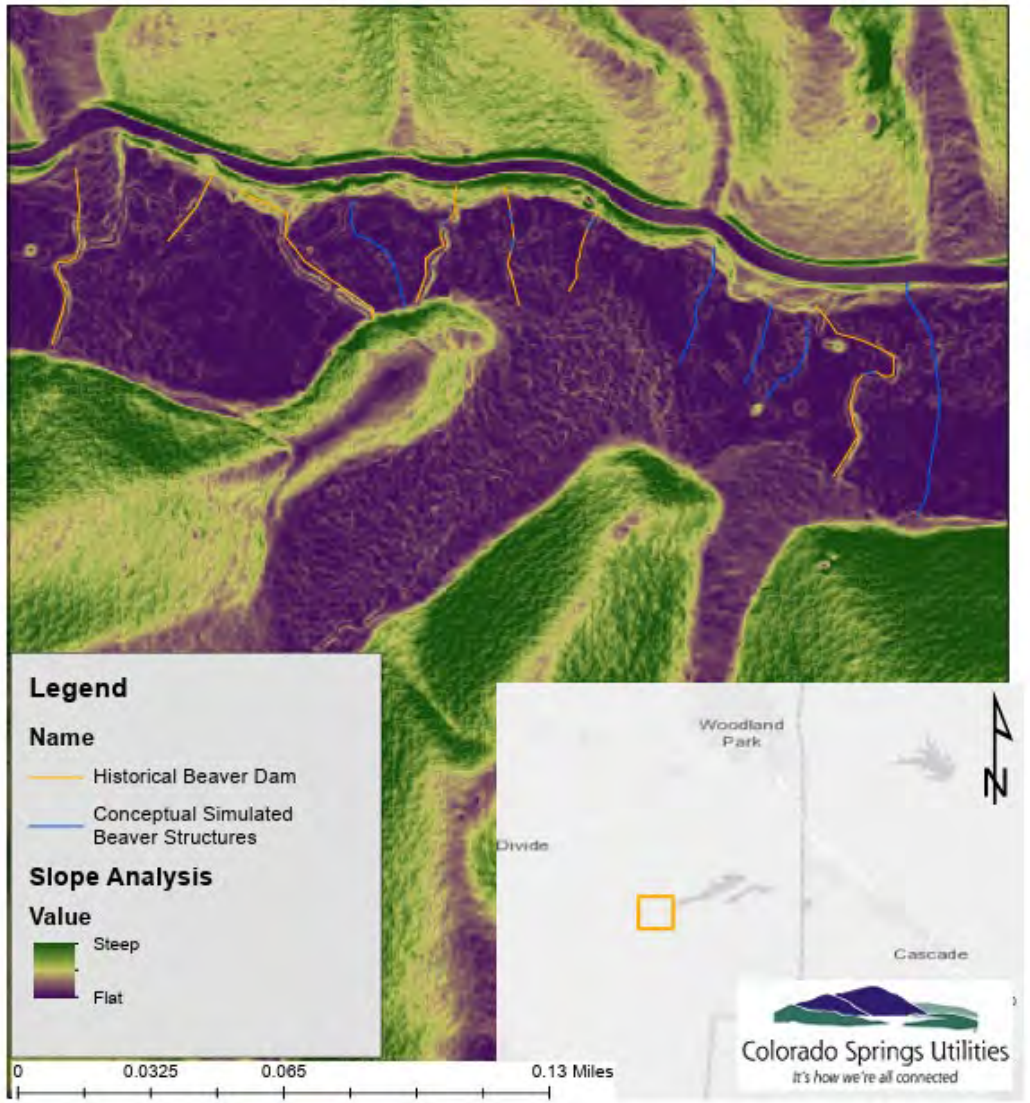


LTPBR – Making the "Simulated" Beaver Dams

CWCB Wildfire Ready Watershed Implementation Grant
North Slope of Pikes Peak Resiliency and Restoration Project
Conceptual Simulated Beaver Structures



CWCB Wildfire Ready Watershed Implementation Grant
North Slope of Pikes Peak Resiliency and Restoration Project

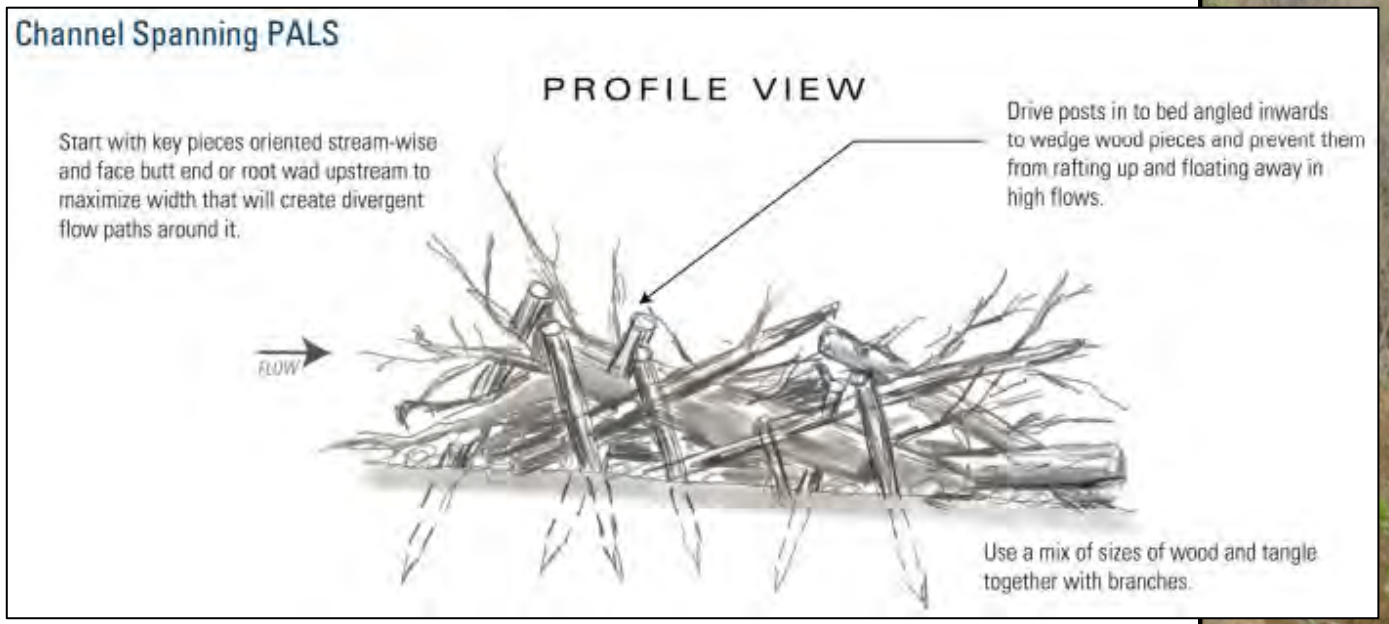


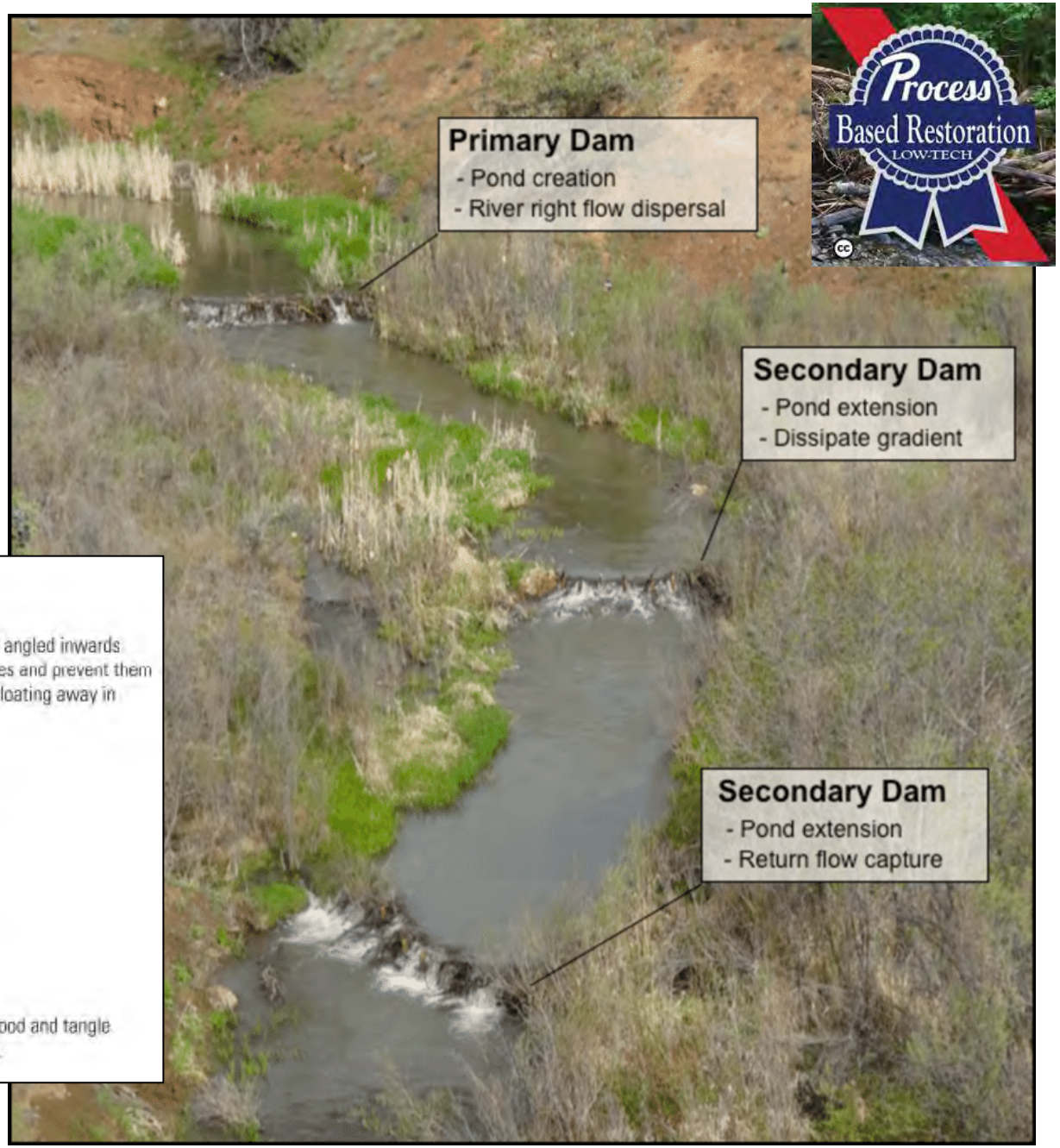
LTPBR – Back to the Future

Beaver Dam it!

LTPBR Fundamentals

- Structures – not exceed ordinary high-water mark, very porous
- Goals – water quality, fuels break, resiliency
- House Bill 270





Chapter 6 - Beaver Dam Analogs - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/Example-of-a-sequence-of-beaver-dam-analogues-on-Bridge-Creek-in-Oregon-The-primary-dam_fig1_319507450 [accessed 14 Feb 2025]

Other Water Quality Issues or Concerns

- Temperature
- PFAS
- Nutrients
- Sediment
- Cyanotoxins

Questions