

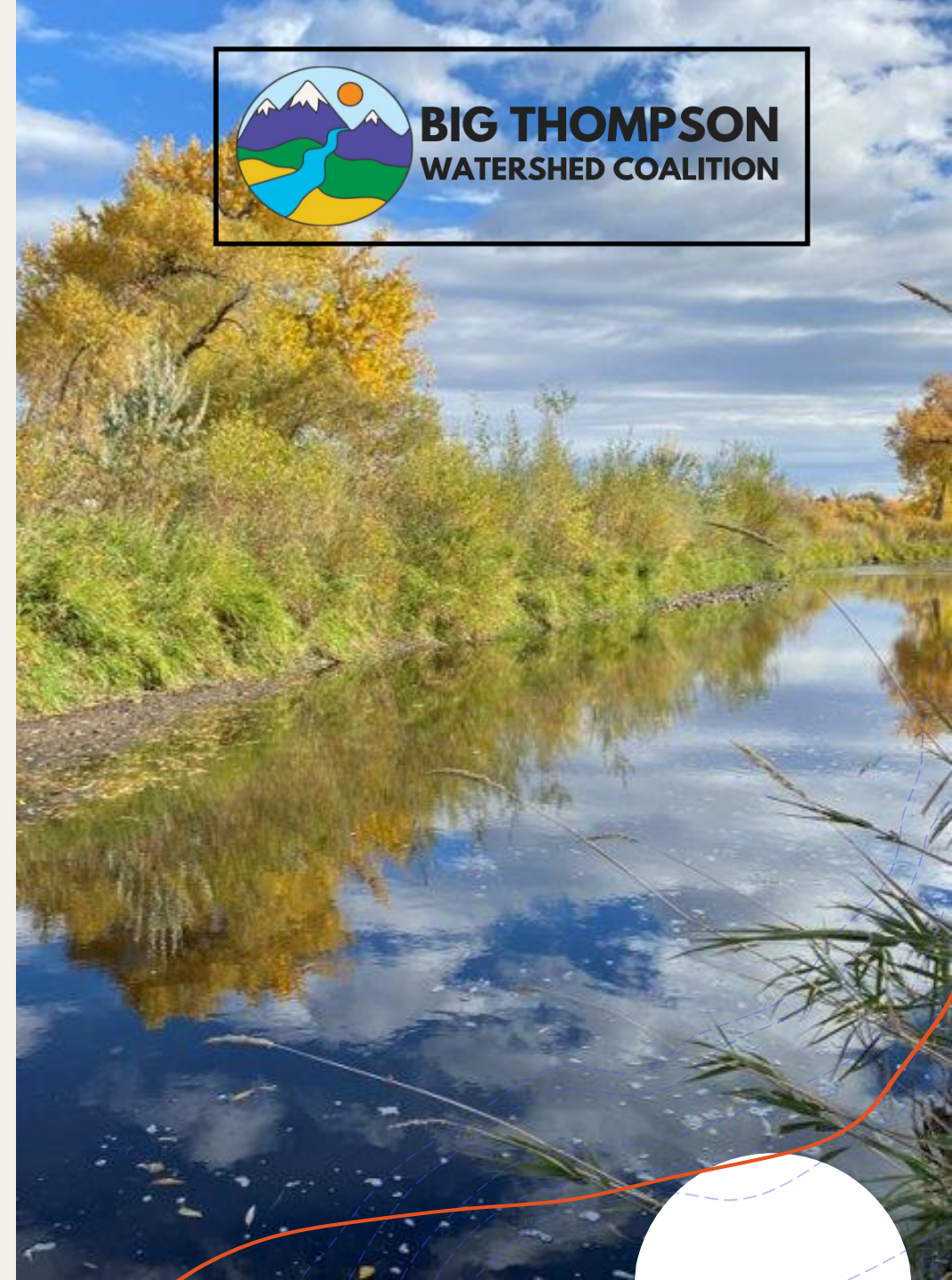


Cameron Peak Fire Recovery



Big Thompson Watershed Coalition

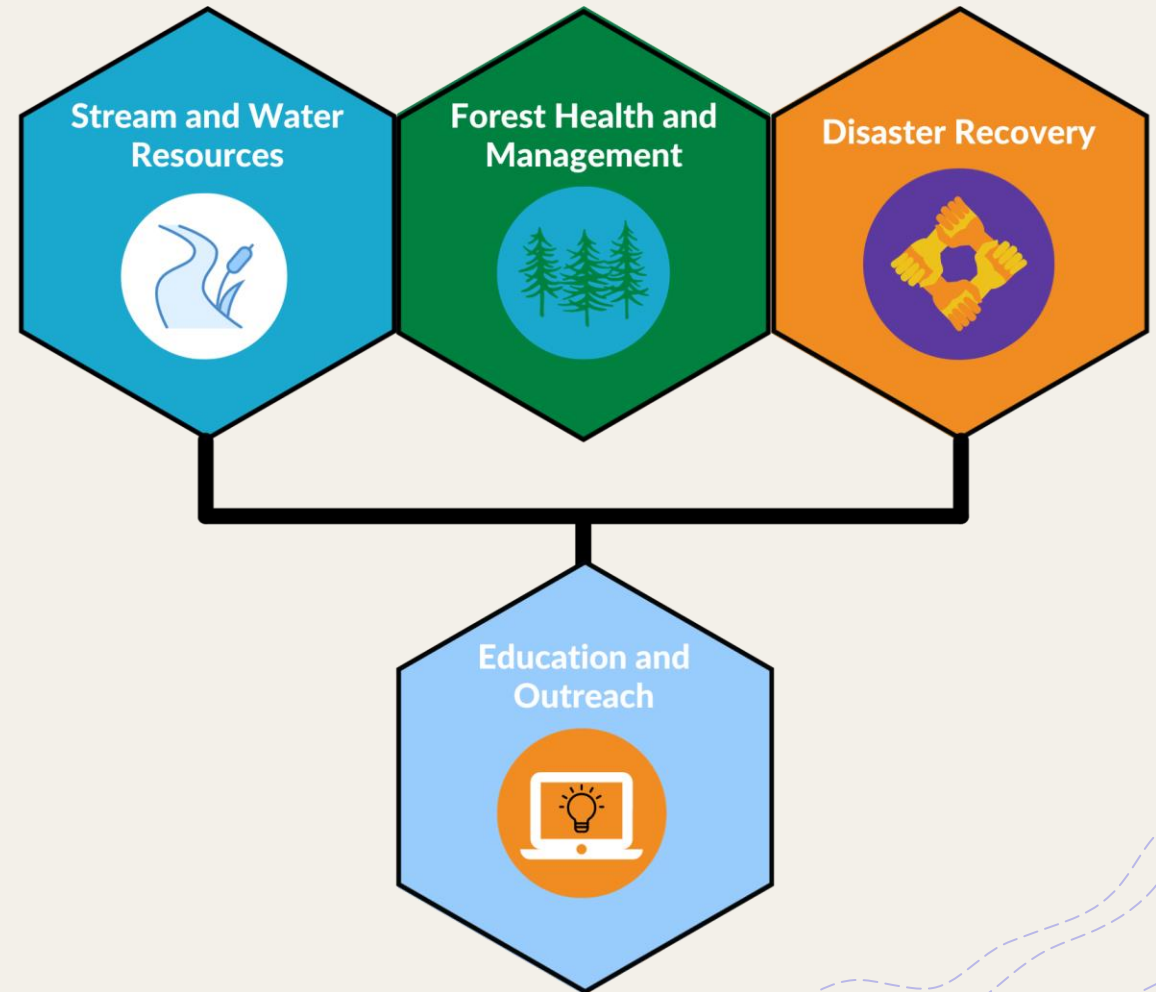
- + Formed after the 2013 flood
- + Brought nearly \$15 million to the watershed for flood recovery
- + 10 river restoration projects, 2 infrastructure projects, 3 major planning projects



Beyond Flood Recovery

+ **Vision for the Watershed:** A healthy and resilient Big Thompson watershed benefitting fish, wildlife, and the people it serves through collaborative efforts for current and future generations.

+ **Mission for the Watershed:** Working with others to take action that protects and restores the health and vitality of the Big Thompson watershed for the use and enjoyment of our community.



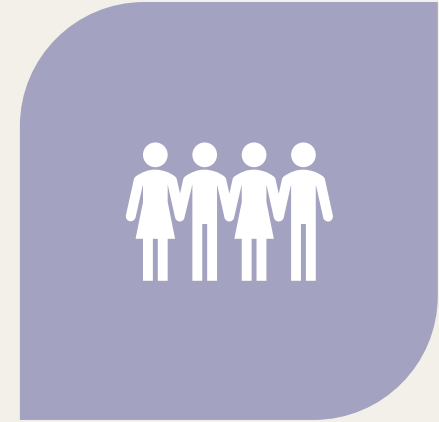
Overarching Goals



**RIVER AND FOREST
RESILIENCE**



**SOURCE WATER
PROTECTION**

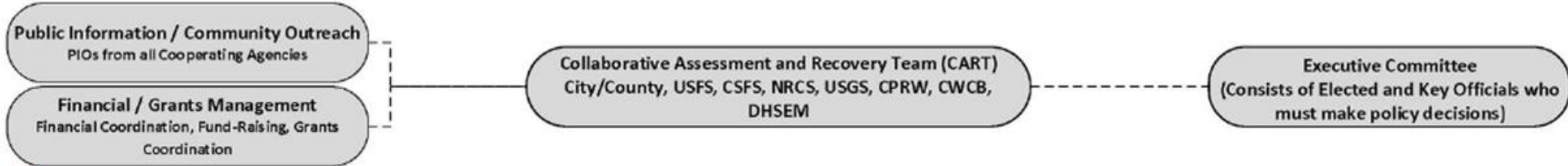


**COLLABORATIVE
STEWARDSHIP**

Cameron Peak Fire Response

Wildfire Response Phases & Stakeholders Involved





Water Recovery Work Group
 Facilitator:
 Jen Kovecses, CPRW

Science and Monitoring

Modeling & Analysis

Infrastructure, Damages Assessment and Repair

Hillslope, Channel & Forest Rehab / Restoration Implementation

Watershed Grants and Fundraising

Infrastructure Work Group
 Facilitator:
 Chris Dahl, USFS and Kohl Parrott, LCOEM

Utilities Assessments, Repair and Restoration

Communications Assessments, Repair and Restoration

Road and Bridge Infrastructure Assessments, Repair and Restoration (City / County / State)

Community Lifelines and Critical Infrastructure

Infrastructure Grants and Fundraising

Public & Environmental Health / Debris Management
 Facilitator:
 LCDHE and Solid Waste

Debris Modeling, Mitigation and Management

Environmental Health Considerations

Public Health (COVID) Considerations

Planning and Building
 Facilitator: Eric Fried and Lesli Ellis
 Larimer Building and Planning Departments

Private property permitting

Building Permits and Needs

Land Use Planning and Community Development

Individual Needs Work Group
 Facilitator: LTRG

Housing Support Services

Donations Management

Volunteer Management

Construction Management

Emotional / Spiritual Care

Private Lands Unmet Needs

Community Support Services Work Group
 (Facilitator: Laura Walker, Larimer HEH Director)

Aging and Adult Services

Housing Stability and Homelessness

Early Learning and Childcare Services

Food and Essential Needs

Behavioral and Physical Health Services

Mitigation and Resilience Work Group
 Facilitator:
 Shayle Sabo, LCOEM

Mitigation Project Implementation

Recovery Plan and Unmet Needs Study

Community Planning and Capacity Building

Resilience Framework Update and Implementation

Mitigation Project Funding

Economic Health
 Facilitator:
 Jacob Castillo, LC
 Economic Development

Agriculture and Farming

Hospitality, Visitor Experience, and Outdoor Recreation

Workforce and Employment

Small Business Support

Economic Development

Re-ignite the Economy Plan

Data and Information Management Work Group
 Facilitator: ??

Data and Modeling

GIS

Models

Assessments (Fire, BAER)

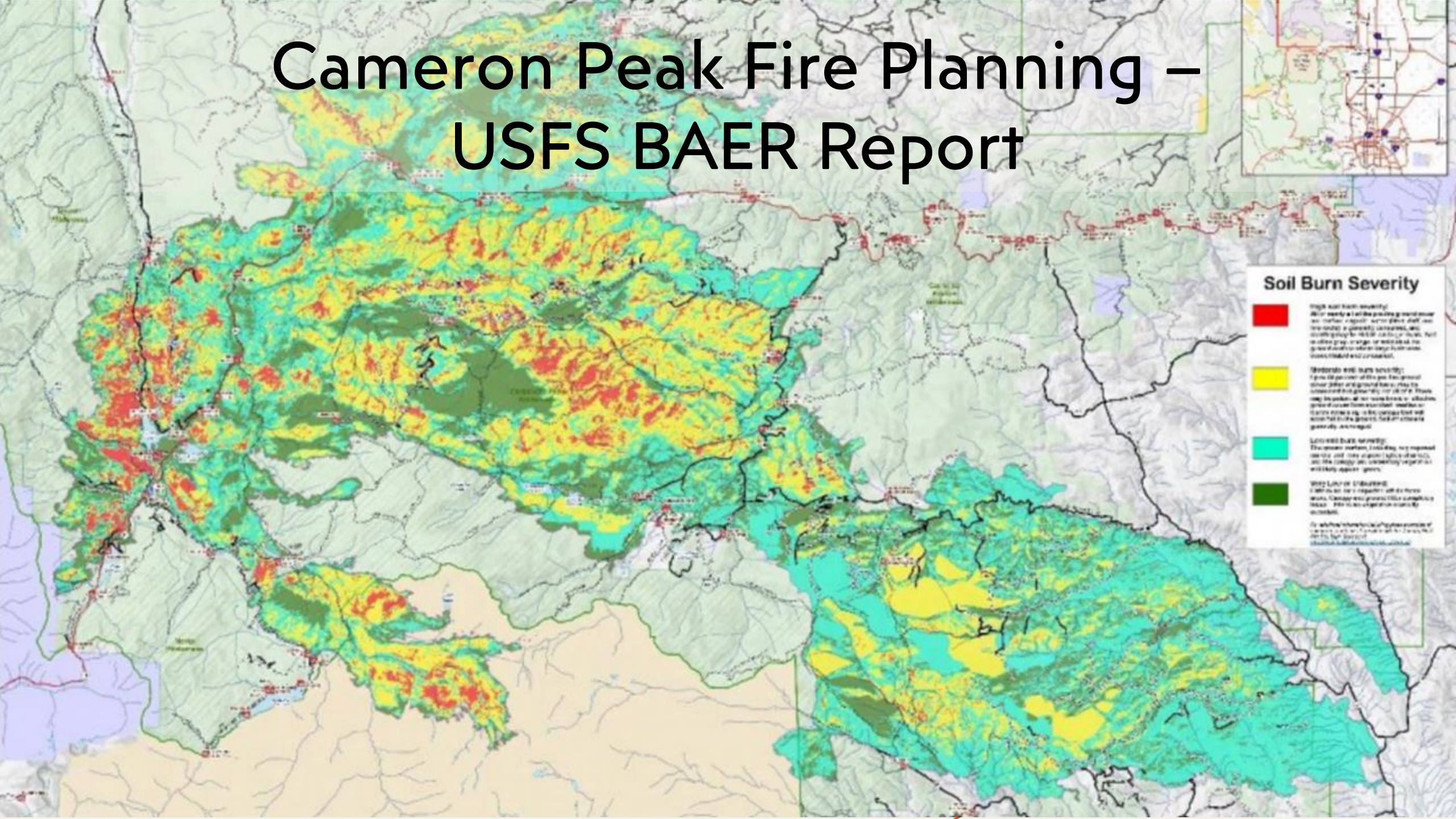
Organization and sharing of information

Tracking data modeling

Facilitating data sharing requests

CPF Recovery Team Structure

Cameron Peak Fire Planning – USFS BAER Report



Cameron Peak Fire Planning – Risk Assessment

LARIMER COUNTY OFFICE OF EMERGENCY MANAGEMENT



CAMERON PEAK FIRE RISK ASSESSMENT



Summary results of the Cameron Peak Fire Risk Assessment and Hydrology Analysis
May 2021

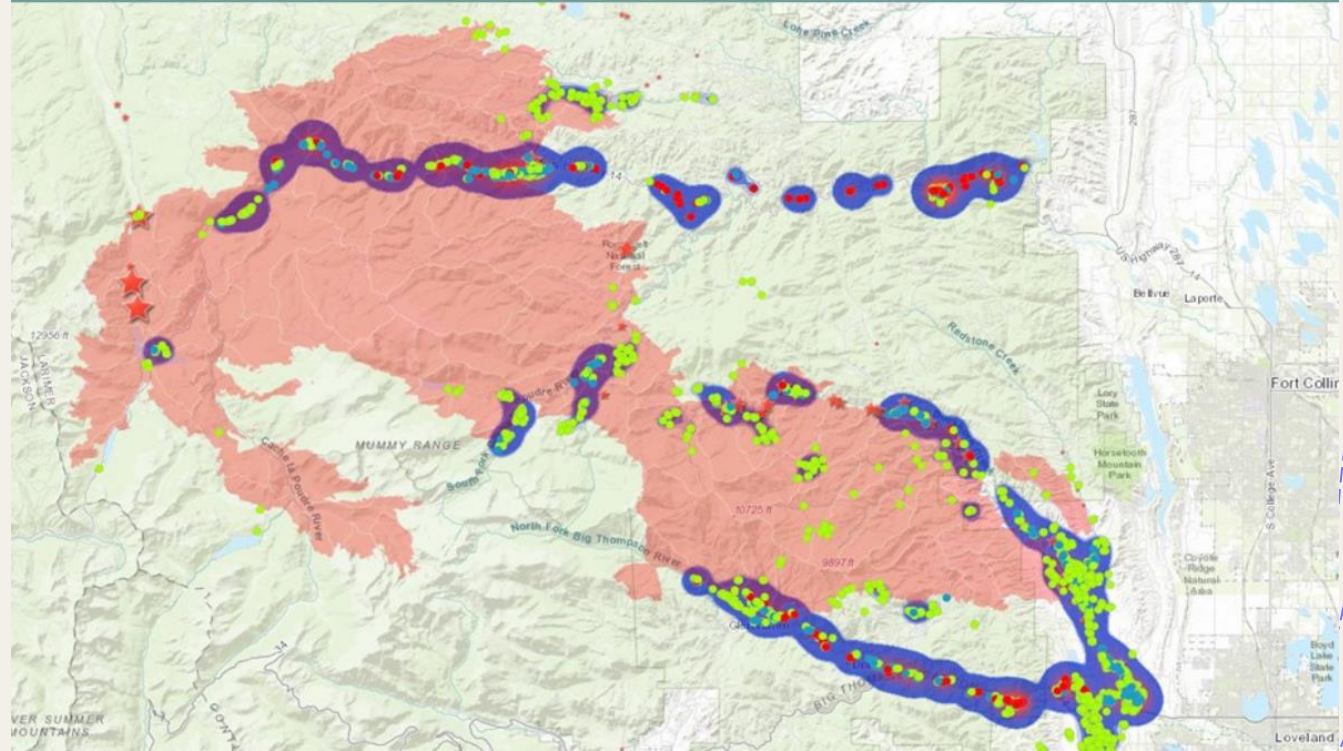


This summary report has been developed to provide community members with information contained in the Cameron Peak Fire Risk Assessment that was completed by Larimer County during the winter of 2020-2021.

Para obtener información en español sobre los esfuerzos de recuperación y los recursos para el incendio de Cameron Peak, comuníquese con Ricardo Perez al (970) 498-7142 o por correo electrónico a perezri@co.larimer.co.us.



Varying Flood Types

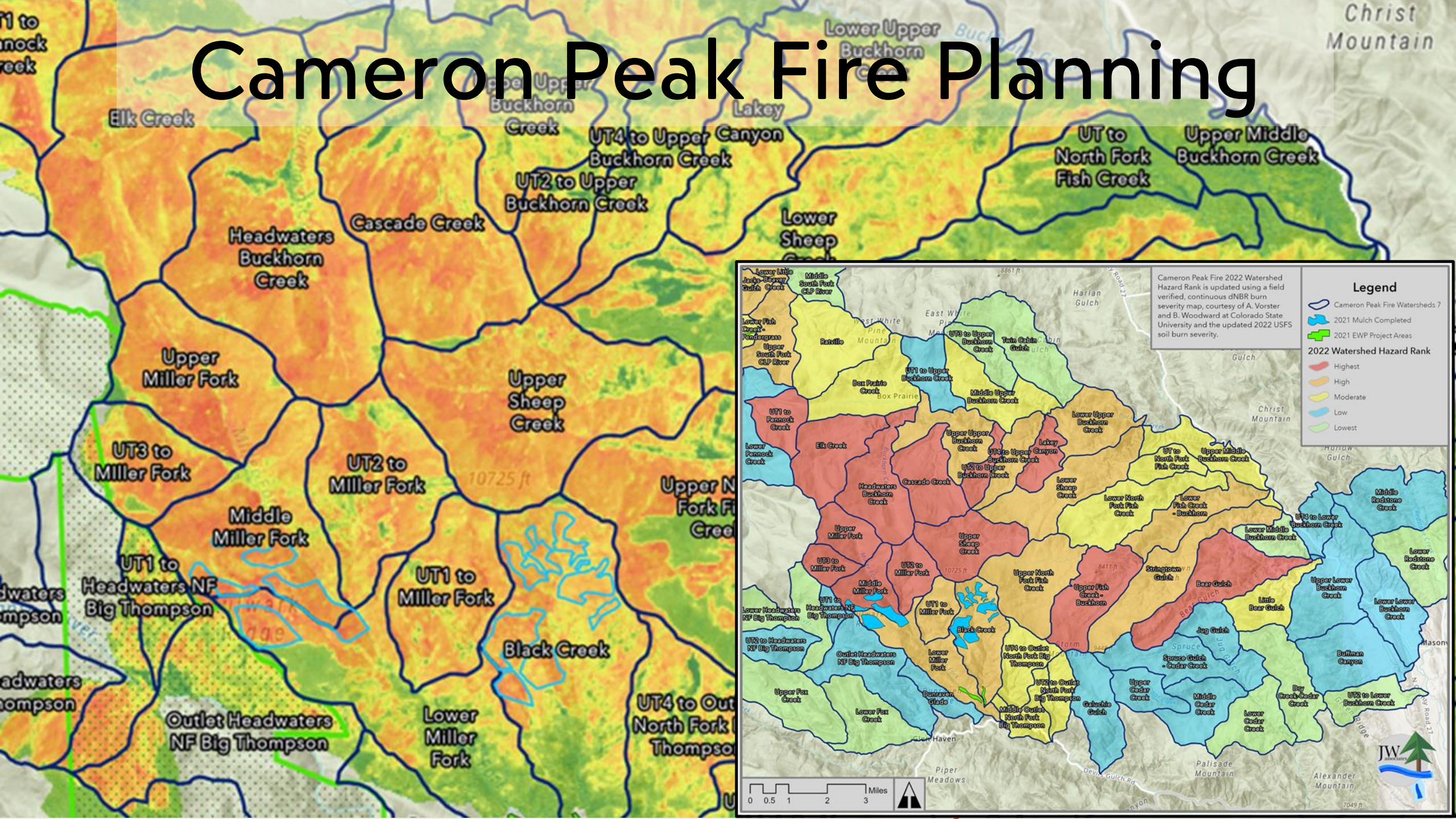


Colorado State provided more detailed hydrologic and hydraulic analyses of the burn area and potential downstream effects.

Cameron Peak Fire Planning



Cameron Peak Fire Planning



Erosion and Post-fire Flooding



The Retreat



The Retreat Flood Resilience – Sediment and Debris Removal



The Retreat Flood Resilience – Sediment and Debris Removal



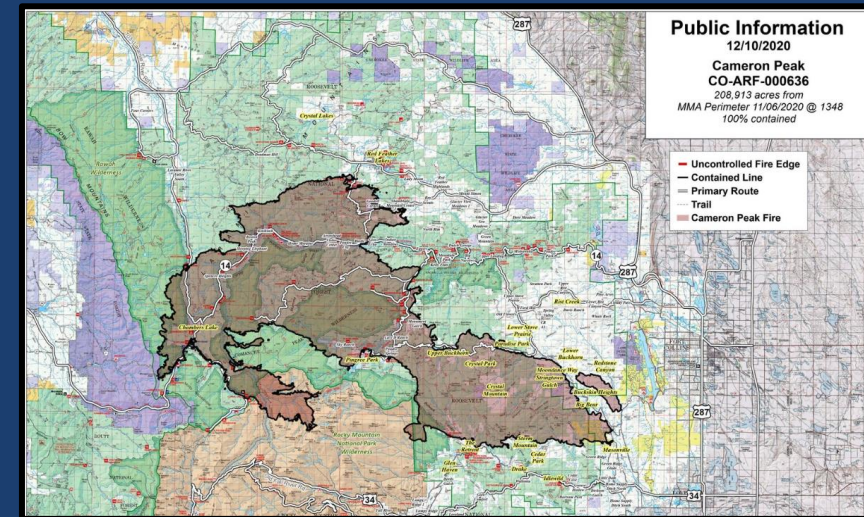
The Retreat Flood Resilience - Partners

- Ayres – Design Engineer / Construction Support
- Larimer County – Emergency Watershed Protection (EWP) Program Manager
- NRCS – EWP Administrator
- Connell Resources – Contractor



The Retreat Flood Resilience – Background

- Cameron Peak wildfire (2020) largest wildfire in Colorado State history (CPRW)
 - 208,913 acres
 - Three watersheds affected (Poudre, Big Thompson, and Laramie)
 - 492 structures destroyed
 - At least 16 mountain communities affected
 - At least 5 drinking water reservoirs affected



Flood After Fire

Did you know wildfires dramatically alter the terrain and increase the risk of floods? Excessive amounts of rainfall can happen throughout the year. And properties directly affected by fires and those located below or downstream of burn areas are most at risk for flooding.

- 1 During normal conditions, vegetation helps absorb rainwater.
- 2 But after an intense wildfire, burned vegetation and charred soil form a water repellent layer, blocking water absorption.
- 3 During the next rainfall, water bounces off the soil.
- 4 As a result, properties located below or downstream of the burn areas are at an increased risk for flooding.

Degree of Land Slope
Higher degrees of land slope speed up water flow and increase flood risk.

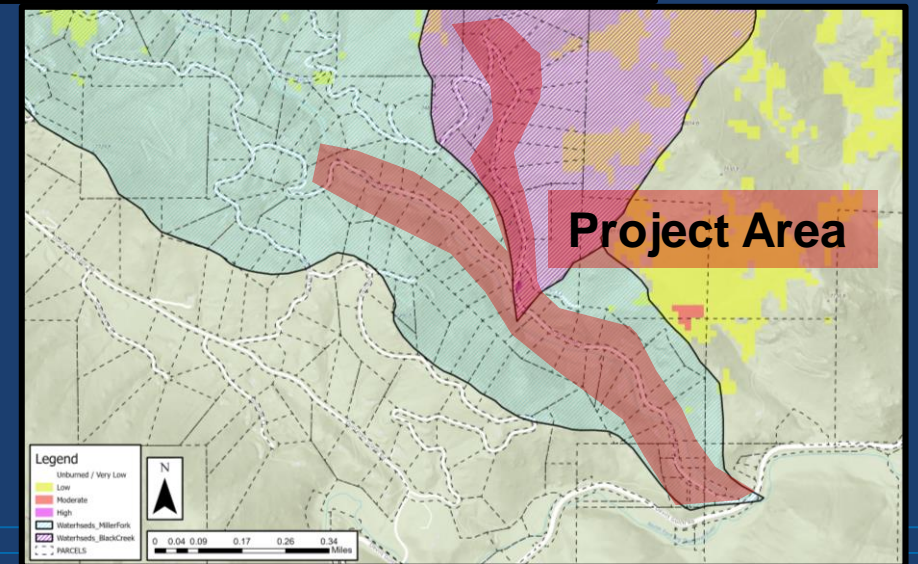
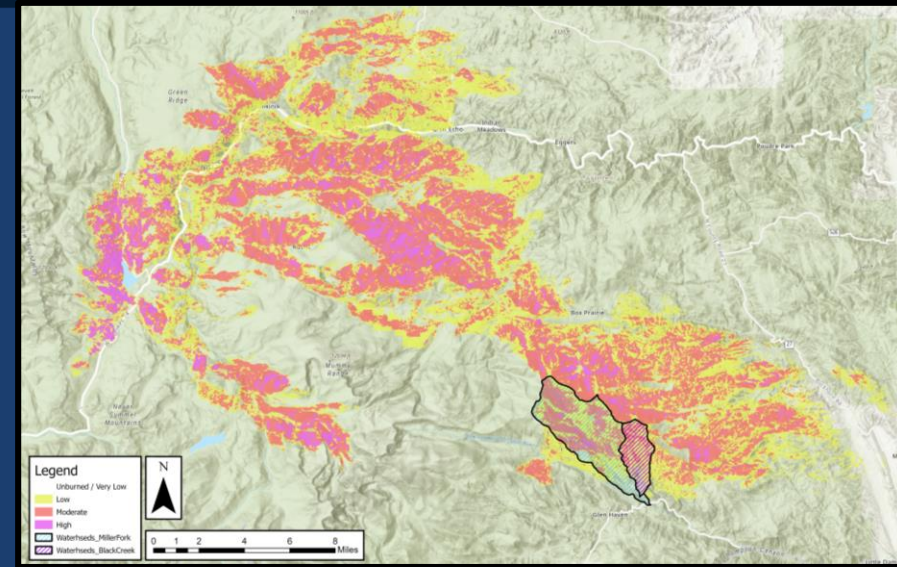
Flash Floods
Intense rainfall can flood low-lying areas in less than six hours. Flash floods roll boulders, tear out trees and destroy buildings and bridges.

Mudflows
Rivers of liquid and flowing mud are caused by a combination of brush loss and subsequent heavy rains. Rapid snowmelt can also trigger mudflows.

The infographic includes the FEMA logo and a stylized illustration of a landscape showing a wildfire, a stream, and houses at risk of flooding.

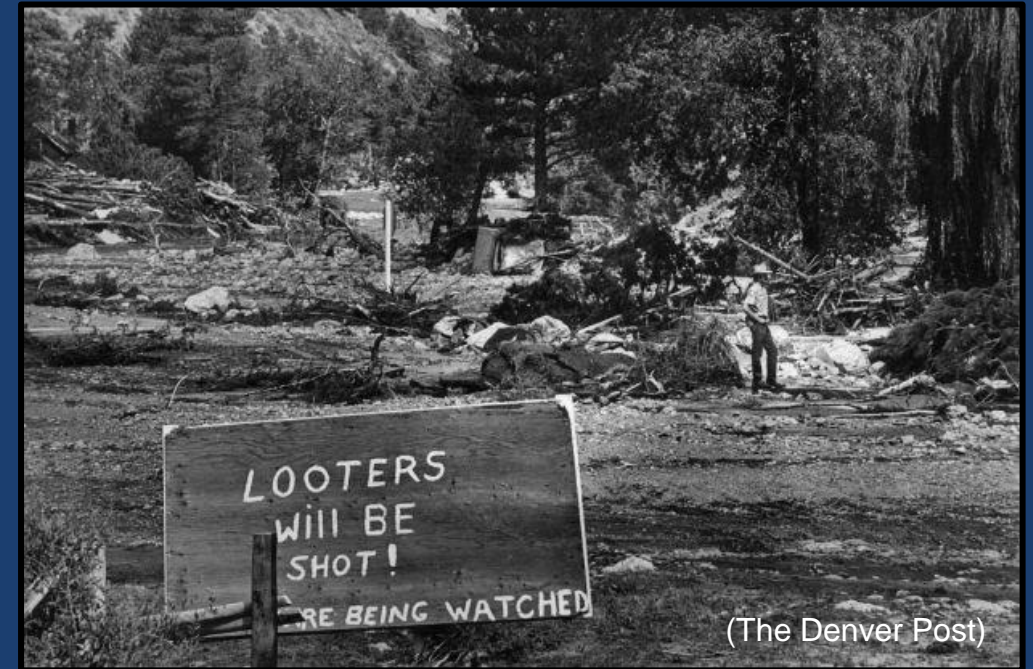
The Retreat Flood Resilience – Background

- Located near Glen Haven Colorado on North Fork of Big Thompson River
- Over 200 residents
- County maintained road access along Streamside Drive and Black Creek Drive
- Coincides with two highly burned and steep watersheds:
 - Miller Fork Basin : 10.6 mi²
 - Black Creek Basin : 3.2 mi²



The Retreat Flood Resilience – Hydrologic History

- 1976 : (Centennial Flood) Deadliest Flash Flood In Colorado State History
- 2013 : 10-year anniversary
- 2021-2023
 - 20+ High Flow Events Since 2021
 - 5+ major events equal or greater than 2013 / 2017



(The Denver Post)

Calculated Peak Discharge for Miller Fork Upstream of North Fork Big Thompson (cfs)					
	2-yr	5-yr	10-yr	25-yr	100-yr FIS
Pre-Fire	346	765	1343	2509	3350
Post-Fire	1475	2469	3624	5663	

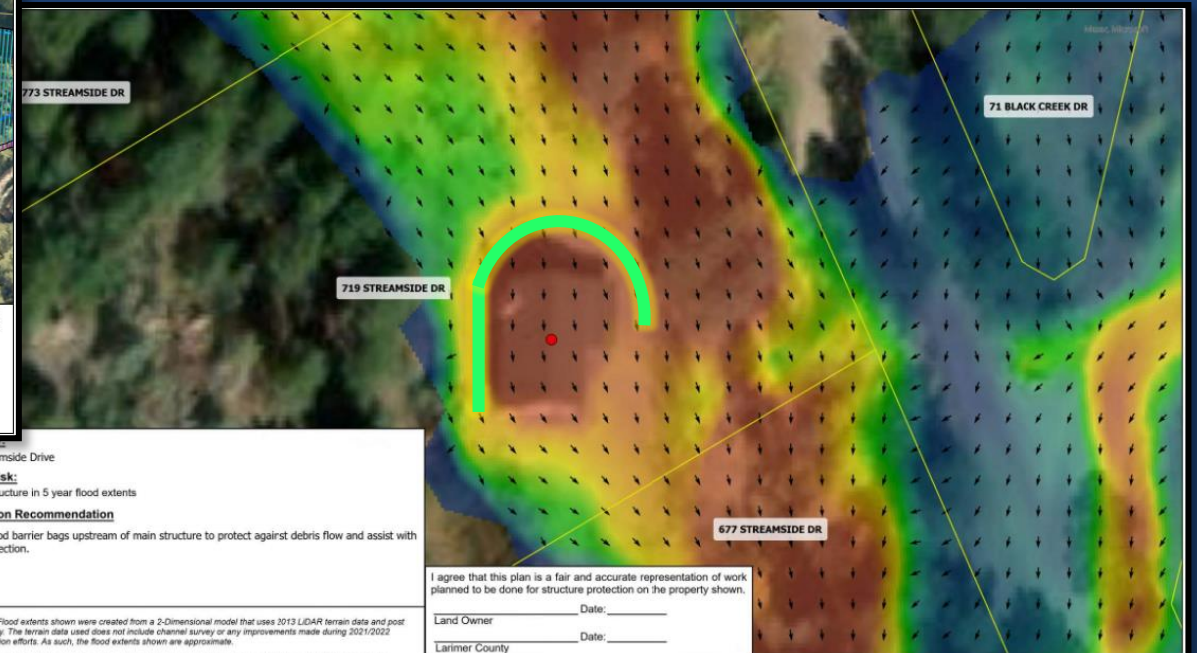
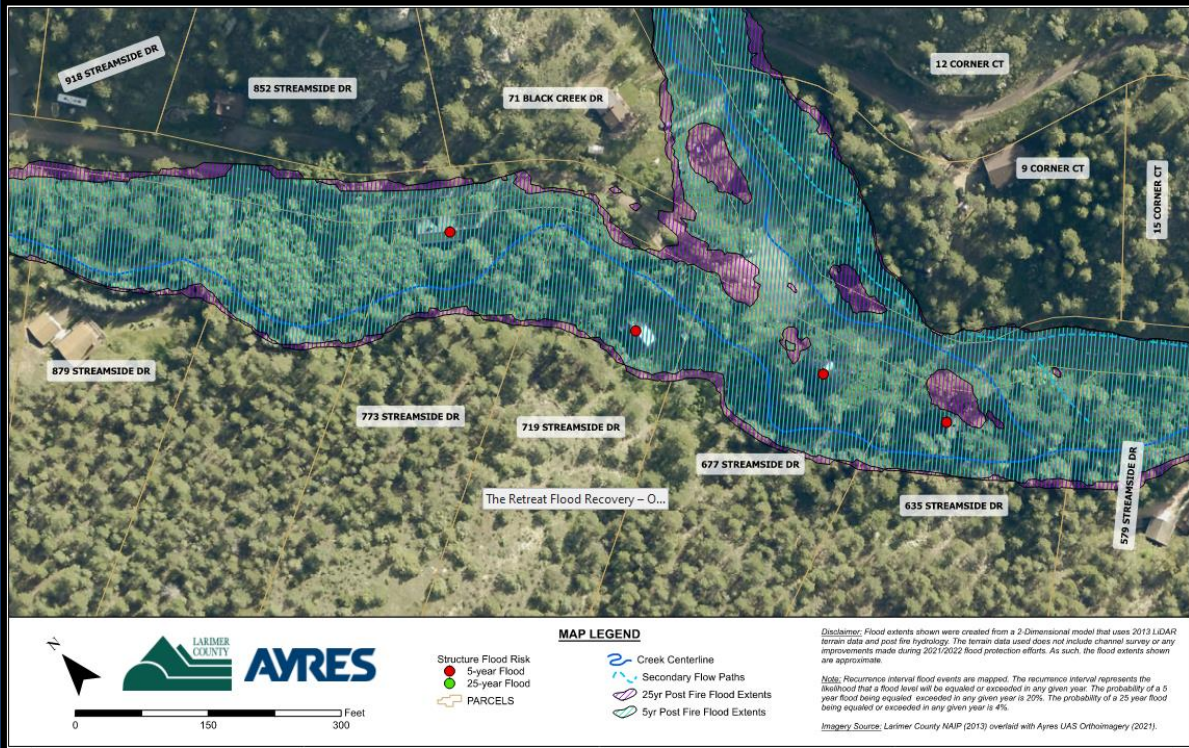
The Retreat Flood Resilience – Project Goals and Features

- Primary goal to improve flood resilience and provide protection to Values Assets at Risk (VARs)
 - Emergency Access Roads
 - County Maintained
 - Private Structure Protection
- Engineered Resilience Features
 - Sediment and Debris Removal
 - Flood barrier bags
 - Stream Fords / Armored Drainage Crossing
 - Water Bars
 - Culvert Crossing Resilience



The Retreat Flood Resilience – Flood Barrier Bags

- 2D modeling to predict extents, depth, and flow direction
- Designed protection level to 25-yr post fire event



719 Streamside Drive

Flood Risk:
High - Structure in 5 year flood extents

Protection Recommendation
Install flood barrier bags upstream of main structure to protect against debris flow and assist with flow redirection.

- Protection added Spring 2022
- Large ~ 100yr FIS Event July 2022

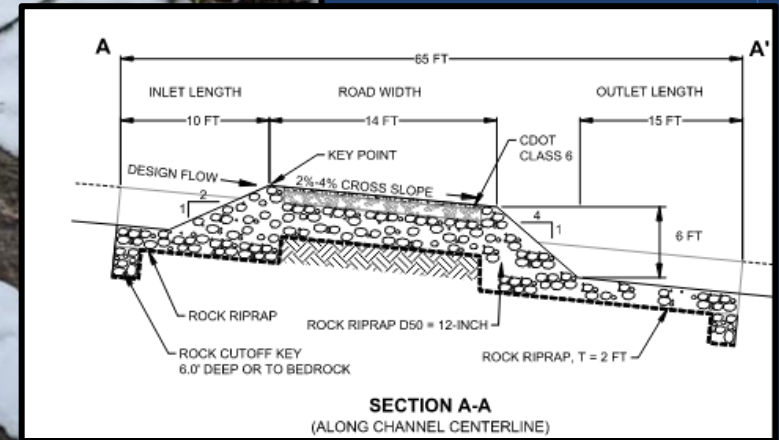
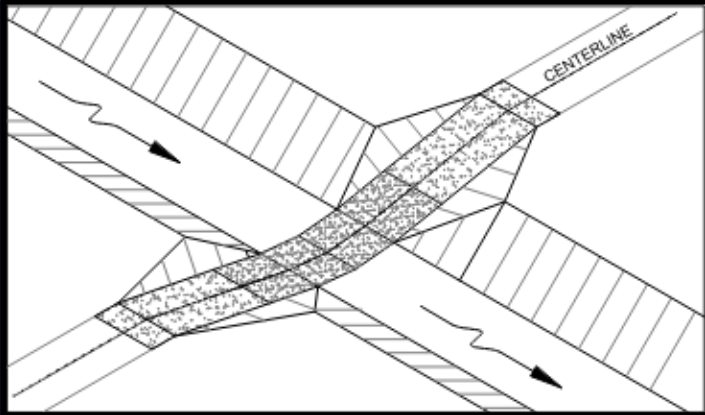
The Retreat Flood Resilience – Flood Barrier Bags



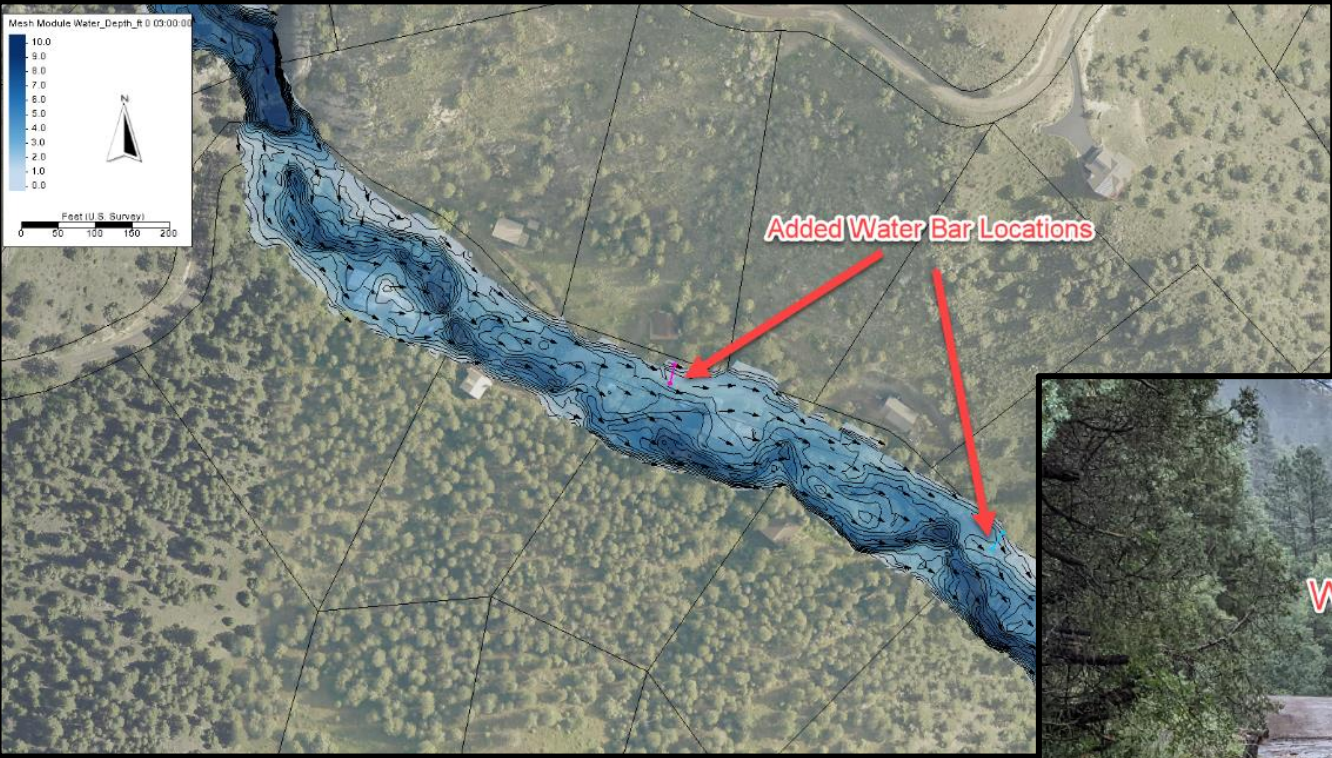
The Retreat Flood Resilience – Stream Ford / Armored Drainage Crossing



The Retreat Flood Resilience – Stream Ford / Armored Drainage Crossing



The Retreat Flood Resilience – Water Bars



The Retreat Flood Resilience – Culverts and Overtopping Protection

- Largest available culverts
 - 7-foot barrels
- Undersized for level of post fire events
- Designed and concentrated overtopping zones and protection



Miller Fork Downstream Culvert Summary Table

Event		2yr Post	5yr Post	10yr Post	25yr Post
Peak Runoff (cfs)		1475	2469	3624	5663
Proposed 84" RCP Headwall	Passing Flow (cfs)	484	521	552	592
	Roadway Flow (cfs)	990	1947	3072	5070

The Retreat Flood Resilience – Culverts and Overtopping Protection



The Retreat Flood Resilience – Culverts and Overtopping Protection



The Retreat Flood Resilience – Culverts and Overtopping Protection



The Retreat Flood Resilience – Look Ahead

- Larimer County EWP efforts for the area is complete, achieved sufficient level of protection for VARs
- Working With Big Thompson Watershed Coalition and City of Loveland further watershed treatments
- Water Quality Focused
 - Sediment basins / sediment removal
 - Low Tech Processed Based Solutions in upper watershed
 - Grants for continued road maintenance and repairs for community and non county-maintained access



CPF Recovery & Restoration



Aerial Mulching



Point-Mitigation



Reforestation



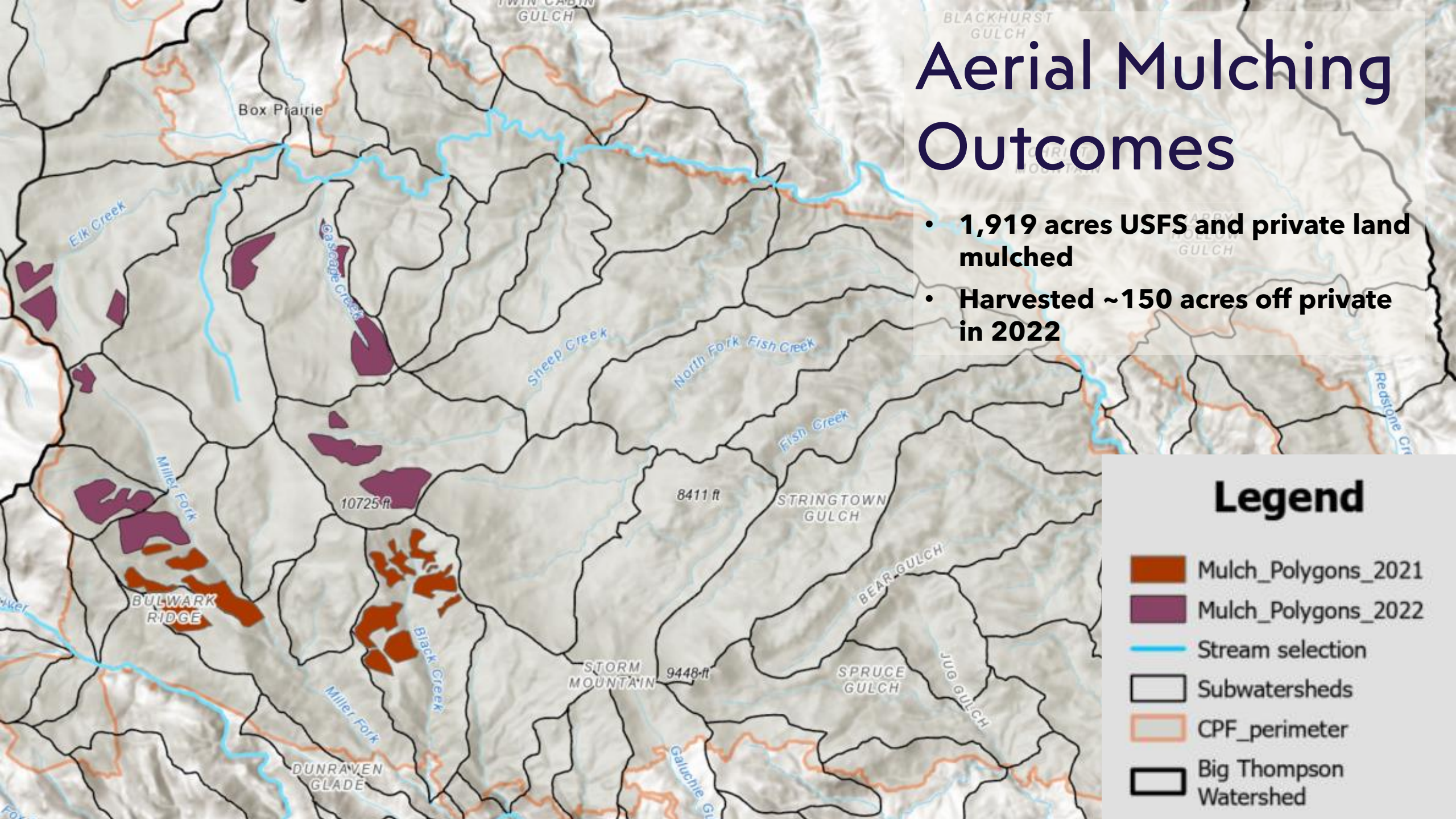
CPF Recovery

Hillslope Stabilization & Aerial Mulching



Aerial Mulching Outcomes

- 1,919 acres USFS and private land mulched
- Harvested ~150 acres off private in 2022



Legend

- Mulch_Polygons_2021
- Mulch_Polygons_2022
- Stream selection
- Subwatersheds
- CPF_perimeter
- Big Thompson Watershed



CPF Recovery

Reforestation





CPF Recovery Reforestation

- + Planted 9,790 trees since 2021
- + Across 145 acres / 17 private properties



CPF Recovery

Point Mitigation /
Water Quality Protection

Point Mitigation



Log Structure



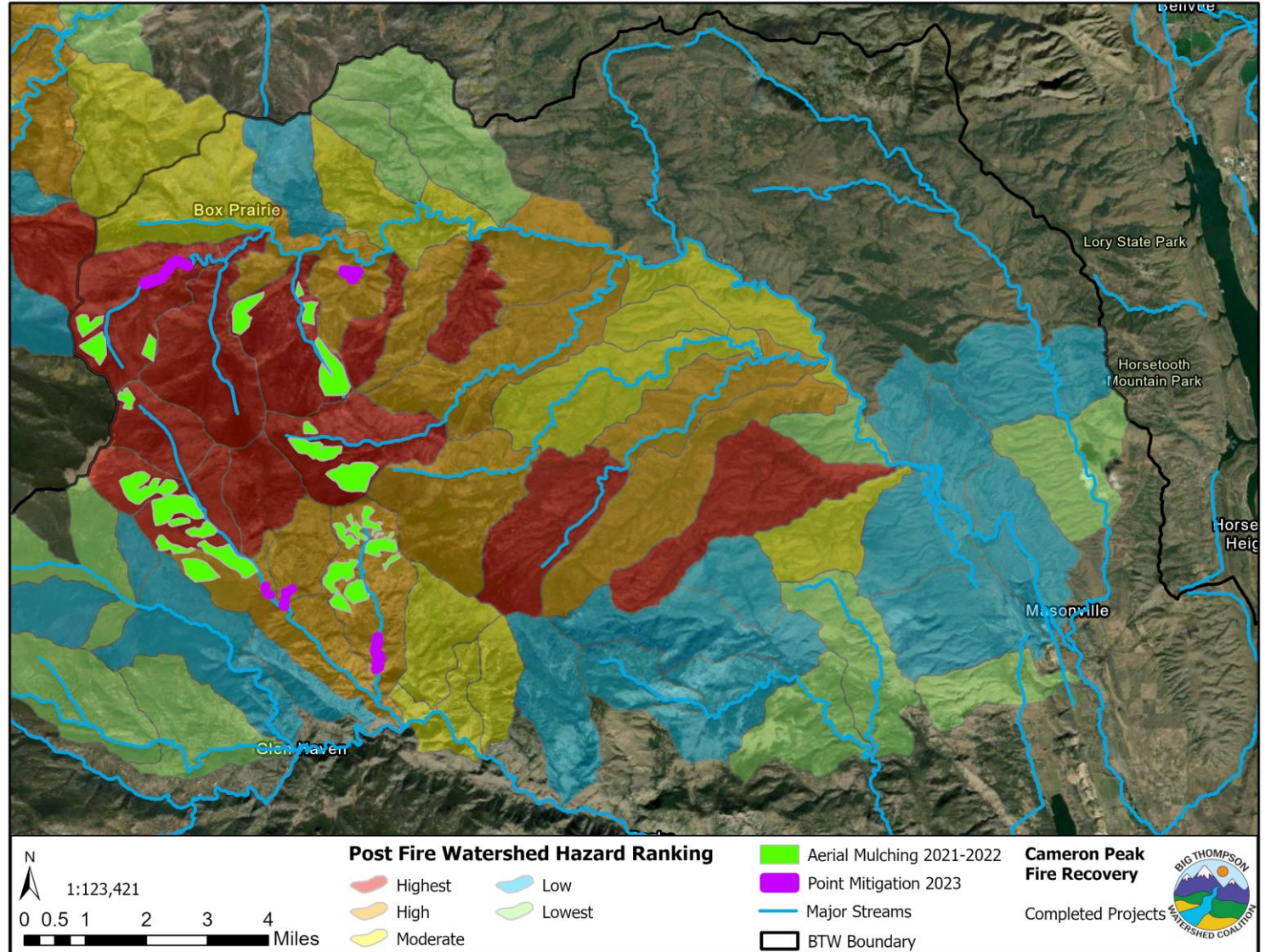
Post Assisted Log Structure
(PALS)



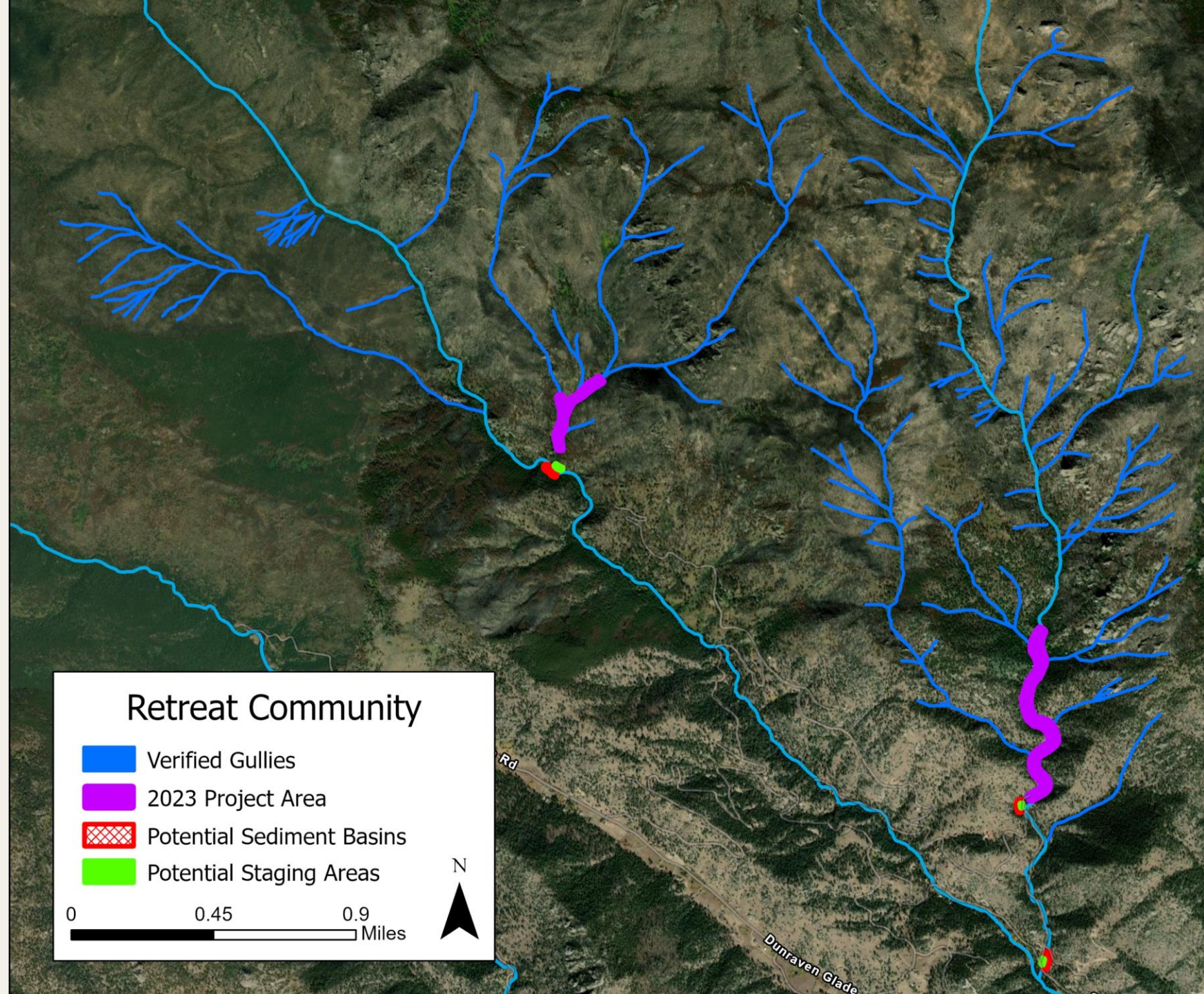
Beaver Dam Analog (BDA)

CPF Recovery

- + 1,919 acres Mulched
- + Log Structures (101)
- + Post Assisted Log Structure (10)
- + Rock Check (4)
- + Beaver Dam Analog (BDA Hybrid) (9)
- + Dredging (Approximately 640 CY)
- + Willow Wattle (2)
- + Willow Staking (2000)
- + Upland & Wetland Reseeding (2 ac)
- + 2.35 Miles of stream restored
- + Over 10,000 feet of straw wattles installed

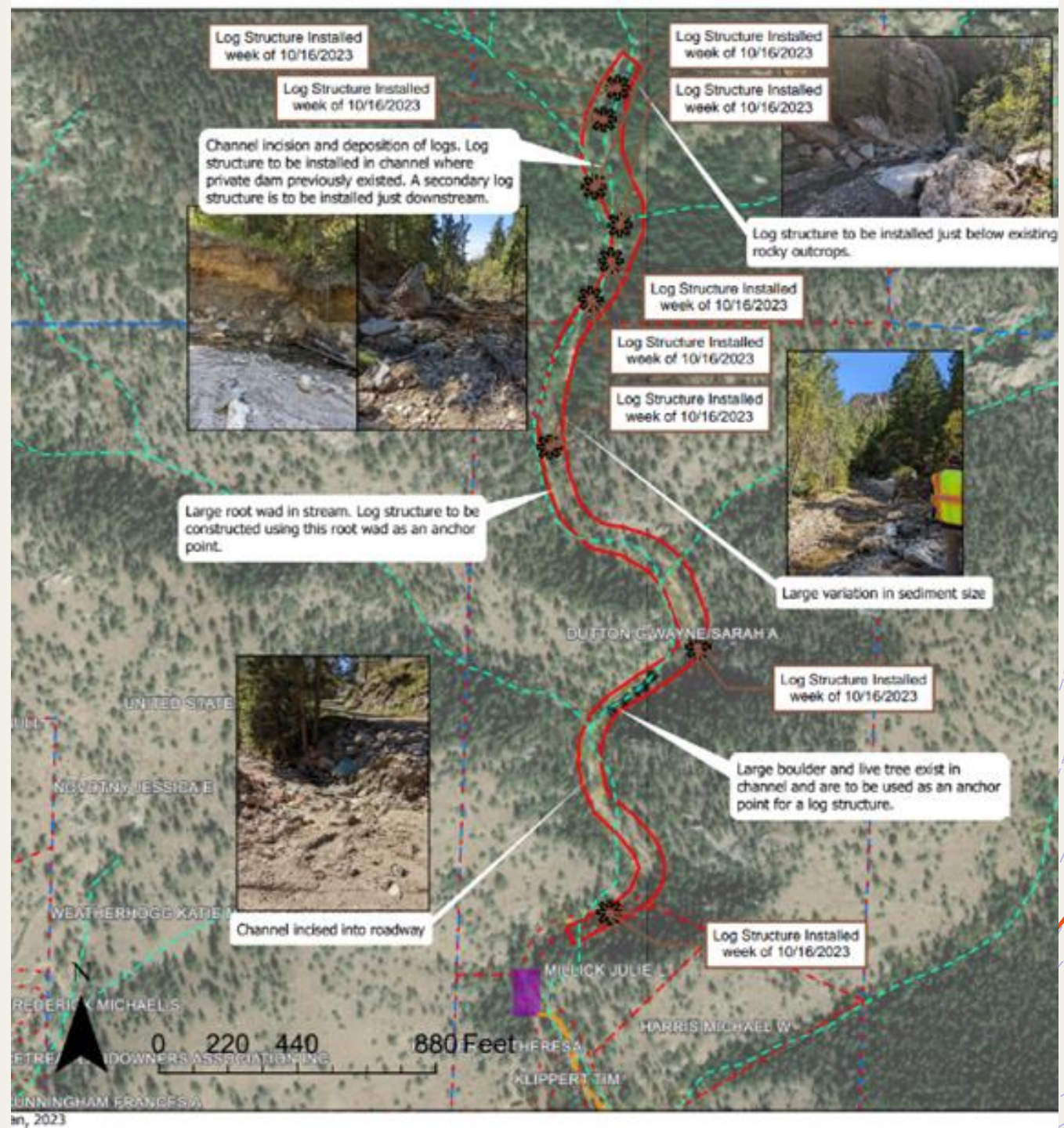


Retreat Watershed View



Black Creek

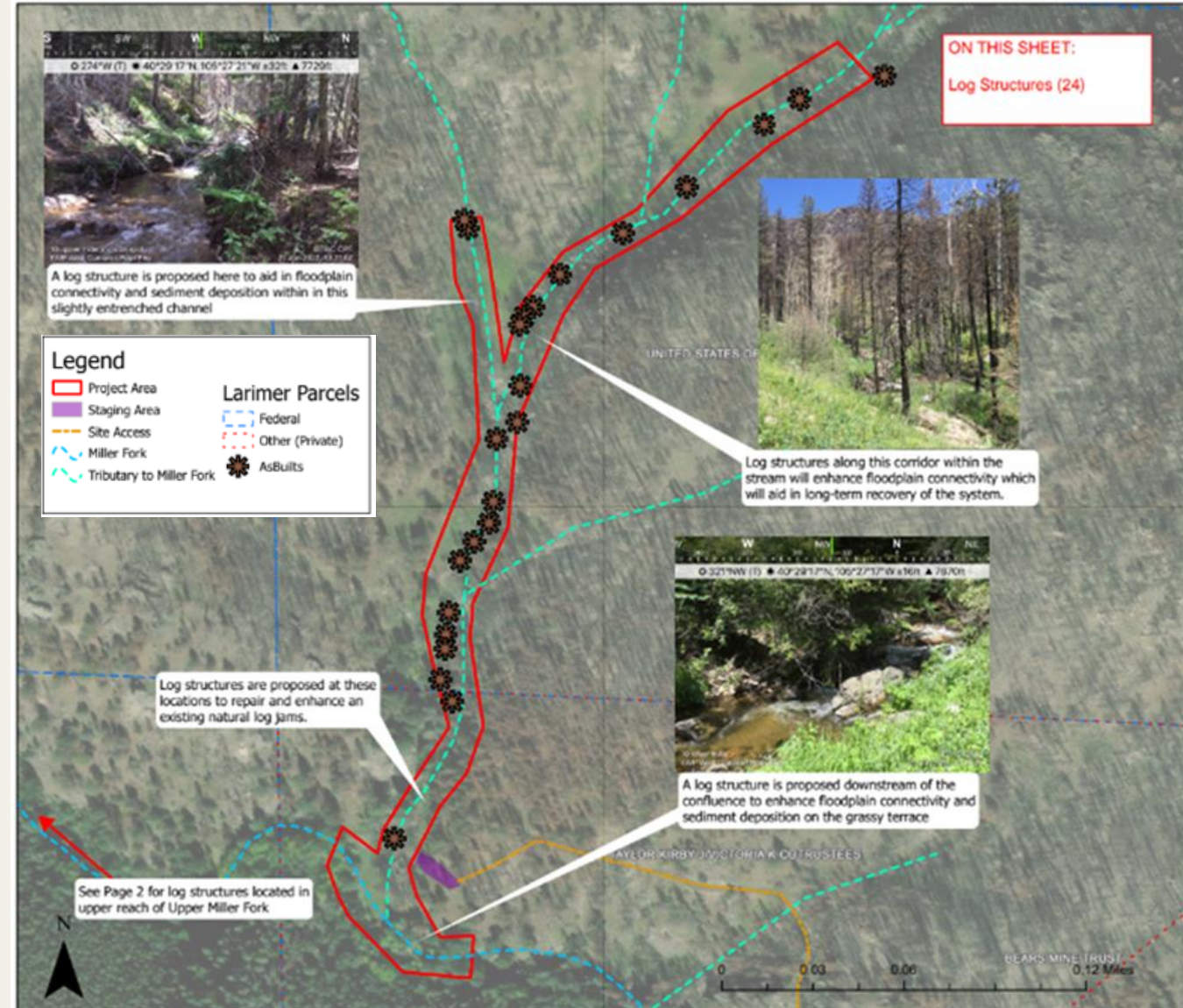
- +Log Structures (9)
- +0.61 miles of stream restored



Upper Miller Fork

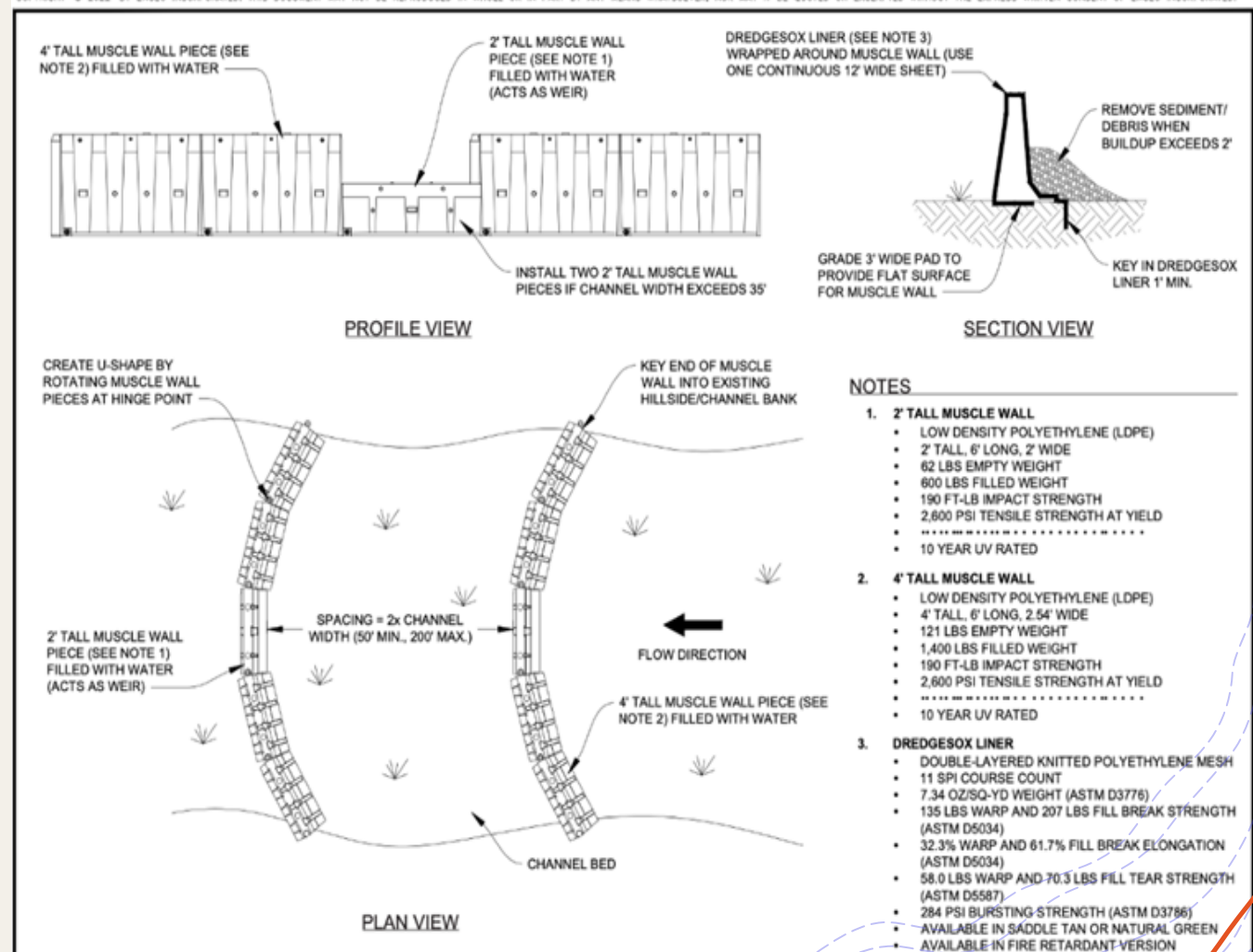
+Log Structures (23)

+0.41 miles of stream restored



Sediment Catchment Basins



- + 2-4 ft Modular Walls
- + Tied into banks of the channel
- + Continually manage sediment storage
- + 12 year life cycle



Muscle Walls in Action


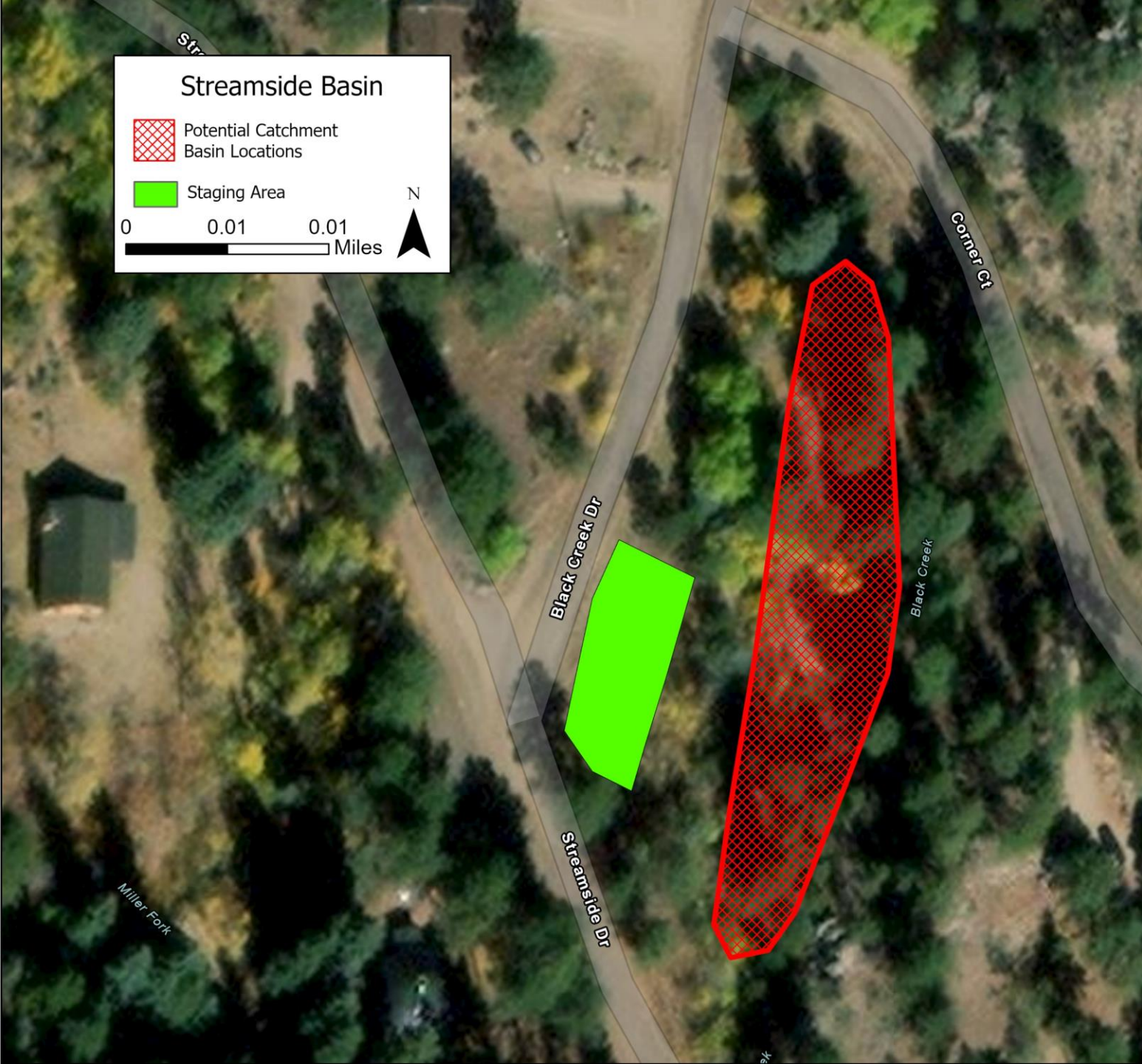


Streamside Basin


-  Potential Catchment Basin Locations
-  Staging Area

0 0.01 0.01 Miles

N

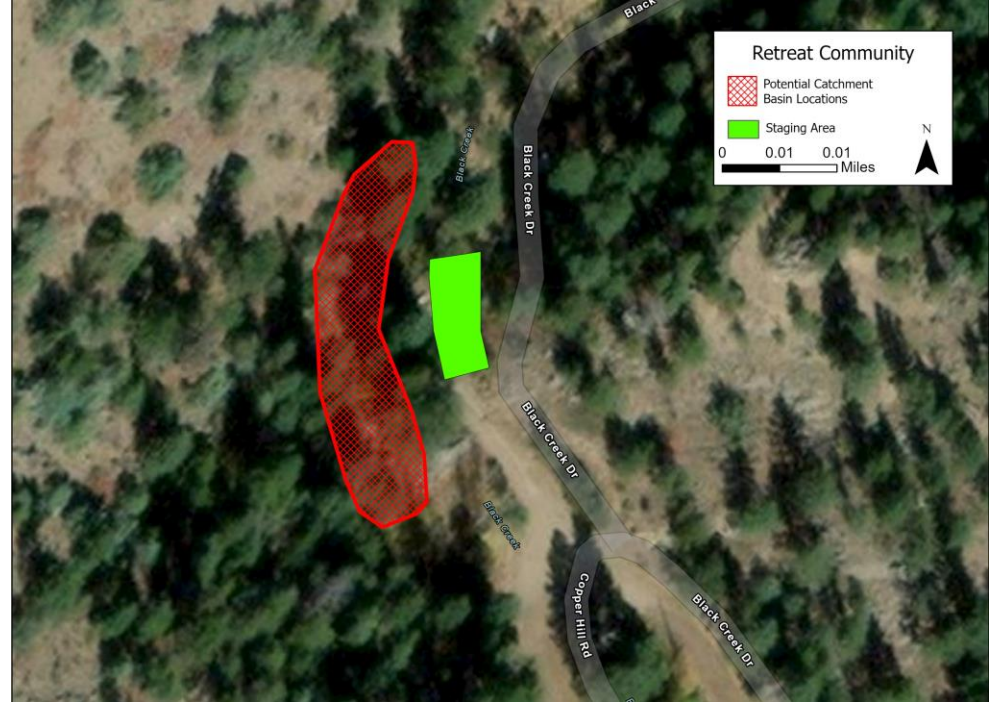



Retreat Community



-  Potential Catchment Basin Locations
-  Staging Area

0 0.01 0.01 Miles

N


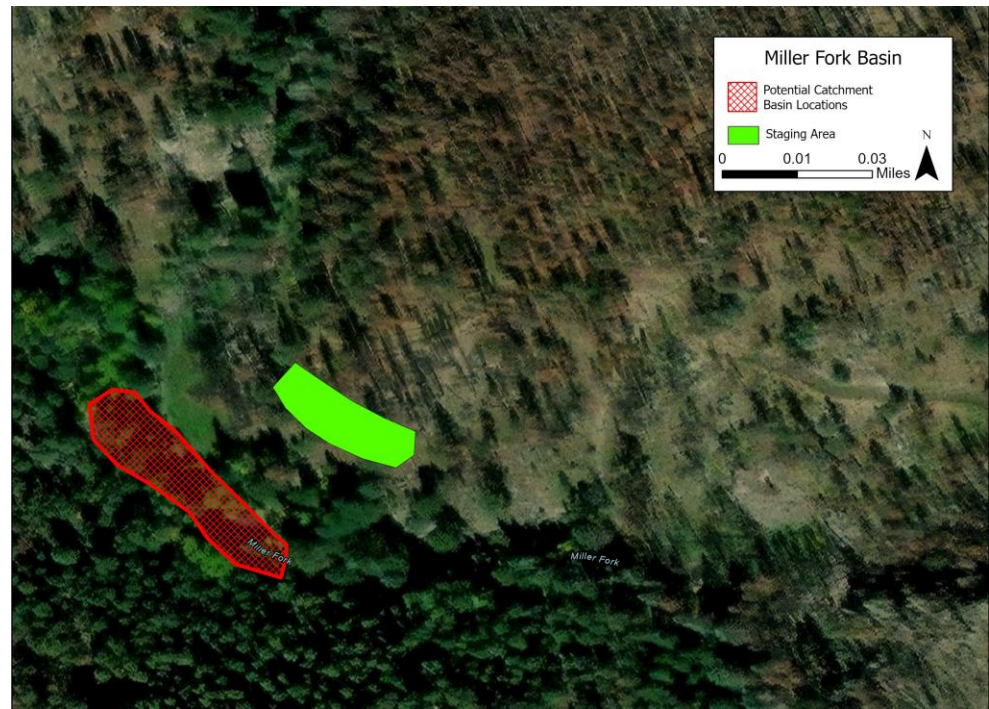



Miller Fork Basin

-  Potential Catchment Basin Locations
-  Staging Area

0 0.01 0.03 Miles

N

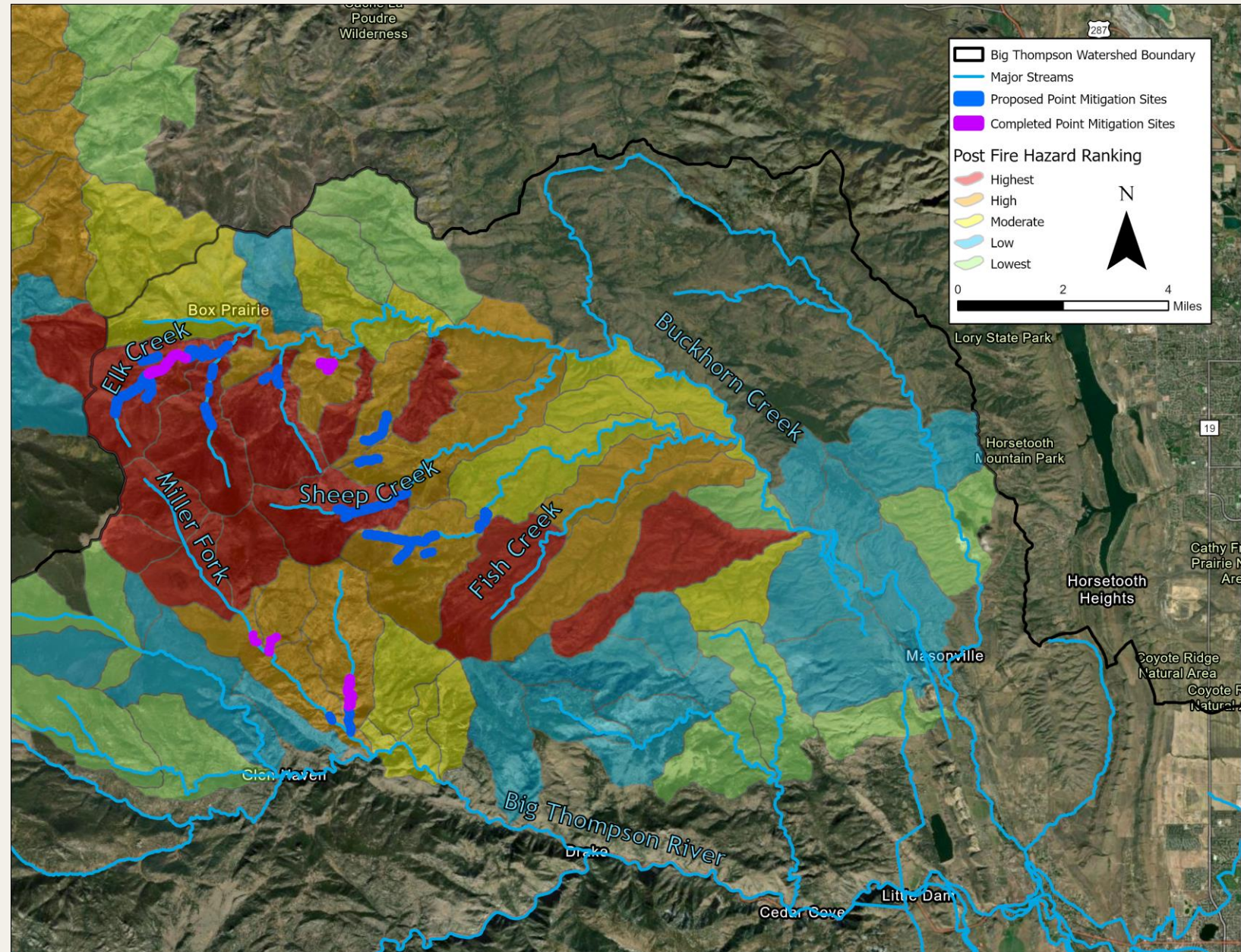
2024 + Proposed Mitigation

+ USFS

- Elk Creek
- Cascade Creek
- Sheep Creek

+ Private

- Upper Buckhorn
- Fish Creek
- Upper Miller Fork and Black Creek (Retreat Community)



Cameron Peak Fire Recovery Funding

Year	2021	2022	2023	2024
CWCB Adaptive Mgmt grant	\$22,000.00			
CWCB #1	\$60,400.00			
CWCB #2	\$167,450.00			
CWCB #3	\$2,587,584.00			
CWCB #4		\$3,525,565.00		
USFS #1		\$47,000.00		
USFS #2			\$120,000.00	
<i>USFS #3 - pending</i>				\$600,000.00
City of Loveland	\$500,000.00			
Community Foundation of Northern CO		\$87,228.50		
CDPHE			\$30,000.00	
Larimer County	\$30,000.00			
<i>CDPHE - pending</i>				\$1,000,000.00
<i>CPW - pending</i>				\$95,000.00
TOTAL	\$3,367,434.00	\$3,659,793.50	\$150,000.00	\$1,695,000.00



Costs of Fire Suppression

Cameron Peak Fire

Fire Suppression
\$136 million

Property Loss
~\$6.3 million

Total Structure Loss
~\$100 million

Recovery
\$25 million +++

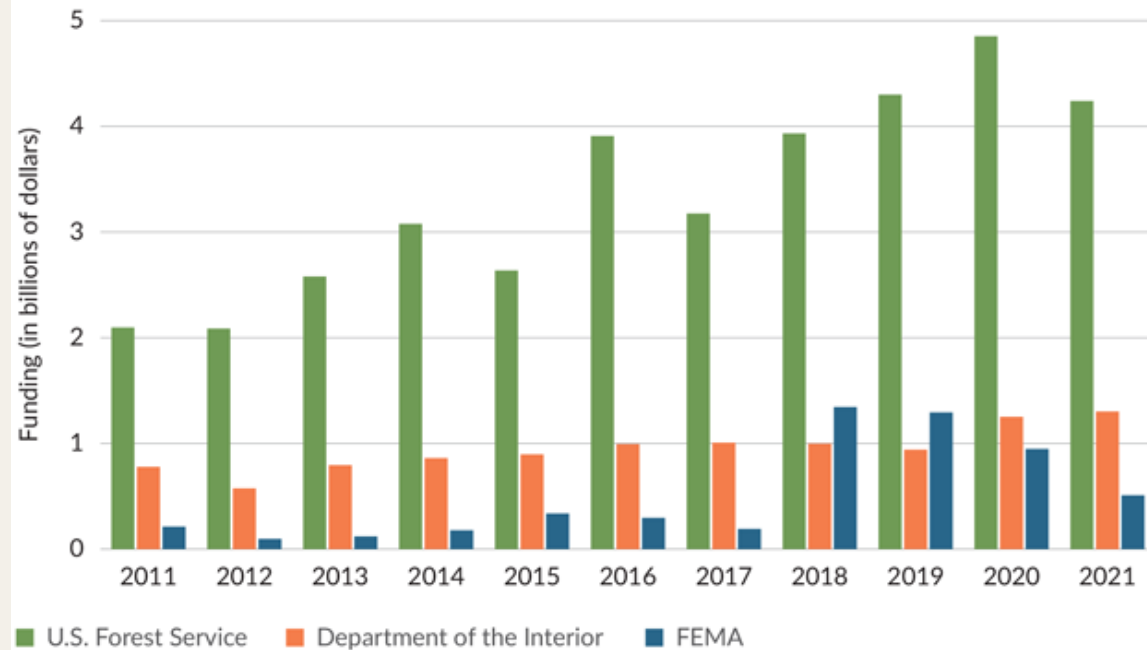
Rising Wildfire Risks Prompt States to Look for New Approaches to Resilience

Innovative land use planning and smarter budgeting could help curtail threat

ARTICLE | January 16, 2024 | By: Kristiane Huber & Colin Foard | Read time: 4 min
Projects: U.S. Conservation & Managing Fiscal Risks

Federal Spending on Wildfire Management Has Grown Significantly Since Fiscal Year 2011

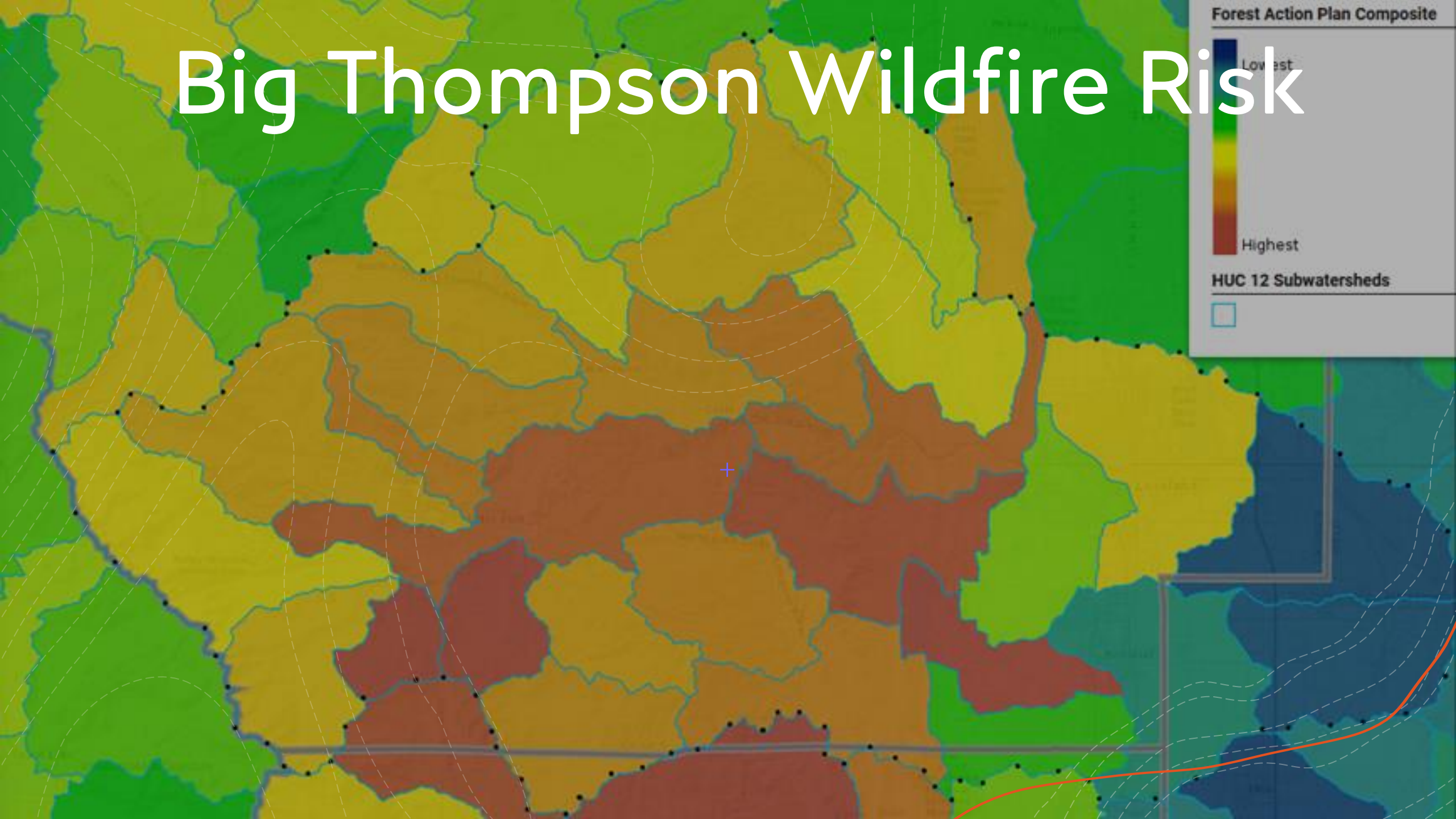
Funding over time for wildfire management activities by the U.S. Forest Service, Department of the Interior, and Federal Emergency Management Agency

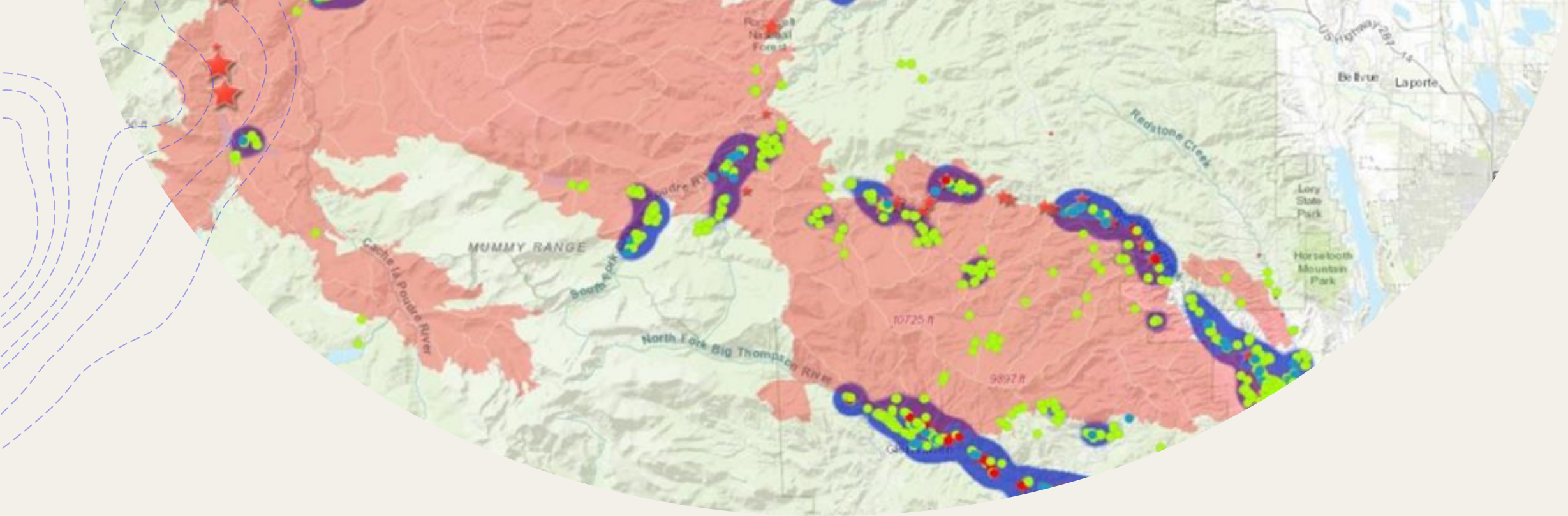


Notes: Information includes appropriations for total wildfire management funding from the U.S. Department of the Interior and the U.S. Forest Service as calculated by the Congressional Research Service. FEMA figures reflect obligations by the agency for Fire Management Assistance Grants (FMAGs) and Major Disaster Declarations.

Sources: K. Hoover, "Federal Wildfire Management: Ten-Year Funding Trends and Issues (FY2011-FY2020)" (2020); K. Hoover, "Forest Service: FY2022 Appropriations" (2021); Federal Emergency Management Agency, OpenFEMA Dataset: FEMA Web Disaster Summaries - V1, and Disaster Declarations Summaries - V2 (2022)

Big Thompson Wildfire Risk





BTWHP Approach

- + CWCB - Wildfire Ready Watersheds
- + Working to understand the susceptibility of the Big T watershed to post-fire impacts and to plan and prepare for them ... before fires occur.
- + Guidance on actions to reduce those post-fire hazards - both before and after a wildfire occurs

Contact Information

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