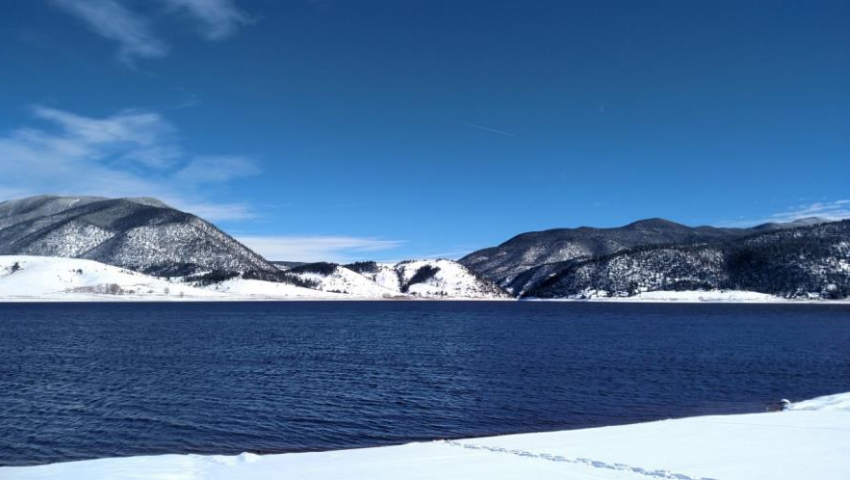
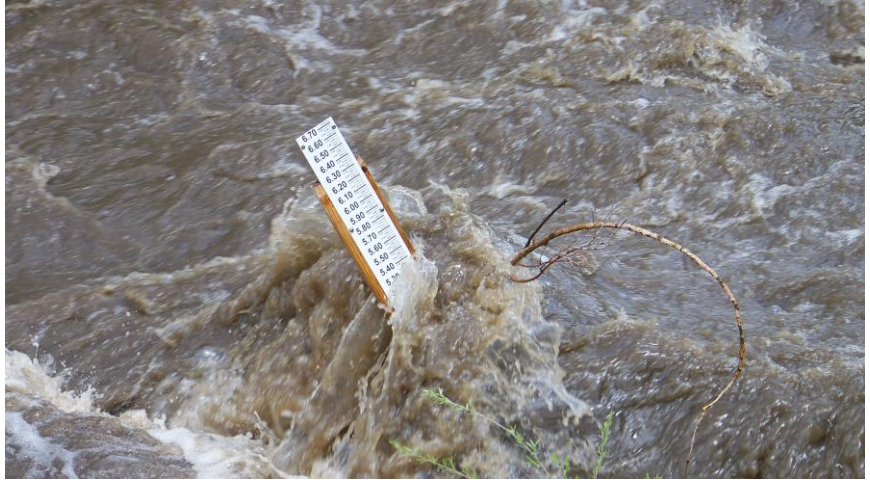




How to address three overlooked but critical post-fire and general climate change related land degradation impacts?

Wildland Urban Forest Summit

Santa Fe, New Mexico – November 17, 2022

Jan-Willem Jansens

ECOTONE
Landscape Planning LLC

INTRODUCTION: My Perspective

Landscape-scale, comprehensive, ecological planning:

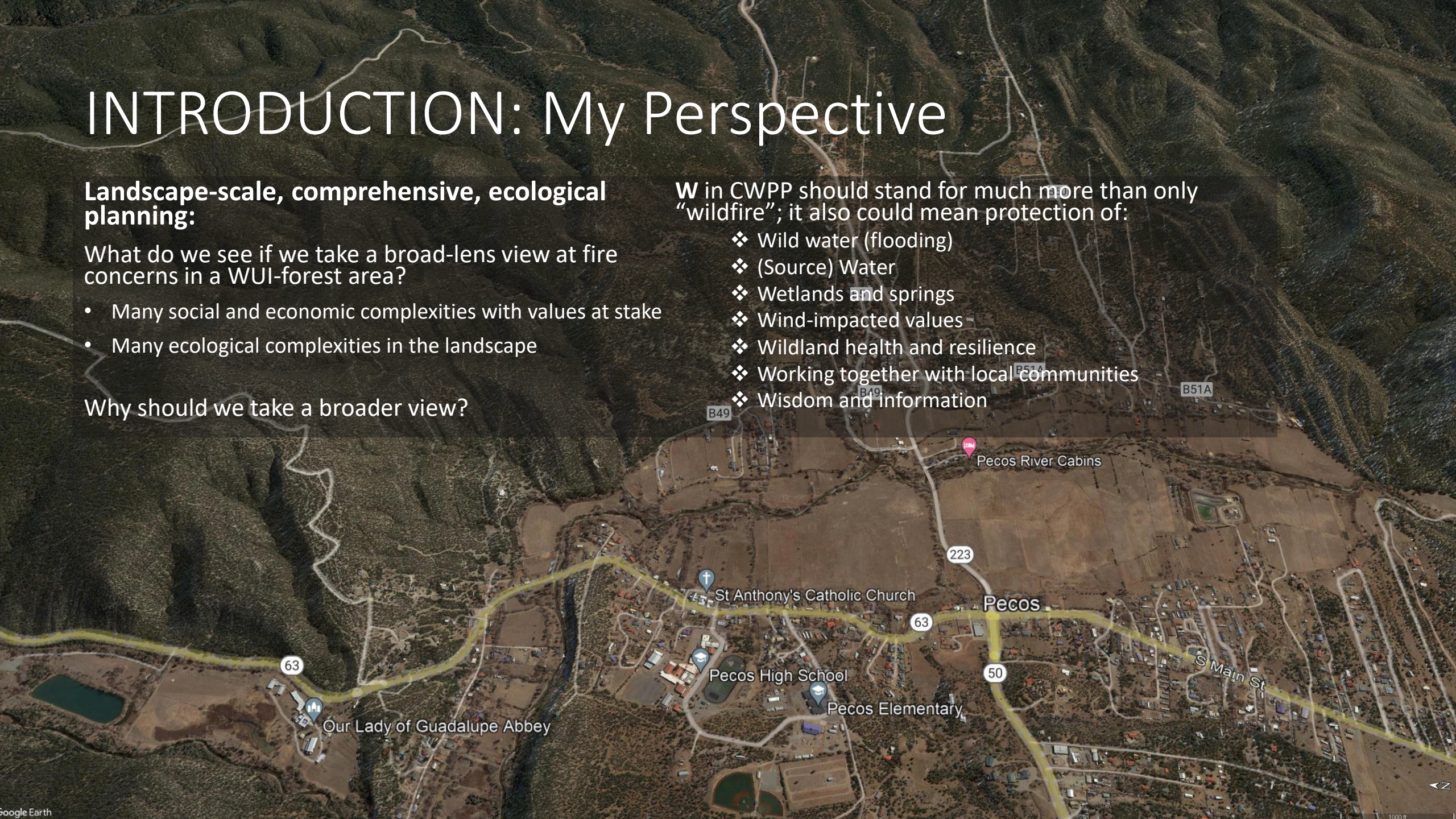
What do we see if we take a broad-lens view at fire concerns in a WUI-forest area?

- Many social and economic complexities with values at stake
- Many ecological complexities in the landscape

Why should we take a broader view?

W in CWPP should stand for much more than only "wildfire"; it also could mean protection of:

- ❖ Wild water (flooding)
- ❖ (Source) Water
- ❖ Wetlands and springs
- ❖ Wind-impacted values
- ❖ Wildland health and resilience
- ❖ Working together with local communities
- ❖ Wisdom and information



INTRODUCTION: Dynamics and Change

Like water, everything flows and is always in motion…

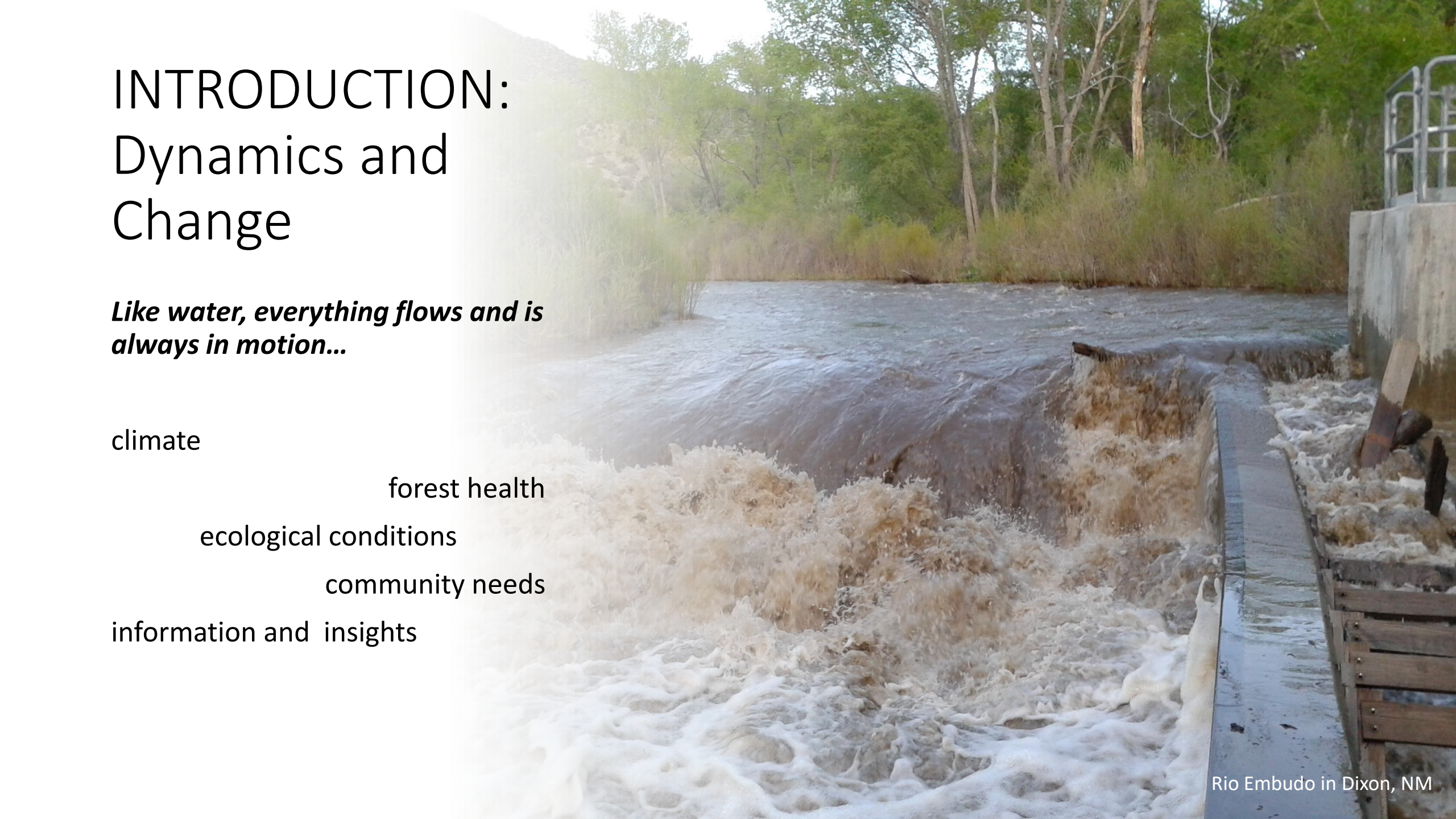
climate

forest health

ecological conditions

community needs

information and insights



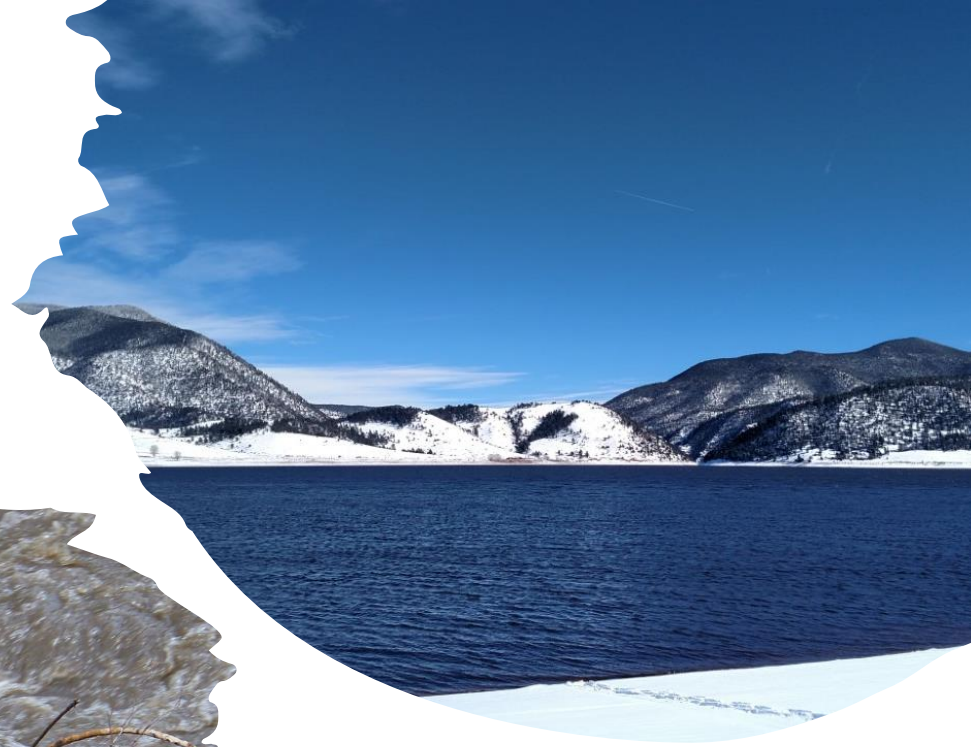
Rio Embudo in Dixon, NM

INTRODUCTION:
Three Key Concerns

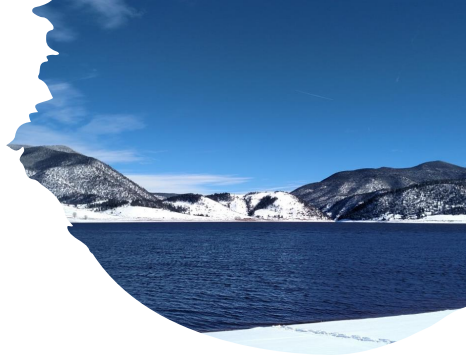
- **Source Water Depletion (SW)**
- **Flash Flooding (FF)**
- **Wind Impacts (WI)**

All three concerns are:

- ✓ Signs of aridification and exacerbated by climate change and poor forest health
- ✓ Causing landscapes to become less productive and less resilient to geo-physical forces
- ✓ Affecting human conditions and calling for new information and new approaches
- ✓ Greatly underestimated and inadequately covered by mitigation programs and funding sources



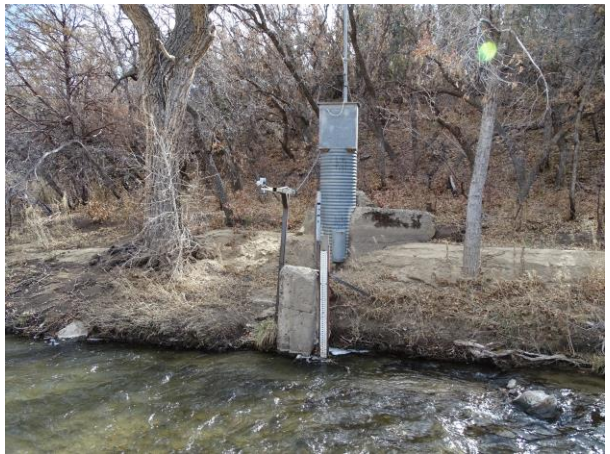
SOURCE WATER: Pre-Fire Impacts

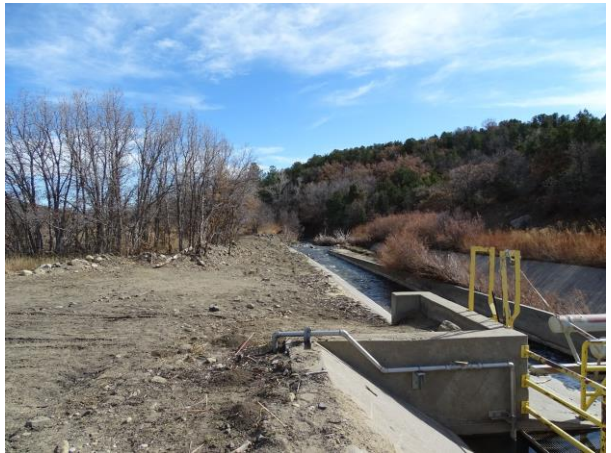


DEFINITIONS:

- ❑ Source water (SW), for EPA = sources of water (such as rivers, streams, lakes, reservoirs, springs, and groundwater) that provide water to public drinking water supplies and private wells. *
- ❑ SW, more broadly = sources of water for irrigation, livestock, cooling water, water used in construction, water used in industrial processes, etc.

*https://www.epa.gov/sourcewaterprotection/basic-information-about-source-water-protection

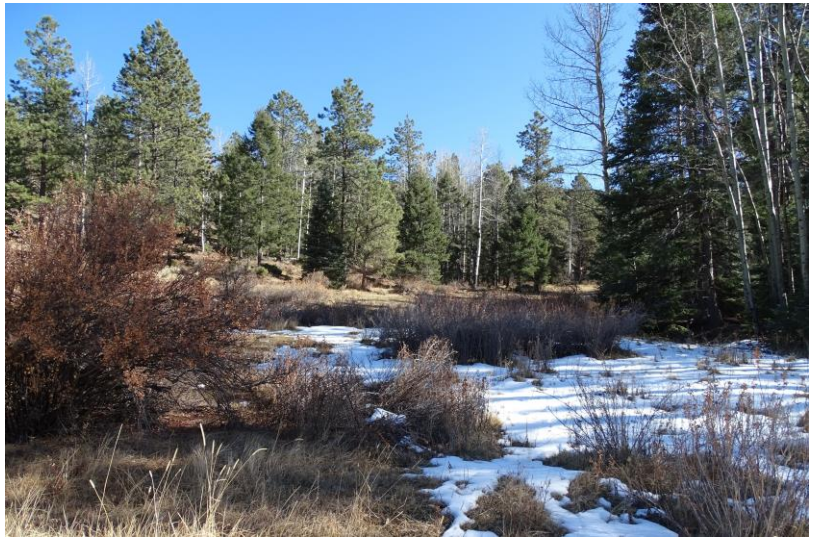


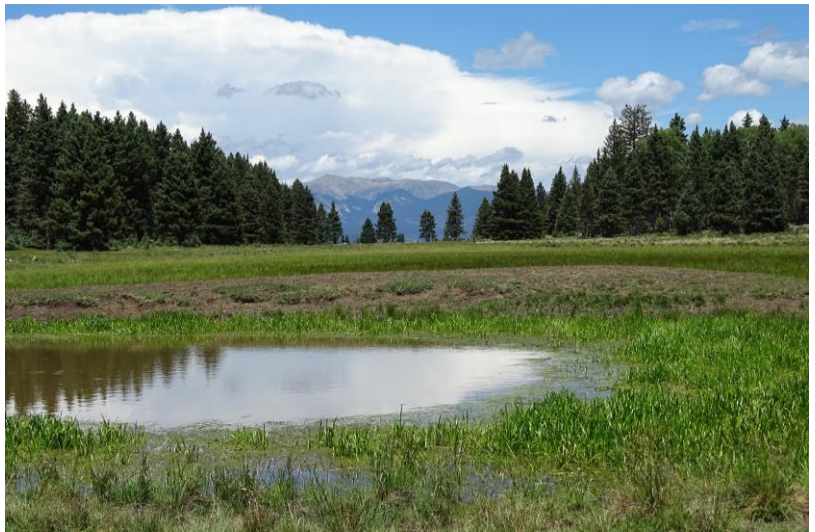


CONCERNS:

- SW supplies declining due to climate change
- More SW pollution → treatment costs
- Some CWPPs overlook drinking water SW
- Many CWPPs overlook importance of springs, wetlands, lakes and streams as SW for irrigation and livestock
- Great need to inventory SW infrastructure pre-fire to ID risk of collapse during and after fires
- Absence of institutionalized relationships between forest/fire managers and water managers

SOURCE WATER: Pre-Fire Treatment Impacts





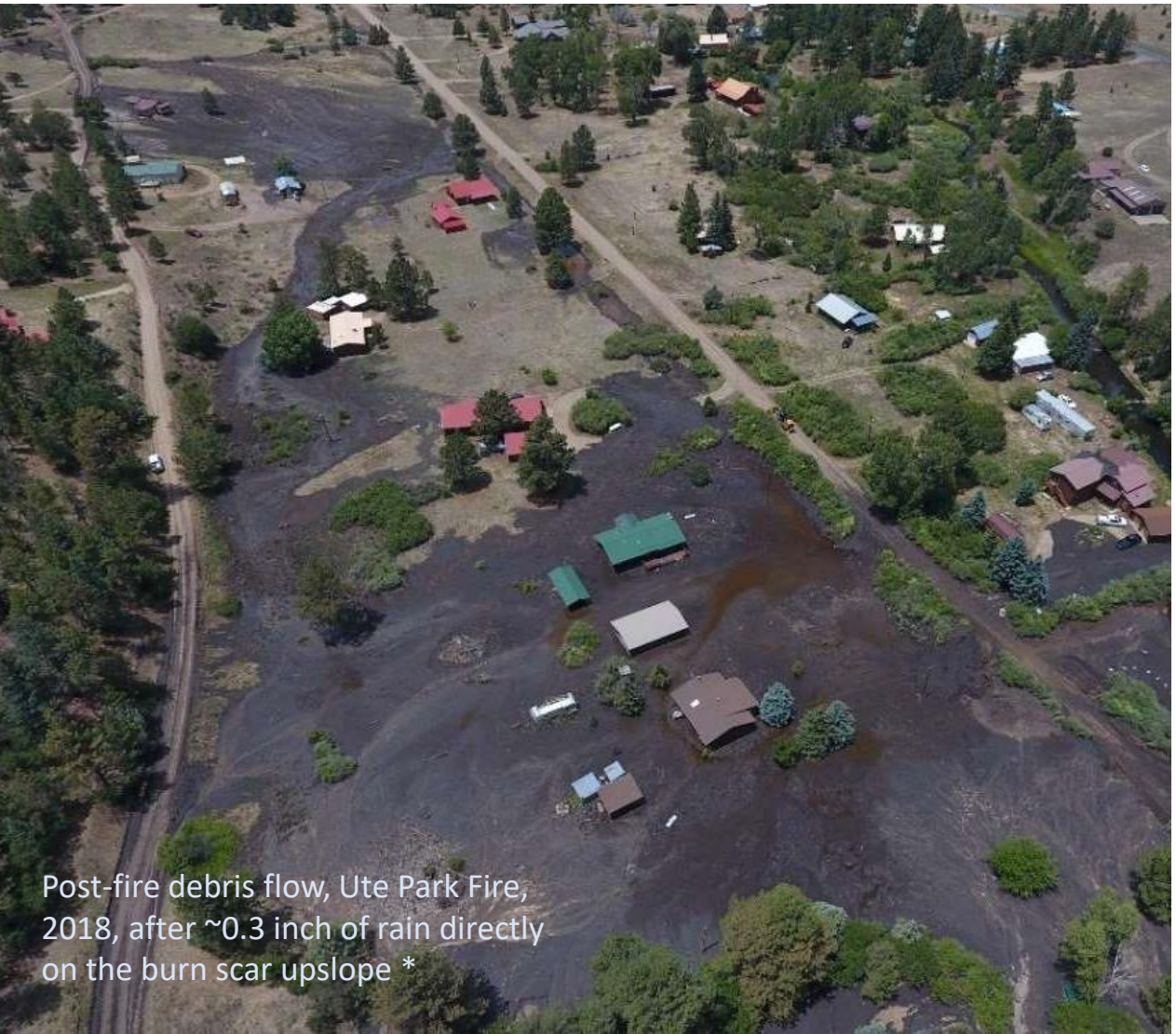
TREATMENTS:

- In high elevation SW areas: specific patch cut prescriptions needed to accumulate and retain snow
- Amount of forest cover of soil directly related to water quality (up to 60% of cover); less cover → water more polluted, treatment needed (cost, space, infrastructure, expertise, etc.)
- Slash mulch cover, understory cover, and soil health and stabilization essential to mitigate this

CONCERNS:

- Lack of communication and understanding between foresters and fire fighters vs. local water managers and well owners
- Poor coordination: water may not be available for fire fighting
- Risk (and fear) that an area may become uninhabitable during and after fire due to lack of (clean) water
- Risk of long-term breakdown of community relations between forest/fire professionals and water stewards

SOURCE WATER: Post-Fire Impacts



Post-fire debris flow, Ute Park Fire, 2018, after ~0.3 inch of rain directly on the burn scar upslope *

PROCESSES:

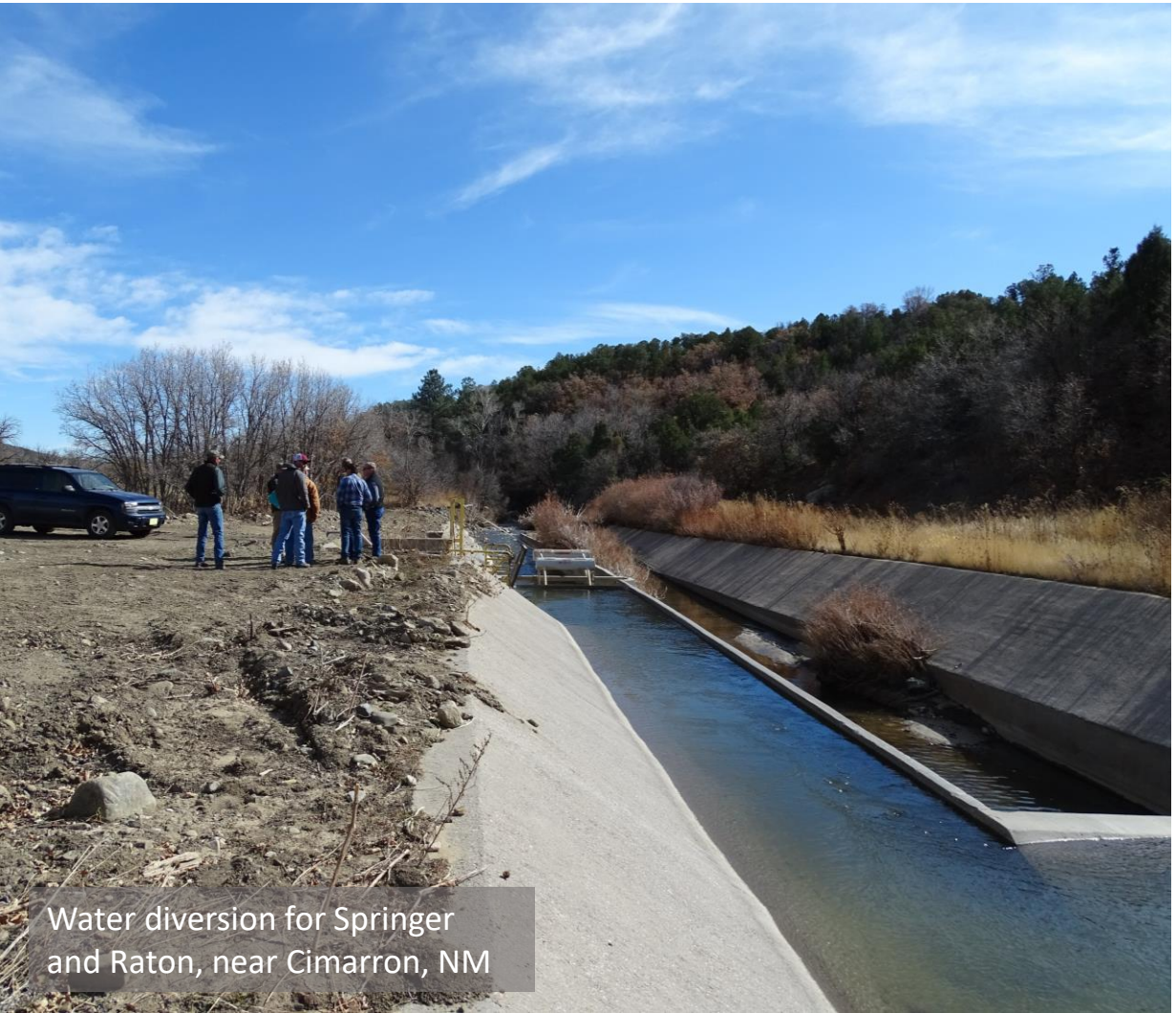
- Shortwave radiation (heating of soil, stems) + long-wave radiation (heat emissions) → rapid snow melt
- Water and power sometimes disconnected

CONCERNS:

- Poor snow accumulation and early, sudden snowmelt
- Water loss from evaporation and wind
- High runoff, mixed with ash, sediment and debris flows
- Water pollution, no access to water, temporary or long-term loss of a critical community water source during and after a fire; water to be trucked in or people leaving
- Broken communications and relationships between forest/fire professionals and volunteer water stewards
- Socio-economic stress and decline

*Ute Park Fire Damage Assessment and Burned Area Emergency Rehabilitation Plan, SWCA August 2018

SOURCE WATER: Data Gaps



Water diversion for Springer and Raton, near Cimarron, NM

TREATMENTS:

- Need to document the most effective and appropriate practices/BMPs regarding SW and train foresters
- Need for testing of prescriptions for snow accumulation and retention in headwaters
- Need for monitoring of mid-elevation thinning and slash placement treatments

INFORMATION:

- Exchange of relevant info and mutual acknowledgement of expertise between foresters/fire professionals and local water managers
- Establishing protocols, institutionalized collaboration and risk assessment pre-fire, during, and after fire
- Studying impacts of forest treatment and fire suppression on well owners and on other SW categories (livestock operators, irrigators/acequias, industry, etc.)

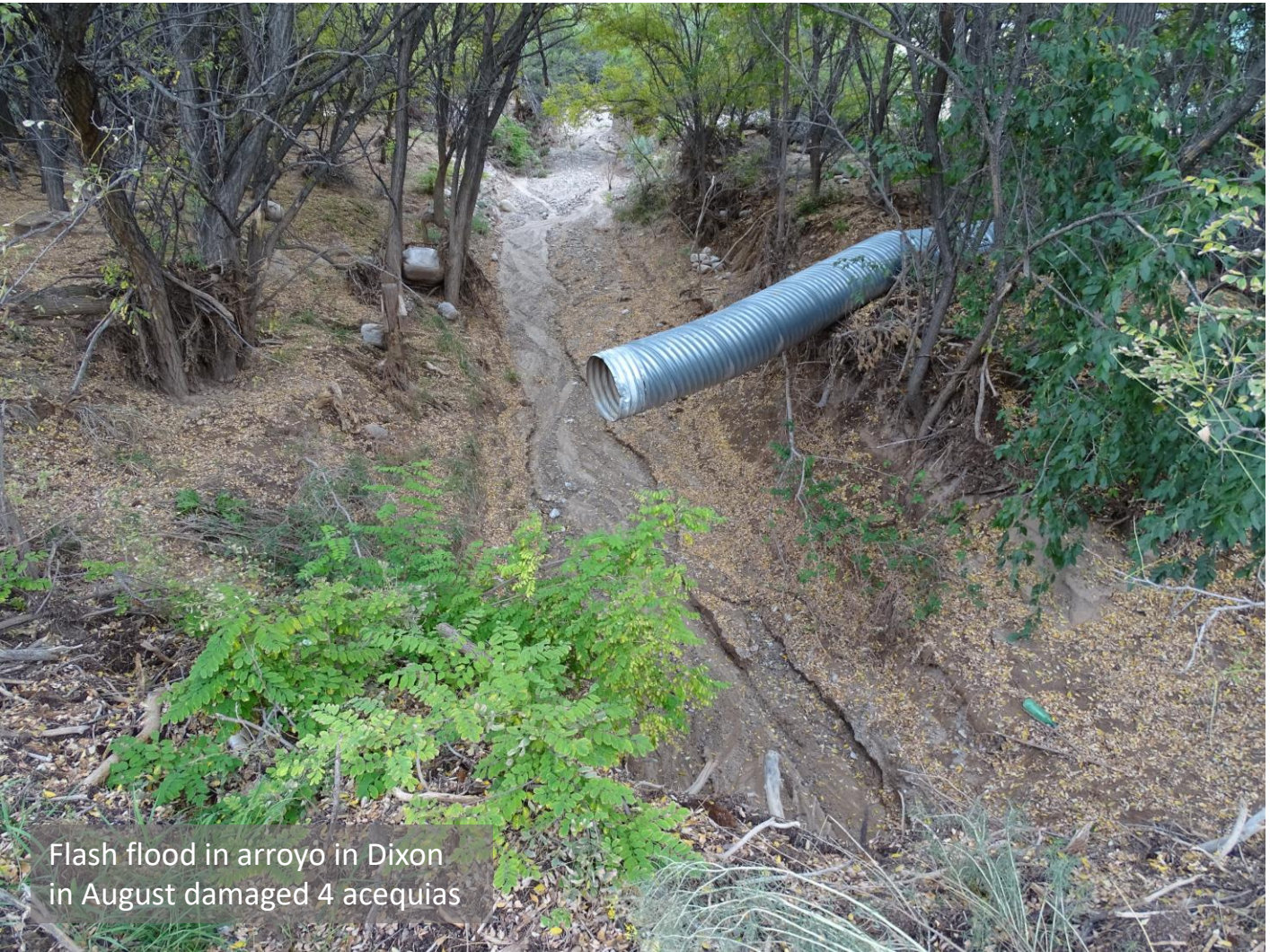
SOURCE WATER: Possible Solutions

San Pedro Parks Wilderness, SW area for La Jara and Cuba, NM

- ❑ Site specific treatments needed in SW forest areas (headwaters; including Wilderness Areas), coupled with collaborative learning
- ❑ Greater focus by USFS and other agencies on SW
- ❑ Information exchange through SW Collaborative* and creation of new, regional SW protection partnerships (adaptive learning networks)
- ❑ Explicit and ample funding programs
- ❑ Collaboration; protocols; exchange of knowledge
  - ➢ Include water managers in developing CWPPs and other forest and fire risk mitigation and education activities
  - ➢ Include a “Community Source Water Protection Plan” section as a component of a CWPPs

https://www.sourcewatercollaborative.org/about-us/

FLASH FLOODING: Pre-Fire Impacts



Flash flood in arroyo in Dixon in August damaged 4 acequias

DEFINITION:

Flash Flood (FF) = a flood caused by heavy or excessive rainfall in a short period of time.*

CONCERNS:

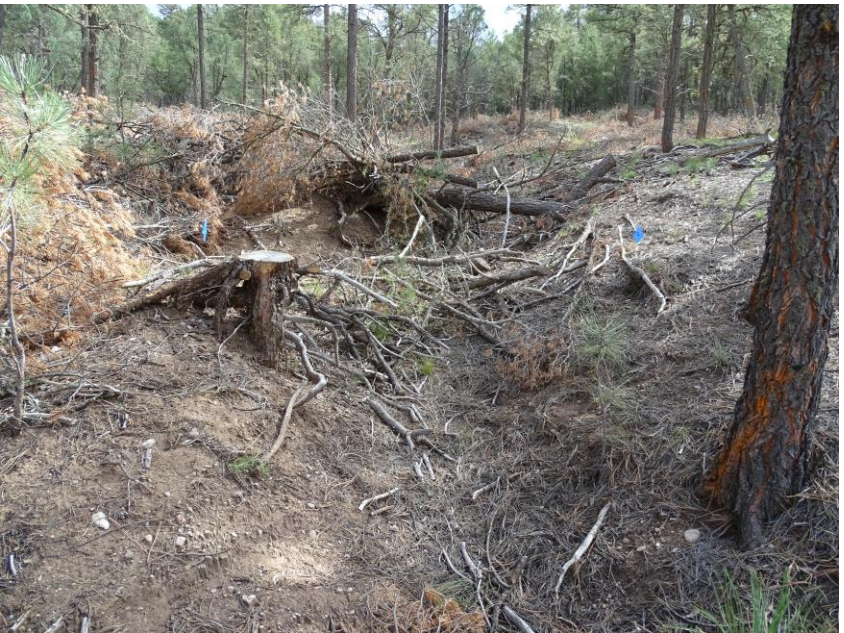
- FF intensity and frequency increasing due to climate change
- Caused by slow-moving thunderstorms, thunderstorms repeatedly moving over the same area, or heavy rains from hurricanes and tropical storms**, or snow melt due to sudden high temperatures
- Fire increases FF chance and intensity
- WUI areas can be affected by flood and erosion damage

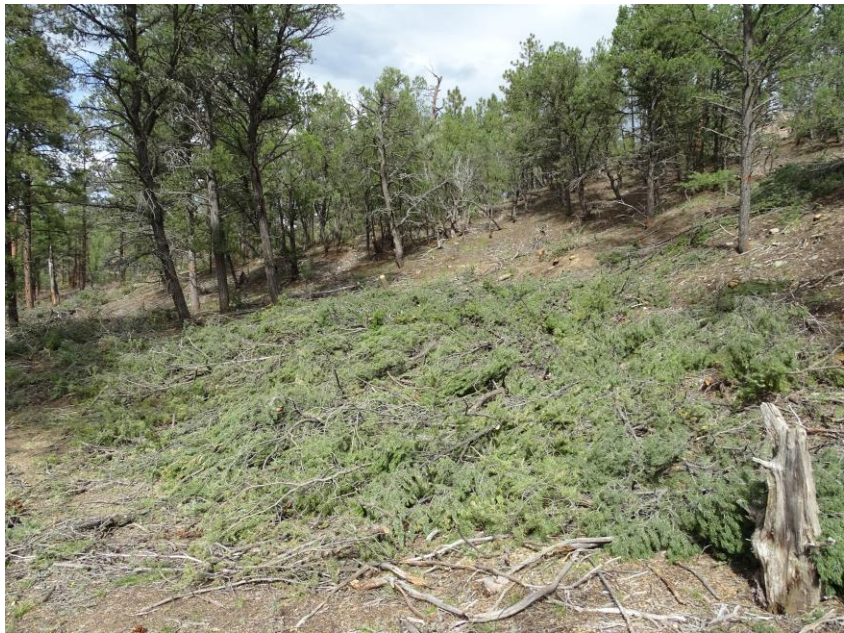
* https://www.weather.gov/mrx/flood_and_flash

** https://www.usgs.gov/special-topics/water-science-school/science/floods-things-know

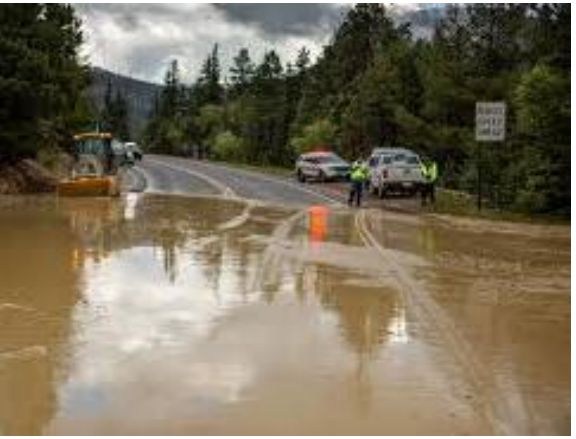
FLASH FLOODING: Pre-Fire Treatment Impacts

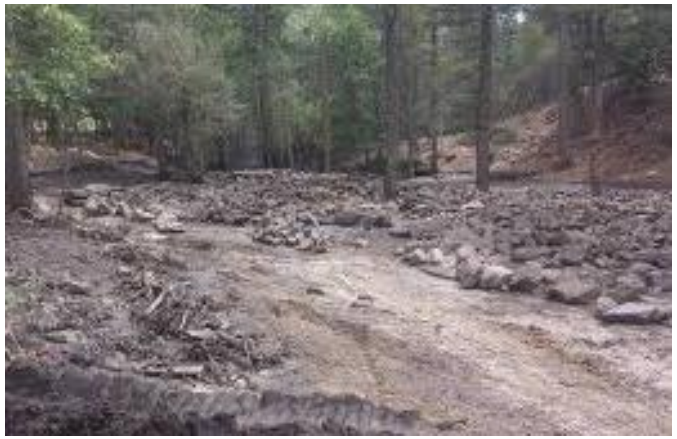
- Forest treatments often lead to temporarily increased sediment flow and water yield in streams
- Mastication or thinning combined with prescribed fire often have the least impacts
- Research needed on specific treatment effects, such as prescribed burn intensities of slash piling and soil erosion rates in relation to soil compaction, residual plant cover patterns, and slash distribution patterns





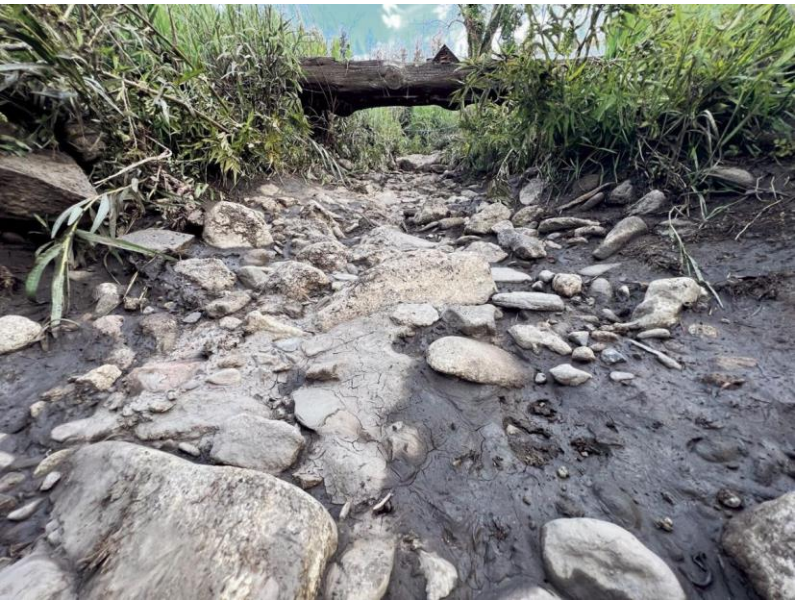
FLASH FLOODING: Post-Fire Impacts

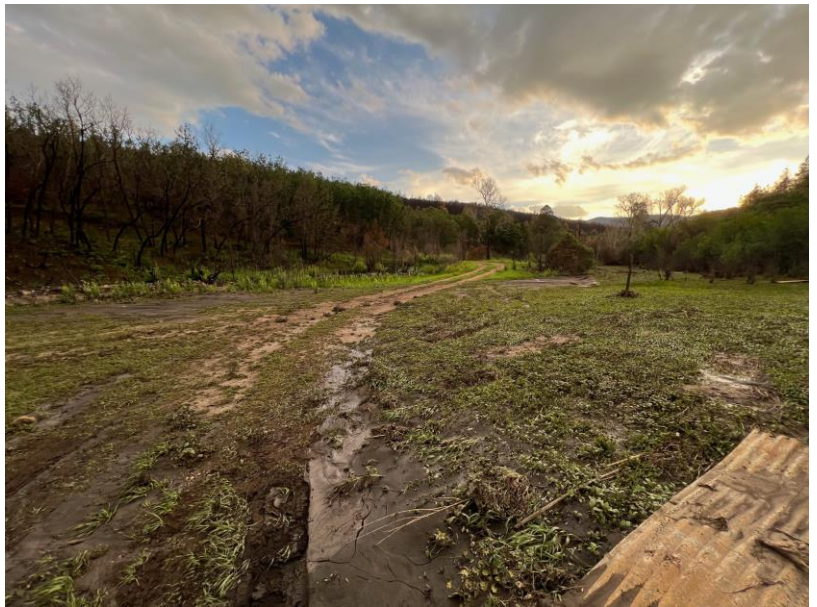


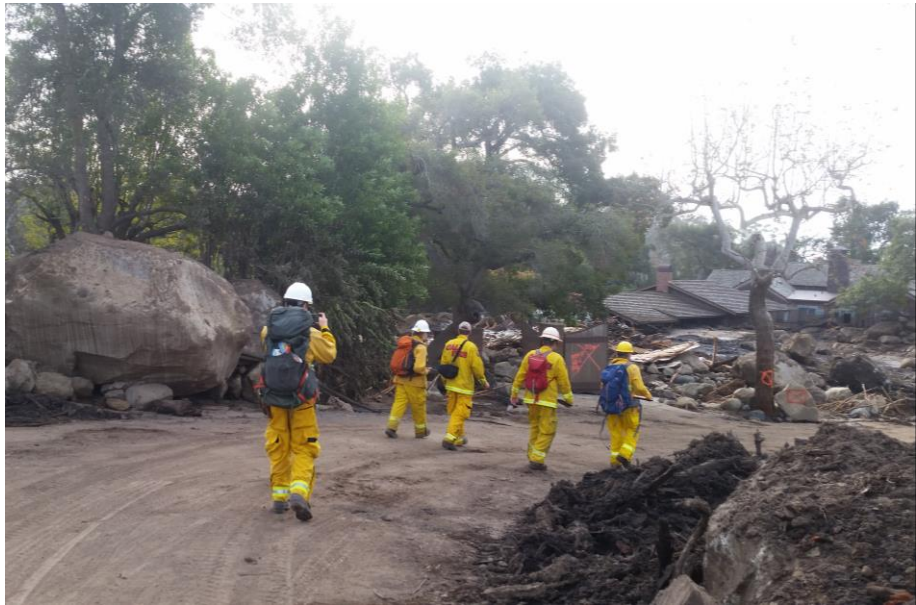


CONCERNS:

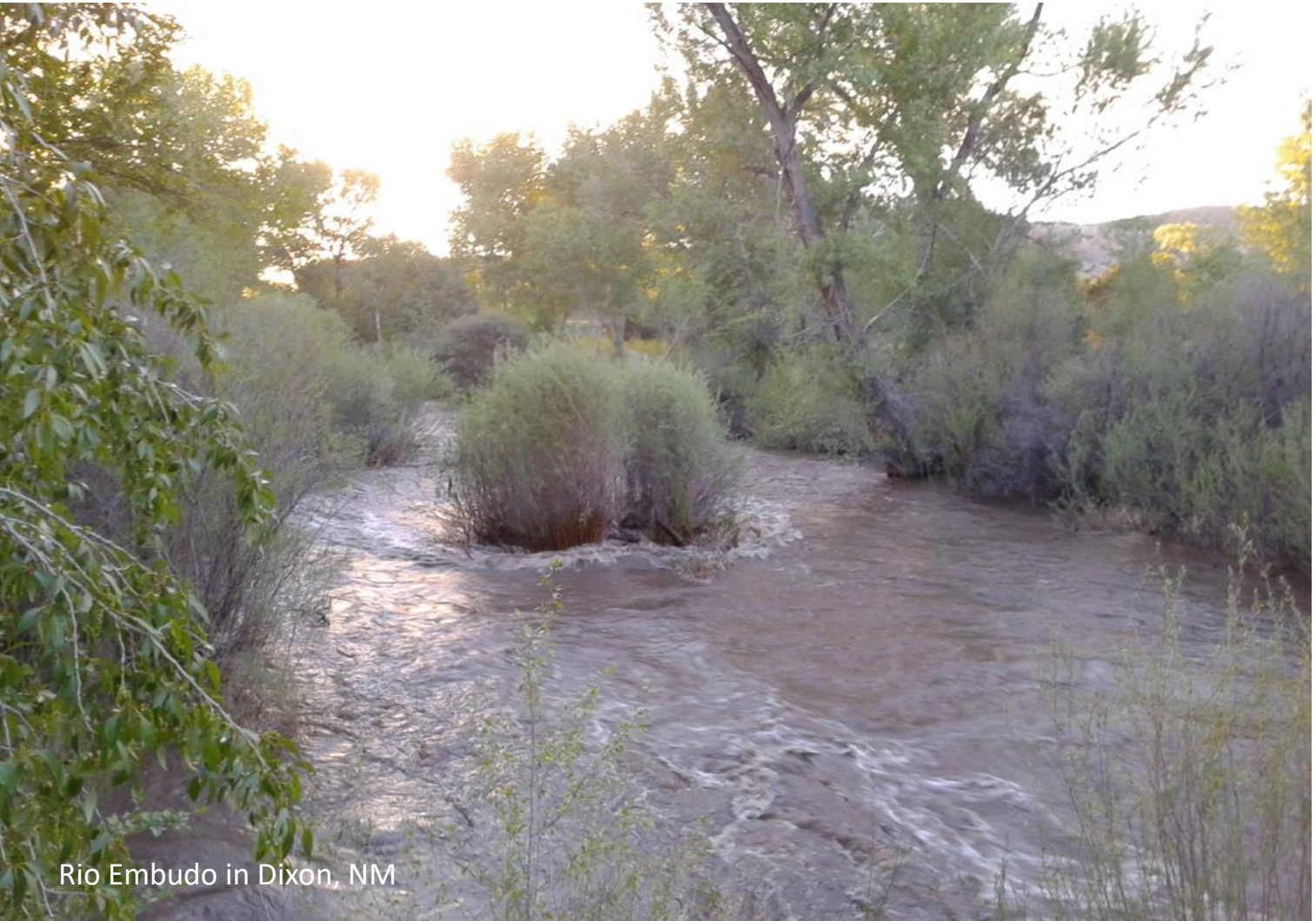
- Risk of great increase in FF intensity and frequency due to bare soil and reduced shear stress and infiltration capacity of the land
- Few funding sources for individual landowners and communities; most assistance is conditional to site status and post-fire conditions







FLASH FLOODING: Data Gaps



Rio Embudo in Dixon, NM

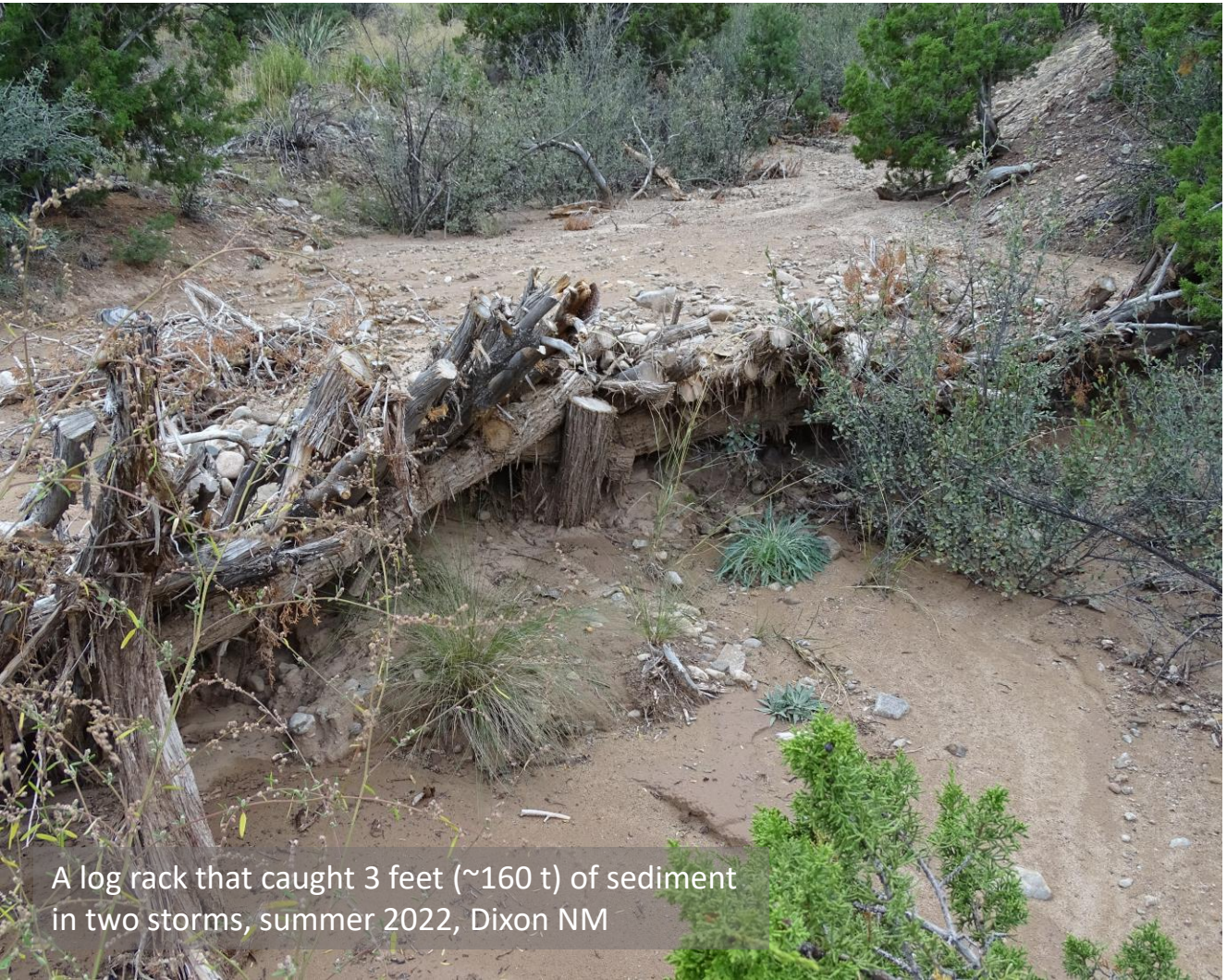
RISK ASSESSMENT:

- How to modify pre-fire treatments to reduce FF intensity and frequency
- FF risk assessment methodology (similar to CWPP approach; and linked to CWPPs)

INFORMATION:

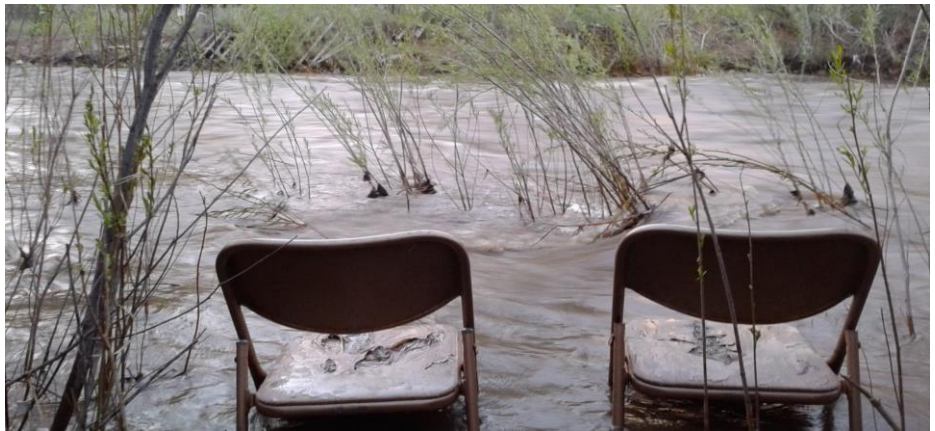
- BMPs to be integrated in forest health prescriptions to reduce FF before and after fire
- Information on FF protection and assistance programs for landowners and communities

FLASH FLOODING: Possible Solutions

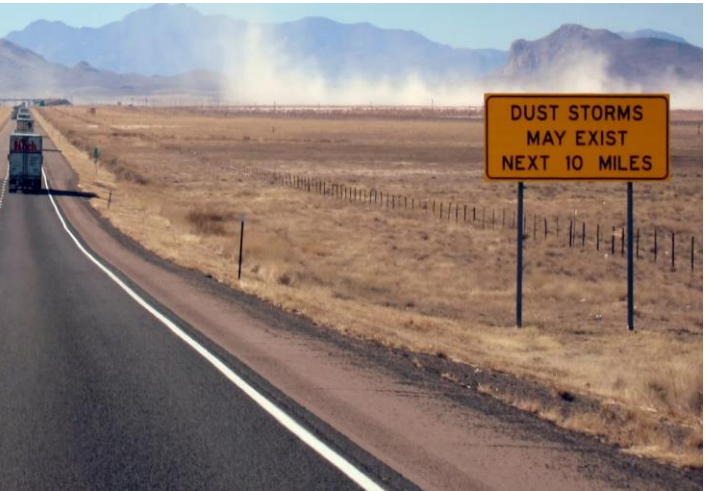


A log rack that caught 3 feet (~160 t) of sediment in two storms, summer 2022, Dixon NM

- ❑ Establish independent FF protection programs with FAQ pamphlets, evacuation systems, funding sources, etc.
- ❑ Greater focus by USFS and other agencies on FF
- ❑ Collaboration; protocols; exchange of knowledge
- ❑ Include a “Community “Wild Water” Protection Plan” section as a component of a CWPPs
- ❑ Design and implement soil and water retention structures; train people and test projects



WIND: Pre-Fire Impacts



DEFINITION:

Wind impacts (WI) = windthrow, wind-driven erosion, and evaporative losses of soil moisture

CONCERNS:

- WI are a major natural disturbance in forest ecosystems.*
- WI are an increasing concern due to climate change
- Wind driven erosion and dust storm intensity and frequencies are increasing
- NM is one of the states in the nation with a high percentage of fine sand and WI risk
- Warm, dry wind causes rapid evaporative water loss
- Wind causes blowdown (wind throw) → coarse fuel accumulation + barriers to forest access for forest treatment and fire fighting
- WI include increased low moisture regimes (risk of fire ignition and expansion)
- WI in WUI areas cause dust (reduced visibility and respiratory problems), declining soil health (erosion, drought), and blowdown (lack of privacy screening)

*Mitchell, S.J. (2013). Wind as a natural disturbance agent in forests: a synthesis, Forestry: An International Journal of Forest Research, Volume 86, Issue 2, April 2013, Pages 147–157, https://doi.org/10.1093/forestry/cps058

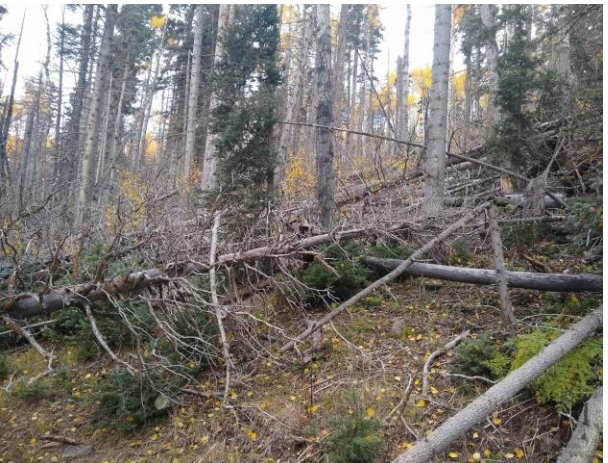
WIND: Pre-Fire Treatment Impacts

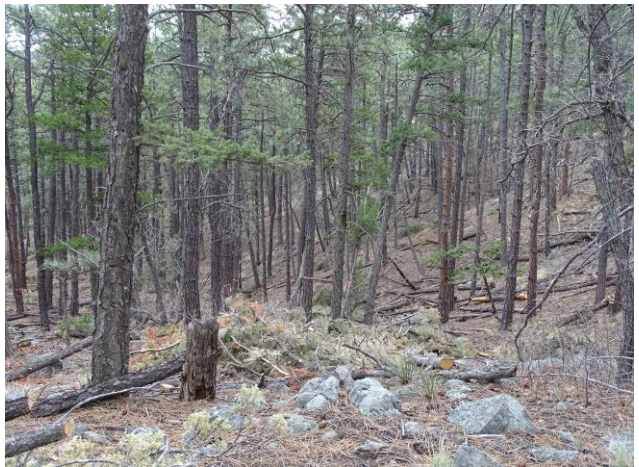
WIND THROW:

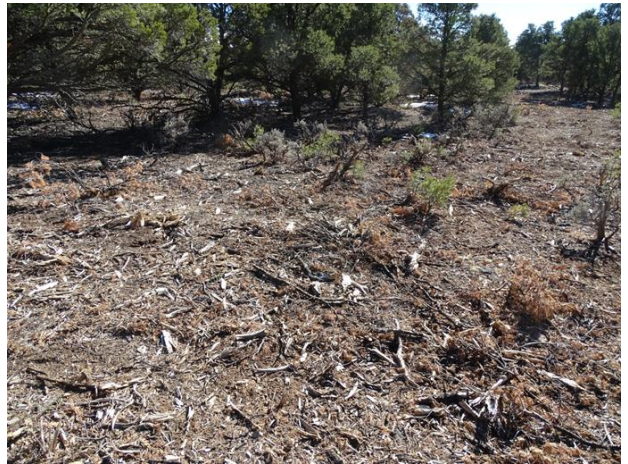
- Blowdown susceptibility = Site-specific conditions and interactions of slope, aspect, soils moisture, canopy structure, and topography
- Related to increases in beetle kill and wildfire risk
- Cutting handlines, patch cuts, and thinning regimes can cause serious wind throw if site conditions of WI are not understood

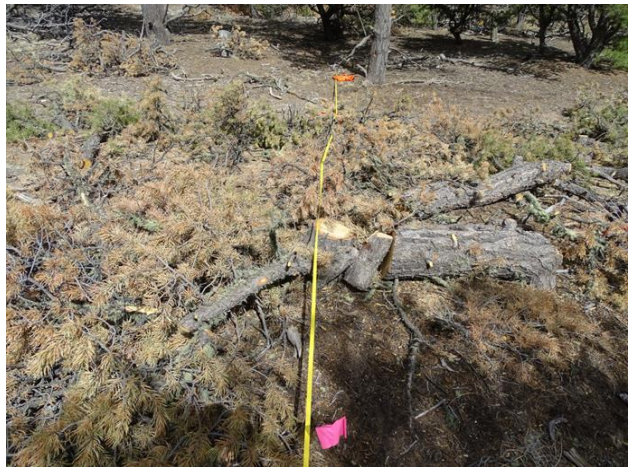
WIND EROSION/DUST AND EVAPORATIVE LOSS:

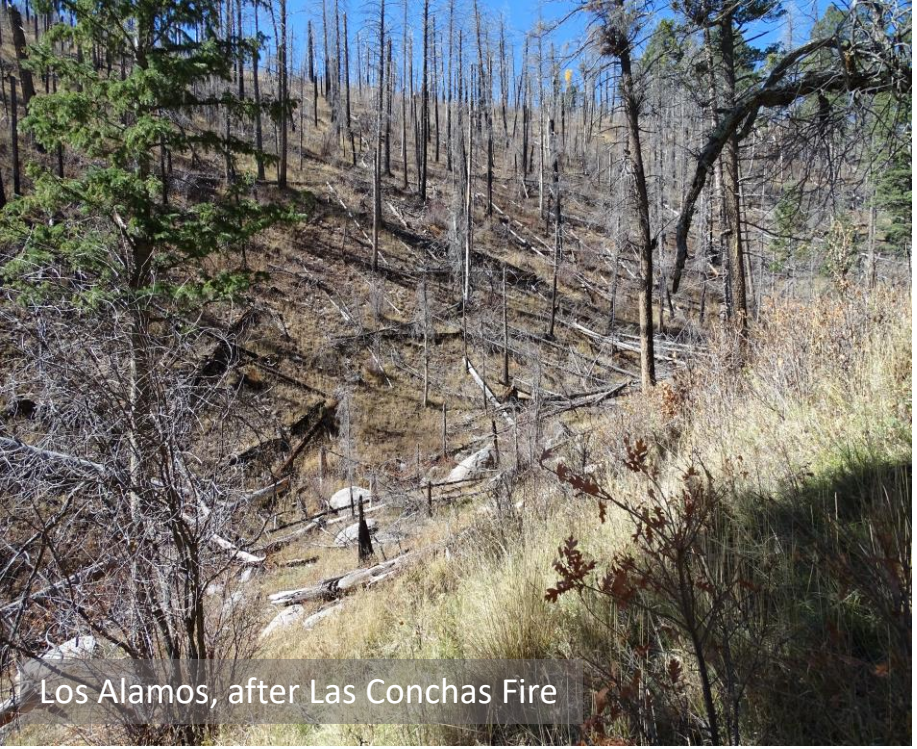
- High on xeric, fine sandy soils, in PJ shrubland and PJ woodland - which covers 55% of NM forest lands
- High when bare soil > 45%, soil is disturbed, poor herbaceous plant cover, and poor tree cover
- Natural and prescribed fire and thinning with slash removal greatly increases WI → wind erosion, dust, evaporative loss → aridification

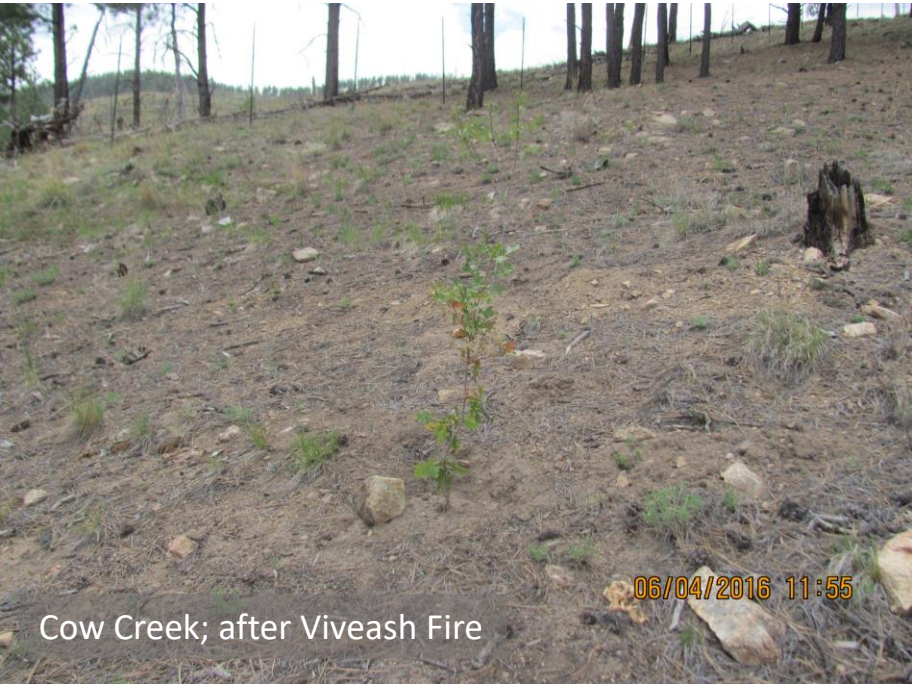









Los Alamos, after Las Conchas Fire



Cow Creek; after Viveash Fire

WIND: Post-Fire Impacts

WIND THROW:

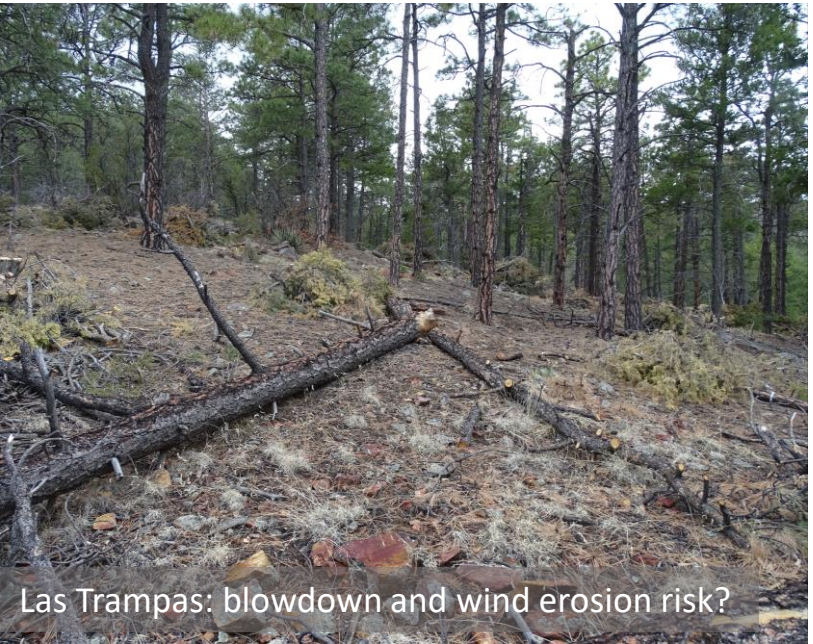
- Significant on sites that were in the lee; in fertile soils that grew tall, small diameter trees, on moist soils or concave slopes
- Dependent on opening size from previous fire and wind events, wind direction, fetch of wind, slope, and amount of already leaning trees

WIND EROSION/DUST AND EVAPORATIVE LOSS:

- WI are greatly increased by fire (natural or prescribed) due to the effects of removal of trees, shrubs, and herbaceous cover and disturbance of soil and soil health
- Leading to increases of wind erosion and sediment flux (dust) by a factor 10-50+
- Most severe on xeric sites with fine sandy soils
- Effects last for 5-8 years

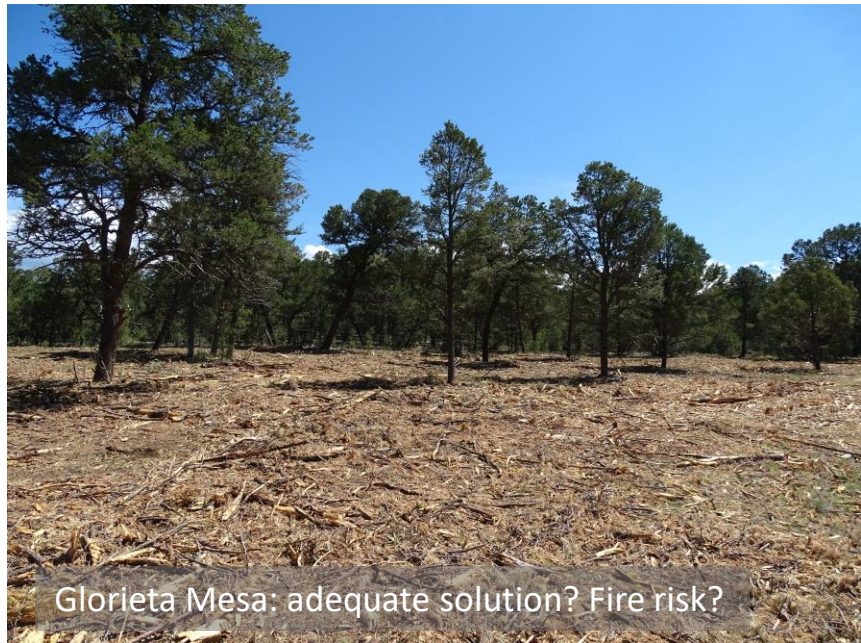
WIND: Data Gaps

- What instruction methods would guide foresters and operators in minimizing wind throw after treatments?
- What are the relationships between wind and evaporative loss (soil moisture) in pre- and post-fire forest settings?
- What are the effects of different stem density reduction practices and technologies on wind impacts?
- How can we reduce fire risk while maintaining vegetation and soil cover to minimize soil moisture loss (ET)?
- What slash treatment techniques are optimal for WI management and doable for operators?



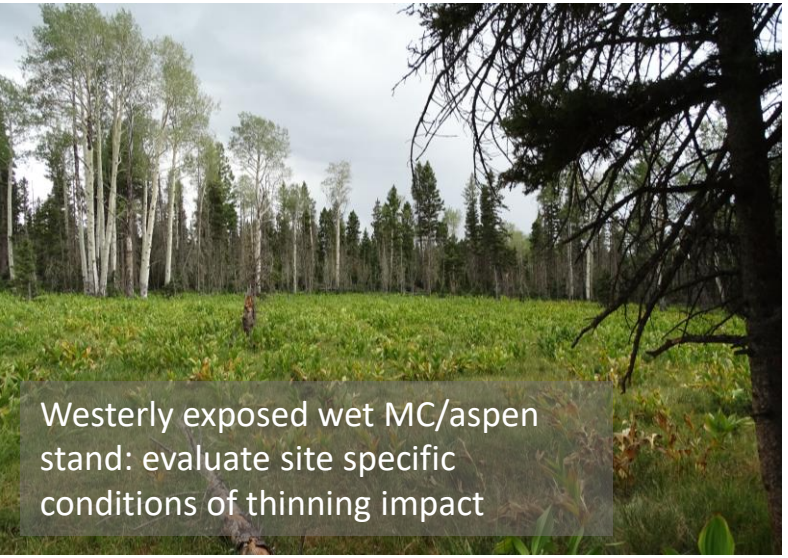
Las Trampas: blowdown and wind erosion risk?

Cimarron Range: blowdown risk? Fire risk?

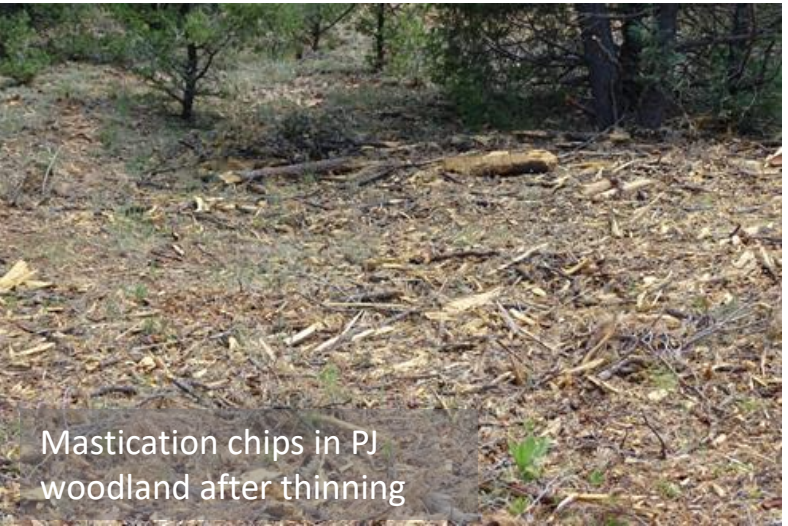


Glorieta Mesa: adequate solution? Fire risk?

WIND: Possible Solutions



Westerly exposed wet MC/aspen stand: evaluate site specific conditions of thinning impact



Mastication chips in PJ woodland after thinning

- ❑ Translate the science on WI into practical guides for foresters and operators; use the guidelines in treatment planning and prescriptions
- ❑ Include WI indicators into project monitoring protocols

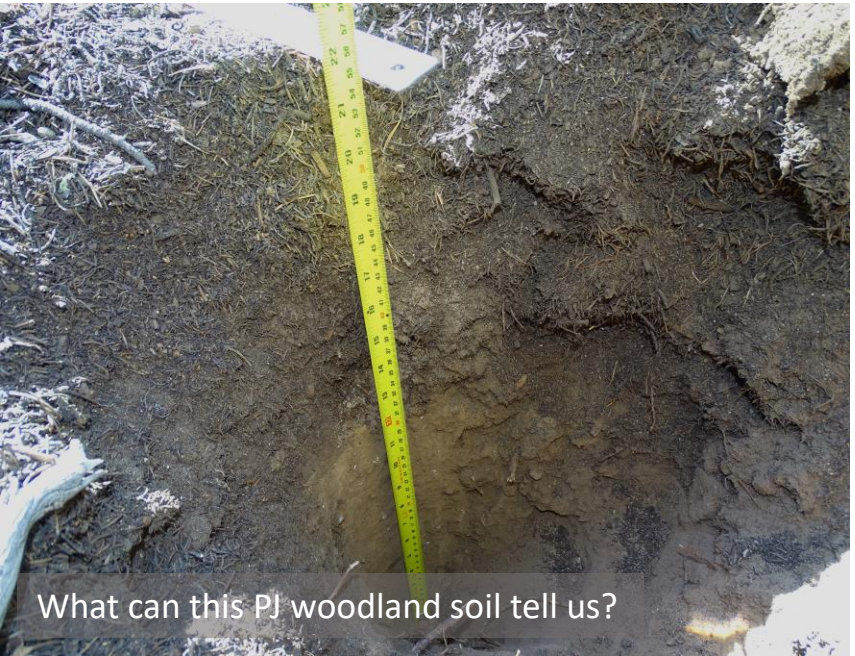
WIND THROW:

- ❑ Develop and implement prescriptions that give consideration to tree removal in relation to site conditions, such as soil / rooting depth, forest structure, etc. to reduce wind throw risk.

WIND EROSION/DUST AND EVAPORATIVE LOSS:

- ❑ Apply the Five Soil Health Principles: especially maintaining soil cover (chips, slash, understory, tree canopies) and plant cover (rooting perennial plants, trees) and minimizing soil disturbance
- ❑ Avoid leaving bare ground after treatments; especially on xeric soils and in the period March-June
- ❑ Minimize burn treatment in PJ shrubland and woodlands; follow thinning (if even necessary) by masticating or deliberate slash distribution

What can this wet MC forest tell us?



What can this PJ woodland soil tell us?

CONCLUSIONS

- Prescriptions that improve soil health, water harvesting, plant cover and organic mulch are key.
- Natural and prescribed fire and tree removal will in most cases dramatically reduce protections of SW, FF, and WI and rapidly increase aridification.
- Forest treatment solutions must be site specific and carefully timed to minimize impacts.
- We need to focus more on coordination, information sharing, more research for finetuning of practices, and learning from each other.
- CWPPs should include focused attention for SW protection, FF prevention, and WI reduction.
- The integration of these issues must take place at a landscape scale and at a community scale.

How much of this is already happening?

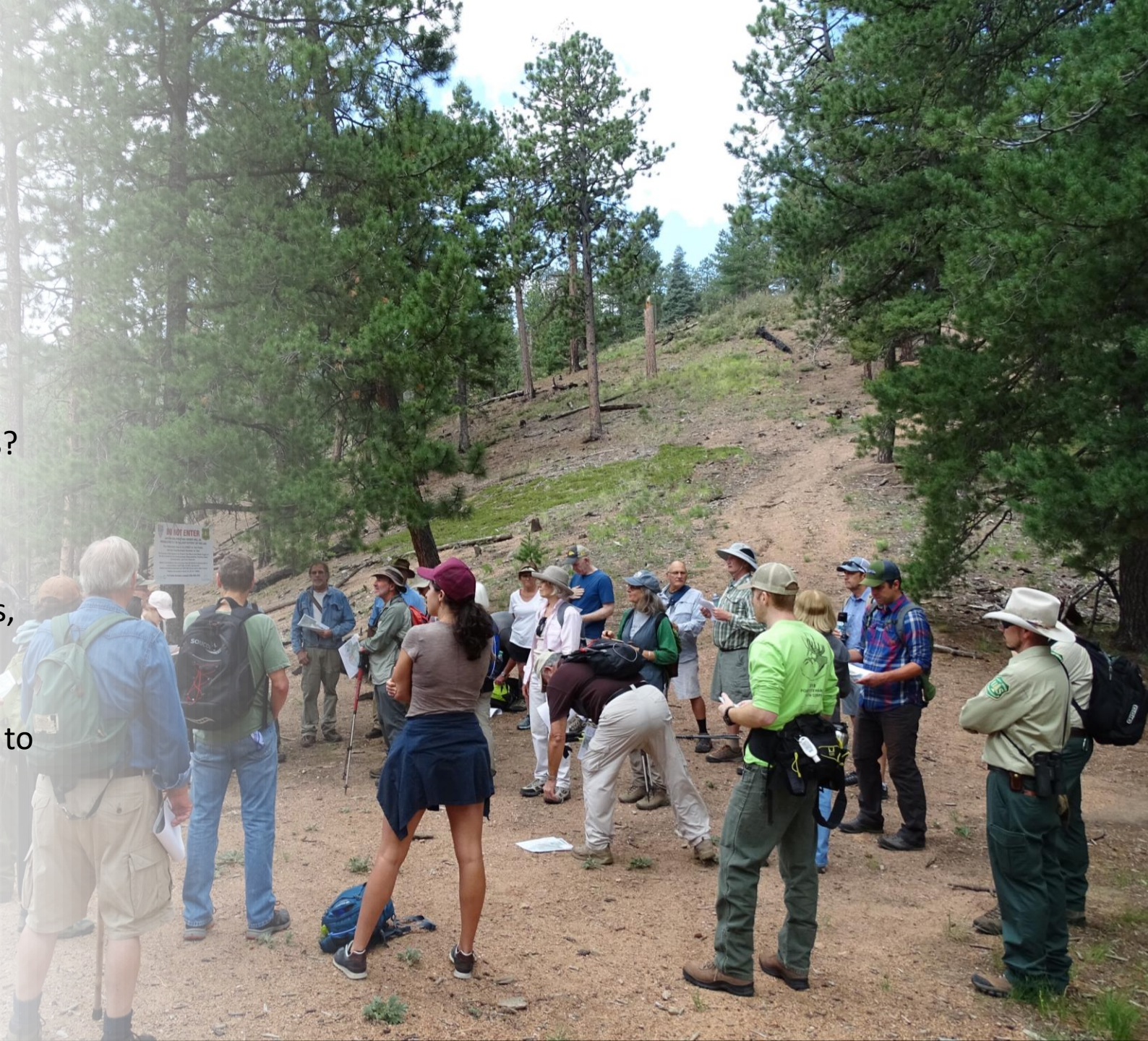
If it's not happening, how can we make it happen?

QUESTIONS: To Start a Conversation

- ❑ How can we balance our need to reduce SW depletion, FF, and WI with fire risk reduction in WUI-forest areas?
- ❑ From your perspective, what mechanisms, services, and practices could help protect and restore SW areas, reduce and mitigate FF impacts, and prevent WI?
- ❑ What can wildfire adaptation experts contribute to the capacity that needs to be built to address these processes?

Questions?

Let's Talk!



MORE PERSPECTIVES AND ACKNOWLEDGEMENTS

With Gratitude for:

Source Water resources

- Cimarron Watershed Alliance and BOR-WaterSMART
- Dr. Mollie Walton and Dr. Charles D. Moeser
- Dr. Martha Graham (NM Rural Water Assoc.)

Flash Flooding resources

- EPA/NMED project on Protecting Springs and Wetlands in the Lower Rio Embudo Watershed
- USFS-CFRP and WoodSharks, LLC on Woodland Restoration in the Lower Embudo Watershed

Wind Impact resources

- Erin McElroy of Ecotone LP, LLC

Reference Documents:

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