FOURMILE CANYON FIRE AT BALD MOUNTAIN OPEN SPACE
Developed by Volunteer Naturalist Claudia VanWie

PICNIC AREA

SET UP AT PICNIC AREA

1. Pelts, mounts, tracks for animals found at Bald Mountain
2. Pondersoa ecosystem poster
3. Fire map
4. Rehabilitation pamphlets and information
5. Fire triangle posters to use at overlook
6. Maps of mountains from top of Bald Mountain

CHARACTERISTICS OF HEALTHY PONDEROSA ECOSYSTEM

1. Discuss producers, consumers, abiotics, decomposers – poster, pelts,
2. Observations of area around picnic table

BOULDER COUNTY FIRE HISTORY AND PONDEROSA PINE STANDS

1. Long-term history: 20,000 years ago, much of the Rockies was covered by a massive ice sheet; has since been warming; vegetation continually changes in response to climate changes and other changes
2. Thomas Veblen and others at CU have looked at fire history by looking at fire scars on trees across the Front Range
    - Before modern fire suppression:
        - low elevation pine (below 7800 feet) had frequent surface fires → trees widely spaced – some fires caused by natural events, others by man
        - about 7800 feet elevation, pine stands are mixed with Douglas fir and lodgepole → fires less frequent, more severe, stand-replacing as well as surface
3. Major increase in fire in 1800s with first settlement → many stands today stem from that time → lots of even aged stands
4. Have gone through a period of fire suppression since → stands have not been thinned, density has increased from 20-50 trees per acre to upwards of 500-1,000 stems per acre → forest health has decreased and severe, damaging wildfires have increased
5. Wildfire spread correlates with wet periods which → greater growth followed by dry periods; correlates with El Nino/La Nina cycle

FOURMILE CANYON FIRE

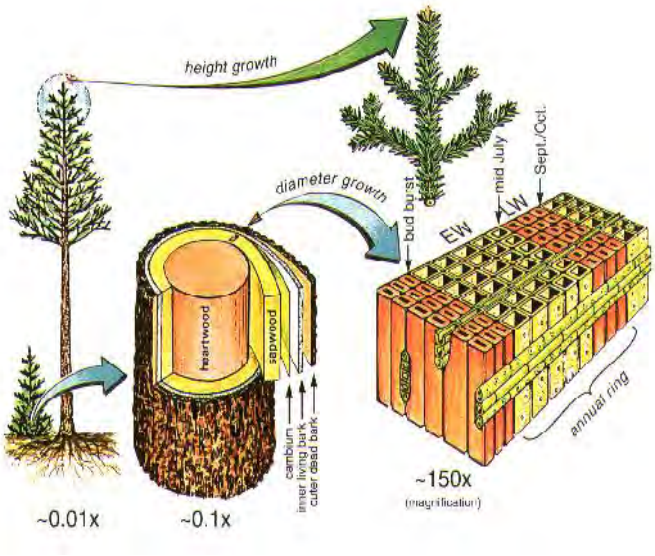
1. Started 9/6/2010 from embers from a fire pit used several days before; wet spring followed by dry August; high winds (60+ mph)
2. Largest wildfire in Boulder County in past 50 years
    - 6,180 acres
    - destroyed 169 structures, estimated value of $217 million

- 3,500 people evacuated
- 1,000 firefighters from 20 states, 30 agencies, 35 fire engines, 7 air tankers, 5 helicopters
- $10 million cost to fight (nationally, costs of fire suppression have doubled in the last decade)
- More costs to come: rehabilitation, loss in property tax revenue, flooding and debris flow, decrease in visitation/tourism

ON TRAIL BEFORE BURN

PONDEROSA PINE

1. Identifying a ponderosa pine
   - Largest conifer in the Southern Rockies
   - Grows between 6,000 – 9,000 feet elevation
   - Max size: 150 feet tall, 3 feet in diameter
   - Long needles in bundles of 2 to 3
   - Bark when mature is made up of large plates that smell like vanilla or butterscotch when warm
   - Each tree has both female and male reproductive structures
     - Cones (female) moderately large with spine tipped scales
     - Have small strobili at ends of branch that shed large amount of wind-blown yellow pollen in spring
   - Older trees have more rounded crowns
   - Oldest trees 300-500 years old
2. Growth of ponderosa – need to know to understand impact of fire
   - Grows from only three points: tip of branches, cambium under the bark, tips of roots
   - Poster: diagrams of each
   - To survive fire, has to have some portion of all three growth areas survive



Growth in buds at ends of branches → branches grow longer, tree grows taller

Growth in cambium → trunk grows wider; tree does not grow taller from trunk; if we put a nail in the trunk and come back in 50 yrs, where will it be? At same height

Growth in root tips → larger network of roots

Cambium produces xylem (water transport tubes) and phloem (food transport tubes) which are between the bark and the sapwood and lays down cells that form new wood

Diagram from http://www.cfr.washington.edu/classes.esc.401/treegrowth.htm

USE OF SLURRY TO FIGHT FIRE (Can still see red tint below top of mountain – could also do this on mountain top where you can see slurry on leaves in shrubs)

- Main ingredients: 85% water, 10% fertilizer (ammonia phosphate and sulfate ions), and 5% minor ingredients (iron oxide for color, clay or bentonite).
- ***How it works:*** *Works by coating fuels with moisture*
- ***How it is applied:*** *Aerial application, dropped by aircraft.*
- ***Good News:*** *It is non-toxic to humans.*
- ***Bad News:*** *It may stain so should be washed off structures to prevent darkening of color. May be harmful to pets if swallowed (fertilizer poisoning).*
- Why is it red? Visibility! Easy to see from the air and ground.

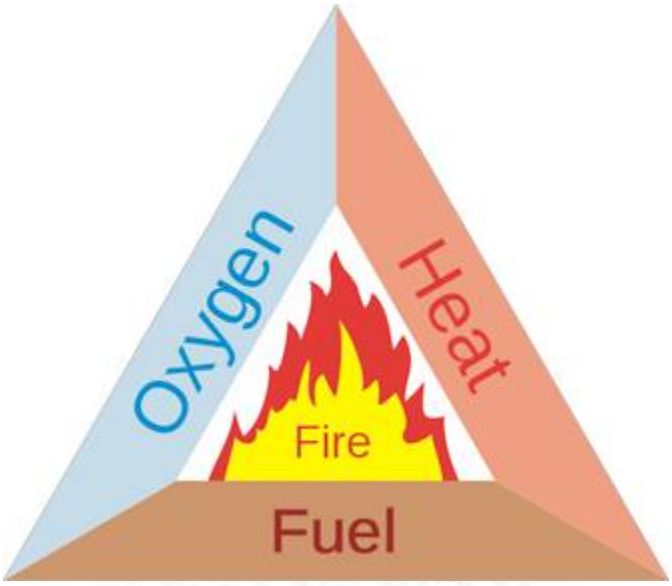
  http://www.fs.fed.us/r2/fire/r2imt/blume202/brush_mtn/slurry.html

- Can kill fish in streams; did so in South Boulder Creek after Walker Ranch/Eldorado fire. Heavy loads of ash can also change stream temps → fish kills

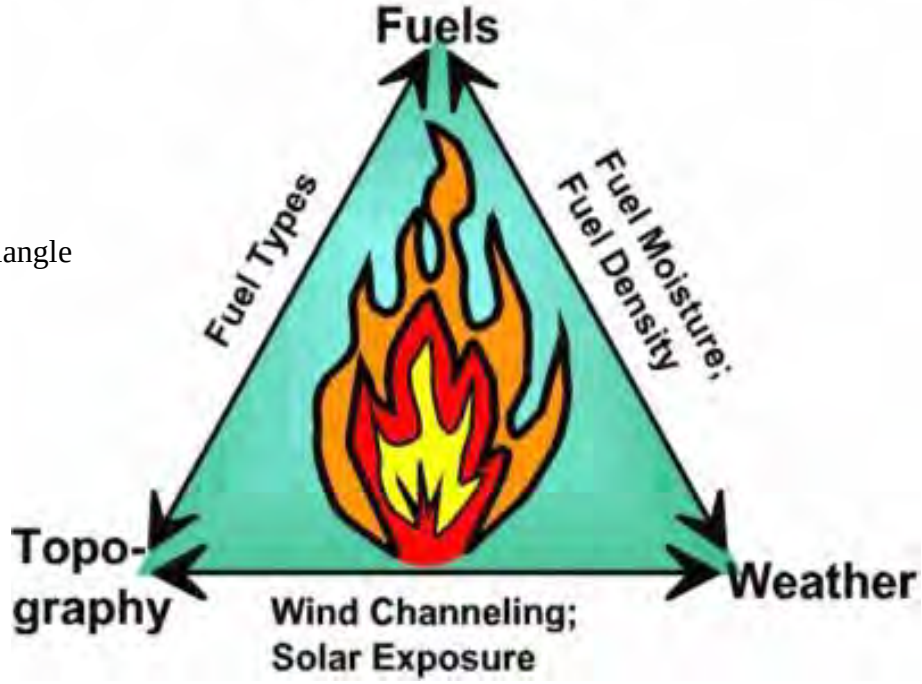
AT OVERLOOK

FIRE BEHAVIOR

Fire triangle



Fire behavior triangle



FIRE BEHAVIOR: BURN PATTERNS

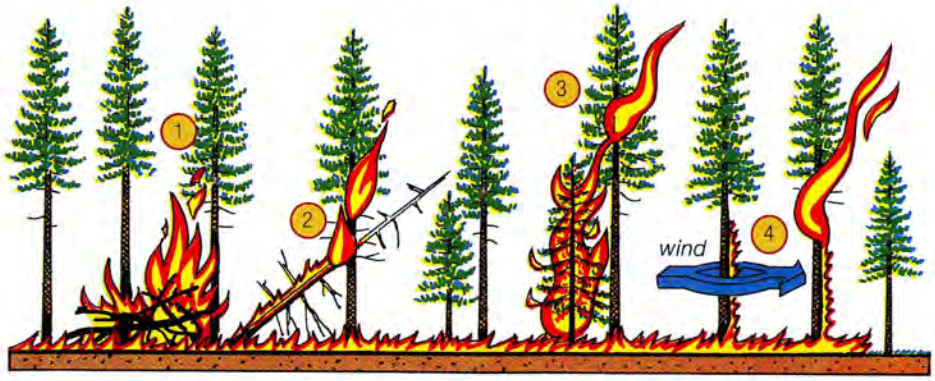
1. Landscape level or large scale: creates a mosaic which can help reduce fire intensity and spread in the future
    - Looking west, can see many areas of green, areas of brown trees, and areas of black
    - Talk how wind, topography, and fuel loading create the mosaic seen

2. Local level or small scale: Look at difference in burn intensity along the trail. For example, fire fighters stopped the fire spread using the trail at the top of Bald Mountain where there the fuel load was light and the topography flat rather than along the trail on the west side of the mountain which is in steeper and forested terrain.

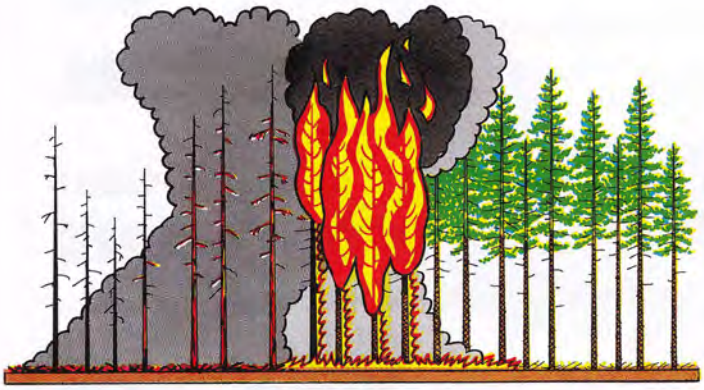
HOW A FOREST BURNS

Most forest fires start from the pilot heat supplied by lightning or by people's matches and sparks. Fires usually start in surface and ground fuels. Environmental conditions must be right for a fire to then "climb" into a tree crown or forest canopy. A plentiful supply of dry fuel, ladder fuels, and dry, warm air facilitates a fire's vertical spread.

Fire climbs into tree crowns by using these fuel ladders:



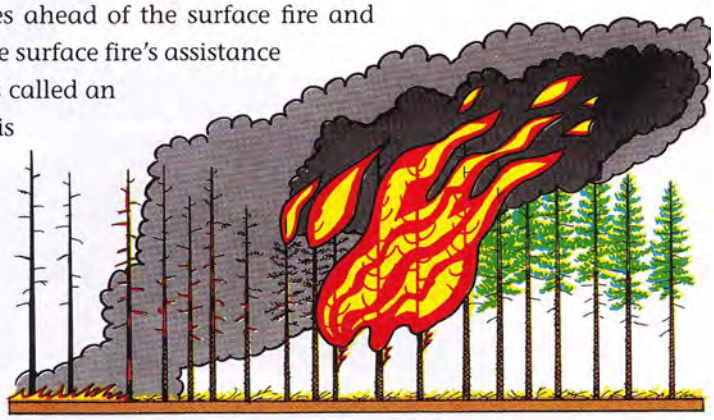
1. Plentiful dry surface fuel burns hot enough to preheat and ignite aerial fuels in the crowns.
2. Fire ascends partially fallen trees into the crowns.
3. Surface fires ignite understory trees whose branches drape near to the ground, yet reach up to the forest canopy.
4. If the living tree's water content is very low, as in a drought, and if there is a wind, a fuel cloud concentrates downwind of the trunk, ignites, and flames "climb" up into the tree's crown.



When a fire climbs into the tree crowns and many trees begin torching, the process is called *crowning*. If it spreads through the tree tops it is called a *crown fire*. Surface and crown fires together preheat unburned trees ahead of the moving flame front. This is called a *dependent crown fire*.

If the crown fire races ahead of the surface fire and if it no longer requires the surface fire's assistance to preheat fuel, then it is called an *independent crown fire*. This occurs in the presence of strong wind.

An independent crown fire can "make a run" of several miles in a single day.



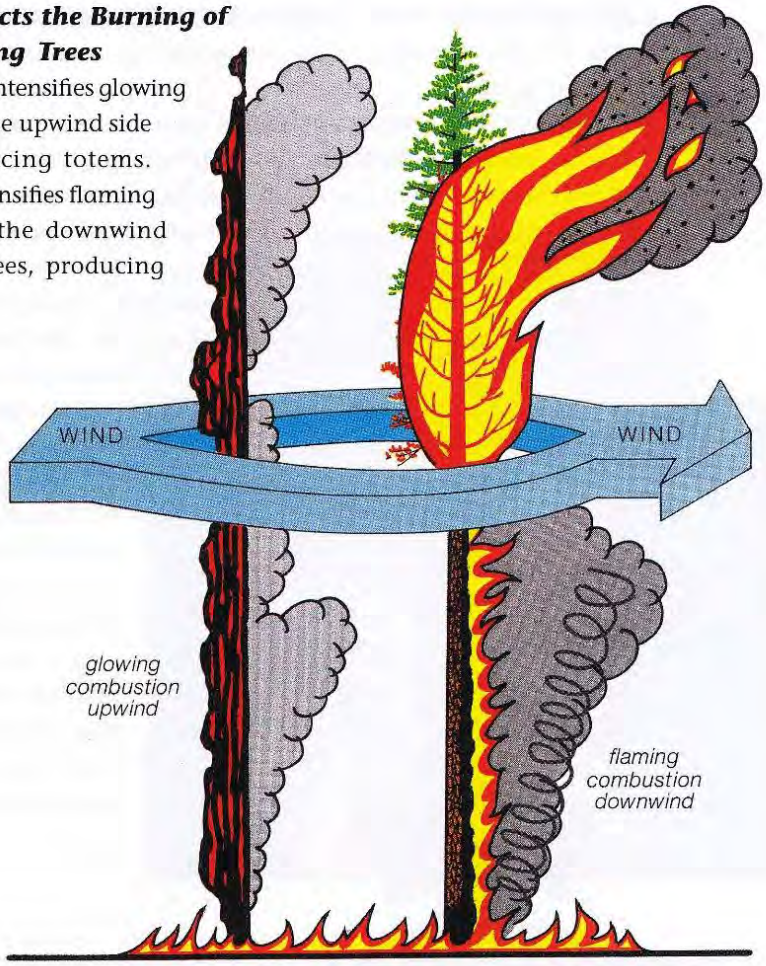
From William H. Cottrell Jr. 2004. The Book of Fire, Second Edition. Mountain Press Publishing Company, Missoula, Montana in cooperation with the National Park Foundation

STOP WHERE THERE ARE EXAMPLES

FIRE BEHAVIOR: BURN PATTERNS ON TREES

How Wind Affects the Burning of Dead and Living Trees

Surface wind intensifies glowing combustion on the upwind side of snags, producing totems. Conversely, it intensifies flaming combustion on the downwind side of living trees, producing two-tones.



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ROLE OF WILDFIRE IN THE ECOSYSTEM

ROLE OF FIRE IN ECOSYSTEM: RECYCLING NUTRIENTS

1. In temperate zones, growth rates generally exceed biochem decomposition → need fire to free nutrients locked up in biologically inert matter, to break down matter/energy that plants have put together from the sun
2. Adds nutrients to soil → Native Americans burned areas to get more pasture, greener grasses; also fire is used to prepare land for planting in many agricultural systems around the world

ROLE OF FIRE IN THE ECOSYSTEM: SOIL EROSION, FLOODS

1. When plants, litter layer, roots removed → soil not stabilized, water hits soil harder, more percolates in → more erosion and faster runoff → floods, debris flows
2. Hydrophobic soils = soils that repel water; formed by gases from burning vegetation forming a waxy coat on soil particles; → increased run-off, less percolation into soil → less germination
3. Thick litter layer, severe slow moving, intense fire; coarse textured soils such as sand or decomposed granite → greater chance of hydrophobic soil
4. Freezing and thawing and animal activity –> break up hydrophobic layer

ROLE OF FIRE IN THE ECOSYSTEM: PLANTS

1. Species may change because:
    - microclimates changed → different growing conditions in a given location
    - more soil nutrients
    - less competition: example – berries do better after a fire
2. Predicting what will come back: ponderosa
    - Will a ponderosa tree survive fire?
        - Trees beyond pole stage, not crowded, have thick bark → resistant to fire
            - If cambium (living layer which generates the xylem and phloem; under the bark) is damaged, see large blobs of pitch exuding from deeply charred bark
            - Look at cut trees to see how deeply char penetrates bark
        - Roots of ponderosa deep → protection
        - Crown scorch and bud kill → main cause of death
            - Some buds need to survive if tree is to grow the following year
            - Buds form in spring; at terminal end of branch; provide tissue for following year's growth
            - Long needles and heavy scales protect buds
    - Ponderosa needs certain climatic conditions to set seed, germinate and to establish seedlings
        - Lower montane: need above average March-May moisture availability

followed by lack of drought in May-November
        - Cone seed production also highly variable → ponderosa successfully sets seed less than 10% of the time
        - Not studied much at upper elevations – may be less moisture dependent
3. Predicting what will come back: grasses and forbs (flowering plants)
    - Intensity of fire and depth of burn are key
        - If root structures remain, grasses, shrubs and forbs can sprout after fire
        - If soil is sterilized and all organics are burned, will take time; extent of erosion may well determine → erosion control (aerial mulching, bark chips etc) is key
    - Noxious weeds may invade because there are more nutrients and less competition from natives; also less canopy cover
4. Prediction what will come back: aspen and shrubs
    - Aspen sprout from extensive root system
    - Many shrubs have very deep roots and can sprout from roots

ROLE OF FIRE IN THE ECOSYSTEM: ANIMALS

1. Look for signs of Aberts squirrel, tracks, deer, birds while hiking
2. The effects of the fire on individual species depend on:
    - the species' mobility
    - the stage of their life cycles
        - Example: Bird species were not immediately affected by Fourmile Fire because the breeding season was over, nests were empty of baby birds
    - changes in their protection and home
        - Fewer trees → fewer nest sites for cavity nesters like woodpeckers and owls
        - Small mammals like chipmunks, squirrels, and deer mice may have lost nest sites, protection (passage under leaves and litter; protected spots)
    - food sources
        - Woodpeckers may have more trees with insects
        - Small mammals may not have adequate food supply within the burn
3. Coyotes and foxes follow small mammals → may need to leave burn area because small mammals have left → compete with coyotes/foxes already in territory
4. Impact on fish: soil erosion from the burned area may increase the amount of sediment in Fourmile creek.
    - Could clog their gills of fish
    - Could clog the gravel in which they spawn.
    - Could increase the water temperature.
        - Depending on the areas, this could have a positive or negative impact on fish and amphibians. Areas originally too cold may become suitable habitat, while areas currently suitable may become too hot.

THE FUTURE: CONCLUSION AT PICNIC AREA/PARKING LOT

As climate warms, models indicate that we will have more frequent and more severe wild fires.

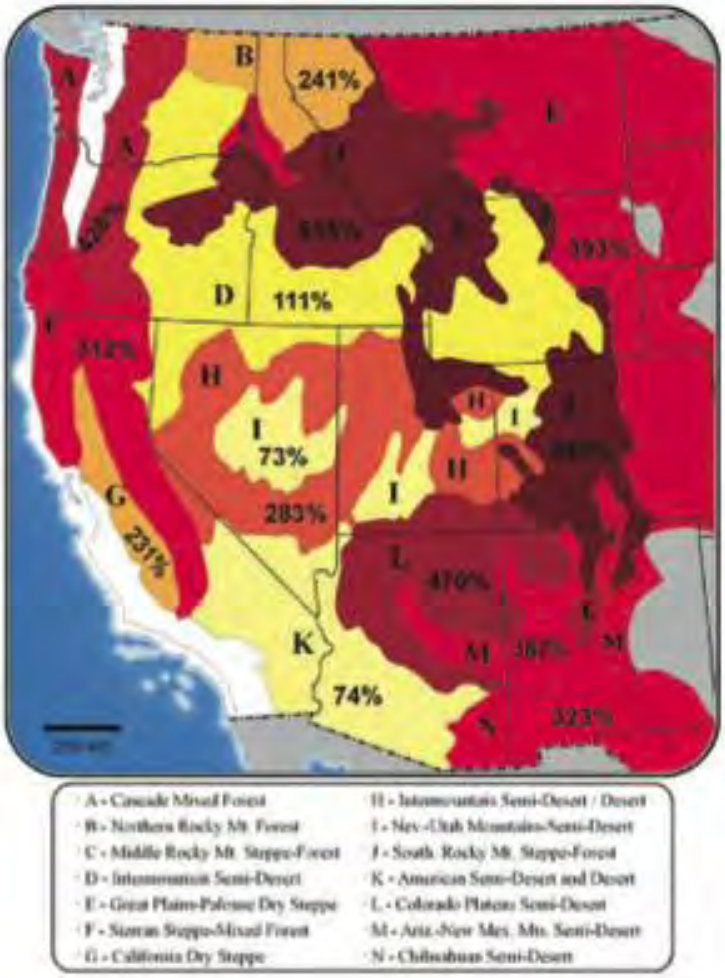

FIGURE 5.8 Map of changes in area burned for a 1°C increase in global average temperature, shown as the percentage change relative to the median annual area burned during 1950–2003. Results are aggregated to ecoprovinces (Bailey, 1995) of the West. Changes in temperature and precipitation were aggregated to the ecoprovince level. Climate-fire models were derived from NCDC climate division records and observed area burned data following methods described in Littell et al. (2009). Source: Figure from Rob Norheim.

Climate Stabilization Targets: Emissions, Concentrations, and Impacts over Decades to Millennia (2011) Board on Atmospheric Sciences and Climate (BASC)

Our options:

1. Do nothing and accept whatever happens
2. Manage the forest to both decrease the likelihood of significant and large fires and to imitate the role of fire in the ecosystem
3. Other ideas??

ADDITIONAL INFORMATION

FELLED TREES NEAR PATH

From: Milne, Shane
Sent: Monday, March 07, 2011 10:41 AM
To: Colbenson, Larry
Cc: Julian, Chad
Subject: Bald Mtn Trees

The Four mile Canyon Fire burned through a 300-yard section of trail on the west side of the property. Fire severity in this area was moderate to high and many trees along this section of trail were completely burned over. Trailside trees that posed immediate threats to emergency personnel were felled during suppression efforts however, many dead trees remained along this section of trail. As remaining trees weaken, it is highly likely that they will fall into the trail risking the safety of trail users. To mitigate these risks it was decided to fell fire damaged trees that occurred within a tree and a half length (apx. 70')of the trail.

Because of the fire severity in this area potential erosion issues needed to be assessed. In mid-November, I walked the area with one of our plant ecologist and we observed significant needle cast (needles that have fallen off live or dead trees) as well as intact root systems of existing grasses. It was agreed that these two factors will aid in slowing down surface runoff as the monsoon season gets underway. Some might argue that contour log felling would be appropriate for this site. This particular erosion control method is designed to increase infiltration, add surface roughness, and replace ground cover. That said, this technique is being used less and less because it is costly to implement and if done improperly can create additional erosion issues. A more popular and effective technique is to add surface roughness to those areas that lost significant ground cover. Surface roughness is anything that slows the downhill course of water and includes wood chips, straw mulch, tree branches, needle cast , etc.

At the time of forestry operations, all trees were felled perpendicular to the slope and completely limbed. Limbs were diced into small pieces and scattered on the forest floor where ground cover had been consumed by the fire. At this time there are no plans to remove the logs or position them in a different way. We will monitor this site during the spring and summer to determine if additional control measures are needed.

For additional info on the fire rehabilitation go to www.bouldercounty.org/fourmilefire

If you have any other questions or would like to discuss this further, please don't hesitate to call or email

Thanks, Shane

303-678-6295