

# Water, Trees and Fire

## Watershed Condition and Stream Flow

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## Forest and Range Fires Degrade Watersheds

## Watershed Quiz Answers

Climate, basin size, soil type, geologic structure, vegetation and land use.

(d) 75 - 80 %

Geologic material groundwater flows through

Riparian vegetation, groundwater and elevation

Temp.

Erosion is delivered sporadically

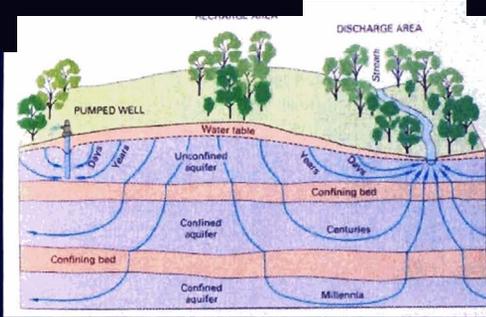
Late summer, low-water minimum flows

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## Linkage Between Uplands and Streams

- Riparian management is watershed management
  - National Research Council, 2002
- Groundwater controls and dictates riparian vegetation
  - Chambers and Miller, 2004

## Streams and Groundwater Linkage



## “Forgotten” Process

- Fire is part of ecological processes shaping forest and rangeland communities
- Fires may affect groundwater levels as well as surface flows

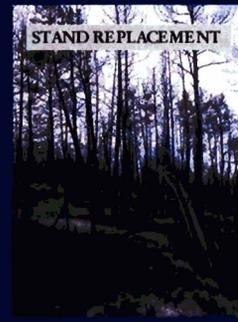


## Fire as a Renewal Process

Forest Type	Fire Interval	Outcome
Inland Douglas Fir	25-50 yrs	Maintains ecotone
Ponderosa Pine	15 - 45 yrs	Parkland
Lodgepole	80 - 100 yrs	Mid elevation sites
Lodgepole	100 - 200 yrs	High elevations
Mixed Conifer	130 - 300 yrs	Mixed age and ssp
Whitebark pine	200 - 400 yrs	Replaced by fir
Coastal Douglas Fir	700 yrs	Ancient forests

Arno, S.F. and S. Allison-Bunnell, 2002

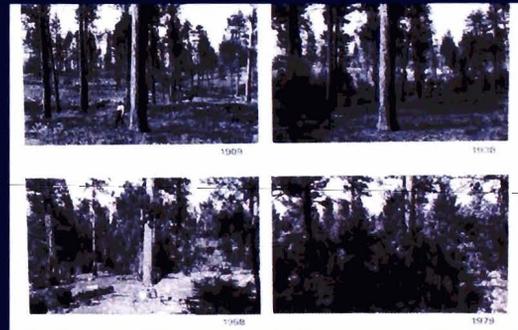
## Fire Regimes



## Aggressive Fire Suppression



## What has happened since Smokey the Bear



## Subsurface Flow Paths



- 40% upslope input arrives as subsurface flow
- 61% of dissolved solids transported

## Conifer Encroachment

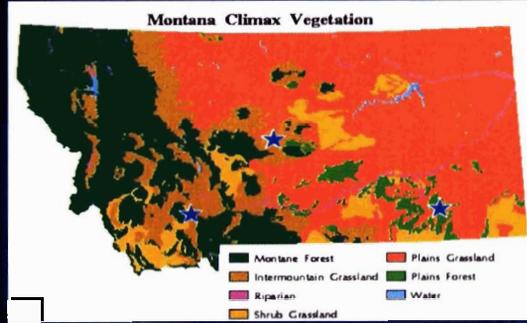
- Aggressive fire suppression opens way for invasion of grass and shrub lands
- Increased conifer canopy could draw more water from shallow groundwater

## Potential Water Losses



- Large trees (10+")
  - 73/ac = 2,562 gal/day
- Mixed
  - 320/ac = 1,664 gal/day
  - 800/ac = 4,160 gal/day
- Comparison
  - 4" precip. every 27 days

## Testing the Hypothesis



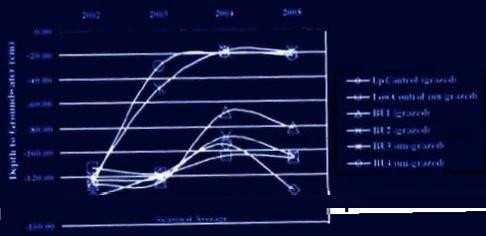
## Study Design



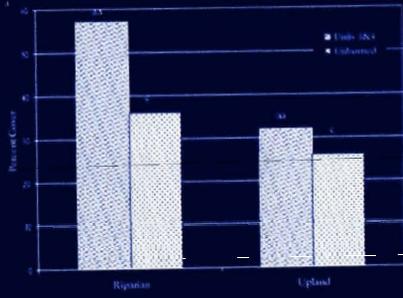
## Post Burn



## Longhorn Site



## 2005 Vegetative Cover



## Wildlife Impacts



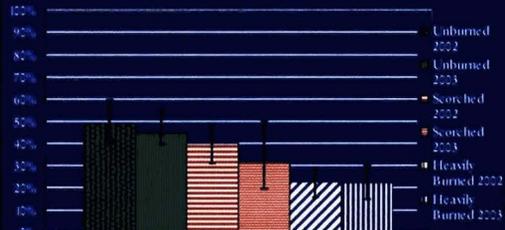
## Habitat

### Thermal Cover 2002 & 2003



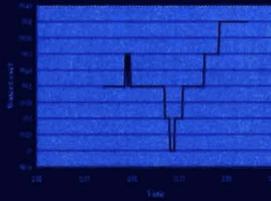
## Habitat

### Hiding Cover 2002 & 2003



## Little Whitetail Project

### Little White Tail Survival Data



19 September 2005



## Re-creating Natural Fire Intervals

Mixed & Low Intensity

Stand Replacing & Catastrophic



## Summary Points



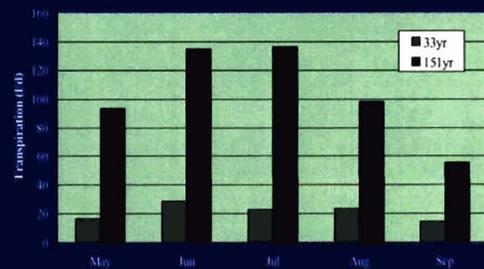
- Over dense stands limit recharge
- Re-creating return intervals can elevate groundwater
- Will elevated groundwater produce higher flow?

## Questions Comments

## Wildfire destroys range and forest resources



## Potential Water Losses



## Fergus Site

- 2002 – no difference due to treatment
- 2003 – significantly more water in units 3 and 4
  - Pre-burn data indicates heavier forest cover
- Soils or geologic difference?

