



Monitoring Results of Alternative WLPZ in the Etna Creek and McKinney Creek watersheds

Michigan-California Timberlands Siskiyou County, California

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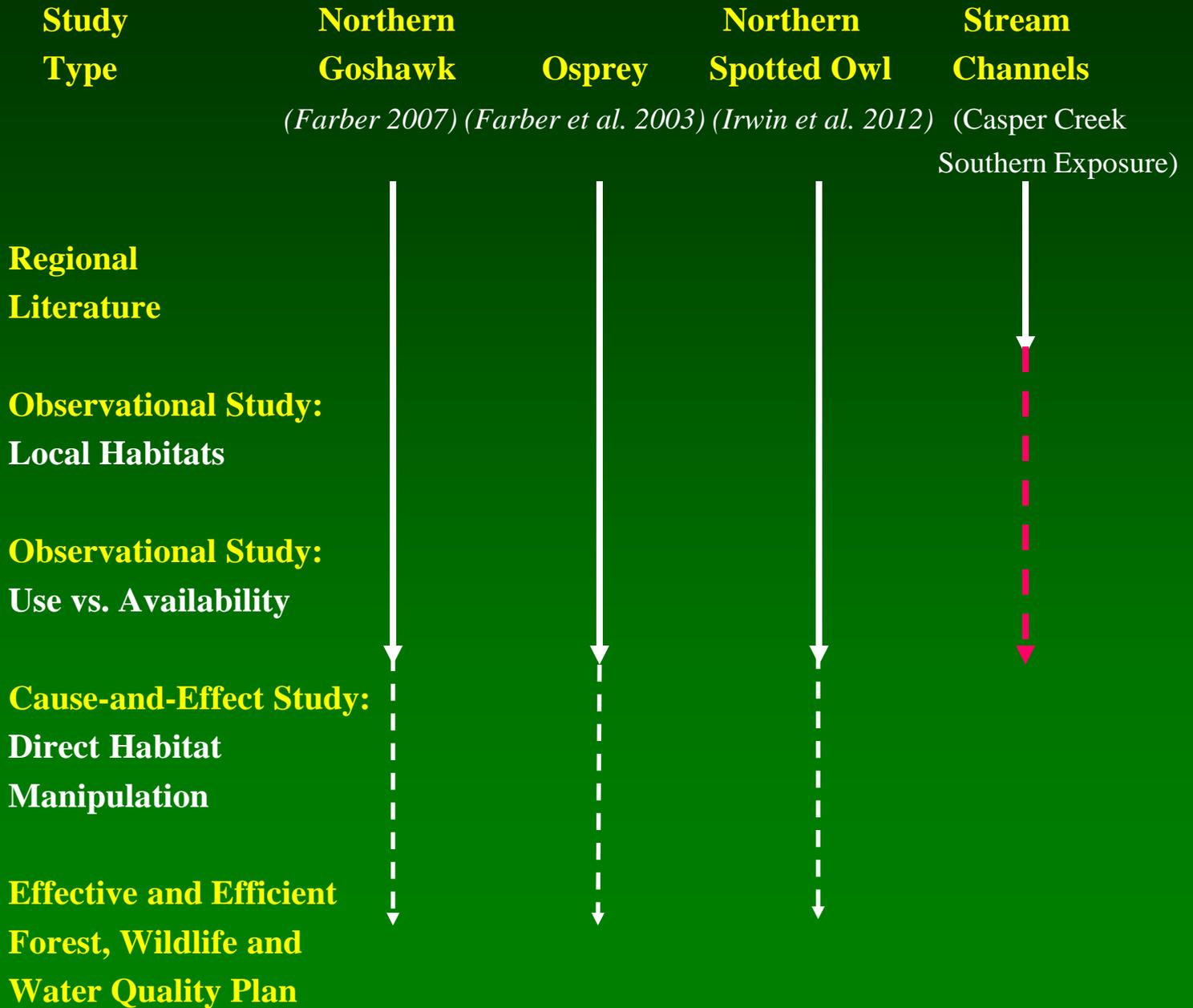
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Snoqualmie, Washington



Board of Forestry disclaimer

- Information and statements shared in this presentation are based on my previous experiences and current position as a Wildlife Biologist for W.M. Beaty and Associates.
- Information and statements shared do not represent proposed rules or policies of the California Board of Forestry and Fire Protection.

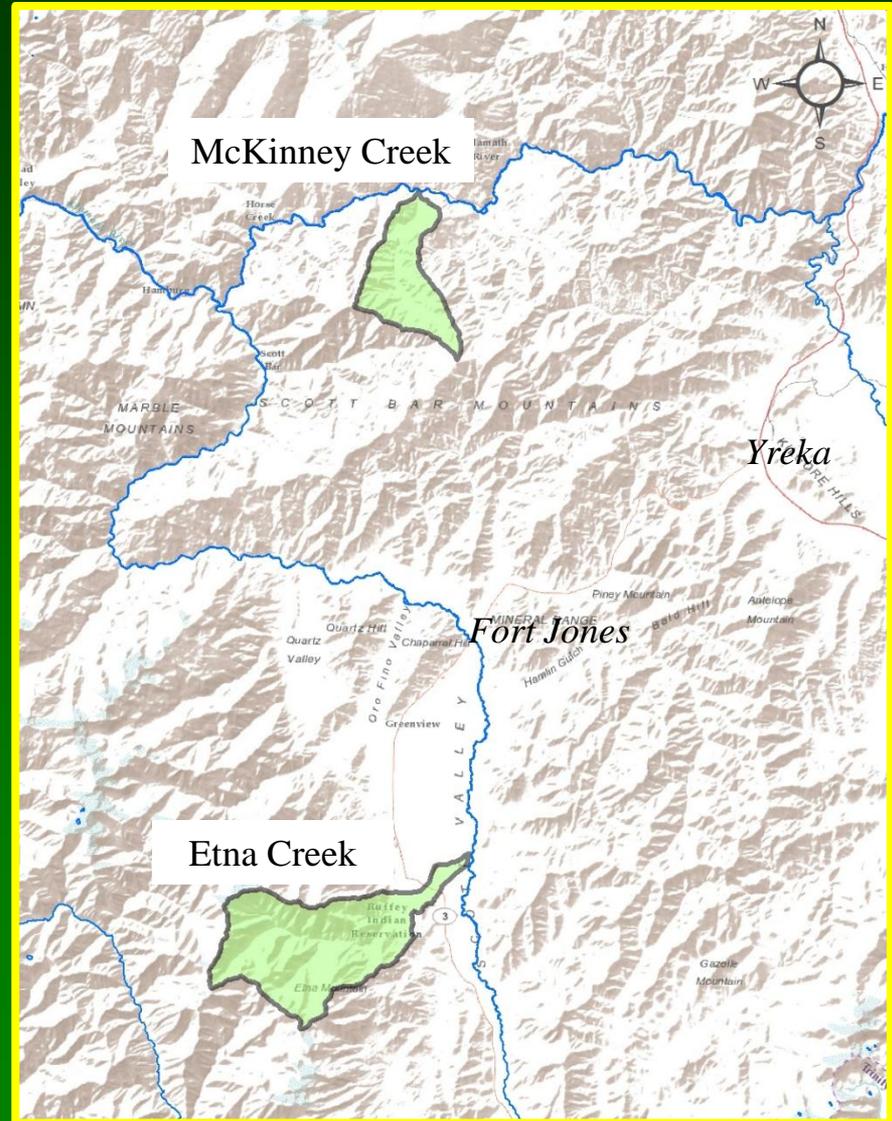






Etna Creek Alternative WLPZ

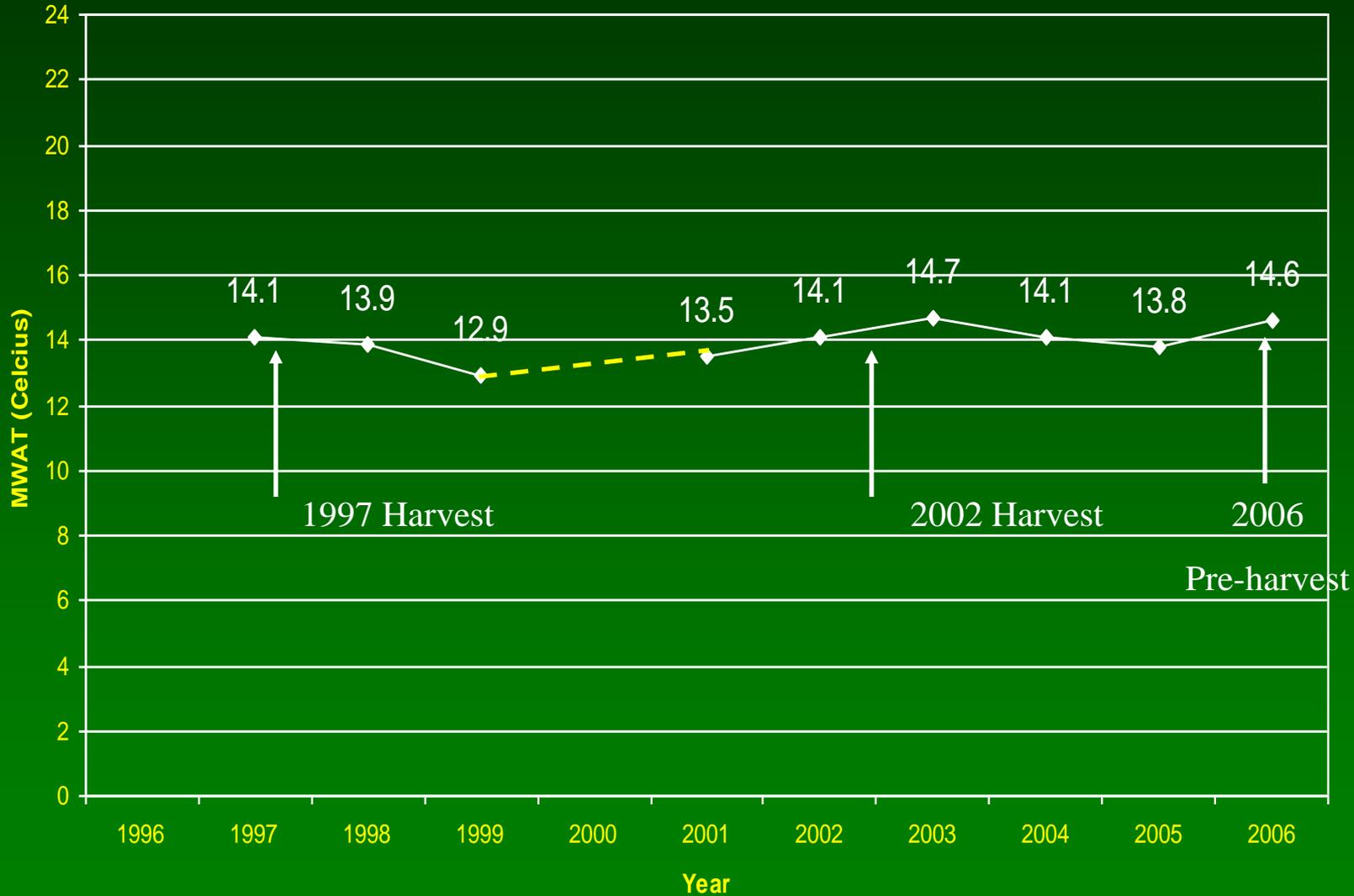
- Tributary to Scott River
17,106 acres
- Decomposed granite
- Small scale study,
Before-After-Control-Impact
(BACI)
- Coho in watershed
Chinook in watershed
Steelhead in study area
- Worked cooperatively with
CAL FIRE, CDFW and
NCRWQCB





Etna Creek channel and riparian assessment

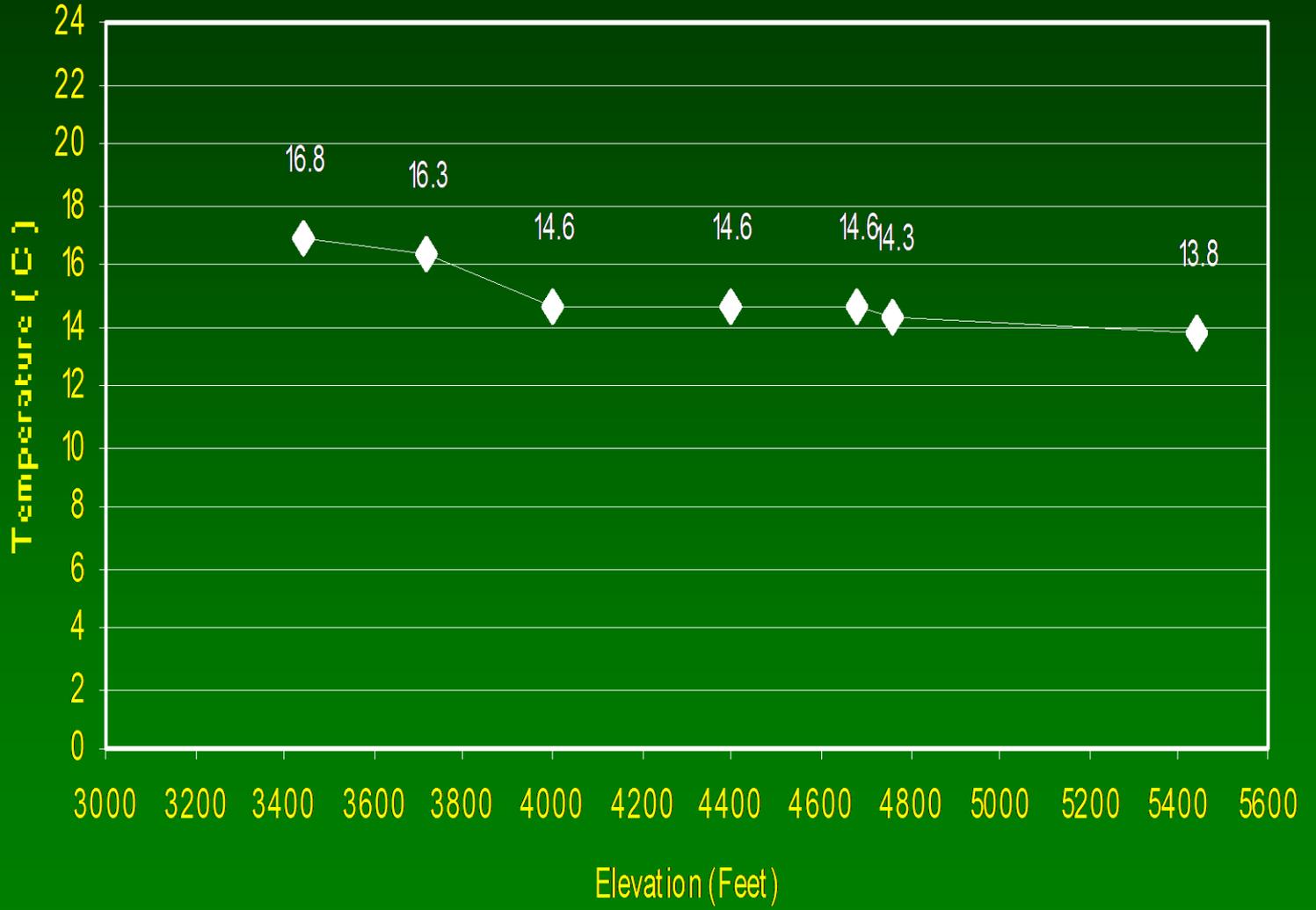
Using Onset Hobo H8 sensors calibrated to NIST thermometer





Etna Creek Temperatures

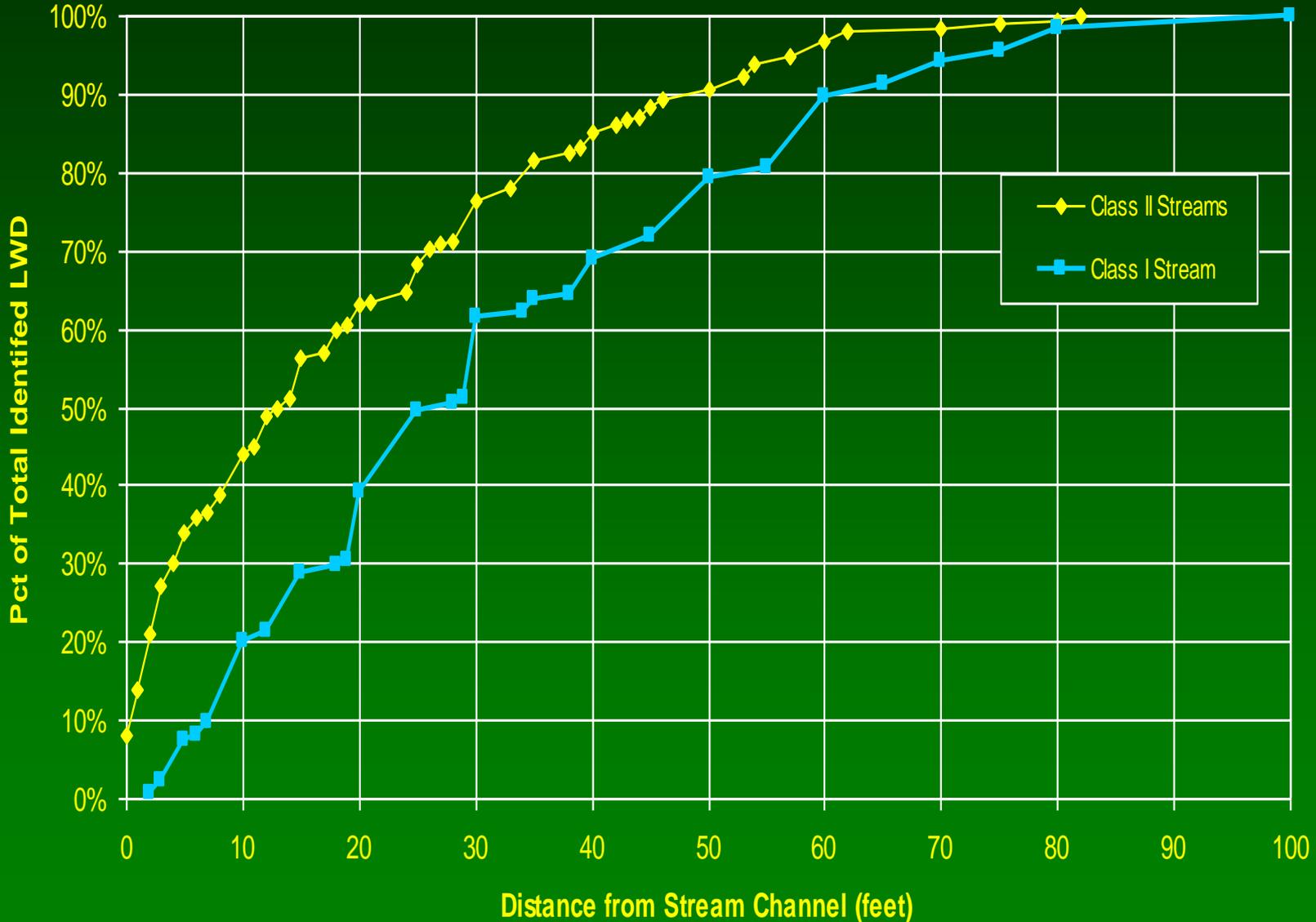
5,440 feet downstream to 3,410 feet
2006 Pre-harvest





Etna Creek channel and riparian assessment

Methodology from McDade et al. 1990

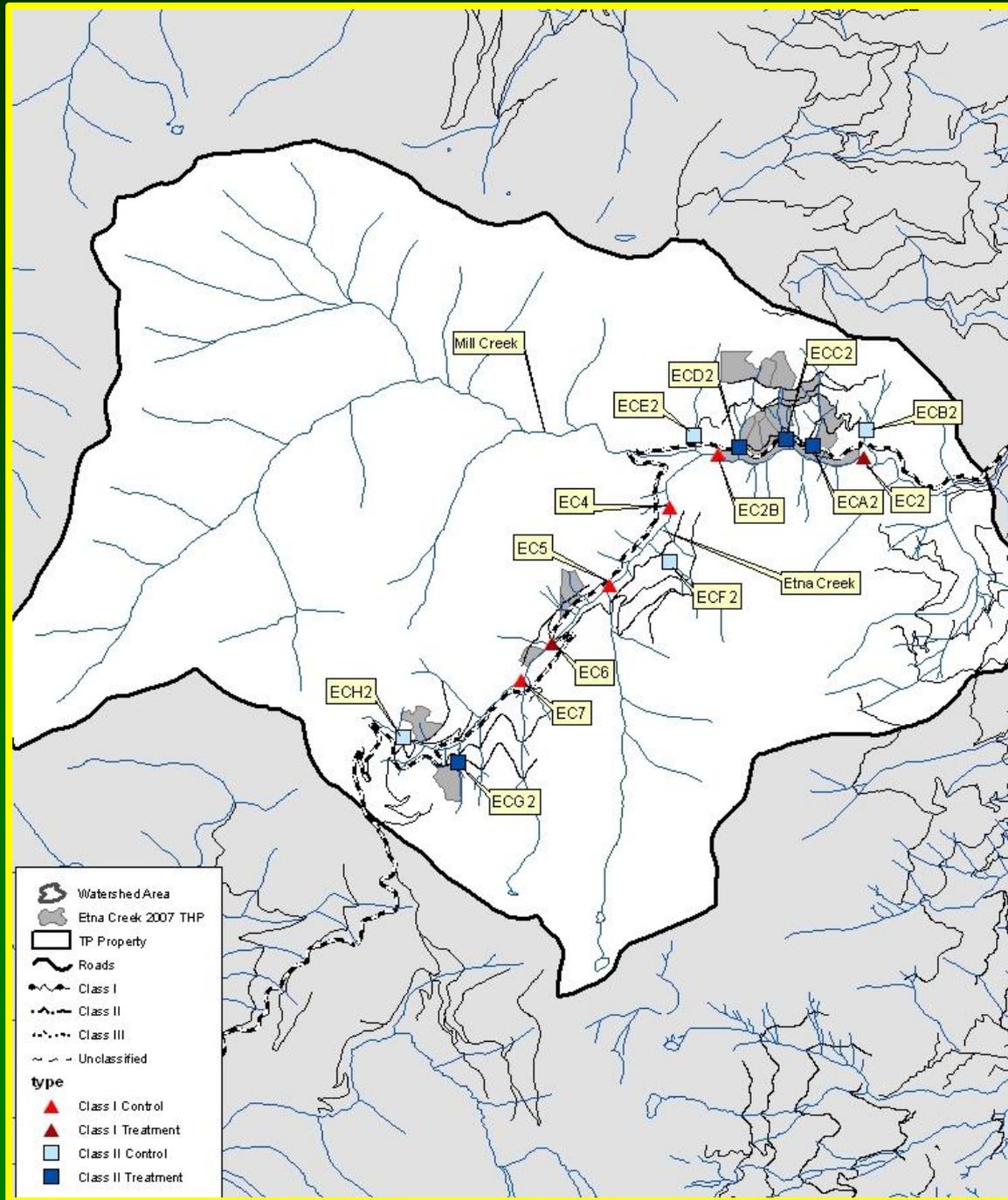


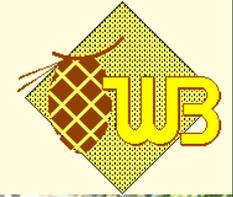


Proposed Alternative WLPZ

- Meetings with CDFW and NCRWQCB
- Shade = Canopy Closure
 - Class I WLPZ = no harvest for 50 ft and 50% CC for next 100 ft.
 - Class II WLPZ = 70% CC for 25 ft and 50% CC for next 75 ft.
- Surface erosion = Primarily from harvest units
- Watershed level water temperature
Reach level water temperature, air temperature and humidity
- Reach level instantaneous stream flow
- Monitoring minimum of 1 year pre and 2 years post treatment monitoring.

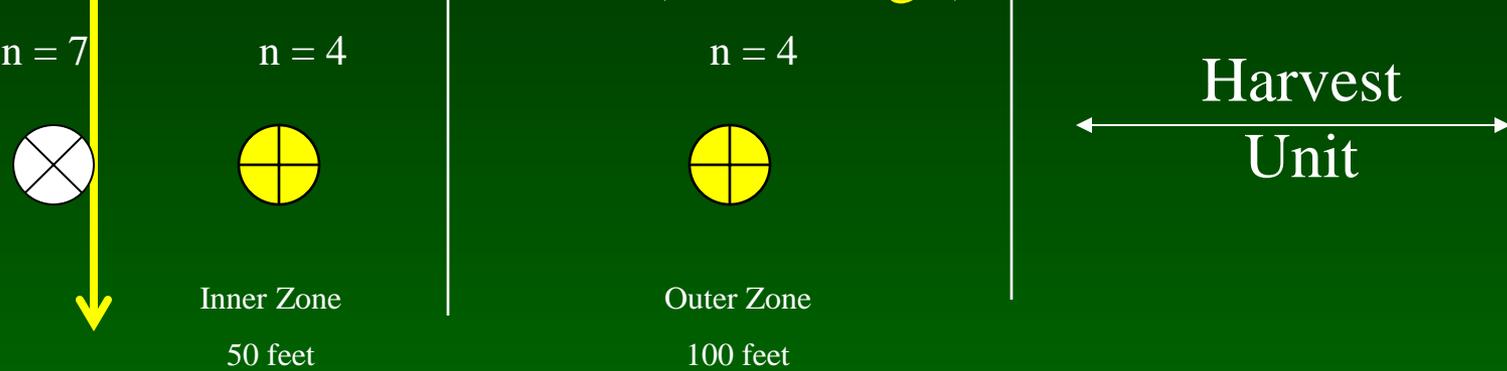




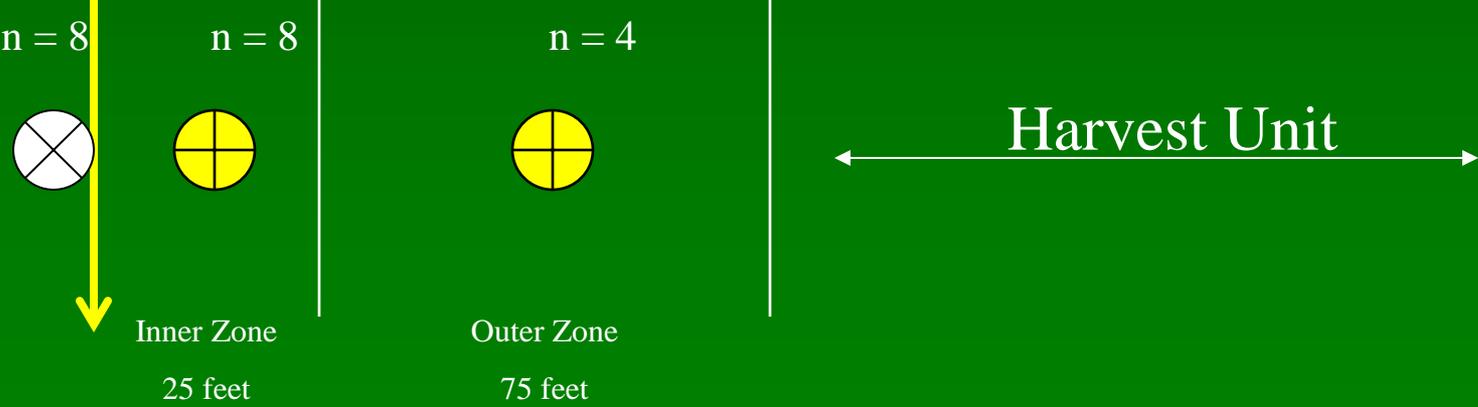


Class I and Class II Streams Station Design

Class I (BA Design)



Class II (BACI Design)





Methods (Canopy closure)

- Canopy closure measured pre and post harvest field surveys for 6,100 feet of Class I WLPZ

Plot every 100 feet of WLPZ resulting in 61 segments.

Plots collected in stream channel, inner and outer zone = 183 plots

- Canopy closure measured pre and post harvest field surveys for 10,980 feet of Class II WLPZ

Plot every 100 feet of WLPZ resulting in 124 segments.

Plots collected in stream channel, inner and outer zone = 372 plots

- Both densiometer and siting tube measurements collected

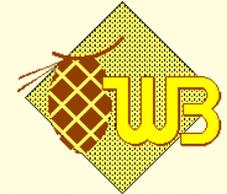




Methods (Sediment Delivery)

- Class I (6,100 ft) and Class II (10,980 ft) field surveyed pre-harvest and 1st and 2nd winter following harvest
- Sediment transport measured qualitatively pre and post harvest
- Visual inspection for sheet, rill and gully erosion from harvest units, skid trails, road relief culverts, road culvert crossings, road rolling dips and small landslides.
- Erosion feature measured by location, type, length-width-depth, existing mitigation measures observed.
- Initiation point and delivery point





Results (Class I WLPZ thinning unit)



Canopy Closure (outer zone)

Densiometer 83% reduced to 73%
Siting tube 72% reduced to 53%



Treatment relative to Control

Inner Zone Air -0.5C

Outer Zone Air 0.3C

Inner Zone RH 5.3%

Outer Zone RH -1.4%



Results (Class I WLPZ clearcut unit)



Canopy Closure

Densiometer	84% reduced to 53%
Siting tube	67% reduced to 53%

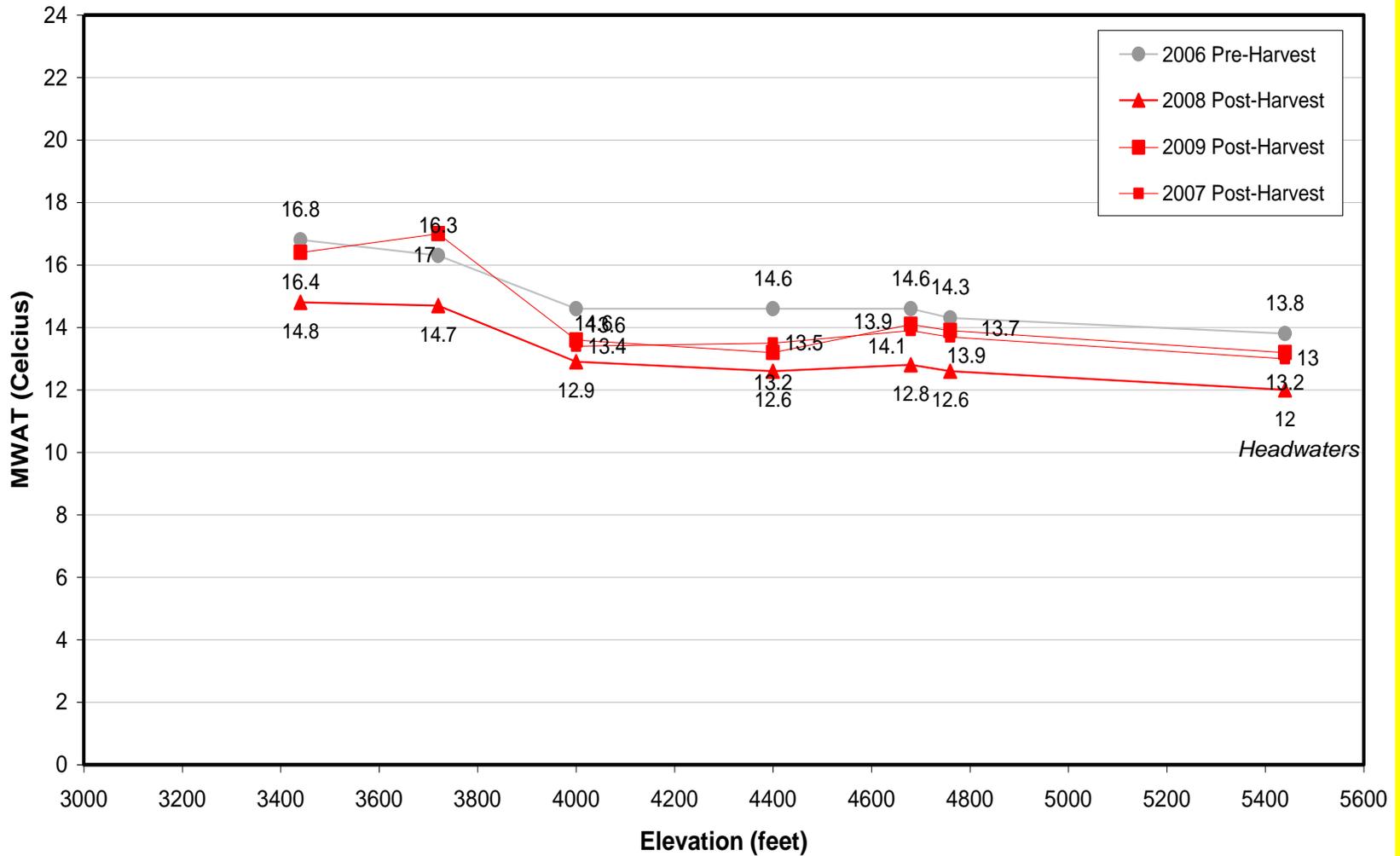
Treatment relative to Control

Inner Zone Air	-0.3C
Outer Zone Air	1.0C

Inner Zone RH	nd% (bear)
Outer Zone RH	-9.0%

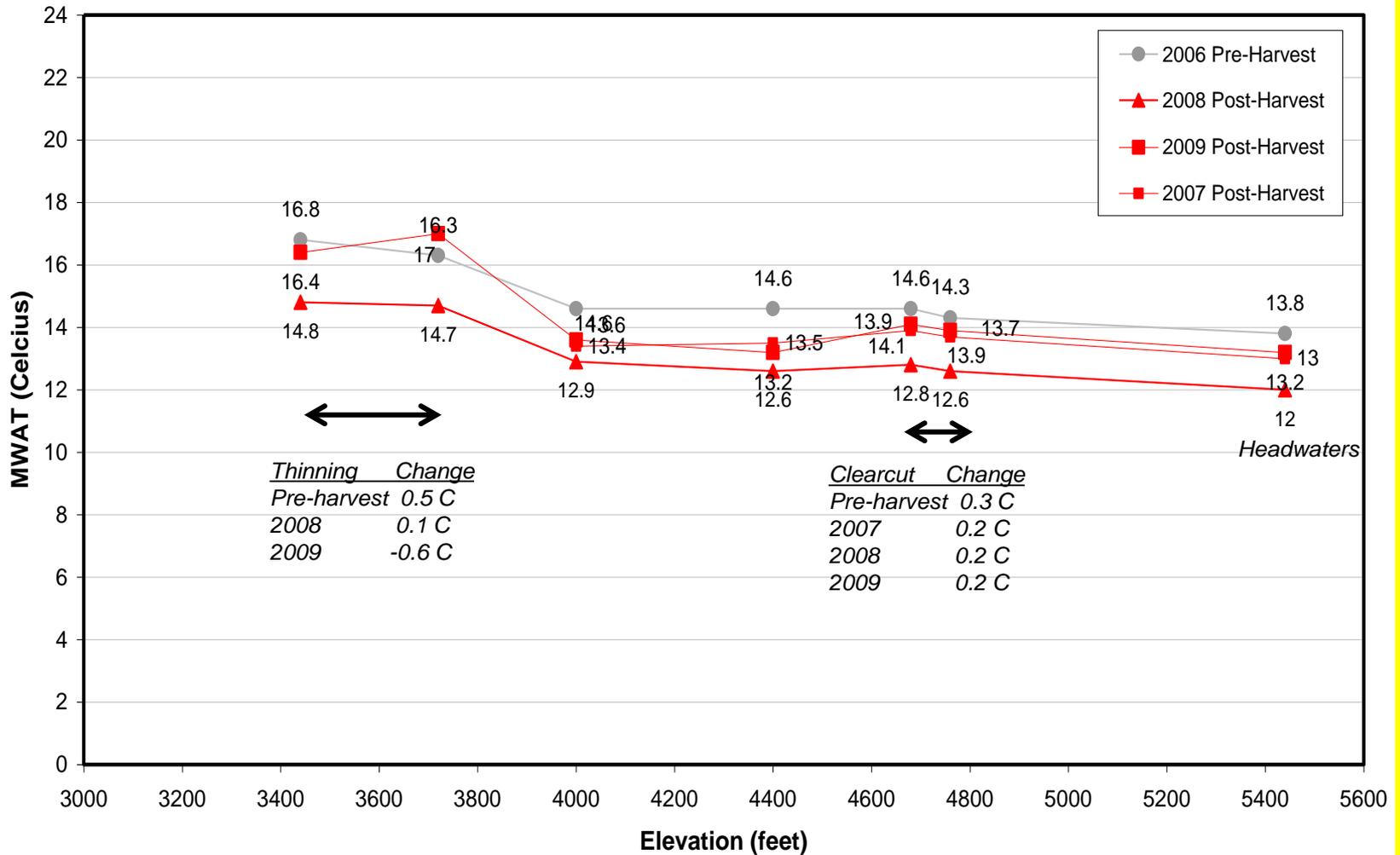


Results (MWAT Class I WLPZ thinning unit and clearcut unit)





Results (MWAT Class I WLPZ thinning unit and clearcut unit)



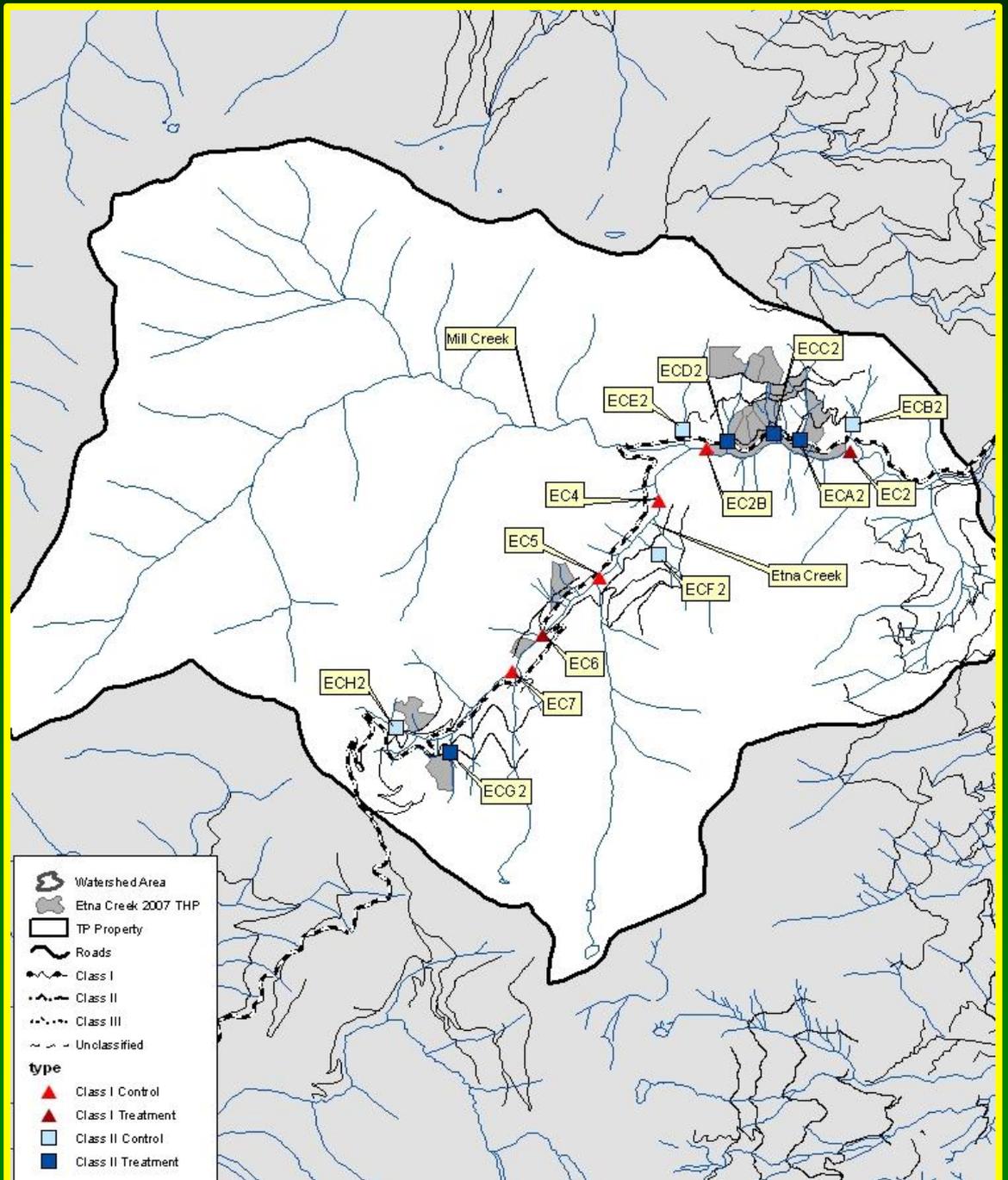


Results

Class II WLPZ

4 Control
4 Treatment

Outer zone
(25- 100 feet)





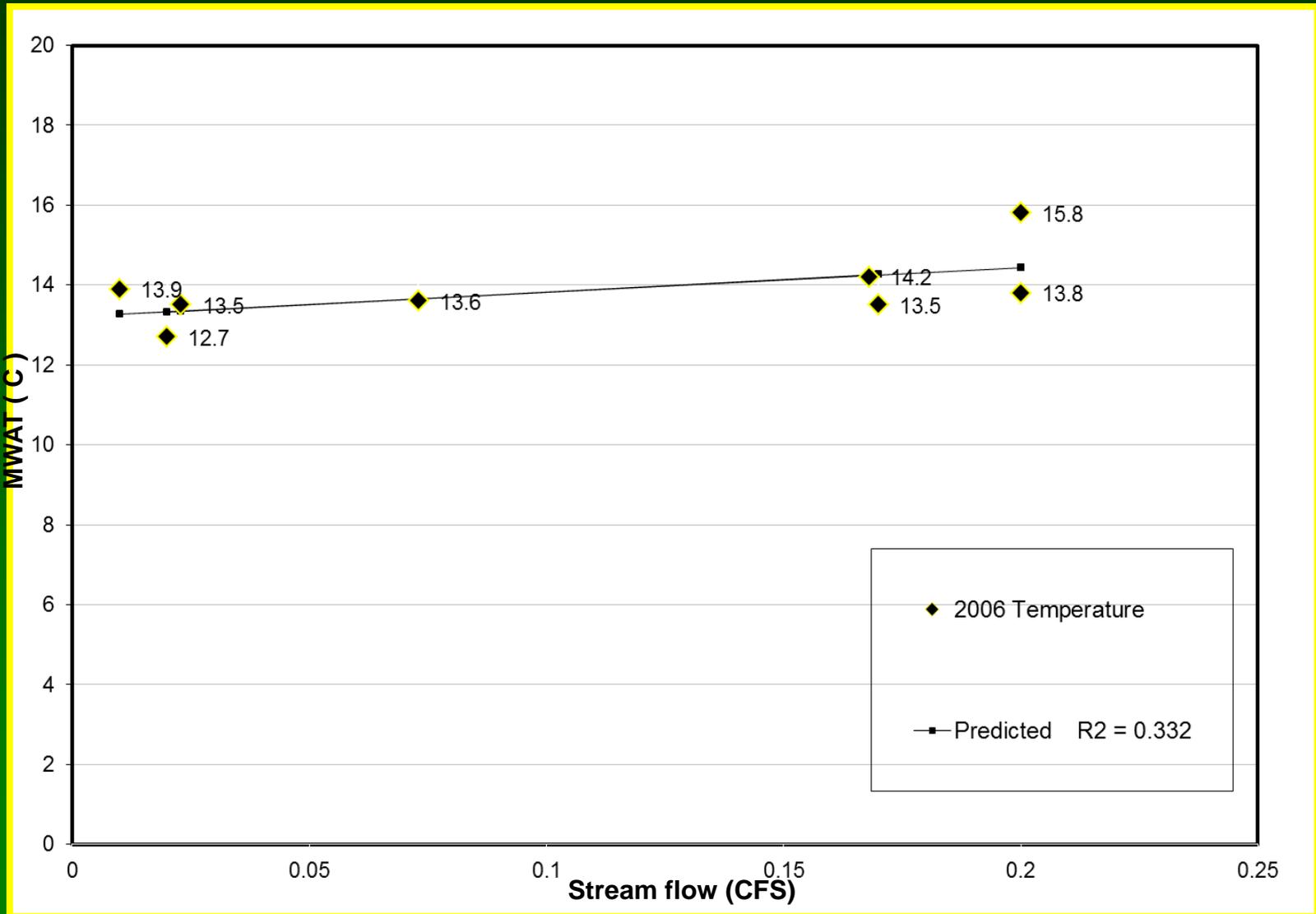
Results: Class II water temperatures (Pre-harvest 2006)



Class II Water Temp Site	Treatment Site (MWAT)	Control Site (MWAT)
ECA2	14.2	
ECC2	12.7	
ECD2	13.6	
ECG2	13.9 (Dewatered)	
ECB2		13.5
ECE2		15.8
ECF2		12.9
ECH2		13.8
Mean	13.6	14.0
Range	12.7 to 14.2	12.9 to 15.8

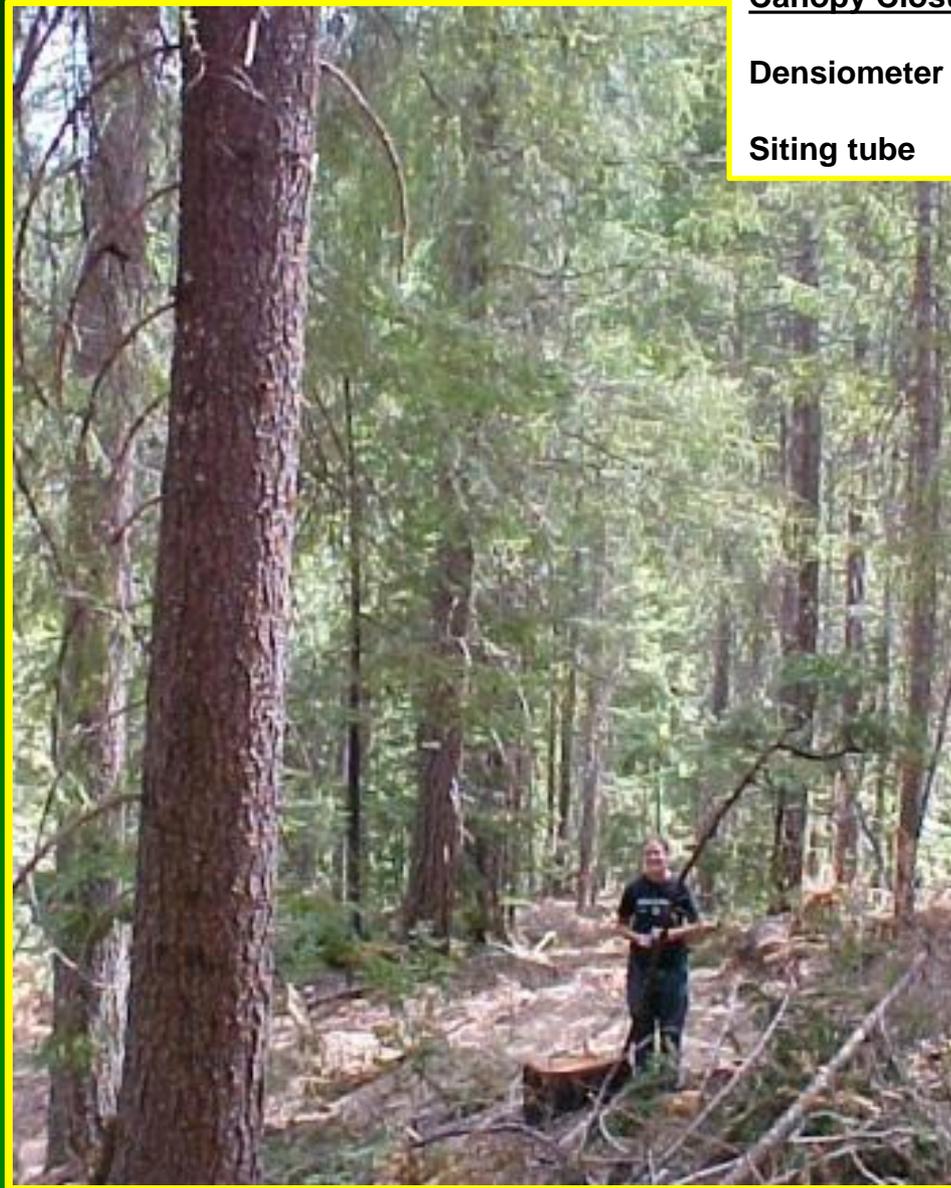


Results: Class II stream flows (Pre-harvest 2006)





Results (Class II WLPZ thinning and clearcut units)



Canopy Closure (outer zone)

Densiometer 83% reduced to 75%

Siting tube 70% reduced to 62%



Results: Class II air temperature and humidity (MWAT)

Outer Zone (25 to 100 feet)

		<u>Air</u> <u>Mean C</u>	<u>Relative</u> <u>Humidity (%)</u>
Treatment (A2,C2,D2,G2)	Pre-harvest	23.1 C	62.8 %
	Post-harvest	<u>22.9</u> -0.2	<u>48.7</u> -14.1
Control (B2,E2,F2,H2)	Pre-harvest	23.6	56.4
	Post-harvest	<u>22.0</u> -1.6	<u>47.2</u> -9.1

Relative to control Outer Zone air increased 1.5 C and RH decreased -5.0%





Results: Class II water temperature (MWAT)

		Range	Mean
Treatment (A2,C2,D2,G2)	Pre-harvest	12.7 to 14.2 C	13.6 C
	Post-harvest	12.0 to 13.9 C	<u>13.1 C</u> -0.5 C
Control (B2,E2,F2,H2)	Pre-harvest	12.9 to 15.8 C	14.0 C
	Post-harvest	12.4 to 14.6 C	<u>13.3 C</u> -0.7 C

Air temperature increased and relative humidity decreased relative to controls, yet stream water temperature remained relatively unchanged.



Results: Surface erosion





Summary of Results

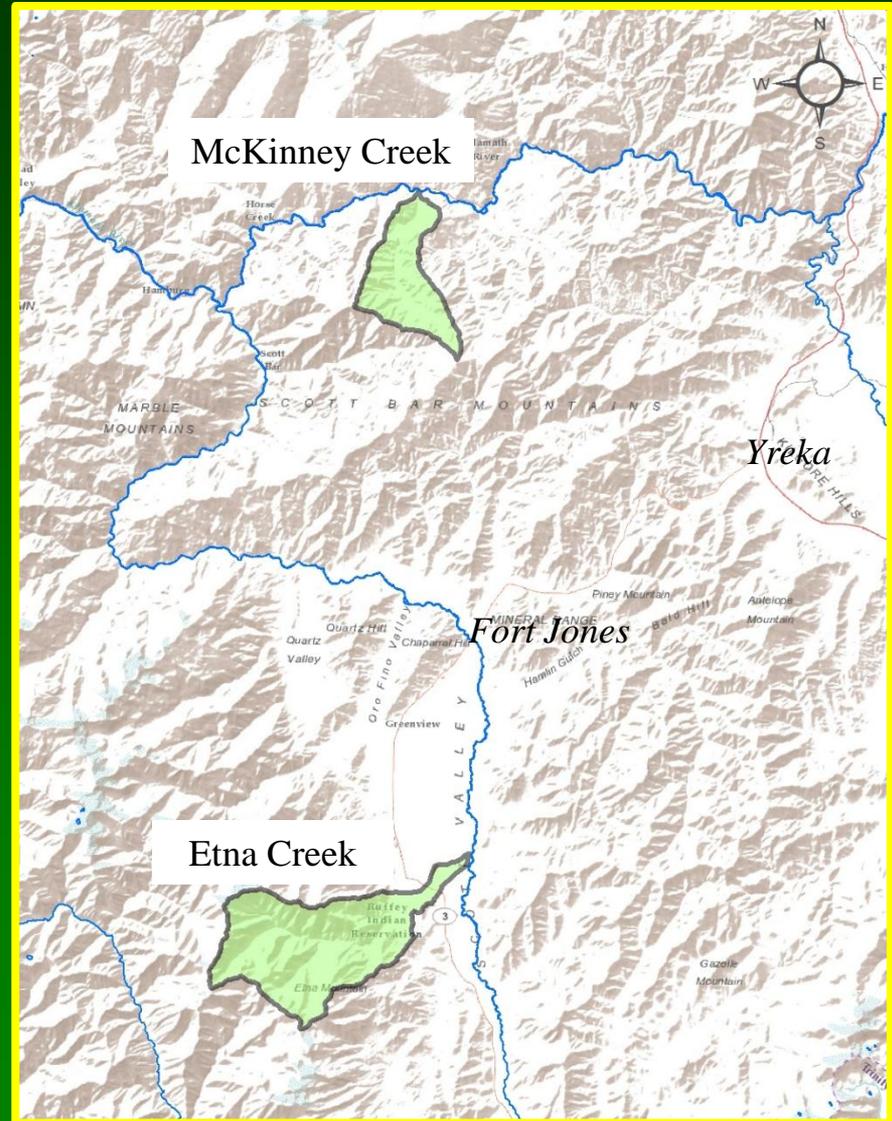
- Class I WLPZ outer zone air increased 1.0C and humidity decreased 9.0% (clearcut unit)
- Canopy closure was reduced from 72% to 53% in Class I WLPZ outer zones and MWAT remained relatively unchanged.
- Class II WLPZ outer zone air increased 1.5C and humidity decreased 5.0%.
- Canopy closure was reduced to 62% in Class II WLPZ outer zones and MWAT remained relatively unchanged.
- Sediment transport (both pre and post treatment) to the WLPZ was stopped by waterbars, slash over all skid trails and landings.





McKinney Creek Alternative WLPZ

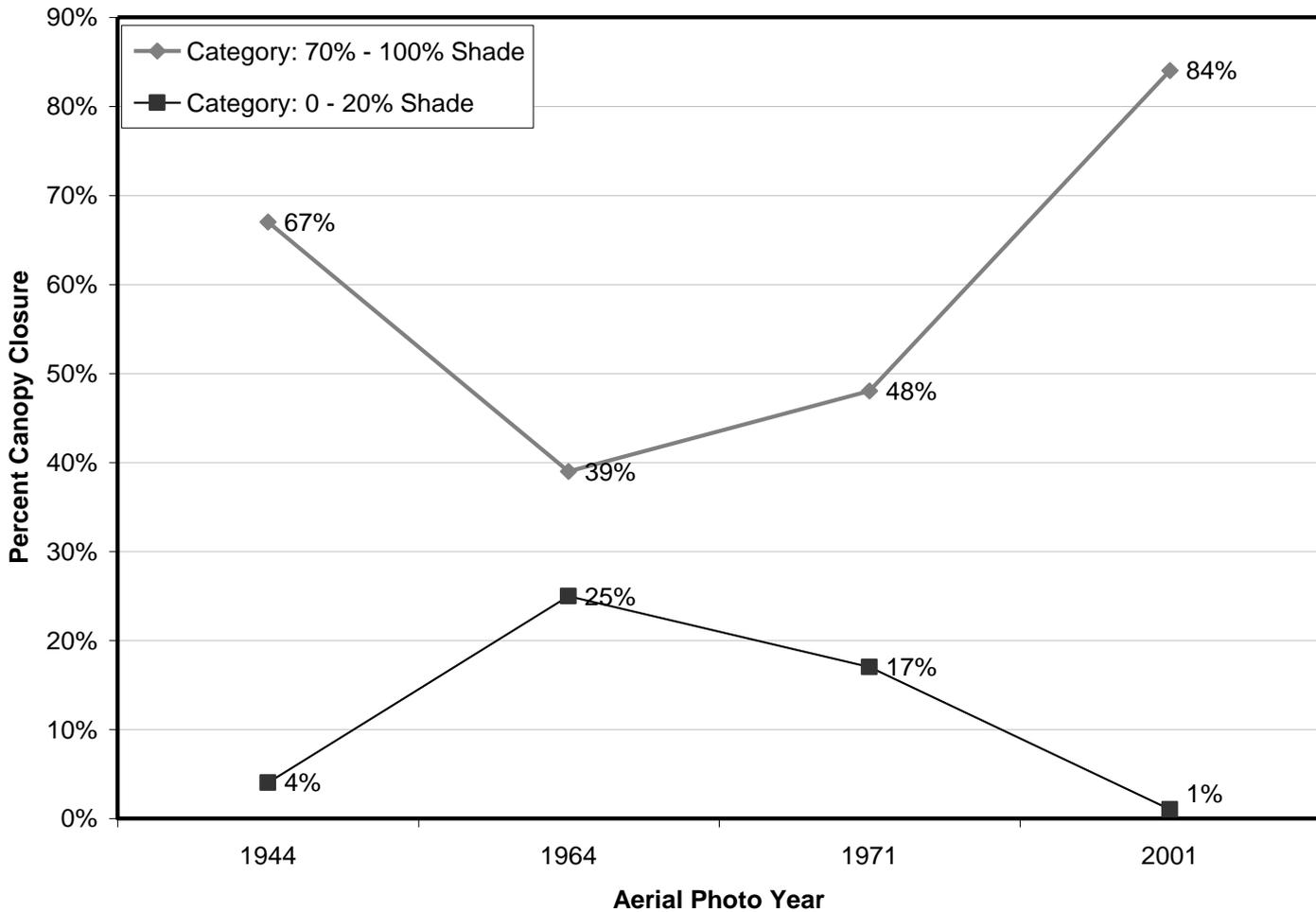
- Tributary to Klamath River
7,289 acres
- Metamorphic/Granite geology
- Small scale study,
Before-After (BA)
- Chinook in watershed
Steelhead in watershed
Native trout in study area
- Worked cooperatively with
CAL FIRE, CDFW and
NCRWQCB.





McKinney Creek channel and riparian assessment

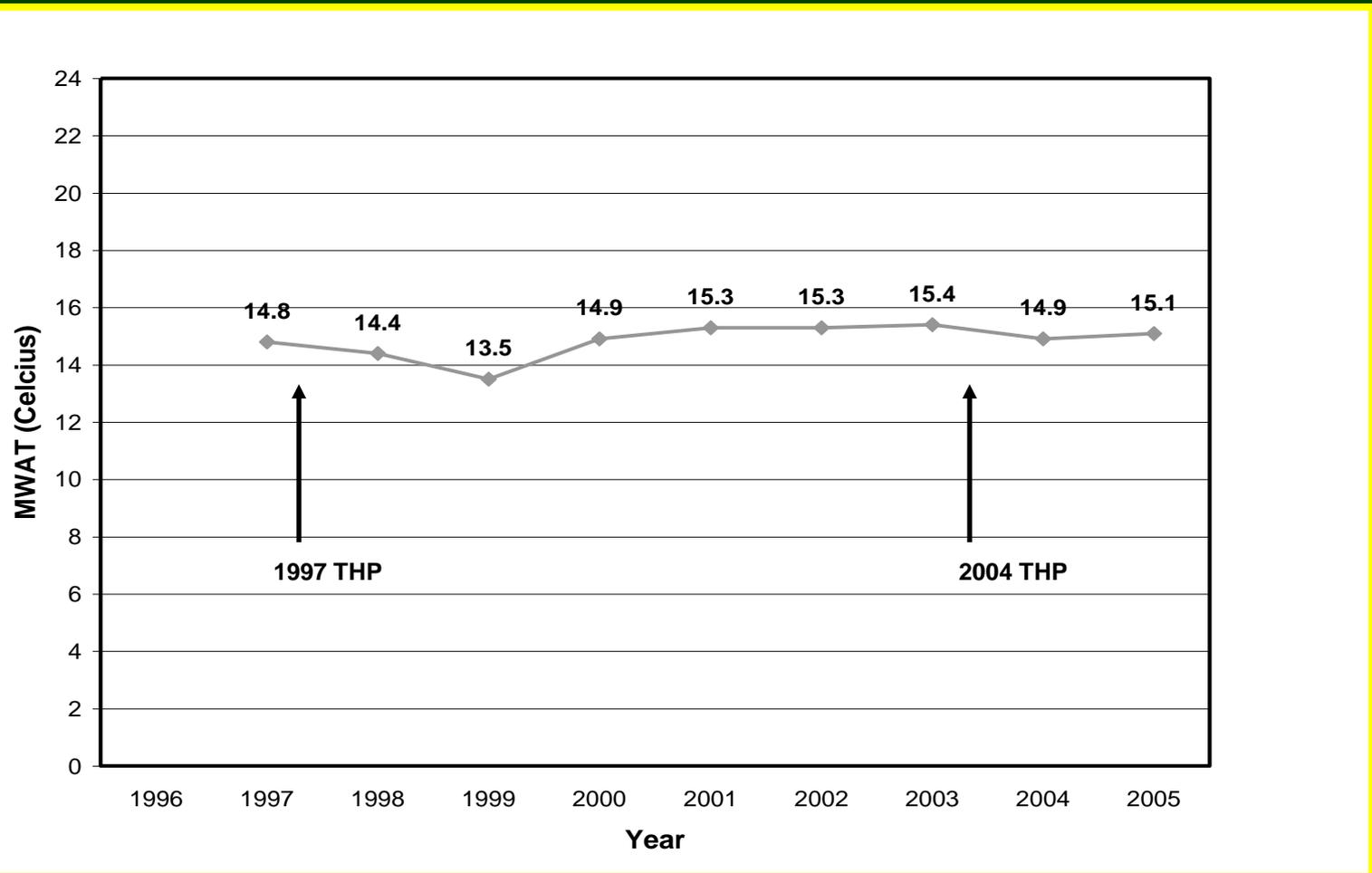
Watershed Analysis methodology (DNR 1995)





McKinney Creek channel and riparian assessment

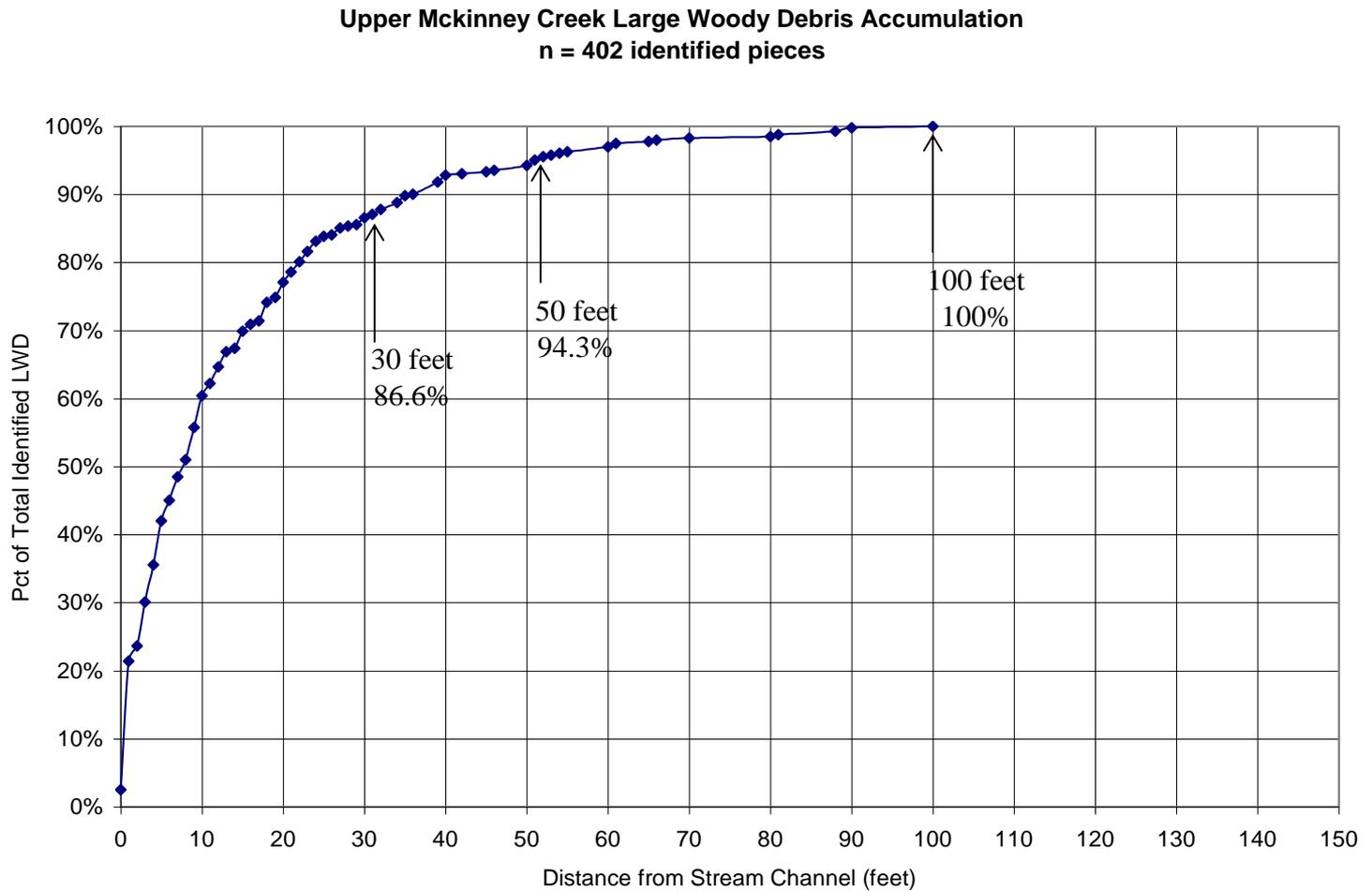
Using Onset Hobo H8 sensors calibrated to NIST thermometer

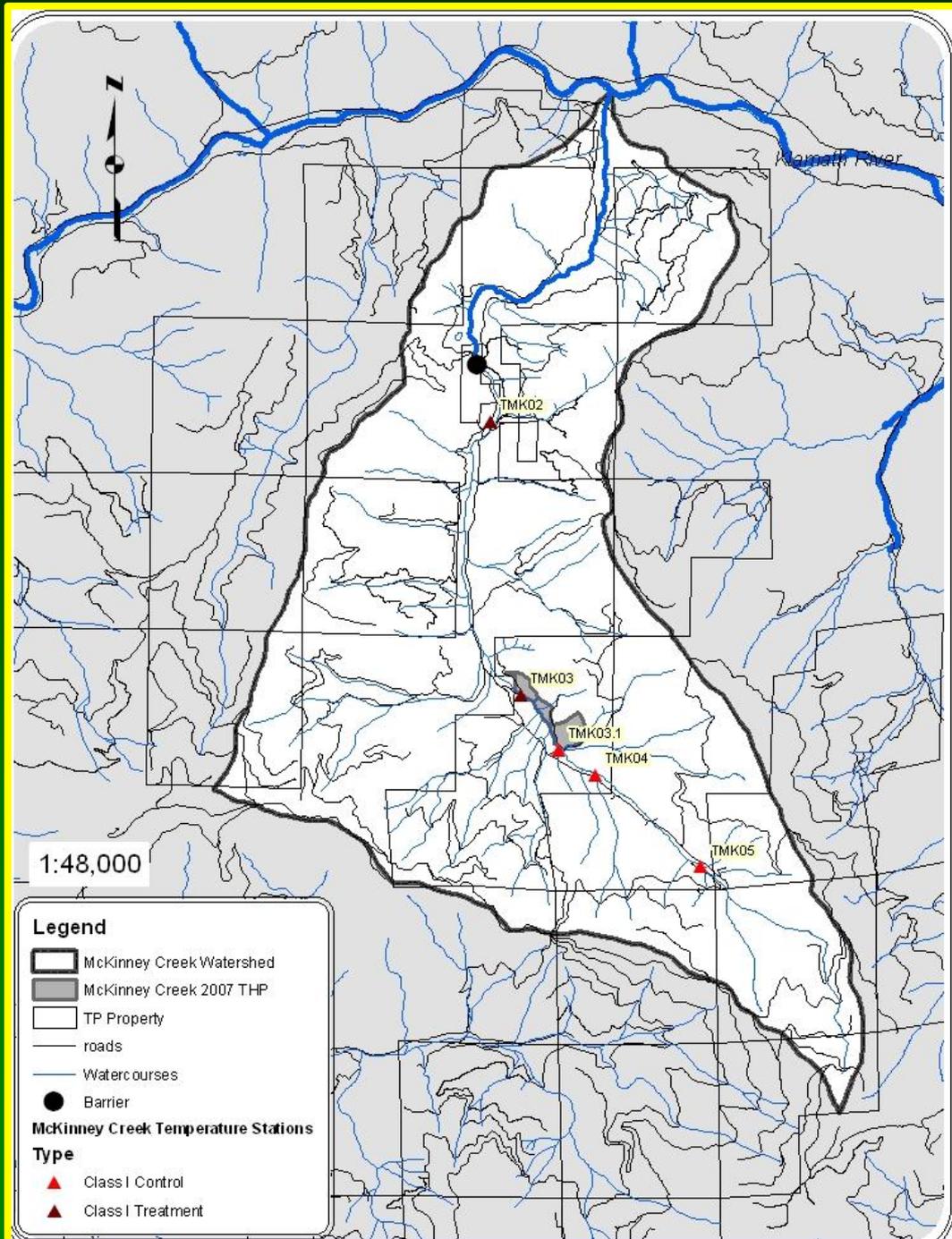




McKinney Creek channel and riparian assessment

Methodology from McDade et al. 1990





1:48,000

Legend

- McKinney Creek Watershed
- McKinney Creek 2007 THP
- TP Property
- roads
- Water courses
- Barrier

McKinney Creek Temperature Stations

Type

- Class I Control
- Class I Treatment



Methods (Canopy closure)

- Canopy closure measured pre and post harvest field surveys for 3,200 feet of Class I WLPZ

Plot every 100 feet of WLPZ resulting in 32 segments.

Plots collected in stream channel, inner and outer zone = 124 plots

- Both densiometer and siting tube measurements collected

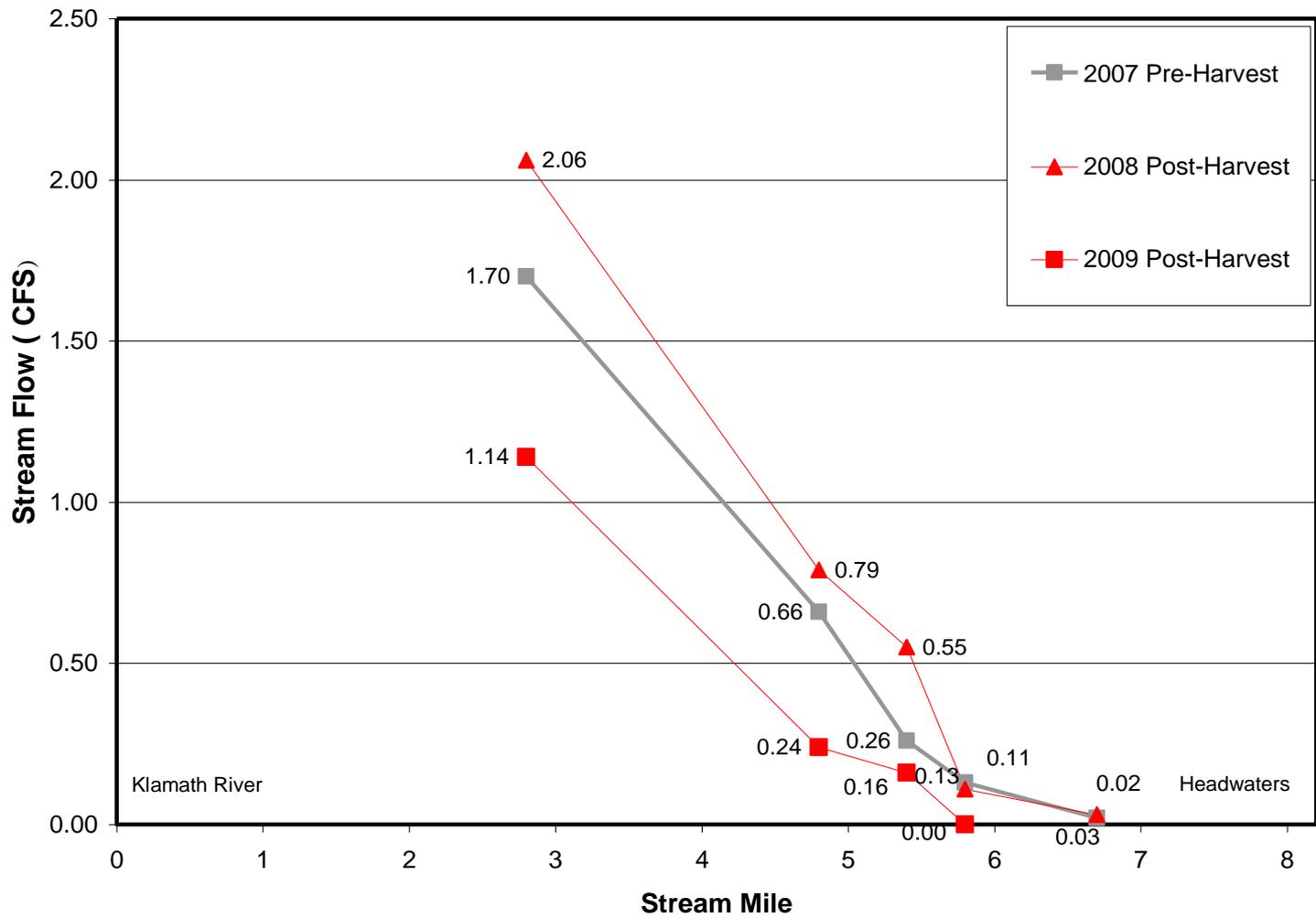
Surface Delivery

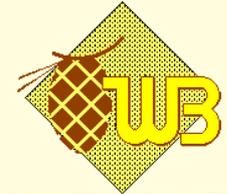
- Class I (3,200 ft) field surveyed pre-harvest and 1st and 2nd winter following harvest
- Sediment transport measured qualitatively pre and post harvest
- Visual inspection
- Erosion features measured
- Initiation point and delivery point





Results: Class I annual stream flow





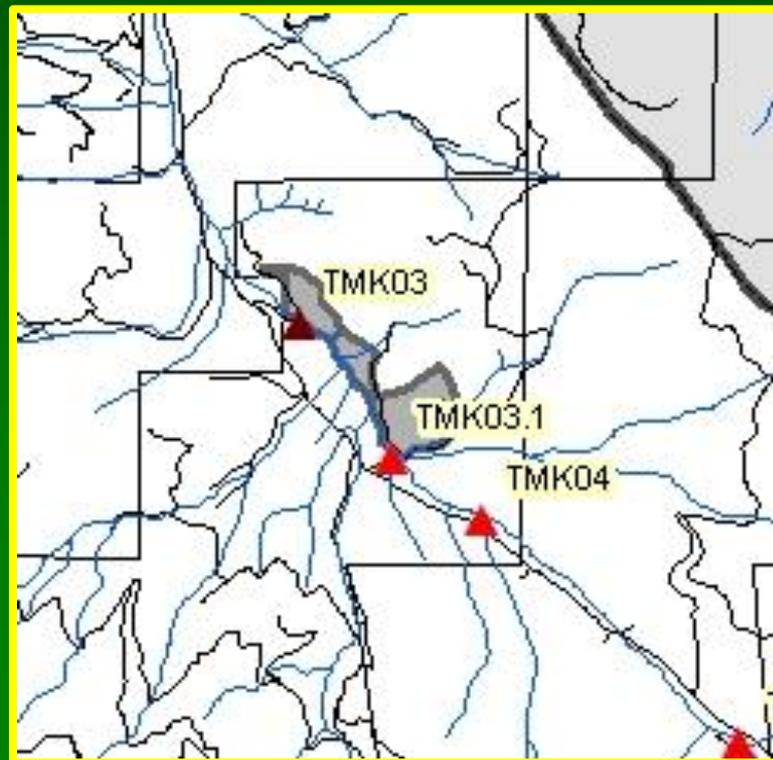
Results (Reach level)

<u>Year</u>	<u>TMK03.1 Control</u>	<u>TMK03 Treatment</u>	<u>Difference</u>
2006 Pre	na	14.7 C	
2007 Pre	13.3 C	13.8 C	0.5 C
2008 Post	13.3 C	13.6 C	0.3 C
2009 Post	14.2 C	15.1 C	0.9 C

Canopy closure (outer zone)

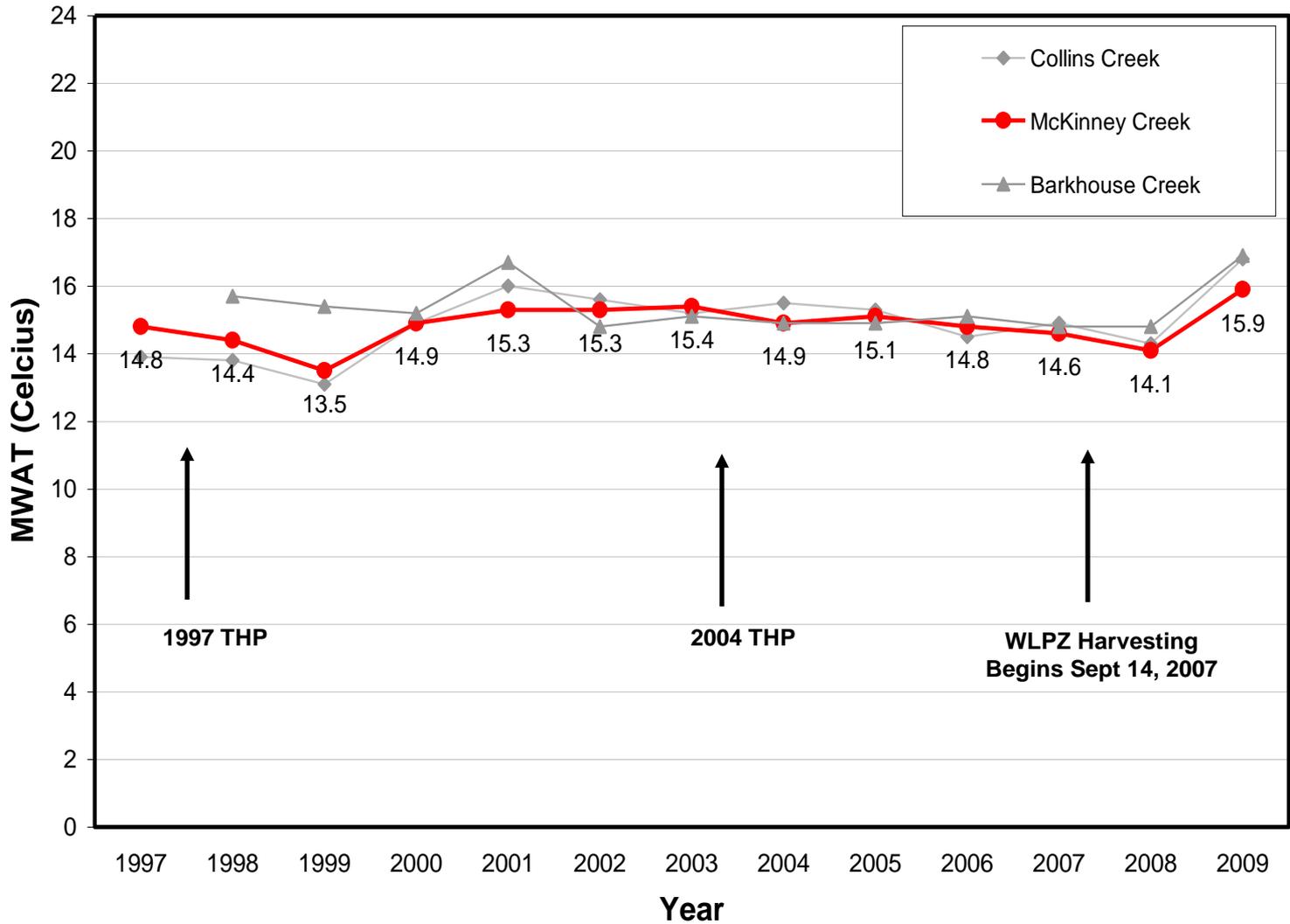
Densimeter 84% reduced to 73%

Siting tube 67% reduced to 53%





Results: MWAT Class I WLPZ clearcut unit(s)





Summary of Results

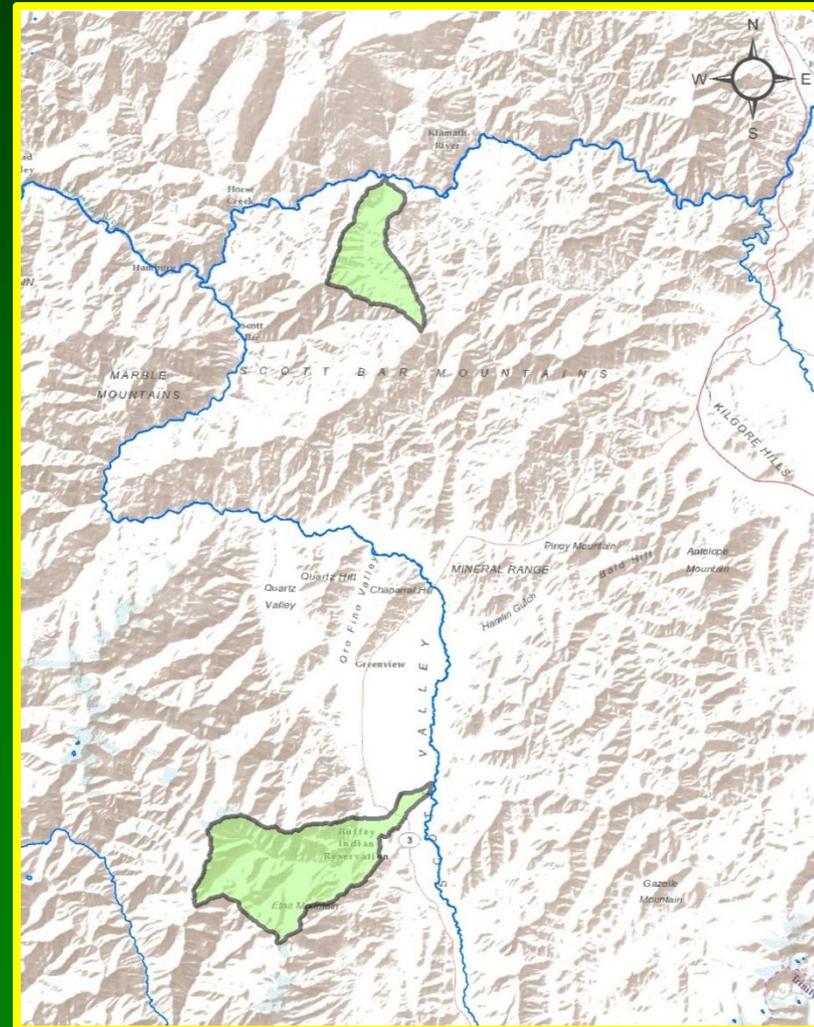
- Canopy closure was reduced from 73% to 53% in Class I WLPZ outer zones.
- MWAT decreased in 2008 and increased in 2009 related to local changes in stream flows and air temperature.
- Post-harvest windthrow of riparian trees in the channel and inner zone was isolated to relatively small portion of WLPZ (group of 13 trees).
- Sediment transport to the WLPZ was stopped by waterbars, slash over all skid trails and landings.





Limitations of Results

- Results indicate that the alternative WLPZ was effective in maintaining stream temperatures and trapping surface erosion.
- Measurements made during the most acute potential impacts from timber harvesting (ie summer water temperatures).
- Due to limited sample size (ie replicates), generalization of results should be limited to similar geomorphic and ecological conditions. (ie. lithotopo types)





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