HAZARDOUS FUELS REDUCTION DEMONSTRATION

California Society of **American** Foresters Winter Meeting

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Tad Mason, CEO
TSS Consultants

OVERVIEW

- Project Goals
- Summary of Objectives
- Project Sponsors
- Project Implementation
- Results
  - Fire and Fuels
  - Soil Impacts
  - Production and Cost
- Observations
- Recommendations
- Acknowledgements

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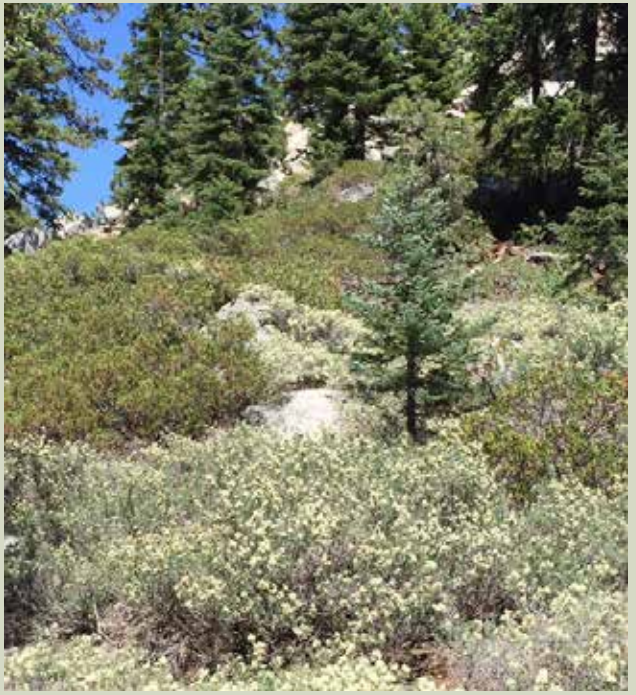
PROJECT FUNDING AND IMPLEMENTATION

- Funding provided by:
  - National Fire Plan grant – USDA Forest Service Pacific Southwest Region and administered by the Watershed Training and Research Center.
  - Southern California Edison
  - California Department of Forestry and Fire Protection
- Implemented by a team lead by:
  - Tad Mason, TSS Consultants
  - Peter Tittmann, UC Berkeley, Center for Forestry
  - Ricky Satomi, UC Berkeley, Center for Forestry
  - David Weise, Fire and Fuels Program USFS PSW Station

PROJECT GOAL

- Successfully demonstrate to natural resource managers, landowners, private contractors, agency personnel, concerned public and other stakeholders, the options available to treat excess biomass material.



PROJECT OBJECTIVES – SHORT TERM

Short term objectives of this project include:

- Improved ability of agencies to plan and budget for future fuels treatment projects.
- Development of an informed cadre of local fuels treatment contractors and local stakeholder groups (e.g., fire safe councils, homeowners association, resource conservation districts).
- Outreach to the general public (e.g., media, homeowners, forest landowners) with regards to fuels treatment opportunities, techniques and latest technology.
- Secure public support for increasing the pace and scale of ecologically sound fuels treatment activities.
- Promotion of cost effective, minimum impact fuels treatment alternatives.

PROJECT OBJECTIVES – LONG TERM

Long term objectives of this project include:

- Significant increase in the number of acres treated in support of the reduction of hazardous fuels and improvement of the ecological health of at risk landscapes.
- Reduction of site impacts from fuels treatment activities.
- Creation of long-term sustainable jobs.
- Promotion of an informed public, one that more fully appreciates the complexities of fuels treatment efforts and the statewide challenge of creating and maintaining fire resilient landscapes.
- Improved water yields, timing and quality.

PROJECT LOCATIONS

EQUIPMENT DEPLOYMENT - FALL 2015

Location	Site Ownership	Vegetation Cover Type	Schedule
Shaver lake	Southern California Edison	High elevation Sierra Nevada mixed conifer	October 5-10
Big Bear Lake	USDA Forest Service, San Bernardino National Forest	High elevation San Bernardino mixed conifer	October 12-17
Santa Rosa Indian Reservation	Santa Rosa Band of the Cahuilla Indians	Mid elevation chaparral	November 16-21

TREATMENT SYSTEM	SHAVER LAKE	BIG BEAR LAKE	SANTA ROSA
Air Burner Burn Boss	y (exhibit only)	No Treatment	No Treatment
Caterpillar 299D (Skid Steer)	y	y	y
FAE Prime Tech PT 175 (Skid Steer)	y	y	y
Fecon FTX 128L (Skid Steer)	y	y	y
Hand Crew	y	No Treatment	y
John Deere JD 210 (Excavator)	y	No Treatment	No Treatment
Kaiser S2 (Excavator)	y	No Treatment	Y
Star Creek (Goats)	y	No Treatment	No Treatment
Takeuchi TB290 (Excavator)	y	y	y
Takeuchi TL12 (Skid Steer)	y	y	y
Timbco 425D (Excavator)	No Treatment	y	No Treatment
Total Acres Targeted for Treatment at Site	**36.97**	**48.5**	**60**

SKID STEER SYSTEMS

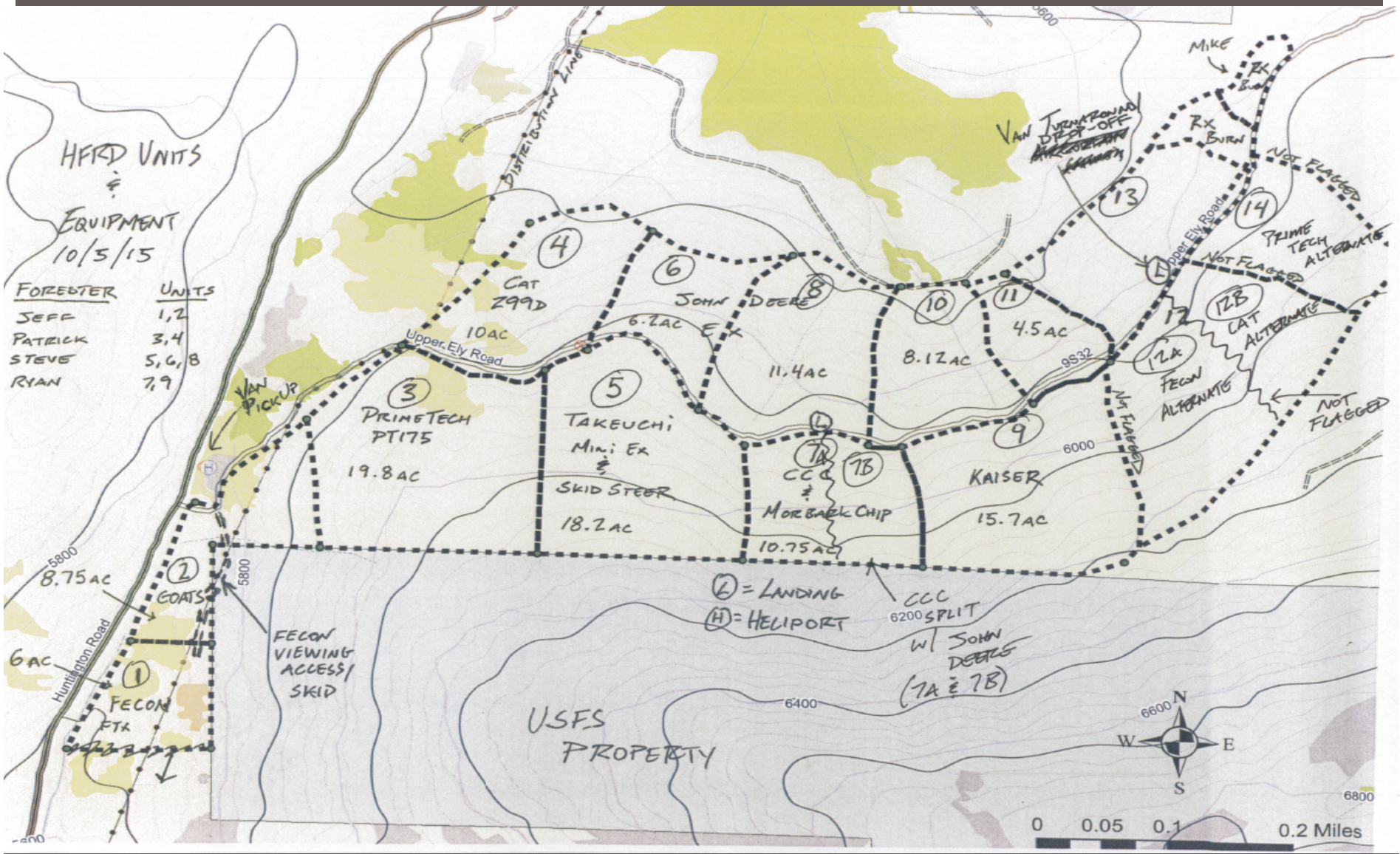
EXCAVATOR SYSTEMS

BIOLOGICAL SYSTEMS

DEMO SCHEDULE

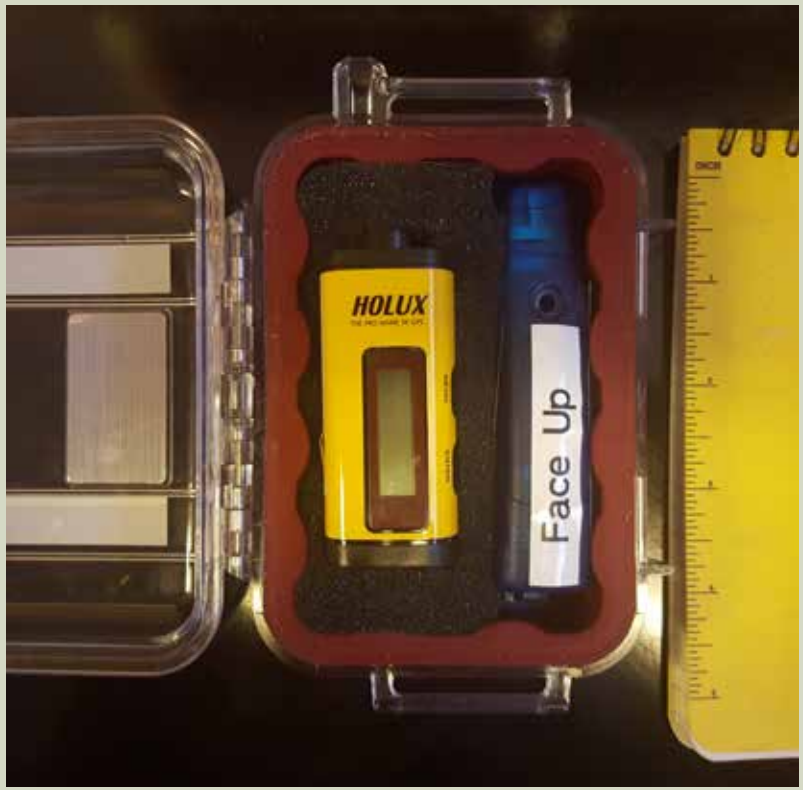
- Day 1: Move in
- Day 2+3+4: Time and motion study. Contractors and media.
- Day 5: Media and general public viewing
- Day 6: Move out

PROJECT LAYOUT



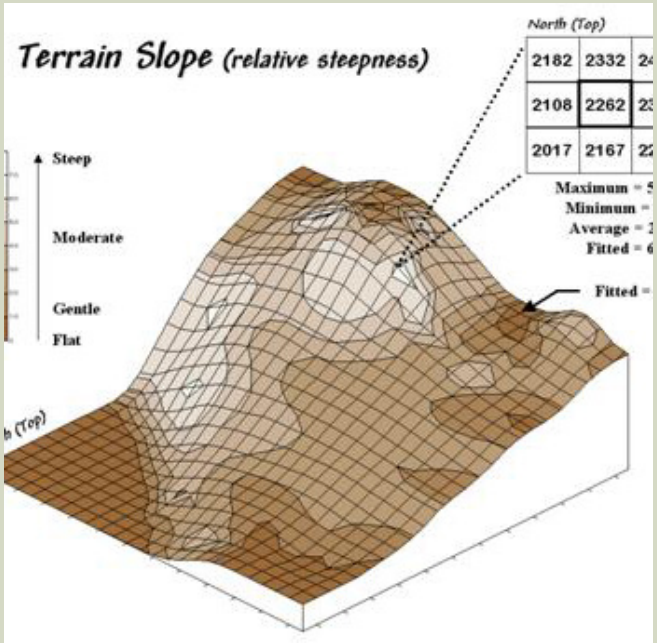
MONITORING – FIELD WORK

- Pre-Treatment:
  - Browns Line Transect and 1/10 ac circular plots to characterize down woody material and vegetation.
  - Photo points.
- During Demo:
  - Acceleromoter and GPS track location and active work (time and motion monitoring).
  - Daily shift reports from operators.
  - Video camera (optional).
- Post-Treatment:
  - Browns Transect and 1/10 ac circular plots to characterize down woody material and vegetation.
  - Photo points.



MONITORING PROTOCOL

- Soil impacts:
  - Characteristics – live plant, fine wood, coarse wood, bare soil, rock.
  - Disturbance – rutting, erosion, compaction, platy. Used USFS Forest Soil Disturbance Protocol. (none (0), low (1), medium (2) or high (3))
- Fire Behavior:
  - Behave Plus to track rate of spread and flame length.
  - Local RAWS weather data at 90th percentile (fuel moistures, wind speed, relative humidity and ambient temperature. Accelerometer and GPS track location and active work.
- System Productivity and Cost:
  - Shift level data collected. Vendors provided key cost data; equip cost, O&M, economic life.



FIRE MODELING RESULTS
SHAVER LAKE

TREATMENT SYSTEM	SHRUB COVER (PERCENT)		10 HOUR FUEL (TONS/ACRE)		RATE OF SPREAD (CHAINS/HOUR)		FLAME LENGTH (FEET)	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Caterpillar 299D	90	62	3.54	3.54	39.9	2.3	10.5	6.3
FAE-Prime Tech PT 175	100	1	4.78	3.39	20.1	0.1	10.0	0.1
Fecon FTX 128L	95	4	2.55	6.76	23.9	0.2	7.1	0.2
Goats	70	46	2.32	3.17	18.6	0.2	6.2	3.2
John Deere JD210 Hand Crew	30	20	2.35	3.52	16.2	5.8	7.8	2.8
Takeuchi TL12	10	4	3.66	3.02	26.2	0.1	6.2	0.1
Entire Site					**23.6**	**0.2**	**8.4**	**1.8**

FIRE MODELING RESULTS
BIG BEAR LAKE

TREATMENT SYSTEM	SHRUB COVER (PERCENT)		10 HOUR FUEL (TONS/ACRE)		RATE OF SPREAD (CHAINS/HOUR)		FLAME LENGTH (FEET)	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Caterpillar 299D	80	45	0.94	4.30	35.4	23.1	6.0	8.2
Fecon FTX 128L	65	5	1.27	5.88	37.9	0.0	5.2	0.1
FAE-Prime Tech PT 175	50	5	1.05	3.84	24.0	1.8	6.9	1.5
Takeuchi TB290	50	10	1.91	5.45	35.4	3.8	6.7	2.5
Takeuchi TL12	40	5	0.58	4.76	19.5	5.0	2.9	2.9
Timbco 425D	75	5	0.12	5.88	22.1	2.6	3.1	1.8
Entire Site					**26.3**	**4.1**	**6.2**	**2.9**

FIRE MODELING RESULTS
SANTA ROSA

TREATMENT SYSTEM	SHRUB COVER (PERCENT)		10 HOUR FUEL (TONS/ACRE)		RATE OF SPREAD (CHAINS/HOUR)		FLAME LENGTH (FEET)	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Caterpillar 299D	100	32	1.44	9.10	18.8	0.1	5.5	3.3
Fecon FTX 128L	92	0	1.14	7.95	10.2	0.5	2.6	0.4
Hand Crew	93	40	4.59	6.42	44.2	0.2	14.8	3.8
Kaiser S2 Spider	95	20	5.07	9.99	55.4	0.2	16.9	0.2
FAE - Prime Tech PT175	95	20	5.40	6.99	60.1	0.1	16.6	0.1
Takeuchi TB290	100	0	3.64	7.92	46.5	0.4	14.0	0.3
Takeuchi TL12	95	15	7.16	13.69	61.4	0.1	18.0	0.1
Entire Site					**27.3**	**0.2**	**12.4**	**0.9**

SOIL IMPACT ANALYSIS RESULTS
SHAVER LAKE

TREATMENT SYSTEM	WOODY COVER (PERCENT)		LIVE VEG COVER (PERCENT)		EXPOSED BARE SOIL (PERCENT)		POST TREATMENT DISTURBANCE RATING
	Pre	Post	Pre	Post	Pre	Post	
Caterpillar 299D	70.00	73.33	86.67	46.67	0.00	6.67	0.26
FAE Prime TechPT175	46.67	86.67	86.67	13.33	6.67	26.67	0.06
Fecon FTX 128L	51.67	50.00	76.67	20.00	23.34	10.00	0.04
Hand Crew	60.00	70.00	60.00	40.00	33.33	0.00	0.00
Goats	70.00	63.33	93.33	66.67	6.67	20.00	0.00
John Deere JD 210G	60.00	70.00	60.00	40.00	33.33	0.00	0.00
Takeuchi TB290	70.00	53.33	60.00	6.67	26.67	33.33	0.00

SOIL IMPACT ANALYSIS RESULTS
BIG BEAR LAKE

TREATMENT SYSTEM	WOODY COVER (PERCENT)		LIVE VEG COVER (PERCENT)		EXPOSED BARE SOIL (PERCENT)		POST TREATMENT DISTURBANCE RATING
	Pre	Post	Pre	Post	Pre	Post	
Caterpillar 299D	30.00	33.33	60.00	26.67	26.67	33.33	0.27
FAE - Prime Tech PT175	100.00	60.00	46.67	53.33	20.00	20.00	0.40
Fecon FTX 128L	36.67	53.33	53.33	0.00	13.33	46.67	0.80
Takeuchi TB290	76.67	50.00	13.33	33.33	6.67	13.33	0.13
Takeuchi TL 12	46.67	60.00	46.67	53.33	33.33	20.00	0.33
Timbco 425D	66.67	50.00	80.00	13.33	20.00	60.00	0.27

SOIL IMPACT ANALYSIS RESULTS
SANTA ROSA

TREATMENT SYSTEM	WOODY COVER (PERCENT)		LIVE VEG COVER (PERCENT)		EXPOSED BARE SOIL (PERCENT)		POST TREATMENT DISTURBANCE RATING
	Pre	Post	Pre	Post	Pre	Post	
Caterpillar 299D	50.00	50.00	60.00	20.00	6.67	6.67	1.60
FAE - Prime Tech PT175	40.00	50.00	73.33	0.00	46.67	6.67	1.80
Fecon FTX 128L	53.33	53.33	80.00	0.00	40.00	13.33	0.4
Hand Crew	46.67	50.00	66.67	6.67	46.67	13.33	1.2
Kaiser S2 Spider	53.33	53.33	80.00	13.33	53.33	6.67	0.80
Takeuchi TB290	53.33	53.33	80.00	6.67	20.00	0.00	1.13
Takeuchi TL 12	50.00	50.00	66.67	0.00	60.00	0.00	1.47

RESULTS – MASTICATION PRODUCTIVITY AND COST

Treatment Type	Treatment System	Shaver Lake		Big Bear Lake		Santa Rosa	
		Production (hour/ acre)	Cost Rate ($/acre)	Production (hour/ acre)	Cost Rate ($/acre)	Production (hour/ acre)	Cost Rate ($/acre)
Hand Crew	CCC Hand Crew	7.5	$1,681.63	-	-	-	-
Hand Crew	Ramona Tribe	-	-	-	-	14.0	$2,713.78
Goat Herd	Star Creek Land Stewards	8.1	$330.74	-	-	-	-
Boom Mount	John Deere JD 210G	9.9	$614.50	-	-	-	-
Boom Mount	Kaiser S2 Spider	3.7	$426.46	-	-	3.5	$398.97
Boom Mount	Takeuchi TB290	8.2	$348.37	5.5	$233.64	9.1	$385.43
Boom Mount	Timbco 425 D	-	-	1.6	$166.56	-	-
Integrated Machine	FAE - Prime Tech PT175	2.2	$166.21	2.6	$192.34	1.4	$107.41
Integrated Machine	Fecon FTX 128L	2.7	$203.48	3.4	$253.88	1.0	$73.54
Skid Steer Mount	Caterpillar 299D	2.0	$122.81	4.5	$274.16	1.3	$76.86
Skid Steer Mount	Takeuchi TL 12	2.6	$112.12	3.9	$168.70	1.8	$77.13

OBSERVATIONS – FIRE AND FUELS

- **Treatment Systems**

All treatment systems systems significantly altered fuel profiles at all three sites.

- **Increased Down Woody Material**

Amount of down woody material increased as a result of treatment – especially in the 10 to 100 hour fuel classes. Predicted fire behavior (spread, flame length, heat) were reduced, often to levels that would allow direct attack by hand crews.

- **Potential Fire Damage to Root Systems/Topsoil**

Elevated levels of down woody material (post treatment), may contribute to below ground root damage in the event of a fire. However, as woody material decomposed over time and is incorporated into the soil, this potential damage will be mitigated.

OBSERVATIONS – SOIL IMPACTS

- **Overall Soil Impacts**

Overall soil impacts were minimal across all three sites. Hand crews and goats had almost no impact (not surprising).

- **Treatment Prescriptions**

Different terrain, ecosystem types and management objectives result in very site specific treatment prescriptions. Prescriptions will impact treatments, which in turn have potential to more significantly impact soils.

OBSERVATIONS – PRODUCTION RATES AND COSTS

- **Productivity and Cost**

Production rates and costs differ based on treatment system, site and complexity of treatment prescription.

- **Vegetation Consistency, Terrain and Prescription**

Cost per acre rate was lowest for nearly all equipment at the Santa Rosa site. This was primarily due to very consistent veg (shrub dominated site), gentle terrain and a very simple prescription. Big Bear site had the most expensive cost, primarily due to varied veg types and complex treatment prescription.

- **Goats and Hand Crews**

Goats and hand crews were by far the mostly costly systems. Suggest deployment on sensitive sites.

OBSERVATIONS – DEMO ATTENDANCE

- **Participation**

Almost 300 guests attended the demos. Guest demographics was wide ranging – from students (high school and University), to land managers, tribal representatives, media (print and TV), fire agencies.

- **Registration**

Use of on-line registration worked well and facilitated follow-up and delivery of results. Overall soil impacts were minimal across all three sites. Hand crews and goats had almost no impact (not surprising).

- **Media Participation**

Attracting media participation can be very challenging. Only four media reps attended (all at the Shaver Lake demo).

- **Outreach**

Strongly suggest use of communications/outreach plans for **each demo as target audiences will shift depending on demo location.**

RECOMMENDATIONS FOR FUTURE DEMONSTRATIONS

- Extend Post-Treatment Monitoring

Consider monitoring post-treatment conditions over an extended period of time (5 to 10 years). Key variables to monitor include soil conditions, veg response, and woody debris decomposition rates.

- Steep Terrain Demos

Replicate HFRD on steep terrain. Much of the terrain considered at risk to wildfire in CA is located on steep ground (> 35% slope).

- Woody Material Collection and Processing

Value-added uses for excess forest biomass material are expanding (thermal, power, soil amendments, advance biofuels) as innovative conversion technologies evolve. Conduct equipment trials to test techniques to optimize collection, processing and transport of forest biomass material.

ACKNOWLEDGMENTS – PART I

- **Steering Committee**
  - Larry Swan, USFS, State and Private Forestry, Region 5
  - Bruce Hartsough, UC Davis, Biological and Agricultural Engineering Department
  - Steven Brink, California Forestry Association
  - Angie Lottes, California Statewide Wood Energy Team
  - Ed Smith, The Nature Conservancy
  - Glen Barley, CAL FIRE
  - Marva Willey, USFS, Fuels Program Region 5
  - Ted Luckham, Southern California Edison
- **Implementation Team**
  - Peter Tittmann, UC Center for Forestry
  - Ricky Satomi, UC Center for Forestry

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  - David Weise, Fire and Fuels Program, USFS Pacific Southwest Station
  - Raymond Aguayo, USFS Mountain Top Ranger District, San Bernardino National Forest
- **Science Advisory Committee**
  - David Weise, Fire and Fuels Program, USFS Pacific Southwest Station
  - Peter Tittmann, UC Center for Forestry
  - Ricky Satomi, UC Center for Forestry
  - Max Moritz, UC Cooperative Extension

MORE INFORMATION

- Copies of the HFRD final report are available for download from the UCANR Woody Biomass Utilization website:

http://ucanr.edu/sites/WoodyBiomass/Technical_Assistance/Hazardous_Fuels_Reduction_Demonstration_753/

In addition the site hosts before/after images, equipment video clips, and equipment images.

QUESTIONS or HECKLING REMARKS?

Tad Mason, Forester
TSS Consultants
916.600.4174
tmason@tssconsultants.com

www.tssconsultants.com