

**OVERSTORY, FUEL LOADING, AND
SOIL CHANGES FOLLOWING
MECHANICAL MASTICATION OR
THINNING OF SOUTHWESTERN
PINYON-JUNIPER STANDS**

**Gerald J. Gottfried and Steven T. Overby
US Forest Service
Rocky Mountain Research Station
Phoenix and Flagstaff
Arizona**

MASTICATION GUIDELINES

- Create a random mosaic of small openings, strips 0.5-3.0 acres in size.
- Reduce density of trees 1-10" d.b.h.
- 80% of treated woody material should be less than 1" in diameter and 6" long.
- Woody material should not be deeper than 6 ".
- Treat in fall or winter.
- Protect live pinyons and designated snags.
- Leave 50% of shrub cover.

Thinning Guidelines

- Thin between 40 to 60% of canopy cover.
- Target dead pinyon and dense pockets of trees.
- Leave good trees > 8" d.b.h. and good saplings.
- Leave clumps of 0.25-2 acres in size.
- Cut 50% of brush canopy in a mosaic pattern.
- Leave designate snags..



OVERSTORY CONDITIONS IN 2005 (TPA)

	Pied-L	Pied-D	Ju-L/D	Total
<u>School</u> Control	99	5	37	141
Mastication	111	25	22	158
Thinning	112	8	17	137
<u>Summit</u> Control	113	157	108	378
Mastication	127	153	111	391
Thinning	83	153	156	392
<u>May</u> Control	69	51	72	192
Mastication	139	53	15	207
Thinning	85	42	27	154

OVERSTORY CHANGES AT MAY CANYON (TPA)

	Pied-L	Pied-D	Juni	Total
Control				
2005	69	51	72	192
2007	92	55	81	228
Mastication				
2005	139	53	15	207
2007	127	18	12	157
Thinning				
2005	85	42	27	154
2007	61	14	17	92

OVERSTORY CONDITIONS IN 2005 (TPA)

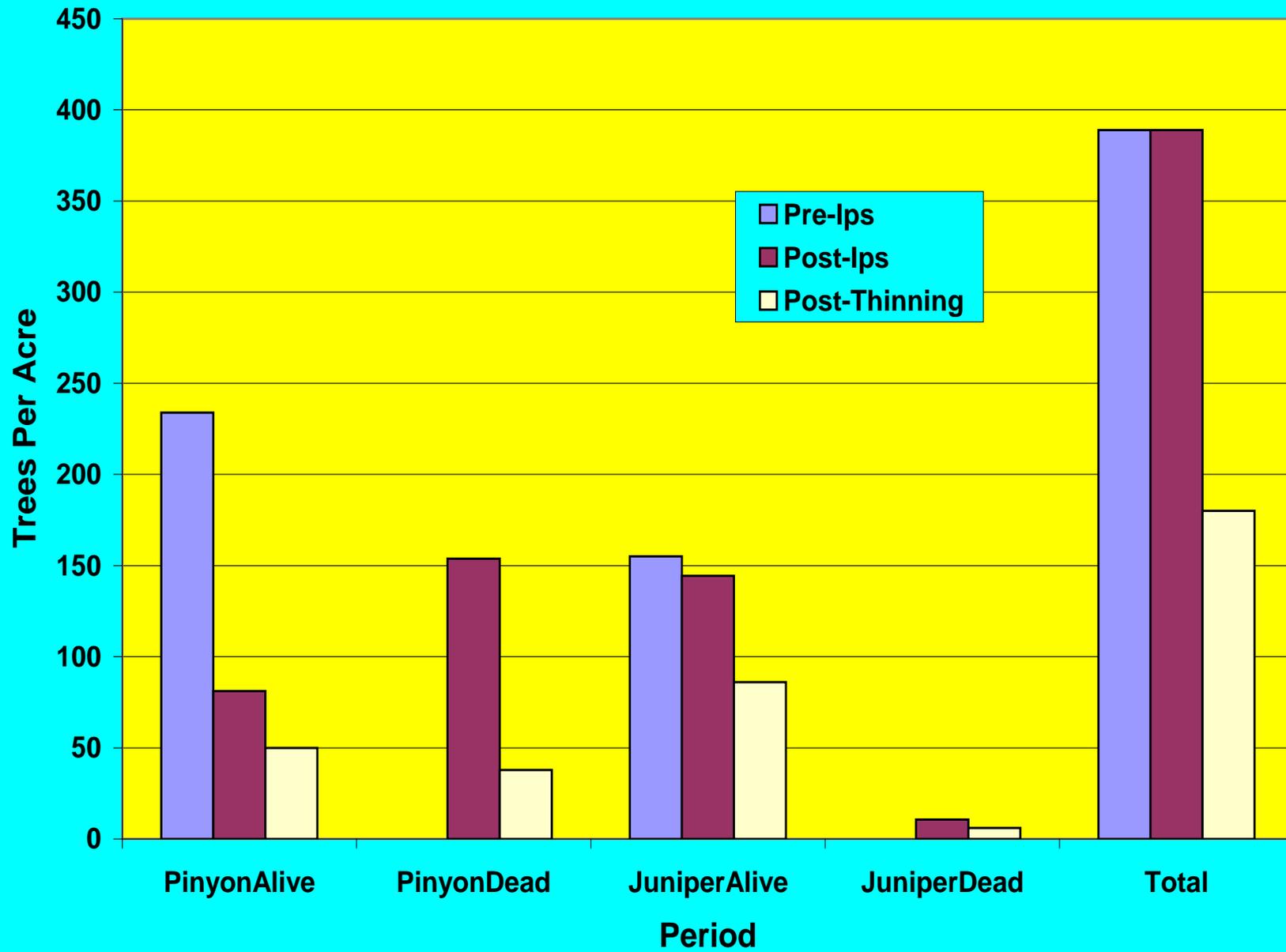
	Pied-L	Pied-D	Ju-L/D	Total
<u>School</u> Control	99	5	37	141
Mastication	111	25	22	158
Thinning	112	8	17	137
<u>Summit</u> Control	113	157	108	378
Mastication	127	153	111	391
Thinning	83	153	156	392
<u>May</u> Control	69	51	72	192
Mastication	139	53	15	207
Thinning	85	42	27	154

PERCENT OF PLOTS BY MASTICATION LEVEL

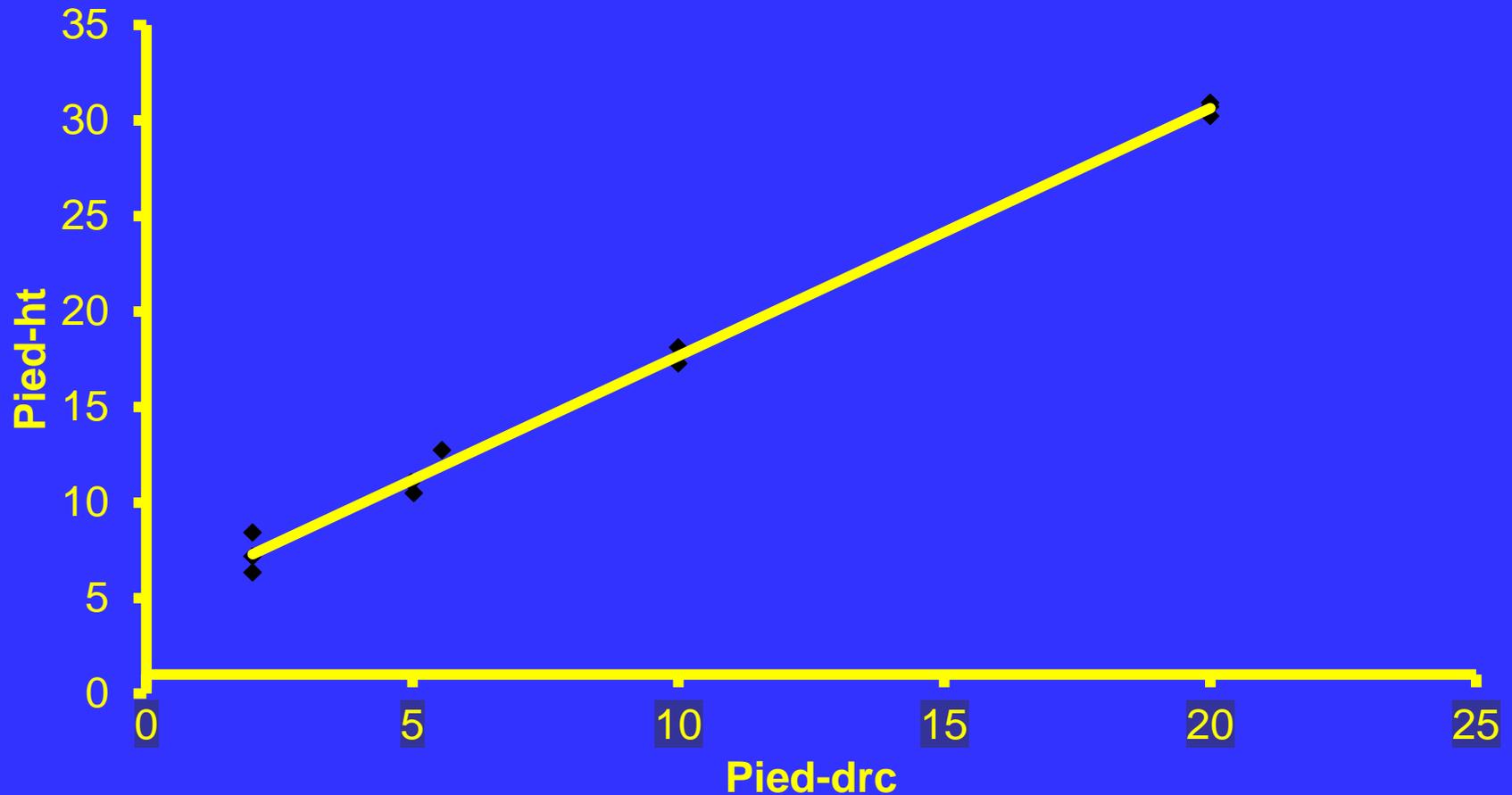


%	School	Summit	May
No trees	6	3	6
0-10	11	44	46
11-49	22	11	17
50-89	33	20	17
≥90	28	22	14

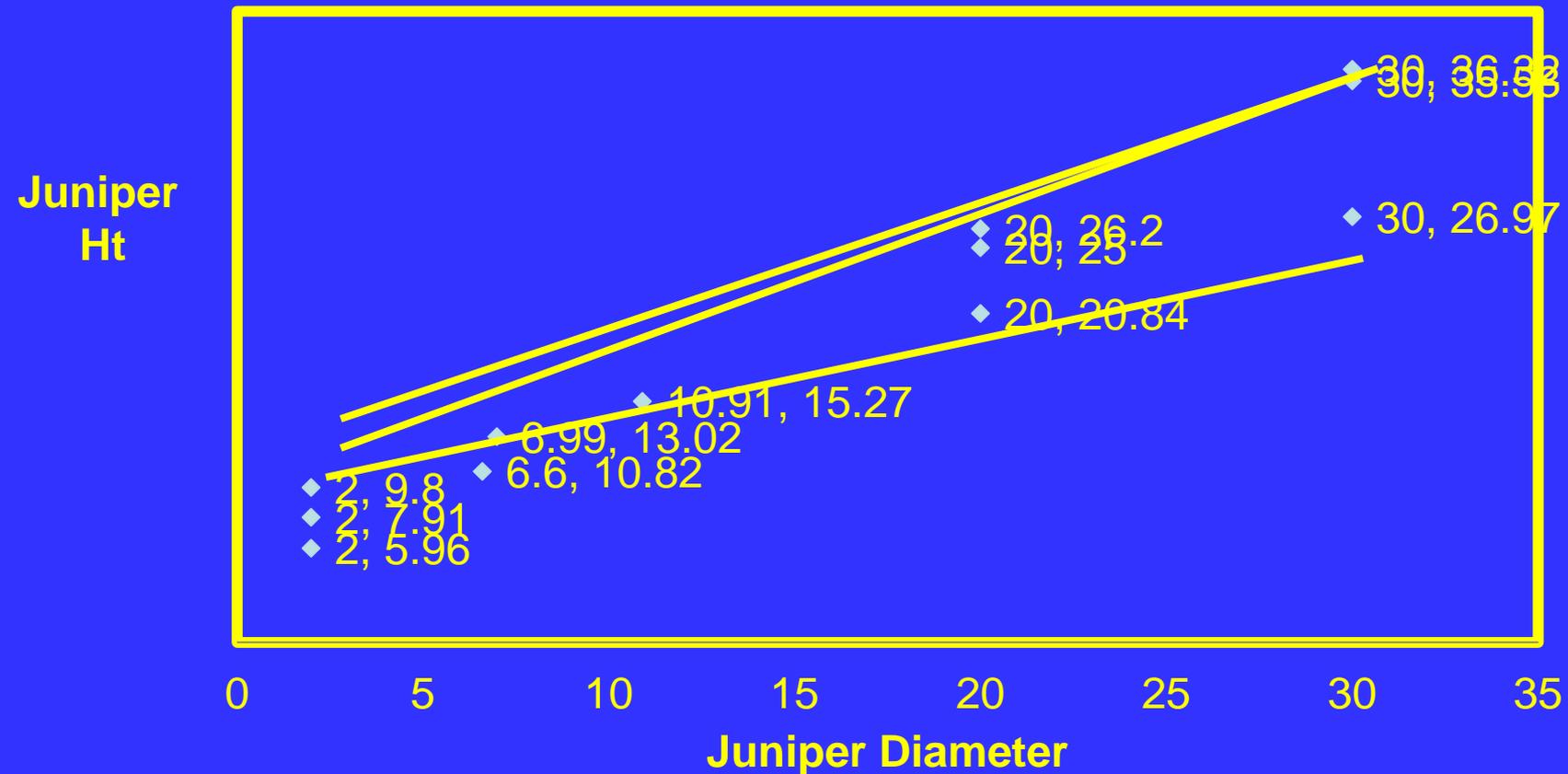
SUMMIT THINNING BLOCK



Pinyon Height-Diameter Relationship for All Three Sites



Juniper Height-Diameter Relationships for the Three Sites



STAND CHANGES AT MAY CANYON

	2005			2007			
	Pied-L	Pied-D	Juni	Pied-L	Pied-D	Juni	Removed
Control							
Trees/ac	69	51	72	92	55	81	--
BA/ac	12	17	38	14	18	42	--
CuFt/ac	97	156	303	123	149	327	--
Mastication							
Trees/ac	139	53	15	127	18	12	46
BA/ac	23	13	4	22	6	4	7
CuFt/ac	156	119	42	361	93	36	40
Thinning							
Trees/ac	85	42	27	61	14	17	73
BA/ac	11	12	10	7	3	7	15
CuFt/ac	64	92	64	39	18	49	111

PINYON AND JUNIPER REGENERATION (TREES PER ACRE) IN 2007

	SCHOOL	SUMMIT	MAY
CONTROL	426.7	415.6	270.6
MASTIC- ATION	199.4	360.0	393.9
THINNING	230.6	286.1	494.4

Percent of Plots Stocked With Regeneration in 2007

	N.S.	< 10 trees	10-20 trees	>20 trees
School Control	0	14	39	47
Mastication	0	61	28	11
Thinning	3	50	33	14
Summit Control	3	25	25	47
Mastication	6	31	30	33
Thinning	6	36	36	22
May Control	3	31	36	30
Mastication	0	36	25	39
Thinning	3	28	16	53

PINYON & JUNIPER REGENERATION (TPA) IN 2007 AT MAY CANYON BY HEIGHT CLASS

	1.0- 3.0 in	3.1- 6.0 in	6.1- 12.0 in	12.1- 24.0 in	24.1- 54.0 in
CONTROL	20.6	97.7	109.4	56.7	74.4
MASTIC- ATION	67.8	121.7	83.9	47.2	73.3
THINNING	55.6	206.1	115.6	55.9	61.7



Bromus tectorum

TOTAL FUEL LOADING BY BLOCK IN TONS PER ACRE BASED ON BROWN (1974).

	2005	2006	2007
School Control	2.19	1.46	2.44
Mastication	1.03	2.17	5.86
Thinning	2.50	1.99	2.41
Summit Control	17.83	5.66	12.67
Mastication	17.50	18.36	14.60
Thinning	9.68	6.33	6.80
May Control	5.18	2.54	9.20
Mastication	3.55	5.42	5.97
Thinning	2.68	2.41	2.12

AVERAGE DUFF AND FUEL DEPTHS (INCHES) BY TREATMENT IN 2005 AND 2007

Site	Treatment	Litter/Duff 2005	Litter/Duff 2007	Fuels 2005	Fuels 2007
School	Control	0.2	0.5	0.4	0.6
	Mastication	0.4	0.8	1.7	1.5
	Thinning	0.3	0.9	0.9	2.0
Summit	Control	0.3	0.4	3.6	4.7
	Mastication	0.7	1.1	2.9	2.1
	Thinning	0.5	0.6	1.4	1.4
May	Control	0.7	0.7	4.5	4.5
	Mastication	1.1	1.7	1.5	1.8
	Thinning	0.2	0.9	1.0	3.2

Changes In Fuel Size Classes In Mastication Blocks (Tons per Acre)

	0.0- 0.25	0.25- 1.0''	1.0- 3.0''	3.0''+	Total
School 05	0.06	0.40	0.24	0.33	1.03
2007	0.31	2.59	2.69	0.27	5.86
Summit 2005	0.25	1.40	3.90	11.95	17.50
2007	0.55	3.32	7.00	3.73	14.60
May 05	0.24	1.60	1.20	0.51	3.55
2007	0.26	2.05	2.87	0.79	5.97

SOME PRELIMINARY CONCLUSIONS FROM THREE SITES

- Both mastication and thinning treatments created mosaics of vegetation and fuel conditions.
- Treatments left larger live trees and healthy saplings and adequate tree regeneration to maintain sustainability, depending on *Ips* and fire.
- Fuel loading in residual areas was variable but will increase as *Ips*-killed trees fall.
- Woody fuels in thinning areas declined or did not change but generally increased in mastication sites over time.

ACKNOWLEDGEMENTS

We would like to acknowledge the financial assistance of the Joint Fire Science Program and the excellent cooperation and support of the Dolores Public Lands Office of the San Juan National Forest, Dolores, Colorado.

We would also like to acknowledge Phil Kemp, Todd Gardiner, and Cara MacMillan of the Dolores Office for their numerous contributions and John Yazzie and Mary Kemp and their RMRS crews for their conscientious work. Todd Gardiner and Mike Battaglia contributed photographs.