

# Appendix A—Equipment and Techniques Survey Response Summary

The equipment and techniques used to treat ponderosa pine ecosystems are reflected in this summary of survey responses.

Equipment and Techniques Response Summary								
Region or unit responding	Equipment	Purpose or technique	Maximum percent slope	Maximum material size	Wheels or tracks	Production rate	Contract cost	Comments
Cedar City RD Dixie NF	Chipper (Morbark)	Change fuel structure	0 to 10%	3 to 10"	Wheels	5 ac/day	\$1600/day	
Cedar City RD Dixie NF	Wheeled Bobcat	Piling of fuels for burning	20 to 40%	2 to 14" (10' long)	Wheels	10 to 20 ac/day	\$700/day	
Cedar City RD Dixie NF	Tracked machine (CAT, D-4)	Piling of fuels for burning	Up to 60%	4 to 18" (10' long)	Tracks	10 to 20 ac/day	\$700/day	
Cedar City RD Dixie NF	Track hoe hoe (CAT 234 with grapple)	Piling of fuels for burning	40 to 60%	8 to 24" (30' long)	Tracks	15 to 30 ac/day	\$1500/day	
Intermountain Region	Dozers (all sizes)	Piling, crushing, rearranging	35%+		Tracks			Used to construct fuel-free zones near houses and property.
Toiyabe NF	Chippers	Chipping						Used to construct fuel-free zones near houses and property.
Stanislaus NF	Brontosaurus on excavator	Cutting and grinding thinned trees			Tracks	2 ac/day (20' by 20' plantation spacing)	\$600/ac	Figures are estimates from contractor putting on demonstration.
Stanislaus NF	CTL system	Thinning	30%	22 to 24"				Max. limb diameter 2". Max. avg. skid distance 1000'.
Stanislaus NF logging	Whole tree	Thinning	35%	24"				Max. limb diameter 4.5". Max. average skid distance 460'.
Beckwourth RD Plumas NF	Chain saw	Cutting	All	All	N/A	Less than 1 ac/day	\$70 to \$100/ac	Useful on steep ground. Disadvantage is slash disposition.
Beckwourth RD Plumas NF	Mechanical shears/saws	Shearing/cutting	Varies	Varies	Both	6 ac/day (Timbco) 4 ac/day (Fortec 160)		Timbco best all around. Saw heads have fire potential due to rock impacts and overheated kerfs in dead materials. Accumulators help production. Hydro-ax, Morbark Wolverine, and three-wheelers are all productive, but cause more ground disturbance.
Beckwourth RD Plumas NF	Wheeled skidders with grapple	Transporting material			Wheels	Varies		Cat 520 series most reliable—works slopes well. Ground disturbance may require mitigation. Used whole-tree yarding.
Beckwourth RD Plumas NF	Peterson 7300 chipper	Chipping material on landing (clean chips)				NA.		Used in combined clean-chip, small-log operation that was considered efficient. Logs were processed on landing with processor head mounted on an excavator. On clean chip production, nonconforming chips were put on the landing and flail was put on the trail.
Beckwourth RD Plumas NF	Morbark 20	Biomass processing on landing				NA.		Used on landing. Also used a tub chipper for biomass.
Beckwourth RD Plumas NF	People with chain saws	Hand piling						Necessary on steep slopes. Spec was 30' dia. around a fluorescent stick. Min. 6'-high pile. Bid on per-pile basis. Piles burned by FS worked well. Had to stake toe of pile to keep it from sliding down steeper slopes.
Beckwourth RD Plumas NF	Tractors with brush rakes	Moving understory material. Piling (method last used in 1995).				10 ac/day	\$100/ac	Benefits: Cost and range of slope conditions. Disadvantages: slow production, soil disturbance, and compaction are limitations.





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Beckwourth RD Plumas NF	Excavator with finger grapple or bucket with thumb (free-swinging grapples require more operator experience)	Grapple piling in thinning and site-prep operations (changed to this method in 1995)				5 to 7 ac/day	\$215 to \$300/ac	Benefits: Can site piles where wanted, work among stumps, work slopes with less soil disturbance and compaction. Clean piles, better positioning ability on steep slopes compared to tractors (safety). Disadvantage: Cost, but no callbacks after burning.
Beckwourth RD Plumas NF	Kemp-West (Kaiser Spyder)	Brush mastication	Used up to 60%				\$600/ac	Very slow. Mobilization and operating costs make it unusable except for special situations.
Beckwourth RD Plumas NF	Morbark Model 20 Total Chiparvestor	Mobile chipping and dispersion	35%	Up to 12" no trouble		3 to 5 ac/day	\$600/ac	Disadvantages: Free-swinging grapple, feed roller not powered.
Beckwourth RD Plumas NF	Morbark 50/36 Mountain Goat in tandem with shear	Mobile chipping and dispersion (demo)	Less than 20%			1 <sup>1</sup> / <sub>4</sub> to 1 <sup>1</sup> / <sub>2</sub> ac/hour		Machine meets a need we have. Average chip depth did not exceed 4". Good concept, but operational problems with machine.
Beckwourth RD Plumas NF	Track-Mac, Shar, Hydro-Ax, Madge Roto-Clear, Slashbuster	Shattering of vegetation				Slow		Disadvantages: Did not do a good job treating materials laid down (Roto-Clear did okay on downed material, but could not lay down standing material). Rock impacts. Shrapnel. Machine damage due to impacts. Safety hazard due to flying debris.
Malheur NF	Track-Mac	Mastication, shredding, rearranging	Up to 35%	3 to 10"	Tracks (8 psi or less)	7 to 10 ac/day	\$62 to \$88/ac	
Malheur NF	Excavator with bucket and thumb or grapple	Grapple piling of debris for burning	Up to 35%	2 to 20"	Tracks (8 psi or less)	5 to 8 ac/day	\$106 to \$132/ac	
Malheur NF	Dozer	Crushing	Up to 35%	3 to 10"	Tracks (8 psi or less)	6 ac/day	\$35/acre	
Chiloquin RD Winema NF	Slashbuster on excavator	Shredding or mulching and selective thinning	35 to 40%	3 to 10"	Tracks	3 ac/day	\$215/hour	Use in combined thin-and-slash treatments in heavily stocked plantations with one entry. Also works well for brush release. (Little reduction in material less than 3" diameter. More likely to spin larger material off head than shred it).
Chiloquin RD Winema NF	Seppi M, PTO-driven hammer flail mulching mower. 3-point hitch to D-4 dozer.	Shredding or mulching and selective thinning	30%	3 to 10"	Tracks	0.75 ac/hour (more if only brush reduction)	\$70/acre	To thin, dozer must back up to each tree. Works better than Slashbuster for brush release. Dozer crushes slash also. (Little reduction in material less than 3" diameter. Not really effective on larger material).





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Chiloquin RD Winema NF	Tomahawk on dozer	Crushing	30%	3 to 10" (some effect on larger material)	Tracks	1 to 2 ac/hour	\$35/ac	May or may not be followed by under-burning. Soil surveys have led to restricted use of mechanized equipment in some areas.
Barlow RD Mt. Hood NF	Feller-buncher (tracked or wheeled) and skidder. Second system is processor/forwarder.	Logging to facilitate reintroduction of prescribed fire (see Notes below).	20% (both systems)	18" or less (average 10 to 12")				Trees are bunched and skidded full length to the landing. In the second system, logs are processed and decked in unit. Forwarder takes material to landing. Tops are piled with excavator or grapple pilers and burned.
Wenatchee NF	Kaiser Spyder	Shreds slash	70%	0 to 8"	Wheels on road. Hydraulic legs in woods.	1 to 2 ac/day	\$850/ac	
Wenatchee NF	Bombardier with hydraulic arm and 5-ft dia. rotary disk.	Shreds slash	35%	3 to 10"	Tracks in woods. Lowboy on highway.	2 ac/day	\$450/ac	
Ochoco NF	Dozer (D4-D6)	Piling	30%	All	Tracks	5 ac/day	\$50 to \$80/ac	
Ochoco NF	Grapple	Piling	35%	All	Tracks	8 ac/day	\$90 to \$150/ac	
Ochoco NF	Dozer (D5-D6)	Crushing	30%	0 to 3"	Tracks	10 ac/day	\$23/ac	
Bend-Ft Rock RD Deschutes NF	Schmeiser Till an' Pack. Pull with med-sized dozer.	Crushing	Less than 20% due to soil disturbance while turning.	0 to 6"	Tracks (6 psi)	20 ac/day	\$33/ac	Must be operated in open stands. Based on 500 acres treated between 1985 and 1995 and 8,000 acres between 1995 and 1998.
Bend-Ft Rock RD Deschutes NF	Industrial mower on farm tractor or ASV Posi-Track	Shearing to 2" height and mulching (used in bitterbrush)	5% (tractor) 30% (ASV Posi-Track (Still testing for soil disturbance))	0 to 3" (highly effective) 3 to 6" marginally effective	Rubber-wheeled tractor (5 psi) Rubber-tracked ASV Posi-Track (less than 3 psi).	10 to 29 ac/day (tractor)	\$29/ac (force account) \$37/ac (contracted)	ASV Posi-Track can operate in tightly spaced stands.

**Notes:** The following are some of the measures used by the Forest Service (Barlow Ranger District, Mt. Hood National Forest) to reintroduce fire into the landscape:

- Require full-length yarding by purchaser, normally with rubber-tired skidders on slopes less than 20% and materials less than 18 inches diameter.
- Leave tops attached. This is used in material larger than 18 inches d.b.h., normally with rubber-tired skidders on slopes less than 20%.
- A third method of abatement that has been used in the past and will continue to be used is a Slashbuster (masticating head). This is normally track mounted with street pads. Production is 2 to 3 acres per 8-hour day, on slopes less than 20%.
- The most commonly used method of slash preparation is an excavator with a modified basket-mounted head for piling. These are relatively small or mid-sized machines with street pads. Production is generally 2 to 4 acres per 8-hour day, and is limited to slopes less than 20%.
- The use of crawler-tractors for machine piling has been greatly reduced over the last few years due to concerns about soil compaction.