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Program

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SMALLWOOD SURVEY RESULTS

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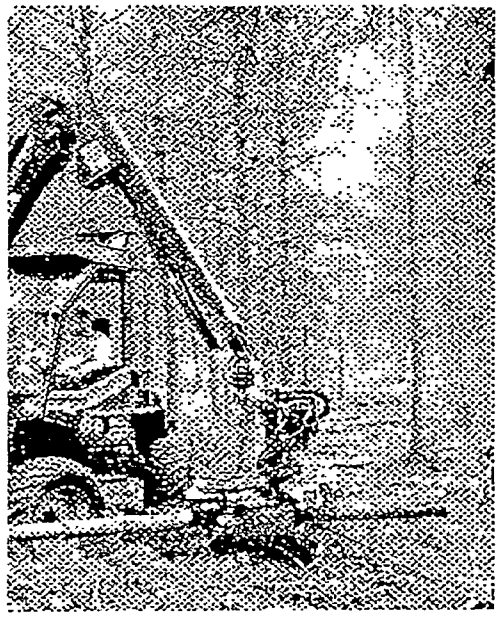

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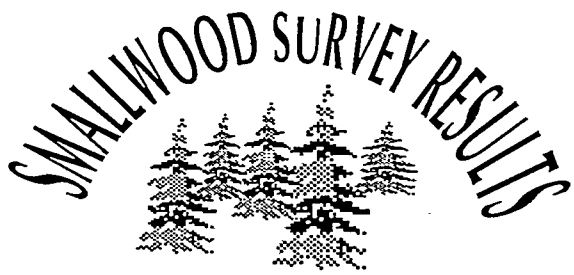


FOREWORD

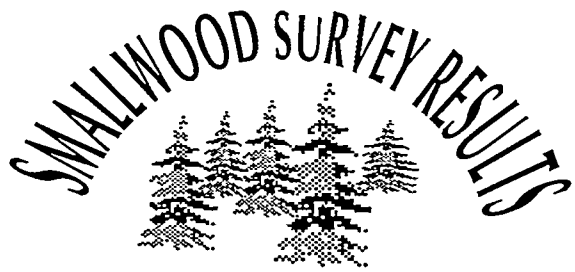
This publication is part of the Smallwood Project at the San Dimas Technology and Development Center. If you have any questions, or potential ideas in the area of smallwood harvesting, contact LaMoure Besse, Project Leader (714-599-1267 or L. Besse: W07A).

The Smallwood Project was initiated by the Timber Sale Technology Committee. This group meets yearly to discuss field needs in the area of timber sales, ranging from the initial sale layout to the transport of forest products. Work is prioritized and future projects are developed to address needs which appear to be multi-regional in scope.

Field personnel who see a need for information to be distributed, have ideas for new product development, or the application of new technology, are encouraged to contact their Regional representative on this committee. The current representatives are:

Bill Carr	R01A
Ray Walker	R02A
Alan Lucas	R03A
Jack Griswold	R04A
Dennis Caird	R05A
Don Studier	R06F12A
Jim Sherar	R08F11A
Ken Shalda	R09A
Al Aitken	R10A

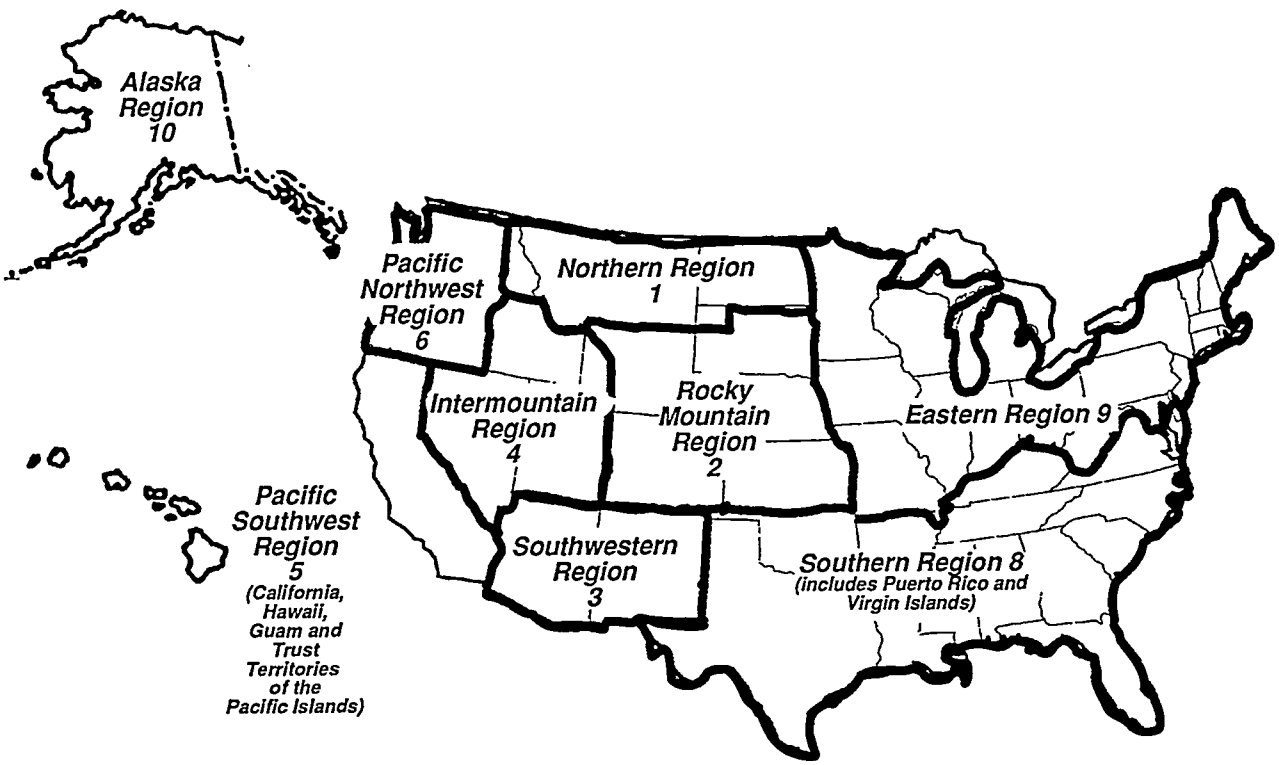
BOB SIMONSON
Program Leader—Timber



INTRODUCTION

In the fall of 1990, the San Dimas Technology and Development Center surveyed the field to learn where thinning or harvesting contracts were being administered in smallwood stands. This publication contains selected responses that reflect where a good deal of the smallwood harvesting activity occured in 1990; who the people were that made it happen; and commentary about the techniques they are using.

Each commentary has been slightly edited to promote clarity and conserve space; and hopefully this process did not change the thought. In other words, this publication is just a compilation of responses in longhand on a survey form by FS field personnel. The responses were selected from throughout the United States to provide the reader with a cross section of current practices. A map showing Forest Service Regions is shown in figure 1 to assist the reader in finding localities of interest. The Forest Service administrative unit from which commentaries were selected are summarized in the table of contents and can be found at the head of each comment. Each heading also includes the name of a person that can be contacted for more detailed information along with the person's electronic (DG) mailing address.



FOREST SERVICE REGIONS

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NORTHERN REGION (R-1)

BITTERROOT NF

Jeffrey Amoss R01F03A

The small timber resources on the Bitterroot NF can be characterized as being primarily lodgepole pine between 2- to 6-in in diameter. Most of the operations conducted in the small timber resource on the BNF have the following characteristics: Primarily lodgepole pine; located on slopes of 10 to 30%; some operators have expressed an interest in using small cable yarding equipment on slopes greater than 30 to 40%. Most of the operations use hand labor to move the material from the stump to the truck. One of the post and pole plants has a harvesting head which attaches to a 3 point hitch on a farm tractor. To date it has not been used on projects on the BNF. Slash disposal methods range from hand piling to tractor piling. Clearcutting has been the predominant silvicultural treatment, however some commercial thinning has been done; tree sizes range from 2- to 6-in, with 500 to 1500 stems per acre. At least 50% of the acreage of the small timber resources has access problems, road or trail construction is needed to get the material out.

LOLO NF

Charles Spoon R01F16A

On the Lolo NF, the small wood harvesting mainly consists of less than 5-in lodgepole pine, either in pure stands or as a component with other species. They occur on gentle to steep landforms exceeding 70%. The average slope is about 30%. We use the traditional harvesting systems including tractor, skidder, skyline, and forwarder. The stand density can be as high as 2000 trees per acre. In pure stands, we have such low value that we find it nearly impossible to access the stands with roads and then if they are accessed, we have difficulty covering the logging costs. Most of the products will be posts, poles, rails, and pulp. The demand for the material is very high, but only when the cost is very low. We do encourage removal of small roundwood on all sales by allowing it to be removed free of charge and without road maintenance.

ROCKY MOUNTAIN REGION (R-2)

ARAPAHO & ROOSEVELT NF—Clear Creek RD

Kris Heiny R02F10D07A

On the Clear Creek District, the majority of stands we target for thinning are decadent lodgepole pine stands in 80 to 100 year age group. (Most of the District's lodgepole pine was either clear cut or burned during the mid to late 1800's by the gold prospectors or miners.) Stand densities range from about 2500 to 10000 stems per acre. Final density is targeted for around 300 to 680 stems per acre with some shaded fuelbreaks as low as 193 stems per acre. Contracts usually specify removal of 4-in and above with force account removal of the residual. In many cases, the 4-in and below is removed under personal use firewood permits. The majority of the activity is restricted to slopes of less than 30%. The restriction is because the contractors use pickup trucks for wood removal and do not have ground or aerial skidding capabilities. Slash is either lopped and scattered (80%), piled (10%), or piled and burned (10%). Most products, including 8- to 14-in diameter trees, is bucked into 8- to 16-ft lengths in the woods and sold as firewood in the local markets, including the Denver metro area. The product size and quantity minimizes mechanical harvesting in this area.

MEDICINE BOW NF—Douglass RD

Don Heiser R02F06D09A

Most of our thinning/harvesting is occurring in natural lodgepole pine stands. The products generally being removed are corral poles, fence posts, and fence stays. Terrain is flat to moderate-easy logging. At the current time, logging is being done by conventional hand felling - some folks have skidders - some still deck by hand. A couple of operators have some machining item, i.e., a Bobcat with shear. Most stands are fairly dense - 4000 to 8000 stems per acre. Many are 100+ years old. We are currently about 50/50 clearcut and thinning. Thinned stands usually have 12- to 15-ft spacing. Size of removed trees is generally 3- to 5-in d.b.h.

UNCOMPANGRE, GUNNISON, & GRAND MESA NF

Jack Cover R02F04A

In Western Colorado on the Grand Mesa, Uncompangre, and Gunnison NF, virtually all of our timber stands fall into the 5- to 18-in diameter class average. We harvest these stands using 3 step shelterwood method primarily using rubber tire skidders on slopes up to 35%. Initial stand density is 100 to 300 trees per acre and the target stand density is 2/3 rds of existing. Species consist of engleman spruce, alpine fir, lodgepole pine, and ponderosa pine.

SOUTHWESTERN REGION (R-3)

CARSON NF—Tres Piedres RD

Kate Klein—R03F02D06A

Commercial thinning operations are being accomplished through personal use green firewood sales in ponderosa pine, 4- to 9-in dbh. We mark the trees to be cut, and people can buy a permit for 4 cords and cut any marked trees in the area to make their 4 cords. The average tree size to begin with was 8-in and average spacing of 10-ft. We are aiming for a spacing of about 20-ft. The ground is level. In our commercial timber sales, trees from 9- to 18-in are removed as part of the harvest, depending on the prescription. Logging in these stands is done by conventional means, chainsaw felling, and tractor skidding.

INTERMOUNTAIN REGION (R-4)

PAYETTE NF

Gary Eckert R04F12A

At the present time, the small logs are included in our normal timber program. However, the ASQ for the Payette includes approximately 4 mmbf of lodgepole pine/subalpine, which will consist of stands of a 10-in average diameter. Stand densities of 300-500 trees per acre are not uncommon. Slopes vary from about flat to 50% with the average of 25-35%. Products could be removed by log or whole tree as long as a certain amount of slash is left in the woods for long term nutrient recycling. Slash disposal will be by pile and burn and broadcast burn. At the present time, our small logs are being harvested with conventional equipment.

SAWTOOTH NF

John Robatcek R04F14A

Our program consists of small, commercial sales in lodgepole pine, usually ranging from 3- to 12-in dbh. Due to stand age and condition, these sales are virtually all clearcuts, followed by either broadcast burning or piling and burning. The quality of this material is poor, and 1/3 to 1/2 of the volume is dead. As a result, most of the material is marketed as firewood, with posts and poles as a secondary use. Very little is utilized for saw timber. Our objective is to convert to young, healthy stands. In that regard, we have met out objectives through natural regeneration on prepared sites. We do little or no pre-commercial or commercial thinning on the Forest.

TOIYABE NF—Carson RD

David Niehaus R04F17D01A

Current projects on the Carson Ranger District consists of thinning second growth stands with commercial sawlog and fuelwood sales. These stands are primarily dense (200-300 sq ft basal area), 80-110 year old jeffery pine. Operations are all on slopes of 35% or less and logged using ground base systems (tractor or rubber tired skidder). Diameters removed range from 8- to 20-in plus dbh with an average of 13- to 14-in. Treatments are designed to remove smaller diameter classes resulting in stands of 90-120 sq ft. Basal area and average diameters of 16- to 18-in dbh. Smaller diameter material exists in pockets for which there is no commercial market. Most material is removed as logs with small amounts being cut into firewood rounds on site. Slash disposal is 80% machine piled and 20% hand piled. Some broadcast underburning has been successful in the past.

PACIFIC SOUTHWEST REGION (R-5)

KLAMATH NF

Jim Benson R05F05A

The Forest is able to sell commercial thinning sales periodically on the Goosenest Ranger District. The sales are in stands that are 50 to 90 years old that began following railroad logging. The area is relatively flat (average slopes 15 to 20%). Initial stand density varies but tends to be groups with 160 to 200 sq ft per acre of basal area. Typical prescriptions are to thin from below, removing merchantable (6- to 8-in dbh depending on market) suppressed intermediates and 5 to 25% of the codominants. The residual basal areas are 100 to 120 sq ft per acre. The primary species involved are pine (ponderosa and jeffery) and white fir. Yarding has been done with small tractors and rubber tired skidders using chokers or grapples. Falling by saw mostly but have had one sale using shears. One sale used a feller-buncher with good results on flat (less than 20%) ground during dry summer months. Best results have been achieved by marking for leave. The other situation on the Forest where we are doing thinning is in our plantations. To date these have been precommercial thinning (thin to waste). Fuel treatment/hazard reduction is a concern. Jim Lipke, sales preparation officer on the Oak Knoll Ranger District has developed an arch and winch arrangement that utilizes a 4x4 rubber tired ATV to skid these trees (most 2- to 6-in dbh) whole from the thinning areas and bunch them on landings. The treatment appears to be cheaper than other methods tried for dealing with this fuels problem. The hope now is that we can

develop a market (chips?) for this material that will pay for all or part of the work. The skidder has been used on slopes up to 50%. I believe there are developing opportunities to use smaller diameter products, there is a considerable supply available on the Klamath.

LASSEN NF

Tom Simonson R05F06A

Two sales are described below: Coyote Biomass Thin, Hat Creek Ranger District. A 400 acre area was thinned in a 80 to 90 year old, low site, east side pine stand. Work was accomplished by use of a timber sale contract-lump sum. The stand consisted of 200 to 300 stems per acre of ponderosa and jeffery pine. It was thinned to 100 to 150 stems per acre. Cut trees ranged from 4-to 12-in dbh. There were seven small, 3 wheel feller buncher, and two rubber tire skidders, skidding whole tree to a chipper. Ground was level.

Prattville Plantation Thin, Almanor Ranger District. A 100 acre biomass thin in a 25 year old ponderosa and jeffery pine plantation on fairly high site. Project is being accomplished with a service contract at approximately $35 per acre. Stand density is 300 to 350 trees per acre and will be reduced to 175 to 200 trees per acre. Cut trees range in size from 2- to 10-in dbh. Two small 3 wheel feller-bunchers with one skidder will feed whole trees to a chipper. Ground is level.

MENDOCINO NF—Upper Lake RD

Blaine Baker R05F08D54A

To date, the Mendocino NF has only undertaken one smallwood harvesting operation on the Upper Lake RD. The project was a 3.6 acre experiment, in a plantation 22 years old, designed to answer questions about what sort of operations in small stands might be feasible. Questions to be answered included: what sort of product lengths would work, how many tons/acre would be removed, and mechanics of the operation. Felling, limbing, and bucking were done by a Forest Service crew, with removal to the roadside accomplished by skidding with a compact 4x4 pickup. A local contractor removed the logs utilizing a self-loading log truck. The project was at best barely economic. Our main problem is lack of market outlets for small material, being over 4 hours from any of the biomass power plants. At present, there is a variable demand for material for pulp chips, but the roading system prohibits chipping in the woods, so again the economics is marginal. Operations in our area are still a long way from being fully mechanized and too far from the biomass operations in the valley to bring competition into play.

SHASTA TRINITY NF
Jeff Bryant R05F14A
Initial Stand Density and/or Spacing and Tree Size. Wild Stands: Stand density ranges from 300 to 800 stems per acre with stem diameters ranging from 4- to 24-in. Tree height ranges from 35- to 60-ft. Managed Stands: Stand density is normally around 350 to 450 stems per acre with diameters ranging from 6- to 16-in. Tree height ranges from 35- to 50-ft. In general, managed stands tend to be more uniform than wild stands. Final Stand Density and/or Spacing both Wild and Managed Stands: From 75 to 200 stems per acre depending on stand age, site class, and future management objectives. .
Maximum and Minimum Stump Diameters Wild stands: 4- to 26-in. Managed Stands: 6- to 18-in.
Maximum and Average Ground Slope Maximum ground slope is 80%, but the majority of the stands requiring thinning are on slopes less than 50% with the average being around 25 to 30%.
Predominant Species to be Removed Species breakdown by volume is estimated as follows: PP.....60% WF.....25% DF.....15%
Slash Disposal varies depending on existing fuel loading, location of the stand (exposure), species, harvest method, and product. Slash disposal alternatives include lop and scatter, crushing, piling, and chipping.

Product Delivery to Roadside and Roadside Processing Products are delivered to road side in all forms and road side processing ranges from saw logs to biomass chips.

Specialized Thinning and/or Loading Equipment A wide range of equipment is used in thinning operations on the Shasta Trinity NF. Other than the conventional chainsaw and skidders, we employ shears, Roto saws, Timco fellers, stroke delimbers and inwoods chippers. We recently awarded a sale that required the use of a cut to length system and expect to have a single grip harvester and a forwarder operating on the Forest by September 1990.

TAHOE NF-Nevada City RD

Ralph Meinel R05F17D56A

A stand of jeffery pine was thinned using the Zig Zag cable system. The stand characteristics are: 380 to 530 stems per acre, 26 years old, 5- to 14-in dbh and 7- to 13-ft spacing. Approximately 50% of the stems were removed to a final spacing of 13- to 20-ft. Trees targeted for cut were the damaged, suppressed, intermediate, and codominants. A report was written on the use of the Zig Zag system and is available from the Forest.

PACIFIC NORTHWEST REGION (R-6)

DESCHUTES NF—Bend RD

Linda Collier R06F01D03A

We are doing quite a lot of thinning in our second growth pine stand. Combining precommercial and commercial thinning in both a service contract and a timber sale contract. Stand density to begin with ranged from 200-2000 trees per acre, ending with densities of about 100 trees per acre. Minimum stump diameter removed was 1-in, maximum was 16-in. Minimum slope was 30%, minimum was 0%. Predominant species removed was ponderosa pine with a few lodgepoles removed. Slash disposal method was whole tree yard and piling. Trees were delimbed at roadside, some chipping being done of this smaller material. Shears are used to fall the trees.

GIFFORD PINCHOT NF

Ron Jackson R06F03A

We've had good luck with small stands around 60-70 years old, removing around 4-8 mbf/acre. Tree size range from 7- to 8-in up to around 15-in. Douglas fir is the primary species. We sometimes leave tops attached and yard tree to landing to reduce slash in works, or just do lop-n-scatter. Economics won't allow much more. Other than slash, we do minimal processing at landing. Not much room at landing for more than this. Average ground slopes are probably near 30%. Most of ops are cable. Some slopes are as much as 60%. A small amount of tractor thinnings. Small, older equipment seems to be most successful (economics, residual damage).

OKANOGAN NF

Brad Flatten R06F08A

We have only within the past 3-4 years been able to successfully sell material less than about 12-in dbh. For that reason, we would use the following breakdowns to discuss "small wood management" on the Okanogan.

5- to 7-in dbh; "submerch" or smaller than acceptable for sawtimber. We have a real need to treat this group over the next decade. Potential and existing beetle problems are forcing us to look into ideas for marketing this type of material. At this time, there has been no activity other than pre-commercial thinning (no marketing).

7- to 12-in dbh; "small wood" within the past 4 to 5 years we have seen an incredible increase in the acceptance of this type of material. Several local mills have "re-tooled" and will now accept material with top diameters down to 4-in. There is active competition for most sales. About 16 mmbf of the annual 63 mmbf cut will come from this size material in the next decade (mbf/acre may average 6-10).

Nearly all sales at this time are logged with ground-based systems. Several local operators have bought mechanized harvest equipment and probably 80% plus is now logged using mechanized harvest systems. We do occasionally have skyline units in this size material but they are usually the exception in a timber sale. Most silvicultural prescriptions are either clearcut, seed-tree, or shelterwood harvests in these smaller stands. Species are primarily lodgepole pine, western larch, or true fir. At this time, whole tree logging is considered acceptable, however, in

	some instances where cones are of concern some
	mitigation may be used to ensure that some are left.
	The need for slash treatment is determined after har-
	vest since the amount of slash can depend heavily on
	what system is used. Typically "jack-pot" burning
	is used to reduce fuel levels. 12- to 22-in dbh -
	"punkins" (just kidding, we do have some big trees
	as well but we have decided to stay out of "old-
	growth" for the next decade). About 47 mmbf of the
	annual 63 mmbf will come from these size stands
	(avg mbf/acre = 5 to 15). We have a real mixture of
	logging systems from mechanized systems to helicop-
	ter. Ground based may account for about 2/3 of the
	volume? In the past, we have had a lot of helicop-
	ter logging on the forest and in the mid-80's prob-
	ably 15-20 mmbf of material 12- to 15-in diameter
	was logged with small helicopters. Silvicultural Rx's
	range from clearcut to thinning. Species include pri-
	marily ponderosa pine and douglas fir. Slash treat-
	ment includes lopping, hand-piling, jack-pot burning,
	and broadcast burning.

ROGUE RIVER NF

Gary Bergstrom R06F10A

Mosquito Thin Sale on the Butte Falls R.D. was logged with a 40-ft tower and a Christy carriage. Average cut tree was 11.9-in dbh and final spacing was 15-to 20-ft. Approximately 12,000 bf per acre was removed. Species was douglas fir. The top was removed with the top log and limbing was done at the landing. Average production was 2 to 3 loads per day. Preferred log length was 40-ft. Excellent results, no stand damage.

WILLAMETTE NF—Detroit RD

Vic Baumann R06F18D04A

The Detroit Ranger District on the Willamette NF is in the process of developing new markets in the area of mscellaneous forest products. To date, we have developed markets that are open to competitively bidding on the following products:

1. Posts and Pole Sales: Removing logging slash behind logging operations. Minimum piece specifications are 3-in by 8-ft. We sold 100.0 mbf of this type of material which normally would be burned.

2. Boughs and Christmas Tree Sales: We sell Christmas tree sales where the tree heights range from 1- to 10-ft tall. Size and species make-up really doesn't matter. Our bough and tree sales generate about $75,000.00 every year in revenue on the Detroit. The end result is a pre-commerically thinned plantation where the purchaser pays the Forest Service to thin the unit. We currently have about 1000 acres under contract.

3. Western White Pine Bough Sales: The purchaser pays the FS for the right to trim boughs flush to the bole of the tree resulting in prevention of blister rust moving into the tree. We sold 55 acres where the purchaser paid the FS $2000.00 to trim the pine for its boughs.

4. Sawlog Sales: Sales 2.0 to 15.0 mbf, used in opening of roads and removing hazards. These small average about $40,000.00 every year and help keep the FS maintenance at a minimum.

WINEMA NF

Gary Keppen R06F20A

Commercial thin in ponderosa pine. Tree size is 6- to 18-in dbh and 2.5 logs per tree removed. The larger and taller trees are the crop trees. Volume removed is 5-8 mbf/acre. Residual basal area is 11 sq ft. Average dbh removed is 10-in. Volume per tree is 80 bf. Leave tree marking is the designation method. Before harvest basal area is between 200-300 sq ft. Most slopes are between 0-15%. Trees are cut and prebunched in skid trails about one chain apart with a swing to tree feller buncher (Timbco 1518 with 22-in rotosaw). Production is about one tree per minute or 12 truck loads per day which average about 4 mbf. Whole trees are yarded with Timberjack 380 skidders with swing grapple or equivalent. Delimbing and bucking is with Denis delimber mounted on Linkbelt 2800 excavator. A landing cat decks logs and piles slash. The log loader is a Linkbelt 3400 hydraulic excavator with heel boom.

Regeneration harvest in lodgepole pine. Average tree is 11-in dbh and 2.5 logs. About 1/3 to 1/2 of volume is dead due to mountain pine beetle epidemic. Harvest volume is 6-8 mbf per acre. Seed trees are left at a spacing of about 50-ft. Minimum dbh of harvest trees is 7-in. Slopes are flat to 25%. Majority of slopes are less than 15%. Either drive to tree, or swing to tree feller bunchers are used. Models are Cat 953 w/shear or Rotosaw, Timbco 2518 w/Rotosaw or Hydroaxe w/shear of Rotosaw. If two products are removed then a two stage operation occurs with green timber removed for sawlogs with grapple skidders. Delimbing and bucking is at the landing by chainsaws, stroke-deck, stroke-boom, or chain flail

	drum. Dead trees are felled and prebunched with feller bunchers and left to dry for one season. Whole trees are yarded with grapple skidders. Delimbing is accomplished along the skid trail by abrasion and at the landing with a flail delimber mounted on a front end log loader (Cat 966). Chips are manufactured with a Morbark chip harvester.
	True Firs. Tree size is typically from 6- to 20-in dbh and 80- to 100-ft prebunched with feller bunchers and left to dry for one season. Whole trees are yarded with grapple skidders. Delimbing is accomplished along the skid trail by abrasion and at the landing with a flail delimber mounted on a front end log loader (Cat 966). Chips are manufactured with a Morbark chip harvester.
	True Firs. Tree size is typically from 6- to 20-in dbh and 80- to 100-ft total height. Density is from 200-400 sq ft basal area. After harvest target density is 100 sq ft basal area at a spacing of 15- to 20-ft. Average dbh and merchantable height 12- to 13-in by 75-ft to a 5-in top. Scribner vole is 120 to 140 bf. Leave tree marking is usually the designation method and variable plot cruising has been the standard cruise system. Leave trees are the larger diameter and tallest trees. Stands have an average age of approximately 80 years. Most harvest units have slopes between 10-35%. A drive-to-tree feller buncher (Cat 953 w/ Christopher shears) and a CAT 518 grapple skidder were used to fell, bunch and skid whole tree to the landing. Delimbing and bucking is done by 2 chainsaws at the landing. Decking and piling of tops and slash is done with CAT D6 dozer with brush rake. Production is 6 truck loads which average 3.9 mbf. Volume per acre removed is 10-15 mbf. Log loader is a truck mounted Barko 350.

SOUTHERN REGION (R-8)

APPALACHICOLA NF

Cloyce Rankin R08F05D01A

Basically, we are dealing with first thinnings in 17-25 year old planted slash pine. Basal areas are 100-140 prior to thinning. We try to leave around 200 trees per acre (basal area 60), from the 400 to 600 trees per acre prior to thinning. Dbh's removed vary from about 3- to 7- to 8-in. Of mechanized equipment, the 3-wheeled Bell feller-buncher seems to be the vehicle of choice around here. Slope is flat 0-5%. Most removal is whole tree. Some short wood is removed but no additional slash disposal is done. On bigger material, a limbing gate is sometimes used at the landing.

APPALACHICOLA NF—Wakulla RD

Bruce Harvey R08F05D06A

The small operations I consider most successful are those that can produce 4-8 loads a day, highly mechanized, and do minimum resource damage. The preferred equipment for operations on our unit would be three wheel feller buncher, small or medium skidder, knuckleboom loader, and 2-3 tractor-trailers. The equipment we get, varies mainly in feller buncher size. At the present time, we have thinning operations and clearcut operations underway. First let me say we have a fairly strong market here for pulp and saw timber. Our unit is located with 100 miles of two pulp mills, this enhances our small timber utilization tremendously. We sell pulpwood 5- to 10.5-in dbh and sawtimber 10.6 dbh and up. We thin our natural stands, usually 40-100 year old timber, 80-100 basal area to 60-70 basal area. Our younger timber or plantations (planted pine) 15-20 years are also thinned and can have 300-600 trees per acre. Some of which are planted 5x12 spacing and some artificially seeded and naturally seeded. We try also to this these to 70 basal area. Our clearcuts consist of the same types of stands and also pulp and sawtimber. Our ground slope is flat. The species we cut are longleaf pine, slash pine, and loblolly pine. Whole tree harvesting is almost always the way. Slash disposal consist of slash being spread our on ramps not higher than 2-ft and burned. One pulpmill accepts trees with limbs and tops. The producer trims only enough to allow for safe hauling. Sawtimber is limbed and bucked at 7- or 8-in top de-

	pending on mill. Sawtimber topwood is also utilized
	and is hauled to one of two chip mills located
	within 30 miles of unit. We currently have an excel-
	lent small timber market and has actually improved
	in last 5 years.

CHATTAHOOCHEE NF—Brasstown RD

James Henderson R08F03D04A

Small timber sale activities on the Brasstown RD, Chattahoochee NF consists of thinnings, shelterwood, and clearcuts. Thinning sales are in shortleaf and white pine and yellow poplar hardwood stands. Basal areas average 120 and are thinned 70-80 for pines and basal areas of 110 are thinned to 60- to 70-in hardwoods.

In the shelterwood cuts, basal areas are reduced from 80-90 to 30-40. The pine varies from 13- to 6-in in stump diameter. Very little clearcutting is being done now on this district. What is done is logged with overhead skyline logging. Minimum stump diameters for this system is about 10-in. Maximum slope for ground based systems is 44% with 20% about average. Anything over 44% is logged with the skyline system. Most ground based skidding involves tree length material and rubber tired skidders. Some stands have a 33-ft log length restriction. Almost all loading is done with knuckle boom loaders. All limbing and topping is done in the woods.

DANIEL BOONE NF—Morehead RD

Ron Taylor R08F02D11A

Good roundwood markets do not exist in our area. Terrain is rough resulting in high logging costs. We thin high density hardwood stands of white and scarlet oak on flat ground. The low value scarlet oak is sold for fire wood and the higher value white oak is left for growing stock. The operators must be able to drive to the site with 4x4 trucks, split, and load directly into the truck, and deliver directly to their market. Only a small portion of our land is accessible. The pine post market is doing well and on similar flat terrain where farm tractors can operate sales can be made: however, few pine stands if any are available for thinning. On the Daniel Boone NF, we have a small cable yarding machine which is loaned out on steep ground for yarding firewood or posts, it generally is used to salvage wood from regeneration clearcuts to shelterwood cuts. Use of this equipment has not caught on very rapidly in this area.

DESOTO NF—Chickasawhay RD

Andy Barwick R08F07D05A

The Chickasawhay Ranger District thins approximately 1200 acres of plantations annually. Most of this thinning is the first thinning in 18 year old slash pine plantations. These stands are located on broad rounded ridge tops with slopes generally less than 10%. Most plantations have had at least 1 prescribed burn. The number of tress per acre ranges from 350-450. The average diameter of the residual tree after thinning is 8-in. As a general rule, all plantation thinnings over 50 acres are sold as area estimate, operator select sales. The desired leave tree spacing is 16- x 16-ft between trees or 170 trees/ acre. Per acre volume removed ranges from 4.5 to 7.0 cf/acre. These sales can be operated successfully by the full range of harvesting systems from shortwood operators using bobtail trucks to longwood operations using feller bunchers, grapple skidders, and delimbing gates. In this area, skilled operators that can thin these plantations from a feller buncher are in short supply. The RD had to develop this expertise into our local market area by using leaf tree marking contracts and developing contractors who could accomplish the contract specs for purchasers without skilled operators.

GEORGE WASHINGTON NF—James River RD

Lin Runyon R08F08D03A

Small harvesting operations that are most successful are in small clearcut areas from 1 to 20 acres in size. Much of our terrain is too steep and rocky to partial cut without damaging residual tress and sacrificing economic visibility due to our poor, low value timber. Stems removed range in size from 6-in dbh to 24-in dbh. Larger trees are usually sold for sawtimber and smaller ones for fuelwood or pulpwood. Maximum slope is 55%. Average is 35 to 40%. Our predominant species is oak. Most trees are cut to length, loaded with small knuckle-boom or wheel loaders and hauled on tandem axle trucks. We also have several small, portable sawmill operators who set their units up on the sales. Very little thinning is done on this District for reasons described above and due to the fact that the timber on this District is past acceptable age.

KISATCHIE NF—Caney RD

Jody Pugh R08F06D06A

We have recently completed about 500 acres of operator select thinning. The initial basal area averaged 120 to 150 with 70 to 80 sq ft remaining after the thin. Stems averaging 5- to 9-in in dbh were removed from slopes that averaged 3 to 12%. The loblolly and shortleaf trees were skidded tree length to the landing and backed through a de-limbing gate. The material then went through an on site whole tree chipper, leaving the woods very clean, as far as slash is concerned. As slash built up around the gate, skidders were used to scatter it to lie within 2-ft of the ground. The sale was planned by first locating a main haul road and trails, skid trails were then flagged at 45 degree angles every 70-ft or so apart. A Bobcat with a small tree shear would weave between the skid trails, cutting trees selected by the operator and carrying them into the skid trails. Other skidders would then take the material to the chipper on a straight skid to the main skid trial with very little damage being done by this method. The key to this operation is having very good operators on the equipment.

KISATCHIE NF—Vernon RD

Henry Hickerson R08F06D05A

We are currently looking at over 400 acres of high density stands (greater than 800 stems per acre, some as high as 1200 stems) being planned for thinning by "operator select contracts". The contract will specify: the spacing to be left, priority of trees to be removed (forked, diseased, overtopped), species to be favored (varies by sight, only being done with pine), basal area to be left. In previous contracts the stump diameters range between 7- and 14-in. We will be experimenting with larger diameter this FY. This contract is being used only in pine (slash, loblolly, and long leaf) stands. The ground slope is flat in Louisiana. Not much slash is left because some of the trees are being used for whole tree chipping, some are long wooded to a 2-in top. After the sale, the area is prescribe burned and shortly thereafter it looks like a park. The products are: short wood, tree length, and chip n' saw. Most contractors are using a 3-wheeled feller-buncher or shear lead. Then a small skidder brings the bunches to landings. This type of logging is good in very tight stands, but requires more contract administration. I have some contracts available or you can contact our sales forester in the SO.

HOLLY SPRINGS NF—Holly Springs RD
R.B. Lowrey R08F07D07A

We are thinning for the first time pine plantations (loblolly pine) that have a basal area of 120-240 sq ft/acre. Our goal is to reduce these basal areas to an average of 75 sq ft/acre. Trees to be removed are selected by the purchaser. The purchaser is required to leave trees at a certain spacing (15-to 19-ft) and with a range of basal area (60-80 sq ft/acre). Trees of good form and disease-free are to be left. So far all of these operators have used a 3-wheeled machine which shears off the tree at the ground and lays the tree in a direction so as to be easily pulled by a grapple skidder. Often pulling to the landing, the skidder operator backs the stems through a limbing gate. Small ends are then trimmed with a chain saw. The stems are then hauled tree length to a concentration yard on a paper mill and weighed. Weights are converted into ccf and the stumpage charged against the purchaser's advance timber deposit.

BIENVILLE NF—Strong River RD

Terry Pierce R08F07D10A

We are thinning loblolly and shortleaf pine stands with initial densities from 110 to 160 sq ft. The goal is to enter at an age of 18 to 20 years and leave the stand with a 16- x 16-ft spacing and a density of 150 to 170 trees per acre. The average leave dbh has been about 8-in and the slopes ranges up to about 7% for fully mechanized sites (10-12% for shortwood operations). Slash is disposed of by direction felling away from roads and lop and scatter to within 2-ft of the ground for a distance of 50-ft from forest development roads (100-ft from state roads). About 60% of the trucks are set up for shortwood but many are switching rapidly tree length or a few to whole tree chipping. There is one operator who bucks into short lengths and prehauls. Only one of our operators chips at the loading deck. Our most current sale uses a feller/buncher for cutting, grapple skidder for movement to the deck and a Prentice knuckle boom loader to load tree length to the trailer. Several areas close by are using mechanical harvesting operations. The major difference seems to be they are using a delimbing gate where we don't allow this equipment.

TOMBIGBEE NF—Tombigbee RD

David Carter R08F07D17A

Most of the small timber on our district is treated at the commercial size during regular timber sales. We sell/mark all pines > 5-in dbh during thinnings. Logging is conventional with chainsaws, or mech feller/bunchers most common. Products are typically tree length although some 5-ft bolts are produced. Skidding in our easy rolling terrain is done by cable or grapple rubber-tired skidders. Hardwood pulpwood is usually not marked is thinnings but is in clearcuts (dbh size 7-in plus). All trees above 10-in (pine) and 12-in (hardwood) are marked as sawtimber if at least one 12-in log is present. Larger poorly-formed trees are sold as pulpwood. Precommercial thinning is usually not done but has been tried in small pine plantations and seed tree (< 3-in dbh) areas. We have used row thinning with a 7-ft (blade length) roller chopper and individual tree release using chainsaws. Both methods were effective but expensive (about $50/acre). Commercial thinnings usually occur in pine stands with basal area over 110 sq ft/acre, <15% slope, target density 80 sq ft/acre, and no slash disposal. Processing before shipping includes: topping, delimbing (sometimes by gate), and loading by knuckle-boom loader.

PISGAH NF—Grand Father RD

Jim Blevins R08F11D05A

We are managing clearcutting salvage operations from Hurricane Hugo. The stump diameters range from 8- to 26-in dbh or greater on slopes ranging from 0-40%. 60% of the product is hardwood, the remainder pine. Slash is treated by cutting it to lie within 2-ft of the ground along system roads, and removing the slash from cuts, fills, and roadways. Products are skidded to landings in tree lengths, and cut up to be loaded and hauled. The most productive operations are usually small (2 and 3 men operations), consisting of a timber cutter, and operators for a rubber tire skidder, a loader, and a truck. The trucks roundwood, sawlogs, or firewood.

OUACHITA NF—Womble RD

Jerry Ingersoll R08F09D10A

Our timber resource consists of trees from 6- to 20-in dbh, which we have managed for sustained yield timber production for many years. We, and other R-8 Forests, routinely harvest trees of this size in thinnings, selection cuts, and final harvest. In fact, many local mills are not equipped to saw trees over 30-in dbh. In other words, almost our entire timber program (12 mmbf/yr on this District and 150 mmbf on the Forest) consists of trees which are of "smallwood" size by your definition. Average conditions for thinnings on the Womble are: initial stand basal area 70-140 sq ft; final basal area 60-100 sq ft; minimum pulpwood tree is 5.6-in dbh; minimum sawtimber 9.6-in dbh; maximum size trees removed are 20- to 26-in dbh except in rare cases; average sawtimber trees are about 12-in dbh; average slope 0-25%; maximum slope is 45%; shortleaf pine is predominant species; slash is generally left, occasionally lopped and scattered where visual concerns are important; trees are skidded tree length after limbing and are hauled tree length (sawtimber) or 8- to 10-ft (pulpwood); rubber-tired skidders and ordinary loaders are used on most sales. We work closely with logging contractors, and have generally avoided significant damage to uncut trees.

SUMTER NF—Enoree RD
Greg Born R08F12D01A

In FY90, we tried our first "operator selection thinning" in 18-25 yr. old loblolly pine plantations. In these sales, only the boundary of the area is marked. The contract specifies the desired basal area and/or spacing to be left. Initial stand densities vary greatly but average around 100-120 sq ft of basal area, with final target density in the 60 to 70 sq ft range in most cases. Minimum diameters that the operator is required to remove is 5-in dbh but most operators will remove stems down to 3-in dbh at their own option. The sale volume is determined by point cruise using the Husky data recorder. Most operators use a 3-wheeled Hydro-axe or 4-wheeled Bobcat feller-buncher. These machines work off corridors approximately 100-ft apart with cut stems bunched in the corridors and skidded to the log deck where they are backed through a limbing gate prior to decking. All material is hauled tree length. Maximum slopes are around 20-25% with the average being around 5-10%. The predominant species removed is loblolly pine, with small amounts of shortleaf, and virginia pines. Minor amounts of hardwood, is removed as roundwood from some sites. The quality of the thinning compares favorably to stands that were leave tree marked but there is a tremendous savings in sale preparation costs. Timber sale administration costs are somewhat higher due to more time being required administering these sales. In the next decade, most southern forests will have increasing amounts of 1st thinnings to accomplish and will need to find more cost-effective and time-saving methods.

TALLADEGA NF—Oakmulgee RD

Dwight Wallace R08F01D04A

Most harvesting of small timber on our District is on fuel thinnings of plantations. Most plantations are loblolly species with a few longleaf. Most of our loblolly is used for pulp and some of our longleaf is to be made into posts. Most pulp is carried to a pulp mill or to a chipping mill nearby. Most plantations average about 100-120 basal area and when thinned are from 60-80 basal area. On our current sales, we marked everything to be cut. Our minimum dbh is 5-in in plantations. Trees are cut and limbed and topped where felled before skidding to landings for loading on trucks. Some are felled with felling machines and bunched and some producers use power saws. Almost all small timber is skidded and hauled tree length on Forest Service. International Paper Company has one person that uses a prehauler to gather timber rather than skid to landings. Most people on FS lands uses skidders with grabbers to do skidding. Most use felling machines that have heads with rotating cutting blade. Production has been slow because of having to look for paint on bowl of tree and then to leave a stump that is not too high or too low to leave a butt mark. We plan to thin plantations in the future by purchaser select. This should speed up the process. Most of our plantations are on ground that could be operated with felling machines.

TALLEDEGA NF—Talledega RD

Don Stephens R08F01D06A

Most of the thinning units or tracts on private land are cut by purchasers that have logged on National Forest land. Most of the methods were about the same until the Forest Service started the latest, purchaser select cutting in plantations. The Forest Service will cruise the plantation before the cut is made to see what volume is there, then the purchaser is required by contract to thin the plantation back to a 60 to 70 basal area. After the area has been cut over, the Forest Service goes back and cruises the area again to find out what is actually left on the site and what has been cut. Then the purchaser is billed for the actual volume that was removed from the sale. The main method used on private land and also used on National Forest lands is "leave tree marking". Where everything is cut except for the trees marked to be left. Both of these practices end up with the same basal area, but the cost is less for purchaser select. No matter what method of selecting trees to harvest is used, the logging techniques are about the same. Felling operations are done with bobcats or skidders with shearer heads or saw head (hydroaxe) with skidders skidding the wood that has been cut and piled to a landing and loaded with knuckle boom loader on tractor trailer truck to go to the mills. The other and older way of thinning, involves pulpwooders cutting with saws into pulpwood length and loading the wood, that has been piled up by hand, with a cable on a big stick loader which hauls about 3 to 6 cords of wood to a pulpwood yard. If logged the old way with a good pulpwooder, the har-

	vest area looks best, but it just won't compare, time wise with the new equipment being used now. Also, you're limited to what areas you can cut due to slope. Most of the plantation thinning is trees around 20 to 30 years old and averaging from 6- to 9-in dbh, with basal area of 120 to 160. Some of the other thinning is done on and off the Forest removing mostly suppressed trees in the understory, ranging from 5- to 20-in dbh with basal area in the range of 80 to 120 and age from 20 to 80. On National Forest lands, the slash has been kept down around trees left. The slash cannot be left piled up around them, mostly because of fire hazard and southern pine beetles. On private lands this practice isn't done. Slash at the log landings on Forest Service land has to be lopped and scattered to be within 2-ft of the ground, and on most logged private land, the slash build up is left as.

EASTERN REGION (R-9)

ALLEGHENY NF—Marienville RD

Randall Durner R09F19D02A

The Allegheny NF has traditionally been a sawtimber product oriented forest, but has sold significant quantities of small roundwood since the mid-fifties. Harvests of small roundwood under a variety of silvicultural prescriptions, includes selection harvest, thinnings, shelterwood seed cut, shelterwood removal cut, and final harvest. Our greatest concern is dealing with small roundwood removal in intermediate type harvests, where the volume per acre is low, 4-7 cords/acre. This includes standing poletimber and topwood. Moving this size material (6 to 10.9 in dbh) from final harvests has not been as difficult since the volume per acres is on the average about double. The other concern we have is limiting soil disturbances to 15% or less of the harvest area. The ANF has sold integrated product sales for years, with pulpwood often listed as optional. Over the last decade, that trend has declined with an increasing demand for small roundwood by Hammermill Paper Co. (recently bought by International Paper) and most recently with the opening of the Allegheny Particleboard Inc., reportedly the third largest medium density particleboard manufacturer in the US. A stand I recently examined, is typical of a commercial thinning entry. It is an Allegheny hardwood type (cherry-maple), 70 years old, 87% relative density, basal area range from 110 to 210 sq ft with an average of 176 sq ft/acre, and average stand dbh of 13.2-in. It was given a non-commercial treatment 8-10 years ago,

	removing an est 20 basal area/acre in small poles 5-
	to 7-in dbh, and a light thinning. 75% of the stand
	is stocked with black cherry. Our silvicultural
	model calls for removal of about 66% of the pulp-
	wood (about 7 cords per acre). The target residual
	basal area was 127 sq ft. The stand is situated on a
	flat ridge. The harvest process consists almost en-
	tirely of rubber tired skidding, tree length, along des-
	ignated skid trails to designated landings. Limbing
	and topping is done in the woods. Most units have
	no special slash treatment requirements unless along
	a roadside zone, or private land. The tree length
	piece will then be bucked into factory lengths of 22-
	ft at the landing, for ease of transport by truck or
	specialized rail cars to the mill. Shorter lengths
	down to 15-ft can also be utilized.
	Pieces less than 15-ft are used for firewood. Small
	pulpwood is handfelled, then machine skidded. Log
	trucks (tri-axles) have self loaders, usually mounted
	near the cab. Some cable logging has been done
	with mixed sawtimber and pulpwood. There is very
	little movement in northwest Pennsylvania toward
	mechanized harvesting, although we have a
	Timberjack TIMBCO feller/buncher now working in
	the area. But this is a very expensive machine and
	must work both sawtimber and pulpwood. The ANF
	is situated on the Allegheny plateau, with broad flat
	ridges, and gentle (0-15%) to steep (16-50%)
	sideslopes. The Forest average slope is 20-30%. We
	have some rocky soils, and on average 50% of our
	soils have restricted operating conditions due to wet/
	moderately drained soils. Seeps and springs are
	common. We sell predominantly hardwood species
	(cherry, ash, maple, basswood, yellow poplar, beech,

	some aspen, oak) with high quality sawtimber and veneer as our main draw. The need to remove small roundwood is a silvicultural necessity, but our markets are strong. In the past, this has been treated as a surplus resource. Minimum diameter dbh harvested is 6-in with a maximum of 28-in dbh. Stands given intermediate treatment are usually reduced to a stocking level of about 60-65% relative density (this varies between northern hardwoods and Allegheny hardwoods). On average, this would represent a basal area range of 100-130 sq ft. This capsulization describes a "typical" stand, and "typical" harvest operation.

CHEQUAMEGON NF—Glidden RD
Edward Paitl R09F02D02A

The Glidden Ranger District is located in northern Wisconsin and consists of a little over 250,000 acres of second growth timber. We cruise and advertise approximately 16 mmbf of timber for sale each year with 80-90% of this being pulpwood. At this time, the sales are almost equally divided between aspen clearcuts had hardwood thinnings. Our aspen clearcuts are about 15-20 cords/acre and must be 40 acres or less in size. Hardwood thinnings vary from 10 cord/acre on up. Initial stand density starts around 150 basal area and will end up around 60-90 basal area after thinning. To be merchantable, both hardwood and softwood must be 5-in plus dbh. Sawtimber starts at 9-in plus for softwood and 11-in plus for hardwood. The predominant species removed are quaking aspen and sugar maple with varying amounts of balsam fir, red pine, other northern hardwoods (red maple, basswood, ash, and birch). The only slash disposal we have is along well traveled roads and is just a lop and scatter situation for 25- to 50-ft. Most products delivered to roadside are cut to 8-ft lengths although some operations have slashers and do pole tree skidding to the landings. The District has also experienced some chipping, shearing, and full tree operations. The most used method is for sawyers to cut to 8-ft length and then to forward wood to landings with various rubber tire skidders. This wood is hauled by logging trucks with pups and mounted loaders on trucks. The Glidden District has very little steep slopes (usually 0-10%). Winter snows and low access areas cause more concerns. I am enclosing a list of operators on the Glidden district in case you want to contact them with questions pertaining to their operations.

CHEQUAMEGON NF—Washburn RD

Duane Raspotnik D09F02D05A

We have been working in first and second red pine thinnings with alternate species of aspen, oak, and jackpine for 15 years. Initial stand density varies from 120 to 180 sq ft of basal area and is thinned to around 90 sq ft of basal area. Stump diameters vary form 6 to 14 in. Most terrain is fairly flat with slopes between 5 and 10%. Slash is generally disposed of within 25-ft of the roads. Some operators hand cut with chainsaws and tree length skid with 440 John Deere pole skidders. Others use feller bunchers and grapple skidders in some of our more open plantations. Tree processors such as a John Deere 490 hoe with a silver streak head which cuts, delimbs, and bunches to 100-in lengths are used. The bunches are then picked up with forwarding equipment and delivered to landings.

GREEN MOUNTAIN NF—Manchester RD

Russ Record R09F20D02A

The total number of timber sales advertised and sold has decreased over the last 10 years from 10-15 per year to 4-8 per year. Nearly all thinning is in northern hardwood stands or CCC plantation. A few small thinning operations have been horse logged with minimal damage. Tractor bunching with a small dozer generally does a good job also unless steeper slopes or very rocky conditions prevail. Most of our sales are purchased by larger contractors or mill owners who then subcontract to the small independent logger.

HIAWATHA NF—Munising RD

Al Saberniak R09F10D03A

The commentary provided was limited to a critique of the survey design but this contact is included because it appears from the response that 15 to 20 smallwood contracts are in effect at any one time. The district plans 6 to 10 projects each year and 25,000 acres will be contracted in the next decade if time and money are available. There are lots of projects on private and state lands in the area effecting perhaps as much as 10,000 acres.

HIAWATHA NF—St. Ignace RD

Jim Evers R09F10D05A

All the timber on this district meets the survey definition of smallwood. Although a sizeable inventory of old aspen exists which is being clearcut as the market and Forest Plan allow, this response will be limited to thinnings and partial cuts in red pine plantations and northern hardwoods. The red pine plantations were established in the CCC days and now have a basal area from 180 to 220 sq ft prior to thinning. The plan calls for thinning these stands from below to about 120 sq ft in basal area for stands with an average dbh of 8-in. As the average diameter of the trees increase, a corresponding increase in basal area is planned. (140 sq ft for 10-in in dbh etc) The stand often contain varying mixtures of jack and white pine which are gotten rid of in this thinning process.

The northern hardwood stands originate after the early 1900's and many are just getting into the small sawlog size class. Basal areas of untreated stands generally range from 120 to 160 sq ft. The thinning plan calls for the reduction in basal area to 70 to 90 sq ft with a cross section of remaining trees in various size classes (structure). In many cases this structural plan is not attained and refinement is needed. The stands contain mostly sugar maple with varying amounts of other hardwoods such as basswood, red maple, yellow and paper birch, beech, white ash, and others. Most are under uneven-aged management with diverse species. Those stands that have been treated appear similar to conventional thinning. Trees are generally marked in all sizes

down to 5-in in dbh in the partial cuts in both pine and hardwood contracts.

The land is very flat and slopes generally are not a factor. Slash is disposed of along the roads for visual purposes and often consists of removal for 25 feet and an additional 25 feet of lopping to 3-ft in height to avoid windrows.

Exact treatment depends on the visual quality objective of the area. Nearly all sales are logged employing "short wood" techniques. Trees are felled with chainsaws and limbed and bucked to 100-in lengths at the stump. The wood is then carried to landings on forewarders and piled. The piles are later loaded onto trucks capable of carrying up to 20 cords to a mill as far as 200 miles distant. It is rare to see a tree length or log length operation in this area and that would be the only case in which other processing would be done at the roadside. New specialized equipment is not used in partial cuts probably because the economic margin local loggers are operating on is so narrow that they cannot invest in anything new, risky or expensive. Markets in the area are traditionally poor and prices are low. Owning even a new conventional skidder would be a dream to most companies.

WHITE MOUNTAIN NF

Ed Merski R09F22A

We have many acres of trees in the 5- to 10-in dbh class that are 50 to 70 years of age. These stands are incorporated into our regular timber sale program and are considered commercial thinnings. Northern hardwood stands meeting this criteria usually contain 120 sq ft of basal area/acre and up and are thinned down to approximately 80 sq ft. Predominate species removed in the initial commercial thinning include red maple, beech, and poor quality sugar maple, yellow and paper birch. Ground conditions average 10-20% slopes with occasional slopes up to 35%. Products delivered roadside form the type of stand usually consist of hardwood pulp and some paper birch, sugar maple, yellow birch, and beech milkwood. Material is usually skidded out using conventional skidders and long lengths usually do not exceed 20-ft in length although on occasion tree length skidding is permitted. The above operations are also repeated in our mixed wood stand where basal area/acre usually run 140 sq ft/acre and up. Spruce-fir stands of this size usually run to 180-200 sq ft/acre. Product are usually pulpwood and small sawloop. In the not too distant future, we will have numerous sapling to small pole stands that are a result of harvesting operations over the past 20-25 years. Markets are developing for chips for co-generation woodburning plants. These young stands (20-40 years of age) would benefit greatly from a thinning at this stage. What is needed is a harvesting system and equipment which would make operations profitable and would not result in ex-

treme damage to the residual stand. Fuel quality chips usually bring $16-$19/ton delivered. Stump age prices for this material rarely exceed $1.00/ton. Thinning operations would greatly benefit the future values of these stands. Working with the fact that it should be a commercial operation of some magnitude (we probably now have in excess of 20,000 acre that would benefit from an operation of this type) and we cannot give this material away under present regulations presents a challenge.

WHITE MOUNTAIN NF—Androscoggin RD

Walter Wintturi R09F22D02A

The Androscoggin RD, White Mountain NF, has had two timber sales in smallwood stands. Thinning prescriptions designed to remove biologically mature species such as aspen and paper birch and undesirable growing stock commonly found in northern hardwood stands were used. The original basal area was 110-120 sq ft which was reduced to 60 to 70 sq ft. Most of the stems were in pulpwood a size class of 6 to 11 inches but some sawtimber was removed in the 12- to 16-in class.

The sales were laid out on slopes of 5-25%. Conventional rubber tired skidders were used to skid the whole length trees to landings over predesignated skid trails. At the landing, the stems were bucked to various products sawlogs, boltwood, pulpwood or biomas (tree tops). No specialized logging equipment was used for felling, bucking or skidding; it was all conventional. Excellent markets exist in the area for these products because of demand causing utilization to be favorable. Since excellent markets exist, specialized equipment is not important in finding acceptable timber sale purchasers and prices. However, the problem with smallwood sales is the efficiency with which trees can be marked and the method for estimating the tree to be cut. Only 6-7 cords (3-3.5 mbf) per acre are harvested making administrative costs to mark the trees very high. It would be desirable to have the ability to sell this timber on some other basis.

	HURON MANISTEE NF—Harrisville RD Larry Throop R09F04D07A
	Currently we thin about 7-9 mmbf of red pine annually. Most is second entry into stands that were planted in the 1930's and 1940's. The initial thinning occurred 10-15 years ago and were generally "shortwood" in 8-ft or 10-ft sticks. Current operations reduce basal areas from about 180-200 sq ft to 100-120 sq ft.
	Tree sizes range from 5- to 14-in dbh. Original thinnings were row thinnings, however, larger equipment has resulted in current thinning operations being a combination of row and select thinning. Rolling terrain varies from flat to 35% slopes. About 75% of timber is skidded whole tree with the remainder being cut into shortwood in 8- to 10-ft sticks. When trees are skidded to the landing whole, there frequently is some degree of processing in the landing area. Most processors delimb and shear tops at some desired diameter. The tops are either chipped or hauled back into the stand depending on the operator and the chip market. Slash must be lopped to lay within 24-in of the ground. Because of the market, small red pine (5- to 6.5-in dbh) is very difficult to sell. 5 to 6000 acres or this type of stand remain unthinned. An additional 4 to 5000 acres of unthinned stands that are marginally marketable with average diameters in the 6.5- to 7.5-in range exist along with considerable acreage in northern hardwoods that need initial thinning.
	Aspen is preferred locally for hardwood pulp and these hardwood stands generally need to be thinned using "shortwood" techniques which are more expensive but prevent damage to the remaining crop trees. Aspen on the other hand can be whole tree skidded.

HURON MANISTEE NF—Manistee RD

Milton Hindman R09F04D03A

In our pine thinnings, the basal area varies from 120 to 240 sq ft with tree spacing around 6- x 6-ft. Two rows are selectively removed and three are left. Trees are thinned to a basal area of 90 sq ft, skidded tree length, and poles are made into treated lumber. Remaining trees are taken to the mills in shortwood and the tops are chipped for fuel wood so all slash is removed. Delimbers are used on the landings Most trees being removed are 6- to 10-in dbh. Our hardwood thinnings involve shortwood operations. Tree length operations are not allowed. Thinning in these stands of 120 sq ft basal area is prescribed to reduce the basal area to 70 sq ft in smaller trees and 100 sq ft in larger trees. Most of the trees in this type of thinning are 6- to 12-in in diameter and 50-70 years old. Slash is treated to lie within 2- to 3-ft of the ground and completely removed along private property and all roads for 25-to 50-ft.

HURON MANISTEE NF—White Cloud RD

Lawrence Stillwell R09F04D04A

Pre-commercial thinnings is accomplished in black and white oak and red maple stands with basal areas of 90 to 120 sq ft. This area is reduced to 70 to 80 sq ft and harvested trees range in size from 3- to 18-in in dbh. The terrain is level to gently rolling hills. Slash scattered to lie within 3-ft of ground in the stand and lower along travel ways, i.e., roads, motorcycle, and hiking trails. Processing is done in the woods as the product is firewood. Small households harvest 5 to 6 cords of wood from 2 to 3 acres. Blocks are skidded/hauled with pickup trucks driving throughout the stand. Occasionally small farm tractors are used.

OTTAWA NF—Bessemer RD

Hank Vandenberg R09F07D02A

D&D has cut approximately 100 acres of hardwood thinning on a current sale. The stands being cut had basal areas of 120 sq ft and trees were marked for cutting to reduce this to 80 sq ft. Maximum stump diameter of harvested trees is roughly 16-in and minimum stump diameter is 6-in. Slopes are gentle and sugar maple is the predominant species.

Marked trees are cut and bunched with a Bobcat shear Model 1213. Trees are skidded with a Clark Ranger Model 664 equipped with grapple to a Hahn harvester which delimbs and bucks the tree into 100 inch sticks. It also loads a 40-ft flatbed trailer in the same operation. On the return trip, the skidder take stops back and scatters them in the stand. This is a very well organized operation and an exceptional job is being done.

OTTAWA NF—Iron River RD

Roger Bofinger R09F07D03A

Harvesting operations for small round wood vary considerably on the District. Most stands are hardwoods (maple, birch, aspen, cherry) with basal area of 120 to 140 sq ft that are thinned down to 70 sq ft. Stump diameters range from 5-to 14-in with most at 8-in. Ground is generally level to 10% slope. Slash reduction is generally "lop to 3-ft". Along collector roads, slash must be cleared 50 back from the roadway. Products are generally 8-ft pulp with 10% of the trees left in random sawlog lengths. All operations are required to spread slash throughout cut over areas so delimbing is more efficiently done in the field or carried back out by grapple skidders. Heel loaders on slasher buck tree length to 8-ft pieces, some Hahn harvesters are used with grapple skidders.

Cutting is done by chainsaw or a forwarder, Drott, Timko, Bobcat are used. Where machines are used for cutting, a hydraulic chainsaw head is preferred although scissor type shears are used in pulp size trees. Trucks and trailers holding 12-20 cords are used depending on distance to the mills. Some mills prefer pole length material so that the decision about whether the fallen tree should be made into a sawlog or pulp can be made at the mill. Most harvesting (70%) is done on frozen ground (December 1-March 15) to protect soft soils, compactable soils, seasonal water drainages, marshes, swamps, etc.

	OTTAWA NF—Ontonagon RD
	John Wilson R09F07D05A
	By survey definition, most of our sales would qualify as smallwood sales but only those stands which are even-aged and of poletimber and very small sawtimber size will be discussed (roughly 6- to 14-in on the stump). These sales are either firewood sales or thinnings as part of a larger sale and typically are in hardwood stands (sugar and red maple, yellow birch and basswood). Initial stand densities range from 100 to 125 sq ft in basal area with the average tree size about 9-in with a range from 6- to 14-in stump diameter. The stands are thinned to approximately 80 sq ft in basal area. Our ground seldom exceeds 15% in slope. Slash is only disposed of along highways and our North Country National Scenic Trail. Slash is topped and scattered within 100-ft of the transportation facility to 3-ft in depth. All slash is removed from ditches and drainages. Most of the hardwood is skidded or pre-hauled (forwarded) to roadside already delimbed and bucked in eight foot lengths. There are slashers operating at roadside and feller bunchers with shears operating in small hardwood thinnings. There are chipping operations in . aspen clearcuts; operations in jack pine where whole length bundles are skidded to landings for delimbing and bucking; and forwarders being used in pulpwood thinnings on the District. Most material is delivered to roadside in 8-ft lengths but some is brought out tree length.

OTTAWA NF—Watersmeet RD

Dave Newman R09F07D06A

The majority of contracts are in second growth northern hardwood stands with basal areas of 110 to 150 plus sq ft. The stands are thinned to 80 to 90 sq ft of basal area. 80% of the material removed has a dbh of 5- to 10-in and is sold as pulpwood or fuelwood. Predominantly, sugar maple is removed. The land is relatively flat to gently rolling with some slopes to 50% in grade for short distances of 300 feet or less. Some bucking is done at the roadside and some whole tree and tree length chipping is done at roadside with chips being blown into vans for delivery to mills. Slash along travelways is lopped and scattered to lie within 3-ft of the ground and is often made available to the public. Occasionally, a small shear and grapple skidder will be used in these thinning operations but the majority is done by hand, felling and skidding poles or bucking up the trees and "shortwooding" them to a roadside landing.

MONONGAHELA NF—White Sulphur RD

George Wilson R09F21D06A

When laying out commercial thinnings, the least amount of tree, soil, and water damage occur if the skid roads are pre-designated. Therefore, I like to mark skid roads while the trees to be thinned are marked. Landings must be located to reduce skidding distance which reduces soil erosion and tree damage. Loggers are advised to start directional felling in areas furthest away from the landings. Tree length and equipment size should be limited to improve stand characteristics and damage to residual trees. There are a multitude of things to consider when drafting a contract. Some of these include:

- *The return expected to the Treasury for the length of the rotation.*
- *Removal of low value stems.*
- *Protection and release of high value stems.*
- *Residual densities and how they relate to local market conditions.*
- *Tree removal specifications.*
- *Road and trail costs.*
- *Slopes.*
- *Slash disposal, cull treatment etc.*

Projects that maximize returns while limiting the costs to operators will make small sales attractive for small product markets. Noncommercial operations may be totally nonrecoverable over lengthy rotations but may be needed to meet other objectives such as visual management or wildlife habitat improvement.

SUPERIOR NF—La Croix RD

Robert Champa R09F09D06A

The following writeup describes a successful and somewhat uniform operation which exists on the La Croix RD. The land condition and types of sales most commonly sold are sales of pulpwood with diameters of 5- to 24-in. Most of the mature timber in our wood economy is in the 8- to 14-in dbh class. When we do thin pine stands, our diameters would number about the same. 95% of our sales are small clearcuts. When we do thin pine stands, our basal area to begin with is 160-240. We would thin this back to 80-100. Spacing varies with age/diameter. Diameters of these stumps would again be from 5- to 24-in depending on site condition, stand age, and productivity. Our maximum slope is 5% with very little of that. 0-5 is the most common slope. Thinning areas are predominately red pine and eastern white pine. Clearcut areas are composed of all species with the heaviest demand at this time being aspen. Conifers are whole tree skidded and processed at the landing. Slash is piled for latter burning by FS. Hardwood (aspen/birch) slash is left in the cuts to decompose naturally. The products brought to the road are whole tree or tree length. The conifers are delimbed and processed into the form for which the logger has contract at that time. Sawlogs, 10- to 16-ft; bottwood, 6- to 12-in diameter 8-ft logs, polewood or 100-in pulpwood. Aspen is shipped tree length/ polewood. At this time, a standard logging operation would have a Case tracked feller buncher with a 22-in shear head. This machine works very well in clear cut areas. Timberjack (Timco) feller bunchers are

also popular. They are very mobile in tight thinning areas (spacing 10-ft). Either of these fellers would have two 640 John Deere, 380 Timberjack, 666 Clark Ranger skidders pulling wood to the landings. The skidders are 95% grapple type. At the landing, delimbers are becoming the "rage" at this time. Many types and styles are available. After the wood is delimbed, it is loaded by Banko 160 loaders or the equivalent (Hood, Husky, Prentice, etc) and hauled to the market. There are many other types of equipment available at this time. I have only described the average operation.

SUPERIOR NF—Laurentain RD

Arthur Lindgren R09F09D01A

Most of our small harvesting operations are successful. The ones that have failed were due to the purchaser having invested too much money for logging equipment. The most successful operators have started small with only a few pieces of equipment and built up their fleet as funds became available. They have worked on thinning sales as well as clearcuts. In most of our thinning sales, the basal area is around 200-220 with a diameter range being from 6-10-in dbh. We shoot for a final basal area of 110-130 in the 50 year old class, and from 90-110 in the 60 year plus age class. The most successful way to harvest a thinning is to use small skidders, do the felling with a Bobcat with snippers, and to tree length skid with branches and top attached. Slashers are then used at the landing for limbing and bucking the trees into log or pulp lengths. Clearcuts range from 10 cords per acre up to 60 cords per acre. The most successful way to harvest these clearcuts is by using a Drott feller bruncher for felling, grapple skidders for skidding, and slashers at the landing site for bucking and limbing. Some operators do run the trees, branches, and all through a chipper. They save time as well as giving them a little over run in volume. Our District is almost flat with slopes ranging from 0-10%. We thin only red pine and white spruce stands to enhance sawtimber production and for aesthetic purposes. Slash is burnt at our landing sites to eliminate the potential of a bug infestations, and for appearance purposes. Our timber sale contracts require that all slash be lopped and scattered to lie

within 2-ft of the ground. All of our landings must be at least 50 feet back from the roadway used by the public. We make sure that slash piles are burnt or scattered on landings located near roads.

WHITE MOUNTAIN NF—Pemigewasset RD

Stan Nistler R09F22D04A

All harvesting done on the White Mountain NF meets the survey criteria of smallwood, for most of our stands range between sapling to 18-in dbh. We are a hardwood forest with stand densities ranging from 80 to 120 sq ft in basal area. Shelterwood thinnings leave between 60 to 80 sq ft of basal area; however, most of our sales are clearcut. Uneven aged management is practiced here with all size and age classes left. Slopes average 20% with a maximum operable slope of 35%. Species removed include yellow and paper birch, beech, sugar and red maple, aspen, and ash. Softwood species may include red spruce, Balsum fir, white pine, and hemlock. Slash is left in the stands and only removed from boundary lines, roads and streams. Tree length skidding with cable skidders is common and fuelwood fired commercial electrical plants are operating in the area to add in a minimal way to the market. Pre-commercial thinnings are not done in this forest.

WHITE MOUNTAIN NF—Saco RD

Rick Young R09F22D05A

Hardwood stands are being commercially thinned in the 5- to 18-in stump diameter range. Most stands were logged in the railroad area and now have a basal area of 120 sq ft, more or less. The stands are thinned to 80 sq ft with stumps ranging from 6- to 24-in. Slopes range up to 30 percent. Beech, red maple, aspen, and paper birch are predominantly removed. Very little whole tree chipping is done on his District and no specialized equipment is used in these thinning operations.

ALASKA REGION (R-10)

CHUGACH NF—Seward RD

Sue Kesti R10F04D03A

All of the sales on Chugach are "small" diameter timber ranging from 5- to 18-in dbh. Most are salvage sales of beetle killed material. At present, we do not have any intermediate thinnings as timber is over mature white/Lutz spruce. Volumes range from 3-10 mbf/acre. Sales are clearcut or overstory removals. 90-100% of stands are dead or infested. Most are cat or skidder shows, slopes range from 0-40%. Due to fire danger or fuel loading, whole tree yarding is required.