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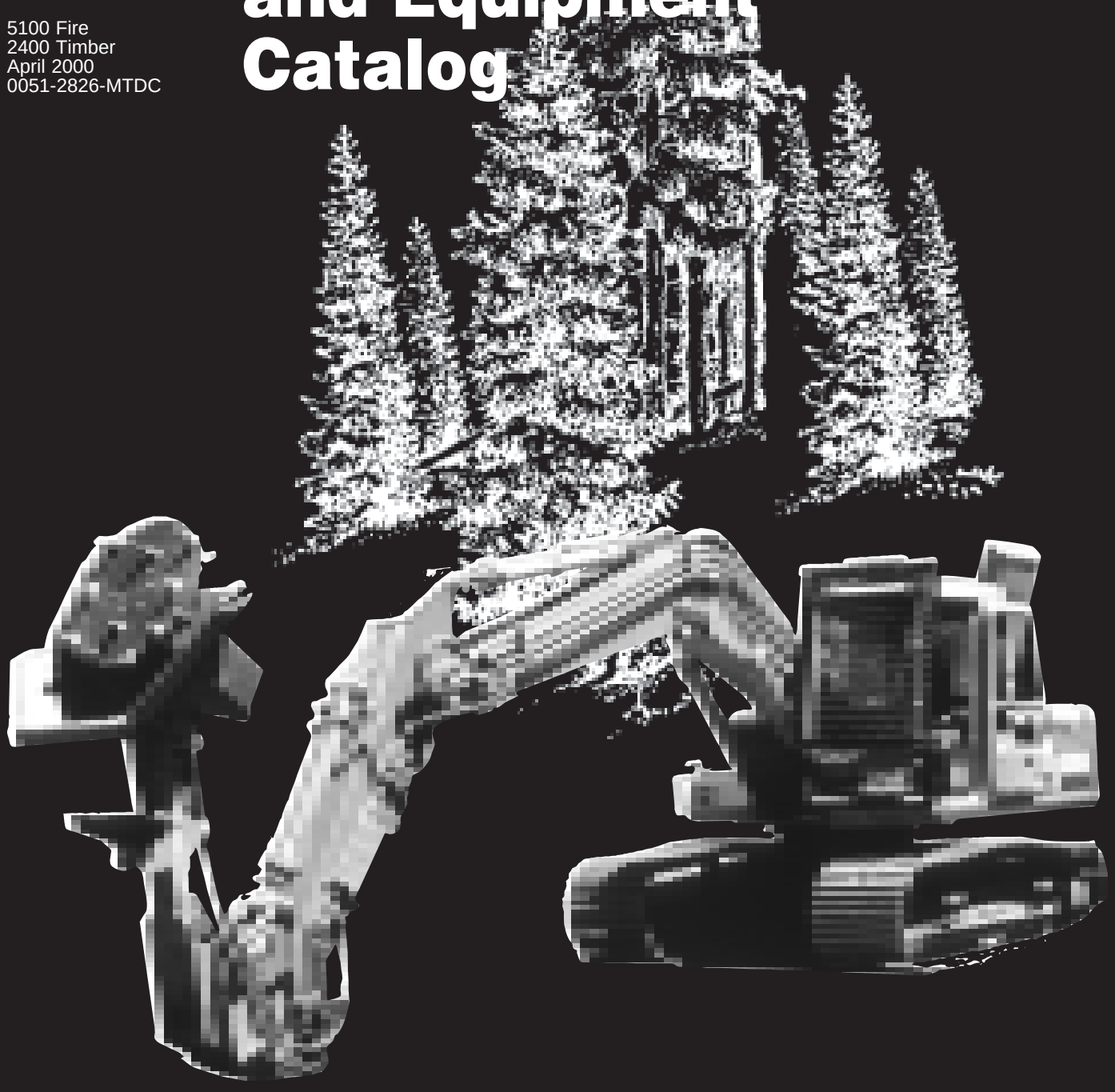
Understory Biomass Reduction Methods and Equipment Catalog



Acknowledgments

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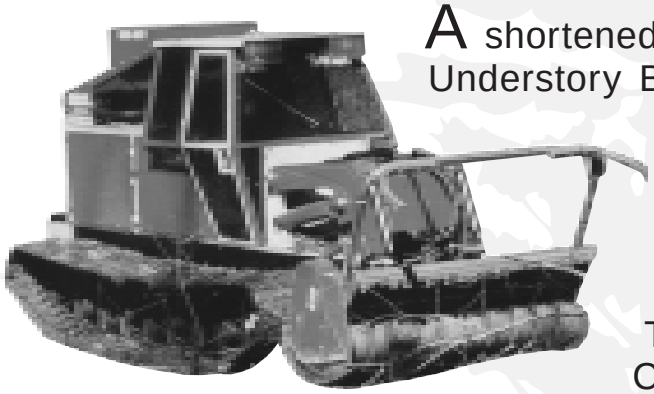


A shortened version of this report titled Understory Biomass Reduction Methods and Equipment (0051-2828-MTDC) does not include the 137-page Catalog of Machines and Specialized Equipment. It is available from the Missoula Technology and Development Center.

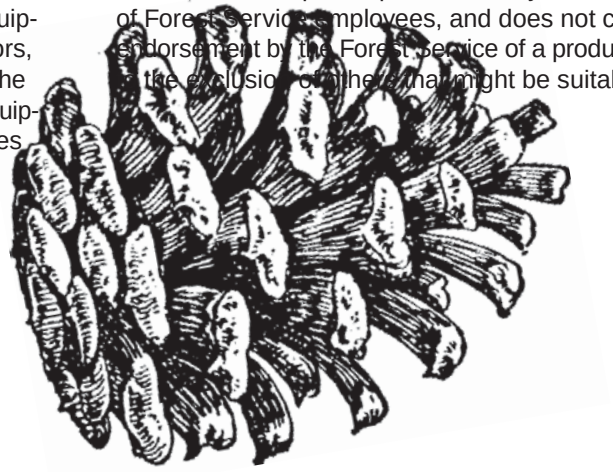
Introduction

This project began at the request of the Washington Office Fire and Aviation Management staff. They asked the Missoula Technology and Development Center (MTDC) to identify or develop equipment and techniques to help managers reduce extremely hazardous fuel-loading (biomass) conditions in ponderosa pine ecosystems where managers wanted to apply prescribed fire (wildland fire for resource benefit) on a landscape basis. The biomass reduction would facilitate the safe use of prescribed fire to maintain the health and vigor of these stands, and make it easier to defend them from wildfire. One project constraint given to MTDC requires that the biomass be considered unmarketable. This means that the sale of products such as wood chips or poles can't offset the cost of reducing the biomass. The methods and equipment identified in this project should apply in other fire-dependent ecosystems.

When MTDC began gathering information about equipment suitable to treat landscape areas before prescribed burns, it quickly became apparent that a comprehensive catalog would not be feasible due to the volume of information, as well as the time and budget allotted to the project. To keep the size of the catalog manageable, the equipment that is commonly available and well known is not included (equipment such as chain saws, winches, skidders, excavators, loaders, nonleveling-cab feller-bunchers, and so forth). The catalog includes a variety of small and large pieces of equipment suitable for many different management objectives and budgets.

Because landscapes needing treatment may cover thousands of acres, machines with high production potential are highly desirable. Stand biomass that has no commercial value necessitates low treatment costs per acre. Some machines were included because they were inexpensive. Others were included because of their ability to operate on extremely steep slopes or rugged terrain (equipment such as self-leveling-cab feller-bunchers, extreme machines, monocable yarders, and so forth). Specialty equipment and systems of many types (low ground pressure machines) were added to the catalog, and so were attachments to commonly available equipment (such as excavator and skid-steer attachments that are particularly effective and efficient in reducing fuel loading).

The *Catalog of Machines and Specialized Attachments* section of this report is not a comprehensive source, but is a general overview of equipment available for manipulating fuel profiles before prescribed burns (or, in some cases, instead of prescribed burns). A reasonable effort was made to include most available types of equipment. The equipment and specifications come from data supplied by the manufacturers. This report is published only for the information of Forest Service employees, and does not constitute an endorsement by the Forest Service of a product or service to the exclusion of others that might be suitable.



Historical Perspective

With few exceptions, the condition of ponderosa pine stands in the American West has changed significantly since the turn of the century. With the arrival of European settlers, wildland fire began to be viewed as a threat to the land's new uses. Whenever possible, wildland fires were excluded from the landscape. This general policy remained in effect until relatively recently when the land managers began to recognize its harmful effects.

Fire has historically acted to control the regeneration and invasion of certain plant species. In the absence of fire, these species now occupy a much greater percentage of the landscape than they once did. Some of these species, such as Douglas-fir, are not entirely suited to the sites they have invaded and are now more susceptible to insects and diseases. Even on sites that are primarily ponderosa pine, trees can become stressed due to competition for moisture, light, and nutrients. Ladder fuels, provided by thick regeneration, now exist from the ground to the crowns of the mature trees. In addition to the increased biomass, the risk of high-intensity fires also has increased. This condition existed to some degree before 1900, but is so extensive today that it has become the norm in ponderosa pine stands.

The effect of these changes is that parent stands are now more vulnerable to fire. When a fire does occur, it will be of much higher intensity and longer duration than if the stand were in a more natural condition. Mature trees that would have survived periodic, low-intensity fires a century ago may be killed by today's high-intensity fires. A fire that would have been a low-intensity ground fire in a more natural stand might now become a stand-replacement fire.

The stands that require work before prescribed fire can be successfully reintroduced may be in the forest (multiple-use areas), at the residential/forest interface, or in wilderness areas. Treatment areas may have good road access or be roadless, and they may have been previously logged or may never have been touched. Slopes can range from flat to those that are steeper than the operating limits of the most sophisticated machinery.

Extent of the Problem

To help determine the extent of this fuel-loading problem, the Washington Office sent out a short field survey. Information requested included the approximate number of acres in ponderosa pine types that needed some sort of preburn treatment and a listing of equipment and techniques that have been used to reduce fuel loading. Some Regions noted that the answers to the questions on ponderosa pine-type acres needing preburn treatment were not readily available from recorded data. Some assumptions had to be made. Approximate reported acres needing preburn treatment were:

❏ Intermountain Region (R-4)—4,788,000 acres.

❏ Northern Region (R-1)—4,650,000 acres.

❏ Pacific Northwest Region (R-6)—3,655,000 acres.

❏ Southwestern Region (R-3)—846,000 acres.

❏ Rocky Mountain Region (R-2)—Substantial (4.4 million total acres in ponderosa pine or mixed stands, the percent needing preburn treatments was not stated).

❏ Southern Region (R-8)—Not applicable. However, due to recent storms, the treatment techniques can be applied to 40,000 to 80,000 acres of blowdown in the National Forests of Texas.

The equipment and techniques identified in the informal survey, along with associated costs and production rates, are summarized in Appendix A.

Project Constraints

Based on interviews with the project initiator, other fire and fuels researchers, and field personnel, this project has the following equipment and technique constraints:

- ❏ There is no current commercial value to site material.
- ❏ Continuous thinning slash is too hazardous to be left in place.
- ❏ Chemicals are not an option.
- ❏ Minimal soil disturbance is desired (displacement, compaction, and so forth).
- ❏ Minimal leave-tree damage is desired.
- ❏ Equipment included must be able to manipulate the unmerchantable material.
- ❏ Equipment included must be readily available.
- ❏ Equipment included must be reliable.

Because so many different management objectives are possible, this report is limited to suggesting several fuel-reduction approaches, identifying appropriate equipment, and making comments on the equipment's ability to meet project constraints. The reader is left to decide if the ideas or equipment presented in this report are suitable for local needs and if they meet applicable guidelines.

Revenue Considerations

Revenue-generating material would provide options to help reduce the treatment cost. When there is no product to generate revenue, the task boils down to finding the lowest-cost strategy to prepare the stands for prescribed fire. The acceptable preburn treatment costs are influenced by the value of the resources that must be protected from catastrophic fire. It is more acceptable to spend large sums near residences and developed areas than in remote forest lands. Care should be taken so monetary considerations do not adversely affect the overall objective. A "cheap" prescribed burn can burn up the resource. Even if a low-cost treatment leaves the desired vegetation, loss of intangible or intrinsic values such as sensitive wildlife habitat—especially for threatened and endangered species—may have costs that are difficult to quantify.

Some acres can be treated inexpensively because little or no preburn treatment is needed, slopes are gentle, and only a small burning and holding crew is needed. Other acres may cost much more to treat and must be averaged with the inexpensive acres to make the overall treatment cost acceptable. This typically occurs when breaks or buffers are created to make the more difficult areas safer to burn. Low-cost units are frequently burned first so Districts can stay within their budgets while meeting resource targets. This creates a potential problem, since low-cost units are not necessarily the ones that have the highest treatment priority. When the more difficult acres are tackled, fewer low-cost acres may be left to average with them.

Increasing concerns about environmental implications of past forest management practices have led to the development of ecosystem restoration and management techniques, where fire hazard and pest problems are addressed in conjunction with timber-production activities. Such cost recovery is beyond the scope of this report. For a discussion on evaluating restoration prescriptions in ponderosa pine stands and the degree to which the value of product removals might underwrite treatment costs, see Product and Economic Implications of Ecological Restoration by Carl E. Fielder and others, Forest Products Journal, Volume 49, Number 2.

Auxiliary projects, such as commercial and individual firewood gathering and post and pole operations, may help offset some costs but rarely get the job done and do not significantly impact revenues. If forestry equipment is already in the woods on another project, it may be considerably more cost effective to use the existing equipment rather than to bring in other machines.

Other Considerations

A particular machine or method may be used not only to meet objectives from a fuels standpoint, but can also assist in meeting silvicultural objectives (regeneration, thinning, and other resource values), NEPA (National Environmental Policy Act) requirements and mitigation measures. These considerations may even set parameters that dictate or highly influence the choice of suitable equipment or the right approach for a particular situation.

In some cases mechanical treatment may be the total treatment because of local regulations limiting smoke, as in California, where alternatives to fire must be considered. Where followup with prescribed fire would otherwise be the normal course of action, managers will have to be satisfied knowing they have made a difference in fire behavior by decreasing dangerous fuel levels.

When hazardous biomass is reduced, all down wood or live vegetation other than ponderosa pine does not have to be removed. Other vegetation and down wood will contribute to diversity and the long-term sustainability of these ecosystems. Brian Ferguson, regional silviculturist from the Intermountain Region, recommends considering mosaics that allow diversity instead of getting rid of all vegetation. Mosaics can reduce fire potential across landscapes by breaking up fire patterns. In some areas, down wood can be left to provide opportunities to meet forest management plan long-term productivity standards for coarse woody debris (greater than 3 inches diameter), provided the debris does not contribute to excessive fuel loading. Machines could be used to distribute the debris.

Brian stated that recent discussions with staff from the Rocky Mountain Research Station (Moscow, ID) resulted in recommendations to rearrange fuels on the forest floor and to use broadcast burns instead of firing concentrated piles. According to this perspective, the use of extremely hot prescriptions and burning large piles can be detrimental to site productivity and nutrient recycling. Broadcast burns result in more uniform distribution of nutrients.

Treatment Concepts

The focus of this report is fuel treatment in a stand of ponderosa-pine overstory with a dense ponderosa-pine understory and/or Douglas-fir encroachment. The concepts are applicable (with or without adaptation) to other stand configurations. The condition of the stand is defined as overgrown with excessive ladder fuel. Ground fuel loading may or may not be excessive. Pockets of dense, small Douglas-fir create an additional problem that's difficult to treat with prescribed fire alone.

Given these conditions, potential treatments will be divided into three categories:

- ❏ Special prescribed-fire techniques.
- ❏ Mechanical treatment.
- ❏ Fuel reduction during harvest (Note: This approach is precluded by project criteria but is included here to assist managers in taking advantage of the opportunities to reduce other fuel-treatment costs.)

Special Prescribed-Fire Techniques

Before considering expensive mechanical treatments, it's important to review possible ways to deal with excessive fuel loading by deviating from the traditional preferred prescribed fire. A preferred prescribed fire, for purposes of this report, is defined as a single burn that removes all the desired fuel with very little risk of escape and little or no problems associated with smoke management. After treatment, the stand can be put into a more historically based burning cycle. The next couple of sections present some schemes that make use of the extreme ends of the burning window and may require a short time interval between burns. Some of the concepts presented are fairly common. Others are speculative, and may or may not be practical or advisable given local circumstances.

Series of Short-Interval Prescribed Fires

A series of low-intensity prescribed fires could be attempted in some stands to use crown scorch to kill undesirable saplings and seedlings. Subsequent burns would consume dead material killed during earlier burns. A minimum of two burns in close succession would be needed. Several burns could be required to get the stand into a condition where a preferred prescribed fire could be safely applied at a landscape level. Some fire personnel have indicated their biggest problem has been getting enough suitable burn days for this technique because of narrow burning and smoke management windows.

John Waverek, Fire Management Officer at the Missoula Ranger District (Lolo National Forest), has had good results with short-interval prescribed fires, even when substantial ladder fuels were present. He generally conducts the first burn on the wetter side of the prescription. Natural barriers are used to contain the fire perimeter, whenever possible. Best results are obtained with some preparation, such as fuel augmentation. If fuels need to be augmented, the use of chain saws should be considered. Sawyers can move quickly through the stand, creating pockets of fuel to be burned. The helitorch is used to burn during wetter periods. This equipment allows burning in wetter conditions than would be possible with ground ignition or with the plastic sphere dispenser. The helitorch works very well in remote, inaccessible terrain where crew safety is a factor in determining whether the project can be accomplished by hand ignition.

The Missoula Ranger District burned 900 acres using this technique for under $14 per acre (cost of first burn, no holding lines constructed). For this approach to be used successfully, the burn boss and crews must be very knowledgeable. An inexperienced crew could end up with results that are less than desirable. Since wetter material has a tendency to smolder and produce smoke, air quality must be carefully monitored. The lack of smoke dispersal can meet with public disdain. Future treatments involve coming back on short intervals (perhaps every 2 years) until site conditions meet management objectives. A little more of the undesirable accumulated fuel and duff layer is removed with each burn.

Although some districts are treating stands exclusively with fire, their work appears to be based only on experience (trial and error). Mick Harrington, a researcher at the Rocky Mountain Fire Sciences Laboratory in Missoula, MT, indicated that very little research, if any, has been done in the area of thinning stands with fire. Research could lead to operational guidelines that would help promote this concept.

Slashing Douglas-fir and Allowing It to Dry

Fire managers in the Northern Region note that dense stands of small Douglas-fir don't burn until the site is fairly dry. Pockets of these trees that are usually found in moister areas of the stand have been known to create barriers that prevent a prescribed fire from carrying. An informal local theory holds that the short needles of Douglas-fir compact tighter than ponderosa pine needles in the duff. This characteristic, combined with the dampness in these pockets, does not produce enough heat to scorch the young Douglas-fir during a prescribed fire. By the time these pockets are ready to burn hot enough to scorch the young Douglas-fir, the ponderosa pine is very flammable and the stand is often out of prescription. Northern Region fire managers have suggested that slashing some of the dense pockets of the Douglas-fir and letting the trees dry will widen the treatment window—a procedure that also works with whitebark pine. A variation is to fell the larger Douglas-firs into the patches of the young firs and let them cure before burning. This would eliminate a large seed source, reduce the ladder fuels and encourage scorching, killing young Douglas-fir seedlings (assuming Douglas-fir regeneration is undesirable).

Burning Duff

Karen Jones, a silviculturist for the Truckee Ranger District on the Tahoe National Forest, mentioned that they occasionally burn the litter/duff layer at the base of pines after snow has melted at the base of the trees, but while snow is still on the ground between the trees. They use a drip torch to ignite the dried litter layer. Snow patches between the trees prevent fire escapes and help control treatment intensity. This approach also reduces flame lengths and fire intensity around tree bases when the crew comes back after snowmelt and burns strips between the trees. This approach may not be adequate to deal with the ladder-fuel problem on the more heavily overgrown sites considered in this report. It can also lead to loss of nutrient cycling and long-term productivity.

Steve Arno, a researcher at the Rocky Mountain Fire Sciences Laboratory, expressed concern that burning the thick duff layer at the base of mature trees could damage root systems. He mentioned that some tree mortality has been attributed to this problem. Raking the duff layer from the base of mature leave trees before burning has been suggested. Steve says that raking the duff around mature trees is also costly and not realistic on large landscape-type burns. The Pacific Southwest Experiment Station is conducting a multiyear study on the effects of burning around large mature sugar pines on the Eldorado National Forest (Pacific Southwest Region). Effects of raking around the base of trees, season of the fire, and fire duration are among the elements being analyzed.

Burning During Snow Season

The Bitterroot National Forest sometimes goes into an area twice in the same year. If there is too much fuel on the ground, crews go in while the unit is still wet or has snow remaining and does a jackpot burn. Jackpot burning ignites ground-fuel concentrations remaining from a slashing operation or from natural fuel buildup over the years. Burn crews return the same year under drier conditions for a followup burn.

A technique used in the past by private timber companies was to wait until the first snowfall before burning. A small crew would traverse the unit using drip torches to ignite anything that would burn. Nature put out the fire during the winter. The concept was to reduce the fuel loading and create a mosaic in the unit at a reduced cost. Some States, such as Montana, have state air pollution laws that generally do not allow fires that will burn for several days to be ignited between November and March. Some exceptions are allowed.

Another burning opportunity occurs in the spring when crews can burn at and below the snow line. Larger fuels are still saturated with moisture. The snow line acts as a natural barrier, preventing escapes. The crew returns to the unit repeatedly as the snow line recedes and the fuels dry out. Spring burning may not be practical because of the smoke management problems associated with smoldering, damp fuels.

Aerial Options

A variation of the last two concepts is to use aerial ignition (helitorch or plastic-sphere dispenser). A major drawback to the helitorch is that vegetation is burned indiscriminately. Occasionally, torch fuel lands on desirable leave trees. A concern when using the plastic-sphere dispenser in wet conditions is the possibility that plastic debris and residual chemicals from the spheres will not be consumed by the fire.

In general, aerial ignition is associated with lower costs. Costs can be reduced further when new treatment areas are near areas that received previous burn treatments. If the helitorch is used, the helicopter can treat the new areas and treat older areas a second time while working from the same helispot. A variation on this approach is to burn smaller blocks on the perimeter of a larger block. The smaller blocks can act as a safety buffer so the interior can be burned under more intense conditions at a later date.

Fireproofed Perimeter With Hot Center Burn

A more radical approach is to fireproof a perimeter and then conduct a hot burn in the middle. Very little preparation takes place in the interior and some crowning will occur. This treatment will occasionally cause intense burns that create mosaics in the stand. Some desirable trees will be lost, but it is to be expected. This approach involves burning under hot prescriptions and making maximum use of the natural barriers like ridgetops or rock outcroppings. The possibility of an unplanned increase in target acres should be discussed and addressed through contingency planning. Increased biomass reduction during the initial burn should reduce the number of times the area has to be burned to achieve the desired end result. If the fire does not escape, this approach should result in lower overall treatment costs. Although fuel-reduction treatment costs may be lower, they must be weighed against possible reduction of stand diversity and long-term productivity. There is also the potential for suppression costs associated with fire escapes. Managers must consider these risks and compare them to the costs and extreme site damage associated with a wildfire during the height of the fire season. This approach is not acceptable near the forest/residential interface, but may be acceptable in more remote areas. Some field units have used this approach successfully on wildlife burns and have kept the treatment costs well within $100 per acre.

Residential/Forest Interface

Although some homeowners in residential/forest interface areas may object to fire treatments because of smoky conditions or blackened ground, these effects usually are short lived. Homeowners need to know that the greatest reductions in fire behavior or flame lengths—short of removing fuels from the site—come through prescribed burning. A well-written burn plan should keep undesirable visual effects to a minimum. The Forest Service's liability is not to be taken lightly. More money may need to be invested in preburn mechanical treatments in stands close to populated areas. Mechanical treatments can range from none to total when they are used instead of, or in conjunction with, fire. Chipping may be an effective option here. Recently, more consideration has been given to breaking up fuel patterns across large areas away from the residential/forest interface, areas that would otherwise be economically unfavorable to treat. The extent of mechanical treatments has to be worked out between fire managers and homeowners.

Mechanical Treatment

When fire alone is judged to be too risky or ineffective under acceptable prescriptions, partial mechanical treatments can be considered. Current treatment cost information is limited and site specific. Slope, stem diameter, stems per acre, and treatment objectives are just some of the factors that make it difficult to predict accurate costs. Cost per acre varies greatly. Appendix A includes some historical mechanical costs as reported in the initial field survey. There probably will be a need for some of the costlier mechanical preburn treatments presented in this section, especially at the residential/forest interface.

Using mechanical methods to rearrange the fuel profile can mitigate the risks of fire escape during prescribed fires. Only the vegetation that directly threatens the survival of the desirable leave trees (taller ladder fuels and concentrated fuel pockets), or vegetation that significantly increases the chance of fire escape, should be treated mechanically. Prescribed fire will kill the smaller standing ponderosa pine and the widely spaced Douglas-fir trees (stems less than 2 to 3 inches diameter).

To minimize preburn treatment costs, mechanically treat only the areas where the fire is most likely to go into desirable leave-tree crowns and perimeter areas surrounding the major area to be burned, especially any residential/forest interface. Once the perimeter areas have been fireproofed, the central area could be burned under a hotter prescription that would reduce the undesirable vegetation more quickly. Costs of the partial mechanical treatment should be spread through all the acres that are burned.

Tracks Versus Wheels

To meet the project's criteria, any machine used in the preburn treatments must not cause excessive soil disturbance (compaction, displacement, and so forth), must not damage leave trees, must be readily available, and must be reliable.

Because tracked machines typically have lower ground pressure and are more maneuverable on slopes, they meet the project's site disturbance concerns better than wheeled machines. (A potential exception may be some of the latest cut-to-length wheeled harvesters working on slash mats. This concept could use further study.) Soil compaction can be mitigated by working on snow or frozen ground, working on slash mats, or working when the soil is very dry. Although equipment with boom-mounted implements requires the operator to constantly reposition the machine, the overriding advantages are that the boom can reach over difficult areas the prime mover can not traverse. In addition, some ground is not compressed by the machine's weight. The boom can work in spaces tighter than the machine can travel through, but the operator must occasionally stop cutting and reposition the prime mover. In a telephone interview, Rick Toupin, a Logging Systems Specialist for the Pacific Northwest Region, mentioned that soil compaction is a significant issue there, and that using ground pressure exclusively to indicate soil compaction is misleading because of other interacting factors. Region 6 uses the amount of ground covered rather than pressure as an indicator of soil compaction during logging operations. This approach would favor a machine with a boom.

Some of the mechanized brush cutters commonly used to clear power line rights-of-way have wheels. Although the wheeled machines are very productive and usually less expensive to purchase and operate, they typically have higher ground pressures and are limited to gentler slopes than their tracked counterparts. Tracked machines would be more versatile in a typical forest setting. Exceptions may be wheeled vehicles equipped with over-the-tire tracks (see catalog section).

Methods to Modify Fuels Profile

Lop and Scatter

The most widely used slash treatment method for precommercially thinning pine stands in eastern California is lopping (with a chain saw) and scattering. Weatherspoon (1982) notes that this is one of the least expensive methods used, but it is also the least beneficial slash treatment for hazard reduction. Weatherspoon says that it can be an effective pretreatment, facilitating subsequent use of prescribed fire in certain stands. This approach will not work in stands of densely packed trees if the thinned slash will cause the fire to scorch leave trees and possibly start a crown fire (see *Project Constraints*). In more open areas lopped material could be scattered in openings. In such cases, the thinned slash might even be needed to carry the ground fire.

Cut With Chain Saw, Hand Pile, and Burn

When cutting the material with chain saws and hand piling it, quite a bit of large woody material can be left scattered onsite to meet guidelines for coarse woody debris. In many

cases only the tops and some branches need to be piled. Small winches could be used if larger materials are to be moved. The piles can be burned when convenient and when fuel moisture is too high to carry a ground fire. Some districts cover the piles with tarps to make them easier to ignite in really wet conditions. The use of chain saws should be considered and compared to any machine felling and piling systems before making a decision. Minimal preburn treatments may favor chain saws and hand piling. Extensive preburn treatments may favor heavy machinery. Using chain saws and hand piling may be the only option on steeper slopes. On the flip side, consideration should be given to the effects of pile burning on soil nutrient depletion.

Cut, Machine Pile, and Burn

A tracked machine with a boom can be used to cut and pile undesirable biomass, manipulating the fuel profile. Equipment should be sized to the vegetation. The feller-buncher is an attractive choice for brush cutting if the machine is already in the area and the saw head can be removed so that a brush head can be quickly installed. If all material is to be burned, the pile can be compacted with the machine, if desired, and left to cure.

One advantage of pile burning is that the piles can be burned during wet weather. This treatment should be done on the perimeter units where there is risk of fire escape. Once a safety buffer surrounding the main area has been mechanically treated and burned, substantially reducing the fire hazard, the main area can be burned. With a safety zone around the main area (either manmade or natural barriers), hotter prescriptions can be considered. For instance, ladder fuels could be thinned exclusively with fire in densely packed stands. Disadvantages to pile burning include the possible negative effect on soil nutrient depletion and collateral damage due to scorching of leave trees.

During the course of an interview with Steve O'Brien, a Northern Region logging engineer, discussion centered on a basal area reduction treatment that is being used by a large commercial logging company on some of its land in the Pacific Northwest. The following scheme is slightly outside the scope of this project but is included because it is a sensible approach if merchantable logs can be taken to offset costs during the course of the fuels treatment. The company's basic idea is to cut the merchantable and "weed" trees at the same time with a feller-buncher head mounted on a boom, and pile all trees (including weed trees). The use of this "hot saw" (continuously running disc saw with accumulator) significantly increases the logger's productivity compared to using a processing head. In another operation the merchantable material in the piles built by the hot saw is fished out and processed into cut-to-length pieces with a second machine equipped with a processor head. The merchantable material is taken out by a forwarder. The limbs and tops are left in the forwarder trail to be driven over.

After the forwarder removes the merchantable material, the unit is burned. The merchantable material provides income to help offset the cost of the preburn and burn treatments. This treatment thins the stand to increase site productivity and reduce the fire hazard.

The advantage to this company's approach is that the operator can work around the base of the leave trees with minimal damage and pile the burnable biomass a safe distance away. The hot saw can handle larger material with no problem. If equipped with a boom, the machine does not have to traverse every inch of ground, minimizing soil disturbance. The weed-tree piles could be concentrated and compacted with the machine if desired. Because the burning window is longer for pile burns, the piles could be burned when it's convenient. Firelines could be easily constructed around the piles if they began burning during a wildfire. Excavators and feller-bunchers are common machines, so this approach could be widely practiced. On gentle slopes, a tracked skid-steer or similar machine with a feller-buncher head may work.

Cut and Trample

A hot saw on a feller-buncher could cut down the trees. The machine could then move the cut material away from the base of the leave trees and run over the cut material. This approach eliminates the need to come back and burn piles before a prescribed fire, and helps break down the slash and put it closer to the ground. The resulting slash mat should also minimize soil disturbance by the machine traveling over it. This method raises questions about defense against wildfire while fuels are scattered on the forest floor. Trampling may reduce the hazard to acceptable levels. This possibility will have to be evaluated on a site-by-site basis. Prescribed burning of fuels that are crushed too finely and mixed with dirt may lead to incomplete combustion (smoldering) and smoke management problems. The amount of crushing must be carefully monitored. If burning later becomes prohibited, decomposition of the trampled slash will be slower on dry sites than on wet sites.

Crush and Chop

Another treatment method is to knock down the young standing trees, brush, and slash (logging and blow down) and crush or chop it up. When ladder fuels are removed or reduced, prescribed fires are easier to manage. The same equipment could be used for fuel augmentation. Weatherspoon (1982) notes that machine crushing can be an effective pretreatment for prescribed burning in some stands. Several papers on the use and productivity of chopping and crushing equipment were found and are referenced in Appendix B. (Anonymous 1967; Bryan 1970; Hopkins and Anderson 1960; Miyata and others 1983).

Crushers such as the Tomahawk in Figure 1 (Young Co., no longer made), the T.G. Schmeiser Co., Inc.'s Till n' Pak, or Hakmet USA's Meri Crusher should work between widely spaced leave trees. Rolling choppers (Figure 2) are commonly used for land clearing and site preparation in the Southeast (Marden Industries, Inc., Savannah Forestry Equipment Co., and Rockland Manufacturing Co.). None of these implements work very well with material that is supple, such as green seedlings. The equipment works better with dead material (slash) or during the winter months when material is frozen. This approach would probably also have to include a method or piece of equipment to get the standing material down. Large dozers with tree shearing blades (Savannah Forestry Equipment Co., Rockland Manufacturing Co., Rome, and Sharpco) have been used for land clearing operations. This equipment train would require a large turning radius, so tree spacing would be a consideration. Detrimental soil disturbance and damage to leave trees are also concerns with these machines (see the Catalog of Machines and Specialized Attachments).

Brush-Cutting, Thinning, and Shredding Machines

When a fire escape would be astronomically expensive, such as when residences are nearby or when the time required for sequential partial burns is not acceptable, mechanical treatments such as brush cutting, precommercial thinning, or shredding may be necessary. A wide selection of machines is available (see Catalog of Machines and Specialized Attachments). Many machines have been developed specifically to dispose of logging slash, but they can be costly to use.

If the objective is to reduce the vegetation in place, several mobile brush cutters and shredders can do the job. Mechanical brush-cutting equipment may have a vertical or horizontal shaft and the head may have fixed or free-swinging cutters. The heads may be machine mounted, boom mounted, or machine pulled. Some equipment manufacturers distinguish between an integrated machine and a specialized attachment, as we have done in the catalog section of this document. Many excellent publications on this subject are available (Karsky 1993; McKenzie and Makel 1991; Ryans and Cormier 1994).

A brush-cutter head mounted on a tracked excavator may offer a reasonable solution on slopes up to 35%. When a brush cutter head (many are commercially available) is mounted on a tracked feller-buncher with a self-leveling cab, the slope steepness may be increased to 50% or slightly more. The tree spacing must be considered. The tail swing on conventional excavators may damage leave trees, but it is negligible on zero-tail-swing feller-bunchers. Even if this equipment permits some kind of treatment on steep slopes, cost will be a factor. Some forests use the Slashbuster head

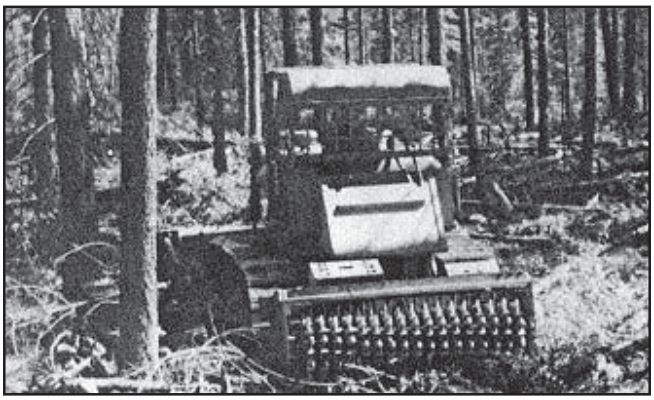


Figure 1—Tomahawk crusher.

Figure 2—Rolling chopper used for land clearing.

(D&M Machine Division, Inc.) on an excavator for fuel treatment and have indicated costs range from $220 to $270 per acre. One forest mounted the Slashbuster on a self-leveling-cab feller-buncher and estimated costs at $600 per acre. (Appendix A has additional information on equipment and techniques for this project as reported by forests.)

Vertical- Versus Horizontal-Shaft Machines

Most of the literature reviewed indicated that vertical-shaft machines are more productive than horizontal-shaft machines (Figures 3 and 4). Vertical-shaft machines produce a coarse, splintered stem and require a larger safety zone than the horizontal-shaft machines. Ryans and Cormier (1994) mention studies that show it is cheaper to cut stems with a vertical-shaft brush cutter and come back and stack the stems than it is to grind the stems with a horizontal-shaft machine. Some forests commented they thought there was more damage to leave trees when they used a vertical-shaft design with free-swinging cutters than when they used a drum shredder with free-swinging cutters. For equipment examples of both types, see the *Catalog of Machines and Specialized Attachments*. Table 1 compares the two designs.

Figure 3—The cutting head on the Kendall Cutter is a typical vertical shaft with free-swinging cutters.

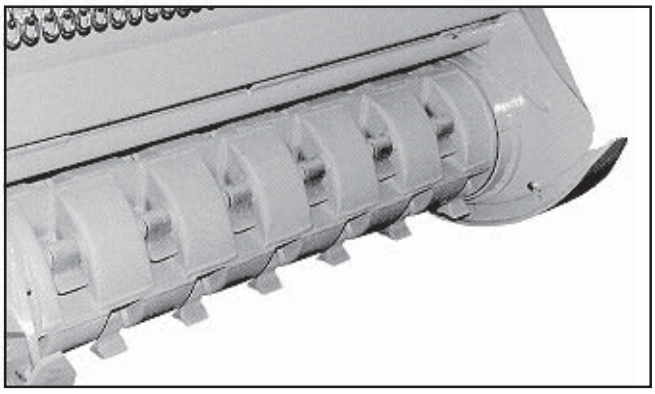


Figure 4—Seppi M drum shredder with free-swinging cutters.

The Slashbuster is a vertical-shaft design with fixed teeth (Figure 5). This head allows vegetation to be mulched in place. The head is also available with a "thumb" that allows vegetation to be piled. An excavator attachment called the VH Mulching Head (West-Northwest Forestry, Inc.) has an optional prototype tool head that uses replaceable carbide teeth and rotates very slowly compared to the Slashbuster. It also comes with a large thumb for piling vegetation. The Shar 20 by Shur Shar Manufacturing (Figure 6) is a specialized machine with a vertical-shaft, fixed-tooth disk, also available with free-swinging cutters on a disk. This machine and similar designs, such as the Lucky Logger (no longer available) and Timbermaster TM-20 (no longer available), have been used successfully on Forest Service lands in the past (McKenzie and Zarate give production data on several machines used for precommercial thinning and slash treatment in *Field Equipment for Precommercial Thinning and Slash Treatment—Update*, Project Record 8424-1204-SDTDC). Drawbacks include huge initial cost for the machine and the limited number of machines currently available. The machines are long and may have difficulty maneuvering in tight spots.

Table 1—Comparison of vertical- and horizontal-shaft reduction heads (McKenzie and Makel 1991).

VERTICAL-SHAFT HEADS—			
Advantages		Disadvantages	
• Low horsepower requirements	• Low blade life	• Can leave high stubs	• Large safety zones required
• Cuts even when dull	• Low energy consumption per per ton of chips produced	• Small bearing area at blade attachment points—can accelerate wear here.	• Can have poor operator visibility
• High kinetic blade energy			• Machine may be longer overall
HORIZONTAL-SHAFT HEADS—			
Advantages		Disadvantages	
• Capable of cutting close to ground	• Both ends of blades usually supported	• Higher power needed to drive cutters	• Poor cutting when the blade is dull (low kinetic blade energy)
• Can be closer-coupled machine	• Can have high kinetic drum energy (flywheel effect)	• Usually low kinetic blade energy	
• Can have good operator visibility		• Blades can be difficult to change	
• Can have large blade bearings			

Figure 5—The Slashbuster has a vertical shaft and fixed teeth.

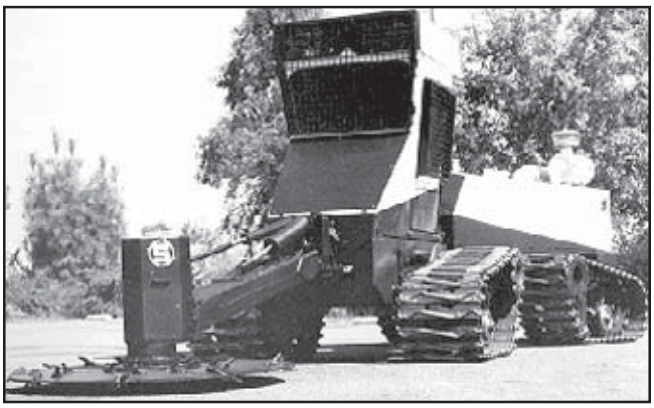


Figure 6—The Shar 20 has a vertical shaft and a fixed-tooth disk.

Tracked machines with booms and slashing heads like the Slashbuster, KDX mulching head (Kemp West, Inc.), Brushco (Figure 7, Quadco Equipment, Inc.), Pro Mac (Pro Mac Manufacturing, Ltd.), and Grizzly Tree Cutter (Alamo Industrial) can reduce fuels in place (see *Catalog of Machines and Specialized Attachments).* Some of these heads are available with a thumb to pile debris. This approach can be costly per acre unless it is used sparingly and the cost is spread over all acres to be burned. The Eldorado National Forest of the Pacific Southwest Region (R-5) has had good results using their Slashbuster in a variety of situations. They added a modified bar with cutting surface to the head, which helps to masticate smaller standing stems. Park-like effects can be achieved by a combination of machine work and successive burns. Park-like results may or may not be desirable from a cost standpoint.

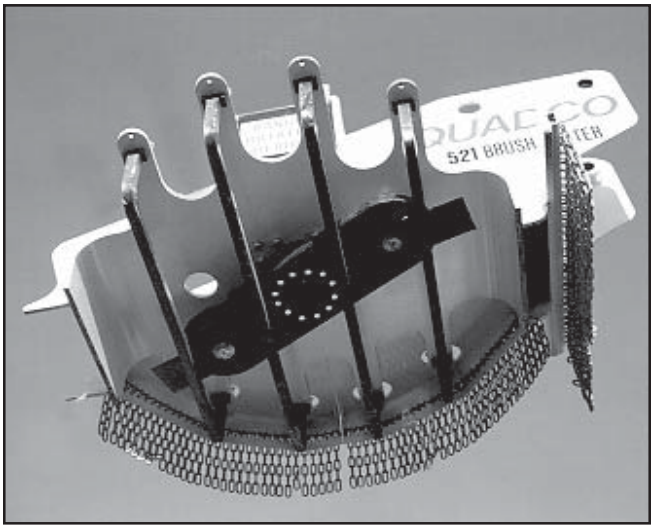


Figure 7—The Brushco brush-cutter attachment (made by Quadco) for excavators.

At one time, the San Dimas Technology and Development Center proposed a concept machine that had a horizontal-shaft drum with fixed teeth (McKenzie 1991). The head was an integral part of the machine, which was intended to thin and mulch trees in strips. The concept machine was never built and tested. Since that time, two companies, Fecon and Rayco, have each developed this type of machine (see Catalog of Machines and Specialized Attachments).

Chip

Another approach is the use of a self-propelled whole-tree chipper (Morbark Mountain Goat and Bandit Industries' Track Bandit in Figure 8, see Catalog of Machines and Specialized Attachments) to reduce fire hazard. Although this may be a feasible approach if a chip or hog fuel market is viable or if burning is prohibited, there are some drawbacks. A self-propelled whole-tree chipper can chop trees at the stump. A machine that cuts the trees must precede the chipper. The use of a felling machine or manual felling in addition to the chipper increases the cost of the operation. If a market for chips is present, provisions must be made to get the chips off the landing or out of the forest. Leaving chips spread out in the forest (assuming they could not be sold) would be a very expensive option, but it may be advantageous from a soils management perspective. The cost of the specialized chipping machines and the number that are available are also concerns. Although the Beckwourth Ranger District, Plumas National Forest in R-5, liked the concept of a feller-buncher working ahead of the Morbark Mountain Goat, they indicated that the Mountain Goat experienced a large percentage of downtime during a demonstration. Concerns about availability and dependability of the self-propelled whole-tree chippers make this approach less than ideal.

Figure 8—Track Bandit Model 1900 self-propelled whole-tree chipper.

Chipping has been done on a limited basis in the residential/forest interface on the Gila National Forest (R-3), Dixie National Forest (R-4), and the Bridger-Teton National Forest (R-4). On the Dixie National Forest, chipping was also used in conjunction with a project to reduce the spruce beetle infestations in camping areas where fire was not an option. Although tied to larger objectives, the projects were still costly. For chipping operations on landings, trailer-mounted whole-tree chippers should be considered.

Remove Biomass

Removing the undesirable biomass from a site involves handling every piece more than once, driving up treatment costs. Even though this report assumes material on the site has no current commercial value, for the sake of a broad discussion let's assume a viable chip or hog-fuel market is present, or that we want to move the biomass to a landing and wait for the market to become more favorable. In this case we need to consider options to get the material to the landing. When terrain permits, skidding material offsite with a rubber-tired skidder is more cost effective than using other logging systems such as cut-to-length and cable yarding. The cost of cable-yarding systems typically runs three times the cost of ground-based systems, according to interviews conducted for this project.

Whole-Tree Skidding

Whole-tree skidding (where the limbs are still attached) is especially cost effective and gets more of the biomass out of the unit. But whole-tree skidding at times has been found to cause undesirable soil disturbance and compaction. The Weyerhaeuser Company has reduced soil impact from rubber-tired skidders by using super-wide tires and studded chains rather than ring chains. Skidding over snow or frozen ground can also mitigate this problem. Whole-tree skidding increases the potential for damage to leave trees. In addition to skidding costs, the material must be cut in a separate operation.

A concern with this technique is nutrient recycling. Weatherspoon (1982) notes that "most nutrients contained in trees are concentrated in foliage and small branches. Removal only of material larger than 3 inches in diameter, therefore, removes relatively little of the nutrient capital of the site." With whole-tree skidding, all branches and tops are taken off the site where the nutrients would not be available for future forests.

Foresters on the Eldorado National Forest have been practicing whole-tree skidding on a number of sales over the past few years and report no adverse effects to date. The forests in the region have a relatively rich litter layer that remains intact when whole trees are removed. Limbs and debris that fall off during the thinning process are not cleaned up afterward. With repeated treatments, detrimental effects might be measurable. However, it was noted that with a 120-year rotation and thinning once every 20 years, trees will continue to produce, and nutrient stores should be maintainable or even increased. Pines hold their needles for 3 years, leaving 17 years for the needles to add to nutrient stores.

Although whole-tree skidding can be one of the cheapest ways to get the material out of the unit, it is often rejected because of soil disturbance, potential leave-tree damage, and additional handling costs. If there is no chip or hog-fuel market, the removed biomass will have to be piled and burned on the landing. The landing might need expansion to make room for the large piles.

Cut-to-Length Systems

Another harvesting technique gaining popularity is the cut-to-length system. This method causes less site damage than traditional rubber-tired skidding. The harvester lays the branches and tree tops in the forwarder's travel path to minimize soil disturbance. The forwarder crushes the branches and tops to reduce fire hazard. The shorter log lengths also reduce damage to leave trees. This approach is popular with some because it leaves more nutrients onsite. Drawbacks include equipment expense and lack of a high-value commercial product.

Girdle

A preburn treatment concept suggested to MTDC was to girdle undesirable trees. Girdled Douglas-fir trees would shed their needles after about 1 year. Ponderosa pines would do so after about 2 to 3 years. A prescribed fire on the wetter end of the prescription could remove the needle layer. Periodic prescribed fires would be passed through the unit as dead trees toppled over in a period of years. Youth crews could perform the work. Manual girdling equipment would have to be used because many youth crews are not allowed to use chain saws.

The girdling concept was discussed with fire researchers who thought the girdled trees would add to the fire hazard. When the needles were cured and still on the tree, ladder fuels would be extremely flammable. After the needle layer was burned off, it would be harder to get subsequent ground fires to carry through the unit, especially on the cooler prescriptions. During subsequent prescribed fires, standing dead trees become burning snags that could cast sparks across containment lines.

Some Equipment Options to Minimize Soil Disturbance on Steeper Slopes

Cut With Chain Saw and Hand Pile

Manual cutting with chain saws and hand piling may be the only feasible mechanical treatment possible on some steep slopes. Refer to the previous discussion in Methods to Modify Fuels Profile. Any other treatment considered should be compared to this one.

Multipurpose, Low-Ground-Pressure, Rubber-Tracked Machines

Some new, smaller, rubber-tracked machines may warrant a closer look. One is ASV, Inc.'s Posi-Track (Figure 9). It is reputed to be very stable on side slopes, but does not have a boom. The manufacturer rates it at 33% gradability on a sidehill. It has very low ground pressure (2 psi for the MD 70 with front loader, 3 psi for the HD 4500 and HD 4520 with front loaders). The Posi-Track can use any skid-steer implement. A feller-buncher head can be mounted, but the machine does not have enough power to operate the larger brush-cutting heads. LMC Corporation makes a similar machine, the Trackmaster 85 rubber-tracked crawler, that also has very low ground pressure (less than 2 psi with a bucket.) The Trackmaster's power source is smaller than the Posi-Track (88.5 hp compared to 115 hp). Davco Manufacturing, Inc. makes a 14-inch cutting-capacity hot saw for the Posi-Track. New Dymax, Inc. makes a 14-inch tree shear with accumulator for skid-steer machines. Hahn Machinery, Inc. and Davco Manufacturing, Inc. make small processor heads that could be used with the Posi-Track. A small nonpowered tree cutter with accumulator (E-Z Implements, Inc.) is available that can handle a maximum tree diameter of 8 inches (see the *Catalog of Machines and Specialized Attachments* for more small tree-cutting equipment options and skid-steer attachments). A grapple and stacking forks are just two of the implements that can be used to create piles in the unit.

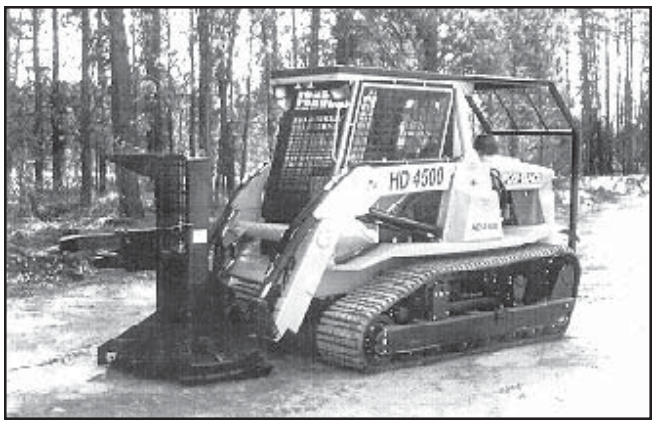


Figure 9—The ASV Posi-Track is a smaller, rubber-tired machine that shows good stability on slopes.

Feller-Bunchers With Self-Leveling Cabs

The private logging company's approach discussed earlier (see Cut, Machine Pile, and Burn under Mechanical Treatment, Methods to Modify Fuels Profile) could be expanded to steeper slopes (up to 50%) by using a feller-buncher with self-leveling cab (Timbco, Prentice, and Timberjack; see Catalog of Machines and Specialized Attachments). Even though common excavators can operate brush-cutting equipment on slopes up to 50%, the self-leveling cab feature is necessary when using a felling head so that there is proper tree orientation when cutting, and stability while moving with

a cut tree on steep slopes. These machines also make excellent platforms for mounting brush-cutting heads. The performance of the early model Timbco feller-buncher (Figure 10) is documented in Stokes and Lanford (1983).

"Cutting upslope and bunching to the front was the single most productive pattern, and cutting downslope and bunching to the rear was the least productive," reported Stokes and Lanford. "To have continuous cutting the most productive pattern involved cutting across-slope and bunching uphill with the butts facing downhill."

Figure 10—Timbco T445C feller-buncher with the Quadco 22-inch disk saw.

reduced substantially. Although it is possible to reduce the biomass in the unit using this approach, it would be extremely expensive to yard all the material to a landing.

Another possibility on steeper slopes is to concentrate the slashed trees into corridors and use a small cable yarder to yard the material to the landing for pile burning. If a market for small wood develops, small yarders like the Bitterroot Mini-yarder, a double-drum skyline and mainline yarder (Figure 12), or a monocable yarder can be considered. One commercial monocable system is the Howe-Line Monocable System (imported under the name Truckhowe, CC), which is not yet widely available in the United States, shows promise (Figure 13). It has a distinct advantage over zigzag-style monocables because it can yard in straight lines using specialized blocks and doubletrees to suspend the cable (see *Catalog of Machines and Specialized Equipment*).

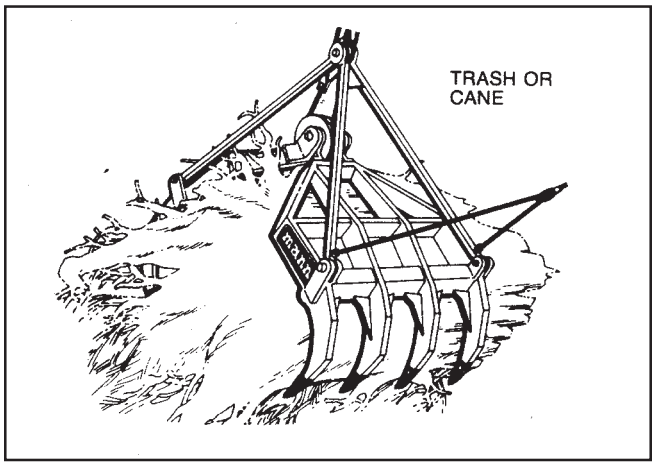


Figure 11—A skyline grapple rake can yard slashed trees that have been collected into corridors. (This model no longer available.)

Cable Yarders

Slash can be cable yarded on steep slopes with skyline grapples (Figure 11) or rakes (Krischuk and Miyata 1986). Once the material is on a landing, it can be piled and burned, or chipped. Unfortunately, the only commercial skyline grapple-rake designs that MTDC was aware of have been discontinued. An interesting option found in the literature is open-pit burning with a wind-generating machine called an air curtain destructor (Lambert 1972). This machine caused the material to burn so hot that smoke emissions were

Cable Chippers

Extra handling of the biomass drives costs up. One variation would be to cable a chipper around the unit and chip the biomass as you go. (See On-Site Chipper for Reduction of Forest Residues, Technical Report 8451-1207-SDTDC.) Drawbacks include the need to cut the material before it goes into the chipper and the possibility that nitrogen will be used by organisms that decompose the wood chips rather than being available for plants if the chips are left in concentrated piles.

Figure 12—The Bitterroot Miniyarder would be suitable for yarding smaller wood.

Figure 13—Eucalyptus clearfell harvesting with Howe-Line monocable system. (Photo courtesty of Professor Loren Kellogg, Oregon State University.)

Extreme Machines

Few machines will allow the operator to comfortably operate a mechanized shredder/brush cutter on slopes steeper than 50%. The Kaiser Spyder, Schaeff Climbing Backhoe, Menzi Muck, and Allied Systems' ATH 28 can operate on these steeper slopes, but they are very expensive to purchase and maintain and are not available in quantity (Figure 14). Johnson (1992–1993) reports spending $987 per acre on 2.4 acres to shred slash with a Kaiser Spyder on slopes steeper than 60%. When the cost was spread over the entire 14-acre burn unit, it was $161 per acre (see Catalog of Machines and Specialized Attachments for specifications on these extreme machines).

Figure 14—The Menzi Muck with a feller-buncher head is one of few machines that can operate brush cutters on slopes greater than 50%. They are cost prohibitive to run and are not readily available.

Fuel Reduction During Harvest

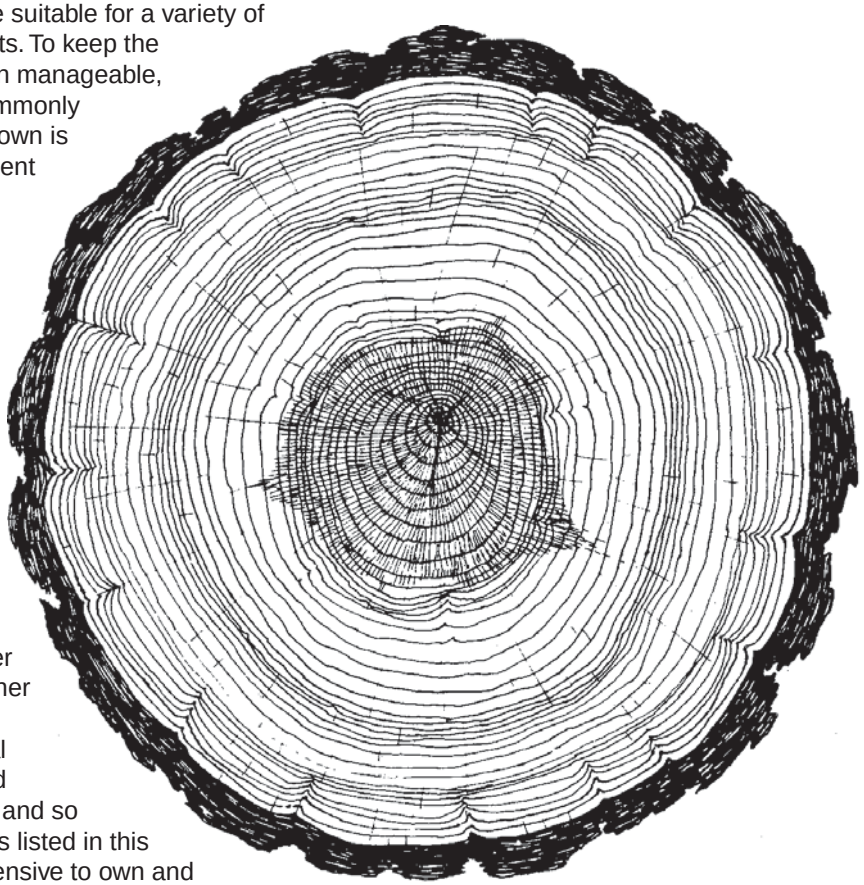
Although timber harvest is outside the present scope of this project, harvest offers a good opportunity to reduce the fuel loading as part of logging activities. Weatherspoon (1982) notes that the "National Forests in California have for a number of years included yarding unmerchantable material (YUM) provisions in many of their timber sale contracts. One purpose is to increase utilization." Utilization of residual small wood or biomass may become economically viable long after the main harvesting activity is over.

John Waverek, fire management officer at the Missoula Ranger District (Lolo National Forest), was interviewed in the early stages of this project. His District is near a cardboard linerboard manufacturing plant that uses wood chips and operates a hog-fuel burner. The District includes a clause in some harvesting contracts that requires extraction of all chippable material down to a 3-inch diameter. To help loggers cope with the sometimes volatile pulp market, the District allows a longer completion time on contracts so that material may not have to be removed from landings while the pulp market is unhealthy. The sale of the pulp-quality chips and hog fuel currently pays for processing and transporting up to 50 miles. Chip prices and market windows can fluctuate widely and the value of chips varies, depending on whether they are clean (destined for the pulp market) or dirty (destined for hog fuel).

Some areas in need of a preburn treatment were logged long ago or may never have been logged. A simplistic approach would be to harvest as much of the undesirable biomass as possible as merchantable products during fuel treatment. Districts would essentially trade the products to help offset the fuel-treatment expense. Posts, poles, chips, hog fuel, and firewood are some of the possible uses for the smaller material. Some larger trees—especially mature Douglas-fir—could be added if needed. Use of this approach may involve contractual issues beyond the scope of this publication. The primary benefit would be a sharp reduction in the tons per acre of fuel loading on the site.

Catalog of Machines and Specialized Attachments

This catalog is a compilation of specifications for equipment suitable for reducing excess biomass in areas before prescribed burns. It is designed to help forest managers make informed decisions. The catalog profiles a variety of lesser known, small, and large pieces of equipment that are suitable for a variety of situations and budgets. To keep the amount of information manageable, equipment that is commonly available and well known is not included (equipment such as chain saws, winches, skidders, excavators, loaders, non-selfleveling feller-bunchers, harvesters, and so forth).



When looking at machine specifications, forest managers will also want to consider how the equipment relates to such factors as: terrain, soil, timber characteristics, weather and climate, fiscal restraints, silvicultural systems, endangered species, regulations, and so forth. Some machines listed in this section are very expensive to own and operate. They were included for managers who might have some high-value acres to guard against wildfire (such as residential/forest interface) and substantial working budgets. Contact information for manufacturers and sources is in Appendix C.

Equipment Suitable for Reducing Excess Biomass

Although hand methods are mentioned in the body of this report, hand equipment (chain saws, axes, and so forth) is not covered in the catalog section because the equipment is commonly known and commonly available.

Mechanical brush treatment equipment is limited to the terrain and slope it can travel. Dick Karsky of MTDC gives recommended slope considerations for wheeled skidders in Site Preparation Equipment for Steep Slopes (9324-2804-MTDC). "Traveling parallel to the contour on slopes greater than 15% should not be attempted. Slopes up to 25% may be treated up and downhill, but only with spot scarification equipment. Six- or eight-wheel-drive forwarders may treat slightly steeper slopes. Skidders with wide tires provide better stability on sideslopes but are prone to slip on wet slash."

Concerning crawler tractors, Karsky states: "Traveling parallel to the contour should only be only be attempted on slopes up to 35%. This can vary depending upon equipment and type. Soft track vehicles such as FMC's may treat slopes up to 40%. Slopes up to 45% may be treated up and downhill, but only with spot scarification equipment."

"Excavators can treat slopes up to 50%. Short slopes greater than 50% can be treated off skid trails, depending upon boom reach…Excavators are very maneuverable, exert a low ground pressure, will accept multiple attachments, have reach capabilities that will reduce the number of passes required by the machine and thus reduce the movement required by the prime mover."

Brush-Cutting, Thinning, and Shredding Machines

Concept—This section contains integral brush cutting, precommercial thinning, and shredding machines. Integral machines, for the purpose of this report, are those in which the prime mover and cutting head are generally regarded as one unit, even though the head may be removable.

- ❏ The equipment is categorized according to the attachment location and orientation of the shaft the cutters revolve around.
- ❏ Heads can be attached directly to the machine (usually to the lift arms), attached to the boom, or machine pulled.
- ❏ Shafts can be vertical or horizontal.

Comments—Even though the machines listed are considered integral, many of the heads can be installed on other machines. Contact the manufacturer for additional information.

Other Known Manufacturers or Sources—Check the Timber West or Timber Harvesting annual buyer's guides for additional information on logging machines and related equipment (see Appendix B for details).

Brush-Cutting, Thinning, and Shredding Machines

Integral Units: Vertical-Shaft Brush-Cutters, Machine Mounted

Hydro-Ax 621E and 721E

Make/Model	Hydro-Ax 621E and 721E
Manufacturer/Source	Blount, Inc.
Distributor	Contact Blount, Inc. for dealer information
Price	Contact dealer
Status	In production
Prime Mover	621E and 721E are prime movers
Prime Mover Engine Power	621E: 177 hp; 721E: 210 hp
Gas/Diesel	Diesel
Transmission	Hydrostatic-mechanical with 2-speed transfer case
Max. Travel Speed	621E: Low, 6.2 mph; High, 16 mph. 721E: Low, 4.6; High, 14.6 mph
Width	621E: 9 ft 8 in; 721E: 9 ft 10 in
Length	621E: 26 ft 7 in; 721E: 28 ft 1 in
Height	10 ft 4 in
Weight	621E: 25,800 lb; 721E: 26,100 lb
Ground Clearance	21 in
Turning Radius	Approximately 18 ft
Slope Limitations and Specified Conditions	Recommended up to 20% slope
Attachment Power Supply	Pump delivery to rotary ax is 65 gpm; 5,500 psi
Attachment Mount (lift arms/booms/3-point/other)	Lift arms
Tires: Size and Gpsi	28L x 26 12PR; approximately 9.8 psi
Attachment Type/Model	Rotary ax attachment
Price, if not Included with prime mover	Included in a typically equipped machine
Maximum Treatable Material Size	7 in
Cutting Mechanism	2 free-swinging blades mounted to rotor bar
Cutting Width	8 ft
Shaft (horizontal/vertical)	Vertical
Rotation Speed	950 rpm
Power Source Required	65 gpm; 5,500 psi
Head Weight	4,750 lb
Other Attachments Available	Stump grinder, 20-in bunching saw; 20-in bunching shear
Special Uses/Adaptations/Other Uses	Bi-rotational cutting drive
Manufacturer's Comments Regarding Equipment Application	Data not supplied

Brush-Cutting, Thinning, and Shredding Machines

Integral Units: Vertical-Shaft Brush-Cutters, Machine Mounted

Gyro-Trac GT-18 XP Brushcutter

Make/Model	Gyro-Trac GT-18 XP Brushcutter
Manufacturer/Source	Gyro-Trac, Inc.
Distributor	Gyro-Trac
Price	$155,000
Status	In production
Prime Mover	GT-18 XP Brushcutter is a prime mover
Prime Mover Engine Power	190 hp
Gas/Diesel	Diesel
Transmission	Hydrostatic
Max. Travel Speed	Data not supplied
Width	100 in
Length	217 in
Height	110 in
Weight	17,300 lb
Ground Clearance	14 in
Turning Radius	0
Slope Limitations and Specified Conditions	70-degrees forward, 45-degrees sideward
Attachment Power Supply	Cutting head: 4,500 psi; 38 gpm
Attachment Mount (lift arms/booms/3-point/other)	Lift arms
Tracks: Size and Gpsi	Rubber with steel cross-links; 28 in; 2.0 psi
Attachment Type/Model	Gyro-Trac Rotary Mower
Price, if not Included with prime mover	Contact manufacturer
Maximum Treatable Material Size	Maximum 8 in; working material, 0 to 5 in
Cutting Mechanism	2 rotary discs
Cutting Width	8 ft
Shaft (horizontal/vertical)	Vertical
Rotation Speed	2,000 rpm
Power Source Required	38 gpm; 4,500 psi
Head Weight	Data not supplied
Other Attachments Available	GT-18 also available with: ROWMEC 7007PH drum shredder (ROWMEC also distributes GT-18 with rotary cutter or drum shredder.)
Special Uses/Adaptations/Other Uses	Seismic lines, pipe lines, transmission/distribution power line rights-of-way, roadside brush clearing, agricultural clearing, precommercial strip thinning
Manufacturer's Comments Regarding Equipment Application	Easily transportable with small truck/trailer, minimizing costs and permits; extremely stable; impressive power/traction performance; dependable, versatile.

Brush-Cutting, Thinning, and Shredding Machines

Integral Units: Vertical-Shaft Brush-Cutters, Machine Mounted

Kendall Brush Cutters 484 and 684

Make/Model	Kendall Brush Cutters: 484; 684
Manufacturer/Source	Kendall Manufacturing
Distributor	Kendall Manufacturing
Price	Contact manufacturer
Status	Built upon request
Prime Mover	484 and 684 are prime movers
Prime Mover Engine Power	484: 114 hp; 684: 152, 170, or 185 hp
Gas/Diesel	Diesel
Transmission	Variable hydrostatic-mechanical with 2-speed transfer case
Max. Travel Speed	First gear: 1.5 mph; Second gear: 3 mph; Third gear: 10 mph
Width	484: 7 ft 6 in; 684: 7 ft 10 in. Size varies with tire sizes
Length	484: 22 ft 10 in; 684: 23 ft 10. Size varies with engine type.
Height	9 ft to 10 ft 5 in, depending on tire size
Weight	484: approximately 17,500 lb; 684: approximately 19,000 lb
Ground Clearance	$16\frac{1}{2}$ in
Turning Radius	16 ft
Slope Limitations and Specified Conditions	Not calculated
Attachment Power Supply	42 to 55 gpm; 5,000 psi
Attachment Mount (lift arms/booms/3-point/other)	Lift arms
Tires: Size and Gpsi	18-4, 23-1, or 28-L (gpsi not calculated)
Attachment Type/Model	Kendall Cutter head
Price, if not Included with prime mover	$28,000
Other Suitable Prime Movers	Hydro-Ax 621, 721; Trackhoe; Barko machines
Maximum Treatable Material Size	10 in
Cutting Mechanism	Two free-swinging blades, one on each end of elliptical bar
Cutting Width	7 ft 6 in
Shaft (horizontal/vertical)	Vertical
Rotation Speed	1,100 rpm
Power Source Required	Closed loop 44 gpm; 5,000 psi
Head Weight	Approximately 3,500 lb
Other Attachments Available	Heavy duty Fecon Bull Hog cutter head; Seppi mower
Special Uses/Adaptations/Other Uses	Mowing rights-of-away, clearing land, precommercial thinning
Manufacturer's Comments Regarding Equipment Application	Oversize shaft, heavy-duty plating, oversize bearings; simple design; easily maintained; articulated; rough-terrain vehicle

Brush-Cutting, Thinning, and Shredding Machines

Integral Units: Vertical-Shaft Brush-Cutters, Machine Mounted

Kendall 690A Cutter

Make/Model	Kendall 690A Cutter
Manufacturer/Source	Kendall Manufacturing
Distributor	Kendall Manufacturing
Price	Contact manufacturer
Status	In production
Prime Mover	690A is a prime mover
Prime Mover Engine Power	185 hp
Gas/Diesel	Diesel
Transmission	Hydrostatic 2 speed
Max.Travel Speed	Low: 5 mph; High: 13 mph
Width	8 ft 6 in with 23.1 tires
Length	25 ft
Height	10 ft
Weight	24,000 lb
Ground Clearance	18 in
Turning Radius	16 ft
Slope Limitations and Specified Conditions	Not calculated
Attachment Power Supply	45 gpm; 5,000 psi
Attachment Mount (lift arms/booms/3-point/other)	Lift arms
Tires: Size and Gpsi	23.1 x 26: 8 psi; 28L x 26 to 6.5 psi; 67/34.00-26: 5.5 psi
Attachment Type/Model	Kendall Cutter head
Price, if not Included with prime mover	Contact manufacturer
Other Suitable Prime Movers	Hydro-Ax 621, 721; Trackhoe; Barko machines
Maximum Treatable Material Size	10 in
Cutting Mechanism	Two free-swinging blades, one on each end of elliptical bar
Cutting Width	7 ft 6 in
Shaft (horizontal/vertical)	Vertical
Rotation Speed	1,100 rpm
Power Source Required	Closed loop 44 gpm; 5000 psi
Head Weight	Approximately 3,500 lb
Other Attachments Available	Heavy-duty Fecon Bull Hog cutter head; Seppi mower
Special Uses/Adaptations/Other Uses	Mowing rights-of-away, clearing land, precommercial thinning
Manufacturer's Comments Regarding Equipment Application	Oversize shaft, heavy-duty plating, oversize bearings; simple design; easily maintained; articulated; rough-terrain vehicle

Brush-Cutting, Thinning, and Shredding Machines

Integral Units: Vertical-Shaft Brush-Cutters, Machine Mounted

Kershaw Klearway 800-1 and 1200

Make/Model	Kershaw Klearway 800-1 and 1200
Manufacturer/Source	Kershaw Manufacturing Co, Inc.
Distributor	Contact manufacturer for dealer information
Price	Contact manufacturer or dealer
Status	In production
Prime Mover	Kershaw 800-1 and 1200 are 4x4 prime movers
Prime Mover Engine Power	800-1: 185 hp at 2,400 rpm; 1200: 225 hp at 2,200 rpm
Gas/Diesel	Diesel
Transmission	1200: Hydrostatic 2 speed; 800-1: Power shift
Max. Travel Speed	800-1: Low, 5.5 and High, 15 mph; 1200: Low, 4.5 and High, 14 mph
Width	800-1: 7 ft 9 in; 1200: 10 ft
Length	800-1: 22 ft 7 in; 1200: 26 ft 8 in
Height	800-1: 8 ft 7 in; 1200: 10 ft 2 in
Weight	800-1: 19,000 lb; 1200: 24,500 lb
Ground Clearance	Data not supplied
Turning Radius	Data not supplied
Slope Limitations and Specified Conditions	Data not supplied
Attachment Power Supply	800-1: Single- and double-vane pumps power cutter head motors, raise/lower cylinders and winch. Max. hydraulic pressure is 2,200 psi. 1200: Cutter head motors, raise/lower cylinders, and winch are powered by two double-vaned pumps. Max. hydraulic pressure is 2400 psi.
Attachment Mount (lift arms/booms/3-point/other)	Lift arms
Tires: Size and Gpsi	800-1: 28L x 26; 1200: 67 x 34.00-25; high flotation
Attachment Type/Model	Kershaw Cutter Head
Price, if not Included with prime mover	Contact manufacturer or dealer
Maximum Treatable Material Size	800-1: 6 in; 1200: 8 in
Cutting Mechanism	Twin rotor discs with two free-swinging knives each
Cutting Width	800-1: 7 ft 8 in; 1200: 9 ft 9 in
Shaft (horizontal/vertical)	Vertical
Rotation Speed	800-1: 2,000 rpm; 1200 : 2,080 rpm
Power Source Required	Data not supplied
Head Weight	Data not supplied
Other Attachments Available	Bullhog 120 Mulcher. 1200 has 30,00-lb winch, optional logger tires, and 8-ft cutter head
Special Uses/Adaptations/Other Uses	Articulated frame; twin cutter heads have independent rotation control to enhance mulching and control direction of debris discharge; blades strike with the highest force in the industry.
Manufacturer's Comments Regarding Equipment Application	Rotary cleans heavy brush and trees up to 8-in dia. Bullhog Mulcher attachment cleans up to 20-in-dia. material.

Brush-Cutting, Thinning, and Shredding Machines

Integral Units: Horizontal-Shaft Brush-Cutters, Machine Mounted

FS4000 Brown Bear Forestry Shredder Tractor

Make/Model	FS4000 Brown Bear Forestry Shredder Tractor
Manufacturer/Source	Brown Bear Corp.
Distributor	Contact manufacturer for dealer information
Price	$235,000
Status	In production
Prime Mover	FS4000 is a prime mover
Prime Mover Engine Power	225 hp
Gas/Diesel	Diesel
Max. Travel Speed	20 mph
Transmission	Hydrostatic, 4-speed
Width	9 ft 5 in
Length	22 ft 6 in
Height	10 ft 8 in
Weight	28,000 lb
Ground Clearance	25^{11}_{12} in
Turning Radius	18 ft 6 in inside
Slope Limitations and Specified Conditions	Data not supplied
Attachment Power Supply	105 gpm; 5,500 psi pressure limited
Attachment Mount (lift arms/booms/3-point/other)	Machine mount
Tires: Size and Gpsi	23.1 x 26LS2 (standard); 28L x 26LS2 (optional). Ground pressure approx. 10 psi
Attachment Type/Model	Flail shredder
Price, if not Included with prime mover	Included in base price of prime mover
Other Suitable Prime Movers	Excavators
Maximum Treatable Material Size	8 to 10 in
Cutting Mechanism	54 free-swinging knives
Cutting Width	8 ft 2 in
Shaft (horizontal/vertical)	Horizontal
Rotation Speed	1,400 rpm
Power Source Required	105 gpm; 5,500 psi
Head Weight	Included with prime mover weight
Other Attachments Available	Brush-cutter, snow blower, angle/straight blades
Special Uses/Adaptations/Other Uses	6-way head (lift, tilt, pitch)
Manufacturer's Comments Regarding Equipment Application	Stirrup-shaped, single-edge cutters with overlapping pattern, each individually pinned

Brush-Cutting, Thinning, and Shredding Machines

Integral Units: Horizontal-Shaft Brush-Cutters, Machine Mounted

Kershaw Klearway 1200 With Bull Hog 100 Head

Make/Model	Kershaw Klearway1200 with Bull Hog 100 Head
Source	Estill's Windbreak Trimming, Inc.
Distributor	Estill's Windbreak Trimming, Inc.
Price	Contact source
Status	In production
Prime Mover	Kershaw 1200 is a prime mover
Prime Mover Engine Power	225 hp at 2,200 rpm
Gas/Diesel	Diesel
Transmission	Hydrostatic 2 speed
Max. Travel Speed	Low, 4.5 mph; High 14 mph
Width	10 ft
Length	26 ft 8 in
Height	10 ft 2 in
Weight	24,500 lb
Ground Clearance	Data not supplied
Turning Radius	Data not supplied
Slope Limitations and Specified Conditions	Data not supplied
Attachment Power Supply	Cutter head motors, raise/lower cylinders, and winch are powered by two double-vaned pumps. Max. hydraulic pressure is 2400 psi.
Attachment Mount (lift arms/booms/3-point/other)	Lift arms
Tires: Size and Gpsi	67 x 34.00-25 high flotation
Attachment Type/Model	Bull Hog 100 Wood Shredder
Price, if not Included with prime mover	Contact source
Maximum Treatable Material Size	Maximum practical size is10 in
Cutting Mechanism	42 fixed hammers on rotor
Cutting Width	6 ft 6 in
Shaft (horizontal/vertical)	Horizontal rotor
Rotation Speed	1,700 rpm
Power Source Required	PTO: 1000 rpm, 100 to 140 hp; hydraulic is 42 to 52 gpm; 4,500 desired psi
Head Weight	3,800 lb
Other Attachments Available	Can also be fitted with a Bull Hog 250 head
Special Uses/Adaptations/Other Uses	Data not supplied
Manufacturer's Comments Regarding Equipment Application	Data not supplied

Brush-Cutting, Thinning, and Shredding Machines

Integral Units: Horizontal-Shaft Brush-Cutters, Machine Mounted

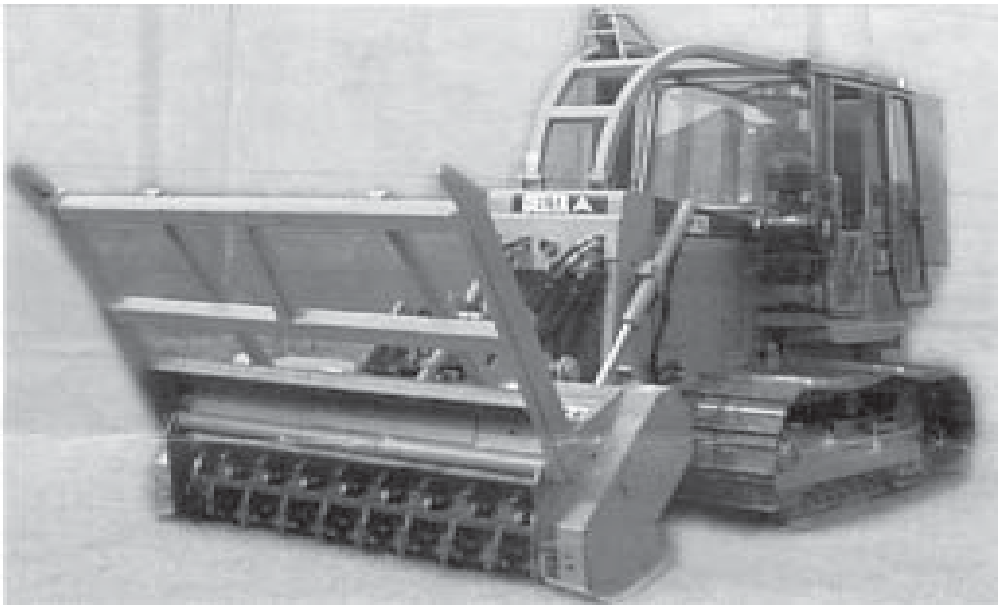
Bull Hog Track Machine, Self-Propelled Mulcher/Grinder

Make/Model	Bull Hog Track Machine, Self-Propelled Mulcher/Grinder
Manufacturer/Source	Fecon Resource Recovery Equipment Systems
Distributor	Fecon Resource Recovery Equipment Systems
Price	Contact source
Status	In production
Prime Mover	RT350
Prime Mover Engine Power	350 hp
Gas/Diesel	Diesel
Transmission	Hydrostatic
Max. Travel Speed	Data not supplied
Width	8 ft $2^{1}|_{2}$ in
Length	20 ft 6 in with Bull Hog attached
Height	9 ft 6 in
Weight	29,700 lb with Bull Hog 250 head
Ground Clearance	20 in
Turning Radius	Turns in own radius
Slope Limitations and Specified Conditions	45 degrees in all directions
Attachment Power Supply	PTO or hydraulically powered
Attachment Mount (lift arms/booms/3-point/other)	Category III 3-point hitch
Track: Type; Width (options); and Gpsi	Steel
Attachment Type/Model	Bull Hog 250 shredder
Price, if not Included with prime mover	Contact source
Other Suitable Prime Movers	Tractors, excavators, front end loaders in same class, with 3-point hitch
Maximum Treatable Material Size	Practical maximum is 16 to 20 in
Cutting Mechanism	48 fixed hammers individually mounted on rotor
Cutting Width	7 ft 6 in
Shaft (horizontal/vertical)	Horizontal
Rotation Speed	1,300 rpm
Power Source Required	1,000 rpm for PTO models 200 hp and up: for hydraulic models, flow = 119 to 95 gpm; desirable pressure is4,500 psi
Head Weight	BH 250 PTO: 7,100 lb; BH 250 hydraulic is 6,200 lb plus mount
Other Attachments Available	Roto Hog brush and stump shredder, hydraulic stump and brush-cutter, flail mulcher, stone crusher, Root Hog/Mixer-Shredder
Special Uses/Adaptations/Other Uses	Slash reduction, preplanting, land preparation, thinning, roadway clearing, stump grinding, brush and slash piles, yard waste recycling, land clearing, handling orchard prunings, pasture renovation
Manufacturer's Comments Regarding Equipment Application	Maneuverability; tool life in excess of 300 hours; tools can work in the dirt; smaller particle size; safe operation; one of highest-powered machines available for this application

Brush-Cutting, Thinning, and Shredding Machines

Integral Units: Horizontal-Shaft Brush-Cutters, Machine Mounted

Delta DT-535 Track-Mounted Mulcher



Make/Model	Delta DT-535 Track-Mounted Mulcher
Manufacturer/Source	Fecon Resource Recovery Equipment Systems
Distributor	Fecon Resource Recovery Equipment Systems
Price	Contact source
Status	In production
Prime Mover	DT-535 is a prime mover
Prime Mover Engine Power	Gross 350 hp, net 325 hp
Gas/Diesel	Diesel
Transmission	Hydrostatic
Max. Travel Speed	Data not supplied
Width	94 in
Length	21 ft or 106 in without mulching head
Height	108 in
Weight	30,000 lb fully equipped
Ground Clearance	14.2 in
Turning Radius	0
Slope Limitations and Specified Conditions	45-degrees up/downslope, 40-degrees sidehill
Attachment Power Supply	Single attachment/Bull Hog
Attachment Mount (lift arms/booms/3-point/other)	Lift arms
Track: Type; Width (options); and Gpsi	Steel, 26 in, 4.77 psi
Attachment Type/Model	BH250 Delta 75
Price, if not Included with prime mover	Included
Maximum Treatable Material Size	Cut 10-in-diameter trees
Cutting Mechanism	Fixed
Cutting Width	7 ft 6 in
Shaft (horizontal/vertical)	Horizontal
Rotation Speed	1,400 rpm
Power Source Required	278 minimum engine horsepower to hydraulics (Fecon specs)
Head Weight	6,196 lb
Special Uses/Adaptations/Other Uses	Slash reduction, preplanting, land preparation, thinning, roadway clearing, stump grinding, at transfer stations, brush and slash piles, yard waste recycling, land clearing, handling orchard prunings and pasture renovation
Manufacturer's Comments Regarding Equipment Application	Tool life in excess of 300 hours; tools can work in the dirt; smaller particle size; safe operation; one of the highest-powered machines available

Brush-Cutting, Thinning, and Shredding Machines

Integral Units: Horizontal-Shaft Brush-Cutters, Machine Mounted

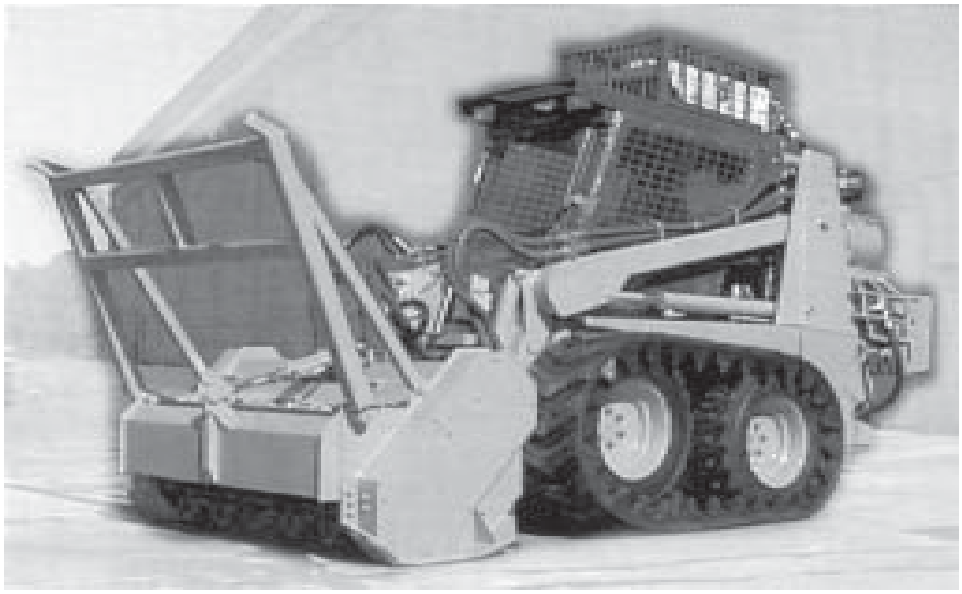
Delta DT-953C Track-Mounted Mower/Brush Rake

Make/Model	Delta DT-953C Track-Mounted Mower/Brush Rake
Manufacturer/Source	Fecon Resource Recovery Equipment Systems
Distributor	Fecon Resource Recovery Equipment Systems
Price	Contact source
Status	In production
Prime Mover	DT-953C is a prime mover
Prime Mover Engine Power	240 hp (optional 450 hp called the 15-in tree-mulching machine)
Gas/Diesel	Diesel
Transmission	Hydrostatic
Max. Travel Speed	Data not supplied
Width	9 ft 6 in
Length	27 ft 9 in with head
Height	10 ft 1 in
Weight	29,100 lb
Ground Clearance	14.8 in
Turning Radius	0
Slope Limitations and Specified Conditions	45-degrees up/downslope; 40-degrees sidehill
Attachment Power Supply	Single attachment/Bull Hog
Attachment Mount (lift arms/booms/3-point/other)	Lift arms
Track: Type, Width (options), and Gpsi	Steel, 26 in , 4.7 psi
Attachment Type/Model	BH 250 Delta 75
Price, if not Included with prime mover	Included
Maximum Treatable Material Size	Continuously cut: 6-in-diameter trees, (240 hp); 15-in-diameter trees, (450 hp)
Cutting Mechanism	Fixed
Cutting Width	7 ft 6 in
Shaft (horizontal/vertical)	Horizontal
Rotation Speed	1,400 rpm
Power Source Required	278 minimum engine horsepower to hydraulics (Fecon specs)
Head Weight	6,196 lb
Special Uses/Adaptations/Other Uses	Slash reduction, preplanting, land preparation, thinning, roadway clearing, stump grinding, at transfer stations, brush and slash piles, yard waste recycling, land clearing, handling orchard prunings, pasture renovation
Manufacturer's Comments Regarding Equipment Application	Tool life in excess of 300 hours; tools can work in the dirt; smaller particle size; safe operation; one of the highest powered machines available for this application

Brush-Cutting, Thinning, and Shredding Machines

Integral Units: Horizontal-Shaft Brush-Cutters, Machine Mounted

Delta DT-200 Skid-Steer Multi-Task Mower



Make/Model	Delta DT-200 Skid-Steer Multi-Task Mower
Manufacturer/Source	Fecon Resource Recovery Equipment Systems
Distributor	Fecon Resource Recovery Equipment Systems
Price	Contact source
Status	In production
Prime Mover	DT200 is a prime mover
Prime Mover Engine Power	195 hp at 2,000 rpm
Gas/Diesel	Diesel
Transmission	Hydraulic
Max. Travel Speed	Data not supplied
Width	70 in
Length	150 in overall
Height	90 in operating height
Weight	8,700 lb operating weight
Ground Clearance	8 in
Turning Radius	0
Slope Limitations and Specified Conditions	45 degrees up and downslope; 40 degrees sidehill
Attachment Power Supply	30 gpm
Attachment Mount (lift arms/booms/3-point/other)	Lift arms
Track Type, Width (options), Gpsi	Rubber, 20 in, 3.5 psi
Tire Size and Gpsi	15-in tires with rubber-track system
Attachment Type/Model	BH80H-275
Price (if not Included with prime mover)	Included
Maximum Treatable Material Size	Maximum practical is 8 to 10 in; continuously cut 6-in-diameter trees
Cutting Mechanism	Fixed
Cutting Width	4 ft 10 in
Shaft (horizontal/vertical)	Horizontal
Rotation Speed	1,700 rpm
Power Source Required	Mower pump 65 gpm; 5,200 psi
Head Weight	2,317 lb
Other Attachments Available	Machine can use any standard skid-steer attachment
Special Uses/Adaptations/Other Uses	Slash reduction, preplanting, land preparation, thinning, roadway clearing, stump grinding, at transfer stations, brush and slash piles, yard waste recycling, land clearing, handling orchard prunings, pasture renovation
Manufacturer's Comments Regarding Equipment Application	Versatile; gets into narrow spaces; minimal impact; tool life in excess of 300 hours; tools can work in the dirt; smaller particle size; safe operation

Brush-Cutting, Thinning, and Shredding Machines

Integral Units: Horizontal-Shaft Brush-Cutters, Machine Mounted

Franklin Tree Farmer Brush-Cutter C4550 and C4950

Make/Model	Franklin Tree Farmer Brush-Cutters C4550 and C4950
Manufacturer/Source	Franklin Equipment Co.
Distributor	Information not supplied
Price	C4550: $154,600; C4950: $183,000 (f.o.b. Franklin, VA, less attachments)
Status	In production
Prime Mover	Four-wheel articulated feller-buncher
Prime Mover Engine Power	C4550: 185 hp; C4950: 215 hp
Gas/Diesel	Diesel
Transmission	Hydrostatic variable displacement
Max. Travel Speed	Low: 6 mph; High 13 mph
Width	C4550: 105 to 125.13 in; C4950: 110 to 126 in (tire dependent)
Length	C4550: 200.25 in; C4950: 225.6 in (less cutter heads)
Height	C4550: 127 in; C4950: 127.75 in
Weight	C4550: 22,200 lb; C4950: 30,400 lb (less cutter heads)
Ground Clearance	C4550: 22.5 in; C4950: 21.19 in
Turning Radius	C4550: 12.3 ft; C4950: 13.9 ft
Slope Limitations and Specified Conditions	Depends on terrain and ground conditions
Attachment Power Supply	C4550: 5,000 psi, 58 gpm; C4950: 5,000 psi, 68 gpm
Attachment Mount (lift arms/booms/3-point/other)	Lift arms
Tires: Size and Gpsi	C4550: 23.1 x 26, 8.7 psi; C4950: 24.5 x 32, 9 psi (options available)
Travel speeds	Low: 0 to 6 mph; high: 0 to 13 mph
Attachment Type/Model	Fecon Bull Hog 120 for C4550; Fecon Bull Hog 150 for C4950
Price (if not Included with prime mover)	BH 120: $30,700 (incl. mounts); BH 150: $35,700 (incl. mounts)
Maximum Treatable Material Size	Best efficiency in material up to 8 in; requires more time to cut larger trees.
Cutting Mechanism	Horizontal drum with fixed carbide teeth
Cutting Width	BH 120: 85 in; BH 150: 88 in
Shaft (horizontal/vertical)	Horizontal
Rotation Speed	1,700 rpm
Power Source Required	BH 120: 5,000 psi, 42 gpm; BH 150: 5,000 psi, 57 gpm
Head Weight	BH 120: 4,000 lb; BH 150: 5,800 lb
Other Attachments Available	Can run a variety of attachments (with engineering approval).
Special Uses/Adaptations/Other Uses	Rights-of-way; fire breaks; fuel/slash reduction; flood-control channels; clearing lots, parks, recreational trails; tree removal; stump grinding; land clearing.
Manufacturer's Comments Regarding Equipment Application	Bull Hog attachments are contained-debris heads and operate safer and cleaner than rotary cutters.

Brush-Cutting, Thinning, and Shredding Machines

Integral Units: Horizontal-Shaft Brush-Cutters, Machine Mounted

Geo Boy Brush-Cutter Tractor With Seppi M Midi Forest 225 Cutter Head

Make/Model	Geo Boy Brush-Cutter Tractor with Seppi M Midi Forest 225 Cutter Head
Manufacturer/Source	Geo-Boy
Distributor	Geo-Boy
Price	Contact manufacturer
Status	In production
Prime Mover	Geo Boy is a prime mover
Prime Mover Engine Power	208 to 250 hp
Gas/Diesel	Diesel
Transmission	Hydrostatic
Max. Travel Speed	8 to 9 mph
Width	8 ft 3 in
Length	21 ft
Height	112 in
Weight	Approximately 20,000 lb
Ground Clearance	Data not supplied
Turning Radius	0
Slope Limitations and Specified Conditions	Depends on ground conditions
Attachment Power Supply	Hydrostatic
Attachment Mount (lift arms/booms/3-point/other)	Lift arms
Track Type, Width (options), and Gpsi	Rubber with steel bars; 33 in; 1.9 psi
Attachment Type/Model	Seppi M Midi Forest 225
Price, if not Included with prime mover	Contact manufacturer
Other Suitable Prime Movers	Data not supplied
Maximum Treatable Material Size	9.75 in
Cutting Mechanism	38 free-swinging or fixed hammers
Cutting Width	7 ft 5 in
Shaft (horizontal/vertical)	Horizontal
Rotation Speed	Operates at approximately 1,900 rpm
Power Source Required	Minimum 180 hp
Head Weight	5,070 lb
Other Attachments Available	All rubber track with chevron tread
Special Uses/Adaptations/Other Uses	Works with most drum type or rotary cutters within weight limits
Manufacturer's Comments Regarding Equipment Application	Clearing brush and small trees; maintaining wilderness road and trails; general right-of-way clearance maintenance
MTDC Comment	This company is developing a more capable rubber-tracked machine called the Heavy-Duty Geo Boy. It can be seen at: http://www.geo-boy.com

Brush-Cutting, Thinning, and Shredding Machines

Integral Units: Horizontal-Shaft Brush-Cutters, Machine Mounted

Magnum 500 Mulching Mower

Make/Model	Magnum 500
Manufacturer/Source	Magnum Mulching Mowers, Inc.
Distributor	Magnum Mulching Mowers, Inc.
Price	$335,000
Status	In production
Prime Mover	Partial 938 chassis provided by Caterpillar Industrial Products, Inc.
Prime Mover Engine Power	Caterpillar 3406E, 492 hp
Gas/Diesel	Diesel
Transmission	Hydrostatic
Max. Travel Speed	Low: 6 mph; High: 15 mph
Width	11 ft 6 in
Length	25 ft
Height	11 ft 6 in
Weight	39,000 lb
Ground Clearance	21 in
Turning Radius	18 ft
Slope Limitations and Specified Conditions	Data not supplied
Attachment Power Supply	Prime mover
Attachment Mount (lift arms/booms/3-point/other)	Lift arms
Tires: Size and Gpsi	30.5 x 32
Attachment Type/Model	Magnum mulching mower head
Price, if not Included with prime mover	Data not supplied
Maximum Treatable Material Size	30 in
Cutting Mechanism	Hammer Mill, 5 rows, 14-lb hammers
Cutting Width	8 ft
Shaft (horizontal/vertical)	Horizontal
Rotation Speed	1,700 rpm
Power Source Required	Data not supplied
Head Weight	10,100 lb
Other Attachments Available	None
MTDC Comments	Head uses dual hydraulic drives. Unit comes with an 800-lb slide bar that allows the head to be moved 16 in left or right.

Brush-Cutting, Thinning, and Shredding Machines

Integral Units: Horizontal-Shaft Brush-Cutters, Machine Mounted

Rayco T185 With FM7200 Forestry Mower/Mulcher

Make/Model	Rayco T185 with FM7200 Forestry Mower/Mulcher
Manufacturer/Source	Rayco
Distributor	Rayco
Price	Contact manufacturer
Status	In production
Prime Mover	T185
Prime Mover Engine Power	185 hp
Gas/Diesel	Diesel
Transmission	Hydrostatic, 2-speed range
Max. Travel Speed	Data not supplied
Width	8 ft 10 in
Length	20 ft
Height	9 ft 8 in
Weight	26,420 lb with mower
Ground Clearance	No hindrance in normal application
Turning Radius	Turns in own radius
Slope Limitations and Specified Conditions	Not to exceed 45-degree slope, continuous
Attachment Power Supply	85 gpm, 6,000 psi
Attachment Mount (lift arms/booms/3-point/other)	Machine
Cutting Head Dimensions	101-in wide; 39-in deep; 82-in high
Track Type, Width (options), Gpsi	24-in pad, 5.0 psi, double-bar grouser
Attachment Type/Model	FM7200 Mower/Mulcher
Price, if not Included with prime mover	Contact manufacturer
Maximum Treatable Material Size	4 in continuous and 6 in intermittent
Cutting Mechanism	36 swing hammers
Cutting Width	101 in
Shaft (horizontal/vertical)	Horizontal
Rotation Speed	2,000 rpm
Power Source Required	85 gpm; 6,000 psi; high pressure hydrostatic
Head Weight	3,740 lb
Other Attachments Available	Hydra-Stumper stump grinder
Special Uses/Adaptations/Other Uses	Site prep, rights-of-away
Manufacturer's Comments Regarding Equipment Application	Brush-cutting, thinning, and shredding

Brush-Cutting, Thinning, and Shredding Machines

Integral Units: Horizontal-Shaft Brush-Cutters, Machine-Mounted

Rayco T725 With 7260 Mower/Mulcher System

Make/Model	Rayco T725 with 7260 Mower/Mulcher System
Manufacturer/Source	Rayco
Distributor	Rayco
Price	Contact manufacturer
Status	In production
Prime Mover	T275
Prime Mover Engine Power	275 hp
Gas/Diesel	Diesel
Transmission	Hydrostatic, 2-speed range
Max. Travel Speed	Data not supplied
Width	8 ft 10 in
Length	20 ft 2 in
Height	9 ft 8 in
Weight	33,500 lb with mower
Ground Clearance	No hindrance in normal application
Turning Radius	Turns in own radius
Slope Limitations and Specified Conditions	Not to exceed 45-degree slope, continuous
Attachment Power Supply	110 gpm; 7,000 psi
Attachment Mount (lift arms/booms/3-point/other)	Machine
Cutting Head Dimensions	101-in wide; 43-in deep; 85-in high
Track Type, Width (options), and Gpsi	24-in double-bar grouser, 6.4 psi
Attachment Type/Model	FM726 Forestry Mower/Mulcher
Price, if not Included with prime move)	Contact manufacturer
Maximum Treatable Material Size	8 in
Cutting Mechanism	84 carbide-tipped fixed tools
Cutting Width	7 ft 9 in
Shaft (horizontal/vertical)	Horizontal
Rotation Speed	1,600 rpm
Power Source Required	110 gpm; 7,000 psi; high-pressure hydrostatic
Head Weight	8,000 lb
Other Attachments Available	Hydra-Stumper stump grinder
Special Uses/Adaptations/Other Uses	Site prep, rights-of-way
Manufacturer's Comments Regarding Equipment Application	Safety (debris is not thrown); end product is neater; spot turns result in greater production; multifunctional capacities at professional levels

Brush-Cutting, Thinning, and Shredding Machines

Integral Units: Horizontal-Shaft Brush-Cutters, Machine Mounted

R.O.W. King Land Clearing Machines, GT-18 and T-7

R.O.W. King Model GT-18

R.O.W. King Model T-7

Make/Model	R.O.W. King Land Clearing Machines, Models GT-18; T-7
Manufacturer/Source	Right-of-Way Maintenance Equipment Co. (ROWMEC)
Distributor	ROWMEC
Price	Contact manufacturer
Status	In production
Prime Mover	GT-18: Gyro-Trac GT-18; T-7: 411 EX Tractor. Also mounts on New Holland 9030 Versatile (T-5)
Prime Mover Engine Power	GT-18: 182.5 hp; 2,600 rpm. T-7: 150 hp continuous
Gas/Diesel	Diesel
Transmission	Hydrostatic
Max. Travel Speed	T-7: Low, 5mph; High,14 mph. GT-18: Data not supplied
Width	GT-18: 100 in; T-7: 8 ft
Length	GT-18: 229 in; T-7: 23 ft 6 in
Height	GT-18: 113 in; T-7: 11 ft
Weight	GT-18: 17,300 lb; T-7: 23,500 lb
Ground Clearance	GT-18: 13 in; T-7: 20 in
Turning Radius	GT-18: 0 degrees; T-7: 42 degrees
Slope Limitations and Specified Conditions	GT-18: 50 degrees; T-7: data not supplied
Attachment Power Supply	Varies with prime mover
Attachment Mount (lift arms/booms/3-point/other)	PH (hydraulic) models, lift arms; DH (self-contained) model, 3-point hitch
Track Type, Width (options), Gpsi	GT-18: Rubber and nylon with steel crosslinks, 28 in, 2.0 psi on flat terrain
Tires: size and Gpsi	T-7: Four Firestone Forestry Special 23.1-26, 7.49 psi
Attachment Type/Model	Heads: 7 ft 10 in; 7010H: 4 ft 10 in; 4010H: PTO and self-contained versions available
Price, if not Included with prime mover	Contact manufacturer
Other Suitable Prime Movers	International Harvester, Trackhoe, Caterpillar, Tiger Cat, John Deere, New Holland, Hydro-Ax, and Gyro-Trac
Maximum Treatable Material Size	8 to 15 in
Cutting Mechanism	Drum shredder with free-swinging stirrup knives
Cutting Width	4 ft 10 in or 7 ft 10 in
Shaft (horizontal/vertical)	Horizontal
Rotation Speed	2,300 rpm
Power Source Required	7010H and 4010H: Hydraulic circuit is 45 gpm at 5,000 psi. PTO is 80 hp, 1,000 rpm. Self-contained is diesel engine that powers the rotor with hydraulics.
Head Weight	7010H: 3,000 lb; 4010H: 2,700 lb
Other Attachments Available	GT-18 is also available with the Gyro-Trac rotary cutter
Special Uses/Adaptations/Other Uses	ROWMEC's T-5 R.O.W. King features a modified Ford 9030 Versatile tractor with hydraulic implement drive, forestry package
Manufacturer's Comments Regarding Equipment Application	Forestry, right-of-way, geophysical and general land clearing

Brush-Cutting, Thinning, and Shredding Machines

Integral Units: Vertical-Shaft Brush-Cutters, Boom Mounted

Rottne 2004 With MK 70 Cutting Head

Make/Model	Rottne 2004 with MK 70 Cutting Head
Manufacturer/Source	Blondin, Inc.
Distributor	Blondin, Inc.
Price	Contact source
Status	In production
Prime Mover	Rottne 2004 (2002)
Prime Mover Engine Power	125 hp (93kW)
Gas/Diesel	Diesel
Transmission	Hydrostatic
Max. Travel Speed	Data not supplied
Width	72 in
Length	78 in without boom
Height	113 in
Weight	Service weight without head is 13,340 lb
Ground Clearance	Maximum 39 in, minimum 8 in
Turning Radius	Data not supplied
Slope Limitations and Specified Conditions	Data not supplied
Attachment Power Supply	Pumping capacity at engine speed is 40 gpm; working pressure is 2850 psi
Attachment Mount (lift arms/booms/3-point/other)	Boom
Boom Type and Reach	Parallel-acting knuckle boom with 21.3 ft outreach
Rires: Size and Gpsi	500/50 x 26.5 T159 Standard
Attachment Type/Model	Cutting Head MK70
Price, if not Included with prime mover	Contact source
Maximum Treatable Material Size	10 cm
Cutting Mechanism	Fixed
Cutting Width	70 cm
Shaft (horizontal/vertical)	Vertical
Rotation Speed	2,800 rpm
Power Source Required	20 to 25 Mpa
Head Weight	220 kg
Other Attachments Available	EGS 400 single-grip harvester
Special Uses/Adaptations/Other Uses	Harvesting, thinning
Manufacturer's Comments Regarding Equipment Application	MK 70 used in planted stands to clean out brush, give more open space for growing; 2004 usually equipped with ESG 400 harvesting head for thinning and MK 70 often used when thinning operations are down in spring

Brush-Cutting, Thinning, and Shredding Machines

Integral Units: Vertical-Shaft Brush-Cutters, Boom Mounted

Shar 20 Cutter

Make/Model	Shar 20 Cutter
Manufacturer/Source	Shur Shar Manufacturing
Distributor	Shur Shar Manufacturing
Price	$150,000
Status	In production
Prime Mover	Shar 20 is a prime mover
Prime Mover Engine Power	128 hp
Gas/Diesel	Diesel
Transmission	Mechanical 4 speed with variable hydraulic drive
Max. Travel Speed	Data not supplied
Width	93 in
Length	18 ft 5 in without cutter head
Height	108 in
Weight	17,500 lb
Ground Clearance	15 in
Turning Radius	Data not supplied
Slope Limitations and Specified Conditions	60% slope; 30% sideslope
Attachment Mount (lift arms/booms/3-point/other)	Boom
Boom Type and Reach	Stick boom, 60 in
Track Type, Width (options), and Gpsi	Rubber belt with steel shoes; 26 in; 4 to 5 psi
Attachment Type/Model	Shar 20
Price, if not Included with prime mover	Included in base price of prime mover
Other Suitable Prime Movers	None
Maximum Treatable Material Size	14 in
Cutting Mechanism	Fixed-tooth (also available as swinging)
Cutting Width	14 ft 6 in
Shaft (horizontal/vertical)	Vertical
Rotation Speed	400 rpm
Head Weight	Included with gross vehicle weight
Other Attachments Available	Shar 20 Cutter Head
Special Uses/Adaptations/Other Uses	See manufacturer's comments
Manufacturer's Comments Regarding Equipment Application	Rugged enough for slash reduction, dense brush, precommercial thinning; accurate enough for use in new plantations without damage to small trees

Brush-Cutting, Thinning, and Shredding Machines

Integral Units: Vertical-Shaft Brush-Cutters, Boom Mounted

Silvana Selective Cutter

Make/Model	Silvana Selective Cutter
Manufacturer/Source	Silvana Import Trading, Inc.
Distributor	Silvana Import Trading, Inc.
Price	Contact source
Status	In production
Prime Mover	Modified Ford 9030, articulated
Prime Mover Engine Power	Ford 9030 (about 105 hp)
Gas/Diesel	Diesel
Transmission	Hydrostatic mechanical
Max. Travel Speed	Data not supplied
Width	2,400 mm
Length	Rear axle to boom-mount is 3,160 mm
Height	2,975 mm
Weight	Data not supplied
Ground Clearance	580 mm
Turning Radius	Data not supplied
Slope Limitations and Specified Conditions	Data not supplied
Attachment Power Supply	Data not supplied
Attachment Mount (lift arms/booms/3-point/other)	Boom
Boom Type and Reach	Articulated, parallel acting; fully extended from mount to tip of head is 5,850 mm
Tires: Size and Gpsi	4 x 4; data not supplied
Attachment Type/Model	Specially designed clearing head and boom
Price, if not Included with prime mover	Contact source
Maximum Treatable Material Size	Data not supplied
Cutting Mechanism	Data not supplied
Cutting Width	0.8-m diameter
Shaft (horizontal/vertical)	Vertical
Rotation Speed	2,500 rpm
Power Source Required	80 l/m; 200 to 250 bar
Head Weight	EK 804 Trimcut head: 160 kg
Other Attachments Available	Optional high ground clearance for straddling trees up to 3 m
Special Uses/Adaptations/Other Uses	Data not supplied
Manufacturer's Comments Regarding Equipment Application	Developed in collaboration with Forest Engineering Research Institute of Canada (FERIC)

Self-Propelled Whole-Tree Chippers

Concept—Certain situations may warrant chipping onsite, especially if burning is prohibited. Chips can be blown back or hauled out. In some areas chip markets may make this option economically more feasible than in other areas. Consideration should be given to the results of removing the nutrient-rich chips from the site.

Comments—Chipping, in general, is an expensive option for reducing biomass onsite, especially if the chipper must be hauled to the landing and material must be brought to the chipper. A tree/brush cutter must precede the chipper. If a loader is required, it adds to the cost. A trailer-mounted self-loading chipper, such as those produced by Bandit or Morbark and Vermeer could conceivably be towed through the stand, but the machines' turning radius and tree spacing could present major problems.

The two whole-tree chippers are presented here as an option in areas where conditions may allow. We are only aware of two manufacturers of self-propelled whole-tree chippers.

Other Manufacturers or Sources—Self-propelled whole-tree chippers are not common. In addition to sources listed in this catalog, other manufacturers of non-self-propelled whole-tree chippers include Peterson Pacific Corporation and Vermeer Manufacturing.

Check the Timber West or Timber Harvesting annual buyer's guides for logging and related equipment (see Appendix B for details).

Other unconfirmed sources of whole-tree chippers listed in Timber West 1999/2000 Buyer's Guide & Directory include:

- Acrowood Corp.
- Diamond Z Manufacturing
- Dura Tech Industries, International
- Forest Processing Equipment
- Forest Tool Co.
- Nicholson Manufacturing Co.
- Peterson Pacific Corp.
- Precision Husky Corp.
- Strong Manufacturing
- Timber Machine Technologies
- Valon Kone Brunette, Ltd.

Self-Propelled Whole-Tree Chippers

1900 Track Bandit

Make/Model	1900 Track Bandit Self-Propelled Whole-Tree Chipper
Manufacturer/Source	Bandit Industries, Inc.
Distributor	Contact manufacturer for dealer information
Price	Track mounted models: $250,000 to $275,000, depending on options
Status	In production since 1990
Prime Mover	Caterpillar 325 undercarriage
Prime Mover Engine Power	Choice of 425 to 500 hp
Gas/Diesel	Caterpillar, Cummins, and John Deere diesels
Transmission	Hydrostatic
Max. Travel Speed	4.2 mph
Width	10 ft 6 in
Length	28 ft
Height	11 ft 4 in
Weight	57,000 lb
Ground Clearance	20 in
Turning Radius	Turnability ratio: 0.57
Slope Limitations and Specified Conditions	Approximately 26 degrees
Track Type, Width (options) and Gpsi	30 in; under 6 psi
Boom Type and Reach	Knuckleboom with 18 ft reach, 35 in, 180-degree grapple rotation
Maximum Treatable Material Size	19-in diameter
Cutting Mechanism	3-knife chipper with 60-in chipper disc; size of knives depends on chip size wanted
Chipper Drum Speed	Approximately 900 rpm
Size of Chip Produced	0.75 in is standard
Attachment Power Supply	475 hp; 2,200 rpm
Special Uses/Adaptations/Other Uses	220-degree swivel discharge. Bandit also makes the 1900 as a towable model, and other sizes of self-propelled chippers.
Manufacturer's Comments Regarding Equipment Application	Processing logging slash, clearing land, harvesting whole trees. Chips used for raw material for paper and board, fuel, wood chips, mulch, logging road beds, and as soil enhancer.

Self-Propelled Whole-Tree Chippers

Morbark 50/48 Mountain Goat

Make/Model	Morbark 50/48 Mountain Goat
Manufacturer/Source	Morbark, Inc.
Distributor	Contact Morbark, Inc.
Price	Contact manufacturer
Status	In production
Prime Mover	50/48 Mountain Goat is a prime mover
Prime Mover Engine Power	650 to 860 hp
Gas/Diesel	Diesel
Transmission	Hydraulic
Max. Travel Speed	2.4 mph
Width	11 ft 6 in
Length	22 ft
Height	11 ft 6 in
Weight	77,000 lb
Ground Clearance	34 in
Turning Radius	Data not supplied
Slope Limitations and Specified Conditions	Data not supplied
Track Type, Width (options) and Gpsi	750 mm triple grouser shoes; 6.3 psi
Boom Type and Reach	Knuckleboom with 18-ft reach; 180-degree swing; 360-degree continuous-rotation grapple
Maximum Treatable Material Size	24 in
Cutting Mechanism	10 Babbitt-style knives, $10^{1}/_{2}$ x $4^{3}/_{8}$ x $^{1}/_{2}$ in; Drum, 48-in diameter, 52-in wide
Chipper Drum Speed	828 rpm
Size of Chip Produced	Data not supplied
Attachment Power Supply	Data not supplied
Special Uses/Adaptations/Other Uses	50/48 Mountain Goat comes with skidder style blade for extra stability and flexibility; Morbark makes a 30/36 Mountain Goat (425 to 460 hp) and trailer-mounted versions of 30/36 and 50/48
Manufacturer's Comments Regarding Equipment Application	Where chips can be broadcast back over terrain, Mountain Goat eliminates the need for skidding and forwarding material

Multipurpose, Low-Ground-Pressure, Rubber-Tracked Vehicles

Concept—These specially designed machines look similar to skid steers with tracks, but they are in a class by themselves. They are tracked machines designed for superior performance on all types of terrain, have a low center of gravity, and very low ground pressure (less than 3 psi), making them an advantageous choice where the ground conditions are sensitive, such as riparian areas.

Comments—These rubber-tracked vehicles are extremely versatile because they accept a wide range of hydraulic and PTO-driven attachments.

Other Manufacturers or Sources—Also check out the following rubber-tracked, low-ground-pressure machines included in this report: Gyro-Track GT-18 XP (2.0 psi); and Geo Boy (1.9 psi).

Melroe's Bobcat has just recently introduced their G-Series Model 864 compact track loader that is a rubber-tracked skid steer with a 73-hp diesel engine. The 17.7-inch track exerts just 3.8 psi. It has 11 inches of ground clearance. Slope limitations are unknown at this time. The machine can be seen at: http://www.bobcat.com.

Check the Timber West or Timber Harvesting annual buyer's guides for additional logging and related equipment (see Appendix B for details).

Multipurpose, Low-Ground-Pressure, Rubber-Tracked Vehicles

ASV Posi-Track All-Purpose Crawler

Make/Model	ASV Posi-Track All-Purpose Crawler: 4810, 2810, 2800. MD-70 special order only. Contact manufacturer for specs. No sealed undercarriage on MD-70. HD-4520 and HD-4500 discontinued.
Manufacturer/Source	All Season Vehicles, Inc. (ASV)
Distributor	Contact manufacturer for dealer information
Price	$45,000 to $55,000
Status	In production
Prime Mover	ASV is a prime mover
Prime Mover Engine Power	4810: 105 hp (net); 2810: 83 hp; 2800: 70 hp
Gas/Diesel	Diesel
Transmission	Hydrostatic
Max. Travel Speed	4810 6 mph; 2810 and 2800: 7 mph;
Width	4810, 2810, and 2800: 69 in
Length Without Loader	4810: 114.75 in; 2810 and 2800: 113 in
Height	4810, 2810, and 2800: 82.5 in
Weight With Loader	4810: 8,640 lb; 2810 and 2800: 7,150 lb
Ground Clearance	4810, 2810, and 2800: 16 in
Turning Radius	0
Slope Limitations and Specified Conditions	33% gradability sidehill
Attachment Power Supply	High-flow auxiliary hydraulic circuit: 4810, 30 gpm at 3,200 psi; 2810 and 2800, 25 gpm at 2,750 psi. Low-flow auxiliary hydraulic circuit: 4810, 19 gpm at 2,950 psi; 2810 and 2800, 19 gpm at 2,750 psi.
Attachment Mount (lift arms/boom/3-point/other)	Loader arms and 3-point hitch
Track Type, width (options), and Gpsi	Kevlar-reinforced rubber. Ground pressure, 18-in track: 4810, 3.0 psi; 2810 and 2800, 2.3 psi without loader; and 2.5 psi with loader. Ground pressure, 24-in track: 2810 and 2800, 2.7 psi without loader; and 1.9 psi with loader.
Attachment Usable by this Machine	Snowblower, 6-way dozer blade, snowblade, hydraulic brush-cutter, trencher, auger, backhoe, forks, grapple bucket, log grapple, 4-in-1 bucket, power rake, tiller, sweeper, 3-point hitch, HD bucket, limb risers, stump grinder, tree shear, hydraulic winch, flail mower, grader, drills, rock pickers, cable plow, crushers, rollers, mixers
Special Uses/Adaptations/Other Uses	Useful where low gpsi and maximum traction is essential
Manufacturer's Comments Regarding Equipment Application	Data not supplied

Multipurpose, Low-Ground-Pressure, Rubber-Tracked Vehicles

LMC Trackmaster 85 Rubber-Tracked Crawler

Make/Model	LMC Trackmaster 85 Rubber-Tracked Crawler
Manufacturer/Source	LMC Corp.
Distributor	Contact manufacturer for dealer information
Price	$42,900
Status	In production
Prime Mover	Trackmaster 85 is a prime mover
Prime Mover Engine Power	88.5 hp
Gas/Diesel	Diesel
Transmission	Hydrostatic
Max. Travel Speed	7.2 mph
Width	66 in
Length	157.7 in
Height	78.8 in
Weight	7,100 lb
Ground Clearance	10 in
Turning Radius	0 in (counter rotation)
Slope Limitations and Specified Conditions	Data not supplied
Attachment Power Supply	Optional PTO; high flow is 30 gpm; maximum working pressure is 3,000 psi: hydraulic pump capacity is 16 gpm; maximum working pressure is 2,500 psi
Attachment Mount (lift arms/boom/3-point/other)	Lift arms and optional 3-point mount
Lift Arm Reach	Loader arms, 110.5-in lift height
Track Type, Width (options) and Gpsi	Rubber on steel; 18-in tracks; 1.9 psi with loader arms and bucket
Attachments Usable by this Machine	Model 5601-A Brush-Cutter, double-flighted auger, dozer blades, mud/concrete haulers, rake, grader blade, cold planer, flail mower, vibratory roller, tiller, stump grinder, rock wheel, cutting wheel, scarifier, landscape rake, 4 -in-1 bucket, pallet forks, trencher, post pounder, snow blower, concrete accessories, and more. Bobcat-style tool plate allows use of most skid-steer attachments.
Special Uses/Adaptations/Other Uses	Loader, dozer or tool carrier; designed for jobs requiring high traction on soft ground with minimal damage
Manufacturer's Comments Regarding Equipment Application	Ultra-low ground pressure; ideally suited for wetlands, marshes, orchards, vineyards, landscaping nurseries, excavating

Other Machines and Miscellaneous Attachments

Concept—These machines and attachments are not easily categorized. Some are built for applications other than brush cutting. Others are general application machines, but may apply to this project because of unusual characteristics or their size.

Comments—The tree trimmers were chosen for their ability to cut down ladder fuels both in stands and along the forest/residential interface. The Sweco trail dozer was included based on its size and versatility.

Although excavators are not included in this catalog, they usually are not cost-effective skidders. In general, they can run a variety of attachments and are excellent platforms for attachments that can reduce biomass. If there is an excavator onsite from another operation, and the area to be treated is small, it may be more cost effective to use the excavator than to bring in a specialized machine.

Other Manufacturers or Sources—Check the annual excavator issue in Equipment Today for information on excavators, and the annual buyer's guides fromTimber West or Timber Harvesting for other logging-related equipment (see Appendix B for details).

Other Machines and Miscellaneous Attachments

Tree Trimmers

Jarraff All-Terrain Tree Trimmer

Jaraff Tree Trimmers, wheeled and tracked.

Make/Model	Jarraff All Terrain Tree Trimmer: 4 x 4; Crawler Models
Manufacturer/Source	Jarraff Industries, Inc.
Distributor	Jarraff Industries, Inc.
Price	Contact manufacturer
Status	In production
Prime Mover	Jarraff is a prime mover
Prime Mover Engine Power	106 hp
Gas/Diesel	Diesel
Transmission	Hydrostatic
Max. Travel Speed	12.5 mph
Width	4 x 4: depends on tires
Length	4 x 4: 37 ft (25 ft from winch to blade)
Height	4 x 4: 10 ft
Weight	4 x 4 is approximately 18,500 lb; crawler is approximately 19,000 lb
Ground Clearance	Data not supplied
Turning Radius	4 x 4: 25 ft; crawler: 0
Slope Limitations and Specified Conditions	Hydraulically powered turntable provides 360-degree range of motion and 40-degree lateral tilt
Attachment Power Supply	Hydraulic
Attachment Mount (lift arms/boom/3-point/other)	Boom
Boom Type and Reach	Non-conductive high-tensile fiberglass
Track Type, Width (options) and Gpsi	Crawler is rubber; 33-in tracks; 1.8 psi
Tires, Size and Gpsi	4 x 4: 23.1 x 26; 20 x 20; 28L x 20; 30 x 26; 66 x 4300-25
Attachment Type/Model	Jarraff Tree Trimmer
Price, if not included with prime mover	Included
Maximum Treatable Material Size	24 in
Cutting Mechanism	Rotary blade, 24 in
Cutting Width	Maximum cutting height is 75 ft
Shaft (horizontal/vertical)	Vertical
Rotation Speed (rpm)	3,200 rpm
Power Source Required	Integral
Head Weight	80 lb
Other Attachments Available	Has 8 ft x 2 ft dozer blade and 20,000-lb line pull winch (capacity for 200 ft of $1\frac{1}{2}$-in line). Crawler has optional grouser bar; 4 x 4 articulated in middle
Special Uses/Adaptations/Other Uses	Good for rural/urban interface or urban rights-of-away where low impact needed
Manufacturer's Comments Regarding Equipment Application	No outriggers needed, lightweight boom

Other Machines and Miscellaneous Attachments

Tree Trimmers

Kershaw Klipper Tree Trimmers, Models 55-4 and 70-10

Make/Model	Kershaw Klipper 55-4 and 70-10 Tree Trimmers
Manufacturer/Source	Kershaw Manufacturing Co., Inc.
Distributor	Estill's Windbreak Trimming, Inc.
Price	Contact manufacturer or dealer
Status	In production
Prime Mover	Klipper 55-4; 70-10 are prime movers
Prime Mover Engine Power	185 hp at 2,200 rpm
Gas/Diesel	Data not supplied
Transmission	Hydrostatic 4-wheel drive
Max. Travel Speed	Data not supplied
Width	Data not supplied
Length	32 ft 8 in, folded for transport
Height	12 ft to top of cab
Weight	55-4 is approximately 28,000 lb; 70-10 is approximately 22,000 lb
Ground Clearance	Data not supplied
Slope Limitations and Specified Conditions	Data not supplied
Attachment Power Supply	55-4: engine-driven triple pump drive; 70-10: engine-driven double pump drive
Attachment Mount (lift arms/boom/3-point/other)	Boom
Boom Type and Reach	55-4 is fiberglass-insulated boom with 60-ft reach; 180-degree boom turret rotation; 360-degree cutter head rotation; 70-10 is steel and fiberglass insulated boom with 43-ft reach; 270-degree boom turret rotation; 300-degree cutter head rotation
Tires, Size and Gpsi	55-4: 67 x 34.00-25 flotation; 70-10: 54 x 37.00 flotation
Attachment Type/Model	Saws
Price, if not included with prime mover	Contact manufacturer or dealer
Maximum Treatable Material Size	Data not supplied
Cutting Mechanism	55-4 is three 20-in saws or one 32-in cutter head saw; 70-10 is three 20-in saws
Cutting Width	55-4 trims from below grade to 60-ft high
Shaft (horizontal/vertical)	Data not supplied
Rotation Speed	Data not supplied
Power Source Required	Integral
Head Weight	Data not supplied
Other Attachments Available	55-4 has optional 66 x 43-25 high flotation tires and optional rail wheels; 70-10 has optional 66 x 34.25 high flotation tires
Special Uses/Adaptations/Other Uses	Data not supplied
Manufacturer's Comments Regarding Equipment Application	70-10: Roadside slope trimmer; 55-4: High-production tree-trimming right-of-way applications

Other Machines and Miscellaneous Attachments

Tree Trimmers

Timberland Tree Trimmer

Make/Model	Timberland Tree Trimmer
Manufacturer/Source	T.S.E. International, Inc.
Distributor	Contact T.S.E. International, Inc.
Price	Contact manufacturer
Status	In production
Prime Mover	Timberland Tree Trimmer is a prime mover
Prime Mover Engine Power	150 hp
Gas/Diesel	Diesel
Transmission	Power shift
Max. Travel Speed	18 mph
Width	10 ft 3 in with 67 x 34 tires
Length	25 ft (for transport)
Height	10 ft
Weight	30,000 lb
Ground Clearance	Approximately 22 in
Turning Radius	Approximately 22 ft
Slope Limitations and Specified Conditions	Front slopes up to 30%; tilt frame allows head to remain vertical on sideslopes up to 7 degrees
Attachment Mount (lift arms/boom/3-point/other)	Boom
Boom Type and Reach	Non-conductive insulated fiberglass; two boom heights available, 60 or 70 ft; reaches from ground level up to 70 ft maximum cutting height
Tires, Size and Gpsi	67 x 34-26; approximately 6.0 psi
Attachment Type/Model	Timberland Five Blade Cutting Head
Price, if not included with prime mover	Included
Maximum Treatable Material Size	6 in
Cutting Mechanism	Five 18-in circular blades on a wand; wand swings 170 degrees, rotates 180 degrees; cutter head can be positioned left to right approximately 50 ft
Cutting Width	60 in; unit is designed to side trim trees and residual plant growth from ground level to 70-ft maximum cutting height
Shaft (horizontal/vertical)	Saw blades are mounted vertically in wand
Rotation Speed	3,200 rpm
Power Source Required	Integral
Head Weight	500 lb
Other Attachments Available	Has 30,000-lb hydraulic, rear-mounted recovery winch with capacity for 270 ft of $^{5}/_{8}$ -in cable; rear tow hitch; optional front recovery winch tow hitch
Special Uses/Adaptations/Other Uses	Each axle has selectable differential lock that reduces site damage on sensitive sites; dozer blade used in lieu of outriggers; dozer blade also available for limited dozing work
Manufacturer's Comments Regarding Equipment Application	Clearing powerline, pipeline rights-of-away, other similar trimming operations; one continuous mile per day, easily attainable in most applications

Other Machines and Miscellaneous Attachments

Trail Dozer

Sweco 480 Trail Dozer

Make/Model	Sweco 480 Trail Dozer
Manufacturer/Source	Sutter Equipment Co.
Distributor	Sutter Equipment Co.
Price	$49,800
Status	In production
Prime Mover	Sweco 480 is a prime mover
Prime Mover Engine Power	80-hp turbo
Gas/Diesel	Diesel, water cooled
Transmission	Twin hydrostatic pumps
Max. Travel Speed	5 mph
Width	4 ft
Length	13 ft 1 in (with blade and rippers)
Height	6 ft 8 in
Weight	9,000 lb
Ground Clearance	8 in
Turning Radius	Counter rotation
Slope Limitations and Specified Conditions	35 degrees
Attachment Power Supply	10 to 30 gpm; 2,200 psi auxiliary circuit
Attachment Mount (lift arms/boom/3-point/other)	Machine and 3-point hitch
Track type, Width (options), and Gpsi	Steel; 11 in; 7.3 psi
Attachment Type/Model	Sweco Flail Mower
Price, if not included with prime mover	$6,800
Other Suitable Prime Movers	None
Maximum Treatable Material Size	2 in
Cutting Mechanism	Hammer-knife teeth
Cutting Width	4 ft
Shaft (horizontal/vertical)	Horizontal
Rotation Speed	2,000 rpm
Power Source Required	23 gpm; 2,000 psi
Head Weight	Data not supplied
Other Attachments Available	Sweco 8- and 9-ft backhoes with optional hydraulic thumb, hydraulic auger, heavy-duty brush rake, dozer slope board, hydraulic winch, roller
Special Uses/Adaptations/Other Uses	Firefighting, building fire breaks, timber thinning
Manufacturer's Comments	6-way blade and rippers are standard.

Other Machines and Miscellaneous Attachments

Three-Point-Hitch Grapples

ImpleMax Three-Point-Hitch Grapples

Make/Model	ImpleMax 6042R, 6042 Rw; 4836R, 4836Rw; FS48, FG48w; FG60 and FG60w
Manufacturer/Source	ImpleMax
Distributor	Contact manufacturer
Price	6042R, $6,632; 6042Rw (12,000 lb), $8,905; 4836R, $5,611; 4836Rw $7,421; FG60, $4,932; FG60w (12,000 lb), $7,189; FG60w (9,000 lb), $6,942; FG48, $4,185; FG48w, $6,180
Status	In production
Preferred Prime Mover	6042R: 55- to 110-hp tractors; 6042Rw: 55- to 110-hp tractors; 4836R and 4836Rw: 30- to 55-hp tractors; FG48, FG48w, FG60, and FG60w: over 30 hp
Other Suitable Prime Movers	Rubber tire or track crawlers
Attachment Mount (lift arms/boom/3-point/other)	(3-point): 6042R, FG60, FG60w: Category II; all others Category I
Grapple Weight	6042R: 940 lb; 6042Rw: 1,118 lb; 4836R: 604 lb; 4836Rw: 740 lb; FG60: 750 lb; FG60w: 850 lb; FG48: 615 lb; FG48w: 715 lb
Grapple Capacity	6042R, FG60, 6042Rw, FG60w: 9.0-sq-ft enclosure area, 60-in max. opening width, 42-in max. opening height. 4836R and FG48: 6.94-sq-ft enclosure area, 48-in max. opening width, 36-in max. open height
Winch Type (built into boom)	6042Rw: 12,000-lb, 10-in drum, up to 185 ft of $^{3}I_{8}$-inch cable, reel speed 48 fpm at 15 gpm; 4836Rw: 9,000-lb, 8-in drum, max. 148 ft of $^{3}I_{8}$-in cable, reel speed 72 fpm at 15 gpm; FG48W and FG60w: 9,000-lb, 10-in drum, max 104 ft of $^{3}I_{8}$-in cable, reel speed 72 fpm at 15 gpm; FG60w: 12,000-lb, 8-in drum, max. 185 ft of $^{3}I_{8}$-in cable, reel speed 48 fpm at 15 gpm
Hydraulics	6042R, 4836R, FG60, and FG48: 3,000 psi, unlimited gpm; 6042Rw, 4836Rw, FG60w, and FG48w: 3,000 psi, 10 to 21 gpm
Other Attachments	Implemax also makes models (with/without winches) that attach to skid steers.
Special Uses/Adaptations/Other Uses	Works in narrow spaces, grabs from difficult angles, excellent visibility, low capital investment, reduces man hours. Custom attachment bracket for special applications.

Other Machines and Miscellaneous Attachments

Three-Point-Hitch Grapples

"Little Red" Logger

Make/Model	"Little Red" Logger
Manufacturer/Source	Taylor Machine Works, Inc.
Distributor	Contact Taylor Machine Works, Inc.
Price	$5,500
Status	In production
Preferred Prime Mover	50 to 80-hp tractors
Attachment Mount (lift arms/boom/3-point/other)	3-point hitch
Height	Data not provided
Weight	750 lb
Opening Sepcifications	Fully open grapple is 35 in; fully closed grapple is 3.5 in
Power Source Needed	Requires one hydraulic function on tractor and two quick-disconnect hydraulic outlets
Other Attachments	"Big Red" Tree Cutter; "Little Red" Logger, Jr. (500 lb)
Special Uses/Adaptations/Other Uses	Data not supplied
Manufacturer's Comments Regarding Equipment Application	Grapple rotates 85 degrees in either direction

Other Machines and Miscellaneous Attachments

General Wood Shear

LaBounty Mobile Wood Shears, MWS 40 and MWS 80

Make/Model	LaBounty MWS-Series Mobile Wood Shear, MWS 40 and MWS 80
Manufacturer/Source	LaBounty
Distributor	Contact manufacturer or visit web site for dealer information
Price	Contact manufacturer or dealer
Status	In production
Preferred Prime Mover	MWS 40: 40 to 60,000-lb excavator; MWS 80: 70 to 95,000-lb excavator
Attachment Mount (lift arms/boom/3-point/other)	Mounts in place of bucket, at end of stick (arm)
Height	Data not supplied
Length	Data not supplied
Width	See Opening Specifications below
Weight	MWS 40 is 3,000 lb; MWS 80 is 5,100 lb
Opening Specifications	Jaws: MWS 40: 30 to 40 in; MWS 80: 50 to 60 in
Jaw Depth	MWS 40: to 29 in; MWS 80: 41 in
Cutting Mechanism	Shears
Power Source Needed	Shears pin on in place of excavator bucket, eliminating the need for additional hydraulics
Other Attachments	LaBounty makes a full line of attachments
Special Uses/Adaptations/Other Uses	Log/wood processing and handling; land clearing
Manufacturer's Comments Regarding Equipment Application	Data not supplied

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Concept—This section includes brush cutting, precommercial thinning, shredding, and crushing attachments. Unlike integral machines, these attachments are readily removed and replaced with another attachment. They can be used on a variety of prime movers.

The equipment is categorized according to the attachment location and orientation of the shaft that the cutters revolve around:

- ❏ Equipment can be attached directly to the machine (usually to the lift arms), attached to the boom, or machine pulled.
- ❏ Shafts can be vertical or horizontal.
- ❏ In some cases, the equipment is available with more than one style of attachment device.

Comments—The Schmeiser Till n' Pak Culti-Packer was included at the suggestion of a Pacific Northwest Region Forest that used it as a brush crusher. A small machine shop may be able to fabricate something similar. Rockland also makes crushers of various kinds. Note that road-compaction equipment, in general, is too blunt for working in the woods. Forestry crushers have sharp edges to cut vegetation.

Although not listed, bidirectional tractors, feller-bunchers, and some extreme machines can use brush-cutting heads. Additional attachments that may be suitable for your prime mover are listed in the Extreme Machine Attachments section.

Other Manufacturers or Sources—In addition to those listed in the catalog, other sources of forestry attachments include: West Northwest Forestry, Ltd.; Rockland Manufacturing Co.; and Vrismo Distributing, Inc.

Besides the land-clearing blades listed in the catalog, other sources include: Rockland Manufacturing Co. and Sharpco, Inc.

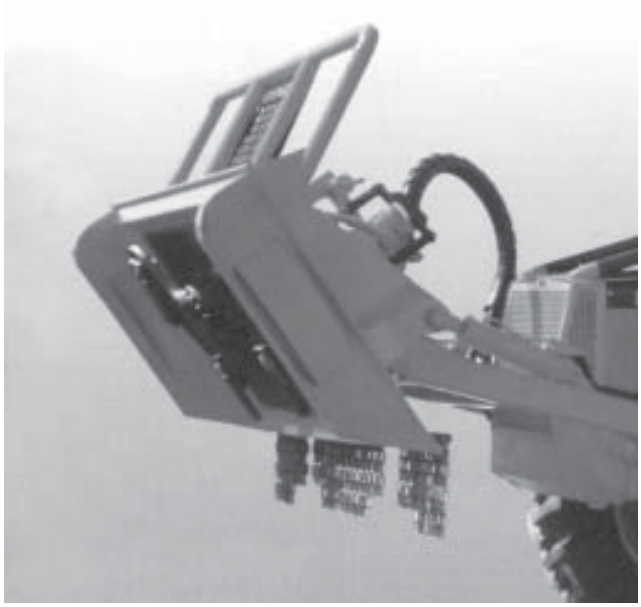
Many major manufacturers of tractors and excavators, such as Case Corp., Deere & Co. Construction Equipment, Komatsu America International Co., New Holland, and so forth, also make forestry attachments. See your local dealer for information.

Also check the Equipment Today annual attachments guide or the Timber West or Timber Harvesting annual buyer's guides for additional information on logging-related equipment (see Appendix B for details).

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush Cutter, Vertical Shaft, Machine Mounted

Brushco Cutting Heads: 8, 9, and 10 Ft



Make/Model	Brushco Cutting Heads: 8 ft; 9 ft; 10 ft
Manufacturer/Source	Quadco Equipment, Inc.
Distributor	Contact Quadco Equipment, Inc.
Price	Contact manufacturer
Status	In production
Preferred Prime Mover	150-hp carrier
Other Suitable Prime Movers	Rubber tired feller-bunchers, multipurpose tractors or converted skidders
Attachment Mount (lift arms/boom/3-point hitch/other)	Lift arms
Maximum Treatable Material Size	6 in
Cutting Mechanism	Dual rotor bars with two free-swinging knives each; dual disk with three free-swinging knives; or dual mulching discs
Cutting Width	8 ft: 96 in; 9 ft: 108 in; 10 ft: 120 in
Shaft (horizontal/vertical)	Vertical
Rotation Speed	Is matched to prime-mover horsepower and hydraulics to keep low-pressure machines (2,800 psi) at 1,500 rpm, or high pressure machines (3,500 to 4000 psi) at 1,398 rpm
Power Source Required	Is matched to prime-mover horsepower and hydraulics
Weight	8 ft is 3,300 lb; ft is 3,530 lb; 10 ft is 3,750 lb
Other Attachments	Quadco also makes a 52-in horizontal model
Special Uses/Adaptations/Other Uses	Boom adapter or mounting lugs are designed and fabricated to fit specific base machine; a self-contained power pack can be engineered to install head on a machine with less capacity than normally required (i.e. low horsepower skidder)
Other Attachments Available	Optional lowering front skirting confines material inside longer, produces smaller chips
MTDC Coment	Hydraulic motor is spring mounted to give extra protection against load spikes.

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush Cutters, Horizontal Shaft, Machine Mounted

Seppi M Brush-Cutter Heads

Make/Model	Seppi M Brush-Cutter Heads: Midi Forest; Midi Forest dt; Forest; Forest M; Forest dt. Each comes in a variety of sizes.
Manufacturer/Source	Brush Technology Division; Carlson Tractor and Equipment Co.
Distributor	Carlson Tractor and Equipment Co.
Price	$20,000 to $126,000
Status	In production
Preferred Prime Mover	Any that can lift required weight and give required horsepower to cutting head: 60 to 300 hp
Other Suitable Prime Movers	Has been used on: Barko 685, 785, 785B, 885, 885B; New Holland TV140, 9030; Antonio Carraro 8400 HTM; Hydra-Mac Hydrostatic 3250 (125 hp)
Attachment Mount (lift arms/boom/3-point hitch/other)	Lift arms; 3-point hitch
Maximum Treatable Material Size	Midi Forest cuts and shreds up to 9 $^{3}/_{4}$-in trees; Midi Forest dt cuts and shreds up to 12-in trees; Forest chips and fells up to 15-in trees; Forest M cuts, shreds, mulches 15 $^{3}/_{4}$-in trees, brush, and branches; Forest dt fells and chips up to 18 in trees
Cutting Mechanism	Free-swinging or fixed-tooth, matched by manufacturer to proper application: Midi Forest, 20 to 42 hammers; Forest, 24 to 42 hammers; Forest M, 38 hammers; Forest dt, 42 to 53 hammers
Cutting Width	Working width: Midi Forest: 4 ft 1 in to 8 ft 3 in; Forest: 4 ft 11 in to 8 ft 3 in; Forest M: 7 ft 5 in; Forest dt: 6 ft 7 in to 8 ft 3 in
Shaft (horizontal/vertical)	Horizontal
Rotation Speed	1,900 to 2,000 rpm
Power Source Required	PTO, 60 to 300 hp; self-contained engine
Weight	Midi Forest: 1,750 to 3,070 lb; Forest: 3,175 lb to 5,950 lb; Forest M: 8,400 lb; Forest dt: 6,265 to 7,850 lb
Special Uses/Adaptations/Other Uses	Data not supplied.
Manufacturer's Comments Regarding Equipment Application	Slope limitation is 30 degrees (limited by ability of prime mover). Reliability and good longevity of equipment.

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush Cutters, Horizontal Shaft, Machine Mounted

Bull Hog Wood Shredders

Make/Model	Bull Hog Wood Shredder: BH80; BH100; BH120; BH150; BH250 (All models available with PTO or hydraulic drive)
Manufacturer/Source	Fecon Resource Recovery Equipment Systems
Distributor	Fecon Resource Recovery Equipment Systems
Price	Contact source
Status	In production
Preferred Prime Mover	Tractors with 3-point hitch; required power
Other Suitable Prime Movers	Fecon makes rubber tired, track- and excavator-type carriers (120 to 450 hp)
Attachment Mount (lift arms/boom/3-point hitch/other)	(Machine pulled; PTO units have 3-point hitch) BH80, BH100, BH120: Category II; BH150, BH250: Category III hydraulic models are mechanically mounted to match carrier
Maximum Treatable Material Size	Practical maximums: BH80, 8 in; BH100, 10 in; BH120, 10 in; BH150, 14 to 16 in; BH250, 16 to 20 in
Cutting Mechanism	Fixed hammers individually mounted on rotor: BH80, 30 hammers; BH100, 42 hammers; BH120, BH 150, BH250, 48 hammers
Cutting Width	BH80: 4 ft 10 in; BH100: 6 ft 6 in; BH120, BH150, BH250: 7 ft 6 in
Shaft (horizontal/vertical)	Horizontal rotor
Rotation Speed	BH80, BH100, BH150: 1,700 rpm; BH250: 1,300 rpm. Processing speed is directly related to hp.
Power Source Required	1,000 rpm for PTO models: BH80 is 80 to 100 hp; BH100, BH120 is 100 to 140 hp; BH150 is 140 to 200 hp; BH250 is 200 hp and up. Desirable hydraulic pressure is 4,500 psi: BH80 is 38 to 31 gpm; BH100, BH120 is 52 to 42 gpm; BH150 is 71 to 57 gpm; BH250 is 119 to 95 gpm
Weight	BH80: PTO is 2,700 lb; hydraulic is 2,300 lb; BH100: PTO is 3,800 lb; hydraulic is 3,300 lb; BH120: PTO is 4,416 lb; hydraulic is 3,800 lb; BH150: PTO is 5,800; hydraulic is 5,100 lb; BH250: PTO is 7,100 lb; hydraulic is 6,200 lb
Other Attachments	All BH models require hydraulic connections to the supply and return lines of the trap door cylinder and top link cylinder; hydraulic models also require connections for primary supply and return line, and a motor case drain; attachments available for excavators, rubber-tire and track machines of 80 to 500 hp
Special Uses/Adaptations/Other Uses	Fecon makes many brush-cutting machines for slash reduction, preplanting, land preparation, thinning, roadway clearing, stump grinding, transfer stations, brush and slash piles, yard waste recycling, land clearing, handling orchard prunings and pasture renovation
Manufacturer's Comments Regarding Equipment Application	Tool life in excess of 300 hours; tools can work in dirt; more aggressive flail machines; smaller particle size; safe operation

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush Cutters, Horizontal Shaft, Machine Mounted

Timberwolf DF 90 Brush-Cutter

Make/Model	Timberwolf Machine-Mounted DF 90 Brush-Cutter, Land Clearing/Thinning Machine
Manufacturer/Source	New Forest Technology, Inc.
Distributor	King Forestry Equipment, Inc.
Price	$98,000
Status	Built upon order
Preferred Prime Mover	Tracked Loader
Other Suitable Prime Movers	Rubber tired loaders with 2 $^{1}|_{2}$-yard capacity and larger, Cat 973 tracked loader, Leibherr LR641 tracked loader
Attachment Mount (lift arms/boom/3-point hitch/other)	Lift arms
Maximum Treatable Material Size	16 in
Cutting Mechanism	22 to 36 free-swinging cutters
Cutting Width	55 to 90 in actual, 60 to 106 in operational
Shaft (horizontal/vertical)	Horizontal
Rotation Speed	1,200 to 2,200 rpm
Power Source Required	Self-contained 270-hp diesel engine
Weight	12,000 lb
Other Attachments	Timberwolf also makes a boom-mounted cutter
Special Uses/Adaptations/Other Uses	Land clearing, strip or selective thinning, hazard reduction; manufacturer will supply or install units on customer's preferred prime mover
Manufacturer's Comments Regarding Equipment Application	Very rugged, high-horsepower machines with high throughput capacity

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush Cutters, Horizontal Shaft, Machine Mounted

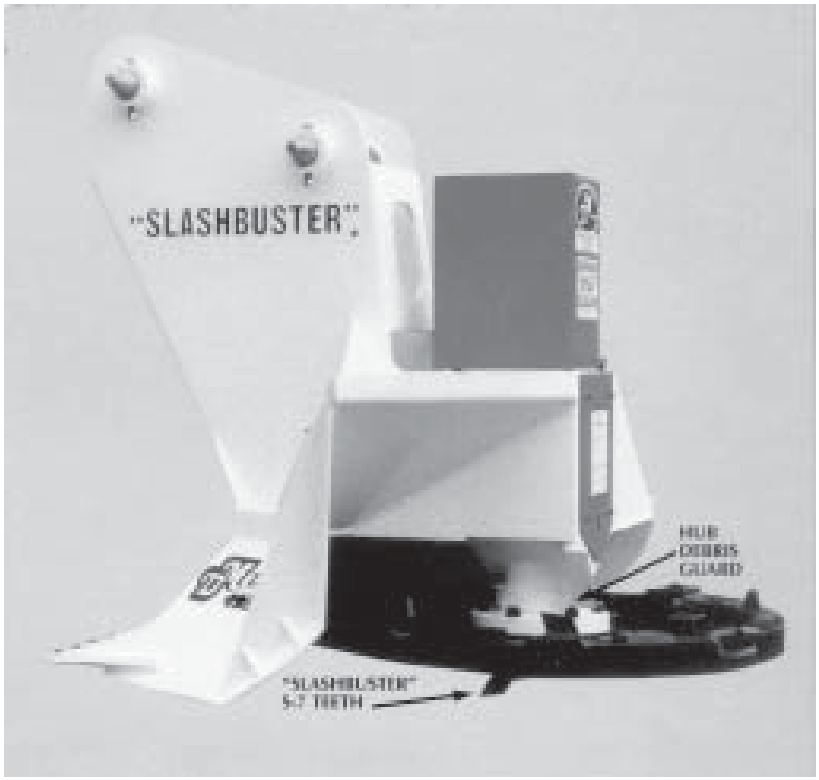
ROWMEC R.O.W. King 4010 DH

Make/Model	ROWMEC R.O.W. King 4010 DH
Manufacturer/Source	ROWMEC
Distributor	ROWMEC
Price	Contact manufacturer
Status	In production
Prime Mover	Loaders and other units capable of handling 6,000 lb
Attachment Mount (lift arms/boom.3-point hitch/other)	Standard universal bracket for front-end loaders; adaptable to other prime movers
Maximum Treatable Material Size	15 in
Cutting Mechanism	4 ft 10 in wide; rotor diameter of 16 in; 24 heat-treated alloy-steel cutters. Adjustable cutting height: ground level to 5 in
Shaft (horizontal/vertical)	Horizontal
Rotation Speed	1,800 rpm normal
Power Source Required	Self-powered, equipped with a 117-hp diesel engine
Weight	6,000 lb
Other Attachments	ROWMEC makes other brush-cutting attachments and systems: 4010H, 7010H, T-5, T-7, and GT-18. T-5 uses the 4010H head on a bidirectional tractor. The T-7 and GT-18 are included in this catalog.
Special Uses/Adaptations/Other Uses	Land clearing, strip or selective thinning, hazard reduction

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush-Cutters, Vertical Shaft, Boom Mounted

Slashbuster HD 422 Head

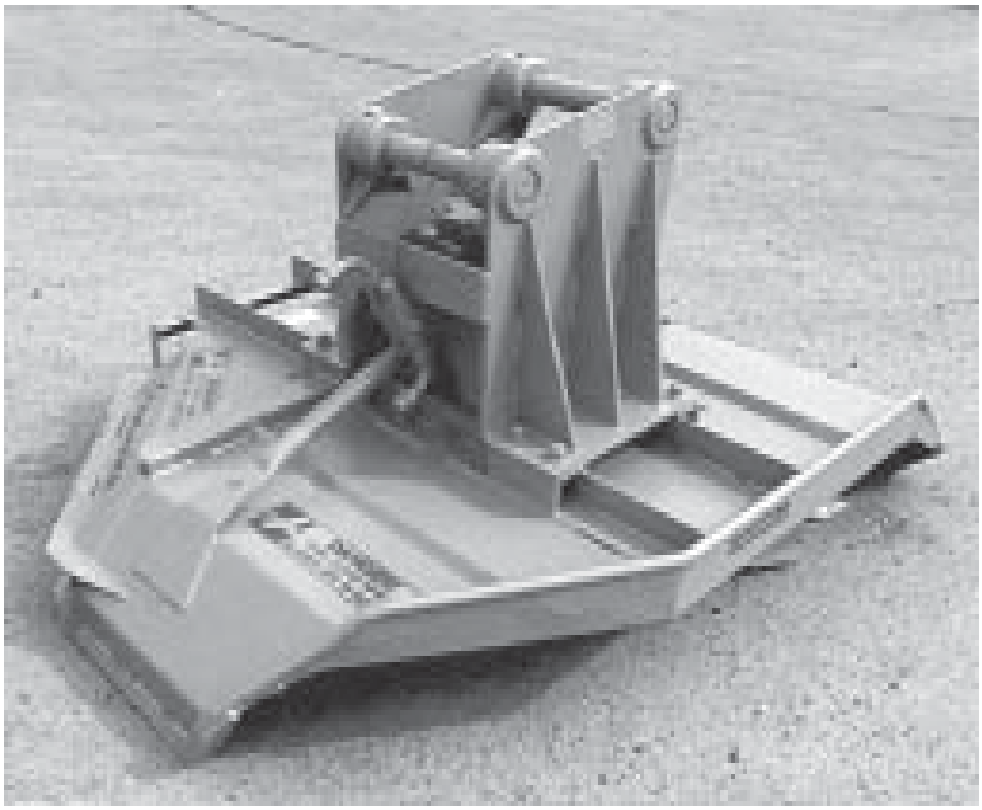


Make/Model	Slashbuster HD 422 Head (Slashbuster comes in many sizes and models, 36 in to 48 in, mini to heavy-duty, with and without third boom and grapple; HD 422 was chosen as a representative model)
Manufacturer/Source	D&M Machine Division, Inc.
Distributor	Contact D&M Machine Division, Inc.
Price	Approximately $50,000, installed
Status	In production
Preferred Prime Mover	Adaptable to 30,000 to 100,000-lb excavators; recommended for long front or standard front excavator
Attachment Mount (lift arms/boom.3-point hitch/other)	Boom
Maximum Treatable Material Size	Up to 14 in
Cutting Mechanism	Hardened teeth on wheel; in shroud for mulching
Cutting Width	46-in cutting swath
Shaft (horizontal/vertical)	Vertical
Rotation Speed	350 to 450 rpm
Power Source Required	32 to 44 gpm; 3,600-psi. Cylinder circuit: intermittent service secondary flow of 15 to 20 gpm
Weight	2,300 lb
Other Attachments	Slashbuster also makes a stump grinder, stirring attachment and a 34-in mower for mini excavators
Special Uses/Adaptations/Other Uses	Optional tilt-mount available, 45 degrees either side of center
Manufacturer's Comments Regarding Equipment Application	Industry standard—smaller heads available for smaller excavators

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush-Cutters, Vertical Shaft, Boom Mounted

CH-55 Rotary Cutter



Make/Model	CH-55 Rotary Cutter
Manufacturer/Source	Gregory Manufacturing Co.
Distributor	Gregory Manufacturing Co.
Price	Contact manufacturer
Status	Customized to your excavator on order
Preferred Prime Mover	Excavators of all sizes
Attachment Mount (lift arms/boom/3-point hitch/other)	Boom-mounted
Maximum Treatable Material Size	5 in
Cutting Mechanism	Two free-swinging offset reversible blades
Cutting Width	66 in
Shaft (horizontal/vertical)	Vertical
Rotation Speed	1,350 rpm
Power Source Required	Hydraulic requirements include 3 gear options: 25 to 30 gpm; 30 to 55 gpm; 55 to 60 gpm
Weight	Approximately 1,725 lb
Other Attachments	None
Special Uses/Adaptations/Other Uses	Forward or reverse cutting; Gregory also makes brush cutter for graders
Manufacturer's Comments Regarding Equipment Application	Heavy, long-reach, hydraulic rotary brush cutter attaches to excavators in lieu of buckets, grapples and other attachments

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush-Cutters, Vertical Shaft, Boom Mounted

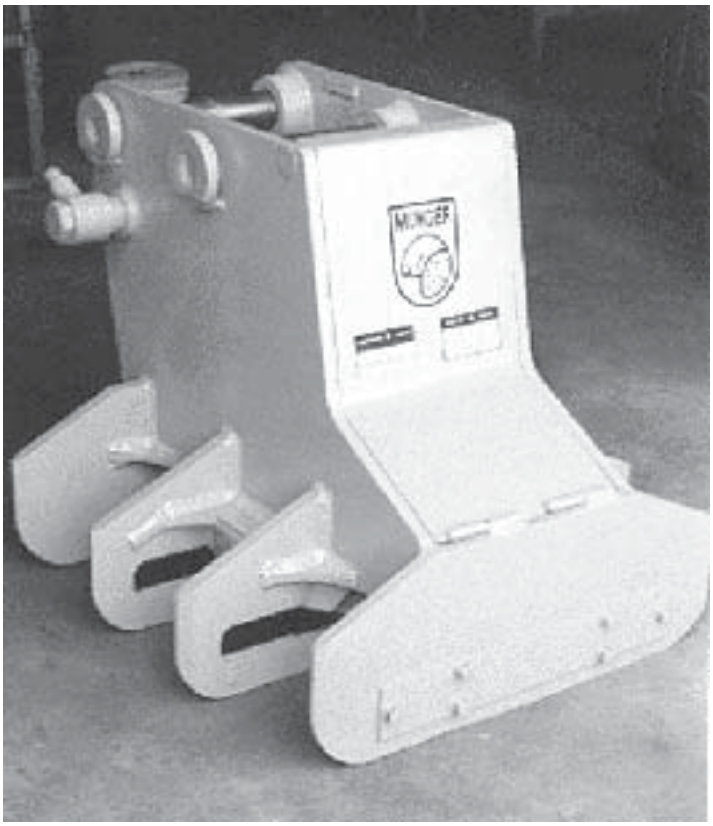
Roanoke G-195 Bush Axe

Make/Model	Roanoke G-195 Bush Axe
Manufacturer/Source	Gregory Manufacturing Co.
Distributor	Gregory Manufacturing Co.
Price	Contact manufacturer
Status	In production
Preferred Prime Mover	Tractors 100 hp and above
Attachment Mount (lift arms/boom/3-point hitch/other)	Boom-mounted
Maximum Treatable Material Size	5 in
Cutting Mechanism	Free-swinging offset reversible blades
Cutting Width	60 in with extra-heavy blade bar
Shaft (horizontal/vertical)	Vertical
Rotation Speed	1,350 rpm
Power Source Required	1,000 rpm PTO; has self-contained hydraulic system with pump
Weight	Operating weight is 2,785 lb
Other Attachments	Also makes axle-mount kits for all tractors; Category II and III quick hitches
Special Uses/Adaptations/Other Uses	Forward or reverse cutting; break-away boom with cutting reach of 18 ft 6 in, high reach of 16 ft 6 in; optional axle-mount stabilizer kit recommended—tractors 100 to 140 hp; Gregory Manufacturing also makes brush-cutters
Manufacturer's Comments Regarding Equipment Application	Heavy, long-reach, rear-mounted hydraulic cutter

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush-Cutters, Vertical Shaft, Boom Mounted

Munger Rotary Brush-Cutters



Make/Model	Munger Rotary Brush-Cutters: SMC-400; SMC-450; SMC-510; SMC-600R and SMC-600H
Manufacturer/Source	Produits Forestiers Mungers, Inc.
Distributor	Contact Produits Forestiers Mungers, Inc.
Price	SMC-400: $15,200; SMC-450: $13,200; SMC-510: $16,800; SMC-600R: $21,300; SMC-600H: $22,600 (f.o.b. factory, not including taxes, U.S. dollars)
Status	In production
Preferred Prime Mover	Excavators with the following minimum horsepower: SMC-400 and SMC-450: 40 hp; SMC-510: 65 hp; SMC-600R and SMC-600H: 80 hp
Attachment Mount (lift arms/boom/3-point hitch/other)	Boom
Maximum Treatable Material Size	(Depending on species): SMC-400 and SMC-450: 4 in; SMC-510: 5 to 7 in
Cutting Mechanism	Rotor disc with two free-swinging blades
Cutting Width	SMC-400 and SMC-450: 23 in; SMC-510: 32 in; SMC-600R and SMC-600H: 34 in
Shaft (horizontal/vertical)	Vertical
Rotation Speed	SMC-400 and SMC-450: 2,600 rpm; SMC-510: 2,500 rpm; SMC-600R and SMC-600H: 2,300 rpm
Power Source Required	SMC-400: 13 gpm, 2,000 to 2,500 psi; SMC-450: 13 gpm, 2,300 to 2,500 psi; SMC-510: 19 gpm, 3,000 psi; SMC-600R and SMC-600H: 24 gpm, 3,000 psi
Weight	(Approx.): SMC-400, 645 lb; SMC-450, 700 lb; SMC-510, 1,100 lb; SMC-600R, 1,900 lb; SMC-600H, 2,600 lb
Other Attachments	Munger also makes flail mowers
Special Uses/Adaptations/Other Uses	SMC-400 capable of 360-degree rotation on lower frame to reach difficult areas
Manufacturer's Comments Regarding Equipment Application	Data not supplied

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush-Cutters, Vertical Shaft, Boom Mounted

Pro Mac Rotary Arm and Blade Brush-Cutters
Alamo Industrial's Grizzly Tree Cutter

Make/Model	Pro Mac Rotary Arm and Blade Brush-Cutters: 36A Low Pressure; 36C High Pressure; 52A Low Pressure; 52C High Pressure
Manufacturer/Source	Pro Mac Manufacturing, Ltd.
Distributor	Most O.E.M. excavator dealerships, such as Case, Caterpillar, Hyundai, John Deere, Kobelco, Komatsu, Line Belt, Samsung; Alamo Industrial distributes the Grizzly Tree Cutter
Price	$7,440 to $15,500 (Prices subject to change)
Status	In production
Preferred Prime Mover	Hydraulic excavator to suit specific size of cutter
Other Suitable Prime Movers	Hydraulic ram skidders with swing booms, like Morgan Silvatrack hydrastatic
Attachment Mount (lift arms/boom/3-point hitch/other)	Standard boom or long-reach boom special applications
Maximum Treatable Material Size	36A, 36C: 3.5 in; 52A, 52C: 6 in
Cutting Mechanism	36A, 36C light duty: blades; 52A, 52C heavy-duty: blades; 52: 3-blade disc
Cutting Width	36A, 36 C: 36-in swath; 52A, 52C: 52-in swath
Shaft (horizontal/vertical)	Vertical
Rotation Speed	1,800 rpm
Power Source Required	36A: 20 to 35 gpm; 2,700 psi; 36C: 16 to 35 gpm; 4,000 psi; 52A: 28 to 48 gpm; 2,700 psi; 52C: 24 to 42 gpm; 4,000 psi
Weight	36A, 36C: 600 lb; 52A, 52C: 1,400 lb
Other Attachments	Pro Mac makes a number of brush-cutters
Special Uses/Adaptations/Other Uses	Independent hydraulic ram; small rubber-tire backhoes
Manufacturer's Comments Regarding Equipment Application	Versatile in cut jobs; mulching ability
MTDC Comments	Specifications for Alamo Industrial's Grizzly Tree Cutter Models 36A, 36C, 52A and 52C are identical to Pro Mac products with the same model numbers

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush-Cutters, Vertical Shaft, Boom Mounted

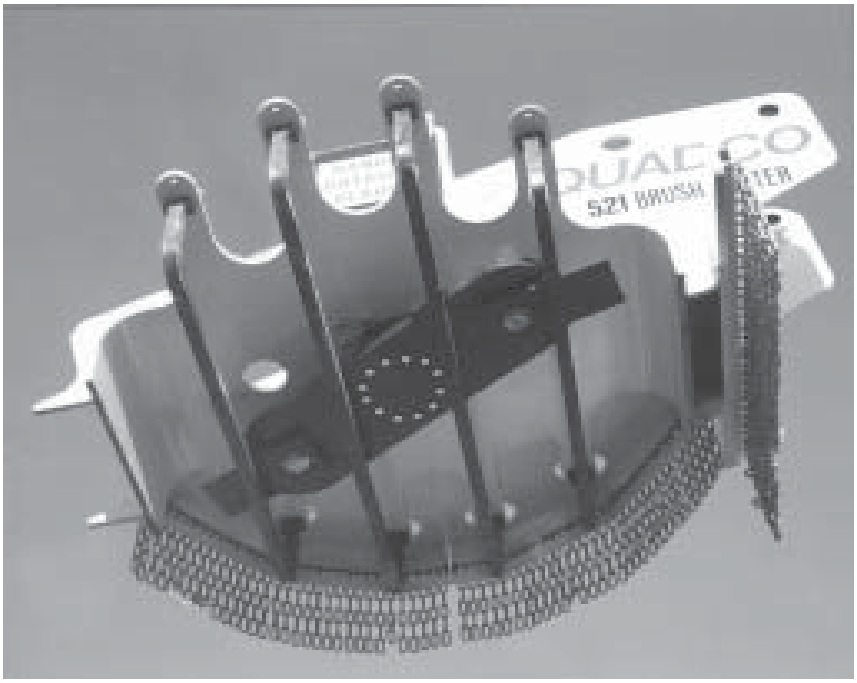
Pro Mac Rotary Disc Brush-Cutters
Alamo Industrial's Grizzly Tree Cutter

Make/Model	Pro Mac Rotary Disc Brush-Cutters: 36 AMP Low Pressure; 36 CMP High Pressure; 52 AMP Low Pressure; 52 CMP High Pressure; 66 AMP Low pressure; 66 CMP High Pressure
Manufacturer/Source	Pro Mac Manufacturing, Ltd.
Distributor	Most O.E.M. excavator dealerships, such as Case, Caterpillar, Hyundai, John Deere, Kobelco, Komatsu, Line Belt, Samsung; Alamo Industrial distributes the Grizzly Tree Cutter
Price	$12,500 to $26,472 (Prices subject to change)
Status	In production
Preferred Prime Mover	Hydraulic excavator to suit specific size of cutter
Other Suitable Prime Movers	Hydraulic ram skidders with swing booms, like Morgan Silvatrack hydrastatic
Attachment Mount (lift arms/boom/3-point hitch/other)	Standard boom or long-reach boom in special applications
Maximum Treatable Material Size	36 AMP and 36 CMP: 6 in; 52 AMP and 52 CMP: 8 in; 66 AMP and 66 CMP: 10 to 12 in
Cutting Mechanism	Rotary disc with carbide-tipped cutters;cutter bits on all discs
Cutting Width	36 AMP and 36 CMP: 36 in; 52 AMP and 52 CMP: 52 in; 66 AMP and 66 CMP: 66 in
Shaft (horizontal/vertical)	Both types available
Rotation Speed	1,650 rpm
Power Source Required	36 AMP: 32 to 35 gpm; 4,000 psi; 36 CMP: 24 to 38 gpm; 4,000 psi; 52 AMP: 35 to 45 gpm; 4,000 psi; 52 CMP: 30 to 42 gpm; 4,000 psi; 66 AMP: 56 to 65 gpm; 4,000 psi; 66 CMP: 38 to 48 gpm; 4,000 psi
Weight	36 AMP and 36 CMP: 1,100 to 1,300 lb; 52 AMP and 52 CMP: 2,000 to 2,700 lb; 66 AMP: 3,600 to 4,200 lb; 66 CMP: 4,000 lb
Other Attachments	Pro Mac makes a number of brush-cutters
Special Uses/Adaptations/Other Uses	Independent hydraulic ram; smaller rubber-tired backhoes
Manufacturer's Comments Regarding Equipment Application	Good munching ability in larger stems
MTDC Comments	Specifications for Alamo Industrial's Grizzly Tree Cutter Models 36 CMP, 52CMP and 66 CMP are identical to Pro Mac products with the same model numbers

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush-Cutters, Vertical Shaft, Boom Mounted

Brushco 52-Inch Cutting Head

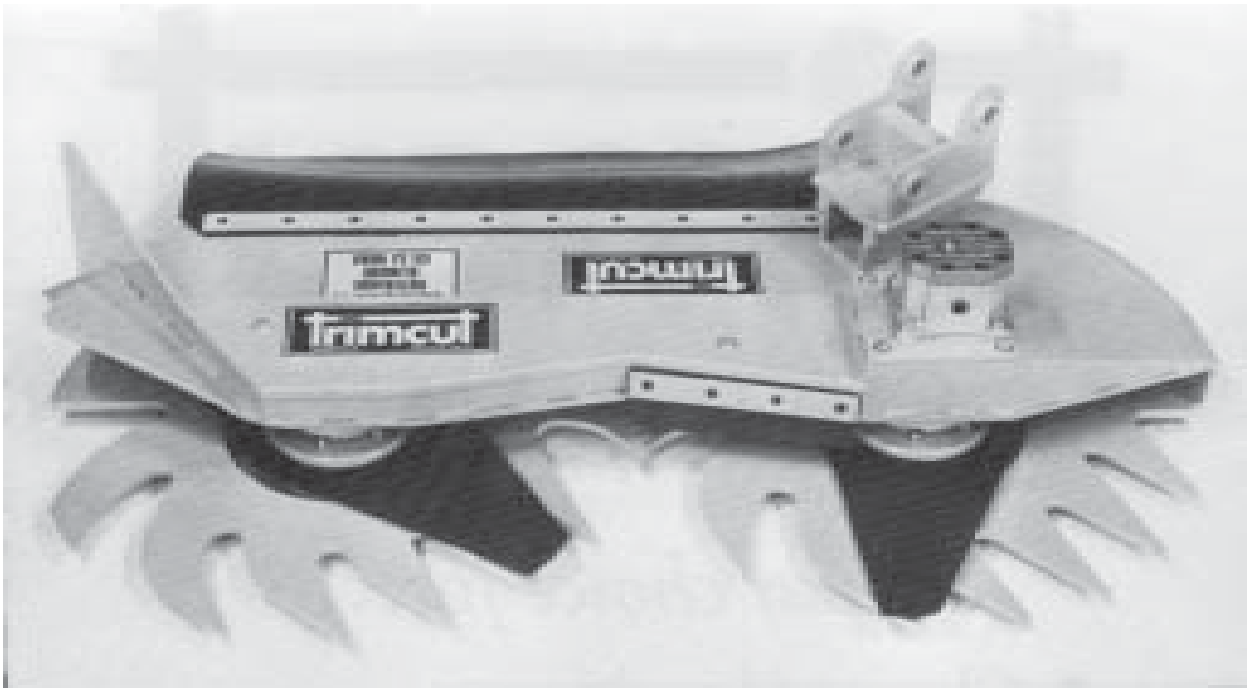


Make/Model	Brushco 52-Inch Cutting Head
Manufacturer/Source	Quadco Equipment, Inc.
Distributor	Contact Quadco Equipment, Inc.
Price	Contact manufacturer
Status	In production
Preferred Prime Mover	100 hp, 15-ton excavator
Other Suitable Prime Movers	Feller-bunchers
Attachment Mount (lift arms/boom/3-point hitch/other)	Boom
Maximum Treatable Material Size	6 in
Cutting Mechanism	Single rotor bar with two free-swinging knives, single disc with three free-swinging knives, or mulching disc
Cutting Width	52 in
Shaft (horizontal/vertical)	Vertical
Rotation Speed	Matched to prime mover's horsepower and hydraulics to keep low-pressure machines (2,800 psi) at 1,500 rpm, or high-pressure machines (3,500 to 4,000 psi) at 1,400 rpm
Power Source Required	Matched to prime-mover horsepower and hydraulics
Weight	2,660 lb
Other Attachments	Quadco also makes 8 ft, 9 ft, and 10 ft brush-cutters for loader arm machines
Special Uses/Adaptations/Other Uses	A boom adapter or mounting lugs are designed and fabricated to fit specific base machine; self-contained power pack that provides constant power can be engineered to install head on a machine with less capacity than normally required.
Manufacturer's Comments Regarding Equipment Application	Data not supplied
MTDC Comment	Hydraulic motor is spring mounted to give extra protection against load spikes

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush-Cutters, Vertical Shaft, Boom Mounted

Trimcut Cutter Heads



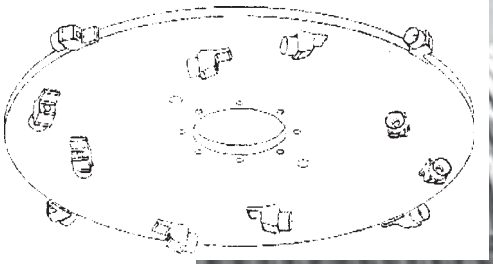
Make/Model	Trimcut Cutter Heads: EK 804; DK 890; DK 1502; DK 1503
Manufacturer/Source	Silvana Import Trading, Inc.
Distributor	Contact Silvana Import Trading, Inc.
Price	Contact source
Status	In production
Preferred Prime Mover	All types of wheel-mounted loaders
Attachment Mount (lift arms/boom/3-point hitch/other)	Boom
Maximum Treatable Material Size	EK models: 15 cm; DK models up to 8 cm
Cutting Mechanism	Single shaft (EK) or dual shaft (DK) with fixed cutting blade and countershear, double- or triple-edged cutting blades or circular saw
Cutting Width	EK 804: 32 in; DK 890: 67 in; DK 1502 and DK 1503: 55 in
Shaft (horizontal/vertical)	Vertical
Rotation Speed	2,000 to 2,500 rpm
Power Source Required	EK 804: 40 to 80 liters/min; DK models: 45 to 100 liters/min
Weight	EK 804: 160 kg; DK models: 300 kg
Other Attachments	Three types of cutter blades available
Special Uses/Adaptations/Other Uses	Separate cutting head can be adjusted to fit most extension-arm systems on the market
Manufacturer's Comments Regarding Equipment Application	Vertical cutting of stem branches is possible; cuts small trees, hedges, dense brush and grass; has been used for clearing roadways, power lines, and ski slopes

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush-Cutters, Vertical Shaft, Boom Mounted

Weldco-Beales ERC Rotary Cutter

ERC Rotary Disc, Cup-Tooth

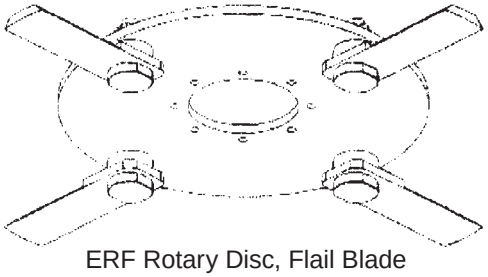


Make/Model	Weldco-Beales ERC Rotary Cutter: ERC 36; ERC 48; ERC 60
Manufacturer/Source	Weldco-Beales, Inc.
Distributor	Contact manufacturer for dealer information
Price	Contact manufacturer or dealer
Status	In production
Preferred Prime Mover	ERC 36: $1\frac{1}{2}$- to 1-yd excavators; ERC 48: 1- to $1\frac{1}{4}$-yd excavators; ERC 60: $1\frac{1}{4}$- to 2-yd excavators
Attachment Mount (lift arms/boom/3-point hitch/other)	Boom
Maximum Treatable Material Size	6 in
Cutting Mechanism	Rotary blade
Cutting Width	ERC 36: 36 in; ERC 48: 48 in; ERC 60: 60 in
Shaft (horizontal/vertical)	Vertical
Rotation Speed	ERC 36: 1,800 rpm; ERC 48: 1,400 rpm; ERC 60: 1,200 rpm
Power Source Required	Data not supplied
Weight	ERC 36: 650 lb; ERC 48: 1,100 lb; ERC 60: 1,320 lb
Other Attachments	Side-tilt extension is available
Special Uses/Adaptations/Other Uses	Moveable opening allows change to ERF wheel
Manufacturer's Comments Regarding Equipment Application	Handles larger diameter brush where mulch required; moveable opening allows operator choose direction of dispelled debris

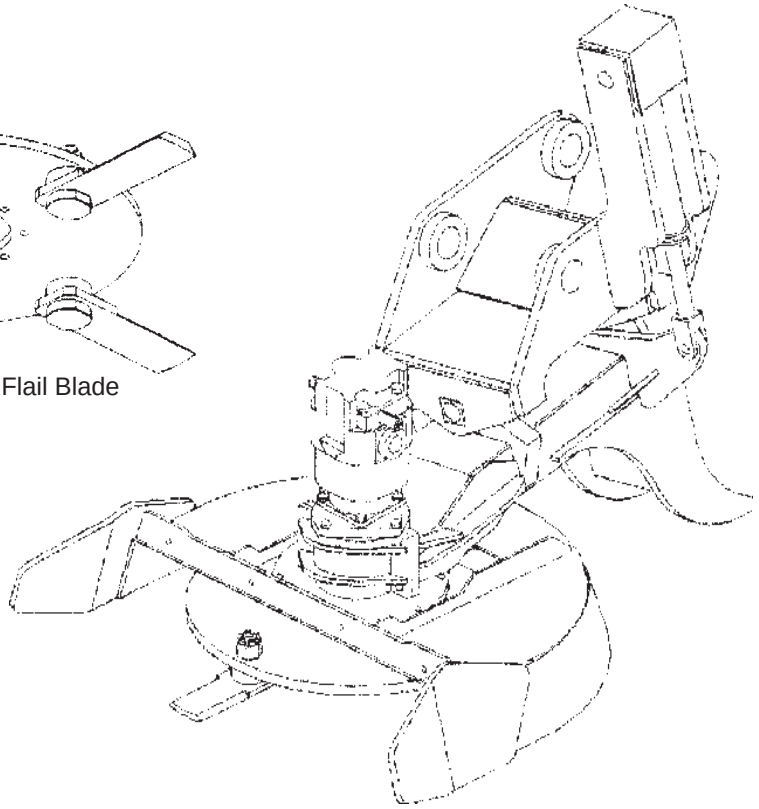
Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush-Cutters, Vertical Shaft, Boom Mounted

Weldco-Beales ERF Rotary Flails



ERF Rotary Disc, Flail Blade

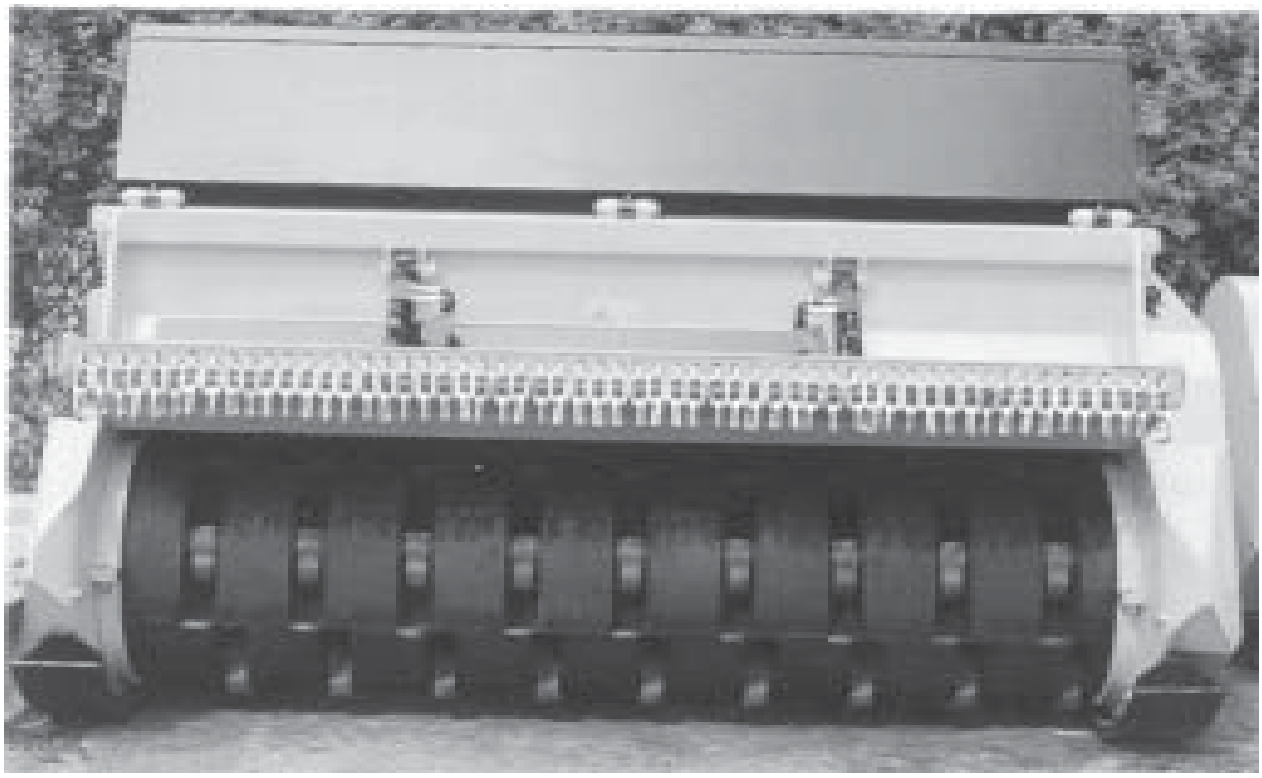


Make/Model	Weldco-Beales ERF Rotary Flails: ERF 36; ERF 48; ERF 60
Manufacturer/Source	Weldco-Beales Inc. Contact manufacturer for dealer information
Price	Contact manufacturer or dealer
Status	In production
Preferred Prime Mover	ERF 36: $^{1}/_{2}$- to 1-yd excavators; ERF 48: 1- to 1$^{1}/_{4}$-yd excavators; ERF 60: 1$^{1}/_{4}$- to 2-yd excavators
Attachment Mount (lift arms/boom/3-point hitch/other)	Boom
Maximum Treatable Material Size	3 to 5 in
Cutting Mechanism	Blade with knives
Cutting Width	ERF 36: 36 in; ERF 48: 48 in; ERF 60: 60 in
Shaft (horizontal/vertical)	Vertical
Rotation Speed	ERF 36: 1,800 rpm; ERF 48: 1,400 rpm; ERF 60: 1,200 rpm
Power Source Required	Data not supplied
Weight	ERF 36: 680 lb; ERF 48: 1,400 lb; ERF 60: 1,800 lb
Other Attachments	Side-tilt extension is available
Special Uses/Adaptations/Other Uses	Moveable opening allows change to ERC wheel.
Manufacturer's Comments Regarding Equipment Application	Handles larger-diameter brush where mulch is required; moveable opening allows operator to choose direction of dispelled debris; use ERC models for trees.

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush-Cutters, Horizontal Shaft, Boom or Machine Mounted

Alamo Severe-Duty Shredder, FMH Series



Make/Model	Alamo Severe-Duty Shredder, FMH Series: 100 H;125 H; 200 E; 225 E; 250; 250 E
Manufacturer/Source	Alamo Industrial
Distributor	Contact manufacturer for dealer information
Price	Contact manufacturer or dealer
Status	In production
Preferred Prime Mover	FMH 100 H: 70-hp excavator; FMH 125 H: 90-hp excavator; FMH 200 E, FMH 225 E, FMH 250 E: 3-cubic-yard loader or larger; FMH 250: 170-hp tractor
Attachment Mount (lift arms/boom/3-point hitch/other)	FMH 100 H, FMH 125 H: hydraulic, excavator boom-mounted; FMH 200 E, FMH 225 E, FMH 250 E: engine-driven, loader-mounted; FMH 250: PTO driven, 3-point-hitch mount
Maximum Treatable Material Size	All models listed: up to 15 in
Cutting Mechanism	Drum with 14 to 40 free-swinging knives
Cutting Width	FMH 100 H: 3 ft 2 in; FMH 125 H: 4 ft; FMH 200 E: 6 ft 4 in; FMH 225 E: 7 ft 2 in; FMH 250 E: 7 ft 10 in; FMH 250: 7 ft 10 in
Shaft (horizontal/vertical)	Horizontal rotor
Rotation Speed	Data not supplied
Power Source Required	FMH 100 H: 70 hp; FMH 125 H: 90 hp; FMH 200 E, FMH 225 E, FMH 250 E come with 170- or 330-hp engines; FMH 250: 170 hp; PTO driven
Weight	FMH 100 H: 3,295 lb; FMH 125 H: 4,162 lb; FMH 250: 8,151 lb
Other Attachments	Alamo also sells the Grizzly Tree Cutter, Arm and Blade Models 36A, 36C, 52A, 52C; and Rotary Disc Models 36CMP, 52 CMP and 66 CMP (similar to Pro Mac tree-cutter series; see Pro Mac data); and FMM series medium-duty shredders (up to 10-in trees); and FML light-duty series (up to 6-in material)
Special Uses/Adaptations/Other Uses	Data not supplied
Manufacturer's Comments Regarding Equipment Application	Data not supplied

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush-Cutters, Horizontal Shaft, Boom Mounted

Seppi M Boom-Mounted Brush-Cutter

Make/Model	Boom-Mounted Brush-Cutter: BMS 100; BMS 125; BMS 150 Brush-Cutters
Manufacturer/Source	Brush Technology Division, Carlson Tractor and Equipment Co.
Distributor	Carlson Tractor and Equipment Co.
Price	Contact manufacturer
Status	In production
Preferred Prime Mover	Any excavator that can lift required weight and give required horsepower to cutting head
Attachment Mount (lift arms/boom/3-point hitch/other)	Boom
Maximum Treatable Material Size	Up to 8 in
Cutting Mechanism	Free-swinging or fixed-tooth, matched by manufacturer to proper application: BMS 100: 16 hammers; BMS 125: 120 hammers; BMS 150: 124 hammers
Cutting Width	Working width: BMS 100: 13 ft 3 in; BMS 125: 14 ft 1 in; BMS 150: 14 ft 11 in
Shaft (horizontal/vertical)	Horizontal
Rotation Speed	1,900 to 2,000 rpm
Power Source Required	Minimum hp: BMS 100: 140; BMS 125: 150; BMS 150: 160; 25 to 50 gpm; 6,000 to 4,000 psi. Maximum 120 hp
Weight	BMS 100: 12,225 lb; BMS 125: 12,730 lb; BMS 150: 13,300 lb
Other Attachments	Seppi makes a variety of brush heads
Special Uses/Adaptations/Other Uses	Data not supplied
Manufacturer's Comments Regarding Equipment Application	Reliability and longevity of equipment. New larger Model 150 d.t. cuts up to 18-in tree; new in May 2000. Has separate engine to operate cutter head.

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush-Cutters, Horizontal Shaft, Boom Mounted

Brontosaurus Brush Mower

Make/Model	Brontosaurus Brush Mower: Standard 3- and 4-ft models; 2.5 Model
Manufacturer/Source	John Brown & Sons, Inc.
Distributor	Contact John Brown & Sons, Inc.
Price	Standard packages, without options: 4 ft: $26,500; 3 ft: $26,500. With power pack rock, guards, and frame strengthening, $72,500. 2.5 Model: $22,500 (power pack not available)
Status	In production
Preferred Prime Mover	Designed for tracked or rubber-tired excavators in the 15- to 20-ton class using auxiliary power pack. Larger excavators (including some 20-ton machines) have sufficient hydraulics to power the head.
Other Suitable Prime Movers	Feller-bunchers, specialized carriers (Gradal, Badger) with telescoping booms
Attachment Mount (lift arms/boom/3-point hitch/other)	Articulating or telescoping boom
Maximum Treatable Material Size	(3 and 4 ft): Steady: 6-in hardwood, 8-in softwood; Random: 8-in hardwood, 10-in softwood; 2.5 Model: 4 to 5 inches
Cutting Mechanism	Horizontal drum shredder with free-swinging, high-carbon steel knives. Std. 4 ft: 24 knives; std. 3 ft: 20 knives; 2.5 Model: 16 knives
Cutting Width	Std. 4 ft: 48 in; std. 3 ft: 36 in; 2.5 Model: 30 in
Shaft (horizontal/vertical)	Horizontal
Rotation Speed	All models: 0 to 1,500 rpm
Power Source Required	Std. 4 ft: 3,500 to 5,000 psi, up to 50 gpm; std 3 ft: 3,500 to 5,000 psi, up to 50 gpm; 2.5 Model: 2,500 to 4,000 psi, 29 gpm
Weight	Std. 4 ft: 4,200 lb; Std. 3 ft: 3,600 lb; 2.5 Model: 3,000 lb
Other Attachments	3- and 4-ft models available with optional auxiliary power pack, John Deere 4045T, 117 hp
Special Uses/Adaptations/Other Uses	2.5 Model can be interchanged with railroad rotary track mowers; chips range from 2 to 6 in; by mowing a second time, chips can be made smaller
Manufacturer's Comments Regarding Equipment Application	Safety, durability, cleanliness of work site (uniform size mulch)

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush-Cutters, Horizontal Shaft, Boom Mounted

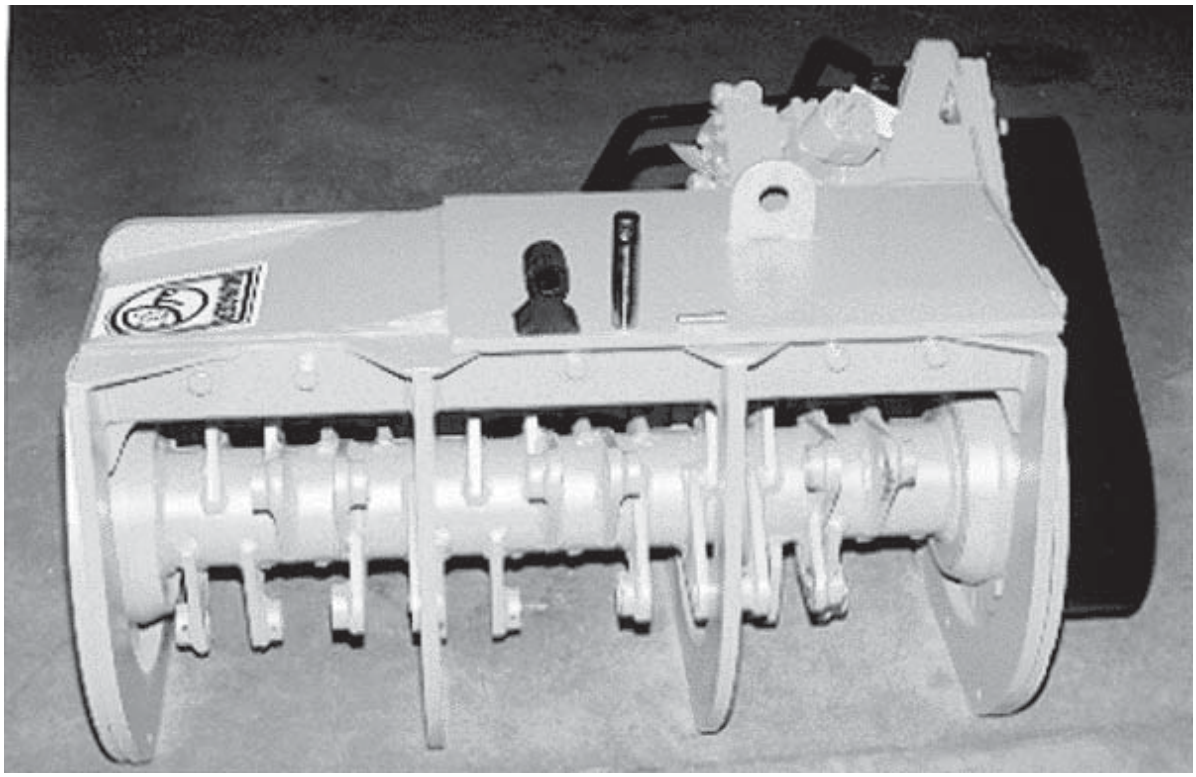
Timberwolf BM55 Boom-Mounted Cutter

Make/Model	Timberwolf BM55 Boom-Mounted Cutter
Manufacturer/Source	New Forest Technology, Inc.
Distributor	King Forestry Equipment, Inc.
Price	$53,000
Status	Built when ordered
Preferred Prime Mover	Tracked excavator
Attachment Mount (lift arms/boom/3-point hitch/other)	Boom
Maximum Treatable Material Size	16 in
Cutting Mechanism	22 to 36 free-swinging cutters
Cutting Width	55 to 90 in actual, 60-106 in operational
Shaft (horizontal/vertical)	Horizontal
Rotation Speed	1,200 to 2,200 rpm
Power Source Required	60 gpm; 5,000 psi
Weight	2,500 lb
Other Attachments	Timberwolf also makes a machine-mounted land-clearing device
Special Uses/Adaptations/Other Uses	Land clearing, strip or selective thinning, hazard reduction; manufacturer will supply or install units on customer's preferred prime mover
Manufacturer's Comments Regarding Equipment Application	Very rugged, high-horsepower machines with high throughput capacity

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush-Cutters, Horizontal Shaft, Boom Mounted

Munger Flail Cutters



Make/Model	Munger Flail Cutters: SMC-050L; SMC-050R; SMC-060
Manufacturer/Source	Produits Forestiers Mungers, Inc.
Price	Contact Produits Forestiers Mungers, Inc. SMC-050L: $19,700; SMC-050R: $21,300; SMC-060: $24,300 (f.o.b. factory, not including taxes, U.S. dollars)
Status	In production
Preferred Prime Mover	SMC-050L: carriers 65 hp and up; SMC-050R: carriers 80 hp and up; SMC-060: carriers 85 hp and up
Attachment Mount (lift arms/boom/3-point hitch/other)	Boom
Maximum Treatable Material Size	Data not supplied
Cutting Mechanism	Open rotor with knives: SMC-050L, SMC-050R = 18 knives; SMC-060 = 24 knives
Cutting Width	SMC-050L, SMC-050R: 41 in; SMC-060: 54 in
Shaft (horizontal/vertical)	Horizontal
Rotation Speed	2,300 rpm
Power Source Required	SMC-050L, SMC-050R: 18 to 30 gpm; 3,000 psi; SMC-060: 24 to 30 gpm; 3,000 psi
Weight	SMC-050L is approximately 1,200 lb; SMC-050R is approximately 1,695 lb; SMC-060 is approximately 1,980 lb
Other Attachments	Munger also makes rotary cutters
Special Uses/Adaptations/Other Uses	Chips range from 6 to 12 in; optional breaking devices available
Manufacturer's Comments Regarding Equipment Application	Safety: heavy-duty frames; flywheels on brush-cutters; low operational costs and excellent reliability

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush-Cutters, Horizontal Shaft, Boom Mounted

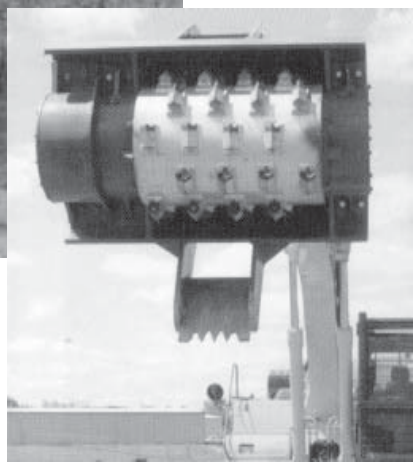
Pro Mac Flail Hammer Brush-Cutters

Make/Model	Pro Mac Flail Hammer Brush-Cutters: 34 Light Duty; 34 Standard Duty; 34 Extreme Duty; 48 Light Duty; 48 Standard Duty; 60 Standard Duty
Manufacturer/Source	Pro Mac Manufacturing, Ltd.
Distributor	Most original equipment manufacturer excavator dealerships, such as Case, Caterpillar, Hyundai, John Deere, Kobelco, Komatsu, Line Belt, Samsung
Price	$17,000 to $19,800 (Prices subject to change)
Status	In production
Preferred Prime Mover	Hydraulic excavator to suit specific size of cutter
Other Suitable Prime Movers	Hydraulic ram skidders with swing booms, like Morgan Silvatrack hydrastatic
Attachment Mount (lift arms/boom/3-point hitch/other)	Standard boom or long reach boom special applications
Maximum Treatable Material Size	Smaller-sized finished product in stems up to 4-in diameter
Cutting Mechanism	Standard-duty flail hammer, free-swinging: 34-in models is 14 teeth or hammers; 48-in models is 18 teeth or hammers; 60-in models is 24 teeth or hammers
Cutting Width	34 light, standard, and extreme duty: 34 in; 48 light and standard duty: 48 in; 60 standard duty: 60 in
Shaft (horizontal/vertical)	Horizontal
Rotation Speed	2,300 rpm
Power Source Required	34 light duty and 34 std. duty is 16 to 35 gpm; 34 extreme duty is 30 to 48 gpm; 48 light duty is 30 to 42 gpm; 48 std. duty is 30 to 48 gpm; 60 std. duty is 32 to 48 gpm. All are 2,700 to 4,000 psi
Weight	34 light duty: 1,250 lb; 34 standard duty: 1,500 lb; 34 extreme duty: 2,600 lb; 48 light duty: 1,300 lb; 48 standard duty: 1,800 lb; 60 standard duty: 2,400 lb
Other Attachments	Pro Mac makes many brush-cutting devices
Special Uses/Adaptations/Other Uses	Independent hydraulic ram; smaller rubber-tire backhoes
Manufacturer's Comments Regarding Equipment Application	Smaller-sized finished product in stems up to 4-in diameter

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush-Cutter, Horizontal Shaft, Boom Mounted

Shinn Cutter Models SC-Lite, SC-2, and SC-3



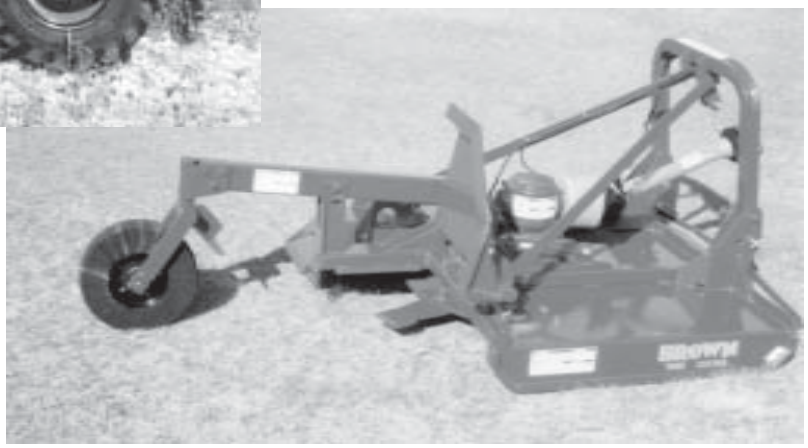
Make/Model	Shinn Cutter Models SC1-Lite, SC-2, and SC-3
Manufacturer/Source	Shinn Cutter Systems
Distributor	Shinn Cutter Systems
Price	SC-LIte: $159,000; SC-2: $190,000; SC-3: $285,000. Prices include installation of power pack and grinding head; customer pays shipping of excavator both ways.
Status	In production
Preferred Prime Mover	360-degree tracked or wheeled excavator. SC-Lite: min. 33,000-lb excavator; SC-2: min. 48,000-lb excavator; SC-3: min. 60,000-lb excavator
Maximum Treatable Material Size	Unlimited
Cutting Mechanism	Fixed
Cutting Width	36 in
Shaft (horizontal/vertical)	Horizontal
Rotation Speed	SC1-Lite: 1,750 rpm; SC-2, SC-3: 1,375 rpm
Attachment Power Supply	Self-contained. Power unit (Caterpillar or Cummins) is mounted to the back of excavator. SC-Lite: 245 to 255 hp; SC-2: 310 to 320 hp; SC-3: 525 to 600 hp
Weight	Depends on power unit and excavator
Special Uses/Adaptations/Other Uses	Row maintenance, first-cut roads, storm debris cleanup, firebreak establishment, large tracts
Manufacturer's Comment	Versatile, cost effective, with ability to grind trees of any diameter to manageable, environmentally friendly mulch. One machine, one operator.

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush-Cutter, Machine Pulled

Brown Tree Cutters

Woods Boss rubber-tired tractor



Brown Tree Cutter

Make/Model	Brown Tree Cutters: TCO-2515C, TCO-2615C, TCF-2615, TCO-2620C, TCF-2620 (other optional models that run at different rpm's are available)
Manufacturer/Source	Brown Manufacturing Corp.
Distributor	Brown Manufacturing Corp.
Price	TCO-2515C: $4425; TCO-2615C: $4665; TCF-2615: $5470; TCO-2620C: $6255; TCF-2620: $7335
Status	In production
Preferred Prime Mover	Tractor with 3-point hitch and sufficient PTO horsepower
Attachment Mount (lift arms/boom/3-point hitch/other)	3-point hitch
Maximum Treatable Material Size	TCO-2515C, TCO-2615C, TCF-2615: 6 in; TCO-2620C, TCF-2620: 8 in
Cutting Mechanism	Four free-swinging blades mounted on a circular disc
Cutting Width	TCO-2515C: 60 in; TCO-2615C, TCF-2615, TCO-2620C andTCF-2620: 72 in
Shaft (horizontal/vertical)	Vertical
Rotation Speed	810 rpm
Power Source Required	TCO-2515C: 50 to 90 hp; TCO-2615C: 60 to 90 hp; TCF-261570: to 90 hp; TCO-2620C: 70 to 100 hp; TCF-2620: 80 to 100 hp
Weight	TCO-2515C is 1,700 lb; TCO-2615C is 2,050 lb; TCF-2615 is 2,315 lb; TCO-2620C is 2,250 lb; TCF-2620 is 2,600 lb
Other Attachments	Brown also makes smaller tree cutters and brush mowers. Vegetative Mowing Equipment (Marietta, GA) makes a special right-of-way tractor called the Woods Boss that is a well-guarded, rubber-tired tractor that can pull the Brown Tree Cutter.
Special Uses/Adaptations/Other Uses	Right-of-way clearing
Manufacturer's Comments Regarding Equipment Application	Data not supplied

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush-Cutters (Land-Clearing Blade), Machine Mounted

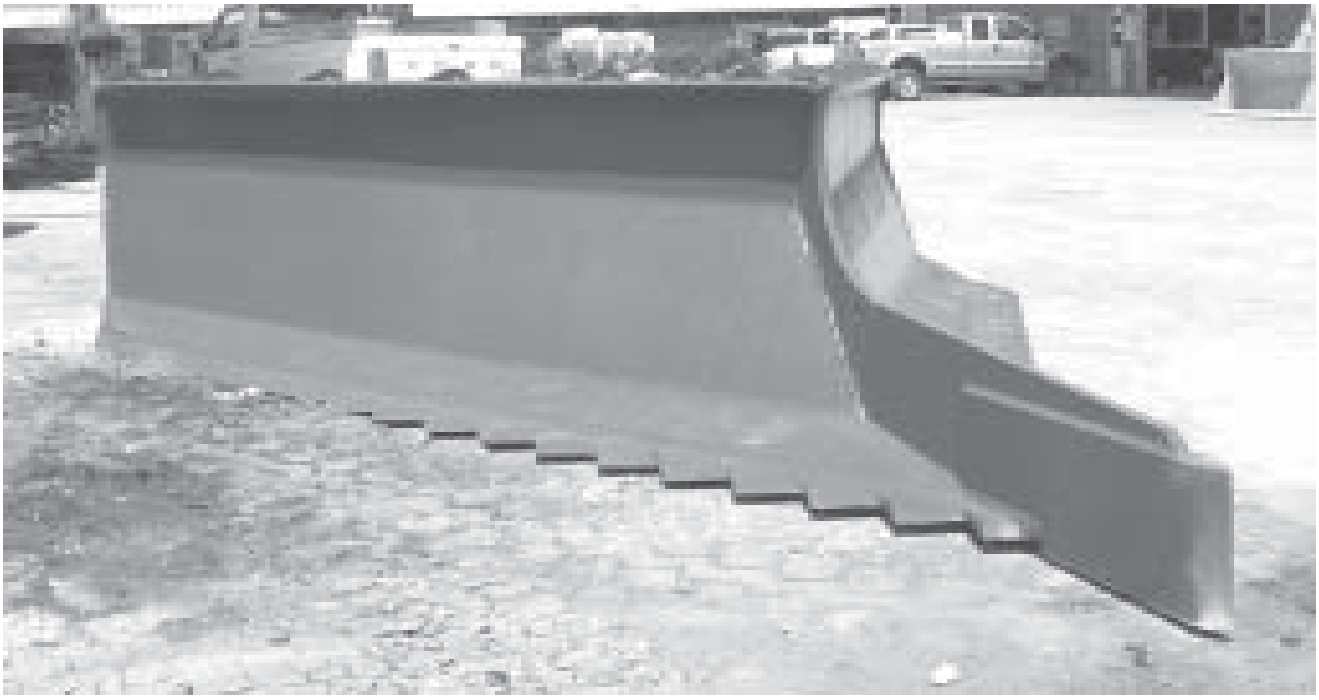
Rome K/G Clearing Blades: KGB and KGBA Series

Make/Model	Rome K/B Clearing Blades: KGB and KGBA Series
Manufacturer/Source	Rome Plow Company
Distributor	Caterpillar dealer network
Price	Contact dealer
Status	In production
Preferred Prime Mover	Models to fit Caterpillar D5 to D9 tractors
Attachment Mount (lift arms/boom/3-point hitch/other)	Machine mount
Height	4 ft $4^{1}/_{2}$ in to 5 ft $4^{3}/_{4}$ in
Length	Trunnion to stinger tip is 19 ft 2 in to 22 ft 8 in
Width	10 ft $9^{1}/_{2}$ in to 13 ft
Weight	3,520 to 16,360 lb
Cutting Mechanism	Serrated blades of tough T-1 steel; shears small trees and vegetation off at ground level and windrows them to the side in one continuous pass. Complete control over falling trees.
Power Source Needed	Host dozer
Other Attachments	RV-Series Vee-Blade cutters with center-mounted “stinger,” Rome tree pusher, root plow, dozer rake, and disk harrows
Special Uses/Adaptations/Other Uses	Builds forest roads and firebreaks
Manufacturer’s Comments Regarding Equipment Application	Data not supplied

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brus-Cutters (Land-Clearing Blade), Machine Mounted

Savannah 1000-Series V-Shear, Land-Clearing Blades



Make/Model	Savannah 1000-Series V-Shear, Land-Clearing Blade: Models 1020; 1030; 1040
Manufacturer/Source	Savannah Forestry Equipment, LLC
Distributor	Contact Savannah Forestry Equipment, LLC
Price	1020 is $29,000; 1030 is $24,500; 1040 is $22,500
Status	In production
Preferred Prime Mover	1020: 250- to 300-hp dozers; 1030 : 200- to 250-hp dozers; 1040: 150- to 180-hp dozers
Attachment Mount (lift arms/boom/3-point hitch/other)	Machine mount
Height	51 in
Length	24 ft from stinger to sidearm trunion cap
Width	9 ft 10 in
Weight	6.3 tons
Cutting Mechanism	Apron with sharpened serrated blade has a wedge design that is presented at an angle to tree stump, allowing small amounts of force to give considerable cutting effect; cuts 28-in stump
Power Source Needed	Host dozer
Other Attachments	Savannah also makes a rolling chopper, and forestry bedding and subsoiling plows
Special Uses/Adaptations/Other Uses	Front stinger can split large trees or stumps and weaken them to allow cutting right through
Manufacturer's Comments Regarding Equipment Application	Data not supplied
MTDC Comment	Rockland and Sharpco also make land-clearing blades. Their products are not shown in this report, but their addresses are in Appendix B.

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush-Cutters (Rolling Choppers), Machine Pulled

Marden Heavy-Duty Brush-Cutter: SB and B Series

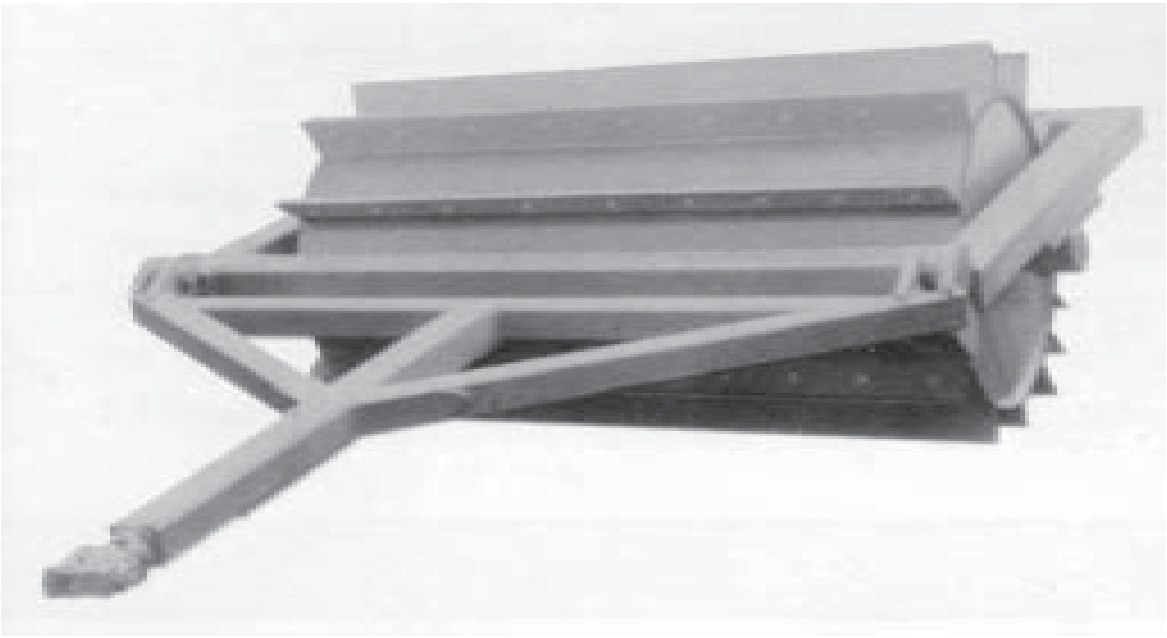
SB10-GK 10-foot Brush-Cutter.

Make/Model	Marden Heavy-Duty Brush-Cutter: SB and B Series—SB10-GK 10-ft brush-cutter shown
Manufacturer/Source	Marden Industries, Inc.
Distributor	Marden Industries, Inc.
Price	Contact manufacturer
Status	In production
Preferred Prime Mover	Cat D-6 or equivalent
Attachment Mount (lift arms/boom/3-point hitch/other)	Rear draw or winch cable with optional rear hydraulic wheel lift
Maximum Treatable Material Size	Up to 4 in
Cutting Mechanism	12 fixed 1 in x 10 in x 10 ft
Cutting Width	10 ft
Shaft (horizontal/vertical)	Horizontal
Rotation Speed	3 to 5 mph
Power Source Required	175-hp drawbar
Weight	17,000 lb empty, 28,500 lb filled
Other Attachments	Marden makes 12 other heavy-duty models designed for crawler tractors, four medium- and light-duty models designed for rubber-tired tractors; drum widths 5 to 12 ft; 2,000 to 38,000 lb; and requiring 20 to 250 drawbar horsepower
Special Uses/Adaptations/Other Uses	Can be attached to winch cable and released downhill, then winched back up to prime mover
Manufacturer's Comments Regarding Equipment Application	Weight and durability
MTDC Comment	SB models have a single drum and B models have a tandem set of drums.

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush-Cutters (Rolling Choppers), Machine Pulled

Rockland Rolling Choppers



Make/Model	Rockland Rolling Chopper: C-6; C-7; C-8; C-10; C-12; C-14; and C-16
Manufacturer/Source	Rockland Manufacturing Co.
Distributor	Contact construction equipment dealers
Price	Contact construction equipment dealers
Status	In production
Preferred Prime Mover	Data not supplied
Attachment Mount (lift arms/boom/3-point hitch/other)	Draw pull
Maximum Treatable Material Size	Single-drum models (d.b.h. = drawbar horsepower): C-6: 35 to 50 d.b.h.; C-7: 50 to 75 d.b.h.; C-8: 97 to 130 d.b.h.; C-10: 130 d.b.h. and up; C-12: 185 d.b.h. and up; C-14: 230 d.b.h. and up; C-16: 268 d.b.h. and up
Cutting Mechanism	C-6: 10 blades; C-7: 10 blades; C-8: 12 blades; C-10: 12 blades; C-12: 12 blades; C-14: 12 blades; C-16: 16 blades
Cutting Width	C-6: 6 ft; C-7: 7 ft; C-8: 8 ft; C-10: 10; C-12: 12 ft; C-14: 14 ft; C-16: 16 ft
Shaft (horizontal/vertical)	Horizontal drum
Rotation Speed	Draw pull
Power Source Required	Draw pull
Weight	C-6: 4,700 to 8,200 lb; C-7: 8,100 to 15,500 lb; C-8: 12,100 to 22,190 lb; C-10: 14,600 to 29,700 lb; C-12: 17,400 to 36,100 lb; C-14: 20,000 to 40,400 lb; C-16: 33,600 to 68,700 lb
Other Attachments	Single drum or multiunits available; multidrum models have 2 extra blades on the rear drum to prevent tracking. They also make a tree shear for a dozer.
Special Uses/Adaptations/Other Uses	Data not supplied
Manufacturer's Comments Regarding Equipment Application	Data not supplied

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush-Cutters (Rolling Choppers), Machine Pulled

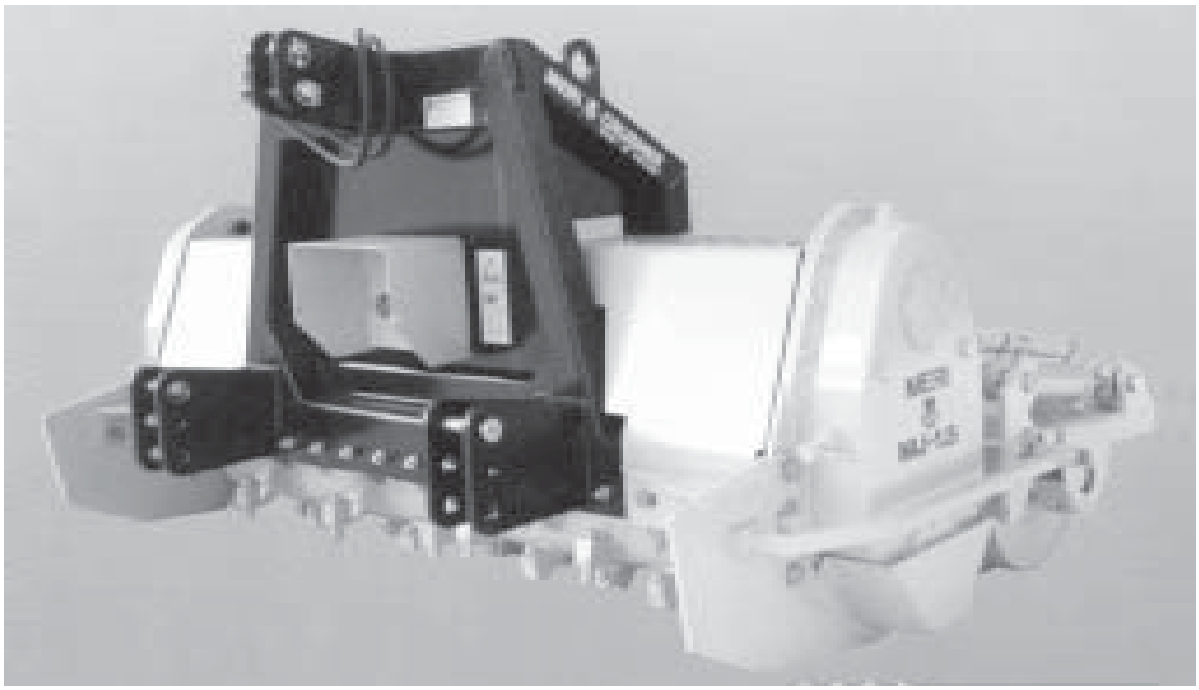
Savannah Model 1110 Chopper Roller

Make/Model	Savannah Model 1110 Chopper Roller
Manufacturer/Source	Savannah Forestry Equipment, LLC
Distributor	Contact Savannah Forestry Equipment, LLC
Price	$27,750
Status	In production
Preferred Prime Mover	For heavy debris: 250- to 300-hp dozer, large 4x4 tractor or skidder
Attachment Mount (lift arms/boom/3-point hitch/other)	Hydraulic offset drawbar with swivel pull
Maximum Treatable Material Size	Data not supplied
Cutting Mechanism	5-ft-diameter roller
Cutting Width	10 ft
Shaft (horizontal/vertical)	Horizontal
Rotation Speed	Draw pull
Power Source Required	Draw pull
Weight	Empty: 6.9 tons; with outside tanks full: 10 tons; with all ballast included: 11.6 tons
Other Attachments	Comes in 10- or 12-ft single units or dual 8-ft models in tandem
Special Uses/Adaptations/Other Uses	Can be built with three water ballast compartments to give four weight options to suit field conditions
Manufacturer's Comments Regarding Equipment Application	Data not supplied

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush-Cutter (Crusher), Machine Mounted

Meri Crusher Heavy-Duty Mulcher and Rototiller

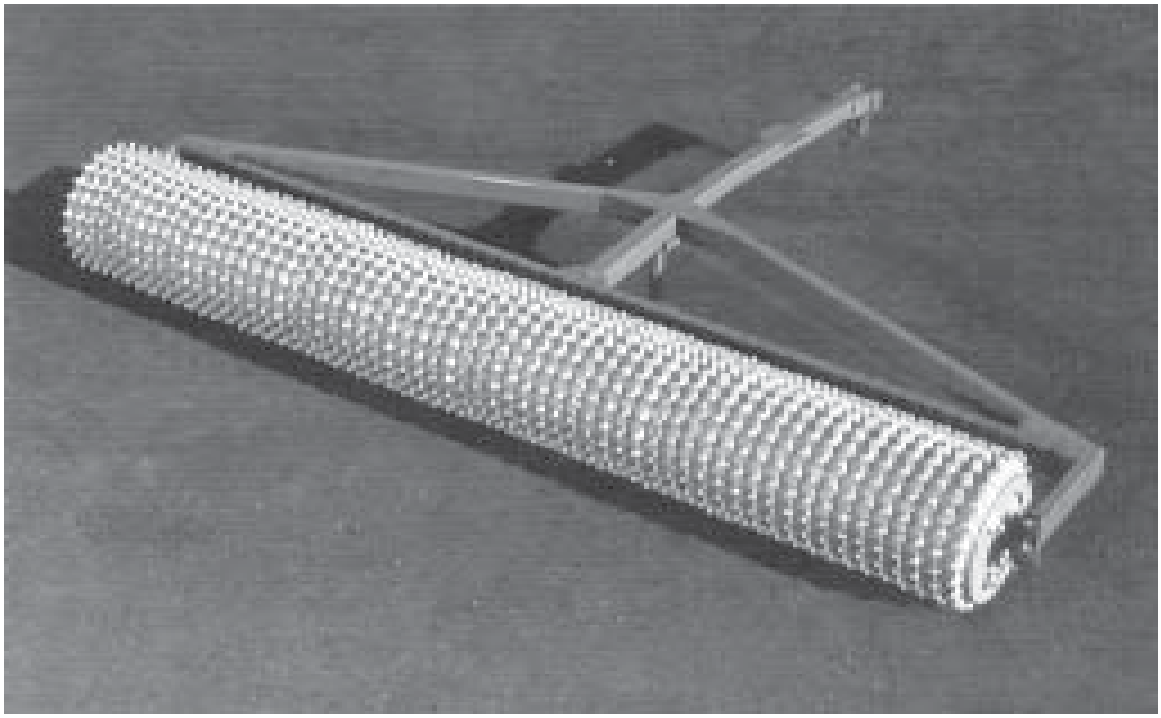


Make/Model	Meri Crusher Heavy-Duty Mulcher and Rototiller: MJ-1.8; MJ-2.3; MJS-2.0 DT; and MJS-2.5 DT
Manufacturer/Source	Suokone Oy
Distributor	Hakmet USA
Price	$15,500 to $34,700
Status	In production
Preferred Prime Mover	Mainly dependent upon application—generally tractors, excavators, bulldozers: MJ-1.8: 65 to 180 hp; MJ-2.3: 80 to 180hp; MJS-2.0 DT: 110 to 180 hp; MJS-2.5 DT: 120 to 180 hp
Attachment Mount (lift arms/boom/3-point hitch/other)	Front or rear-mount mechanical or hydraulic mounting (3-point hitch, boom, and so forth)
Maximum Treatable Material Size	Depends upon speed operated: slash and limbs 2 to 3 in
Cutting Mechanism	Fixed carbide-tipped in holders welded to crusher drum: MJ-1.8: 64 cutters; MJ-2.3: 85 cutters; MJS-2.0 DT: 74 cutters; MJS-2.5 DT: 93 cutters
Cutting Width	Working width: MJ-1.8: 5 ft 11 in; MJ-2.3: 7 ft 7 in; MJS-2.0 DT: 6 ft 7 in; MJS-2.5 DT: 8 ft 2 in
Shaft (horizontal/vertical)	Drum is horizontal, no shafts for cutters; cutters are vertical
Rotation Speed	540 rpm on all models except the MJS-2.0 DT and MJS-DT, which are 380 rpm
Power Source Required	1,000-rpm PTO preferred, 540 optional
Weight	MJ-1.8: 1,686 to 2,117 lb; MJ-2.3: 1,918 to 2,459 lb; MJS-2.0 DT: 2,745 lb; MJS-2.5 DT: 2,999 lb
Length	5 ft 5 in to 5 ft 9 in
Height	4 ft 3 in to 4 ft 7 in
Other Attachments	Smaller models
Special Uses/Adaptations/Other Uses	Dust control, reconditioning and maintaining roads, ground preparation of tough soil, elimination of pruning debris, stump grinding, and so forth; capable of working where the prime mover able to operate; can be used with an hydraulic roller or felling frame
Manufacturer's Comments Regarding Equipment Application	Shreds wood, grinds stumps, pulverizes hard soil and incorporates chips to desired depth (0-10 in); doesn't throw material outside the implement

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Crusher (Culti-Packer), Machine Pulled

Schmeiser Till an' Pak Culti-Packer



Make/Model	Schmeiser Till an' Pak Culti-Packer
Manufacturer/Source	T.G. Schmeiser Co., Inc.
Distributor	Contact for manufacturer for nearest dealer
Price	List $1,000 to $13,000 depending on size
Status	In production
Preferred Prime Mover	Varies with size, tractor with draw-bar hitch
Attachment Mount (lift arms/boom/3-point hitch/other)	Draw pull or 3-point hitch
Maximum Treatable Material Size	Unknown; used in forests, duck preserves
Cutting Mechanism	Attachment consists of tubes with approximately rings of curved teeth per foot of width, available in 8-, 10-, 12-, and 14-in diameters; can be used singly or in squadrons
Cutting Width	Custom made in lengths from 2 to 24 ft
Shaft (horizontal/vertical)	Horizontal tubes
Rotation Speed	Draw pull
Power Source Required	Draw pull
Weight	Weight is per foot, depending upon ring and tube size; average is 200 lb/ft
Special Uses/Adaptations/Other Uses	Designed to break clods and pulverize soil, seal in fertilizer or fumigants, turn and mulch soil, pack soil (in pack mode)
Manufacturer's Comments Regarding Equipment Application	Data not supplied

Small-Tree Cutting/Processing Heads

Concept—Equipment for this section was selected on the basis of the size of material the equipment could handle. Heads were limited to handling material up to about 14 inches in size. These small attachments can be used by some carriers that are not built specially for them.

Comments—The Risley Slingshot was included because it is a relatively low-cost, single-grip, stroke-type harvester that combines felling, accumulating, limbing, and processing into a single harvesting operation at the stump.

Other Manufacturers or Sources—In addition to those listed in the catalog, other sources of tree shears that fit on skid steers as well as other machines include:

- E-Z Implements, Inc. (nonpowered, uses two free-spinning sharpened steel discs)
- Agra Axe International, Inc.
- Gregory Manufacturing Co.

Felling and processing heads are quite common. While other manufacturers may not make heads as small as those featured in this catalog, other manufacturers include:

- Case Corp.
- Denharco, Inc.
- Hultdins, Inc.
- Deere & Co. Construction Equipment
- Timbco Hydraulics, Inc.
- Timberjack, Inc.

Check your local dealers or see the Equipment Today annual attachments guide, Canadian Forest Industries semiannual harvesting heads issue, or the Timber West or Timber Harvesting annual buyer's guides for additional information on logging-related equipment (see Appendix B for details).

Other unconfirmed sources of felling and harvesting heads of many types and sizes listed in Timber West 1999/2000 Buyer's Guide & Directory include:

- AFM-Forest, Ltd.
- Barko Hydraulics, LLC
- Bell Equipment N.A., Inc.
- Blondin, Inc.
- Blount, Inc.
- Caterpillar Inc.
- Danzco
- Dika Industries, Ltd.
- Foresteri Patu
- Franklin Equipment Co.
- Gilbert-Tech, Inc.
- Harvest Systems, Inc.
- Hytec Manufacturing, Inc.
- Lakewood Mechanical
- Lako Oy
- Log Max
- Loggtech AB
- McIntee Forest Products
- MQP, Inc.
- Neuson
- Partek Forest, Inc.
- Pierce Pacific Manufacturing Co.
- Ponsee USA, Inc.
- Quadco Equipment, Inc.
- Rotobec USA, Inc.
- Second Growth, Inc.
- Tigercat Industries, Inc.
- Votech Innovation, Ltd.
- Waratah Forestry Attachments

Small Tree-Cutting/Processing Heads

Tree Shears for Skid Steers, Wheel Loaders, and Other Machines

Dymax Tree Shears

Make/Model	Dymax Tree Shears: 10-in and 14-in Land-Clearing Shears; 14-, 16-, and 20-in Forestry Tree Shears
Manufacturer/Source	New Dymax, Inc.
Distributor	Bobcat, ASV Posi-Track, New Holland, Gehl, Caterpillar, and Case dealers
Price	Contact dealer for current models and prices
Status	In production
Preferred Prime Mover	Minimum 40-hp skid steer; ASV Posi-Track
Other Suitable Prime Movers	Skid steers, small wheel loaders, hydraulic excavators (14- and 20-in shears)
Attachment Mount (lift arms/boom/3-point hitch/other)	Lift arms
Maximum Treatable Material Size	10 to 20 in
Cutting Mechanism	10-in shear: 1 steel shear blade; 14-in shears: 2 steel shear blades
Overall Width	10-in land-clearing shear: 68 in; 14-in models: 63 in
Power Source Required	10-in land-clearing shear: 10 to 18 gpm, 1,700 to 3,000 psi; 14-in land-clearing shear and 14-in forestry tree shear: 13 gpm, 2,500 to 3,000 psi
Weight	10-in land-clearing shear: 720 lb; 14 in land-clearing shear: 1,300 to 1,420 lb; 14 in forestry shear: 1,810 to 1,950 lb; 16-in forestry shear: 2,380 to 2,950 lb; 20-in forestry shear: 5,350 to 6,110 lb
Other Attachments Available	14-in land-clearing shear has optional push bar; 14-in forestry tree shear has optional accumulator, and/or double grapple arms in forestry tree shear is also available.
Special Uses/Adaptations/Other Uses	Small operator thinning, rights-of-way maintenance and utility cutting
Manufacturer's Comments Regarding Equipment Application	Cost-effective method of small-operator thinning, clearing, and maintenance

Small Tree-Cutting/Processing Heads

Tree Shears for Skid Steers, Wheel Loaders, and Other Machines

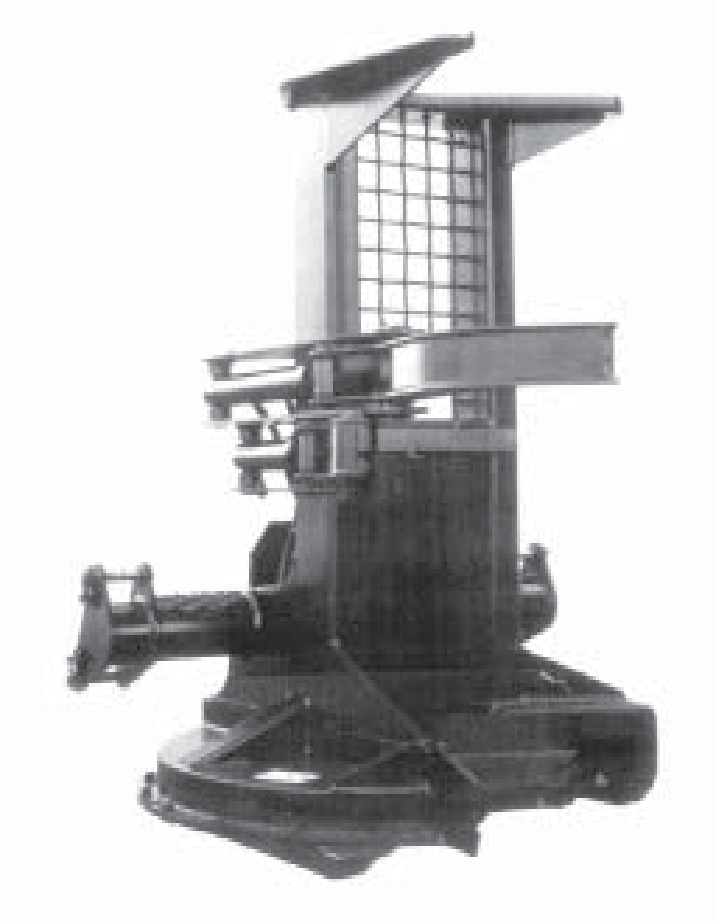
"Big Red" Little Mite Tree Cutter

Make/Model	"Big Red" Little Mite Tree Cutter
Manufacturer/Source	Taylor Machine Works, Inc.
Distributor	Contact Taylor Machine Works, Inc.
Price	$6,500
Status	In production
Preferred Prime Mover	Minimum 50-hp farm tractor, front-end loader, or skid steer
Attachment Mount (lift arms/boom/3-point hitch/other)	Lift arms
Maximum Treatable Material Size	12-in softwood, 6-in hardwood
Cutting Mechanism	Clamp and blade
Cutting Width	Full-open clamp: 21 in; full-open blade: 24 in
Overall Width	80 in
Power Source Required	Tractors with minimum 50 hp. Requires one hydraulic function on tractor and two quick-disconnect hydraulic outlets.
Weight	1,450 lb
Other Attachments Available	"Little Red" Logger (3-point hitch grapple)
Special Uses/Adaptations/Other Uses	Data not supplied
Manufacturer's Comments Regarding Equipment Application	Data not supplied

Small Tree-Cutting/Processing Heads

Feller Disc Saw Head

Davco QC 1200 Feller-Buncher

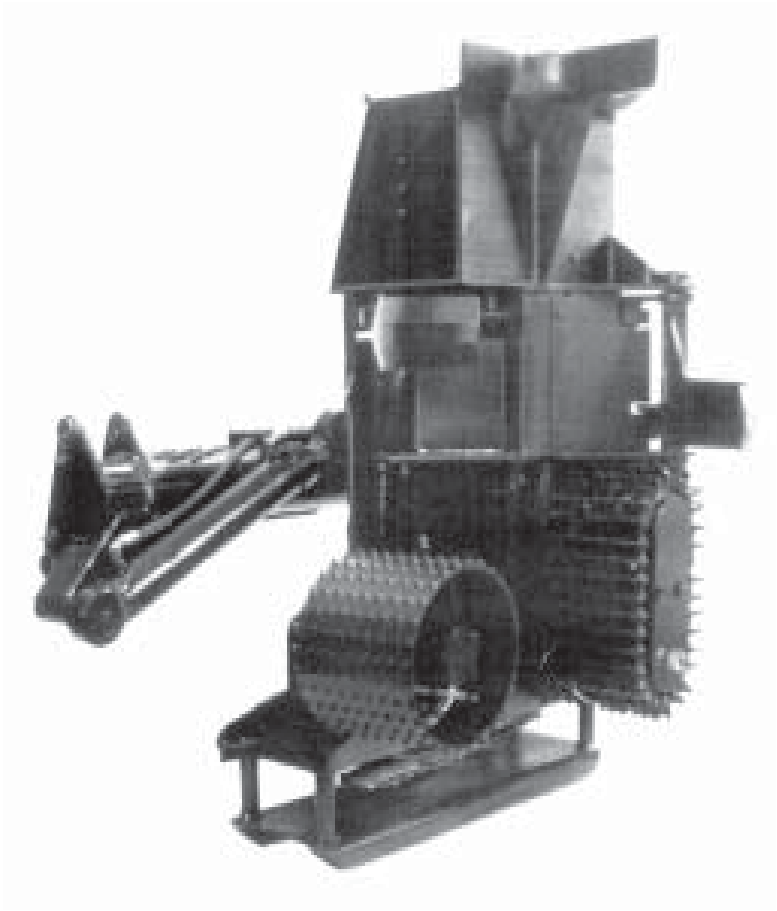


Make/Model	Davco QC 1200 Feller-Buncher
Manufacturer/Source	Davco Manufacturing, Ltd.
Distributor	Davco Manufacturing, Ltd., or Posi-Track dealers
Price	Contact dealers
Status	In production
Preferred Prime Mover	Posi-Track HD4500 or Posi-Track HD4520
Other Suitable Prime Movers	Suitable for small boom type carrier
Attachment Mount (lift arms/boom/3-point hitch/other)	Fixed mount
Maximum Treatable Material Size	14-in single cut
Cutting Mechanism	36-in diameter hot saw with high speed 1 5/8 square rotatable teeth
Overall Width	42 in
Rotation Speed	1,800 rpm
Power Source Required	2,750 psi; 25 to 30 gpm
Weight	1,100 lb
Other Attachments Available	Davco also makes a small processor head and brush-cutter
Special Uses/Adaptations/Other Uses	Data not supplied
Manufacturer's Comments Regarding Equipment Application	All Davco attachments are user friendly with a short operator learning period

Small Tree-Cutting/Processing Heads

Small Single-Grip Harvester Heads

Davco TP 1000 Tree Cutter

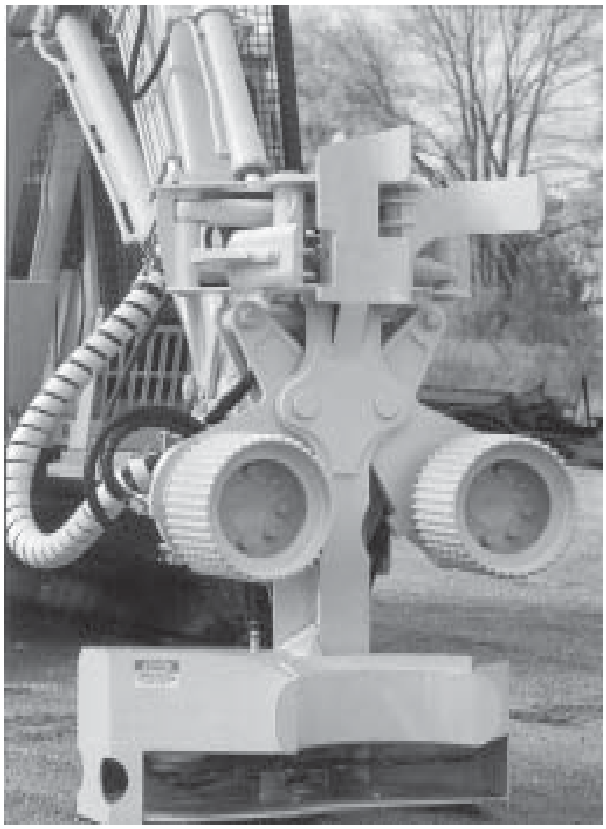


Make/Model	Davco TP 1000 Tree Processor
Manufacturer/Source	Davco Manufacturing, Ltd.
Distributor	Davco Manufacturing, Ltd., or Posi-Track dealers
Price	Contact dealers
Status	In production
Preferred Prime Mover	Posi-Track HD4500 or Posi-Track HD4520
Other Suitable Prime Movers	Suitable for small loader-type carrier with approval
Attachment Mount (lift arms/boom/3-point hitch/other)	Fixed mount
Maximum Treatable Material Size	12 in
Cutting Mechanism	Bar saw
Overall Width	49 in
Power Source Required	2,750 psi; 25 to 30 gpm
Weight	1,100 lb
Other Attachments Available	Davco also makes a small feller-buncher head and a brush-cutter
Special Uses/Adaptations/Other Uses	Fells, limbs; has computerized measuring with 4 presets, track drive on tree
Manufacturer's Comments Regarding Equipment Application	All Davco attachments are user friendly with short operator learning period

Small Tree-Cutting/Processing Heads

Small Single-Grip Harvester Heads

Fabtek Series 2000 13-Inch Processor Head



Make/Model	Fabtek Series 2000 13-in Processor Head
Manufacturer/Source	Fabtek, Inc.
Distributor	Contact manufacturer for dealer information
Price	Contact dealer
Status	In production
Preferred Prime Mover	Carrier with minimum weight of 16,000 lb and minimum 55 hp
Attachment Mount (lift arms/boom/3-point hitch/other)	Boom
Maximum Treatable Material Size	Maximum 15 in between rollers, prefer 13 in
Cutting Mechanism	34-in saw bar
Overall Width	Data not supplied
Rotation Speed	Saw chain speed is 3,000 fpm; Limb speed is 8 to 13 fps
Power Source Required	Minimum 29 gpm; 4,100 psi; supplemental cooling may be required
Weight	Operating weight is 2,400 lb
Other Attachments Available	Fabtek makes a variety of forestry equipment
Special Uses/Adaptations/Other Uses	Rubber rollers for sensitive wood processing
Manufacturer's Comments Regarding Equipment Application	Dependable, economical, tough; this is a heavy-duty head for this purpose

Small Tree-Cutting/Processing Heads

Small Single-Grip Harvester Head

Keto 51 Harvester Head

Make/Model	Keto 51 Harvester Head
Manufacturer/Source	Forestry Equipment, Inc.
Distributor	Contact Forestry Equipment, Inc. for a local retailer
Price	$50,000 with computer measuring system
Status	In production
Preferred Prime Mover	Boom-type excavator mount with 60 to 90 hp; 13,000 to 20,000 lb
Other Suitable Prime Movers	Kobelco Model 60
Attachment Mount (lift arms/boom/3-point hitch/other)	Boom
Maximum Treatable Material Size	Maximum about 12-in tree, fell and process
Cutting Mechanism	17-in saw bar
Overall Width	Data not supplied
Rotation Speed	Chain drive-sprocket speed approximately 6,000 rpm
Power Source Required	42 to 66 gpm; maximum system pressure is 3,800 psi; maximum flow, pressure and horsepower may not be allowed to take place simultaneously
Weight	880 lb
Other Attachments Available	Hakmet makes models for 8- to 50-ton carriers
Special Uses/Adaptations/Other Uses	Good for small wood thinning
Manufacturer's Comments Regarding Equipment Application	Track-feed system gives more positive grip, less damage to tree than a wheel machine, does bigger limbs, stiffer trees

Small Tree-Cutting/Processing Heads

Small Single-Grip Harvester Heads

Hahn HSG 140 Single-Grip Harvester

Make/Model	Hahn Single-Grip Harvester: HSG 140
Manufacturer/Source	Hahn Machinery, Inc.
Distributor	Contact Hahn Machinery, Inc.
Price	$50,750
Status	In production
Preferred Prime Mover	Large skid steers and mini excavators
Other Suitable Prime Movers	Mini excavators, 3- or 4-wheeled carriers
Attachment Mount (lift arms/boom/3-point hitch/other)	Boom, lift arms
Maximum Treatable Material Size	14 in
Cutting Mechanism	24-in barsaw
Overall Width	$38\frac{1}{2}$ in
Rotation Speed	Feed Rate: High speed (motors in series) 32 gpm; 11 fps; 3,300 psi; Low speed (motors in parallel) 32 gpm; 5 fps; 3,300 psi. Rotor motor: HSG 140 is 630cc
Power Source Required	Maximum system pressure is 3,300 psi
Weight	1,850 lb
Other Attachments Available	Hahn also makes the HSG 160, a single-grip harvester that cuts 16-in trees, big tree processors and merchandising machines
Special Uses/Adaptations/Other Uses	First thinning
Manufacturer's Comments Regarding Equipment Application	Electronic length-measuring system standard; diameter indicator optional

Small Tree-Cutting/Processing Heads

Small Single-Grip Harvester Head

Risley Slingshot Single-Grip Stroke Harvesters

Make/Model	Risley Slingshot Single-Grip Stroke Harvesters: S18R; S21R; S24B
Manufacturer/Source	Risley Equipment
Distributor	Contact Risley Equipment
Price	Contact dealer
Status	In production
Preferred Prime Mover	Excavators/carriers over 80 hp
Attachment Mount (lift arms/boom/3-point hitch/other)	Boom
Maximum Treatable Material Size	Maximum cut capacity: S18R: 18 in; S21R: 21 in; S24B: 24 in
Cutting Mechanism	18- or 21-in circular cutting disc or 24-in barsaw
Overall Width	Stroke length all models: 110 in
Rotation Speed	Limb power: 10,000 lb; limbing speed, 7 ft/second; side rotation, 220 degrees
Power Source Required	S18R: 60+ gpm/3,000 psi; S21R: 80+ gpm/3,000 psi; S24B: 40+ gpm/3,000 psi
Weight	S18R: 5,000 lb; S21R: 5,800 lb; S24B: 4,100 lb
Other Attachments Available	Data not supplied
Special Uses/Adaptations/Other Uses	Unique single-grip, stroke-type harvester that combines felling, accumulating, limbing, and processing into a single harvesting operation at the stump; can leave all limb debris in front of carrier as ground pressure cushion
Manufacturer's Comments Regarding Equipment Application	Effectively limbs difficult hard and soft woods

Slash-Piling Attachments

Concept—The primary benefit of a grapple is to reduce hook and unhook times when handling material. Grapples move with a clamshell-type action and are available with single-opposed teeth for skidding and log handling. The multitoothed grapples are useful for manipulating biomass (moving and stacking slash and brush).

Comments—Log grapples and log forks are not included in this report because they are common. A sample of other types of grapples, grapple saws, rakes, and brush-handling equipment commonly available is included.

For purposes of this report, we define grapple variations as follows:

- ❏ A grapple has one tooth on one side, one or more teeth on the other side.
- ❏ A grapple rake has two or more teeth on one side, and two or more teeth on the other side.
- ❏ A grapple brush rake is a grapple rake that is designed specifically for brush.

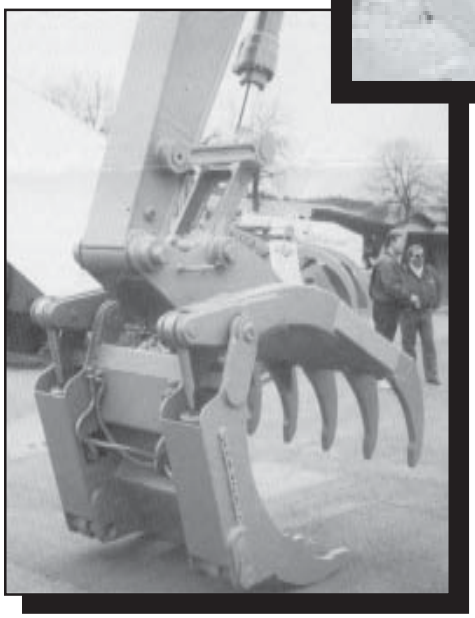
Common grapple configurations include those that are rigidly attached (pin on) and those that provide a link or knuckle connection for a less rigid stance (dangle). Some grapples have added rotational abilities (up to 360°) with continuous or partial rotation. They are attached to the end of the boom by a pin-on attachment, dangle attachment, or by a moveable linkage that allows the rotating body to articulate.

Specialized grapples for higher levels of production are also available. Common examples include:

- ❏ IMAC Design Group, Limited's Powerclam grapple.
- ❏ Jewell Manufacturing Incorporated's heavy-duty grapple rake, rotating clamshell grapple rake, and hydraulic logging grapple.
- ❏ Komatsu America International Co.'s rotary grab and HDR, TW, and TR series grapples.
- ❏ LaBounty's HDR series grapples, TR series grapples, and RGS-Series grapples.
- ❏ ACS Industries' heavy-duty grapples (pin-on, dangling, and rotating), MHG and MRG series (sold under Mann trade name) and their PXG series excavator/backhoe grapples (sold under PAC trade name).
- ❏ PSM Corporation's continuous rotating grapples and free-hanging clamshell.
- ❏ Rockland Manufacturing Co.'s grapples and grapple forks
- ❏ Shamrock Steel Fabricators, Inc.'s Piranha-Series grapples.

Clamshell grapple rake by Jewell Manufacturing.

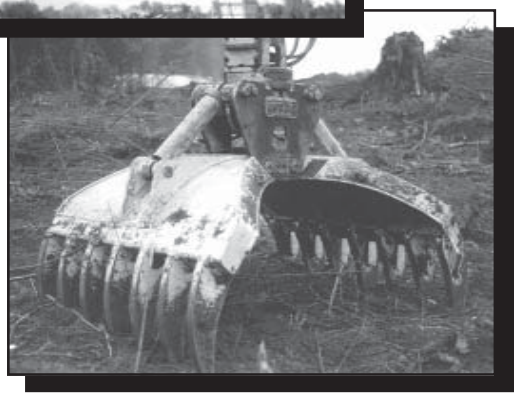
PSM Corporation's articulating grapple.



Piranha-Series grapple by Shamrock Steel Fabricators, Inc.

- ❏ Stan Leach Timber Inc.'s custom-made grapple brush-rake attachments.
- ❏ Young Corporation's 3 x 2 grapples, log grapples, and brush grapples; skidding grapples; and orange-peel grapples designed for large amounts of loose material.

One type of grapple brush-rake attachment made by Stan Leach Timber, Inc.



Brush grapple by Young Corp.

Some heavy-equipment manufacturers also offer buckets and thumbs that are useful for site preparation and slash/brush piling. The IMAC Design Group recommends combining half a bucket and half a grapple rake or thumb for added flexibility at the job site. Buckets are useful for constructing fireline in units for prescription fires. With a thumb opposed, the bucket could also be used to move debris, but it is not as efficient as a clamshell rake.

Other Manufacturers or Sources—Grapples, whether designed specifically for logging or for general contract work, are commonly available. Many major heavy-equipment manufacturers make grapples of one type or another for different types and sizes of machines.

Check your local dealers, or see the Equipment Today annual attachments guide, or the Timber West or Timber Harvesting annual buyer's guides for additional information on logging-related equipment (see Appendix B for details).

A variety of grapples are pictured. In addition to sources listed in the catalog, some other sources of log, skidding, pulp, and yarding grapples include:

- Amulet Manufacturing Co.
- Deere & Co. Construction Equipment
- Global Forest Equipment, Ltd.
- ImpleMax
- Kumatsu America International Co.
- Mack Manufacturing
- PSM Corp.
- Risley Equipment, Ltd.
- Rockland Manufacturing Co.
- Ross Corp.
- Shamrock Steel Fabricators, Inc.
- Stan Leach Timber, Inc.
- Young Corp.

Other unconfirmed sources of grapples listed in Timber West 1999/2000 Buyer's Guide & Directory include:

- Attachments International
- Barko Hydraulics, LLC

- Blount, Inc.
- Brigden Manufacturing, Inc.
- Cameco Industries
- Caterpillar, Inc.
- Crane Equipment Manufacturing
- CWS Industries, Inc.
- Danzco
- Eagle Log Loader/IMT, Inc.
- Esco Corp.
- Forestry Suppliers, Inc.
- Johnson Industries, Ltd.
- Lane Equipment Co.
- Multitek, Inc.
- New Dymax, Inc.
- Partek Forest, Inc.
- Pierce Pacific Manufacturing Co.
- Progress Industries, Inc.
- Ramey Sales & Service
- Risley Equipment, Ltd.
- Robotec , Inc.
- S&R Industries, Inc.
- Tigercat Industries, Inc.
- Two Harbors Machine
- Waratah Forestry Attachments
- Weldco-Beales, Inc.

In addition to those listed in the catalog, other sources for rakes of various kinds (skidder, dozer, bucket, and so forth) include:

- Amulet Manufacturing Co.
- Deere & Co. Construction Equipment
- Hensley Attachments
- Rockland Manufacturing Co.

Other unconfirmed sources of rakes listed in Timber West 1999/2000 Buyer's Guide & Directory include:

- Attachments International
- IMAC Design Group, Inc.
- Shamrock Steel Fabricators, Inc.
- Stan Leach Timber, Inc.

Thumb and claws for buckets are relatively common. In addition to those listed in this catalog, other sources of bucket thumbs and claws include:

- ACS Industries, Inc.
- Amulet Manufacturing Co.
- Mann Corp.
- Progressive Attachments Corp.
- Rockland Manufacturing Co.

Logging forks are very common. In addition to those listed in the catalog, some other sources of logging forks include:

- IMAC Design Group, Inc.
- Rockland Manufacturing Co.
- Young Corp.

Other unconfirmed sources of logging forks listed in the Timber West 1999/2000 Buyer's Guide & Directory include:

- Attachments International
- Medford Fabrication
- Multitek, Inc.
- PSM Corp.
- Shamrock Steel Fabricators, Inc.
- Weldco-Beales, Inc.
- Young Corp.

Slash-Piling Attachments

General Pin-On Grapple Rake

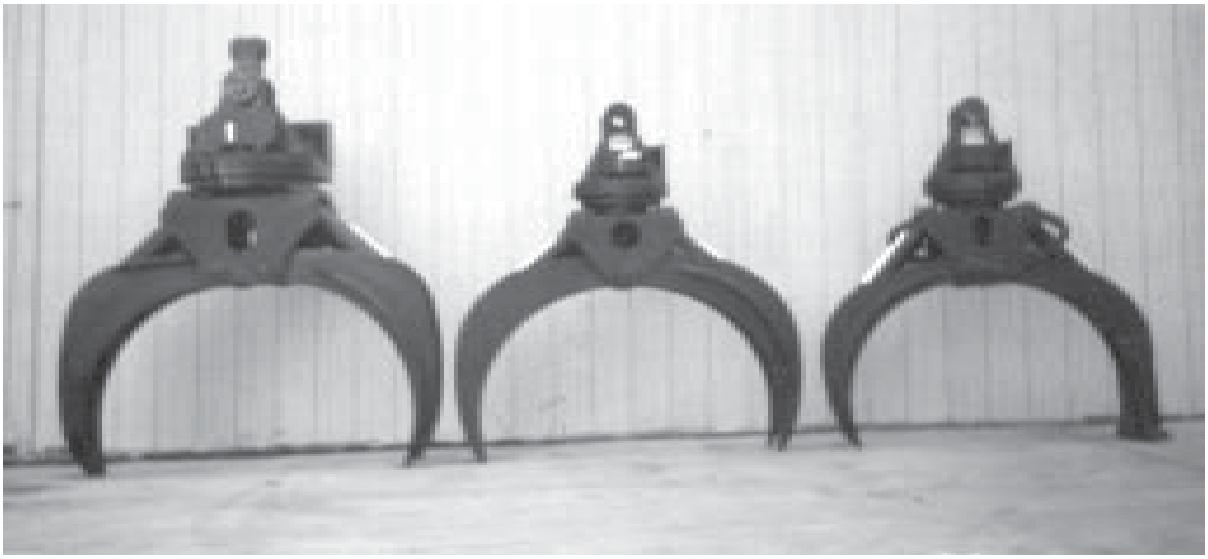
Mann MHG-Series Heavy-Duty Grapples

Make/Model	Mann MHG Series Heavy-Duty Grapples: MHG 5; MHG 10; MHG 15; MHG 20; MHG 25; MHG 30; MHG 35; MHG 40; MHG 45
Manufacturer/Source	ACS Industries, Inc.
Distributor	Contact ACS Industries, Inc.
Price	Contact ACS Industries, Inc.
Status	In production
Preferred Prime Mover	Excavators: MHG 5: to 20,000 lb; MHG 10 : 21 to 28,000 lb; MHG 15: 29 to 36,000 lb; MHG 20: 37 to 48,000 lb; MHG 25: 49 to 60,000 lb; MHG 30: 61 to 75,000 lb; MHG 35: 76 to 90,000 lb; MHG 40: 91 to 125,000 lb; MHG 45: 126 to 165,000 lb
Attachment Mount (lift arms/boom/3-point hitch/other)	Boom
Height	Data not supplied
Length	Tooth length: MHG 5: 11 in; MHG 10: 13 in; MHG 15: 16 in; MHG 20: 18 in; MHG 25: 19 in; MHG 30: 20 in; MHG 35: 22 in; MHG 40: 24 in; MHG 45: 24 in
Width	MHG 5: 25 in; MHG 10 : 36 in; MHG 15: 40 in; MHG 20: 44 in; MHG 25: 50 in; MHG 30: 54 in; MHG 35: 58 in; MHG 40: 58 in; MHG 45: 62 in
Weight	(Approximate): MHG 5 is 600 lb; MHG 10 is 1,000 lb; MHG 15 is 2,000 lb; MHG 20 is 2,500 lb; MHG 25 is 3,000 lb; MHG 30 is 3,700 lb; MHG 35 is 4,600 lb; MHG 40 is 5,500 lb; MHG 45 is 8,500 lb
Opening Specifications	MHG 5 is 62 in; MHG 10 is 75 in; MHG 15 is 94 in; MHG 20 is 106 in; MHG 25 is 113 in; MHG 30 is 122 in; MHG 35 is 132 in; MHG 40 is 141 in; MHG 45 is 150 in
Rake Tooth Specifications	Number of teeth top/bottom: MHG 5, MHG 10, MHG 15, MHG 20: 4/3; MHG 25, MHG 30, MHG 35, MHG 40, MHG 45: 5/4
Tooth Spacing, (CL to CL)	MHG 5: 8 in; MHG 10: 12 in; MHG 15: 13 in; MHG 20: 14 in; MHG 25: 12 in; MHG 30: 13 in; MHG 35: 14 in; MHG 40: 14 in; MHG 45: 15 in
Power Source Needed	Host excavator
Other Attachments Available	ACS Industries makes a large variety of brush-handling equipment
Manufacturer's Comments Regarding Equipment Application	Longer, stronger, open tooth design, with tooth length approximately 1/3 of grapple side
MTDC Comment	There are many more pin-on-type grapples listed in the Slash Piling Attachments introduction

Slash-Piling Attachments

General Dangle Grapple

Rotobec Grapple: Model 4642-9150



Make/Model	Rotobec Grapple: Model 4642-9150 (over 60 different models available)
Manufacturer/Source	Rotobec Western Sales
Distributor	Most dealers
Price	Contact dealer
Status	In production
Preferred Prime Mover	All with appropriate weight/power specifications
Attachment Mount (lift arms/boom/3-point hitch/other)	Boom
Height	Open: $54\frac{1}{2}$ in; closed: 62 in (measurements include rotation)
Length	Data not supplied
Width	$14\frac{3}{4}$ in
Weight	820 lb
Opening Specifications	Opens 42 in; closes $4\frac{1}{2}$ in
Rake Tooth Specifications	Grapple tines: bypass type
Power Source Needed	Host excavator
Other Attachments	Rotobec makes the following grapples: continuous rotation (free-swinging and positioned), pulpwood, combination log/pulpwood, log sorting/loading, heavy-duty logging, forwarder, Butt 'n' Top, multipurpose (butting times) and multipurpose brush (bypass); Rotobec also makes clamshell buckets, hydraulic log loaders, harvesting heads, forwarder, and heal packages for excavators
Special Uses/Adaptations/Other Uses	Data not supplied
Manufacturer's Comments Regarding Equipment Application	Any number of log or multipurpose grapples will work depending upon the application and host machine
MTDC Comment	There are many more dangle-type grapples listed in the Slash-Piling Attachments introduction

Slash-Piling Attachments

Rotary Grapple Saw (Special Variant)

Hultdins Grapples With Supersaw 550S

Make/Model	Hultdins Grapples TL430 and TL480 with Supersaw 550S
Manufacturer/Source	Hultdins, Inc.
Price	Contact dealer
Status	In production
Preferred Prime Mover	12- to 30-ton machines: forwarders, excavators, loaders, knuckleboom loaders, shovel loaders
Attachment Mount (lift arms/boom/3-point hitch/other)	Boom
Height	From tip of open grapple arm to top of rotator: TL430/550S: 55.7 in; TL480/550S: 60.4 in
Length	From outer arm to outer arm: TL430/550S: 53.8 in; TL480/550S: 60 in;
Width	TL430/550s: 17.5 in; TL480/550s: 20 in
Weight	TL430/550S: 1,450 lb; TL480/550S: 1,700 lb
Opening Specifications	Maximum opening: TL430/550S: 43 in; TL480/550s: 48 in Minimum gripping diameter: TL430/550S: 4.22 in; TL480/550S: 5 in
Cutting Mechanism	39-in saw bar; maximum saw-cutting diameter: $27\frac{1}{2}$ in
Lifting Capacity	56,200-lb load capacity
Power Source Needed	32 to 58 gpm; 2,300 to 4,500 psi; recommended 48 gpm; 3,600 psi
Other Attachments	Also available without saw as “Super Grip” grapple TL Series (for tree-length work) and SG Series (for shortwood)
Special Uses/Adaptations/Other Uses	Continuous rotation
Manufacturer’s Comments Regarding Equipment Application	Blowdown, crosscutting, trimming, limbing, shovel logging, topping, merchandising

Slash-Piling Attachments

Rotary Bucket Saw (Special Variant)

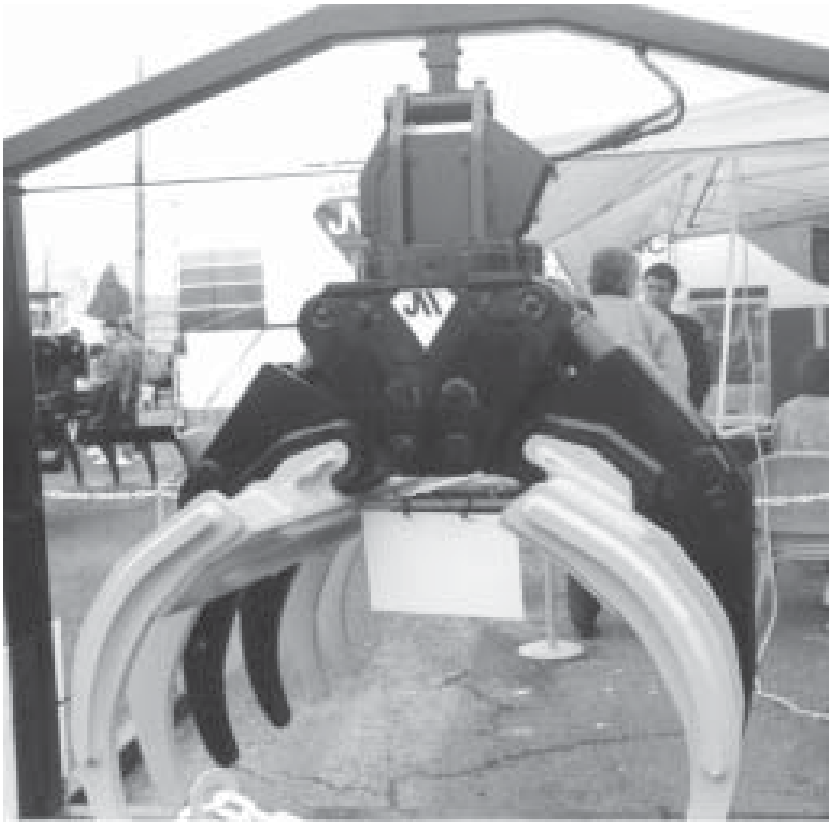
IMAC Combination Blowdown Saw and Powerclam Bucket or Grapple

Make/Model	IMAC Combination Blowdown Saw and Powerclam Bucket or Grapple
Manufacturer/Source	IMAC Design Group, Ltd.
Distributor	S&R Industries, Inc.
Price	Contact manufacturer for price: depends on application and prime mover
Status	In production
Preferred Prime Mover	25,000- to 170,000-lb excavators with grapple jaws
Attachment Mount (lift arms/boom/3-point hitch/other)	Boom
Height	Varies by host excavator requirements
Length	36-in bar on saw
Width	Varies by host excavator requirements
Weight	Saw assembly, approximately 245 lb
Cutting Mechanism	36-in bar on saw
Lifting Capacity	Varies by host excavator requirements
Power Source Needed	25 to 50 gpm; 2,500 to 4,000 psi; also requires three extra spools or valve-in-head option
Other Attachments	IMAC suggests mating half a Powerclam bucket with half a Powerclam grapple rake for added versatility; saw attachment available for all IMAC Powerclam Buckets; IMAC also makes Powerclam buckets, brush rakes, and grapples for loading/sorting and shortwood/pulpwood
Special Uses/Adaptations/Other Uses	360½ rotation, can cut off rootball in any position; bucket can be used to limb, bunch, pile, sort, remove stumps, load, forward, scarify, rehabilitate sites, build or deactivate roads, ditch, place culverts, make waterbars, log rights-of-way
Manufacturer's Comments Regarding Equipment Application	Low profile gives increased breakout force and more lift height; lighter weight yields more payload; versatile tool

Slash-Piling Attachments

General Add-On Brush-Rake Arms

Jewell Quick-Change Brush-Rake Arms



Make/Model	Jewell Quick-Change Brush-Rake Arms for All Sizes, Makes, and Models of Hydraulic Logging Grapples
Manufacturer/Source	Jewell Manufacturing, Inc.
Distributor	Equipment dealers
Price	Contact manufacturer
Status	In production
Attachment Mount (lift arms/boom/3-point hitch/other)	Grapple
Height	Designed to fit standard grapples
Length	Designed to fit standard grapples
Width	Designed to fit standard grapples
Weight	Designed to fit standard grapples
Rake Tooth Specifications	Data not supplied
Lifting Capacity	Designed to fit standard grapples
Power Source Needed	Relies on grapple's hydraulics
Other Attachments	Jewell makes a full line of attachments for material handling
Special Uses/Adaptations/Other Uses	Designed for rugged applications
Manufacturer's Comments Regarding Equipment Application	Arms can be changed in minutes using mounting lugs

Slash-Piling Attachments

General Pin-On Skidder Rake

Mann Pin-On Skidder Rakes

Make/Model	Mann Pin-On Skidder Rakes: MSR-1; MSR-2; MSR-3; and MSR-4
Manufacturer/Source	ACS Industries, Inc.
Distributor	Contact ACS Industries, Inc.
Price	Contact ACS Industries, Inc.
Status	In production
Preferred Prime Mover	MSR-1: skidder to 9,000 lb; MSR-2: 10- to 15,000-lb skidder; MSR-3: 16- to 25,000-lb skidder; MSR-4: 26- to 40,000-lb skidder
Attachment Mount (lift arms/boom/3-point hitch/other)	Blade mount
Height	Blade height plus tooth penetration
Length	Data not supplied
Width	Standard (six teeth) rake is 6 in less than tire width; wide rake (seven teeth) is to outside of cutting blade; extrawide rake is to outside of tires
Weight	Approximate: MSR-1: 500 lb; MSR-2: 750 lb; MSR-3: 1,000 lb; MSR-4: 1,500 lb
Rake Tooth Specifications	Distance between teeth: MSR-1: 15 in; MSR-2: $15\frac{1}{2}$ in; MSR-3: 16 in; MSR-4: $16\frac{1}{2}$ in Tooth penetration: MSR-1, MSR-2: $13\frac{1}{2}$ in; MSR-3, MSR-4: $14\frac{1}{2}$ in Tooth thickness (outside/inside): MSR-1: $1\frac{1}{2}$ to $1\frac{1}{4}$ in; MSR-2: $1\frac{1}{2}$ in; MSR-3: $1\frac{3}{4}$ to $1\frac{1}{2}$ in; MSR-4: 2 to $1\frac{3}{4}$ in
Lifting Capacity	Depends upon host excavator
Power Source Needed	Host machine
Other Attachments	ACS Industries makes a full line of attachments
Special Uses/Adaptations/Other Uses	Log bunks designed into outer arms
Manufacturer's Comments Regarding Equipment Application	Data not supplied

Slash-Piling Attachments

General Loader Bucket Rake

PAC PBR Bucket Rake

Make/Model	PAC PBR Bucket Rake: different sizes to fit on buckets up to 4k, 4-7k, 7-12k, 12-16k, 16-22k
Manufacturer/Source	ACS Industries, Inc.
Distributor	Contact ACS Industries, Inc.
Price	Contact ACS Industries, Inc.
Status	In production
Preferred Prime Mover	Front-end loader, backhoe, skid steer
Attachment Mount (lift arms/boom/3-point hitch/other)	Bucket
Height	Depends on bucket size
Length	Depends on bucket size
Width	Depends on bucket size
Weight	Depends on bucket size
Rake Tooth Specifications	Data not supplied
Lifting Capacity	Depends on bucket size
Power Source Needed	Mounted on bucket
Other Attachments	ACS Industries makes other rakes, thumbs, and similar attachments
Special Uses/Adaptations/Other Uses	Converts bucket into a rake; loader bucket becomes a multitask attachment
Manufacturer's Comments Regarding Equipment Application	Data not supplied

Slash-Piling Attachments

General Loader Grapple Rake

Mann MLG-Series Loader Grapple Rakes

Make/Model	Mann MLG-Series Loader Grapple Rakes: MLG-0; MLG-1; MLG-2; MLG-3
Manufacturer/Source	ACS Industries, Inc.
Distributor	Contact ACS Industries, Inc.
Price	Contact ACS Industries, Inc.
Status	In production
Preferred Prime Mover	Model MLG-0: wheel loaders to 18,000 lb; MLG-1: wheel loaders 19,000 to 30,000 lb; MLG-2: wheel loaders 31,000 to 43,000 lb; MLG-3 data not supplied
Attachment Mount (lift arms/boom/3-point hitch/other)	Blade mount
Height	MLG-0: $60\frac{3}{4}$ in; MLG-1: 65 in; MLG-2: $86\frac{1}{2}$ in; MLG-3: $93\frac{1}{4}$ in
Length	Data not supplied
Width	MLG-0: $77\frac{3}{4}$ in; MLG-1: 94 in; MLG-2: 111 in; MLG-3: 120 in
Weight	MLG-0: 2,189 lb; MLG-1: 2,955 lb; MLG-2: 5,707 lb; MLG-3: 8,454 lb
Opening Specifications	Data not supplied
Rake Tooth Specifications	Tooth length: MLG-0: 18 in; MLG-1: 21 in; MLG-2: 26 in; MLG-3: 31 in Tooth separation: MLG-0, MLG-1: $14\frac{1}{2}$ in; MLG-2, MLG-3: $14\frac{1}{4}$ in Tooth thickness outside/inside: MLG-0: $1\frac{1}{4}$ to 1 in; MLG-1: 1 to $1\frac{1}{4}$ in; MLG-2: $1\frac{3}{4}$ to $1\frac{1}{2}$ in; MLG-3: $2\frac{1}{4}$ to 2 in
Lifting Capacity	Depends upon host
Power Source Needed	Data not supplied
Other Attachments	ACS Industries makes a full line of attachments
Special Uses/Adaptations/Other Uses	Piling grapple for on-site pickup and cleanup; sort, salvage, sift and pick up wood waste, stumps and demolition debris
Manufacturer's Comments Regarding Equipment Application	Loader blade becomes a multitask attachment

Skid-Steer Attachments

Concept—Skid steers are common machines, but specialized attachments for them can be difficult to locate. We have included a representative selection of brush-cutting and handling equipment useful for this project. Log grapples, log forks, and similar equipment for skid steers are quite common and beyond the scope of this report. We have generally listed a representative model of each.

Comments—Although rubber-tired vehicles often have an advantage of greater travel speed and more efficient skidding, they have the disadvantage of higher ground pressures and less traction than their tracked counterparts. Over-the-tire tracks were included as a way to increase wheeled-machine traction on steeper slopes and uneven terrain, and to redistribute weight. The Small Tree-Cutting/Processing Heads section contains many tree-harvesting heads that would work well with skid steers.

Other Manufacturers or Sources—Skid-steer attachments, in general, are commonly made by the manufacturers of skid steers. Contact your local skid-steer dealer. ASV has information on companies that make skid-steer attachments that fit on the ASV Posi-Track. Hydra-Mac also makes skid-steer loader attachments.

In addition to sources listed in the catalog, other sources for over-the-tire tracks include:

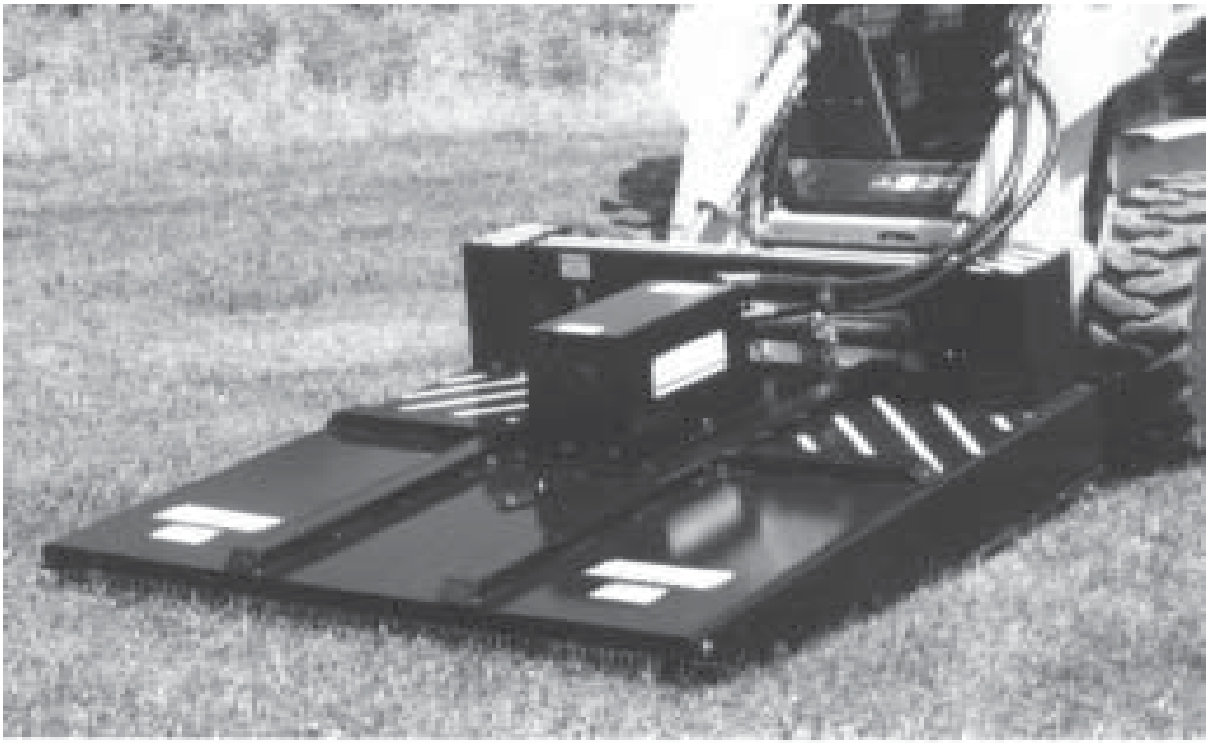
- Grouser Products
- Hultdins, Inc.
- New Holland
- Omnitrack, LLC (rubber over-the-tire tracks).

Also see the Equipment Today annual attachments guide, or the Timber West or Timber Harvesting annual buyer's guides for additional information on logging-related equipment (see Appendix B for details).

Skid-Steer Attachments

Brush-Cutters, Vertical Shaft

Ammbusher Rotary Brush-Cutters

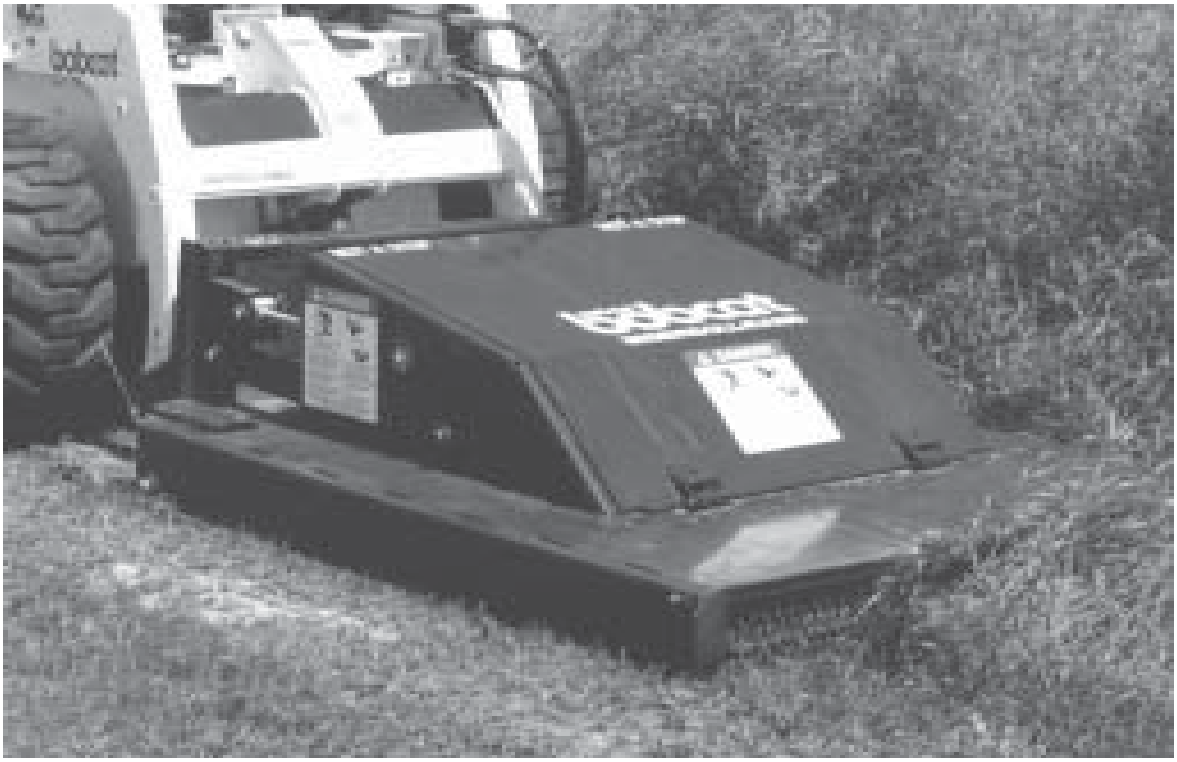


Make/Model	Ammbusher Rotary Brush-Cutters: AM480; AM601; and AM720
Manufacturer/Source	Ammbusher, Inc.
Distributor	Contact manufacturer for dealer information
Price	Contact dealer
Status	In production
Preferred Prime Mover	Skid loaders
Other Suitable Prime Movers	Can be used by skid steers with 42 gpm flow
Attachment Mount (lift arms/boom/3-point hitch/other)	Lift arms
Maximum Treatable Material Size	Up to 3 in
Cutting Mechanism	Rotary cutter: AM480: 2 blades; AM601: 2 or 4 blades; AM720: 2 or 4 blades
Cutting Width	AM480: 48 in; AM601: 60 in; AM720: 72 in
Overall Width	Not much wider than cutting width
Weight	AM480: 800 lb; AM601: 940 lb; AM720: 1,140 lb
Shaft (horizontal/vertical)	Vertical
Rotation Speed	Approximately 850 rpm
Power Source Required	AM480: 11 to 25 gpm; AM601: 13 to 25 gpm; AM720: 15 to 25 gpm
Special Uses/Adaptations/Other Uses	Bidirectional cutting
Manufacturer's Comments Regarding Equipment Application	Maneuverability; mulches; operator can see what is being cut

Skid-Steer Attachments

Brush-Cutters, Vertical Shaft

Brushcat Rotary Cutter



Make/Model	Brushcat Rotary Cutter
Manufacturer/Source	Bobcat Co.
Distributor	Check website for dealer information
Price	$4,900
Status	In production
Preferred Prime Mover	700- and 800-series Bobcat loaders
Other Suitable Prime Movers	Data not supplied
Attachment Mount (lift arms/boom/3-point hitch/other)	Lift arms
Maximum Treatable Material Size	3 in
Cutting Mechanism	Two blades on rotating disc
Cutting Width	60 in
Overall Width	62 in
Weight	1,350 lb
Shaft (horizontal/vertical)	Vertical
Rotation Speed	11,190 fpm at 13 gpm; 24,100 fpm at 28 gpm
Power Source Required	Minimum 13 gpm; 2,500 to 3,000 psi; best flow range: 1,500 to 2,500 psi
Other Attachments	Bobcat makes numerous other dedicated attachments that may address forestry needs
Special Uses/Adaptations/Other Uses	Bidirectional cutter rotation possible; can be operated traveling forward and reverse
Manufacturer's Comments Regarding Equipment Application	Even cutting height; ability for deck to float avoid scalping ground

Skid-Steer Attachments

Brush-Cutters, Vertical Shaft

Brown 5601-A Heavy-Duty Hydraulic Mower

Make/Model	Brown 5601-A Heavy-Duty Hydraulic Mower
Manufacturer/Source	Brown Manufacturing Corp.
Distributor	Brown Manufacturing Corp.
Price	$5,600
Status	In production
Preferred Prime Mover	ASV Posi-Track or LMC Trackmaster
Other Suitable Prime Movers	Data not supplied
Attachment Mount (lift arms/boom/3-point hitch/other)	Lift arms
Maximum Treatable Material Size	3 to 4 in diameter
Cutting Mechanism	Two $^{1}I_{i2}$ x 6-in ultra-KOR reversible (free-swinging blades)
Cutting Width	66 in
Overall Width	76 in
Weight	1,225 lb
Shaft (horizontal/vertical)	Vertical
Rotation Speed	900 rpm
Power Source Required	2,500 psi, 30 gpm
Other Attachments	Data not supplied
Special Uses/Adaptations/Other Uses	Data not supplied
Manufacturer's Comments Regarding Equipment Application	Data not supplied

Skid-Steer Attachments

Brush-Cutters, Vertical Shaft

Davco BC 705 and 604 Brush-Cutters

Make/Model	Davco BC 705 and BC 604 Brush-Cutters
Manufacturer/Source	Davco Manufacturing, Ltd.
Distributor	Davco Manufacturing, Ltd., or Posi-Track dealers
Price	Contact dealer
Status	In production
Preferred Prime Mover	Posi-Track HD4500 or Posi-Track HD4520 or 4810
Other Suitable Prime Movers	Suitable for small loader-type carrier with approval
Attachment Mount (lift arms/boom/3-point hitch/other)	Quick attach
Maximum Treatable Material Size	4 in
Cutting Mechanism	4 replaceable, free-swinging knives
Cutting Width	BC 705: 70 in; BC 604: 60 in
Overall Width	BC 705: 74 in; BC 604: 64 in
Weight	BC 705: 1,500 lb; BC 604: 1,300 lb
Shaft (horizontal/vertical)	Twin disc, vertical
Rotation Speed	700 rpm
Power Source Required	2,750 psi; 25 to 30 gpm
Other Attachments	Davco also makes felling and processing heads
Special Uses/Adaptations/Other Uses	Brushing along roads, ditches and regrowth
Manufacturer's Comments Regarding Equipment Application	All Davco attachments are user friendly with a short operator learning period

Skid-Steer Attachments

Brush Shredder, Horizontal Shaft

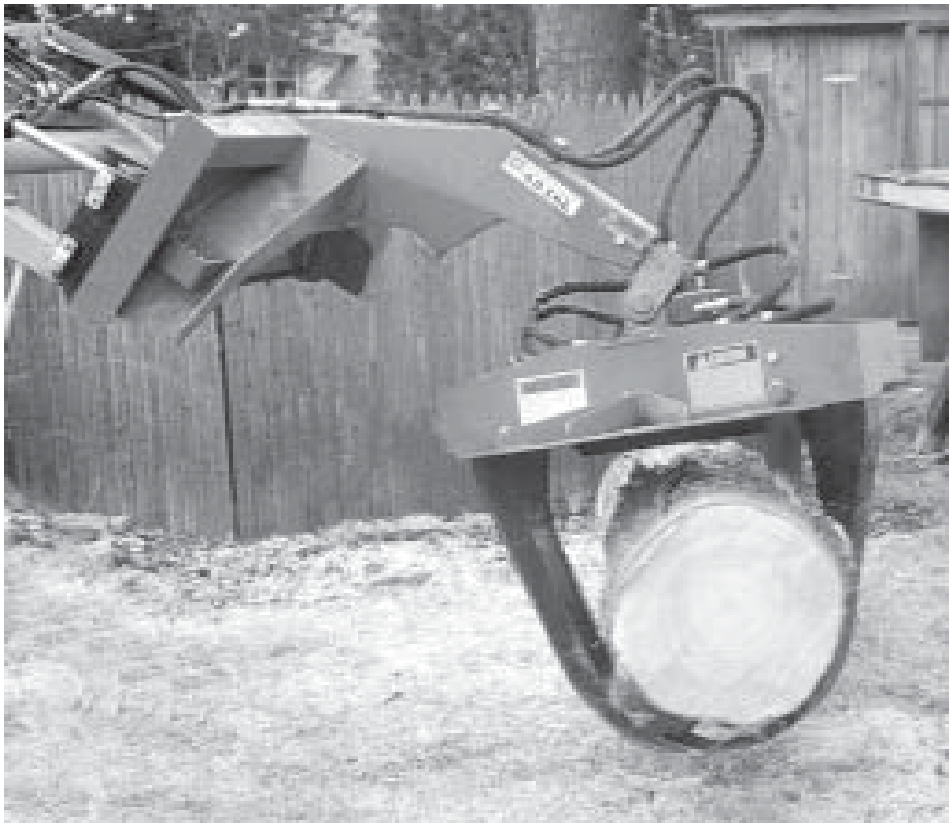
Loftness BMO-Series Orchard/Brush Shredders

Make/Model	Loftness BMO-Series Orchard/Brush Shredders: 42 BMO; 42 BMOH; 60 BMO; 60 BMOH; 72 BMO; 72 BMOH; 84 BMO; 84 BMOH; 96 BMO (All BMO models come in either PTO driven or hydraulic-driven (BMOH) except 96 in, which is only available as PTO-driven)
Manufacturer/Source	Loftness Specialized Farm Equipment, Inc.
Distributor	Contact manufacturer for dealer information
Price	$4,999 to $6,599
Status	In production
Preferred Prime Mover	Skid steers with 25 to 40 gpm; track vehicles or tractors with 3-point hitch
Other Suitable Prime Movers	Data not supplied
Attachment Mount (lift arms/boom/3-point hitch/other)	Category I or II free link or quick hitch, or 3-point hitch
Maximum Treatable Material Size (in/cm)	$1\frac{1}{2}$-in continuous; 3-in-diameter maximum
Cutting Mechanism	3-lb forged knives on rotor: 42 BMO, 42 BMOH: 16 knives; BMO, 60 BMOH: 20 knives; 72 BMO, 72 BMOH: 20 knives; 84 BMO, 84 BMOH: 24 knives; 96 BMO: 28 knives
Cutting Width (in/cm)	42 BMO, 42 BMHO: 42 in; 60 BMO, 60 BMHO: 60 in; 72 BMO, 72 BMHO: 72 in; 84 BMO, 84 BMHO: 84 in; 96 BMO: 96 in
Overall Width (in/cm)	Approximately 16 in wider than cutting width
Weight (lb/kg)	42 BMO = 1,250 lb, 42 BMOH = 1,200 lb; 60 BMO = 1,450 lb, 60 BMOH = 1,400; 72 BMO = 1,690 lb, 72 BMOH = 1,650 lb; 84 BMO = 1,740 lb, 84 BMOH = 1,650 lb; 96 BMO = 1,790 lb
Shaft (horizontal/vertical)	Horizontal
Rotation Speed (rpm)	2,100 rpm
Power Source Required	42 BMO: 35 hp, 42 BMOH: 24 to 32 gpm; 60 BMO: 35 hp, 60 BMOH: 24 to 37 gpm; 72 BMO: 40 hp, 72 BMOH: 24 to 42 gpm; 84 BMO: 50 hp, 84 BMOH: 28 to 42 gpm; 96 BMO: 60 hp
Other Attachments	Rake teeth, swivel wheels in lieu of full-length gauge roller
Special Uses/Adaptations/Other Uses	Data not supplied
Manufacturer's Comments Regarding Equipment Application	Data not supplied
MTDC Comment	Seppi makes a skid-steer-sized drum shredder that should be considered, too. Contact Brush Technology Division, Carlson Tractor Co.

Skid-Steer Attachments

General Skid-Steer Grapple

ImpleMax Grapples



Make/Model	ImpleMax: 4836L Pro Grapple; 4836Lw Pro Grapple/Winch
Manufacturer/Source	ImpleMax
Distributor	ImpleMax
Price	4836L: $5,870; 4836Lw: $7,643 (f.o.b. Bozeman, MT)
Status	In production
Preferred Prime Mover	Any skid-steer loader with a quick coupler that has lift capacity of greater than 1,500 lb
Other Suitable Prime Movers	Also fits on tractor loader arms with modified coupler
Attachment Mount (lift arms/boom/3-point hitch/other)	Loader arms
Overall Width	Length: 53 in; width: 48 in; Maximum opening: 48 in
Weight	4836L: 640 lb; 4836Lw: 800 lb
Power Source Required	Maximum rating: 3,000 psi; 4836Lw: 10 to 21 gpm; 4836L: unlimited gpm
Other Attachments	ImpleMax also makes tractor models (with and without winches) that attach to tractors with a Category I or II 3-point hitch
Special Uses/Adaptations/Other Uses	4836Lw comes with a 9,000-lb hydraulic winch built into boom, 8-in drum, max. 148 ft of $^{3}I_{8}$-in cable with reel speed of 72 fpm at 15 gpm
Manufacturer's Comments Regarding Equipment Application	Works in narrow spaces, grabs from difficult angles, excellent visibility, low capital investment, reduces manhours

Skid-Steer Attachments

General Skid-Steer Stacking Forks

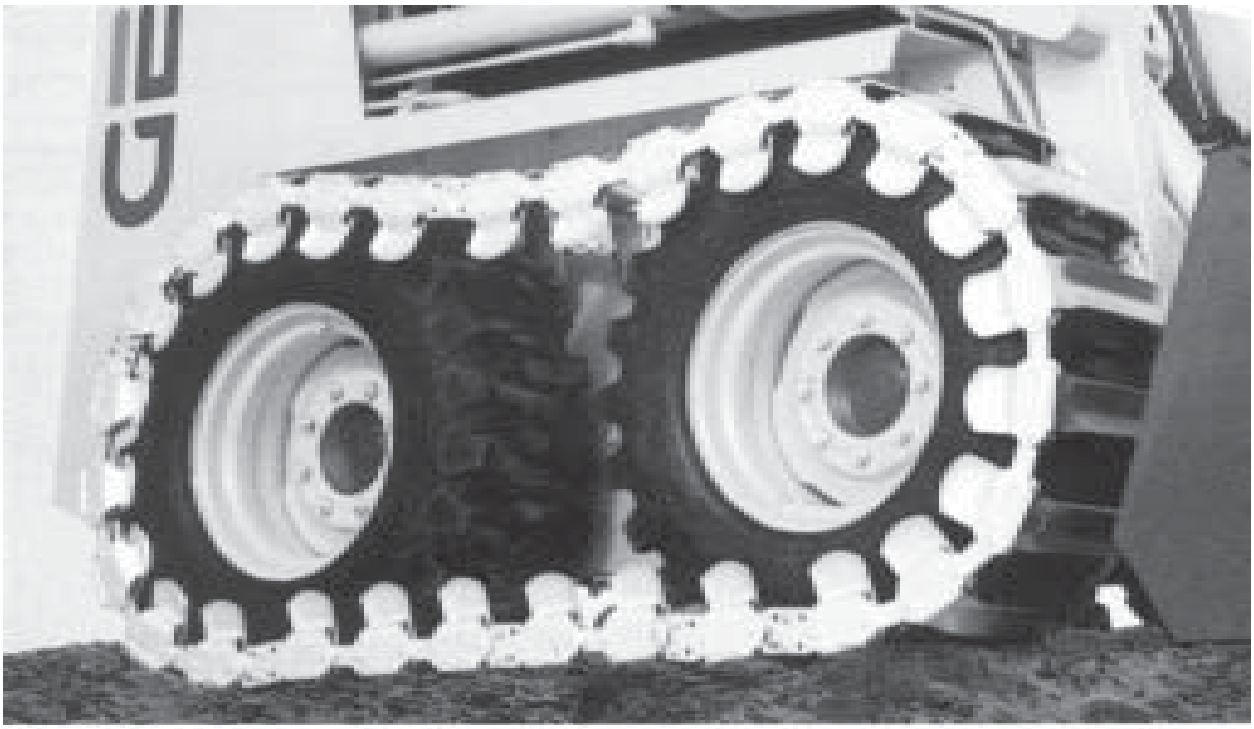
Dymax Heavy-Duty Stacking Fork

Make/Model	Dymax Heavy-Duty Stacking Fork
Manufacturer/Source	New Dymax, Inc.
Distributor	Bobcat, ASV Posi-Track, New Holland, Gehl, Case dealers
Price	Heavy duty: $3,460
Status	In production
Preferred Prime Mover	Skid steers
Other Suitable Prime Movers	Small wheel loaders and telescopic handlers
Attachment Mount (lift arms/boom/3-point hitch/other)	Lift arms
Maximum Treatable Material Size	Rake has five tines, 39 in usable length; heavy-duty model is ideal for thicker brush, limbs and small trees
Overall Width	66 in
Weight	960 lb
Power Source Required	Additional hydraulics may be required
Other Attachments	Standard model is also available
Special Uses/Adaptations/Other Uses	Used for brush/slash piling
Manufacturer's Comments Regarding Equipment Application	Data not supplied

Skid-Steer Attachments

General Over-the-Tire Skid-Steer Track

Loegering Over-the-Tire Steel Track: Trail Blazer



Make/Model	Loegering Over-the-Tire Steel Track: Trail Blazer
Manufacturer/Source	Loegering Manufacturing, Inc.
Distributor	Contact Loegering
Price	Contact distributor for current models and prices
Status	In production
Preferred Prime Mover	Trail Blazer for skid steers up to 120 hp
Other Suitable Prime Movers	Designs for Bobcat, Case, Caterpillar, John Deere, Gehl, Mustang, New Holland, Thomas, and other skid-steer loaders
Attachment Mount (lift arms/boom/3-point hitch/other)	Tires
Overall Width	Trail Blazers: 4-in-wide pads
Weight	Depends upon series
Other Attachments	The Eliminator rake; Mud Bucket; over-the-tire steel tracks available for other types of equipment
Special Uses/Adaptations/Other Uses	Traction and flotation
Manufacturer's Comments Regarding Equipment Application	More traction, most pad-to-ground contact for greater floatation; machine friendly; easier skid steering
MTDC Comment	Other companies to check besides the original equipment manufacturer would be Grouser and Omnitrack—some offer nonmetallic tracks.

Equipment Suitable for Steeper Slopes

Some specialized machines are designed for slopes up to 100% and even steeper. When machines with no self-leveling characteristics are used on steep slopes, the operator sits at a slanted attitude. The slanted attachment, depending on its rotational or swing capabilities, may or may not be in the correct attitude for optimum cutting. Slope specifications for machines covered in this section are included in the technical specifications for each piece of equipment.

In Site Preparation Equipment for Steep Slopes (9324-2804-MTDC), Dick Karsky notes that:

"On steep slopes where equipment cannot operate, preparing the site by hand with hand tools is always an option. The option may be the only one available on some sites, but it is very expensive and time consuming."

Self-Leveling Cab Feller-Bunchers

Concept—The cab-tilting ability of self-leveling cab feller-bunchers allows the cutting head to be kept at an efficient cutting angle for the material when the feller-bunchers are working on steep slopes. Self-leveling cab feller-bunchers are also more comfortable and efficient for the operator. The power of the machines allows them to run many heads, including brush heads designed for excavators.

Comments—The feller-buncher's reach using its turret and boom means fewer passes across the ground, resulting in less soil disturbance. The tilt function keeps the machine and operator more stable on steep slopes.

If non-leveling cab feller-bunchers are already onsite from a commercial harvest operation, it may be efficient to use them. They have plenty of power to run implements and are able to work on moderately steep slopes. The larger feller-bunchers would not be appropriate for a fuel reduction job with a Slashbuster-type head because of the added cost of the machine and possible increased residual stand damage in tight quarters (non-zero tail swing).

On the other hand, tracked, non-self-leveling cab feller-bunchers with zero tail swing would also be appropriate for thinning. Although not covered in this catalog, the Valmet T-500 (Partek Forest, Inc.) may be a useful piece of equipment for some applications. While it is technically not a feller-buncher, it is similar to a Timbco feller-buncher with a squirt boom and processor head.

Allied Systems Co.'s ATH 28 Tree Harvester could also be considered a self-leveling feller-buncher. See Extreme Machines for technical data.

Other Manufacturers or Sources—Self-leveling cab feller-bunchers are much less common than their non-tilting counterparts. Check your local feller-buncher dealers and see the Canadian Forest Industries annual steep slope issue, or the Timber West or Timber Harvesting annual buyer's guides for additional information on logging-related equipment (see Appendix B for details).

Other unconfirmed sources of tilting cab feller-bunchers listed in Timber West 1999/2000 Buyer's Guide & Directory include:

- Madill, Inc.
- Risley Equipment, Ltd.
- Tigercat Industries, Inc.

Self-Leveling Cab Feller-Bunchers

Self-Leveling Track Boom Feller-Buncher

Prentice Track Boom Feller-Bunchers

Prentice Track Boom 730A (620 shown at left).

Make/Model	Prentice Track Boom Feller-Bunchers: 620; 720; 630A; 730A
Manufacturer/Source	Blount, Inc.
Distributor	Contact manufacturer for dealer information
Price	Contact dealer
Status	In production
Prime Mover	620, 720, 630A, 730A Track Boom Feller-Bunchers are prime movers
Prime Mover Engine Power	620: 215/250/260 hp; 720: 250/260 hp; 630A and 730A: 260 hp
Gas/Diesel	Diesel
Transmission	Hydrostatic
Max. Travel Speed	620 and 720: Low, 1.25 mph; High, 3.25 mph. 630A: Low, 1.14 mph; High, 2.91 mph. 730A: Low, 1.11 mph; High, 2.84 mph
Width	620: 119 in; 720: 125.5 in; 630A: 136 in; 730A: 139 in
Length	620: 181.73 in; 720: 184.59 in (without heads); 630A: 181 in; 730A: 184 in
Height	620: 144.66 in; 720: 148.27 in; 630A: 160 in; 730A: 161 in
Weight	620: 58,100 lb, 720: 67,000 lb; 630A: 70,000 lb; 730A: 76,000 lb
Ground Clearance	620: 28.03 in; 720: 31.6 in; 630A: 28 in; 730A: 32 in
Turning Radius	Data not supplied
Tail Swing	620, 720: 0; 630A, 730A: back, 25 in; side, 45 in; tracks, 24 in
Slope Limitations and Specified Conditions	Turntable level: 620, 720 to 51%; 630A, 730A to 27%
Mount (lift arms/booms/3-point/other)	Boom
Power Source	620, 720 CLT harvester plumbing is 35 to 125 gpm, up to 4,000 psi; 630A, 730A power-flow hydraulics is 1 x 32 gpm; 3,500 psi
Boom Type and Reach	620, 720: 23 ft; 630A, 730A: 23 ft 6 in
Track: Type, Width (options); and Gpsi	(Steel) 620: 5.19 to 7.70 psi with tracks 24 to 36 in; 720: 7.05 to 7.56 psi with tracks 24 to 36 in; 630A, 730A: 24- to 30-in pad options with gpsi from 10 to 6.74 psi depending upon model and configuration
Attachments or Integral Heads (type/model)	Contact manufacturer for discussion
Attachment Usable by this Machine	Felling head adapters available for O.E.M. approved felling heads
Special Uses/Adaptations/Other Uses	4-way leveling; some models also available without leveling capabilities
Manufacturer's Comments Regarding Equipment Application	Data not supplied

Self-Leveling Cab Feller-Bunchers

Hydro-Buncher

Timbco T-400-D Series Self-Leveling Hydro-Bunchers

Make/Model	Timbco T-400-D Series Self-Leveling Hydro-Bunchers: T425-D; T445-D; T450-D; T455-D
Manufacturer/Source	Timbco Hydraulics Inc.
Distributor	Contact manufacturer for dealer information
Price	Contact dealer
Status	In production
Prime Mover	T-400-D Series Self-leveling Hydro Bunchers are prime movers
Prime Mover Engine Power	Custom matched to requirements: 200 to 250 hp
Gas/Diesel	Diesel
Transmission	Dual hydrostatic
Max. Travel Speed	T425-D: 3.5 mph; T445-D: 3.3 mph; T450-D: 3.2 mph; T455-D: 3.0 mph
Width	T425-D: 9 ft 8 in to 10 ft 8 in; T445-D, T450-D, T455-D: 10 ft 4 in to 11 ft 4 in
Length	Overall track length: T425-D: 14 ft 4 in; T445-D, T450-D: 15 ft 4 in; T455-D: 15 ft 2 in
Height	T425-D: 12 ft 2 in; T445-D: 12 ft 5 in; T450-D: 12 ft 6 in; T455-D: 12 ft 7 in
Weight	T425-D: 52,535 lb; T445-D: 56,675 lb; T450-D: 56,075 lb; T455-D: 59,275 lb
Ground Clearance	T425-D: 27 in; T445-D: 30 in; T450-D: 31 in; T455-D: 32 in
Turning Radius	Data not supplied
Tail Swing	Zero over track, rear
Slope Limitations and Specified Conditions	Cab levels 27 degrees (51% slope) forward; 7 degrees (12% slope) rear and 20 degrees (36% slope) to each side
Mount (lift arm/booms/3-point/other)	Boom
Power Source	Implement pump: 75 gpm; relief pressures (implement): 3,800 psi
Boom Type and Reach	Patented boom geometry; standard reach of 21 ft 5 in to attachment pin; max. available reach of 30 ft 11 in to attachment pin.
Track: Type, Width (options); and Gpsi	Steel. Pressure ranges: T425-D, 7.41 to 5.20 psi; T445-D, 7.66 to 5.39 psi; T450-D, 6.46 to 5.25 psi; T455-D, 6.40 to 5.49 psi
Attachments or Integral Heads (type/model)	Contact manufacturer
Attachment Usable by this Machine	Has interchangeable boom configurations for close cut and power sticks, telescopic sticks for dangle-mount, CLT-brand attachments
Special Uses/Adaptations/Other Uses	Slopes
Manufacturer's Comments Regarding Equipment Application	Data not supplied

Self-Leveling Cab Feller-Bunchers

Level-Swing Feller-Buncher

Timberjack 608L Leveling Feller-Buncher

Make/Model	Timberjack 608L Leveling Feller-Buncher
Manufacturer/Source	Timberjack, Inc.
Distributor	Contact manufacturer for dealer information
Price	Contact dealer
Status	In production
Prime Mover	608L is a prime mover (D6D-sized track and tractor-type rollers)
Prime Mover Engine Power	230-hp Cummins 6CTA8.3
Gas/Diesel	Diesel
Transmission	Data not supplied
Max. Travel Speed	High: infinitely variable to 2.5 mph; Low: 1.1 mph
Width	120 in over 24-in tracks
Length	174 in less booms
Height	150 in
Weight	59,150 lb including S547 felling, standard equipment, half-tank of fuel, and all fluids
Ground Clearnace	30 in
Tail Swing	12 in over side (24-in tracks)
Slope Limitations and Specified Conditions	Cab levels to 27 degrees (51% slope) forward; 10 degrees (18% slope) rear; and 20 degrees (36% slope) to each side
Mount (lift arms/booms/3-point/other)	Boom
Power Source for Attachments	Designed for Timberjack high-speed disk felling heads; contact Timberjack for other applications.
Boom Performance	Max. cut radius: 23 ft 3 in; min. cut radius: 12 ft 7 in. Net cut capacity at max reach, 3,366 lb
Track: Type, Width (options); and Gpsi	24-in single grouser (std): 8.1 psi; 28-in single grouser (opt): 7.2 psi (all pressures measured with S547 felling head)
Attachments (type/model)	Timberjack S547 high-speed disc-saw felling head with accumulator and +/- 15-degree wrist (weighs 5,510 lb)
Price, If Not Included With Prime Mover	Contact distributor
Maximum Treatable Material Size	22 in
Attachments Usable by this Machine	Disc-saw felling head, dangle-mounting processing head. Contact Timberjack before using other attachments to ensure use will not void machine warranty.
Special Uses/Adaptations/Other Uses	Slopes; leveling system shifts upper structure 36 inches ahead over track frame while tilting forward
Manufacturer's Comments Regarding Equipment Application	Can do full tree or cut to length

Extreme Machines

Concept—Some landscapes have small pockets of terrain that are difficult to access. These highly specialized machines may prove effective in such cases. They have even been used to perform work in stream beds. For the purpose of this report, extreme machines are those capable of working on slopes much steeper than 50%.

Comments—The high cost and relative rarity of extreme machines may be a deterrent to their use on all but the most exceptional sites (such as the forest/urban interface).

Other Manufacturers or Sources—Due to the specificity of their design, the extreme machines are not commonly available.

See the Canadian Forest Industries annual steep-slope issue, or the Timber West or Timber Harvesting annual buyer's guides for additional information on logging-related equipment (see Appendix B for details).

Extreme Machines

Tree Harvester

ATH 28 Tree Harvester

Make/Model	ATH 28 Tree Harvester
Manufacturer/Source	Allied Systems Co.
Distributor	Allied Systems Co.
Price	$625,000 (head included)
Status	In production
Prime Mover	ATH 28 is a prime mover
Prime Mover Engine Power	210 hp
Gas/Diesel	Diesel
Transmission	Hydrostatic
Max. Travel Speed	1.9 mph
Width	13 ft
Length	22 ft 4 in
Height	17 ft (can be lowered for transit)
Weight	94,700 lb
Ground Clearance	30 in
Turning Radius	Can turn in its own length by pogoing with boom and sawhead
Tail Swing	104 in
Slope Limitations and Specified Conditions	Designed to operate at 70% slope; best efficiency is around 50% slope
Attachment Mount (lift arms/boom/3-point/other)	Boom
Attachment Power Source	166 gpm; 4,800 psi
Boom Type and Reach	Welded, fabricated box boom construction; 28 ft
Track: Type, Width (options); and Gpsi	Steel track, clipped and mud relieved; 24 in; length on ground = 70 in; ground contact pressure = 14 psi
Cutting Head	Rotosaw 2600 (special design for ATH 28)
Special Uses/Adaptations/Other Uses	Extreme slopes
Manufacturer's Comments Regarding Equipment Application	Purpose built, steep-slope feller-buncher with self-leveling upper works

Extreme Machines

Walking Excavators

Kaiser S2 Spyder All-Terrain Walking Excavator

Make/Model	Kaiser All Terrain Walking Excavator: S2 Spyder, 4 x 4 (three models)
Manufacturer/Source	Kemp West, Inc.
Distributor	Kemp West, Inc.
Price	$160,000 to 215,000
Status	In production
Prime Mover	S2 is a prime mover
Prime Mover Engine Power	122 hp
Gas/Diesel	Diesel
Transmission	Hydrostatic 2 speed
Max. Travel Speed	6.2 mph
Width	8.86 ft to 14.93 ft
Length	20.01 ft
Height	8.37 ft
Weigh	19,420 lb
Ground Clearance	6.68-ft maximum, 1 ft while traveling
Turning Radius	Minimal
Tail Swing	0
Slope Limitations and Specified Conditions	All terrain, works safely at 50% slope; also travels in water
Attachment Mount (lift arms/boom/3-point/other)	Boom
Attachment Power Source	47.5 gpm, 3,625 psi
Boom Type and Reach	Extenda-boom, 27 ft
Tires: Size and Gpsi	(Drive tires) 1300 x 530-533; steer tires 36 x 11; ground pressure approx. 6.8 psi
Cutting Head	KDX Mulcher (See Extreme Machine Attachments section)
Attachments Usable by this Machine	Mulcher, tree harvester, digging bucket, grapple bucket, stump grinder, flail mower, ripper tooth, gravel suction unit, drill rig, boom rotator, hammer
Special Uses/Adaptations/Other Uses	Extreme slopes
Manufacturer's Comments Regarding Equipment Application	Data not supplied

Extreme Machines

Walking Excavators

Menzi Muck A71 Mobile All-Terrain Excavator

Make/Model	Menzi Muck All Terrain Excavator: A71 Mobile
Manufacturer/Source	Menzi USA Sales, Inc.—Menzi Muck AG
Distributor	Menzi USA Sales, Inc.
Price	Models A21, A51, A71; A71 Mobile: $60,000 to $200,000
Status	In production
Prime Mover	A71 Mobile is a prime mover
Prime Mover Engine Power	A71 Mobile, 114-hp Perkins engine
Gas/Diesel	Diesel
Transmission	Hydrostatic
Max. Travel Speed	5 mph
Width	Adjustable
Length	Adjustable
Height	Adjustable
Weight	18,000 to 19,000 lb
Ground Clearance	Adjustable
Turning Radius	Turns on own axis
Tail Swing	4 ft 1 in
Slope Limitations and Specified Conditions	Up/downslope: 100%; across slope: 70%
Attachment Mount (lift arms/boom/3-point/other)	Boom
Attachment Power Source	31 gpm, adjustable psi
Boom Type and Reach	Telescoping; 26 ft 6 in
Tires: Size and Gpsi	20 x 20 flotation; approximately 3-6 psi (depending upon attachments)
Cutting Head	Menzi heavy-duty flail (See Extreme Machine Attachments section)
Attachments Usable by this Machine	Buckets, mowers, brush-cutters, timber handling, grapples, hydraulic hammers
Special Uses/Adaptations/Other Uses	Extreme slopes; has claws/pads
Manufacturer's Comments Regarding Equipment Application	Ditch cleaning, ditch mowing, swamp work, bridge areas, construction, canal and lake maintenance, extreme slope construction, adverse conditions
MTDC Comment	A21 and A51 are very small machines and may be too underpowered to run large brush-cutting heads.

Extreme Machines

Walking Excavators

Schaeff Walking Excavators

Make/Model	Schaeff Walking Excavator: HS41 M ; HS41 MM
Manufacturer/Source	Schaeff of North America, Inc.
Distributor	Contact Schaeff of North America, Inc.
Price	Contact manufacturer
Status	In production
Prime Mover	HS41 M; HS41 MM are prime movers
Prime Mover Engine Power	80 hp
Gas/Diesel	Diesel
Transmission	Hydrostatic
Max. Travel Speed	HS41 M: Low, 1.5 mph; high, 3.7 mph. HS41 MM; Low, 1 mph; high, 3 mph
Width	82 in
Length	268 in
Height	157 in
Weight	19,380 lb
Ground Clearance	14 in when in travel position
Turning Radius	Inside is 157 in; outside is 237 in
Tail Swing	0
Slope Limitations and Specified Conditions	Across hillside/slope: 70%; up and downhill slope: 100%; travels in water up to 6 ft
Attachment Mount (lift arms/boom/3-point/other)	Boom
Attachment Power Source	60 gpm, 3,625 psi
Boom Type and Reach	Two-piece with extender hoe; 272 in
Tires: Size and Gpsi	HS41 M: 20 x 20 front; 7.50 x 15 rear; HS41 MM: 4 x 20 x 20
Cutting Head	Uses: mowers by Pro Mac Manufacturing, Ltd.; saw heads/shears by Esco, Corp. or Denharco, Inc. (See Brush-Cutting, Thinning, Shredding, and Crushing Attachments section)
Attachments Usable by this Machine	Variety of buckets (including ditch cleaning with or without rotator), mowing attachments, brush-cutters, sawheads and shears; in general will take most excavator attachments if they meet weight and flow requirements; Schaeff makes several sizes of mobile walking excavators
Special Uses/Adaptations/Other Uses	Extreme slopes
Manufacturer's Comments Regarding Equipment Application	Forest clearing work, cleaning work around lakes and waterways; construction; demolition

Extreme Machine Attachments

Concept—This section includes brush-cutting heads that are designed specifically for extreme machines. They can also be used by other excavator-type carriers with appropriate specifications.

Comments—Most extreme machines are also capable of using excavator-type grapples. The KDX mulcher head, while listed as an extreme machine attachment, has been used successfully on excavators.

Other Manufacturers or Sources—Extreme machines can often use standard attachments with compatible hydraulic and other requirements. Refer to the other attachment sections in this catalog for other possible extreme-machine attachments and check with manufacturers for details.

Also see the Equipment Today annual attachment issue, or the Timber West or Timber Harvesting annual buyer's guides for additional information on logging-related equipment (see Appendix B for details).

Extreme Machine Attachments

Disc Saw, Vertical Shaft, Boom Mounted

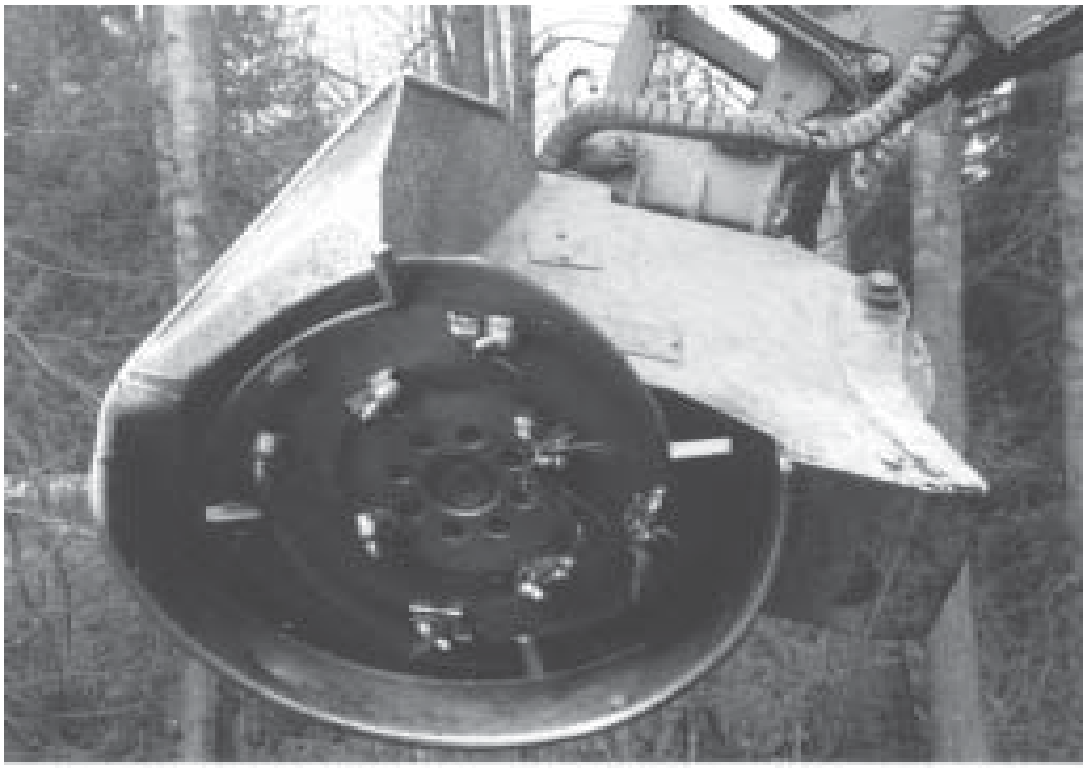
Risley Rotosaw 2600 ATH Harvester Head

Make/Model	Risley Rotosaw 2600: ATH Harvester Head
Manufacturer/Source	Risley
Distributor	Allied Systems Co.
Price	Included in price of prime mover
Status	In production
Preferred Prime Mover	ATH 28
Other Suitable Prime Movers	Excavator-type feller-bunchers
Attachment Mount (lift arms/boom/3-point/other)	Bucket link at end of boom
Maximum Treatable Material Size	28 in
Cutting Mechanism	Disc saw with insert-type teeth
Width of Cut	Up to 28 in
Width of Head	58 in
Weight	8,600 lb
Shaft (horizontal/vertical)	Vertical
Rotation Speed	150 rpm
Power Source Required	80+ gpm, 2,500 psi; motor spool control valve required
Special Uses/Adaptations/Other Uses	Very steep slopes
Manufacturer's Comments Regarding Equipment Application	Rugged and fast

Extreme Machine Attachments

Mulcher, Vertical Shaft, Boom Mounted

KDX Mulcher

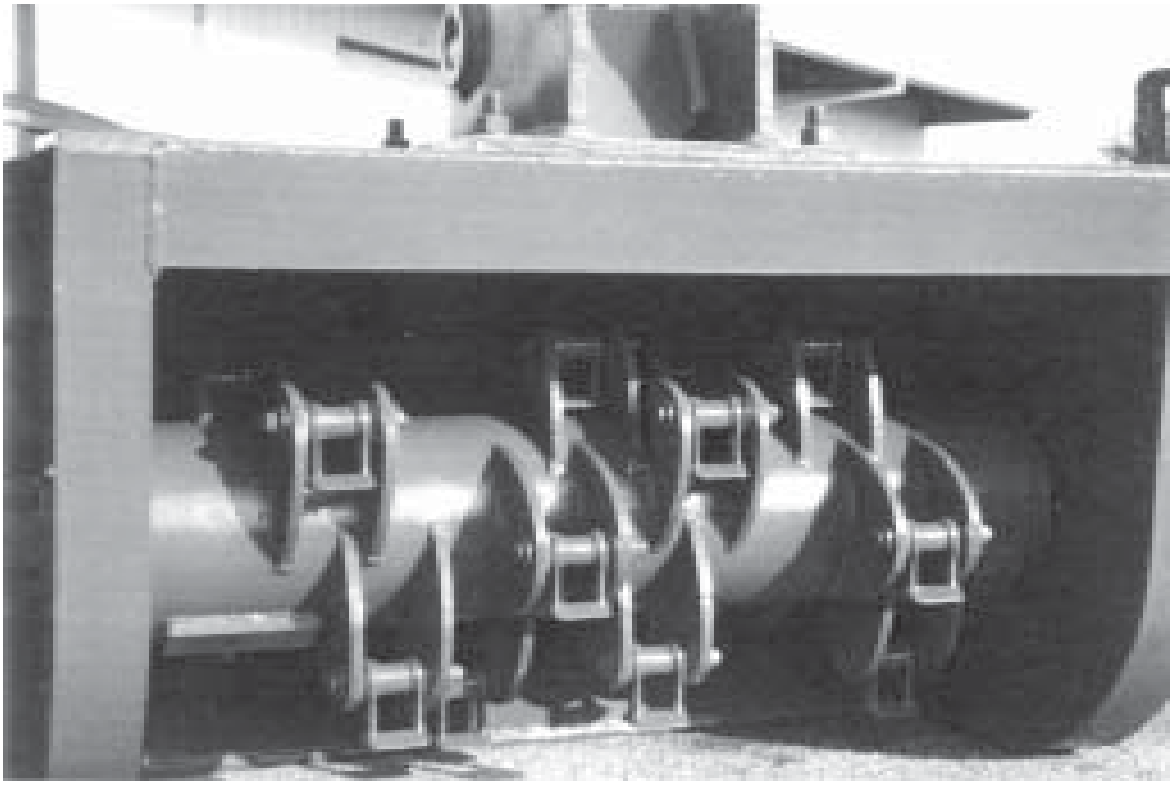


Make/Model	KDX Mulcher
Manufacturer/Source	Kemp West, Inc.
Distributor	Kemp West, Inc.
Price	$36,254
Status	In production
Preferred Prime Mover	Kaiser walking excavator (Spyder)
Other Suitable Prime Movers	150-series excavator or larger
Attachment Mount (lift arms/boom/3-point/other)	Boom
Maximum Treatable Material Size	6 to 8 in
Cutting Mechanism	Fixed
Width of Head	38 in
Weight	900 lb
Shaft (horizontal/vertical)	Vertical
Rotation Speed	1,200 rpm
Power Source Required	20 gpm, 3,600 psi
Special Uses/Adaptations/Other Uses	Often used on excavators
Manufacturer's Comments Regarding Equipment Application	Mulcher wheel and housing creates fine mulch

Extreme Machine Attachments

Flail, Horizontal Shaft, Boom Mounted

Menzi Muck Heavy-Duty Flail Mower



Make/Model	Menzi Heavy-Duty Flail Mower
Manufacturer/Source	Menzi USA Sales, Inc.
Distributor	Contact Menzi USA Sales, Inc.
Price	$12,000
Status	In production
Preferred Prime Mover	Menzi Muck
Other Suitable Prime Movers	Data not supplied
Attachment Mount (lift arms/boom/3-point/other)	Boom
Maximum Treatable Material Size	Brush to 5 in
Cutting Mechanism	Flail
Width of Cut	(Flail) hydraulic tilt 70% left and right 3 ft
Width of Head	39 in
Weight	1,200 lb
Shaft (horizontal/vertical)	Horizontal
Rotation Speed	2,300 rpm
Power Source Required	280 bar is 75 liters; hydraulic motor built in direct drive
Special Uses/Adaptations/Other Uses	Many
Manufacturer's Comments Regarding Equipment Application	Mulches best

Small Cable Yarders

Concept—Yarding may be an option in areas of steep slopes or difficult terrain when feller-bunchers or other machines would not be effective. For this report we chose to stay with small cable-yarding systems of 10,000-pound line pull or less. We also included some unique monocable systems. The Jewell/Allied Power Products, Inc. Yoader (combination yarder and loader) was included for its unusual flexibility—it can be used to shovel-log, load logs at landing, shotgun log, and it has a slack thrower for tongs. Allied Power Products, Inc. can put cable drum winches on most equipment to meet yarding needs. Winches were not included in this section as they were considered outside the scope of this project.

Comments—Stem extraction can be done aerially (helicopter), by ground (skidding or forwarding), or by cable yarding. Highlead and skyline cable systems require a cleared path and appropriate slope to allow clearance of the yarded material and to haul the material. Each cable requires a separate drum, and a yarder can have up to 4 drums: mainline, skyline, slackpull, and strawline (to pull the rest of cable into position). Monocable systems require a capstan winch and a series of special blocks to position the cable in the stand. Yarding can be done uphill or downhill. While moving the material by a cable reduces traffic over ground, roads are required within yarding distance.

Some yarders employ carriages to move the material. The main types of carriages are radio controlled and slackpull.

Other Manufacturers or Sources—See the Canadian Forest Industries annual steep-slope issue, or the Timber West or Timber Harvesting annual buyer's guides for additional information on yarding equipment (see Appendix B for details).

Other unconfirmed sources of small commercial wood yarders listed in Timber West 1999/2000 Buyer's Guide & Directory include:

- Christy Manufacturing, Inc.
- Madill, Inc.
- Ross Corp.
- TLD Gauthier, Inc.

Carriage manufacturers include:

- Acme Manufacturing Co.
- Christy Manufacturing, Inc.
- Diamond Manufacturing, Inc.
- Eagle Carriage and Machine, Inc.
- Enviroquip Sales, Ltd.
- Koller USA Corp.
- Maki Manufacturing, Inc.
- Northwest Harvesters, Inc.
- Ross Corp.
- Skylead Logging Equipment Co.

Other unconfirmed sources of carriages listed in Timber West 1999/2000 Buyer's Guide & Directory include:

- Boman Industries, Inc.
- TLD Gauthier, Inc.
- Global Forest Equipment, Ltd.

Small Cable Yarders

Yarding Converter Packages

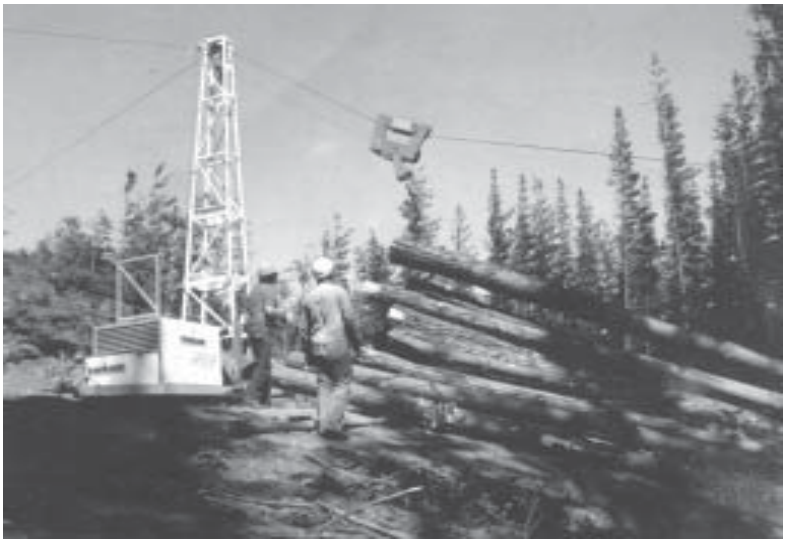
Jewell Hydraulic Dual-Winch Yarding Packages

Make/Model	Jewell Hydraulic Dual-Winch Yarder for log loaders; with mast assembly for excavators; Yoader conversion (combination log loader, winch/tong—thrower and yarder winch; also with dual winches)
Manufacturer/Source	Jewell Manufacturing, Inc.
Distributor	Contact Jewell Manufacturing, Inc.
Price	Contact manufacturer
Status	In production
Prime Mover	Excavator; log loader, 20- to 40-ton range
Yarder Power Plant	Depends upon host machine
Gas/Diesel	Depends upon host machine
Transmission	Hydraulic two-speed, self-contained winches
Weight	Two-drum system adds 5,000 lb to base machine
Boom/Tower	Tower (36 to 52 ft) varies by machine requirements
Controls	Winch controls are direct-acting pilot
Number of Drums	Four
Cable Capacity	Drum 1: 296 ft, $^{5}/_{8}$-in or 210 ft, $^{3}/_{4}$-in cable; Drum 2: 728 ft, $^{5}/_{8}$-in or 516 ft, $^{3}/_{4}$-in cable; Drum 3: 1,125 ft, $^{5}/_{8}$ in or 797 ft, $^{3}/_{4}$-in cable; Drum 4: 1,456 ft, $^{5}/_{8}$-in or 1,032 ft, $^{3}/_{4}$-in cable Mainline pull (lb/kg), dual winch specifications: Mean drum = 16,049 lb, 218 fpm; or 3,427 lb, 1,018 fpm; Main yoader winch has 9,000-lb line pull, 800 fpm Inhaul line speed; capacity 400 ft, $^{9}/_{16}$-in cable; comes with logging grapple
Mainline Speed	Line pulls to 50,000 lb
Maximum Yarding Distance	Yarder conversion—tong throw to 300 ft, shotgun yard to 1,000 ft
Carriage	Most commonly used is Christy manual slack-pulling carriage; some use
Shaft (horizontal/vertical)	small motorized carriages such as Eaglet II or Acme 10
Special Uses/Adaptations/Other Uses	Data not supplied
Manufacturer's Comments Regarding Equipment Application	Data not supplied

Small Cable Yarders

Three-Drum Yarder

Koller Three-Drum Cable Yarders



Koller K501 cable yarder (left) and K300.

Make/Model	Koller Three-Drum Cable Yarders: K300 Trailer-Mount; K501Trailer-Mount; K501 Truck-Mount; K501 Track-Mount
Manufacturer/Source	Koller Austria
Distributor	Northwest Harvesters, Inc.
Price	K300 trailer-mount with Koller SKA 1 carriage: $94,600; K501 trailer-mount with Koller SKA 2.5 carriage: $169,000; K501 truck-mount with Koller SKA 2.5 carriage: $187,000; K501 track-mount with Koller SKA 2.5 carriage: $234,000
Status	In production
Prime Mover	K301; K501 trailer-mount: 3-ton truck; K501 truck-mount: 5 ton, 6 x 6 military truck; K501 track-mount: M32 tank undercarriage
Yarder Power Plant	K300 trailer-mount: 62 hp; K501 trailer- or truck-mount: 112 hp or 160 hp; K501 track-mount: 160 hp
Gas/Diesel	Diesel
Transmission	K300 trailer-mount: hydrostatic; K501 truck-mount: 4-speed automatic; K501 track-mount: 545 Allison automatic
Weight	K300 trailer-mount: 9,000 lb; K501 trailer-mount: 17,500 lb; K501 truck-mount: 46,200 lb; K501 track-mount: 51,000 lb, including lines
Boom/Tower	K 300 trailer-mount: 23 ft; K501 (all): 33 or 40 ft
Controls	Generally ground; radio and cab options
Number of Drums	Three or four
Cable Capacity	Trailer-mounted models: Mainline: 1,150 ft, $^{3}/_{8}$-in cable; Skyline: 1,150 ft, $^{5}/_{8}$-in cable; Guyline: 100 ft, $^{9}/_{16}$-in cable. Truck- and track-mounted models: Mainline: 1,800 ft, $^{1}/_{2}$-in cable; Skyline: 1,600 ft, $^{3}/_{4}$-in cable; Haulback: 2,900 ft, $^{7}/_{16}$-in cable; Guyline: 145 ft, $^{3}/_{4}$-in cable
Mainline Pull	K300: 4,000 lb at medium drum; K501 (all): 8,100 lb at medium drum
Mainline Speed	K300: 985 ft/min; K501 (all) is 1,000 ft/min
Maximum Yarding Distance	K300: 1,200 ft; K501 (all) is 1,640 ft
Carriage	K300: Koller SKA 1; K501(all): Koller SKA 2.5 or Eaglet
Special Uses/Adaptations/Other Uses	K501 truck- and track-mounted models have a 7-ft tower extension
Manufacturer's Comments Regarding Equipment Application	Data not supplied

Small Cable Yarders

Four-Drum Yarder

Skylead Four-Drum Cable Yarder

Make/Model	Skylead Four-Drum Cable Yarder: C-40 16000 Series with Skidder, Truck, or Trailer Mount
Manufacturer/Source	Skylead Logging Equip. Corp.
Distributor	Contact Skylead Logging Equip. Corp.
Price	Contact manufacturer
Status	In production
Prime Mover	Skidder, truck, or trailer
Yarder Power Plant	130 to 174 hp
Gas/Diesel	Diesel
Transmission	Four-speed transmission
Weight	Approximately 41,000 lb, mounted on typical skidder without cable or rigging
Boom/Tower	40-ft round, tubular latticed tower
Controls	Hydraulic
Number of Drums	Four
Cable Capacity	Mainline: 2,000 ft of $^{1}/_{2}$-in cable; Haulback: 4,200 ft of $^{1}/_{2}$-in cable; Skyline: 2,000 ft of $^{3}/_{4}$-in cable; Guyline: 200 ft of $^{3}/_{4}$-in cable; Strawline: 4,000 ft of $^{1}/_{4}$-in cable
Mainline Pull	16,180 lb at mid-drum
Mainline Speed	1,525 fpm at mid-drum
Maximum Yarding Distance	2,000 ft
Carriage	Mini Maki I, Mini Maki II, Eaglet, Koller SKA-1, Skylead C7
Special Uses/Adaptations/Other Uses	Data not supplied
Manufacturer's Comments Regarding Equipment Application	Data not supplied

Small Cable Yarders

Three- or Four-Drum Yarder

Urus I 300 Skyline Mini Tower Yarder and Urus II Universal 600 Skyline Yarder

Make/Model	Urus I 300 Skyline Mini Tower Yarder; Urus II Universal 600 Skyline Yarder
Manufacturer/Source	Global Forest Equipment Ltd.
Distributor	Contact Global Forest Equipment Ltd.
Price	Urus I 300: $118,000; Urus II 600: $190,000
Status	In production
Prime Mover	Truck, trailer-mounted, or skidder
Yarder Power Plant	Urus I 300: 100 hp; Urus II 600: 185 hp
Gas/Diesel	Diesel
Transmission	Urus I 300: Allison 4 speed transmission: Urus II 600: Volvo hydraulic drive; also available with standard transmission
Weight	Urus I 300: 5,020 kg on trailer with cables; Urus II 600: 22,000 kg on truck with cables
Boom/Tower	Urus I 300: 33-ft steel tower; Urus II 600: 40-ft steel tower
Controls	Urus I 300: Ground-operated, hydraulic controls; Urus II 600: Cab-operated, hydraulic controls
Number of Drums	Urus I 300: 3; Urus II 600: 4
Cable Capacity	Urus I 300: Mainline: 1,050 ft of $^{3}I_{8}$-in cable; Skyline: 1,050 ft of $^{5}I_{8}$-in cable; Haulback: 2,100 ft of $^{5}I_{16}$-in cable; Guyline: 150 ft of $^{5}I_{8}$-in cable Urus II 600: Mainline: 2,000 ft of $^{1}I_{2}$-in cable; Skyline: 2,000 ft of $^{3}I_{4}$-in cable; Haulback: 4,100 ft of $^{3}I_{8}$-in cable; Strawline: 4,165 ft of $^{1}I_{4}$-in cable; Guyline: 160 feet of $^{3}I_{4}$-in cable
Mainline Pull	Urus I 300: 4.6-ton breakout force; Urus II 600: 5.5-ton breakout force; 2.8 tons throughout working distance
Mainline Speed	Urus I 300: 1,180 ft/min; Urus II 600: 885 ft/min with load, 1,770 ft/min empty
Maximum Yarding Distance	Urus I 300: 1,000 ft; Urus II 600: 2,000 ft
Carriage	Urus I 300: Steufer Hydraulic; Urus II 600: Eaglet or Maki or Steufer
Special Uses/Adaptations/Other Uses	See below
Manufacturer's Comments Regarding Equipment Application	Urus yarders are commonly used for commercial thinning or selective harvesting second growth timber from steep slopes, swampy ground or rocky terrain not suitable for ground-based equipment

Small Cable Yarders

Monocable Yarders

Howe-Line Trailer-Mount Monocable System

Make/Model	Howe-Line Trailer-Mount Monocable System
Manufacturer/Source	Howe-Line, CC; exported as Truckhowe, CC
Distributor	Howe-Line, CC
Price	Ready to use, including training in USA, not including shipment is $25,000; Freight estimate to Idaho is $2,000
Status	In production
Yarder Power Plant	14-hp Hatz
Gas/Diesel	Diesel
Transmission	Data not supplied
Weight	Depends on amount of cable: empty, 750 kg
Controls	Operator or radio control option, manufacturer suggests buying radio model locally known
Cable Capacity	600-m standard; starts with 400 m of cable and adds 100-m sections with special quick coupler; not tested with more than 900 m of cable
Mainline Pull	Line pull is tailored to suit operation, e.g.: 600 m of cable with 200-mm capstan = 3.5 tons (metric) at 20 m/min; 280-mm capstan = 2.6 tons (metric) at 30 m/min
Maximum Yarding Distance	Tension controls: manually move trailer forward; put cable on a separate drum that can tension; or move the trailer forward with a vehicle 600 m of cable swaged 10 mm can effectively penetrate forest about 250 m (lead) with a further 50-m lead for roadside stacking; Not tested with more than 900-m cable which equals 400-m penetration
Special Uses/Adaptations/Other Uses	Cost efficient to operate; handles 8-ft logs, 12-in diameter, or anything 2 people can pick up (approximately 100 kg); has had over 3 metric tons on system at once
Manufacturer's Comments Regarding Equipment Application	Good for steep, deep, rocky and swampy areas

Small Cable Yarders

Truck- or Trailer-Mounted Miniyarder

Bitterroot Miniyarder

Make/Model	Bitterroot Miniyarder
Manufacturer/Source	Plans available from USDA Forest Service, Missoula Technology and Development Center
Price	Varies, depending upon fabricator
Status	Plans only; custom made
Prime Mover	Can be mounted on a $^{3}/_{4}$-ton truck or trailer
Yarder Power Plant	18 hp
Gas/Diesel	Gasoline
Transmission	Hydrostatic
Weight	1,600 lb rigged
Boom/Tower	$2^{1}/_{2}$-in pipe A-frame, $17^{1}/_{2}$ ft long; 180-degree swivel head; manually raised/lowered
Controls	15-ft mechanical push/pull cable
Number of Drums	2
Cable Capacity	Skyline, mainline drums: 800 ft of $^{1}/_{4}$-in cable or 650 ft of $^{3}/_{8}$-in cable
Mainline Pull	0 to 2,000 lb
Mainline Speed	0 to 400 fpm
Maximum Yarding Distance	800 ft
Special Uses/Adaptations/Other Uses	Light enough to transport via helicopter
Manufacturer's Comments Regarding Equipment Application	Publication number 4100-8541-2601, September 1985

Small Cable Yarders

Truck-Mounted Small Yarder

Clearwater Cable Yarder

Make/Model	Clearwater Cable Yarder
Manufacturer/Source	Plans available from the Forest Service, Missoula Technology and Development Center
Price	Varies depending upon fabricator
Status	Plans only; custom made
Prime Mover	5-ton truck recommended
Yarder Power Plant	Ford industrial model LSG-633 P 6-cylinder; 200 cu in; 68 hp at 2,800 rpm
Gas/Diesel	Diesel
Transmission	Hydrostatic
Weight	13,000 lb, fully rigged
Boom/Tower	Mast is 10 x 10 x $^{1}/_{2}$-in-wall square-wall tubing; 170-degree fairlead swivel; hydraulically raised and lowered
Controls	Remote up to 50 ft; 12-volt dc electric over hydraulic; remote to 50 ft
Number of Drums	Three
Cable Capacity	Mainline Drum: 900 ft of $^{3}/_{8}$-in cable; Skyline Drum: 800 ft of $^{1}/_{2}$-in cable
Mainline Pull	3,500 lb, maximum
Mainline Speed	0 to 1,000 fpm
Maximum Yarding Distance	800 ft
Carriage	Christy carriage suggested
Special Uses/Adaptations/Other Uses	See Forest Service plans
Manufacturer's Comments Regarding Equipment Application	Lightweight, three-drum system that makes harvesting small material practical; publication number: 5100-8151-2602, May 1981

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 reponses.

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.

Equipment and Techniques Response Summary, continued

Region or unit responding	Equipment	Purpose or technique	Maximum percent slope	Maximum material size	Wheels or tracks	Production rate	Contract cost	Comments
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%			$1^{1}I_{4}$ to $1^{1}I_{2}$ 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).

Equipment and Techniques Response Summary, continued

Region or unit responding	Equipment	Purpose or technique	Maximum percent slope	Maximum material size	Wheels or tracks	Production rate	Contract cost	Comments
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 underburning. 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 to12")				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.

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Canadian Forest Industries. JCFT Forest Communications, 1 Pacifique, St-Anne-De-Bellevue, QC, H9X 1C5, Canada. 514/457-2211. E-mail: jcft@aei.ca. Published eight times annually. Noteworthy: annual steep slope issue in September and semiannual harvesting heads issue in April/May.

Equipment Today. Cygnus Publishing, Inc.; P.O. Box 803, 1233 Janesville Avenue, Fort Askinson, WI 53538 Phone: (920) 563-6388 Website: http://www.equipmenttoday.com. Published monthly with an extra edition mid-March. Noteworthy: annual January attachment issue, annual June excavator issue.

Timber Harvesting. Hatton-Brown Publishers; P.O. Box 2268, Montgomery, AL 36104. Phone: (334) 834-1170 E-mail: mail@timberharvesting.com. Published 10 times annually. Noteworthy: annual Loggers' Resource Guide in January.

Timber West. Timber West Publications, Inc.; P.O. Box 610, Edmonds, WA 98020. Phone: (425) 778-3388 E-mail: timberwest@aol.com. Published monthly. Noteworthy: annual Buyer's Guide & Directory in June.

Web Sites

Forest Engineering Research Institute of Canada:
Web site: http://www.feric.ca

Forest Industry Network (has links to many sites):
Web site: http://www.forestind.com

Logging and Sawmilling Journal
Web site: http://www.forestnet.com

Appendix C—Manufacturer or Source Addresses

Acme Manufacturing Co.
136 North 42nd Street
Springfield, OR 97478
Phone: (541) 741-2200
Fax: (541) 741-2212

Acrowood Corp.
4425 South 3rd Avenue
Everett, WA 98206
Phone: (425) 258-3555
Fax: (425) 252-7622

ACS Industries, Inc.
2151 Mogadore Road
Kent, OH 44240
OH Phone: 800-321-2348
WA Phone: 800-688-6266
Fax: (330) 678-0859
E-mail: rlarwin@acs-coupler.com
Web site: www.acs-coupler.com

AFM-Forest, Ltd.
Ahjokatu 26
40320 Jyvaskyla Finland
Phone: (358) 14-675100
Fax: (358) 14-675355

Agra Axe International, Inc.
P.O. Box 250
Caney, KS 67333
Phone: (316) 879-5858 or 888-394-6598
Fax: (316) 879-5844
E-mail: ese-intec@terraworld.com

Alamo Industrial
1502 East Walnut Street
Seguin, TX 78155
Phone: 800-882-5762
Fax: (830) 379-0864
E-mail: slock@alamo-industrial.com
Web site: http://www.alamo-industrial.com

Allied Power Products, Inc.
6590 South West Fallbrook Place
Beaverton, OR 97008
Phone: (503) 626-0654
Fax: (503) 644-9223
E-mail: sales@alliedpower.com
Web site: http://www.alliedpower.com

Allied Systems Co.
2300 Oregon Street
Sherwood, OR 97140
Phone: (503) 625-2560
Fax: (503) 625-7980
E-mail: engineering@alliedsystemsco.com
Web site: www.alliedsystems.com

Ammbusher, Inc.
P.O. Box 456
Dillsboro, IN 47018
Phone: 800-432-5955
Fax: (812) 926-1616
E-mail: ammbush@one.net
Web site: http://www.ammbusher.com

Amulet Manufacturing Co.
5640 West End Road
Arcata, CA 95521
Phone: (707) 822-2282
Fax: (707) 822-2398
Web site: http://www.amuletmfg.com

ASV—All Season Vehicles, Inc.
P.O. Box 5160
Grand Rapids, MN 55744
Phone: (218) 327-3065 or 800-346-5954
Fax: (218) 327-2376
E-mail: sales@asvi.com

Attachments International
RR2, Box 444
Pelican Rapids, MN 56572
Phone: (218) 863-6444
Fax: (218) 863-6446

Bandit Industries, Inc.
6750 Millbrook Road
Remus, MI 49340
Phone: (517) 561-2270 or 800-952-0178
Fax: (517) 561-2273
E-mail: brushbandit@eclipsetel.com
Web site: http://www.banditchippers.com

Barko Hydraulics, LLC
P.O. Box 16227
Duluth, MN 55811
Phone: (715) 392-5641
Fax: (715) 392-3931
E-mail: sales@barko.com
Web site: http://www.barko.com

Bell Equipment N.A., Inc.
2843 Highway 80
Garden City, GA 31408
Phone: (912) 966-2615
Fax: (912) 964-1594
Web site: http://www.bell.co.za

Blondin, Inc.
P.O. Box 1287
Indiana, PA 15701
Phone: (724) 349-9240
Fax: (724) 349-9242
E-mail: rotblon@aol.com
Web site: http://www.rottneusa.com

Blount, Inc.
Forestry and Industrial Equipment Division
535 Mack Todd Road
Zebulon, NC 27597
Phone: (919) 269-2438
Fax: (919) 269-0257
Web site: http://www.blount-fied.com

Bobcat Co.
P.O. Box 6000
West Fargo, ND 58078-6000
Phone: (701) 241-8700
Fax: (701) 241-8704
E-mail: infocenter@bobcat.com
Web site: htp://www.bobcat.com

Boman Industries, Inc.
2470 Ewald Avenue SE
Salem, OR 97302
Phone: (503) 362-7657
Fax: (503) 399-8535

Brigden Manufacturing, Inc.
101 Spears Road
Quesnell, BC V2J 4Z3 Canada
Phone: (250) 992-3710 or 800-665-2530
Fax: (250) 992-3841
E-mail: treetow@uniserve.com

Brown Bear Corp.
P.O. Box 29
Corning, IA 50841
Phone: (515) 322-4220
Fax: (515) 322-3527
E-mail: brnbear@mddc.com
Web site: http://www.brownbearcorp.com

Brown Manufacturing Corp.
Route 3, Box 339
Ozark, AL 36360
Phone: (334) 795-6603 or 800-633-8909
Fax: (334) 795-3029
Web site: www.brownmfgcorp.com

Brush Technology Division
Carlson Tractor and Equipment Co.
14375 James Road
Rogers, MN 55374
Phone: (763) 428-5099 or 800-642-4441
Fax: (763) 428-5051
E-mail: seppi@ct-e.com
Web site: www.ct-e.com/brushtech.htm

Cameco Industries
P.O. Box 968
Thibodaux, LA 70302
Phone: (504) 447-7285
Fax: (504) 447-0299

Case Corp.
700 State Street
Racine, WI 53404
Phone: (414) 636-6011
Fax: (414) 636-7809
Web site: http://www.casecorp.com

Caterpillar, Inc.
100 NE Adams Street
Peoria, IL 61629
Phone: (309) 675-8995
Fax: (309) 675-4757

Christy Manufacturing, Inc.
P.O. Box 2259
Orofino, ID 83544
Phone: (208) 476-4870
Fax: (208) 476-5339

Crane Equipment Manufacturing
33740 Seavey Loop
Eugene, OR 97405
Phone: (541) 746-9681
Fax: (541) 746-8928

CWS Industries, Ltd.
19490 92nd Avenue
Surrey, BC V4N 4G7 Canada
Phone: (604) 888-9008
Fax: (604) 888-9006

Danzco
1006 143rd SE
Tenino, WA 98589
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Fax: (309) 765-1859
Web site: http://www.deere.com/ind

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Eagle Log Loader/IMT, Inc.
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Esco Corp.
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Franklin Equipment Co.
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Votech Innovation, Ltd.
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Vrisimo Distributing, Inc.
P.O. Box 1490
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Fax: (209) 883-9565

Waratah Forestry Attachments
6215 Fulton Industrial Boulevard
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Weldco-Beales Manufacturing Corp.
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West Northwest Forestry, Ltd.
370 Armour Place
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Fax: (250) 578-6967
Web site: http://www.vhmulcher.com

Young Corp.
P.O. Box 3522
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Phone: (206) 624-1071 or 800-321-9090
Fax: (206) 682-6881

Index—Equipment List by Category

Locating Equipment and Manufacturers/Sources in the Catalog Section

Other Machines and Miscellaneous Attachments

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Brush-Cutting, Thinning, Shredding, and Crushing Attachments

Small Tree-Cutting/Processing Heads

Slash-Piling Attachments

Slash-Piling Attachments

Skid-Steer Attachments

Self-Leveling Cab Feller-Bunchers

Extreme Machines

Extreme Machines (continued)

Extreme Machine Attachments

Small Cable Yarders

Notes

Notes

Library Card

Windell, Keith; Bradshaw, Sunni. 2000. Understory biomass reduction methods and equipment catalog. Tech. Rep. 0051-2826-MTDC. Missoula, MT: U.S Department of Agriculture, Forest Service, Missoula Technology and Development Center. 156 p.

Ladder fuels and dense pockets of young Douglas-fir make it especially difficult, if not impossible, to get desirable results with prescribed fire in ponderosa pine stands without some creative burning techniques or mechanical preburn treatment using equipment and techniques discussed in this report. Although stands of ponderosa pine with Douglas-fir encroachment are the focus for fuel treatments in this report, the equipment and techniques discussed will probably have applications for other species.

This report consists of two sections. The first section contains the results of numerous interviews, a field survey, and a literature search. This section discusses fuel reduction equipment and methods that have been tried in the past, those that are currently being used, and those that may warrant consideration in the future.

The second section is a catalog of equipment suitable to treat landscape areas before prescribed burns. It is the result of an extensive market search. The catalog is designed to help forest managers make informed decisions. It profiles a variety of small and large pieces of equipment suitable for many different situations and budgets. To keep the size of the catalog manageable, equipment that is commonly available and well known is not included (equipment such as skidders, excavators, loaders, and so forth).

An abbreviated version of this report (32 p.) is available for managers interested in the first section, but not the detailed equipment specifications. The abbreviated report is Understory Biomass Reduction Methods and Equipment (Tech. Rep. 0051-2828-MTDC).

Keywords: Douglas-fir, fuel treatment, ponderosa pine, prescribed fire, residues, thinning

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