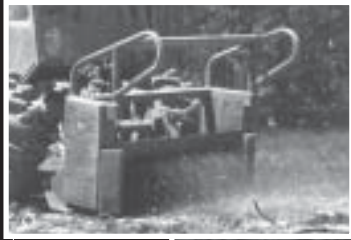




Small-Area Forestry Equipment



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 Technology and Development Program
 Missoula, MT**

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Introduction

The changing nature of resource management has led to a dramatic decrease in large-scale, high-volume commercial timber operations on National Forest lands. With few exceptions, forest practices of prior decades are no longer viable options

for today's resource managers. Competing interests and limited resources have resulted in a broader interest in "small-area" forest operations. The equipment used in large-scale forest operations many times cannot operate economically and efficiently in small-

scale forest operations. The USDA Forest Service's Washington Office Timber Staff asked the Missoula Technology and Development Center to identify or develop equipment that could be used in smaller forested acreages. ☞



Small-Area Forestry

MTDC was asked to determine the equipment that works best on small-area forestry operations. To find out exactly what small-area forestry operations entailed, we interviewed silviculturists from several Forest Service Regions to determine the types of operations conducted in small areas and identify possible special-equipment needs. For the purpose of this project, *small area* will encompass a land area of 10 acres or less. These units may or may not be adjacent to roads. Harvest can be either a small clearcut or individual/selective cut (uneven-age management). The trees may be either hardwood or softwood timber types. Besides timber harvest, other small-area forestry operations include:

- Brush/slash disposal
- Site preparation
- Planting
- Thinning
- Biomass extraction/utilization.

MTDC distributed a questionnaire Servicewide to determine tasks that could benefit the most from equipment-development efforts. Commercial thinning and final harvest are usually done by private contractors. Since numerous

harvesting systems are readily available on the commercial market, these tasks were not addressed in this project. Priorities were set for the remaining tasks (Appendix D). The highest-priority tasks were biomass reduction and precommercial thinning. This report focuses on mechanized equipment to perform these tasks. The equipment identified for use in these operations will be on the smaller side of the equipment that is commercially available.

Several types of equipment, attachments, and implements are listed in this report. Desirable traits in the equipment sought by MTDC include high maneuverability, ability to work in tight spaces, ready availability, reliability, and the ability to work lightly on the land.

The equipment identified in this report represents only a small percentage of the equipment available on today's market. Common items, such as chain saws, are mentioned but not included in Appendix B—Small Mechanized Equipment, and Appendix C—Attachments and Implements. Inclusion in the report does not constitute an endorsement. The growth of small-area forestry operations brings new equipment to

the market every year. Previous models that are no longer in production can frequently be found on the secondary market and may provide excellent value and service. The equipment presented in this report is intended to serve as a starting point for resource managers. You are encouraged to conduct your own research once you have identified your operational needs. Equipment may be available through local distributors or dealers. Information on new and existing equipment can be found on the Internet, in the Thomas Register, or in trade magazines (Appendix A—Useful Forestry Equipment Publications) that focus on forest operations.

This report lists some equipment capable of removing trees up to 8 inches or more in diameter, but a more complete source of general harvesting equipment is the San Dimas Technology and Development Center's report, *Smallwood Equipment Catalog* (9224-1501-SDTDC). Another San Dimas report, *Field Equipment for Precommercial Thinning and Slash Treatment—Update* (9124-1201-SDTDC) lists larger slash-reduction equipment for use in larger units. Several Canadian publications listed in Appendix A should be helpful. 



Biomass Utilization


Biomass utilization provides an option to maintain the economic viability of a small-area forestry operation such as thinning trees for timber stand improvement or to reduce fire hazard. Whenever possible, commercial utilization of excess biomass material should be considered. Possible biomass markets include:

- Small saw logs
- House logs
- Posts and poles
- Pulp
- Hog fuel
- Christmas trees
- Bows for wreaths
- Firewood.

The need for many of these materials can be seasonal. If a market exists, the product can be skidded or yarded to a road or landing for loading and removal.

When biomass is utilized, larger saw logs may have to be added to the contract to offset the cost of the biomass-reduction treatment. While new road construction may be too costly for these projects, some existing road reconstruction may be necessary. It is best to schedule biomass reduction activities

with timber harvesting so that equipment already onsite can be used, and the cost of transporting equipment is reduced.

If there is no commercial market, alternative methods to deal with the accumulation of biomass on the site should be considered. If the material presents a fire hazard, it can be piled onsite, piled and burned, prescribed burned, killed with herbicides, crushed, masticated, or chipped. 



The Ideal Prime Mover

The basic criteria for the ideal prime mover for small-area forestry operations were developed from interviews and a Servicewide survey that was conducted by MTDC. The ideal prime mover would meet or exceed these following specifications:

- Minimal ground disturbance (rutting, compaction, and so forth).
- Minimal damage to leave trees.
- Work in tree spacing of 12 to 15 feet.
- Work in different canopy levels.
- Ideal equipment height would not exceed 10 to 12 feet.
- Ideal turning radius would be 12 feet or less.
- Machine width of 8 to 12 feet (8 feet for easy transport).
- Reach of 25 feet if arm is involved.
- Ability to pick up 18-inch-diameter logs 16 feet or longer.
- Ability to work on slopes from 0 to 65 percent.
- Teflon or rubber grousers to prevent sparks.

None of the commercial machines we found met all of these criteria. Some of those that we reviewed met most of the criteria.

Equipment Identified

Several smaller pieces of equipment that were reviewed could be used or modified for mechanized operations in smaller forested areas. When using smaller equipment, production rates may be lower than would be possible with larger equipment (depending on the terrain and tree spacing). The number of personnel required and the time needed to complete the job may increase. Although larger equipment would be expected to increase productivity, the spacing of trees and the need to minimize damage to “leave trees” restricts the size of equipment that can be used. It is advantageous to use the

largest piece of mechanized equipment suitable for the tree spacing if it will perform the work without causing unacceptable site damage, such as damage to leave trees, excessive soil compaction, or any other undesirable ground disturbance. The equipment should minimize the need for laborers and not fatigue the operator. Specifications for the specialty equipment are located in Appendix B and C.

Since the majority of persons responding to the questionnaire were interested in methods and equipment for use in areas with closely spaced trees, many common larger forestry machines are not covered by this report. For information on larger forestry equipment, refer to the information sources listed in Appendix A or contact the equipment manufacturers or distributors.

Equipment for Closely Spaced Trees (12 to 15 Feet)

Equipment used for precommercial thinning or brushing includes brush-cutting saws, chain saws, or small machine brushing heads. Specialty prime movers (Appendix B) identified include: tracked skid steers, ASV Posi-Track, the Trackmaster 85, Sweco 480, Gyro-Trac, and mid-sized excavators. Appendix B lists many useful attachments for these prime movers. The manufacturer of the Slashbuster (D & M Machine) says that a 150-series excavator with their LW422 or 420B head can work in a 10- by 10-foot tree spacing on slopes of up to 35 percent. Excavators smaller than a 120 series are really too small to operate Slashbuster’s smallest slashing head (Mini-360). Drum shredders are available (such as the Royer Woodsman by ROWMEC) that can mount on smaller articulated tractors.

Smaller equipment for skidding wood products on tractor ground includes small dozers, skid steers, the Sweco 480 (with logging arch), the TF-42C mini-skidder, and the ASV Posi-Track (with the ImpleMax tractor grapple). Although excavators can be used for skidding, they are slow (about 3 miles per hour). By comparison, the ASV Posi-Track can skid at about 7 miles per hour. The other machines typically can skid between 3 and 7 miles per hour. A skid-steer machine with attachments can work in tight spaces, but is limited to a 20-percent slope straight up and down. Manufacturers do not recommend using them on sideslopes. Skid-steer machines can skid trees safely only on relatively flat ground.

The ASV Posi-Track is similar to a skid-steer machine, but has rubber tracks and can work on slopes of 33 to 40 percent. The ASV Posi-Track is a heavy-duty platform that can be used in smaller forested areas. It can use any attachments (such as tree shears or grapples) developed for the skid-steer machines. Although the Posi-Track must drive over all treated areas (unlike excavators), its ground pressure is only 3 psi (for the HD 4520 with bucket). Even though the ASV Posi-Track is not as versatile as an excavator, it is not as expensive and can be transported more easily. The Posi-Track’s operator compartment can be easily guarded against flying debris (with wire screens or Lexan shielding). The Trackmaster 85 is a similar machine that has an 88.5-hp diesel engine compared to the 115-hp diesel engine of the ASV Model 4520 Posi-Track.

Small machines used for skidding that the operator does not ride include the Iron Horse, Wood Dog, and Modulaire. These machines travel between 2 and 8 miles per hour. The Iron Horse is a Swedish machine currently marketed in the Eastern United States. The Wood Dog was developed as a research project at the University of Idaho. Its

appearance resembles the Iron Horse, but the Wood Dog is remote-controlled. It is on the verge of being produced commercially. The Modulaire MD15, another remotely controlled, rubber-tracked unit, could be modified for forestry applications on steeper slopes. The Wood Dog and Modulaire would be safer on steeper slopes than the Iron Horse because they are remotely controlled. The operator would not have to be near a machine that might roll. The Wood Dog or Modulaire could also have a remotely activated safety line developed and attached to them for use on steep slopes. Remote control would increase operator safety and reduce fatigue.

If chipping onsite is the desired treatment, a small chipper can be mounted on a trailer and pulled by a small prime mover (such as the Sweco 480 or ASV Posi-Track). Of course, if a market exists for pulp or hog fuel, a chipper, tub grinder, or recycling machine can be positioned at a central landing.



Equipment for Widely Spaced Trees (15 Feet or More), Including Small Clearcuts

All of the equipment identified in the previous section will also work in small clearcuts. An excavator that is able to accommodate a number of attachments and has been used in small clearcuts and select cuts is the Hitachi EX-150 91-hp excavator. The Eldorado National Forest uses it with the 420B Slashbuster head for brush disposal, and they have also used it to slash manzanita 20-feet tall and 8 to 14 inches in diameter. The Hitachi EX-150 has since been replaced by the EX-160-V, but the EX-150 is still available on the secondary market.

Although the Hitachi EX-150 excavator works, the Forest recommends a 125- to 150-hp excavator. Slashbuster says its smallest head (Mini-360) can be mounted on a Kubota KH-191 (59-hp) excavator. This combination can only thin trees up to 4 to 5 inches in diameter and cannot dig in the dirt. The Eldorado Forest has street tracks on its excavator so it can be moved from unit to unit without being loaded on a trailer. They put long bolts in the grousers when more traction is needed for steeper ground, and have used it on slopes of up to 40 percent.

The Hitachi EX-150 weighs 32,000 lb, so it is light enough to be put on a trailer and pulled by a dump truck, reducing the Forest's transportation costs. According to fleet managers in the Forest Service's Northern Region (R1), the largest tilt-bed trailers can haul a machine no more than 8½-feet wide and weighing no more than 40,000 lb. The overall height of the loaded trailer must not exceed 13½ feet or it may be too high for highway overpasses. Equipment that exceeds these limits must be carried on a lowboy trailer and may require special permits that will increase transportation costs.

Excavators with a forest rake or grapple attachment can be used for brush piling. A bucket on the excavator can be used to construct fire-control line for prescribed burning. If the Slashbuster head causes too much damage, small feller-buncher and processor heads are available.

Drawbacks to using an excavator in small-area forestry projects include the machine's high initial cost and the difficulty of using it in tightly spaced trees, because of the machine's tail swing. Larger machines like the 200/220 series are needed to power some of the larger attachments that allow

higher productivity. The larger machines must be transported by lowboy trailer. Because of the cost of transportation, the larger machines probably would not be economical unless they were already on the site. One advantage of excavators is that operators can use them for other activities such as general construction when the machines are not being used for forestry work.

Some smaller, rubber-tired skidders like the Turboforest TF-42C, and winches mounted on farm tractors (such as the Turboforest MT-60 winch), have been developed for increased skidding efficiency in the smaller forested areas.

Other interesting machines reviewed in the course of this project were the self-propelled whole-tree chippers. Morbark makes the *Mountain Goat* that can chip trees up to 18 to 24 inches in diameter at the stump, and Bandit Industries' *Track Bandit* will chip trees around 19 inches, but these units are very large. For this reason they are not practical for the small acreages and tight spaces envisioned in this project.

Equipment for Steep Slopes

Small cable yarders like the Bitterroot Mini Yarder or Koller K300-series yarder can be used for small-area forestry projects on steep ground. If the cable-yarding machines with towers are used, yarding corridors will be needed. Prebunching can increase efficiency. Excavators can be used for prebunching on milder slopes and may even be modified with cable drums to be used as small yarders. Excavators can also be rigged for "tong" throwing in small clearcut areas. Jewel Manufacturing

in Oregon (Ph: (503) 230-0456) is one company that specializes in modifying excavators for cable yarding and tong throwing. These tasks usually require at least a 200-series excavator. Mono-cable yarders do not require long, straight yarding corridors, but may not be suitable for the steepest slopes.

Although machines like the Timbco with a self-leveling cab and the Keyser Spyder can work on steeper slopes, they are expensive to purchase and operate, can cause stand damage due to slippage on steep slopes, and must be carried on a lowboy, increasing transportation costs.

All-Terrain Vehicles (ATV's)

The widespread use of ATV's for recreation and forest operations appears to make them candidates for small-area forestry operations. Their low cost and their ability to be light on the land meet some of the criteria in this report. They

are being used in small-area forestry for such activities as cargo transporting, transportation, and skidding.

Several companies are manufacturing or selling small log-skidding arches for use with ATV's. For information on this type of equipment, contact the manufacturer directly. Manufacturers and addresses include:


Manual winch—
Future Forestry Products, Inc.
P.O. Box 1083
Willamina, OR 97396

Self-loading sled, mini-skidder, and skidding cones—
Nova Sylva
1587 Denault Street
Sherbrooke, QC Canada J1H2R1
Ph: (819) 821-4617
Fax: (819) 821-4671

Skidmate—
Forestry Suppliers, Inc.
P.O. Box 8397
Jackson, MS 39284-8397
Ph: 800-647-5368; Fax: 800-543-4203
Web site: http://www.forestry_suppliers.com

For information on the Lipke Arch (uses electric winch)—
USDA FS, Scott River Ranger District
Attn: Jim Lipke
11263 North Highway 3
Fort Jones, CA 96032
Ph: (530) 468-1242
Fax: (530) 468-1290


We have not found any OSHA-approved ATV structures to protect the operator from rollovers and falling objects. For logging activities such as skidding, the lack of these structures could be viewed as a violation of State and/or Federal OSHA regulations (when an employer-employee relationship exists).

The Swedish University of Agricultural Sciences, Faculty of Forestry, has published a report on the use of ATV's in forestry, *ATVs in Forestry: Risk of Accidents, Ergonomic Problems, and Possible Solutions* (Research Notes No. 283, SRN SLU-ST-UPPRLT-283-SE, ISSN 0282-2377). Appendix A lists several articles that discuss skidding operations with ATV's. 



Operators should be properly trained to operate the equipment they will be using. All employees engaged in these activities shall be trained in safe working procedures and hazard recognition. Only qualified operators shall be permitted to operate equipment. Where required, operators

shall have a valid State driver's license with the applicable endorsements for the machinery they will be operating. Supervisors and employees jointly have the responsibility to complete and review a job hazard analysis (JHA) for their projects and equipment. The JHA shall specifically address safe working prac-

tices for employees who work near mechanized equipment. Work should comply with all State and Federal OSHA regulations. All work should be conducted within the manufacturer's operating guidelines. This includes maximum load and weight-distribution specifications. 



Task-Based Equipment Recommendations

The table below lists various tasks and the small equipment available to perform them. Steep slopes,

tree diameters, tree spacing, and other variables are important to consider when selecting the best equipment to

address your needs. Appendixes B and C have specifications and sources for the equipment listed below.

Small-Area-Forestry Tasks and Equipment to Use When:

The site is on tractor ground (flat to 35-percent slope), and the harvesting that is accomplished using ground-based equipment has been completed. When the site is a small clearcut, a larger excavator (like the 200 series) with multiple attachments should be considered.

TASK	EQUIPMENT TO USE
Move Wood Products to Landing _____	Skid with Posi-Track (ASV) with grapple Skid with small cat Skid with Sweco 480 (with log arch) Skid with Bobcat (limited to relatively flat ground) Turboforest TF-42C miniskidder Trackmaster 85 Skid with Iron Horse or Wood Dog Mono-cable yarder Skid with Modulaire and grapple; remote control (concept)
Brush Disposal _____	Small excavator with brushing head Posi-Track (ASV) with brushing head Delta DT200 Bobcat with brushing attachment (flat ground) Small articulated tractor with drum shredder Gyro-Trac ROWMEC Sweco 480 with brushing head (concept) Modulaire with slashing head (concept) Brush saws and piling Chain saws and piling Herbicides and burning
Precommercial Thinning _____	Small excavator with tree shear, feller-buncher, or processor Posi-Track (ASV) with tree shear, feller-buncher, or processor Bobcat (tracked) with tree shear, feller-buncher, or processor (relatively flat ground) Small articulated tractor with drum shredder Sweco 480 with tree shear (concept) Modulaire with or tree shear (concept) Brush saws Chain saws
Slash Piling _____	Small excavator with clam bucket, rake, or grapple (over 35-percent slope) Posi-Track (ASV) or Trackmaster 85 with stacking forks Bobcat (tracked) with stacking forks (relatively flat ground) Modulaire with arm and grapple (concept) Small cat with brush rake
Chipping in Unit _____	Towed portable chipper Sweco 480 with chipper
Chipping on Landing _____	Commercial chipper
Site Preparation _____	Hawk Power Scalper FERIC excavator scarification rake

Small-Area-Forestry Tasks and Equipment to Use When:

There are small partial cuts, the ground is steeper than 50 percent, and harvest has been completed.

TASK	EQUIPMENT TO USE
Move Wood Products to Landing _____	Bitterroot Mini Yarder Mono-cable yarder Koller K300-series yarder Excavator with double drum winch modification Small jammer with tongs (clearcut) Modulaire with grapple and safety line (concept) Wood Dog with safety line (concept)
Brush Disposal _____	Brush saws Chain saws Herbicides and burn
Precommercial Thinning _____	Brush saws Chain saws Hawk Power Scalper (concept)
Slash Piling _____	In-unit winches for concentrating Hand piling (leave or burn) Cable up to landing and pile or burn there Modulaire with arm and rake with safety line (concept)
Chipping _____	Cable yard up to landing and chip (or burn) there
Site Preparation _____	Hawk Power Scalper



Prescribed fire is a popular alternative to mechanically treating slash and brush on steep slopes.



Conclusions

❑ None of the commercial machines identified in this report met all of the criteria listed for the ideal prime mover.

❑ Numerous machines on the market are capable of removing trees or the

biomass from small openings in forested areas. Such machines are currently being used by contractors across the United States and in other countries. New equipment is continually being developed.

❑ The use of excavators is common. This versatile machine is a valuable platform for developing accessories that can be used in small forested areas. ☺



Appendix A—Useful Forestry Equipment Publications

Forest Service T&D Reports

Year	Document Number	Title
1978	7824-1203-SDTDC	Field Equipment for Precommercial Thinning and Slash Treatment
1984	8424-1203-SDTDC	Update Field Equipment for Precommercial Thinning and Slash Treatment
1991	9124-1201-SDTDC	Update Field Equipment for Precommercial Thinning and Slash Treatment
1992	9224-1501-SDTDC	Smallwood Equipment Catalog
1993	9324-2837-MTDC	Reforestation Equipment
1993	9324-2804-MTDC	Site Preparation Equipment for Steep Slopes
1996	9623-1207-SDTDC	Mechanized Trail Equipment
1996	9624-2842-MTDC	Hawk Scarifier
1997	9724-2826-MTDC	Reforestation and Nurseries
1998	9824-2336-MTDC	Hawk Power Scalper

Canadian Reports

Harvesting Systems and Equipment in British Columbia. A.J. MacDonald. Handbook No. HB-12. Forest Engineering Research Institute of Canada (FERIC), B.C. Ministry of Forests, British Columbia, Canada. 1999.

All-Terrain Vehicles (ATV's) For Forestry Work. J. Dunnigan, L. Beauliel, and M.P. Folkema. Woodlot Technology Technical Note TH-109. Forest Engineering Research Institute of Canada (FERIC), Quebec, Canada. November 1987.

Self-Loading Sled For Skidding Long Lengths With an ATV (Prototype). Jean Dunnigan. Field Note No: Skidding/

Forwarding-21. Forest Engineering Research Institute of Canada (FERIC), Quebec, Canada. June 1992.

Handbook: Using An All-Terrain Vehicle To Produce Long-Length Logs. Pierre Cardorette. Office des Producteurs de Bois de la Region de Quebec (OPBRQ) and Forest Engineering Research Institute of Canada (FERIC), Quebec, Canada. 1995.

The "Yeti" and the "Ideal Traction": ATV Attachments for Winter Forwarding on Small Woodlots. Jean Dunningan. Field Note No: Skidding Forwarding-5. Forest Engineering Research Institute of Canada (FERIC), Quebec, Canada. June 1988.

Compendium of Commercial Thinning Operations and Equipment in Western Canada, compiled by Janet L. Mitchell, R.P.F., and I.B. Hedin, R.P.F., M.F., Forest Engineering Research Institute of Canada, Western Division, December 1995.

Small Scale Woodlot Equipment, a compilation sponsored by the Maritime Woodlot Extension Committee, Nova Scotia Dept. of Natural Resources in Halifax, N.S.; Dept. of Natural Resources and Energy, Fredericton, N.B.; and Dept. of Agriculture, Fisheries and Forestry, Charlottetown, P.E.I., 1996.

Trade Magazines

Timber Harvesting, January issue (Products/services/supplies index)
P.O. Box 2268
Montgomery, AL 36102-2268
Phone: (334) 834-1170
Fax: (334) 834-4225

Canadian Forest Industries
1 Pacifique
Ste-Anne-De Bellevue, Quebec H9X 1C5
Phone: (514) 457-2211
Fax: (541) 457-2558
E-mail: jcft@aei.ca

Timber West, June issue (Buyer's guide and directory)
P.O. Box 610
Edmonds, WA 98020-0610
Phone: (425) 778-3388
Fax: (425) 771-3623

Web Sites

Forest Engineering Research Institute of Canada
<http://www.feric.ca>

Forest Industry Network
<http://www.forestind.com>

Logging and Sawmilling Journal
<http://www.forestnet.com>



Appendix B—Small Mechanized Equipment

I N D E X	
(Prices subject to change)	
Nonriding Utility Vehicle, Jonsered Iron Horse _____	14
Nonriding Utility Vehicle, Wood Dog (Radio Controlled) _____	14
Nonriding Utility Vehicle, Modulaire (Radio Controlled) _____	15
Utility Vehicle, Gyro-Trac Messek 10,000-lb Carrier _____	15
Skid-Steer-Type Vehicle, ASV Posi-Track _____	16
Skid-Steer-Type Vehicle, Trackmaster _____	16
Skid-Steer-Type Vehicle, Melroe Bobcat _____	17
Skid-Steer-Type Vehicle, Delta Multi-Task _____	17
Excavator, Bobcat _____	18
Excavator, Hitachi _____	18
Small Dozer, Sweco Trail Dozer _____	19
Tracked Brush Cutter, Gyro-Trac _____	19
Tracked Brush Cutter, ROWMEC R.O.W. King Mower _____	20
Feller-Buncher, Hydro-Ax Tri-Wheel _____	20
Feller-Buncher, Bell Tracked Slewboom _____	21
Low-Impact Skidder, Turboforest _____	21
Low-Impact Skidder, KMC Track _____	22
Small Yarder, Bitterroot Mini Yarder _____	22
Small Yarder, Clearwater _____	23
Small Yarder, Koller Cable _____	23
Small Yarder, Miller Mono-Cable _____	24
Small Yarder, Howe-Line Mono-Cable _____	24



Nonriding Utility Vehicle
Jonesred Iron Horse

Models:

125 S, 125-PWW, and 129-PWW

Distributor:

Tilton Equipment Company
 P.O. Box 68, Lafayette Road
 Rye, NH 03870
 Phone: 800-447-1152 or (603) 964-6560
 Fax: 800-545-1163
 E-mail: tilton@nh.ultranet.com

Purchase Price:

\$6,895; \$9,240; \$10,459
 (Prices may vary by region.)



Jonesred Iron Horse with winch and timber cart.

Status: In production

Prime mover: Iron Horse is a prime mover.

Engine power: 5.4 hp (125 S, 125-PWW) and 8.9 hp (129-PWW)

Gas or diesel: Gas, 4-cycle

Transmission: Variator via centrifugal clutch and V-belt

Width: 42.5 inches (108 cm)

Length: 110.25 in (280 cm)

Height: 42 inches, 50 inches, and 68 inches (with fairlead)

Ground clearance: 10 inches, 8.5 inches (with deck)

Weight: 727.5 lb (330 kg); 926 lb (420 kg)

Ground pressure: 2.5 psi (w/1,000-lb load)

Track: Rubber (two)

Track width: 15 inches

Track options: Spike kit

Hydraulic pressure: (minimum) 1,980- to 3,230-psi auxiliary circuit

Flow: 3.4- to 5.5-gpm auxiliary circuit. Flow rate varies relative to engine and hydraulic

pump. All models can be equipped with external hydraulics as an option.

Dedicated attachments: Manual or powered winch; Self-unloading timber cart that can be fitted with skids for winter operation; Timber cart that can be fitted with skids for winter operation; Loader (designed for use with winch); Lattice cart; Tipper platform; Combi platform.

Nonriding Utility Vehicle
Wood Dog
(Radio Controlled)

Manufacturer:

Isothermal Systems Research (ISR)
 511 3rd Street
 Clarkston WA 99403
 Phone: (509) 758-2613
 Fax: (509) 758-1280
 E-mail: wbeasley@spraycool.com

Purchase Price: \$25,000



Wood Dog.

Status: Ready for production

Prime mover: Wood Dog is a prime mover.

Engine power: 23 hp

Gas or diesel: Gas, 2-cycle

Transmission: Hydrostatic

Width: 46 inches

Length: 6 ft

Height: 4 ft

Ground clearance: 9 inches

Weight: 1200 lb

Ground pressure: ½ psi empty; 3 psi with 4,000-lb load

Turning Radius: Zero

Slope limitations: Empty: sidehill 45°, forward uphill 60°, forward downhill 50°, traction dependent. Loaded: load dependent.

Track width: 15 inches

Track options: Bolt-on rock or ice cleats

Hydraulic pressure: (minimum) 1,500 psi,

auxiliary circuit

Flow: 4 gpm, auxiliary circuit

Radio control distance: 300 ft

Drawbar pull: 4,000 lb

Dedicated attachments: Three designs of fireline trenchers are under development: Chain flail trencher, rotary disk plow trencher, combination chain flail/rotary disk trencher. Contact manufacturer for information on other attachments.

**Nonriding Utility Vehicle
Modulaire**

Model: RT-20

Distributor:
Il-Tracker, Inc.
P.O. Box 606
Portland, OR 97207
Phone: (503) 292-8682
Fax: (503) 292-8697

Purchase Price:
Contact dealer for latest price and model updates.



Modulaire remote-controlled vehicle.

Status: In production
Prime mover: Modulaire is a prime mover.
Engine power: 60-hp Kubota 2800 S
Gas or diesel: Diesel
Transmission: Hydrostatic
Width: 64 in (1620 mm)
Length: 87 in (2200 mm)

Height: 32 to 42 inches (800 to 1060 mm)
Ground clearance: 5.5 to 16 inches (140 to 400 mm)
Weight: 2,650 lb (1200 kg)
Track: Rubber (two)
Track width: 12.5 inches (320 mm)
Forward speed: 8 mph (12 kmh)

Hydraulic pressure: (minimum) 3,000 psi, auxiliary circuit
Flow: 34 gpm, auxiliary circuit
Attachments and Implements: Contact manufacturer for information on other attachments.

**Utility Vehicle
Gyro-Trac Messek
10,000-lb Carrier**

U.S. Sales Office:
Gyro-Trac, Inc.
603 Fairington Drive
Summerville SC. 29485
Phone: 888-490-8722 or (843) 821-1588
Fax: (843) 821-1587
E-mail: gyrotrac@gyrotrac.com
Web site: <http://www.gyrotrac.com>

Purchase Price: \$89,000 (U.S.)



Gyro-Trac Messek 10,000-lb carrier.

Status: In production
Prime mover: Messek Carrier is the prime mover.
Engine power: 122 hp
Gas or diesel: Diesel
Transmission: Hydrostatic
Width: 89 inches
Length: 157 inches

Height: 96 inches
Ground clearance: 28 inches
Weight: 10,690 lb
Load capacity: 10,000 lb
Ground pressure: 1.3 psi
Turning Radius: Zero
Speed: 0 to 7 mph
Tracks: Two rubber, with steel cross links

Track width: 28 inches
Hydraulic pressure: Information not supplied by the manufacturer.
Flow: Information not supplied by the manufacturer.
Attachments: Brush hog, skidder, boom cutter, backhoe, aerial lift, chemical sprayer, and dump body.

Skid-Steer-Type Vehicle
ASV Posi-Track

Models: 4810; 2810; 2800 (MD-70 on special order; contact manufacturer for specs; no sealed undercarriage); HD-4520 and 4500 discontinued.

Manufacturer:
 ASV, Inc.
 P.O. Box 5160, 840 Lily Lane
 Grand Rapids, MN 55744
 Phone: 800-346-5954 or (218) 327-3065
 Fax: (218) 327-2376
 E-mail: sales@asvi.com

Purchase Price:
 \$45,000 to \$55,000



ASV Posi-Track MD 2800.

Status: In production
Prime mover: ASV is a prime mover.
Engine power: 4810: 115 hp (gross), 105 hp (net); 2810: 75 hp (gross); 2800: 70 hp (gross)
Gas or diesel: Diesel
Transmission: Hydrostatic
Width: 69 inches
Length: 155 inches
Height: 82.5 inches
Ground clearance: 16 inches
Weight with loader: 4810: 8,600 lb; 2810

and 2800: 7,150 lb
Ground pressure, 18-inch track: 4810: 2.7 psi without loader; 3.0 psi with loader. 2810/2800: 2.3 psi without loader; 2.5 psi with loader.
Ground pressure, 24-inch track: 2810/2800: 1.7 psi without loader; 1.9 psi with loader.
Turning radius: Zero
Slope limitations: 33-percent grade sidehill
Track: Rubber, Kevlar-reinforced
Track width: 18 inches standard; 24 inches

optional on 2810 and 2800.
High-flow auxiliary hydraulic circuit: 4810: 30 gpm at 3,200 psi; 2810/2800: 25 gpm at 2,750 psi
Low-flow auxiliary hydraulic circuit: 4810: 19 gpm at 2,950 psi; 2810/2800: 19 gpm at 2,750 psi
Top speed: 4810: 6 mph; 2810/2800: 7 mph
Dedicated Attachments: ASV with Davco brush cutter; Category I three-point hitch

Skid-Steer-Type Vehicle
Trackmaster

Model: Trackmaster 85

Manufacturer:
 LMC Corporation
 1080 North Main Street
 Brigham City, UT 84302
 Phone: (435) 734-3500
 Fax: (435) 734-2332

Purchase Price: \$42,900



Trackmaster 85.

Status: In production
Prime mover: Trackmaster is a prime mover.
Engine power: 88.5 brake horsepower
Gas or diesel: Diesel
Transmission: Hydrostatic
Width: 5 ft 5 inches
Length: 13 ft 2 inches
Height: 6 ft 7 inches

Ground Pressure: 1.9 psi with loader arms and bucket
Weight: 7,000 lb
Ground pressure: Not available
Track: Two rubber on steel
Track width: 18 inches each
Hydraulic pressure: Maximum working pressure 2,500 psi; PTO/HiFlow maximum working pressure 3,000 psi

Flow: Hydraulic pump capacity 16 gpm; PTO/HiFlow 30 gpm
Maximum travel speed: 7.2 mph
Slope limitation: 30°
Attachments: PTO; Category I three-point hitch. Contact manufacturer for information on other attachments. Universal tool plate will allow use of most skid steer attachments.

Skid-Steer-Type Vehicle
Melroe Bobcat

Models: Bobcat 763H, 863H
 (Other models and sizes available)

Manufacturer:
 Melroe Company
 P.O. Box 6019
 Fargo, ND 58108-6019
 Phone: (701) 241-8705
 Fax: (701) 241-8779
 Web site: <http://www.bobcat.com>

Purchase Price: 763H with bucket:
 \$22,450; 863H with bucket: \$28,400

Safety Note: Skid steers are best suited for operation on flat ground.



Bobcat skid steer Model 863 with bucket.

Status: In production
Prime mover: Both models are prime movers.
Engine power: 763H: 46 hp; 863H: 73.5 hp
Gas or diesel: Diesel
Transmission: Hydrostatic
Width: 763H: 60 or 66 inches; 863H: 66 or 72 inches
Length: 763H: 101.8 inches; 863H: 107.4 inches
Height: 763H: 7.5 inches; 863H: 8.5 inches
Ground clearance: Varies with tire and track options.

Weight: 763H: 5408 lb; 863H: 7180 lb
Ground pressure: Varies
Loader arm lift: (radius lift) 763H: 114.5 inches to hinge lift; 863H: 121.0 inches to hinge lift
Turning Radius: Zero
Tracks: Available as an option
Track width: Varies
Track options: Rubber or steel
PSI with different tracks: Varies
Wheels: 763H: 10-16.5 or 31 x 15.5 Ultra Grip tires; 863H: 12-16.5 or 31 x 15.5 Ultra Grip tires

Hydraulic pressure: 763H: 3,000 to 3,050 psi auxiliary circuit; 863H: 3,000 psi auxiliary circuit
Flow: 763H: 25-gpm, auxiliary circuit; 863H: 28-gpm, auxiliary circuit
Dedicated attachments: Rotary cutter (Appendix C)
Note: The Bobcat skid steer is listed as a representative example of other skid-steer machines that are made by companies such as Case, New Holland, GEHL, Mustang, and others.

Skid-Steer-Type Vehicle
Delta Multi-Task

Model: Delta DT-200 skid steer

Distributor:
 FECON, Inc.
 10350 Evendale Drive
 Cincinnati, OH 45241
 Phone: (513) 956-5700 or 800-528-3113
 Fax: (513) 956-5701
 Web site: <http://www.fecon.com>

Purchase Price: \$130,000 to \$150,000



Delta DT-200 skid steer.

Status: In production
Cutting head mechanism: Rotating drum
Cutters: Carbide tipped, fixed tooth
Cutting width: 56 inches
Maximum material size: Eight to 10 inches is the practical cutting size; rated for 6-inch diameter, continuous.
Type drive: Hydraulic
Rotation speed: 1700- to 2000-rpm cutter head
Prime mover: Mower is mounted onto a

skid steer as a fixed unit.
Engine power: 204 hp gross; 195 hp net
Gas or diesel: Diesel
Transmission: Hydrostatic
Width: 70 inches
Length: 150 inches
Height: 90 inches
Ground clearance: 8 inches
Weight: 8,700 lb
Ground pressure: 5.3 psi
Slope limitations: 45° up or down; 40°

side bank
Track width: 20 inches
Wheels: 15 inches with rubber-track system
Hydraulic pressure: 5200 psi peak; 3800 psi continuous to head primary circuit
Flow: 65-gpm mower pump; 30-gpm auxiliary circuit can be diverted or shared with loader arms.
Potential uses: Clear undergrowth, brush, stumps, root balls, and shred whole trees.

Excavator
Bobcat

Model: Bobcat makes several models of excavators. The mini 300-series excavators seem best suited for small-area forestry applications.

Manufacturer:
Melroe Company
P.O. Box 6019
Fargo, ND 58108-6019
Phone: (701) 241-8705
Fax: (701) 241-8779
Web site: <http://www.bobcat.com>

Purchase Price: \$25,000 to \$58,000



Bobcat X337 excavator.

Status: In production
Prime mover: Bobcat Excavators are prime movers.
Engine power: 15.7 to 46 hp
Gas or diesel: Diesel
Transmission: Hydrostatic
Width with bucket: 39 to 74.8 inches
Length with bucket: 151.59 to 218.9 inches; 97.2 to 153.6 inches

Reach on boom: 149.5 to 242.3 inches maximum digging reach at ground level
Height: 88.34 to 99.4 inches
Weight: 3,180 to 11,300 lb
Ground pressure: 3.38 to 4.49 psi
Track: Rubber or steel
Track width: Varies
Track options: Rubber or steel
Hydraulic pump capacity: 2,500 to 3,000

psi, auxiliary circuit.
Flow: Excavators: 7.9 to 20 gpm, auxiliary circuit.
Attachments: Contact manufacturer for full line of attachments.
Note: These machines are only a small sample of mini-excavators. Other manufacturers have similar models.

Excavator
Hitachi

Model: The Hitachi EX-160-V is shown to represent smaller excavators.

Manufacturer:
Hitachi Construction Machinery Corp.
20411 Imperial Valley Drive
Houston, Texas 77073
Phone: (281) 821-2400
Fax: (281) 821-0981

Purchase Price: \$151,700 (U.S.)



Hitachi EX-160-V excavator.

Status: In production
Prime mover: EX-160-V is a prime mover.
Engine power: 99 hp
Gas or diesel: Diesel
Transmission: Hydrostatic
Width: 8 ft 10 inches with 28-inch-wide tracks
Length: 28 ft
Height: 9 ft 2 inches to top of cab
Ground clearance: 18 inches

Weight: 33,960 lb
Ground pressure: 5.4 psi
Boom length: 16 ft 9 in
Boom arms: 16 ft 9 inches; 6 ft 7 inches; 8 ft 6 inches; 10 ft 2 inches
Boom reach: 6 ft 7 inches to 26 ft 10 inches; 8 ft 6 inches to 28 ft 7 inches; 10 ft 2 inches to 30 ft 1 inch.
Turning Radius: 9 ft 7 inches
Tracks: Two

Track width: 28-inch shoes
Track options: Shoes: 20, 24, 28, and 30 inches (psi varies with different tracks)
Hydraulic pressure: Main relief: 4,977 psi
Flow: Main circuit operates two pumps, 33.2 gal per pump.
Attachments: Most excavator attachments will fit the Hitachi EX-160-V.