

# 1.0 Cone Harvesting



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Cones are collected for their seed, which is both fragile and perishable. Therefore, cone harvesting must be carefully planned and executed to insure high quality seed. Harvesting methods generally are dictated by tree species, terrain, and timing. During the entire harvesting process, it is imperative to insure that individual seed lots are properly identified.

Several methods are used for cone harvesting. Cones may be gathered manually or with cone collection equipment after they have fallen or have been dislodged from trees and before the cones have opened. Cones may be dislodged with poles, pole saws, hooks, and tree shakers. Catching frames may be used to facilitate cone gathering.

Cones may be picked directly from the tree. Tree climbing equipment such as climbing irons (spurs), ladders, and tree bicycles are commonly used. Lifting devices such as mobile aerial towers and ladders are also used when economically and physically expedient.

Trees may be felled and the cones gathered manually. Seeds that have already dispersed from the trees may be gathered directly from the ground with a vacuum seed harvester or with a net retrieval system. These specialized methods are used in seed orchards on certain species.

Once harvested, cones must be treated carefully. The main consideration during cone handling and storage is to insure that cones do not become over-heated. Cones should be placed in porous sacks or other containers that leave enough room for expansion. A good rule of thumb is to only place 1 bushel of cones in a 2-bushel capacity sack. The use of forklifts or conveyers speeds up the handling process at the extractory.

Loose cones or sacks of cones are usually stored on trays or racks, both before and after delivery to an extractory. Cones should be kept cool and dry with ample air movement; if cones are stored in a poorly ventilated area, the use of fans to expedite air movement is recommended. The main consideration is to insure that cones do not heat. Cones that are moist provide an ideal environment for damaging mold. So, cool, dry, well-ventilated storage is essential.

# 1.1 Cone Collection



Manual cone collection generally requires the collector to get up to the top one third of the crown of the tree. This may be done with a variety of devices— ladders, tree grippers, and various types of tree climbing gear. Once in the tree top, the collectors will need equipment such as poles, polesaws, and hooks to safely assist in the removal of the cones from the tree.

On relatively flat ground and in seed orchards, aerial lifting equipment is often utilized. Ground collection systems are also used in seed orchard collection schemes.

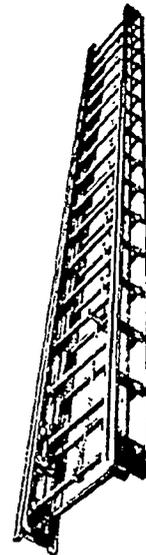
## Climbing Equipment

Climbing equipment is used by individuals to scale trees and pick cones. The equipment includes ladders, grippers, steps, irons, and various other support systems. Poles, saws, and hooks are carried by climbers to dislodge cones. Climbing equipment is most frequently used in wildland seed harvesting.

## Ladders

Both one-piece and extension ladders may be used in harvesting cones. Some ladders have siderails and top shelves, others can be converted from a one-piece to an extension ladder. Ladders are generally made of aluminum or a lightweight alloy. Weight-to-height ratios limit their use to short trees.

Ladders are locally available at hardware and paint stores or can be ordered from general forestry suppliers.



### Ladders:

Aluminum Ladder Co.  
P.O. Box 5329, Dept. LS  
Florence, SC 29502  
(803) 662-2595

A.M. Leonard, Inc.  
P.O. Box 816  
6665 Spiker Rd.  
Piqua, OH 45356-0816  
(513) 773-2694

Bishop Ladder Co., Inc.  
1400 Park St.  
Hartford, CT 06106  
(203) 951-3246

Forestry Suppliers, Inc.  
P.O. Box 8397  
205 W Rankin St.  
Jackson, MS 39284-8397  
(800) 647-5368

Louisville Ladder Co.  
1163 Algonquin Parkway  
Louisville, KY 40208  
(502) 636-2811

Patent Scaffolding Co.  
One Bridge Plaza  
Dept. TR  
Fort Lee, NJ 07024  
(201) 461-8700

R.D. Werner Co., Inc.  
P. O. Box 580  
Greenville, PA 16125  
(412) 588-8600

Sauze Technical Products Corp.  
212 Oak St. Ext.  
Plattsburgh, NY 12901  
(518) 561-6440

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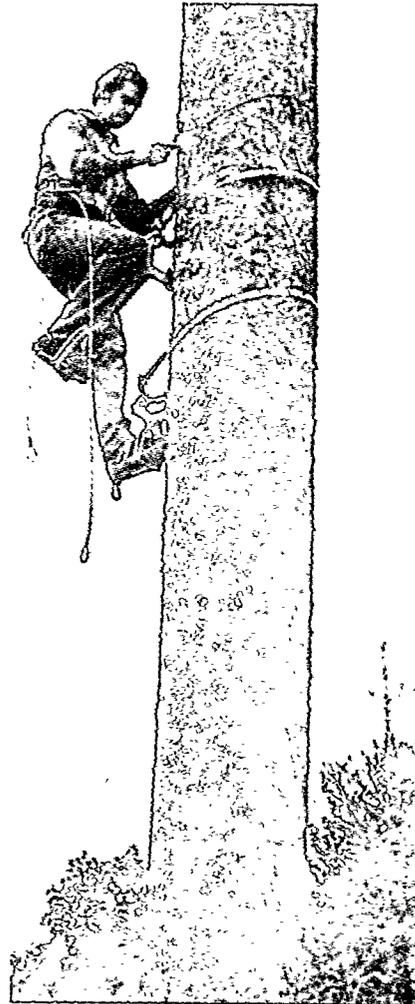
## Tree Climbing Ladders

Sectional tree climbing ladders consist of 10-foot aluminum ladder sections that lock together and are chained against the tree. Any heights may be climbed if enough ladder sections are available. Sections shorter or longer than the standard 10-foot sections can be custom made.



## Swiss Tree Grippers (Tree Bicycles)

A tree bicycle (Swiss tree gripper) is an apparatus that allows a climber to walk up or down a tree with both hands free. It consists of a foot pad, stirrups, and steel bands that wrap around a tree and it is effective for climbing trees up to 26 inches in diameter. The bicycle may be removed while the climber is in the tree and is effective in all terrain.



### Tree Climbing Ladders:

Ben Meadows Co.  
P.O. Box 80549  
Atlanta (Chamblee), GA 30366  
(800) 241-6401

Forestry Suppliers, Inc.  
P.O. Box 8397  
205 W Rankin St.  
Jackson, MS 39284-8397  
(800) 647-5368

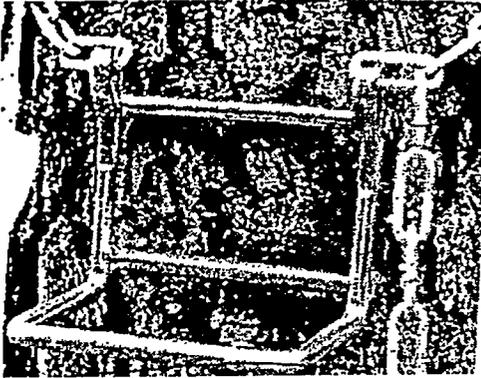
### Swiss Tree Grippers:

Ben Meadows Co.  
P.O. Box 80549  
Atlanta (Chamblee), GA 30366  
(800) 241-6401

Forestry Suppliers, Inc.  
P.O. Box 8397  
205 W Rankin St.  
Jackson, MS 39284-8397  
(800) 647-5368

## Tree Steps

Individual steps may be chained to a tree without damaging the bark. The first step is placed 6 feet from the ground, with successive steps placed 2 feet apart. Steps are tested at more than 1,000 lbs, with a load rating of 440 lbs. A safety belt should be used with the steps.



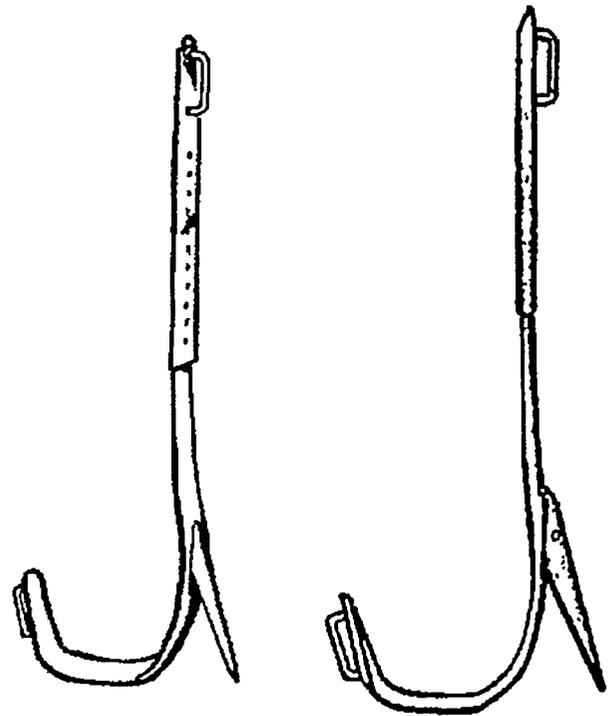
### Tree Steps:

Ben Meadows Co.  
P.O. Box 80549  
Atlanta (Chamblee), GA 30366  
(800) 241-6401

General Supply Corp.  
P.O. Box 9347  
303 Commerce Park Dr.  
Jackson, MS 39286-9347  
(601) 981-3882

## Tree Climbing Irons

Tree climbing irons (spurs) are metal stirrups welded to gaffs, long enough for a secure grip in the bark, without causing excessive bark damage. Gaffs 1 to 3 inches long are available for rough bark. The length of leg shanks is adjustable for fit, from 15 inches to 19 inches. Leather harnesses circle the leg at the ankle and leg, with leg padding available on special order. Trees of all sizes in all types of terrain may be scaled with climbing irons. A belt with safety straps is recommended.



### Tree Climbing Irons:

Bartlett Mfg. Co.  
3003 E Grand Blvd.  
Detroit, MI 48202  
(313) 873-7300

A.M. Leonard, Inc.  
P.O. Box 816  
6665 Spiker Rd.  
Piqua, OH 45356-0816  
(513) 773-2694

Ben Meadows Co.  
P.O. Box 80549  
Atlanta (Chamblee), GA 30366  
(800) 241-6401

Nasco  
901 Janesville Ave.  
Fort Atkinson, WI 58538  
(414) 563-2446

Forestry Suppliers, Inc.  
P.O. Box 8397  
205 W Rankin St.  
Jackson, MS 39284-8397  
(800) 647-5368

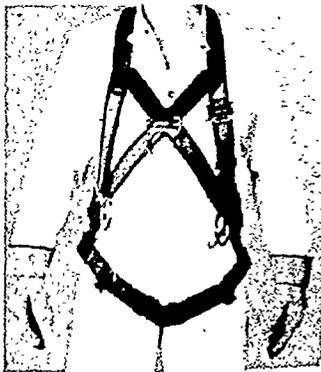
Sauze Technical Products Corp.  
212 Oak St. Ext.  
Plattsburgh, NY 12901  
(518) 561-6440

## Tree Climbing Support

Safety saddles for climbing consist of belts of strong cotton or nylon strapping, normally 1-3/4 to 3 inches wide, with some belts up to 5 inches wide. The belts are reinforced with web padding or leather straps. For support, "D" rings are attached to the belt. Two "D" rings allow suspension by an overhead line, while four rings allow an additional safety strap around a tree. These are useful when topping trees or finding temporary anchorage. The "D" rings are made of drop-forged steel. Most belts provide a positioning belt (slope belt) for support, while others use leg loops. For extra support, some belts have both. Some saddles also have extra-wide belts for back support. Belts are fastened with tongue buckles that have holes reinforced with brass grommets. Some belts come with a tool belt snap and "O" rings for tools. Saddles come in small, medium, and large. Whole or partial-body harnesses are attached to the overhead line by back waist "D" rings.

Belts are similar to saddle belts in construction and width. Belts have two "D" rings for support.

Nylon suspension ropes with snap-hooks are available. Lanyards are available in 6-foot lengths.



## Sky Genie Tree Climber System

This integrated system is used for precision-controlled descent needed when working away from the tree's bole. The climber controls descent by providing friction to the mechanism. The unit comes with nylon line and permanent loops, descent control mechanism, tree climber harness, one crotch lanyard, one snap ring, and carrying case with instructions. Kits are available for trees from 75 feet to 175 feet.



### Tree Climbing Support:

Bartlett Mfg. Co.  
3003 E Grand Blvd.  
Detroit, MI 48202  
(313) 873-7300

Ben Meadows Co.  
P.O. Box 80549  
Atlanta (Chamblee), GA 30366  
(800) 241-6401

Forestry Suppliers, Inc.  
P.O. Box 8397  
205 W Rankin St.  
Jackson, MS 39284-8397  
(800) 647-5368

A.M. Leonard, Inc.  
P.O. Box 816  
6665 Spiker Rd.  
Piqua, OH 45356-0816  
(513) 773-2694

Sanderson Safety Supply Co.  
800 SE Hawthorne Blvd.  
Portland, OR 97214  
(503) 238-5700

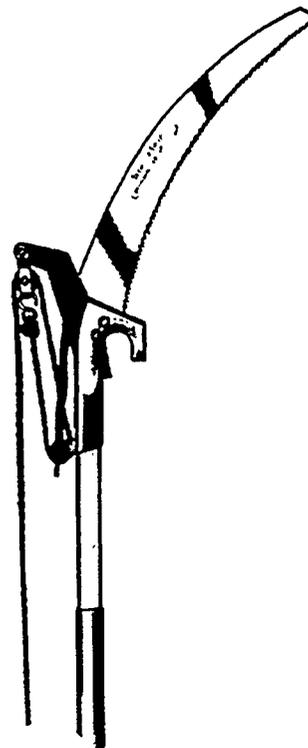
Sauze Technical Products Corp.  
212 Oak St. Ext.  
Plattsburgh, NY 12901  
(518) 561-6440

### Sky Genie Tree Climber System:

Forestry Suppliers, Inc.  
P.O. Box 8397  
205 W Rankin St.  
Jackson, MS 39284-8397  
(800) 647-5368

## Poles, Pole Saws, and Hooks

Lightweight, rigid poles with pruners, saws, or hooks may be used to dislodge cones from trees. Most poles are made of aluminum, plastic, fiberglass, or lightweight alloy. They are available in many lengths, but are difficult to use on tall trees and fatiguing to use for extended periods.



<p><b>Poles, Pole Saws, and Hooks:</b></p> <p>American Standard Co. P.O. Box 325 Plantsville, CT 06479 (203) 628-9643</p> <p>Azel Corp. 2121 S. Susan St. E Santa Anna, CA 92704 (714) 557-6426</p> <p>Bartlett Mfg. Co. 3005-T E Grand Blvd. Detroit, MI 48202 (313) 873-7300</p> <p>Ben Meadows Co. P.O. Box 80549 Atlanta (Chamblee), GA 30366 (800) 241-6401</p> <p>Canadian Forestry Equipment, Ltd. 90 E. Boul. Brunswick Blvd. D.D.O., Quebec Canada H9B 2T5 (403) 484-2447</p>	<p>Corona Clipper Co. P.O. Box 1388 1540 E Sixth St. Corona, CA 91718-1388 (714) 737-6515</p> <p>Fairmont Hydraulics 415 N Main Fairmont, MN 56031 (507) 238-4357</p> <p>Forestry Suppliers, Inc. P.O. Box 8397 205 W Rankin St. Jackson, MS 39284-8397 (800) 647-5368</p> <p>General Supply Corp. P.O. Box 9347 303 Commerce Park Dr. Jackson, MS 39286-9347 (601) 981-3382</p> <p>Gilmour American Std. Co. P.O. Box 325 Plantsville, CT 06479 (203) 628-9643</p>	<p>Hickok, Inc. P.O. Box 2091 Wenatchee, WA 98807 (509) 662-6065</p> <p>Lannen Tehtaat Oy Plant Systems Div. SF-27820 Iso-Vimma (Sakyla) Finland (938) 70-300</p> <p>Nasco 901 Janesville Ave. Ft. Atkinson, WI 58538 (414) 563-2446</p> <p>Porter-Ferguson, Inc. 321 Newbury St. Danvers, MA 01923 (508) 774-1629</p> <p>Sauze Technical Products Corp. 212 Oak St. Ext. Plattsburgh, NY 12901 (518) 561-6440</p> <p>Seymour Smith &amp; Son, Inc. 900 Main St. Oakville, CT 06779 (203) 274-2558</p>	<p>Stanley Hydraulic Tools 3810 SE Naef Rd. Milwaukee, OR 97222 (503) 659-5660</p> <p>Timm Enterprises, Ltd. P.O. Box 157 5204 Trafalgar Rd. Oakville, Ontario, Canada L6J 4Z5 (416) 878-4244</p> <p>True Temper Hardware Div. Emhart Consumer Group P.O. Box 3500 465 Railroad Ave. Shiremanstown, PA 17011</p> <p>Uittokalusto Oy Fredrikinkatu 61, PL 455 00101 Helsinki, Finland (90) 694-2400</p> <p>Zip-Penn P.O. Box 1779 2008 E 33rd St. Erie, PA 16512 (814) 898-2008</p>
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## Collection Equipment

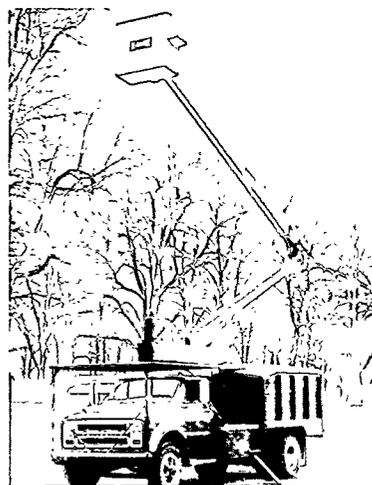
Mechanical systems such as aerial lifts, seed tree shakers, nut harvesters, and cone rakes are also used extensively to collect tree seed. These systems are normally used on easy terrain such as seed orchards.



## Mobile Aerial Lifts

Aerial lifts provide flexibility in cone harvesting or pruning on fairly level ground. An operator in the basket controls the movement. Baskets can be ordered to hold one or more operators and some baskets are insulated against electric shock. Controls are protected from accidental activation. Hydraulic outlets allow pruning loppers, chain saws, or other tools to be used on some lifts and a wide variety of hydraulic attachments are available.

Large aerial lifts are generally designed for utility work. They are mounted on trailers or trucks. Booms can rotate 360 degrees and working height ranges from 35 to 85 feet. Manufacturers offer a wide selection of models and accessories. Foot controls are offered on some models. Attachable bags can hold harvested cones, which an operator can then dump into a bin carried on the trailer.



### Aerial Lifts:

Edwards Equipment Co.  
4312 Main St.  
Yakima, WA 98903  
(509) 248-1770

Elliot Equipment Corp.  
2600 Florence Blvd.  
Omaha, NE 68110  
(402) 341-1004

Fairmont Hydraulics  
415 N Main  
Fairmont, MN 56031  
(507) 238-4357

Friday Tractor Co., Inc.  
69226 CR 687  
Hartford, MI 49057  
(616) 621-3318

Gilmour  
American Standard Co.  
P.O. Box 325  
Plantsville, CT 06479  
(203) 628-9643

Hickok, Inc.  
P.O. Box 2091  
Wenatchee, WA 98807  
(509) 662-6065

Porter-Ferguson, Inc.  
321 Newbury St.  
Danvers, MA 01923  
(508) 774-1629

H.C. Ranger, Inc.  
P.O. Box 177  
NW 22610 Bluemound Rd.  
Waukesha, WI 53187-0177  
(414) 547-1000

Reynolds Televator Corp.  
1005 W Laketon Ave.  
Muskegon, MI 49441  
(616) 722-3698

Snorkel Economy  
P.O. Box 65  
Stockyards Station  
St. Joseph, MO 64504  
(913) 989-4481

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## Tree Shakers

Tree shakers can collect cones quickly in areas accessible to vehicles and can operate on trucks up to 30 inches in diameter. If the bole is too large, the shaker can shake limbs. Cones on the ground are picked up by hand or some other means. The shaker boom reaches up to 18 feet, with some manufacturers providing booms to 21 feet on request. The boom is operated by a single control. Operators can choose between 3- and 4-wheel models. For uneven terrain, 4-wheel models are recommended.

During operation, the hydraulic boom lifts the shaker head to the correct height. To grasp the bole, the boom can rotate to the side or can tilt up or down. The shaker head grasps the tree firmly and pads on the shaker head prevent slippage or damage to bark. Some manufacturers, like Orchard Machine Corporation, make heads that shake the tree in specific patterns. Forest Service tests have found the shakers to work best by grasping the trunk high, starting to shake slowly, and then increasing shaking intensity to a sharp burst at the end.

A modified shaker for use in wildlands was developed by the Missoula Technology and Development Center. A complete description of the project can be found in the report *Wildland Cone and Seed Harvesting: Road-Side Shakers*, April 1987, USDA Forest Service, Missoula Technology and Development Center, Building 1, Fort Missoula, Missoula, MT 59801, (406) 329-3900.



### Tree Shakers:

Albany Tractor Co.  
1709A S Stappey Blvd.  
Albany, GA 31701  
(912) 432-7468

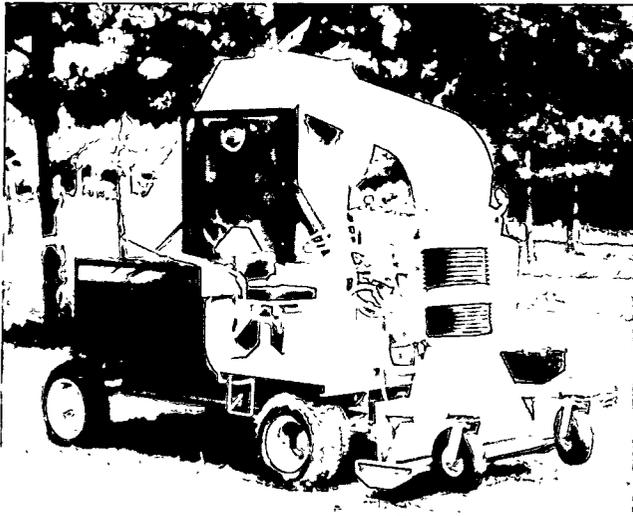
Northern Michigan Equipment Co.  
P.O. Box 1270  
Traverse City, MI 49685  
(616) 943-3700

E.D. Kilby Mfg., Co.  
286 W Evans-Reimer Rd.  
Gridley, CA 95948  
(916) 846-5625

Orchard Machinery Corp.  
2700 Colusa Highway  
Yuba City, CA 95991  
(916) 673-2822

## Vacuum Seed Collector

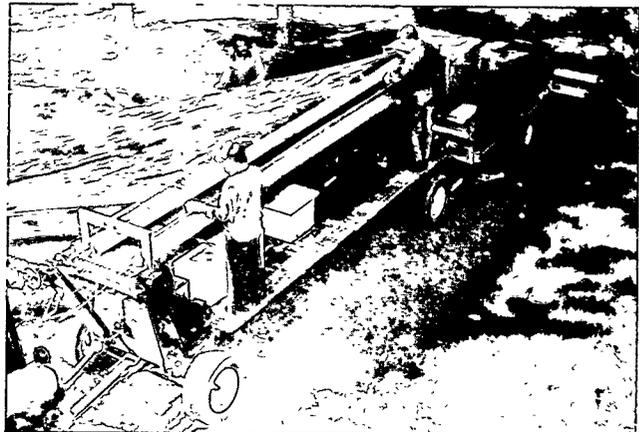
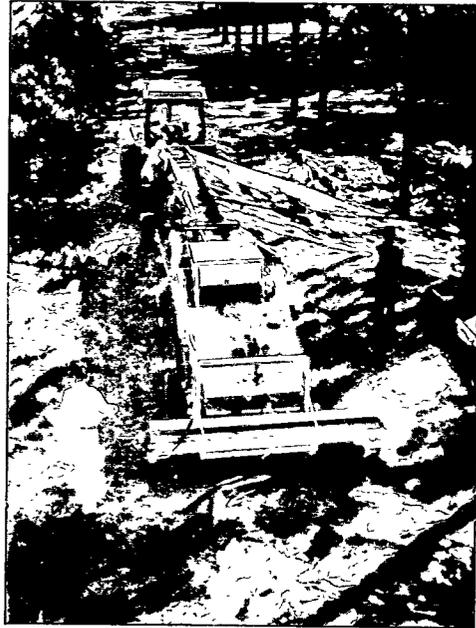
A vacuum seed collector was used in seed orchards in the South to collect Loblolly seeds. This vacuum seed collector was developed by Bowie Industries of Texas for the North Carolina State Industry Tree Improvement Cooperative. This machine has a large vacuum head that sucks up pine straw, fine dust, and seeds and drops this material into a separator system. The separator separates the tree seed and seed-sized material from the pine straw and pine dust.



## Orchard Seed Harvester

A net retrieval system for retrieving plastic netting from seed orchard floors after seeds fall and separating the seeds from the majority of the pine straw and trash was developed by MTDC engineers. This system has been used very successfully in Loblolly pine seed orchards in the southern United States.

Although, at the present time, there is no commercial source for this equipment, drawings are available. With these drawings, a local job shop can custom-build this equipment. Request drawing number MTDC-851, *Orchard Seed Harvester* from the Missoula Technology and Development Center, Building 1, Fort Missoula, Missoula, MT 59801.

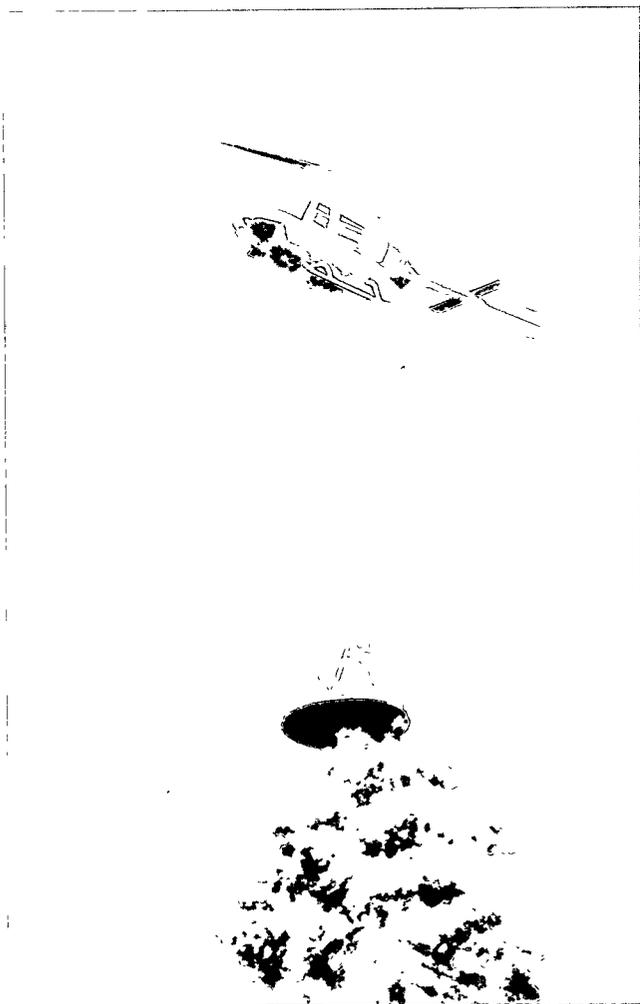


### Vacuum Seed Collector:

Bowie Industries, Inc.  
P.O. Box 931-T  
Bowie, Texas 76230  
(817) 872-1106

## Cone Rakes

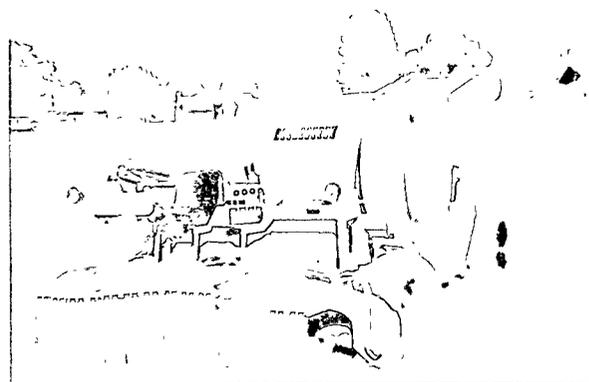
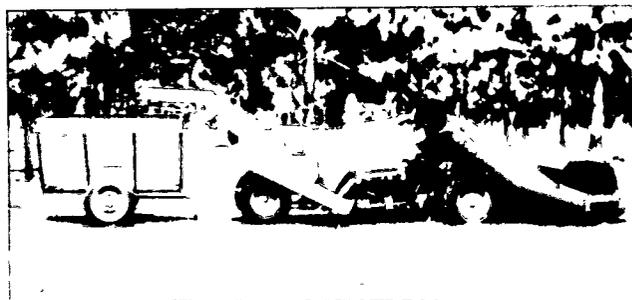
Cones may also be gathered with cone rakes. These are circular devices that are suspended from helicopters, lowered onto trees, then raised. These devices dislodge the cones, which fall to the ground to be collected by hand. They were originally developed in British Columbia. Currently, they are being used on the West Coast of the United States. Several helicopter companies contract this service. Contact Dick Hallman, Missoula Technology and Development Center, Building 1, Fort Missoula, Missoula, MT (406) 329-3946, for more information.



## Nut Harvesters

Nut harvesters have been adapted to the problems of collecting cones in tree orchards. This equipment gathers large numbers of cones in a short time, but is limited to use in cultivated tree orchards. Most nut harvesters consist of a paddle wheel in the pickup head, conveyors, air-stream cleaning devices, and a cone container. Sticks and heavy objects are not removed.

Equipment efficiency is improved by mowing the grass in the orchard a few days before harvest so that cones aren't hidden. Then the cone harvester is driven around the trees in a spiral pattern. The pickup head floats to small contour changes, but will not collect cones in depressions. The remaining cones are picked up by hand. One manufacturer reported that their harvester picked up to 20 bushels of Loblolly cones in 25 minutes.



### Nut Harvesters:

Flory Industries  
P.O. Box 908  
4737 Tomes Rd.  
Salida, CA 95368  
(209) 545-1167

Ramacher Mfg., Co.  
P.O. Box 506  
Linden, CA 95236  
(209) 887-3815

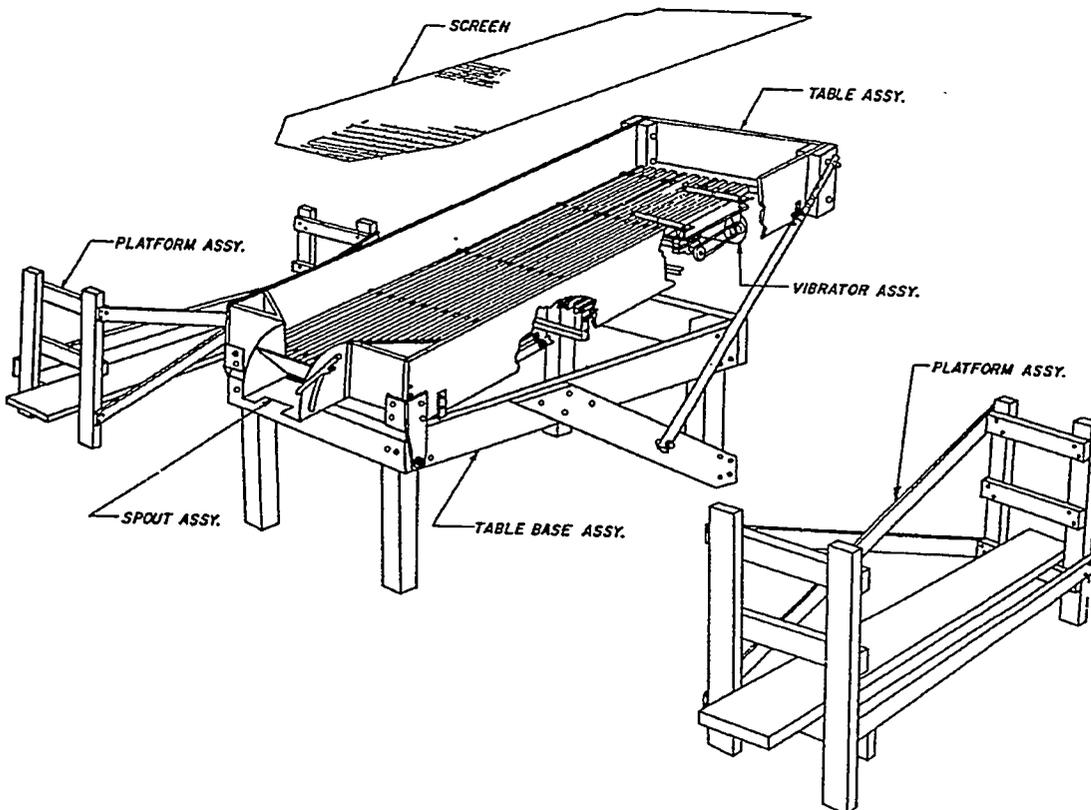
Weiss-McNair, Inc.  
531 Country Dr.  
Chico, CA 95926  
(916) 891-6214

## Cone Inspection Table

Drawings are available upon request to construct an inexpensive table used to inspect and clean cones as they are received at collection points. Two or three people are required for efficient operation. One person dumps the cones onto the table; a second person examines the cones and removes any litter too large to go through the slats; and a third person measures and sacks the cones.

Request Drawing No. MEDC- 303 from:

USDA Forest Service  
Missoula Technology and  
Development Center  
Building 1, Fort Missoula  
Missoula, MT 59801.



## 1.2 Cone Handling and Storage

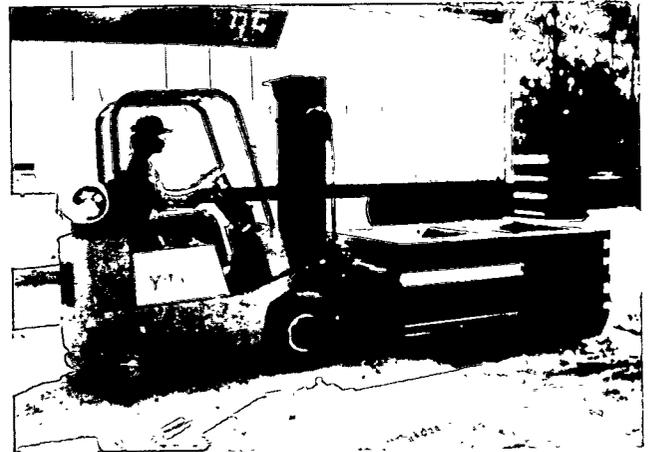


*Careful handling and storage of cones is critical to obtain high quality seed.*

*Conveyors must be selected so the cones or seeds are not damaged. During storage, cones need large amounts of air circulation and cool, dry conditions. Cones are generally stored for brief periods of time prior to the extraction process because of the volume of cones delivered to seed extractories. While cones are in interim storage, further maturing of the seed often occurs. Cones are most vulnerable to overheating and mold during this storage period. Trays or sacks in combination with racks are best utilized to prevent mold formation because they allow the cones to be spread out and allow air to circulate around and through the cones. Wire bins function in much the same way.*

### Cone Trays

Some nurseries store cones on trays that are commercially available or trays can be made to order. Most trays are manufactured from wood, metal, polyethylene, fiberglass, or cellulose fiber and are available in a range of sizes.



<p><b>Cone Trays:</b></p> <p>C.R. Daniels, Inc. 3451 Ellicott Ctr. Dr. Ellicott City, MD 21043-4191 (301) 461-2100</p> <p>Flexcon Products Corp. 673-T Morris Ave. Springfield, NJ 07081 (201) 467-3323</p> <p>T.R. Miller Mill Co. P.O. Box 708 Brewton, AL 36427 (205) 867-4331</p>	<p>NVF Co. P.O. Box 68-T Haley Dr. Yorklyn, DE 19736 (302) 239-5281</p> <p>Panel Controls Corp. 1000 Mt. Elliott Ave. Detroit, MI 48207 (313) 568-2400</p> <p>Plastech International, Inc. P.O. Box C-5050 John Fitch Industrial Park Warminster, PA 18974 (215) 441-5200</p>	<p>Regal Plastic Co. 440 E 11th St. Kansas City, MO 64127 (816) 483-3040</p> <p>Snow Corp. P.O. Box 12067 4350 McKinley St. Omaha, NE 68112 (402) 453-2200</p> <p>Southpine, Inc. P.O. Box 530127 Birmingham, AL 35253 (205) 879-1099</p>	<p>Toteline Molded Fiberglass Tray Co. 1000 E Erie St. Linesville, PA 16424 (814) 683-4500</p> <p>Tri-State, Inc. P.O. Box 337 505 Fourth St. Henderson, KY 42420-0337 (502) 826-8361</p>
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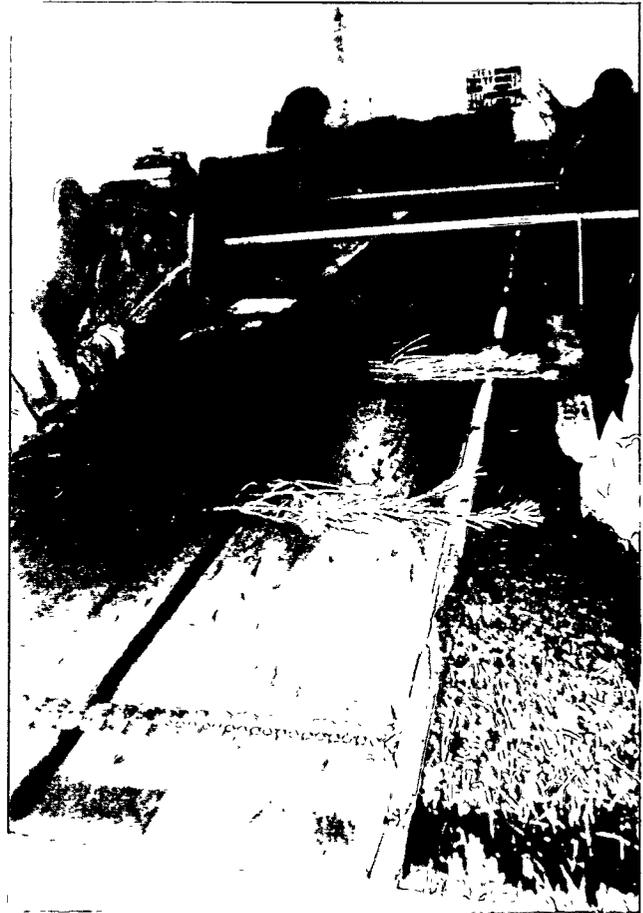
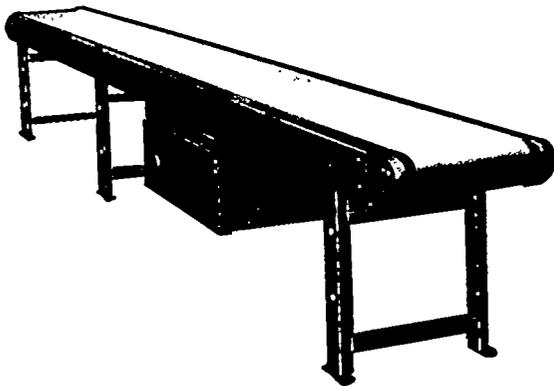
## Conveyors

Conveyors are used in the nursery for moving loose cones and seedlings as well as containers. Many nurseries use them when grading seedlings. Manufacturers will help nurseries design conveyor systems with the correct size and speed.

Conveyors come in various types, including belt, roller, chain, bucket, and vibratory. They can be obtained in different lengths or widths and can be designed with curves, spirals, angles, and can be built vertically like an elevator.

Belt conveyors are generally powered by electric motors. Some conveyors are built expressly for loose material with walled sides and dividers on the belt to prevent material from rolling backwards. Portable conveyors can be used in the field. Some conveyors are enclosed for dust control. Screw

conveyors with covers are used to transport free-flowing bulk materials. Belts may be treated to resist water, chemicals, and fertilizers. Belt surface friction can be selected to provide a smoother flow of materials.



### Conveyors:

AAR Brooks and Perkins  
Handling Technology Div.  
P.O. Box 1227  
Aberdeen, NC 28315  
(919) 944-2167

Ace Supply, Inc.  
P.O. Box 1098  
315 N Kit Ave.  
Caldwell, ID 83606-1098  
(208) 459-0731

AEC Machinery, Ltd.  
143 Brockley Dr.  
Hamilton, Ontario  
Canada L&E 3C4

Aeroil Products Co., Inc.  
Wesley St.  
South Hackensack, NJ 07606  
(201) 343-5200

Andec Corp.  
2310 E Logan St.  
Decatur, IL 62526  
(217) 428-4365

Baker Material Handling Corp.  
P.O. Box 2400  
2450 W 5th North St.  
Summerville, SC 29484  
(803) 875-8000

Bulk Handling Sys., Inc.  
1040 Arrowsmith  
Eugene, OR 97402  
(503) 485-0999

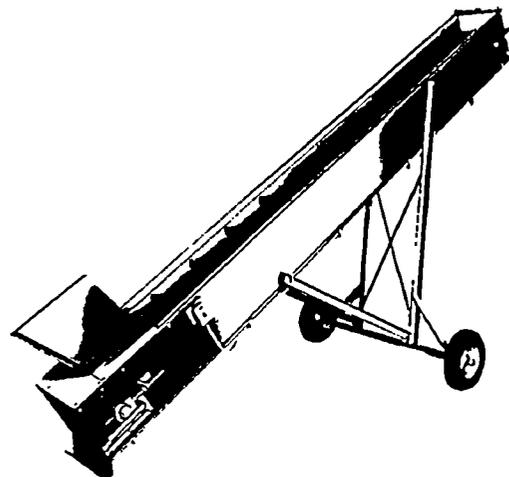
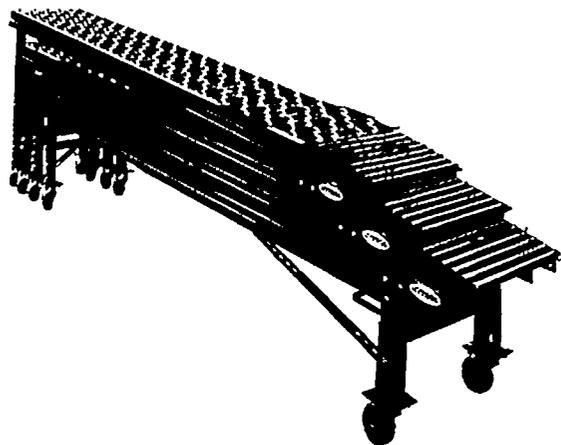
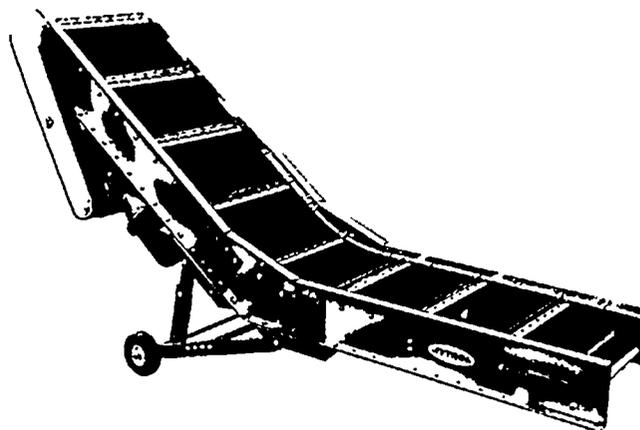
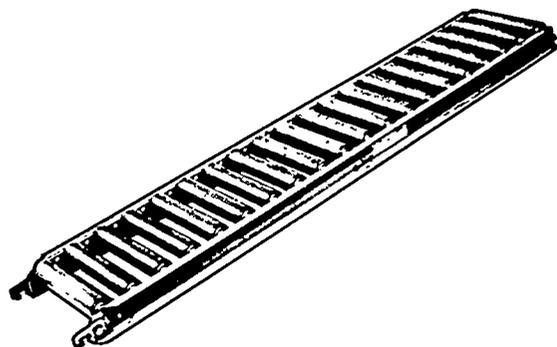
Canadian Forestry Equipment, Ltd.  
90 E. Boul., Brunswick Blvd.  
D.D.O., Quebec  
Canada H9B 2T5  
(403) 484-2447

Conveyor Matic, Inc.  
31475 Utica Rd.  
Fraser, MI 48026  
(313) 296-0200

Conveyor Systems, Inc.  
6453 Main St.  
Morton Grove, IL 60053  
(312) 966-7700

Conveyors, Inc.  
2735 S Highway 55  
Eagan, MN 55121  
(612) 456-9225

Corn States Metal Fabricators, Inc.  
P.O. Box 65635  
1323-T Maple St.  
West Des Moines, IA 50265  
(515) 225-7961



**Conveyors:**

H.D. Davis Sons Mfg. Co., Inc.  
P.O. Box 395  
Bonner Springs, KS 66012  
(913) 422-3000

The Duplex Mill & Mfg. Co.  
P.O. Box 1266  
415 Sigler St.  
Springfield, OH 45501  
(513) 325-5555

Forsbergs, Inc.  
P.O. Box 510  
Thief River Falls, MN 56701  
(218) 681-1927

General Kinematics Corp.  
777 Lake Zurich Rd.  
Barrington, IL 60010  
(312) 381-2240

Hohl Machine and Conveyor Co.  
1580 Niagara St.  
Buffalo, NY 14213  
(716) 882-7210

S. Howes Co., Inc.  
1974 Miller St.  
Silver Creek, NY 14136  
(716) 934-2611

Hytrol Conveyor Co., Inc.  
2020 Hytrol Dr.  
Jonesboro, AR 72401  
(501) 935-3700

Litton Industrial Automation  
Unit Handling Systems  
Litton Lane  
Hebron, KY 41048  
(606) 334-2500

Oliver Mfg. Co., Inc.  
P.O. Box 512  
Rocky Ford, CO 81067  
(303) 254-6371

Rapistan Corp.  
507 Plymouth Ave. NE  
Grand Rapids, MI 49505  
(616) 451-6200

Sauze Technical Products Corp.  
212 Oak St. Ext.  
Plattsburgh, NY 12901  
(518) 561-6440

Stewart-Glapat Corp.  
P.O. Box 2486  
1637 Moxahala Ave.  
Zonesville, OH 43702  
(614) 452-3601

Triple/S Dynamics  
1031 S Haskell Ave.  
Dallas, TX 75223  
(214) 828-8600

Tri-State Metal Fabricators, Inc.  
Building 8  
Spokane Industrial Park  
Spokane, WA 99216  
(509) 926-7165

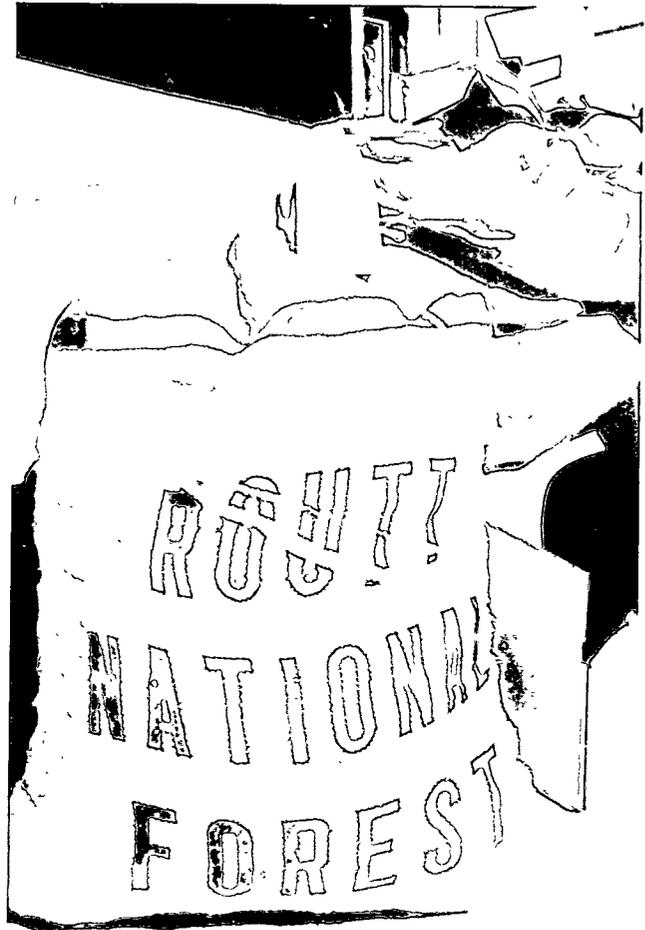
Union Iron Works, Inc.  
P.O. Box 1069  
1102 N 18th St.  
Decatur, IL 62525  
(217) 429-5148

Versa Ferguson Conveyor  
P.O. Box 152-T  
Mt. Sterling, OH 43143  
(614) 869-2738

White Bag Co., Inc.  
P.O. Box 607  
Warehouse Row & Campbell Dr.  
Jacksonville, AK 72076  
(501) 982-9551

## Sacks

Cones are collected and stored in sacks. Burlap sacks have been traditionally used because they are porous and aid in wicking moisture from the cones. Plastic mesh sacks are an alternative to burlap. Sacks can be manufactured in various sizes.



### Sacks:

Acro Plastics  
Div. of Lowry Mfg., Inc.  
8630 Airport Highway  
Holland, OH 43528  
(419) 865-0258

Alabama Bag and Burlap Co.  
P.O. Box 320797  
4330 Powell Ave. S  
Birmingham, AL 35232-0797  
(205) 595-6116

Armin Plastics Corp.  
841 S Norbury  
Lombard, IL 60148  
(312) 916-8277

Bemis Paper Bag Div.  
P.O. Box 171821  
Memphis, TN 38187-1821  
(208) 523-0546

Canton Canvas Products  
336 6th St. NE  
Canton, OH 44702  
(216) 453-2525

C.R. Daniels, Inc.  
3451 Ellicott Center Dr.  
Ellicott City, MD 21043-4191  
(301) 461-2100

Dowling Bag Co..  
P.O. Box 1768  
Valdosta, GA 31601  
(912) 244-0133

Friedman Bag Co., Inc.  
P.O. Box 3067 Annex  
801 E Commercial St.  
Los Angeles, CA 90051  
(213) 595-6116

Halsted Corp.  
P.O. Box 4068, Bergen Str.  
78-94 Halladay St.  
Jersey City, NJ 07304  
(201) 433-3323

Humphry's Textile Products Co.  
1243 Carpenter St.  
Philadelphia, PA 19147  
(800) 523-4503

More Plastic Bags  
801 Suite G  
Mahler St.  
Burlingame, CA 94010  
(415) 692-8018

Protective Lining Corp.  
603 39th St.  
Brooklyn, NY 11232  
(800) 221-9712

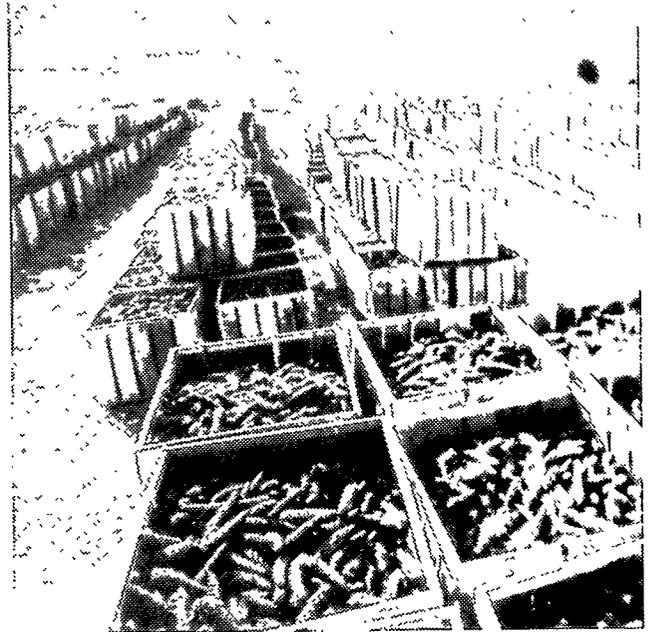
Troy Sunshade Co.  
607 Riffle Ave.  
Greenville, OH 45331  
(800) 833-8769

Western Kraft Paper  
5800 SW Western Ave.  
Beaverton, OR 97705  
(503) 641-4455

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## Storage Bins

Bins can be used to store large numbers of cones and can be made of plastic, wood, or steel mesh. They come in a wide variety of sizes, shapes, and styles, and may be made to custom order. Some models can be collapsed or stacked to minimize storage space in the off-season. Mesh bins allow drying and ventilation. Most bins must be handled by a forklift, although some are available with wheels.



### Storage Bins:

BMC Mfg., Inc.  
100-T S Mill St.  
Plymouth, MI 48170  
(313) 453-5400

C.R. Daniels, Inc.  
3451 Ellicott Center Dr.  
Ellicott City, MD 21043-4191  
(301) 461-2100

InterMetro Industries Corp.  
653 N Washington St.  
Wilkes-Barre, PA 18705  
(717) 825-2741

A.M. Leonard, Inc.  
P.O. Box 816  
6665 Spiker Rd.  
Piqua, OH 45356-0816  
(513) 773-2694

T.R. Miller Mill Co.  
P.O. Box 708  
Brewton, AL 36427  
(205) 867-4331

Pacific Wire Works  
14615 Anson Ave.  
Santa Fe Springs, CA 90670  
(213) 921-7925

Plastech International, Inc.  
John Fitch Industrial Park  
P.O. Box C-5050  
Warminster, PA 18974  
(215) 441-5200

Portage Industries Corp.  
1325 Adams St.  
Portage, WI 53901  
(608) 742-7123

Rubbermaid Commercial  
Products, Inc.  
3124 Valley Ave.  
Winchester, VA 22601  
(703) 667-8700

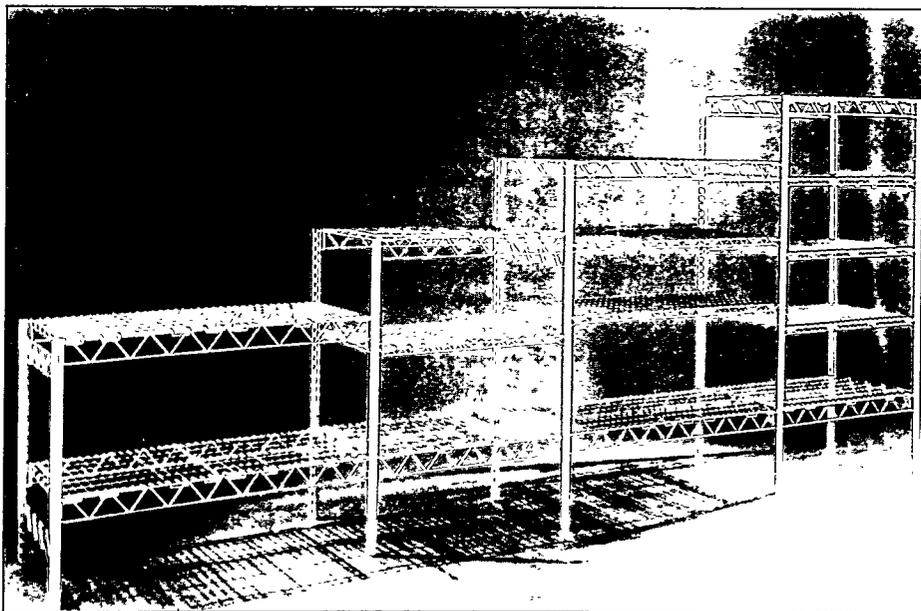
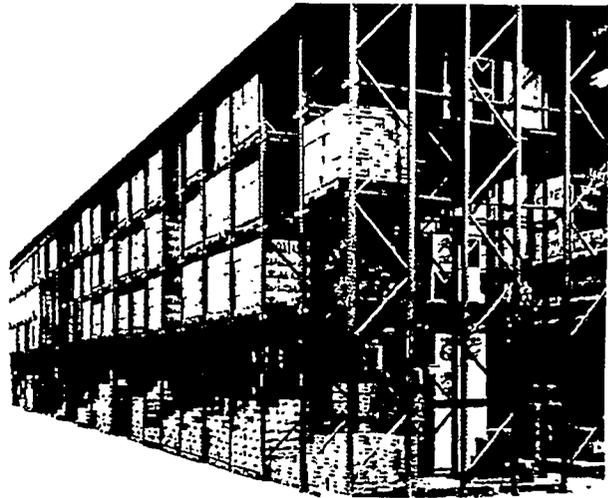
Summit Products Co.  
P.O. Box 909  
146 S Beeson Ave.  
Uniontown, PA 15401  
(412) 437-7251

Tri-State Metal Fab, Inc.  
Bldg. 8  
Spokane Industrial Park  
Spokane, WA 99216  
(509) 926-7165

Union Steel Products, Inc.  
P.O. Box 60  
509 N. Albion St.  
Albion, MI 49224  
(517) 629-2181

## Rack Storage

Loose cones, sacks, or containers filled with cones may be stored on racks. Some nurseries hang cone sacks on custom-built racks. Racks, which may have adjustable or removable shelves, can be constructed of metal or wood and some models can be disassembled when not in use. Many brands are commercially available or they may be made to order.



### Rack Storage:

Acme Steel Co.  
13500 S Perry Ave.  
Riverdale, IL 60627-1182  
(312) 849-2500

Bernard Franklin Co.  
4055-T Torresdale Ave.  
Philadelphia, PA 19124  
(215) 744-9300

BMC Mfg. Inc.  
100-T S Mill St.  
Plymouth, MI 48170  
(313) 453-5400

Equipto  
225 S Highland Ave.  
Aurora, IL 60507  
(312) 859-1000

Frazier Industrial Co.  
P.O. Box F  
Fairview Ave.  
Long Valley, NJ 07853  
(201) 876-3001

InterMetro Industries Corp.  
653 N Washington St.  
Wilkes-Barre, PA 18705  
(717) 825-2741

Modern Equipment Co., Inc.  
2011 Cumming St.  
Omaha, NE 68102  
(402) 341-4939

Paltier Corp.  
1701 Kentucky St.  
Michigan City, IN 46360  
(219) 872-7238

Penco Products, Inc.  
200 Brower Ave.  
Oaks, PA 19456  
(215) 666-0500

Pucel Enterprises, Inc.  
1440-T E 36th St., Dept. TR  
Cleveland, OH 44114  
(216) 881-4604

Ridg-U-Rak, Inc.  
120-T S Lake St.  
North East, PA 16428  
(814) 725-8751

Tier-Rack Corp.  
818 Olive St., Dept. B  
St. Louis, MO 63101  
(314) 241-5451