THE WOODLAND WORKBOOK

LOGGING

EC 1582 • August 2006 $2.50

Timber Harvesting Options for Woodland Owners

R. Parker and S. Bowers

Contents

Bob Parker, Extension forester, Baker and Grant counties; and Steve Bowers, Extension forester, Lane and Linn counties; both of Oregon State University.

Timber harvesting is a common activity on many small woodland properties. Whether a harvest is large or small, landowners must carefully evaluate their overall goals and objectives before beginning. A well-conducted harvest will help realize those goals, but a poor job may lead to disappointing results that have to be endured for a very long time.

Many landowners have little, if any, personal experience with timber harvesting and are unfamiliar with the myriad choices of equipment and methods. The goal of this publication is to assist landowners in selecting the harvesting options most appropriate for their specific timber and property characteristics as well as their unique goals and objectives.

Figure 1.—Harvesting small timber in eastern Oregon.

Objectives when conducting a harvest might include:

- Maximize financial return from the stand
- Improve stand vigor, growth, and yield and product quality
- Protect streams and water quality
- Minimize damage to residual trees
- Enhance wildlife habitat
- Enhance recreation opportunities and/or prepare a building site

Well-defined objectives lead to a sound analysis of available harvesting options and development of a sensible harvesting plan. If a contractor will be hired to do the work, a good harvest plan starts with a well-written contract that specifies the equipment and methods for attaining the desired objectives.

Many landowners prefer to do their own timber harvests. While there might be advantages in doing so, all harvesting activities are inherently dangerous, and safety must be the foremost consideration throughout the entire operation.

Oregon State University | Extension Service

Choosing the best harvest system

Characteristics of the harvest site, particularly timber size and site topography, have the greatest influence in determining the appropriate harvesting system. Performance categories in Table 1 (see pages 4–5) are the main aspects to consider when selecting a system. Whether performing a clearcut, salvage harvest, commercial thinning, or fuel reduction project, the landowner needs to consider all the factors in Table 1 when selecting a harvesting system. The logging crew's skills also play a major role in how various harvesting systems perform across all categories.

Comparisons among systems within a particular category are generalizations and may occasionally be misleading. The production potential of bulldozers and rubber-tire skidders is listed as "medium," but under certain circumstances they may out-produce a cable operation described as having a "high" production potential. Within an individual performance category, the descriptors (low, medium, high) often overlap and, when all pertinent categories are considered, a particular system may operate at a lower or higher level than described in the literature.

In addition, the slope and yarding distance limits in Table 1 are merely guidelines. For example, some bulldozers and mechanized systems can operate on slopes steeper than the suggested limits, which serve as caution indicators within a given category. Other factors, such as soil characteristics and rules under the Oregon Forest Practices Act, may affect the range of acceptable limits for a particular system.

Costs can be difficult to compare among different harvesting systems. Costs to consider include the machinery operating costs and the cost per thousand board feet (MBF). The cost per MBF is a better comparative indicator, but landowners also must consider environmental costs. For example, excessive soil disturbance from inappropriate equipment can lead to erosion, stream sedimentation, and reduced site productivity. On-the-ground operating conditions (topography, timber size and volume, etc.) are highly variable from site to site, shifting the relative advantage of each harvesting system and requiring a careful evaluation of specific site conditions.

Selecting the right harvesting system involves considering the size of timber, total volume to remove, production potential, and environmental concerns.

Figure 2.—Harvesting with a farm tractor.

STEVE PILKERTON

Figure 3.—Harvesting with a rubber-tire skidder.

PAUL ADAMS

Figure 4.—Harvesting with a mechanical harvester.

STEVE PILKERTON

Figure 5.—Horse logging.

Timber size and volume per acre

Timber size is one of the most important aspects to consider. For example, the yarding equipment should move logs efficiently from the stump to the landing. If equipment is too small, struggling to skid logs might lead to unnecessary stand damage or might force the operator to cut logs into shorter lengths, which have lower value. If the equipment is much larger than needed to move logs efficiently, the cost per MBF may be too high or the equipment may cause unacceptable levels of residual-stand and site damage.

STEVE PILKERTON

Figure 6.—Cable harvesting on steep ground.

The volume of timber removed per acre directly influences harvesting costs and is as important a factor as the size of timber. For details on measuring trees and logs, refer to EC 1127*, Measuring Timber Products Harvested from Your Woodland;* EC 1190, *Stand Volume and Growth: Getting the Numbers;* and EC 1129, *Tools for Measuring Your Forest* (see page 8).

Topography

Topography is the other leading factor in determining which harvesting options are feasible and desirable. Gentle terrain generally provides the most options, and everything from horses to large crawler tractors, rubber-tire skidders, and even cable systems may be both possible and practical.

Options decrease as topography becomes steeper and more uneven, placing greater demands on equipment. Crawler tractors and rubber-tire skidders can operate on very steep ground, but at some point practicality and safety become serious concerns and necessitate other choices. Protecting the site from excessive soil disturbance also might become an issue.

Steep slopes, limited road access, and environmental concerns may preclude ground-based equipment and require the use of cable machines or helicopters. Cable harvesting requires a careful evaluation of not only timber size, yarding distance, and production potential, but the contour of the ground as well. The cable needs to be sufficiently elevated to carry the weight of the logs without dragging them through the soil, which can disturb soil excessively.

Production potential

The length of time available to complete the job helps determine the daily production rate required. If timber needs to be harvested quickly to avoid wet weather or to capture a high log market opportunity, production potential needs to be high. This is a good time to emphasize the importance of planning ahead. Logging contractors are busier during the dry months, so it is important to schedule the logger long before the desired harvest date. It is imperative that a written contract contain defined starting and

ending harvest operation dates, regardless of the production potential.

If harvesting must be completed quickly, the options will be reduced to those systems that are currently available. One of the advantages of a longer planning horizon is a wider range of available loggers and harvesting systems.

Cost of production

Typically, ground-based systems are less expensive than mechanized, cable, and helicopter systems. However, the cost per MBF is affected more by the size of the trees, volume per acre removed, and yarding distance than by the daily cost of the selected system. Production cost per MBF is determined by dividing the daily operating costs by the volume of logs produced per

Table 1. General performance of various timber yarding systems.

Performance category	Type of timber yarding systems								
	Horse	**Farm tractor**	**Crawler tractors**	**Wheeled skidders**	**Excavators**	**Mechanized systems**	**Small cable systems**	**Large cable systems**	**Helicopter**
Timber size	Small timber: generally less than 16 inches dbh	Small to medium-size timber: generally less than 20 inches dbh	Capable of handling all sizes in design range of machine	Capable of handling all sizes in design range of machine	Small to large timber, depending on design range of machine	Small to medium-size timber, less than 30 inches dbh	Small to medium-size timber, depending on design range of machine	Small to large timber, depending on design range of machine	Capable of handling all diameters but limited by weight of timber
Topography	Gentle slope; less than 5% downhill yarding preferred	Gentle slope; less than 5% downhill yarding preferred	45–55% slope; downhill yarding preferred	35–45% slope; downhill yarding preferred	35–45% slope	Up to 45% slope	Deflection needed but suited to steep slopes	Deflection needed but suited to steep slopes	No limit
Production potential	Low	Low	Low to high	Low to high	Medium to very high	Medium to high	Low to medium	Medium to high	Very high, but weather restricts operability
Production costs	Per-day rate is low, but per-MBF rates are medium to high	Per-day rate is low, but per-MBF rates are medium to high	Low to medium depending on timber and site conditions	Low to medium depending on timber and site conditions	Low to medium depending on timber and site conditions	Low to medium depending on timber and site conditions	Low to high depending on timber and site conditions	Medium to high depending on timber and site conditions	Very high hourly costs, but per-MBF rates acceptable depending on yarding
Road access requirements	300–500 ft maximum skidding distance	300–500 ft maximum skidding distance	Up to 1,000 ft possible; less than 700 ft preferred	Up to 1,000 ft possible; less than 700 ft preferred	300–500 ft; longer distances possible	Up to 3,000 ft possible; less than 1,500 ft preferred	Up to 1,500 ft possible, depending on machine design limits	From 1,000 to 5,000 ft possible, depending on machine design limits	Distance limited only by costs per MBF, as determined by production rate
Stream protection	Generally excellent with proper practices	Generally excellent with proper practices	Can be very good depending on proximity to stream and proper practices	Can be very good depending on proximity to stream and proper practices	Can be very good depending on proximity to stream and proper practices	Good with proper practices; stream crossings need ODF notification	Excellent with proper practices; cables can lift logs across streams	Excellent with proper practices; cables can lift logs across streams	Excellent protection
Site disturbance	Minimal disturbance but may need additional equipment for slash work; small landings (less than 50 ft diameter)	Minimal disturbance but may need additional equipment for slash work; small landings (less than 50 ft diameter)	Medium to high disturbance; soil compaction potential; damage to residual stand possible; can treat slash; medium landings (about 75 ft diameter)	Medium to high disturbance; soil compaction potential; damage to residual stand possible; can treat slash; medium landings (about 75 ft diameter)	Low to medium disturbance possible with proper practices; slash handling possible; may damage residual stand in partial cuts; serves dual role as a log loader	Medium disturbance; small to large landings depending on equipment and system choices; damage to residual stand possible	Minimum to medium disturbance possible with proper practices; may damage residual stand in partial cuts; small to medium landings	Minimum to medium disturbance possible with proper practices; slash handling possible; may damage residual stand in partial cuts; small to medium landings	Minimal disturbance; slash handling a problem; requires large (100 ft) landings plus 50 ft set-down and maintenance area
Availability	Few; depends on local area	Common	Commonly used by most contractors	Commonly used by most contractors	More contractors becoming available	More contractors becoming available	Generally available but planning and scheduling may be important to secure a contractor	Common use in western Oregon's steep slopes; becoming infrequent east of Cascades	Few contractors available
Additional capabilities		Tractor also capable of traditional farm uses, providing multi-purpose capability	Crawler tractors also used for building roads and landings, installing culverts, and treating slash	Skidders can be used for slash treatment	Excavators also used to build roads and landings and for slash treatment and various excavating operations	Typically highly specialized machines, suitable for yarding only	Typically highly specialized machines, suitable for yarding only	Typically highly specialized machines, suitable for yarding only	High costs an obstacle for use beyond harvesting

USDA FOREST SERVICE/WWW.FORESTRYIMAGES.ORG

Figure 7.—Heavy slash after harvesting.

day. The results can be surprising. A horse may cost $350 per day and a mechanical harvesting or cable system $3,500 a day or more. However, a horse skids approximately one or two truck loads of logs per day, while the mechanized or cable systems produce from six to twenty truck loads per day, resulting in similar costs per MBF for each system.

Special demands such as slash piling, stream protection, installing culverts, and other factors mentioned in Table 1 have a significant impact on the total costs of production and must be considered when comparing the relative costs of different harvesting systems.

Road access

Prior to beginning a harvest operation, a landowner should evaluate road access to determine whether existing roads are:

- Adequate for heavy equipment such as log trucks
- Placed to provide reasonable skidding distances for the intended harvesting system
- Located and constructed in a manner that prevents damage to streams or other sensitive areas

If existing roads are inadequate, then the landowner needs to consider incorporating road improvements and/or road construction clauses into the logging contract.

For each type of harvesting system, locate roads and landings on a map and determine the maximum and average distances the logs will be skidded. Along with the estimated volume to be removed, the logger needs this information to estimate production rates and costs.

Stream protection

Landowners have obligations for stream protection under the Oregon Forest Practices Act. The first step is to determine the class of stream, which can be done by taking a map or aerial photo along with a legal description of the property to the Oregon Department of Forestry (ODF) office that serves that area. ODF stewardship foresters can make a determination from their stream class maps.

Once the class of stream is identified, landowners can determine from the Forest Practices Act regulations the type and level of protection needed. The harvest plan should reflect both the legal requirements and the landowner objectives.

Before the start of any commercial activity related to growing or harvesting forest tree species, it is imperative that the

JOHN GARLAND

Figure 8.—Streams typically require special protection.

STEVE PILKERTON

Figure 9.—Soil disturbance from logging with heavy equipment.

landowner contact the ODF and file for a Notification of Operations Permit. It is a good idea to work with the ODF to identify areas of concern and to develop satisfactory plans for addressing those concerns prior to beginning operations. Don't risk violating the Forest Practices regulations!

Site disturbance

Site disturbance refers to how the land is affected by the harvest activities. Soil compaction and displacement should be minimized during logging because they can reduce site productivity.

When writing a logging contract, specify the acceptable number and size of landings and skid trails. If certain areas should not be disturbed during harvest, the areas should be clearly identified on the ground and noted in the written contract.

Another aspect of site disturbance is damage to residual trees in a thinning. Because these trees are an investment, it is important to protect them from damage. It is worthwhile to establish acceptable limits of residual-stand damage, with clear penalties for exceeding the limits, in the logging contract.

Slash cleanup is important for reducing fire and insect hazards; however, slash work can disturb sites significantly. Landowners need to determine what amount of cleanup is necessary to meet Forest Practices requirements as well as their own objectives and preferences. This may require a balancing act between slash reduction and minimizing site disturbance.

JANA ALBERS, MINNESOTA DEPARTMENT OF NATURAL RESOURCES/WWW.FORESTRYIMAGES.ORG

Figure 10.—Tree damage resulting from poor skidding practices.

JOHN GARLAND

Figure 11.—Site disturbance resulting from intensive slash disposal.

Availability of contractor

This aspect of harvesting emphasizes the importance of planning ahead. Landowners who want to harvest as soon as possible will have a limited selection of contractors. Different harvesting systems require different lead times: a ground-based operator can likely be located on short-term notice, whereas a cable or helicopter operation requires long-term planning due to the limited number of operators. Contact your local ODF or OSU Extension office for information on available contractors.

Summary

Achieving a satisfactory timber harvest depends directly on thorough planning. The guidelines suggested in this publication will help landowners choose a harvesting system that will best meet overall goals and objectives for their woodland property.

For more information

The following OSU Extension publications are available via the catalog on the Extension website, at http://extension.oregonstate.edu/catalog/

Many publications can be viewed and downloaded at no charge, and printed copies of any of them can be ordered (prices will vary, and there is a charge for shipping and handling). Printed publications also can be ordered through the office of OSU Extension that serves your county, or by contacting:

Publication Orders
Extension & Station Communications
Oregon State University
422 Kerr Administration
Corvallis, OR 97331-2119
email puborders@oregonstate.edu
phone toll free 1-800-561-6719
fax 541-737-0817

Designated Skid Trails Minimize Soil Compaction, EC 1110

Logging Selectively: A Practical Guide to Partial Timber Harvesting in the Forests of the Inland Northwest and the Northern Rocky Mountains, PNW 534

Measuring Timber Products Harvested from Your Woodland, EC 1127

Planning Woodland Roads, EC 1118

Soil Compaction on Woodland Properties, EC 1109

Stand Volume and Growth: Getting the Numbers, EC 1190

Tools for Measuring Your Forest, EC 1129

The Woodland Workbook series comprises some 60 publications prepared by Oregon State University Extension foresters specifically for owners and managers of private, nonindustrial woodlands. Workbook publications contain information of long-range and day-to-day value for anyone interested in wise management, conservation, and use of woodland properties. Publications are available for purchase separately. For information about how to order, and for a current list of titles and prices, contact the OSU Extension Service office that serves your county. Or, visit Extension's online catalog of educational materials at http://extension.oregonstate.edu/catalog/

This publication was produced and distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914. Extension work is a cooperative program of Oregon State University, the U.S. Department of Agriculture, and Oregon counties.

Published August 2006.