ECOST

A stump-to-mill timber production cost-estimating program for cable logging eastern hardwoods.

by Chris B. Ledoux

ECOST utilizes data from stand inventory, cruise data, and the logging plan for the tract in question. The program produces detailed stump-to-mill cost estimates for specific proposed timber sales. These estimates are then utilized, in combination with specific landowner objectives, to assess the economic feasibility of cable logging a given area. The program output is summarized in tabular format by harvesting component, and the input parameters are also echoed in a summary table. The manager, logger, or planner can use the estimates in their cable logging planning efforts. The ECOST program also provides comparison of alternative harvesting machines; equipment selection; timber stand prescription planning; and, linked with a suitable growth model, optimization of silvicultural investment analysis and break-even analysis.

System Requirements

Version V1 of ECOST is available for Hewlett Packard HP 9845T desktop computers with HP 9545T BASIC, 64K RAM, and printer[1].

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Cost and Contact

The computer program described is available on request with the understanding the U.S. Department of Agriculture cannot assure its accuracy, completeness, reliability, or suitability for any other than that reported. The recipient may not assert any proprietary rights thereto nor represent it to anyone as other than a government-produced computer program. For cost information, write Chris B. LeDoux, USDA Forest Service, Northeastern Forest Experiment Station, P.O. Box 4360, Morgantown, West Virginia 26505. Send a blank certified Hewlett Packard data cartridge. BASIC source code of Version 1 is also available for the Data General Eclipse computer. Contact C.B. LeDoux at the above address for details.

General Description

ECOST integrates all of the cable-logging data that has been developed for eastern hardwoods on steep terrain into a complete stump-to-mill cost estimation system. The system provides detailed cost and delay estimates for specific user-specified harvesting scenarios. The detailed estimates and delays are estimated by component for felling, limbing, bucking, yarding, loading, hauling, move in and out, and initial rig up and down. The detailed estimates are summarized in tabular form by yarding machine for easy, quick comparisons. The manager, logger, or planner can use these as decision tables to evaluate and compare a variety of harvesting options.

ECOST operates on an individual stand or harvest block basis, providing stump-to-mill cost estimates that are specific to each stand or block. The tabular estimates can be arranged by stand or harvest block so that individual stands can be combined into a total timber sale cost data base that provides a powerful tool for cable-logging cost estimation.

Cable Yarding Machine Options

ECOST produces cost estimates for six cable yarders rigged in the following uphill configurations: Skylok 78 rigged as a running skyline; Appalachian Thinner rigged as a jammer; Urus 1000-3 rigged as a standing skyline: Bitterroot rigged as a shotgun; Koller K-300 rigged as a shotgun; and the Ecologger I rigged as a live skyline. These cable yarders as rigged reflect most of the conditions a logger would encounter on steep terrain. Of course, there are many yarding machines to choose from so our equipment choices are not exclusive.

Hauling and Road Class Configurations

ECOST provides cost estimates for five truck classes and five road classes. Cost estimates for the following truck classes are provided: flat bed, 4x2, single axle; flat bed, 6x4, tandem axle; truck tractor, 4x2, single axle with tandem trailer; truck tractor, 6x4, tandem axle with tandem trailer; and truck tractor, 6x4, tendem axle with tandem 30-35 foot trailer with additional 15-20 foot trailer. Cost estimates are provided for hauling over the following road class/design speeds: 35, 25, 16, 8, and 4 miles per hour. The five truck and road classes provide estimates for most eastern hardwood hauling conditions.

Stand Input Parameters

The following data are required for stump-to-mill cost estimation: (1) arithmetic average cut tree diameter, inches; (2) volume removed per acre, ft^3; (3) average slope yarding distance, feet; (4) yarder type (six to select from); (5) haul distance, miles; (6) truck class; and (7) road class. These items can be obtained from inventory and cruise data, and the logging plan for the tract in question. One of the summary tables for the Koller K-300 yarder from a typical program run is presented in *Figure 1*.

Versions Available

There is currently one version of ECOST in use. ECOST V1 was made available for public distribution. It was written in Hewlett Pack-

Figure 1. Typical Program Output for K-300 Yarder.

Yarder Type: Koller - K300
Arithmetic Average Tree Diameter: 6.000
Volume Removed per acre: 4,000.000
Delay Cost per cubic feet: .030
Move Cost per cubic feet: .030
Average Slope Yarding Distance: 450.00
Milage one way: 30.000

(All costs are cost/acre.)

Road Class	2	3	4	5	6
Truck Class 1					
Fell, Buck, Limb	932.216	932.216	932.216	932.216	932.216
Yarding	881.424	881.424	881.424	881.424	881.424
Loading	510.307	510.307	510.307	510.307	510.307
Hauling	143.088	594.636	1046.184	1497.732	1497.732
Delay	120.000	120.000	120.000	120.000	120.000
Move	120.000	120.000	120.000	120.000	120.000
Total Cost	2707.035	3158.583	3610.131	4061.679	4061.679
Truck Class 2					
Fell, Buck, Limb	932.216	932.216	932.216	932.216	932.216
Yarding	881.424	881.424	881.424	881.424	881.424
Loading	510.307	510.307	510.307	510.307	510.307
Hauling	243.084	694.632	1146.180	1597.728	2049.276
Delay	120.000	120.000	120.000	120.000	120.000
Move	120.000	120.000	120.000	120.000	120.000
Total Cost	2807.031	3258.579	3710.127	4161.675	4613.223
Truck Class 3					
Fell, Buck, Limb	932.216	932.216	932.216	932.216	932.216
Yarding	881.424	881.424	881.424	881.424	881.424
Loading	510.307	510.307	510.307	510.307	510.307
Hauling	343.080	794.628	1246.176	1697.724	2149.272
Delay	120.000	120.000	120.000	120.000	120.000
Move	120.000	120.000	120.000	120.000	120.000
Total Cost	2907.027	3358.575	3810.123	4261.671	4713.219
Truck Class 4					
Fell, Buck, Limb	932.216	932.216	932.216	932.216	932.216
Yarding	881.424	881.424	881.424	881.424	881.424
Loading	510.307	510.307	510.307	510.307	510.307
Hauling	443.076	894.624	1346.172	1797.720	2249.268
Delay	120.000	120.000	120.000	120.000	120.000
Move	120.000	120.000	120.000	120.000	120.000
Total Cost	3007.023	3458.571	3910.119	4361.667	4813.215
Truck Class 5					
Fell, Buck, Limb	932.216	932.216	932.216	932.216	932.216
Yarding	881.424	881.424	881.424	881.424	881.424
Loading	510.307	510.307	510.307	510.307	510.307
Hauling	543.072	994.620	1446.160	1897.716	2349.264
Delay	120.000	120.000	120.000	120.000	120.000
Move	120.000	120.000	120.000	120.000	120.000
Total Cost	3107.019	3558.567	4010.115	4461.663	4913.211

ard HP 9845T BASIC and is currently being used by researchers, and Region 8 and 9 of the National Forest System.

A new, more comprehensive version (ECOST V2), written in FORTRAN, is now being programmed suitable for mainframe and microcomputers. ECOST V2 will include two additional pieces of equipment: the Forest Service built Clearwater yarder and the Radio Horse 9 prebunching winch. The major difference between versions 1 and 2 is that version 2 will include two more machine options and a more detailed move in and out and rig up and down costing component.

[1]The use of trade, firm, or corporation names in this article is for the information and convenience of the reader. Such use does not constitute an official endorsement or approval by the U.S. Department of Agriculture, the Forest Service, or the Forest Resources Systems Institute of any product or service to the exclusion of others that may be suitable.

Literature

LeDoux, Chris B. 1985. Stump-to-mill timber production cost equations for cable logging eastern hardwoods. USDA For. Serv. Res. Pap. NE-566. 6p.