



CENTRAL HARDWOOD NOTES

Computer Models For Economic And Silvicultural Decisions

Computer systems can help simplify decisionmaking to manage forest ecosystems. We now have computer models to help make forest management decisions by predicting changes associated with a particular management action. Models also help you evaluate alternatives. To be effective, the computer models must be reliable and appropriate for your situation.

Modeling is a forecast system that allows managers the flexibility to develop various alternative scenarios, for both financial analysis and silvicultural practices. The goal may be wildlife habitat improvement, enhancement of visual quality or timber production. Treatment options to meet these goals might include thinning, harvesting, releasing, or doing nothing at all. Treatment options usually must comply with limited budget and workforce constraints.

Some basic guidelines for using computer models in decisionmaking are:

1. Establish goals for a given area and define the decision criteria
2. Define alternative actions
3. Obtain appropriate/applicable software to fit specific situations
4. Obtain necessary inventory data to describe the area (i.e., stand characteristics, costs associated with specific treatments, etc.)
5. Predict the consequences of alternative actions
6. Interpret results of the computer predictions
7. Evaluate alternatives
8. Select preferred alternatives
9. Choose and schedule actions to meet specified goals
10. Monitor results and revise plans as necessary

Critically evaluate computer-generated predictions. Computer results cannot replace experience or common sense, but they can be powerful tools to help you decide. Remember, models predict the average experience for stands growing under a range of conditions. For any given stand a variety of site-specific factors may not be included in the model.

Tables 1 and 2 list some available computer models to help managers evaluate financial analyses and/or silvicultural treatments in a management regime. The tables also list growth and yield computer models for silvicultural decisions and economic models to evaluate management practices. Economic evaluation systems are incorporated into some of the growth and yield models. The tables identify appropriate areas of use by state for single models and by region for consolidated models.

Table 1 .-Available economic software

Model	Applications	Features	See complete reference under these authors
INVESTMENT ANALYSIS FOR TIMBER MANAGEMENT	Timber management plans	<ul style="list-style-type: none"> • Present net value • Benefit/cost ratio • Composite rate of return • Equal annual equivalent 	Perkey (n.d.)
QUICKSILVER	Forestry investments	<ul style="list-style-type: none"> • five output reports • Input transaction for the case • Cash flow details in two tables • Financial return • Before- and after-tax replacement costs and future discounted values • A business operating statement 	Vasievich (1984)
CASH	Project analysis (Forestry, Agriculture, Engineering, etc.)	<ul style="list-style-type: none"> • Annual cash flows • Measures of project performance • Sensitivity analysis of discount rate 	Blinn (1985)
WORTH	Forestry investments	<ul style="list-style-type: none"> • Net present worth • Soil expectation value • Annual equivalent ratio • Internal rate of return • Discounted benefit/cost ratio 	Martin (1987)
STUMP	Timber utilization and mill processing	<ul style="list-style-type: none"> • Appraises timber • Determines appropriate stumpage value • Maintains log-yard inventories • Predicts end product yields • Monitors sawmill production 	Brisbin (1988)

Table 2.-Available growth and yield software

Model	Type	Species and area of application	Type of management	See complete reference under these authors
GROAK	Stand level	Upland oaks; IA,IL,IN,KY,MO,OH	Even-age	Dale (1972)
SILVAH	Stand table	Allegheny hardwoods; PA,NY	Even-age; uneven-age	Marquis (1984)
OAKSIM	individual tree	Upland oaks; ¹ KY,OH	Even-age	Hilt (1985a, b)
CENTRAL STATES TWIGS	Individual tree	Pure and mixed species; Central States-particularly IL, IN, MO	Even-age; uneven-age; economic analysis	Shifley (1987) Belcher (1982)
NORTHEAST TWIGS	Individual tree	Pure and mixed species; CT,DE, KY,MA,MD,ME,NH, NJ,NY,OH,PA,RI, VT, WV	Even-age; uneven-age; economic analysis	Hilt et al. (1987)
G-HAT	Individual tree	Appalachian mixed hardwood stands; GA,NC,TN,VA	Even-age	Harrison (1986)
YIELD-MS	Consolidated models	Pure and mixed species; Central States; Appalachian Region	Even-age; economic analysis	Hepp (1987) Hepp (1982)
ERGYS	Consolidated models	Pure and mixed species; Central States, Lake States, and Northeast	Even-age; uneven-age; economic analysis	Gullet (1986)

¹OAKSIM works for any upland oak stand as long as oaks compose 75 percent of the stand.

Much of the software and documentation listed may be obtained from the Forest Resources Systems Institute (FORS), a clearinghouse for forestry related software, publications, and special services. FORS is not limited to growth and yield and financial analysis models, but can also provide inventory, harvesting, and sawmilling software. Their address is 201 North Pine Street, Suite 24, Florence, AL 35630. The phone number is (205) 767-0250.

For more information on growth and yield models see Note 5.10 *Growth and Yield Models for Central Hardwoods*.

References

- Belcher David M. 1982. TWIGS: the woodman's ideal growth projection system. In: *Microcomputers, a new tool for foresters*; 1982 May 18-20; West Lafayette, IN. West Lafayette, IN: Purdue University, Department of Forestry: 70-95.
- Blinn, Charles R.; Rose, Dietmar W. 1985. CASH: a general cash flow and sensitivity analysis microcomputer program for conducting project analysis. Staff Pap. Ser. 54. St. Paul, MN: University of Minnesota, College of Forestry. 36 p.
- Brisbin, Robert L.; Yaussey, Daniel A.; Fuller, Leslie G. 1988. A progress report on STUMP: a system of timber utilization and mill processing. *The Compiler*. 6(1): 9-13.
- Dale, Martin E. 1972. Growth and yield predictions for upland oak stands 10 years after initial thinning. Res. Pap. NE-241. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 21 p.
- Gullett, Thomas L. 1986. ERGYS - bringing growth and yield to the forest manager. In: *Wiant, H.V.; Yandle, D.O.; Kidd, W.E., eds. Forestry microcomputer software symposium*; 1986 June 29-July 2; Morgantown, WV. Morgantown, WV: West Virginia University: 203-218.
- Harrison, Wade C.; Burkhart Harold E.; Burk, Thomas E.; Beck, Donald E. 1986. Growth and yield of Appalachian mixed hardwoods after thinning. Blacksburg, VA: Virginia Polytechnic Institute and State University, School of Forestry and Wildlife Resources. 48 p.
- Hepp, Todd E. 1988. A user manual for YIELD-MS timber planning tool for mixed stands Version 1 .1 Norris, TN: Tennessee Valley Authority, Office of Natural Resources and Economic Development, Division of Land and Economic Resources. 63 p.
- Hepp, Todd E. 1982. YIELD: timber yield forecasting and planning tool. *Southern Journal of Applied Forestry*. 6(3): 135-139.
- Hilt, Donald E. 1985a. OAKSIM: an individual-tree growth and yield simulator for managed even-aged, upland oak stands. Res. Pap. NE-562. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 21 p.
- Hilt, Donald E. 1985b. User's guide to OAKSIM: an individual-tree growth and yield simulator for managed even-aged, upland oak stands. Gen. Tech. Rep. NE-104. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 22 p.

- Hilt, Donald E.; Teck, Richard M.; Fuller, Leslie G. 1987. Generalized individual-tree models for the northeast. *The Compiler*. 5(4): 17-27.
- Marquis, David A.; Ernst, Richard L.; Stout, Susan L. 1984. Prescribing silvicultural treatments in hardwood stands of the Alleghenies. Gen. Tech. Rep. NE-96. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 90 p.
- Martin, A. Jeff. 1987. WORTH. Madison, WI: University of Wisconsin-Extension, Department of Forestry. 11 p.
- Perkey, Arlyn W. (n.d.). Investment analysis for timber management with the Radio Shack PC-2. Morgantown, WV: U.S. Department of Agriculture, Forest Service, Northeastern Area State and Private Forestry. 15 p.
- Shifley, Stephen R. 1987. A generalized system of models forecasting Central States tree growth. Res. Pap. NC-279. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 10 p.
- Vasievich, J.M.; Wiethe, R.W.; Frebis, R. 1984. Quick-silver: the forestry investment analysis program. Research Triangle Park, NC: Southeastern Center for Forest Economics Research. (Software)

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