



United States
Department of
Agriculture

Forest Service

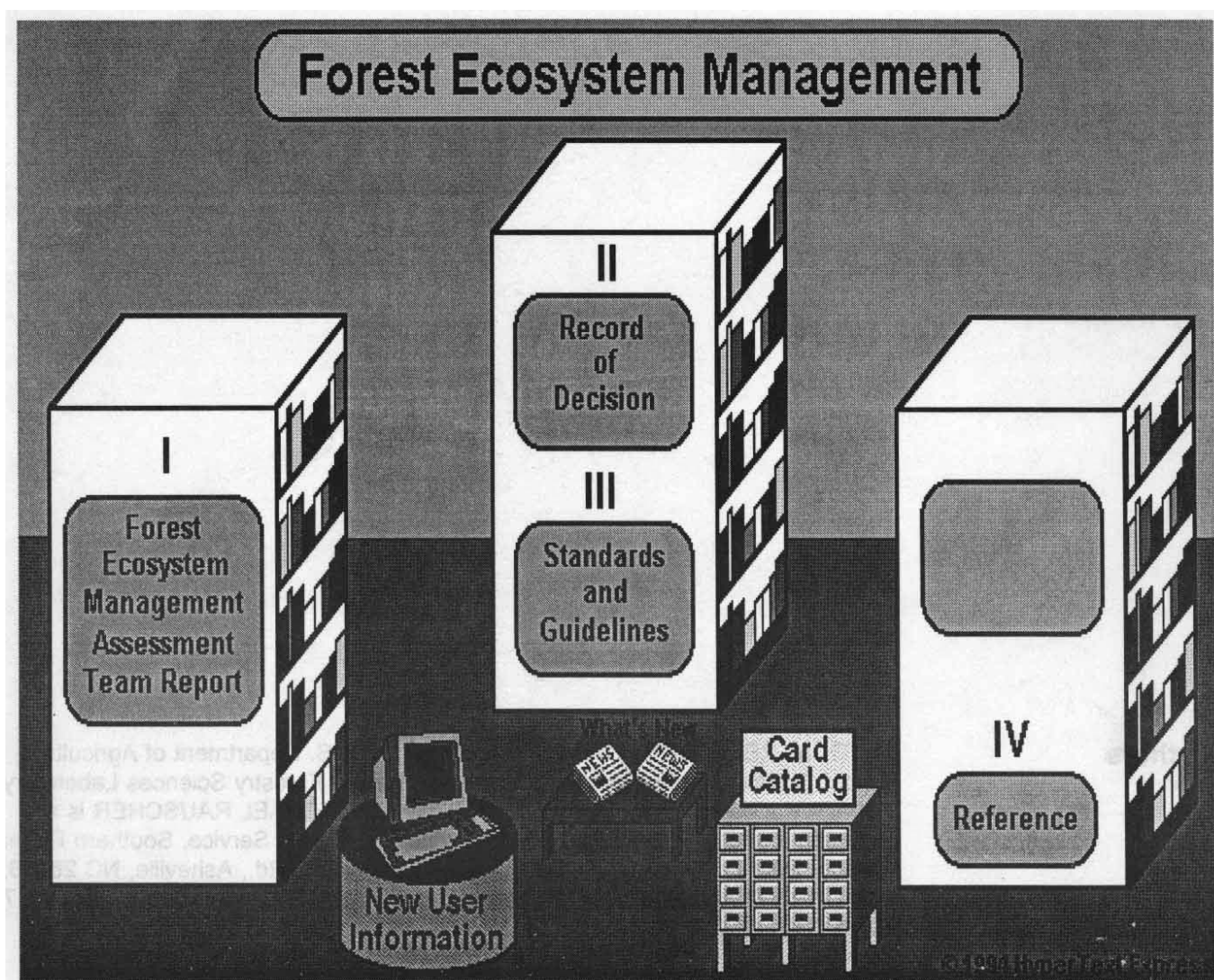
Pacific Northwest
Research Station

General Technical
Report
PNW-GTR-357
November 1995



A Hypermedia Reference System to the Forest Ecosystem Management Assessment Team Report and Some Related Publications

Keith M. Reynolds, H. Michael Rauscher, and
Christopher V. Worth



This file was created by scanning the printed publication. Text errors identified by the software have been corrected; however, some errors may remain.

Authors

KEITH M. REYNOLDS is a research pathologist, U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Forestry Sciences Laboratory, 3200 SW Jefferson Way, Corvallis, OR 97331; H. MICHAEL RAUSCHER is a research forester, U.S. Department of Agriculture, Forest Service, Southern Research Station, Bent Creek Experimental Forest, 1577 Brevard Rd., Asheville, NC 28806; and CHRISTOPHER V. WORTH is president, Hypertext Express Inc., HCR Box 78, Warba, MN 55793.

Abstract

Reynolds, Keith M.; Rauscher, H. Michael; Worth, Christopher V. 1995. A hypermedia reference system to the Forest Ecosystem Management Assessment Team report and some related publications. Gen. Tech. Rep. PNW-GTR-357. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 13 p.

The hypermedia system, ForestEM, was developed in HyperWriter for use in Microsoft Windows. ForestEM version 1.0 includes text and figures from the FEMAT report and the Record of Decision and Standards and Guidelines. Hypermedia introduces two fundamental changes to knowledge management. The first is the capability to interactively store and retrieve large amounts of different types of information, such as text, graphics, voice, and video. The second fundamental change concerns new abilities to share information. Hyperdocuments, once begun, can be expanded and improved iteratively. Each iteration, possibly worked on by different people, can be more comprehensive and useful than previous ones. One of the most important features of hypermedia is its ability to greatly enhance access to information. Also, hypermedia has the advantage of low reproduction cost and rapid dissemination of updates.

Keywords: Hypermedia, hypertext, FEMAT report, record of decision, standards and guidelines.

Introduction

Federal forest land management in the Pacific Northwest was brought to a virtual standstill in 1992 due to environmental controversies that culminated in a series of legal challenges to Forest Service management policy regarding the northern spotted owl (*Strix occidentalis*) (the so-called Dywer decisions; Caldwell and others 1994) and a series of reports sponsored by the agency (Johnson and others 1991; Thomas and others 1990, 1993). In response, President Clinton convened the Forest Conference in Portland, Oregon, in April 1993 to bring all concerned parties together and try to break the gridlock on forest resource management in the region. The Forest Ecosystem Management Assessment Team (FEMAT) was commissioned shortly thereafter. The FEMAT report (FEMAT 1993) was issued in July 1993. Despite many detractors, the FEMAT process has produced the most concrete and thorough statement to date of what is required of ecosystem management (USDA Forest Service and USDI Bureau of Land Management 1994). The Standards and Guidelines, published as an attachment to the latter Record of Decision, define a variety of land allocation types, prescribe detailed and specific management procedures for them, and establish an aquatic conservation strategy with particular emphasis on management of riparian areas.

The Record of Decision and Standards and Guidelines produced as part of the so-called President's plan are an important set of documents for implementing the recommendations of the FEMAT report. The FEMAT report, itself, is an important reference for the Standards and Guidelines. Together, these three documents provide a large volume of reference material with a complex, highly cross-referenced structure that can make access to relevant information a challenging task for land managers. As we describe in the next section, access to and use of this type of material can be greatly enhanced through hypermedia technology.

Hypermedia is a powerful technology for coping with the explosive growth of knowledge. But because it is still a relatively novel technology, it is helpful to understand why switching to the new medium may be a worthwhile technological shift from the familiar paper text medium. The balance of this paper provides an overview of the hypermedia system that has been developed and a brief user guide.

The Value of Hypermedia The Information Dilemma

Presidential science advisor, Vannevar Bush (1945), realized that:

The difficulty seems to be not so much that we publish unduly in view of the extent and variety of present-day interests, but rather that publication has been extended far beyond our ability to make real use of the record. The summation of human experience is being expanded at a prodigious rate, and the means we use for threading through the consequent maze to the momentarily important item is the same as was used in the days of square-rigged ships.

Perhaps somewhat ironically, rapid advances of the past 10 to 20 years in computing technology have only aggravated the problems noted by Bush (Riner 1991). From a historical perspective, it is easy to see the degree to which electronic information has progressively permeated our society (Grice 1989). The ability to create, organize, and distribute knowledge has become so important that it can substantially affect the well-being of individuals, organizations, and nations.

The most revolutionary change in computing in the 1980s was the spread of desktop computers. The most revolutionary change in the 1990s will be the spread of vast electronic hyperdocuments to the desktop computing environment (Martin 1990). According to Riner (1991),

Businesses are becoming increasingly dependent upon efficient access to this huge volume of information. A critical element in the movement to highly interactive information systems is our ability to take the massive amounts of already existing information and convert it for use on interactive computer systems.

Hypermedia introduces two fundamental changes to knowledge management. The first is the capability to interactively store and retrieve large amounts of different types of information such as text, graphics, voice, and video (Shneiderman and Kearsley 1989). Hypermedia may radically alter the way in which we read, write, and organize our knowledge (McKnight and others 1991). The second fundamental change concerns new abilities to share information (Shneiderman and Kearsley 1989). Hyperdocuments, once begun, can be expanded and improved iteratively. Each iteration, possibly worked on by different people, can be more comprehensive and useful than previous ones.

Accessibility

One of the most important features of hypermedia is its ability to greatly enhance access to information. We know many things but often are uncertain how to use what we know. We have tools, but we frequently are uncertain about what tasks to put them to because tools, by their nature, alter our perception of tasks. This process is often recursive: tools alter tasks alter tools and so on (Joyce 1991). "We are surrounded by reference materials, but without the ability to use them, they are just another source of anxiety. I think of them as Buddhas, sitting on my shelf with all that information and a knowing smile" (Richard Saul Wurman in Devlin and Berk 1991).

Often, the problem is not finding information, or even building a place to store it, but rather filtering out useful from irrelevant or redundant information (Devlin and Berk 1991). Hypermedia is currently our most powerful tool for organizing and synthesizing the complex human knowledge base. Hypermedia has many advantages that make it well suited for creating and publishing almost any type of document (McKnight and others 1991).

Easy access, defined as providing information in a way that meets users' needs and allows them to move between chunks of information quickly and easily, may be one of the biggest advantages to placing information into a hyperbase (Schlumlienzer 1989). Hypermedia improves access by;

- Providing a single access system for material that, in print, is scattered in physical as well as logical space.
- Allowing lengthy text to be easily searched, edited, and pasted into other hypermedia documents (Martin 1990).
- Allowing writers to offer different outlines, called facets, of the same text material so that readers can choose among them for more flexible access (Bolter 1990).
- Allowing low-cost publishing and widespread distribution on CD-ROM optical disks (McKnight and others 1991).

Low Cost and Rapid Dissemination

Hypermedia has the advantage of low reproduction cost and rapid dissemination of updates. Hypermedia technology offers the opportunity to integrate the three major electronic industries of computing, publishing, and broadcasting (Nielsen 1989). Updating, publishing, and distributing information in hypermedia can be made more efficient than using print media. One day the cost of dissemination may be reduced significantly by implementing national networks with fiber optic cables (Yankelovich and others 1990). In the meantime, the cost of publishing in CD-ROM format is already quite reasonable.

Education and Training

The true measure of the value of a hyperdocument is the users' ability to learn, find, and use information quickly and efficiently (Martin 1990). Hypermedia offers professionals "just-in-time" education, in which they learn about something just before using it. This concept is analogous to "just-in-time" parts supply for the manufacturing industry. Maintaining a large inventory of seldom-used information is just as costly as maintaining a large supply of parts.

In a hyperdocument, users can get to information faster than by looking it up in a paper document (Martin 1990). Large technical manuals are ideal candidates for hypermedia. In one study funded by the U.S. Army, two groups of M60 tank mechanics were used to study the effectiveness of a hypermedia technical maintenance manual (Riner 1991). One group was trained to use the papertext manual, and the other group was trained to use a hypermedia-based manual. The Army study showed a 3-to-1 reduction in troubleshooting errors in the group using hypermedia. It also took much less time to train someone with the hypermedia manual than with the paper text manual (Riner 1991).

Although computers have been used in education for years, hypermedia has only recently received attention as a possible teaching and learning tool. Hypermedia can be an effective learning tool to the extent that it focuses on the important relations between the concepts and the subject. The hope is that because hypermedia focuses on structure as well as content, a deeper understanding of the subject matter may be imparted to the student (Shneiderman and Kearsley 1989). Hypermedia is useful for "just-in-time" learning because it allows the user to quickly find required problem-related information. As such, hypermedia may be used as an immediately accessible reference source to provide timely and useful information for solving specific problems in real time (Nielsen 1989).

Reduced Document Size and Complexity

The hypermedia environment is well suited for bringing large, complex bodies of information together in small physical spaces to emphasize the interconnectedness of knowledge (Slatin 1990). The ability of hypermedia to link large quantities of information makes it possible to combine related information that otherwise might not be combined. The best hyperdocuments are those that seem much smaller than they actually are because the user can access information quickly and easily (Martin 1990). Detail is hidden from the user until and unless the user chooses to view it. Thus, it is possible to include appendices, examples, background information, original sources, bibliographic references, and other reference material (Shneiderman and Kearsley 1989) without materially increasing the complexity of the hyperdocument the user sees.

Overview of the Hypermedia Reference System

Good hyperdocuments can store large quantities of data, information, and knowledge in a small physical package and a manageable conceptual space (Martin 1990). Access by searching and browsing is fast and easy. The advent of economical

CD-ROM technology and gigabyte-size hard disks makes it practical to work with extremely large sets of information. Documents that are information-rich, highly cross-referenced, or have complex, well-defined structure can benefit from conversion to hypermedia (Riner 1991). Some specific types of documents that are good candidates for hypermedia conversion are manuals (maintenance, procedure, operation, and programming), textbooks, tutorials, technical references, standards and guides, and reports (Martin 1990, Riner 1991, Shneiderman and Kearsley 1989).

The hypermedia system, ForestEM, was developed in Hyper-Writer (Ntergaid, Milford, CT 06460) for use in Microsoft Windows (Microsoft Corporation, Redmond, WA 98052).¹ ForestEM version 1.0 includes text and figures from the FEMAT report (1993), and the Record of Decision and Standards and Guidelines (USDA Forest Service and USDI Bureau of Land Management 1994).

Hyperlinks

The power of hypermedia is based on intelligent engineering of information into chunks or topics. Structural topics define how information is organized. Information topics contain a "chunk" of information that usually corresponds to a well-defined topic that stands on its own. Inevitably, however, some information topics relate to other information topics, and, where such cross-references occur, hyperlinks provide a logical bridge between the chunks of information.

Structural Topics of ForestEM

Basic structural components of the hypermedia system include:

- graphic-based access to major sections of the documents
- global outline view
- outlines for major sections
- glossary of terms
- literature citations
- lists of tables and figures

¹ The use of trade or firm names in this publication is for reader information and does not imply endorsement by the U.S. Department of Agriculture of any product or service.

Navigation in ForestEM	All structural components include hyperlinks that allow the user to navigate among and within components. For example, hyperlinks have been inserted in information topics wherever cross-references, such as "see section ... ," occur. Glossary terms, literature citations, figures, and tables are also hyperlinked to their occurrences in information topics. Outlines, which are structural topics, consist almost exclusively of hyperlinks to information topics. Because of the size and complexity of information stored in ForestEM, the global outline view provides users with a useful way to keep track of their location in the body of information. A history function lets users view the sequence of steps they have taken through the logical structure of topics and backtrack to specific topics.
Text Search	ForestEM provides a facility for performing global searches on keyword combinations. By default, a search is global, but searches can optionally be restricted to a specific document.
Printing, Copying, and Exporting ForestEM Topics	Any topic displaying text or graphics can be sent directly to a printer or be copied to the Windows clipboard for pasting to another Microsoft Windows application. In addition, text and graphics can be exported directly to files external to ForestEM.
Installation System Requirements	The runtime version of HyperWriter (HyperReader) is supplied with the ForestEM system. To use ForestEM, a 386 PC-compatible or better must be available. ForestEM version 1.0 requires about 10 MB of hard disk space and Microsoft Windows 3.1.
Installing the System	Program installation is mostly automatic. In Windows Program Manager, choose Run from the File menu and type "a:install" on the command line (substitute "b" if installing from drive b). By default, ForestEM is installed in the directory, M-IRFEM, on the C drive. The user has the option, however, to change both the drive and directory. The install program also asks you to confirm your choice of drive and directory before the install program proceeds. Once you have selected the OK button to start the install process, the \HRFEM application directory is created, files are copied, and a group window and program icon for the application is created in Program Manager.
Using the System	For basic instructions on methods for scrolling in windows, closing windows, and so forth, refer to the "Microsoft Windows User's Guide."
Mouse Terminology	In the following discussion, click and double click refer to the left mouse button. Instructions will explicitly say "right click" only when necessary.
System Startup	To start the ForestEM application from the Windows Program Manager: 1. Double-click on the ForestEM group window icon to open the group window. 2. Double-click on the program item icon to start the application.

3. Click the start button (fig. 1) to close the opening topic and move to the main library topic.
4. Click the enter button (fig. 2) on the library doors to enter the library (fig. 3).

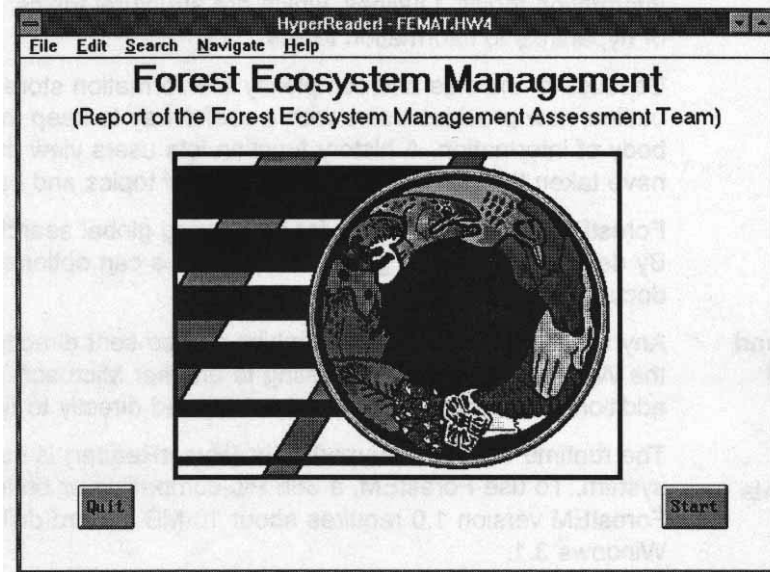


Figure 1—Opening window of ForestEM.

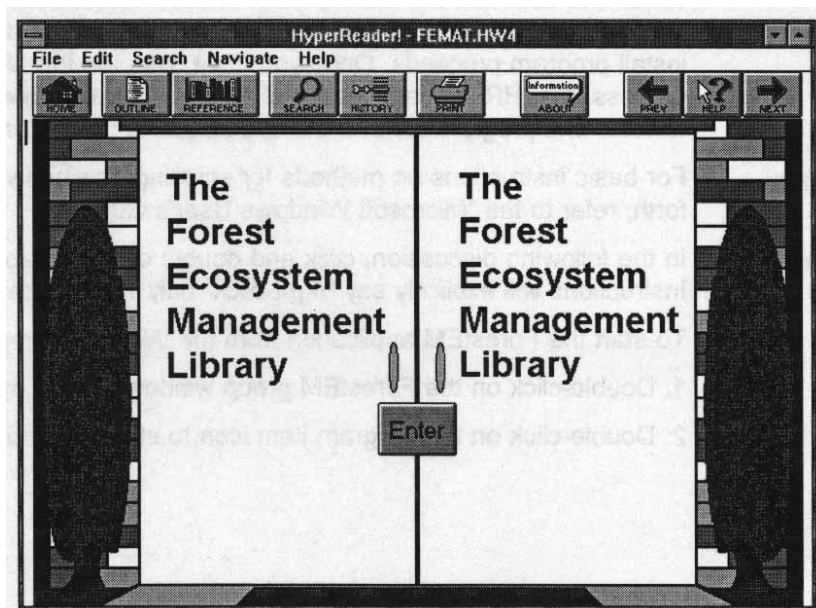


Figure 2—Entrance into the library.

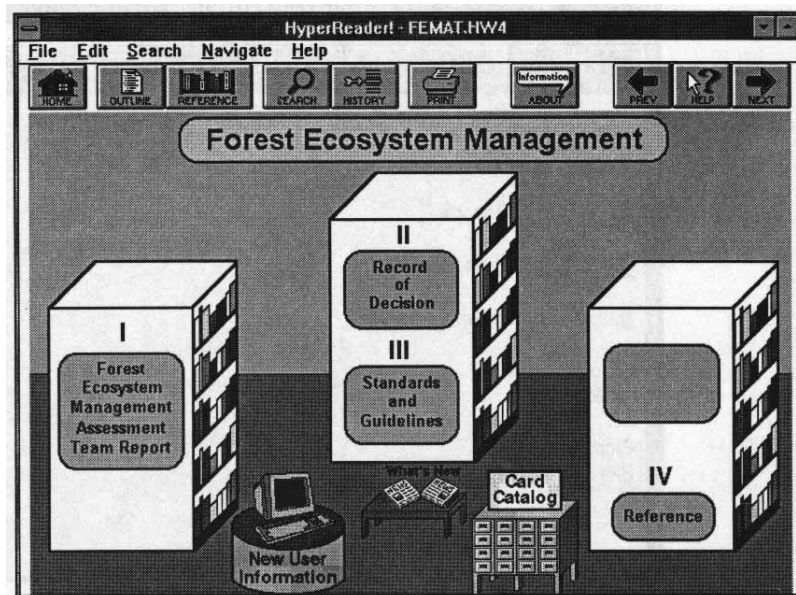


Figure 3—Graphic representation of the library, which provides access to major sections in ForestEM

Basic Navigation

Hyperlinks—Hyperlinks in ForestEM can be text bracketed either by green triangles or graphic objects. Graphic objects representing hyperlinks are identifiable because the mouse pointer will change to a pointing hand when placed over the object.

- Move the mouse pointer to the text or graphic and click to traverse either type of link.
- When in the linked topic, either a right click or pressing the escape key (Esc) will backtrack to the previous topic.

ForestEM maintains a history of all topics that are called; successive right clicks move you successively backward through a chain of topics.

Main ForestEM outlines—Many topics contain their own internal structural outlines that are used to navigate to subordinate topics. However, there are also two main outlines (chunk outlines) that provide direct global hyperlink access to most topics in ForestEM.

Clicking the outline button in the application button bar (fig. 3) provides hyperlink access to a collapsible chunk outline (fig. 4). Click on the large green cross in front of an item in the outline to expand the topics under the item (fig. 5). The crosses toggle an item between the expanded and collapsed states.

All text-based topics display a green diamond in the upper left corner of the topic window. Click on the diamond to go to a fully expanded version of the chunk outline. This duplicate chunk outline is particularly useful for users to keep track of their location within the total outline structure, and it is an important navigational resource because of the size and depth of the full topic structure within ForestEM.

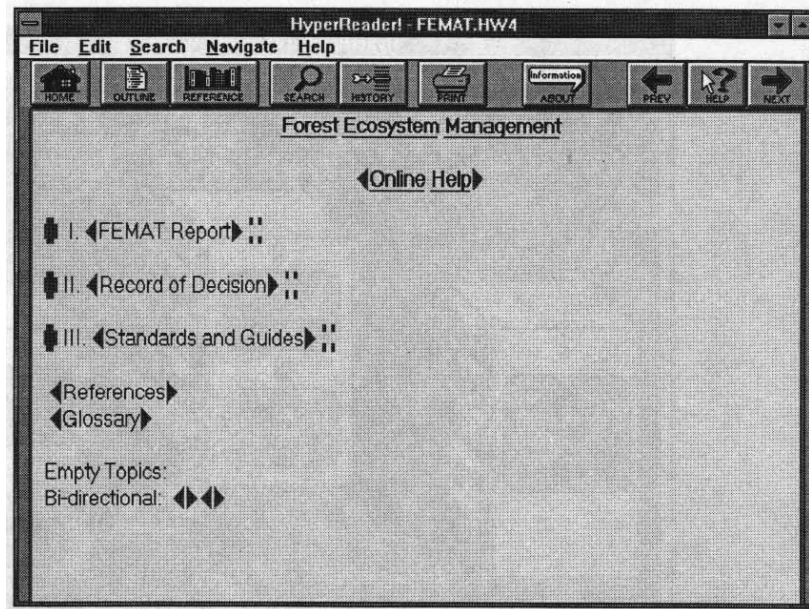


Figure 4—Collapsed chunk outline of ForestEM topics. Compare with figure 5

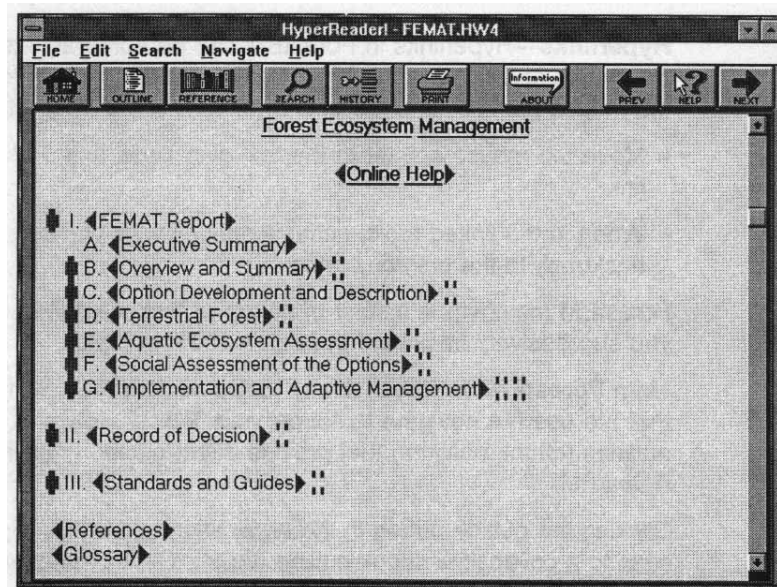


Figure 5—Example of an expanded outline entry Compare with figure 4

The Library

The library (fig. 3) is a graphic representation of the main ForestEM topics. Main topics of ForestEM are displayed on the library stacks. Click on a topic to hyperlink to the associated document. For example, click on the region labeled Standards and Guidelines to go to that document. When a document is selected, its main subtopics are displayed as a stack of books (fig. 6).

Click on the appropriate book to hyperlink to that section of the document. When a book is selected, the hierarchy of subtopics contained in the book is then displayed as a table of contents in the opened book (fig. 7).

Other graphic objects in the library are:

- New user information—on-line help for new ForestEM users.
- Card catalog—duplicates functions of the search and outline buttons on the application button bar, and provides access to the bibliography (see below).
- Reference—duplicates functions of the reference button on the application button bar (see below).
- What's new—update information for later releases of ForestEM after version 1.0.

The ForestEM Button Bar

Home button—Click the home button to return to the ForestEM introductory window (fig. 1). From this topic, ForestEM can be exited by clicking the quit button. Alternatively, the application can be exited from anywhere in the topic structure by double-clicking the control menu (small gray box) in the extreme upper left corner of the application window.

Outline button—Click to view the collapsible chunk outline of topics. See Main ForestEM outlines under the earlier section, "Basic Navigation," on procedures for expanding and collapsing the outline structure.

Reference button—Click to display a pop-up window with the following hyperlinks:

- index of figures
- index of tables
- glossary
- bibliography

Click on the desired hyperlink to traverse to the corresponding topic. The indices of figures and tables are presented as lists of hyperlinks to the specific items. The glossary and bibliography topics both display alphabetically labeled buttons (fig. 8); click on the appropriate alphabet button for the name or term, then scroll in the topic window to get to the specific entry.

Search button—Click to display the find dialog window, which is used to construct boolean searches on key words. Use the help button in the dialog window to get detailed instructions on how to specify a search and options that can be set for performing searches. The search button performs the same function as the search menu item on the application menu bar.

History button—Click to display an ordered list of the topics that have been viewed up to the current time in the present ForestEM session. Select an item from the list and select the OK button to go to the selected topic.

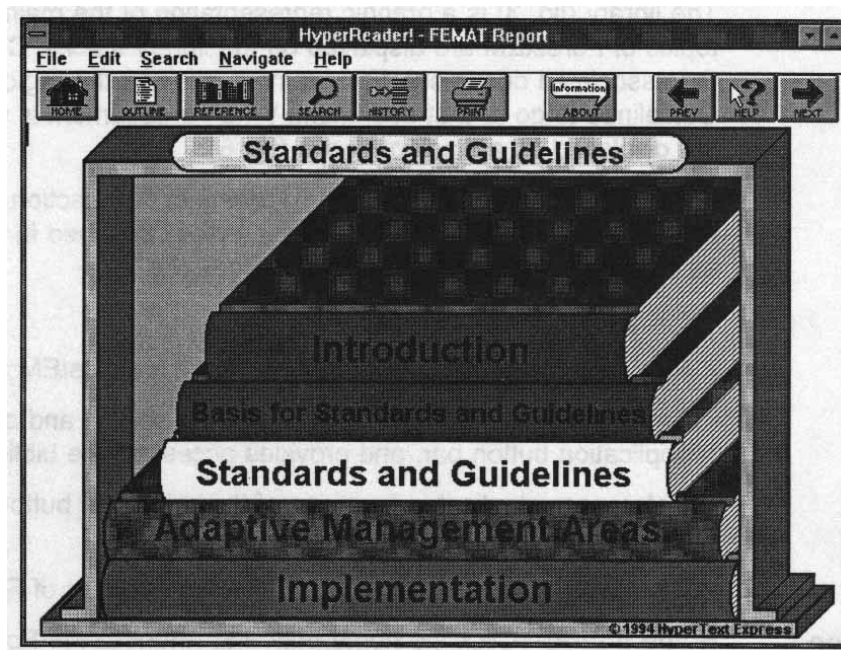


Figure 6—Graphic representation of hyperlink access to major sections of the Standards and Guidelines

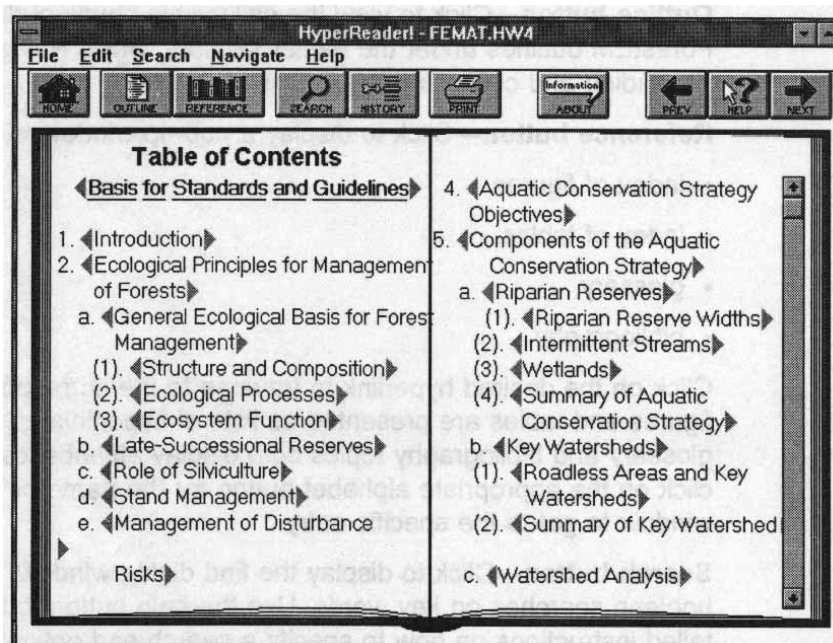


Figure 7 Hyperlink access (table of contents) to the hierarchy of topics within the section, Standards and Guidelines, in the Standards and Guidelines document.

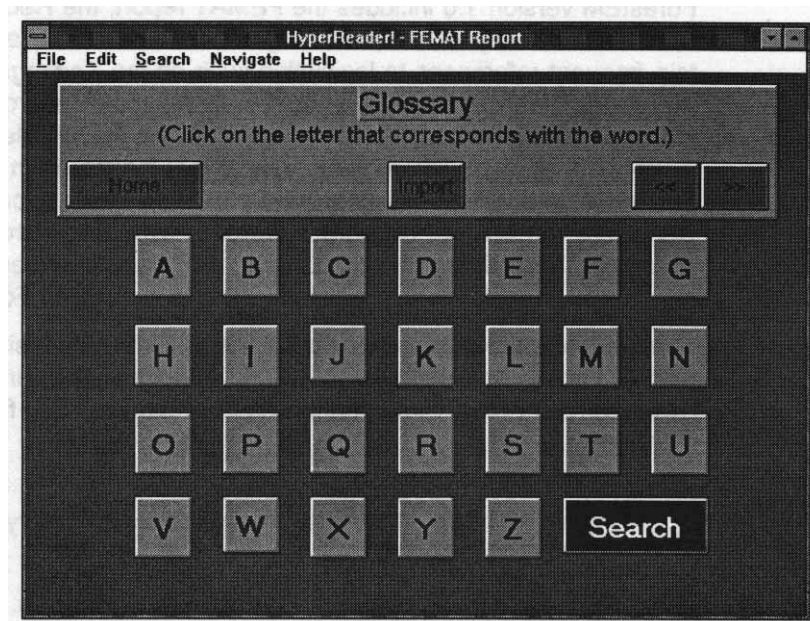


Figure 8. Hyperlink access to glossary entries via alphabetical buttons

Print button—Click to print the text of the currently displayed topic. Note that the contents of a graphic topic are not printable.

About button—Click to get information about Hyper-Writer, and the authors.

Prev[ious] button—Click to return to the previous topic.

Help button—The help button provides access to a new-user help topic that is more specific to our particular system. New-user help even includes a small expert system to assist users in determining what kind of help they need. The help button also provides access to another large hypermedia system, "The Encyclopedia of Hypertext" (Rauscher and others 1993) that provides extensive treatment of the theory, value, and use of hypertext.

Next button—Click to advance to the next topic in an ordered list of topics.

The ForestEM Menu Bar

Many of the functions available in the application menu bar have been duplicated in the buttons described in the previous section to simplify access. Full documentation for all commands available from the menu bar can be obtained on-line by selecting help on the application menu bar.

User Feedback and a Possible Version 2.0

Prototype versions of ForestEM were supplied to various individuals in the USDA Forest Service and other Federal agencies for preliminary evaluation and critique. Feedback from these individuals has helped shape version 1.0. With the wider distribution of the system accompanying its official release, we hope users will feel free to contact the senior author and provide additional comments to improve the usefulness of the program (see inside front cover for address).

ForestEM version 1.0 includes the FEMAT report, the Record of Decision, and Standards and Guidelines pertaining to the President's plan. These documents contain frequent references to legislation such as the Endangered Species Act, Clean Water Act, National Forest Management Act, and Resources Planning Act. We think it would be extremely useful to include both the text of relevant legislation and Agency-specific regulations pertaining to that legislation in a subsequent version of ForestEM. In addition, the Regional Ecosystem Office (Forest Service, Pacific Northwest Region, Portland, Oregon) is currently overseeing production of a user guide to watershed analysis that we think would also be a useful addition to ForestEM. User comments on addition of these and other documents to ForestEM also are invited.

Acknowledgments

The authors thank Michael A. Foster (Penn State University, College Station, PA), Alan J. Thompson (Environment Canada, Victoria, BC), and Elaine K. Sutherland (Northeastern Forest Experiment Station, Delaware, OH) for their reviews of the manuscript.

Literature Citations

- Bolter, J.D. 1990.** Topographic writing: hypertext and the electronic writing space. In: Delany, P.; Landow, G.P., eds. Hypermedia and literary studies. Cambridge MA: The MIT Press: 106-118.
- Bush, V. 1945.** As we may think. *The Atlantic*. 176 (July): 101-108.
- Caldwell, L.K.; Wilkinson, C.F.; Shannon, M.A. 1994.** Making ecosystem policy: three decades of change. *Journal of Forestry*. 92: 7-10.
- Devlin, J; Berk, E. 1991.** Why hypertext? In: Berk, E.; Devlin, J., eds. Hypertext/hypermedia handbook. New York: McGraw-Hill: 9-11. Chapter 2
- Forest Ecosystem Management Assessment Team. 1993.** Forest ecosystem management: an ecological, economic, and social assessment. Portland, OR: U.S. Department of Agriculture; U.S. Department of the Interior [and others]. [Irregular pagination].
- Grice, R.A. 1989.** Online information: what do people want? what do people need? In: Barrett, Edward, ed. *The society of text*. Cambridge, MA: The MIT Press: 22-44.
- Johnson, K.N.; Franklin, J.F.; Thomas, J.W.; Gordon, J. 1991.** Alternatives for management of late-successional forests of the Pacific Northwest: a report to the Agriculture Committee and the Merchant Marine Committee of the U.S. House of Representatives. Corvallis, OR: College of Forestry, Oregon State University. 59 p.
- Joyce, M. 1991.** Selfish interaction or subversive texts and the multiple novel. In: Berk, Emily; Devlin, Joseph, eds. Hypertext/hypermedia handbook. New York: McGraw-Hill: 79-92. Chapter 8.
- Martin, J. 1990.** Hyperdocuments and how to create them. Englewood Cliffs, NJ: Prentice Hall. 203 p.
- McKnight, C.; Dillon, A.; Richardson, J. 1991.** Hypertext in context. Cambridge, MA: Cambridge University Press. 166 p.
- Nielsen, J. 1989.** Hypertext and hypermedia. New York: Academic Press. 263 p.
- Rauscher, H.M.; Alban, D.H.; Johnson, D.W. [and others]. 1993.** The encyclopedia of hypertext. *AI Applications*. 7: 41.

- Riner, R.W. 1991.** Automated conversion. In: Berk, Emily; Devlin, Joseph, eds. Hypertext/hypermedia handbook. New York: McGraw- Hill: 95-110. Chapter 9.
- Schlumlienzer, P.C.. 1989.** Shadow-fusing hypertext with AI. IEEE Expert. Winter: 65-78.
- Shneiderman, B.; Kearsley, G. 1989.** Hypertext hands-on! an introduction to a new way of organizing and accessing information. Reading, MA: Addison-Wesley. 165 p.
- Slatin, J. 1990.** Reading hypertext: order and coherence in a new medium. In: Delany, P.; Landow, G.P., eds. Hypermedia and literary studies. Cambridge, MA: The MIT Press: 153-169.
- Thomas, J.W.; Forsman, E.D.; Lint, J.B. [and others]. 1990. A conservation strategy for the northern spotted owl: a report of the Interagency Scientific Committee to address the conservation of the northern spotted owl.** Portland, OR: U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior, Bureau of Land Management, Fish and Wildlife Service, National Park Service. 427 p.
- Thomas, J.W. [and others]. 1993.** Viability assessments and management considerations for species associated with late-successional and old-growth forests of the Pacific Northwest. Washington, DC: U.S. Department of Agriculture, Forest Service. 530 p.
- U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior, Bureau of Land Management. 1994.** Record of decision for amendments for Forest Service and Bureau of Land Management planning documents within the range of the northern spotted owl. [Location of publishers unknown]. 74 p.
- Yankelovich, N.; Meyrowitz, N.; van Dam, A. 1990.** Reading and writing the electronic book. In: Delany, Paul; Landow, George P., eds. Hypermedia and literary studies. Cambridge, MA: The MIT Press: 53-79.

Reynolds, Keith M.; Rauscher, H. Michael; Worth, Christopher V. 1995. A
hypermedia reference system to the Forest Ecosystem Management Assessment
Team report and some related publications. Gen. Tech. Rep. PNW-GTR-357.
Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest
Research Station. 13 p.

The hypermedia system, ForestEM, was developed in HyperWriter for use in Microsoft Windows. ForestEM version 1.0 includes text and figures from the FEMAT report and the Record of Decision and Standards and Guidelines. Hypermedia introduces two fundamental changes to knowledge management. The first is the capability to interactively store and retrieve large amounts of different types of information such as text, graphics, voice, and video. The second fundamental change concerns new abilities to share information. Hyperdocuments, once begun, can be expanded and improved iteratively. Each iteration, possibly worked on by different people, can be more comprehensive and useful than previous ones. One of the most important features of hypermedia is its ability to greatly enhance access to information. Also, hypermedia has the advantage of low reproduction cost and rapid dissemination of updates.

Keywords: Hypermedia, hypertext, FEMAT report, record of decision, standards and guidelines.

The **Forest Service** of the U.S. Department of Agriculture is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives—as directed by Congress—to provide increasingly greater service to a growing Nation.

The United States Department of Agriculture (USDA) prohibits discrimination in its programs on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, and marital or familial status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means of communication of program information (Braille, large print, audiotape, etc.) should contact the USDA Office of Communications at (202)720-2791.

To file a complaint, write the Secretary of Agriculture, U.S. Department of Agriculture, Washington, DC 20250, or call (202) 720-7327 (voice), or (202) 720-1127 (TDD). USDA is an equal employment opportunity employer.

Pacific Northwest Research Station
333 S.W. First Avenue
P.O. Box 3890
Portland, Oregon 97208-3890

U.S. Department of Agriculture
Pacific Northwest Research Station
333 S.W. First Avenue
P.O. Box 3890
Portland, Oregon 97208-3890

Official Business
Penalty for Private Use, \$300

do NOT detach label