

Using hyperdocuments to manage scientific knowledge: the prototype Encyclopedia of Southern Appalachian Forest Ecosystems

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Abstract

Despite the overwhelming body of research available on the ecology and management of Southern Appalachian forests, a gap exists between what scientists know and what the management community is able to apply on the ground. Most research knowledge still resides in highly technical, narrowly focused research publications housed in **libraries**. The internet, combined with increasingly sophisticated hyperdocument authoring systems, makes web-based hyperdocuments a practical and affordable way to manage this scientific knowledge. The USDA Forest Service developed the Encyclopedia of Southern Appalachian Forest Ecosystems (ESAFE; http://www.sciencedirect.com/science?_ob=RedirectURL&_method=externObjLink&_locatort=url&_cdi=5042&_plusSign=%2B&_targetURL=http%253A%252F%252Fwww.forestencyclopedia.net%252F), a hyperdocument-based encyclopedia system available on the internet, to address this need for more accessible, understandable, condensed, and synthesized research knowledge. This project aims to synthesize what we know scientifically about the management and ecology of Southern Appalachian forest ecosystems, organize it logically, and make it universally available at no cost to users. ESAFE is composed of original summaries of hundreds of topic areas compiled from over 5000 literature sources by over 15 authors specifically for this purpose. Presently, ESAFE has over 1100 pages of content that includes over 150 tables, 150 figures, 3000 internal hyperlinks, and 1800 external hyperlinks. Unlike most internet-based hyperdocuments, quality control of the encyclopedia is ensured through a complete peer-review process similar to traditional scientific journals. The encyclopedia is built upon a dynamic content management system (CMS), developed using Zope software, that provides a platform for authoring, editing, reviewing, publishing, and updating content directly through the internet. This CMS creates a mechanism for updating the site with peer-review content directly through the internet, so that the knowledge base can be continually updated, expanded, and improved. Using tools like ESAFE, busy forest managers can more easily find answers to questions from their own desks. It has been favorably evaluated by a diverse group of land managers, the general public, and ecosystem

scientists. It is also currently being used as a prototype for several other forestry-related hypertext encyclopedias.

Keywords: [Knowledge management](#); Hyperdocuments; Southern Appalachians; Content management systems; Peer-review

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References

Gibbons et al., 2000 M. Gibbons, C. Limoges, H. Nowotny, S. Schwartzman, P. Scott and M. Trow, *The New Production of Knowledge*, SAGE Publications, London (2000) pp. 167–168.

Gray, 2001 P.H. Gray, A problem-solving perspective on knowledge management practices, *Decision Support Syst.* **31** (2001), pp. 87–102. [SummaryPlus](#) | [Full Text + Links](#) | [PDF \(142 K\)](#)

Hermann, 1996 Hermann, K.A., 1996. The Southern Appalachian Assessment GIS Database CD ROM Set. Southern Appalachian Man and the Biosphere Program, Norris, TN (http://www.sciencedirect.com/science?_ob=RedirectURL&_method=externObjLink&_locator=url&_cdi=5042&_plusSign=%2B&_targetURL=http%253A%252F%252Fsunsite.utk.edu%252Fsamab%252Fdata%252FSAA_data.html).

Heinrichs et al., 2003 J.H. Heinrichs, L.J. Hudspeth and J.S. Lim, Knowledge management. In: Hossein Bidgoli, Editor, *Encyclopedia of Information Systems* vol. **3**, Academic Press, Amsterdam (2003), pp. 13–31. [Abstract](#)

Hubbard and Dangerfield, 1998 W.G. Hubbard and C. Dangerfield, Understanding and overcoming forestry technology transfer barriers in the U.S. in extension forestry. In: J.E.

Johnson, Editor, *Bridging the Gap Between Research and Application*, Virginia Tech Printing Services, Blacksburg VA (1998) (July 19–24).

Jackson et al., 2003 S.W. Jackson, G.M. Hopper and W.K. Clatterbuck, Web-Based learning for private forest and range landowners and managers, *Proceedings of the Society of American Foresters National Convention* October 24–28, Buffalo, NY (2003).

Jordin et al., 2003 J.B. Jordin, W.G. Hubbard, D.K. Kennard, W.H. Milnor, H.M. Rauscher and B. Veal, Using the Zope web application framework to build and manage a large encyclopedia of scientific knowledge. In: T. Innes, Editor, *Natural Resources Information Management Forum: Putting Knowledge to Work. B.C. FORREX Series vol. 8*, FORREX Natural Resources Extension Partnership, Kamloops (2003), pp. 135–145.

National Research Council, 1990 National Research Council, (NRC), *Forestry Research: A Mandate For Change*, National Academy Press, Washington, DC (1990) 84 pp.

Nodvin et al., 1993 Nodvin, S.C., Rigell, J.S., Twigg, S.M., 1993. An Indexed Reference Database of the Great Smoky Mountains, North Carolina and Tennessee. National Park Service, Southeast Region, Technical Report NPS/SERGRSM/NRTR-93/08, NPS-D-413.

Ratschiller and Gerken, 2000 T. Ratschiller and T. Gerken, *Web Application Development with PHP 4.0*, New Riders, Indianapolis (2000) 384 pp.

Rauscher, 1991 H.M. Rauscher, The encyclopedia of AI applications to forest science, *AI Appl.* **5** (1991) (2) insert (592 KB, 235 pages, 449 links [electronic]).

Rauscher et al., 1995a H.M. Rauscher, D.A. Perala and C.V. Worth, The ecology and management of aspen, *AI Appl.* **9** (1995) (3) insert (1.23 MB, 297 pages, 747 links [electronic]).

Rauscher et al., 1995b H.M. Rauscher, M. Twery, J. Palmer, R. Hoffman, S. Stout, J. Steinman, P. Kollasch, D. Bennett, L. Thomasma, J. Hornbeck and C.V. Worth, The northeast decision model design document, *AI Appl.* **9** (1995) (3) insert (3.6 MB, 813 pages, 978 links [electronic]).

Rauscher et al., 1997 H.M. Rauscher, D.L. Loftis, C.E. McGee and C.V. Worth, Oak regeneration: a knowledge synthesis, *FORS Compiler* **15** (1997) (1) insert (electronic).

Reynolds et al., 1995 Reynolds, K. M., Rauscher, H.M., Worth, C.V., 1995. A Hypermedia Reference System to the Forest Ecosystem Management Assessment Team Report and some Related Publications. USDA Forest Service, Pacific Northwest Research Station, General Technical Report PNW-357 + electronic files.

Rittel and Webber, 1973 H.W.J. Rittel and M.M. Webber, Dilemmas in a general theory of planning, *Policy Sci.* **4** (1973), pp. 155–169. [Full Text via CrossRef](#)

Schmoldt et al., 1998 Schmoldt, L. Daniel, M.F. Winn and P.A. Araman, Web site access statistics and delivery of research results. In: J.E. Johnson, Editor, *Understanding and Overcoming Forestry Technology Transfer Barriers in the U.S. in Extension Forestry:*

Bridging the Gap Between Research and Application, Virginia Tech Printing Services, Blacksburg VA (1998).

Simard, 2000 A.J. Simard, Managing knowledge at the Canadian forest service, Natural Resources Canada/Canadian Forest Service, Ottawa/Canada (2000) 88 pp.

Spicklemire et al., 2001 S. Spicklemire, K. Friedly, J. Spicklemire and K. Brand, Zope Web Application Development and Content Management, New Riders, Indianapolis (2001) 454 pp.

Stickney et al., 1994 Stickney, P. L., Swift Jr., L.W. and Swank, W.T., 1994. Annotated Bibliography of Publications on Watershed Management and Ecological Studies at Coweeta Hydrologic Laboratory, 1934–1994. USDA Forest Service, Southeastern Forest Experiment Station, General Technical Report SE-30.

Stock and Rauscher, 1996 M.W. Stock and H.M. Rauscher, Artificial intelligence and decision support in natural resource management, *N. Z. J. Forestry Sci.* **26** (1996), pp. 145–157. [Abstract-GEOBASE](#) | [\\$Order Document](#)