

Use of CD-ROMs to Provide a Repertoire of Forest IPM Digital Information to Clientele and User Groups

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ABSTRACT

Proper management decisions relating to forest insects and disease organisms must be based upon identification of the organism(s) and an understanding of the ecosystem biology. Since insects and forest pathogens are small, diverse and varied, the availability of good pictures greatly aids in their identification. However, ready access to good pictures of these organisms and their damage has been a problem for many people. Although the Internet and the World Wide Web provides exciting opportunities to deliver timely and quality information, many users are still accessing the Web via dial-up communications, which severely limits the ability to transmit the large file sizes common with quality, color images. With the expanded availability of multimedia-capable computers and the evolution of the Internet there is great potential to provide images and appropriate supportive materials to groups needing this information. To address this need, we have begun a series of projects that have/will culminate in the formation of an archive of high quality forestry-related images and subsequent release of subsets of these images in consumer-ready Photo CD digital format. This paper is based upon projects in which we have, are or will be using digital images of forest pests. Already released in cooperation with The U.S. Southern Forest Insect Work Conference is Southern Cooperative Series Bulletin 383 which contains two hundred (200) digital pictures of many southern forest insects and their damage. SCS 383 is shipped with Eastman Kodak's Access software and is available for \$ 25 (U.S.) plus shipping for international orders. For information on SCS Bulletin 383 and other projects, visit our World Wide Web site at:

http://www.ces.uga.edu/Agriculture/forest/www_cdad.html

Keywords: Forest IPM, forest insects, forest pathogens, multimedia, digital images.

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INTRODUCTION

Forestry is an important component of U.S. and world-wide agriculture. Although there are many insects and microorganisms in forested environments, most of them are beneficial and do not significantly affect our use or management of the forests. However, some insects and microorganisms become pests and can negatively affect individual trees and forest stands. Forest pests can and do impact the beauty and health of many trees and cause significant economic losses. Integrated Pest Management (IPM) and the Forest Health Initiative now being endorsed by The United States Department of Agriculture Forest Service and other U.S. agencies are important because they allow us to enjoy and manage forested ecosystems, help minimize the negative impact of potential forest pests, and can minimize the use of chemical pesticides when intelligently incorporated into management plans. IPM is part of a management system that integrates all appropriate disciplines and available technologies to manage pest populations so that their negative impact(s) are reduced or eliminated (Metcalf and Luckmann 1975). Although significant amounts of both private and governmental funds are expended on research, suppression and management of selected forest pests (e.g., gypsy moth, nun moth, various pine bark beetles, etc.), the number of forest IPM educational specialists is decreasing. Our collective ability to develop and provide forest IPM information to our clientele continues to be taxed. Many governmental agencies, including the USDA Forest Service have produced many high-quality, color forest pest information booklets, fact sheets and other comprehensive training materials in years past. However, at least in the United States, relatively few have been updated or printed since the mid-to-late 1980's, largely due to decreasing publication budgets and increased printing costs. Additionally, with the general downsizing in personnel and ongoing budget reductions in public institutions in the U.S. (and presumably other countries), the prospect of an increase in availability of traditional published guides containing IPM color visuals is dim.

OPERATIONAL PARADIGM

We believe that the adage “a picture is worth a thousand words” is true when dealing with the complex of small, diverse forest insects and microorganisms and their impacts. Proper identification is essential before any management scenario is developed to deal with a suspected pest. The availability of high-quality pictures greatly increases the likelihood that a suspected pest problem will be correctly identified. At issue then, is how to provide high-quality images to a diverse audience in a flexible manner?

For discussions sake, we propose to group image delivery into *static* and *flexible* methods of delivery, realizing that there are other probable methods and that there is considerable overlap between the categories. We define images to include: photographs, line drawings, artwork, videos, computer graphics, drawings, animations, etc.

In the *static delivery* group, we include image delivery methods that allow the user relatively little capability of altering either the images or the accompanying information without considerable time

and effort. We include 35mm slides, photographic prints, paper-based publications, videotape, and electronic documents in the static delivery method. Users are able to use them only in the form, format, size and layout in which they were provided without extensive alterations. We include electronic documents in this grouping since they are generally in a proprietary format which precludes editing or modification and reuse by the user.

Flexible delivery methods allow the user to easily alter the format, form, and layout of images before integrating them into documents. We include materials delivered via the World Wide Web, on compact disc as Kodak Photo CDs or other widely accepted format or using a combination of the two.

In contrast to static delivery, flexible delivery techniques hold far more promise in terms of adaptability and educational value. We intend to make images and information available in a dynamic format that allows users to develop customized IPM educational materials to suit their own needs and applications.

PROJECT OBJECTIVES

The principle objectives of our digital image projects are/were to:

1. Collect and archive a selection of high-quality images (principally photographs originally in 35mm slide format) dealing with forest insects and pathogens.
2. Digitize, catalog and ensure that correct and complete identification, description and photographic credits accompany images in our collection.
3. make image sets available to a large number of users in a flexible manner,
4. Disseminate image sets in digital format on medium that is computer accessible and that would not require the consumption of large amounts of user hard disk space,
5. Provide those image sets to users in an inexpensive manner as a repertoire of easily accessible digital images for subsequent forest IPM uses and applications.

The information presented here reflects the authors experiences in developing the *Forest Insects and Their Damage* (Douce, et al 1995) Photo CD set and a Forest Integrated Pest Management digital image set (to be released in early 1997). The primary reason we chose to adopt the Kodak Photo CD format was its compatibility across platforms. While our experiences are largely limited to the Windows platform, Photo CDs will work under both Microsoft Windows or the Macintosh operating system—the two most prevalent operating systems.

The technical aspects of delivering digital images and information are beyond the scope of this paper. For technical information, we refer the reader to *Collection, Development and Delivery of*

Forest Integrated Pest Management Images via CD-ROM (Douce, Moorhead, and Watson, 1996), which addresses the developmental aspects relating to the production and release of Photo CDs. The aforementioned paper covers such topics as the acquisition of desired images, the process of digitizing and editing images, the development and importance of a textual database, packaging and delivery, and the legal aspects of production and distribution. Also, there are many excellent periodicals and magazines that have regular feature articles on digital imaging, electronic delivery of materials and multimedia authoring. We have found *Syllabus*, *PC Graphics and Video*, *Presentations*, *Multimedia Producer* and *Digital Video* to be particularly helpful publications. In most cases, we have not provided original photography, rather our intent was to retrieve original slides and photographs from agency and individual photographers archives. Many of the images that we obtained were used to produce the many excellent USDA Forest Service and other U.S. and State agency publications, published principally, in the 1970's and 1980's. Unfortunately, in many cases, the original images used in the publications had been returned to the individual or location from which they were obtained—without retaining a duplicate image copy or any record of the source of the image. In most cases, no centralized archival of images occurred. Consequently, the authors/project coordinators had to make extensive contacts and requests of the many individuals and agencies to locate and obtain the desired images.

OPERATIONAL CONSIDERATIONS OF USING DIGITAL IMAGES

Assuming the appropriate biological and scientific expertise to develop educational training materials, there are still a few basic aspects of digital imaging that must be addressed before successfully producing computer-delivered presentations and programs:

1. The author must have access to the desired images in an appropriate digital file format. This format should be compatible with the computer software that will be used to develop and present the materials.
2. The author must either possess or have access to the appropriate computer software and hardware.
3. The author must have the technical knowledge and expertise available to develop, package and deliver the product to the intended clientele.

There are a number of digital file formats and file types that are used for graphics. To be useful for a potential author/user, the digital formats must be standardized or at least convertible to formats easily usable in the desired application program. The resolution, color-bit pattern, and the overall quality of the image is tremendously important and must be appropriate for the final intended application.

Since high resolution image files are quite large, developers need to carefully evaluate trade-offs between image file size and the quality and resolution of the graphic necessary for the desired application.

Authors and users of digital images must be concerned with many issues normally in the realm of graphic artists. Color palettes, hue, saturation, sharpness, contrast, and a variety of other aspects of digital photography must be considered. Authors and program designers must be functionally versed in graphic design. We refer the reader to books such as *Digital Imaging For Visual Artists* (Grotta and Grotta 1994) for more information.

One must have the appropriate software and hardware to develop, observe, experience and distribute information. Developers must be proficient in the utilization of appropriate computer software and hardware systems when designing a presentation or some other method of information delivery. These individuals must also possess or have access to expertise in the scientific discipline that are the subject of the presentations. Consequently, it is often necessary to form a project design and application team comprised of individuals with the necessary broad-based experience and capabilities. In our efforts to develop a collection of forest entomology images, we have concluded that the Kodak Photo CD technology provides the best overall solution for delivery of images in particular projects. Benefits of this format include: standardized file storage and retrieval capabilities, an internationally recognized digital image format, Kodak's technological backing, delivery of very high resolution images with the inherent capability of converting to a wide variety of other digital formats, and the ability to deliver images on compact discs across multiple operating systems. Technical specifications of the Kodak Photo CD technology are given in a set of World Wide Web documents on the Kodak Company Home Page at <http://www.kodak.com>.

Kodak's Photo CD format, which was first developed in 1992, allows images to be viewed in any of five different resolutions each of which is appropriate for specific applications. The Photo CD format is considered a de facto standard for high-quality, low-cost storage of digital images for the desktop computer. Images can be retrieved quickly and easily with consistent image quality and no degradation over time. After the Photo CD is created, the original images cannot be altered. Listed below are the five levels of image resolutions on the standard Photo CD format.

Example Use	Approximate Size (uncompressed)	Resolution (pixels)	Kodak Image Name
For 35mm film output (prints, slides, etc.)	18 Megabytes	2048 x 3072	16 Base
High Definition TV, small prints	4.5 Megabytes	1024 x 1536	4 Base
TV or monitor viewing	1.13 Megabytes	512 x 768	Base
Image selection	280 Kilobytes	256 x 384	Base/4
Index images	70 Kilobytes	128 x 192	Base/16

IMAGE APPLICATIONS

Once the images are available in a standardized file format in appropriate color and resolution, it is relatively easy to import them into one of the popular computer-based presentation packages including Microsoft PowerPoint, Corel (WordPerfect) Presentations, Harvard Graphics, etc. The images can also be enhanced by using a graphics editing software package (Adobe Photoshop, Corel PhotoPaint, Macromedia X-RES, etc.). Once the images are imported into these packages, it is relatively easy to create and/or customize an image or to create a presentation. Most computer presentation packages provide the user with the ability to:

1. present the image in its original format or to modify, crop or magnify portions of the image to show particular features of interest. We use this feature for example to highlight the differences between the small bark beetles belonging to the genus *Dendroctonus* and *Ips*. Both beetles are small and are commonly found in the same environment and can be significant pests of pines. One of the key diagnostic features is the shape of the beetles' rear-end. *Dendroctonus* beetles (which include U.S. species of the Southern Pine Beetle and the various Turpentine beetles) have rounded eleytron or rear-ends. Members of the *Ips* beetles (which include several species of commonly found U.S. engraver beetles) have the eleytron scooped-out (concave) with varying numbers of small "teeth". Using PowerPoint we can first show an overall image to show the shape and relative size of the beetles (Figure 1), then follow-up with a crop and magnification of the same image more clearly showing the differences in the rear-end of the beetles (Figures 2 and 3). We have found this approach to be highly effective.



Figure1



Figure 2



Figure 3

2. add titles and labels, insert arrows or pointers, or cut-and-paste objects from more than one source to highlight specific features of interest. For example, we frequently add the common and scientific name to a slide of a pest or beneficial insect. Of course, we can also create title and textual information slides and insert them between images. We frequently intermix screens containing life cycle, behavioral characteristics and control information within our presentation.
3. considerably enhance the graphic. For example, an image can be modified to change colors, and highlight details. Images can be treated with special effects (to create a woodcut-appearance, for instance) or adapted for use as a background image. This must be done with some caution and intent in order to avoid erroneous results.

USE OF IMAGES IN OTHER COMPUTER MULTIMEDIA APPLICATIONS

Once quality images are available in digital format, they can be easily incorporated into virtually any software package. These programs are available to assist a user/author in creating anything from simple on-screen presentations to sophisticated interactive multimedia applications and even World Wide Web pages.

USE OF IMAGES IN TRADITIONAL IMAGE DELIVERY METHODS

Digital images can also be used to great advantage in what we consider as “traditional” publications. In the past, if pictures were to be included in high quality publications such as color

fact sheets, handbooks, guide books, text and reference books, a slide or color photograph was provided to the publisher/printer who then created a “color-separation.” That separation was used to “print” an image on paper in the appropriate location within the text. Today, many printers set their publications on a computer using software such as Adobe PageMaker. Often the printer can insert the desired image directly into the document from a file provided to them on a diskette or compact disk bypassing the expense and time associated with the older color separation process. It is also important to remember that, usually, the printer maintains rights to the color separation. If the image provider needed to use a particular plate for another purpose or for additional prints of the same material, it was necessary to pay the printer for reuse of “your” image.

If the digital images are archived and stored in appropriate high-resolution image formats such as the Kodak Photo CD (PCD) format, the images can be converted to support a wide variety of traditional needs and applications including:

1. general consumer and specialty publications.
2. articles and pages created “on-the-fly”.
3. output to a film recorder for the production of prints, slides, posters, etc.

CONCLUSION

We feel that it is important that we as educators working in the Forest Management arena somehow provide a wide array of users with an easily accessible, comprehensive repertoire of quality Forest Integrated Pest Management images. These images should be in digital form so as to be efficiently and effectively used in printed materials as well as in electronic applications. The standardization of file sizes and formats, ready access, permanency of storage and ease of retrieval on a local computer system will greatly enhance the delivery of educational efforts in Forest Integrated Pest Management. Users will be able to quickly retrieve and customize desired images and integrate them into their particular application or presentation using common commercial software.

BIBLIOGRAPHY

Cranshaw, W., D. Leatherman and B. Kondratieff. 1995. *Insects That Feed On Colorado Trees and Shrubs*. Bull. 506A. Colorado State University, Cooperative Extension Service, Ft. Collins, CO, USA. 197 p.

CSU. 1995. *Put Knowledge To Work*. CD95A. Adobe Acrobat format CD ROM. Section: Insects That Feed On Colorado Trees and Shrubs. Colorado State University, Cooperative Extension Service, Ft. Collins, CO, USA.

Douce, G. K., G. J. Lenhard, B. T. Watson and D. J. Moorhead. 1995. *Forest Insects and Their Damage*. Southern Forest Insect Work Conference Photo CD Vol. I and II. SERA-IEG-12, Southern Cooperative Series Bull. 383.

Douce, G. K., D. J. Moorhead, and B. T. Watson. 1996. *Collection, Development and Delivery of Forest Integrated Pest Management Images via CD-ROM*. Proceedings Sixth International Conference on Computers in Agriculture.

Gosney, M., B. Hurter, A. Stone, M. Kaproff, R. Bagarley, B. Lawler and J. Estrada. 1995. *The Official Photo CD Handbook*. Verbum, Inc. Peachpit Press. 346 p.

Kodak. 1994. Fully Utilizing Photo CD Images. PhotoYCC Color Encoding and Compression Schemes. Photo CD Information Bulletin PCD 045, Article 4. Eastman Kodak Co. 5 p.

Lynch, P. J. 1996. Creating Graphics for the World Wide Web: File Formats for Web Pages. Syllabus. Vol. 9 (4):46-48.

Metcalf, R. L. and W. H. Luckmann. 1975. *Introduction to Insect Pest Management*. John Wiley and Sons, New York. 587 p.

Multimedia Producer. Knowledge Industry Publications, Inc., 701 Westchester Ave., White Plains, NY 10604-3098 USA. WWW: <http://www.kipinet.com>.

Multimedia World. PC Communications, Inc., 501 Second St # 600, San Francisco, CA 94107 USA. WWW: <http://www.multimedia.com>.

PC Graphics and Video. ADVANSTAR Communications, 201 E. Sandpointe Ave., Suite 600, Santa Ana, CA 92707 USA. WWW:<http://www.advanstar.com/pcgv>

Presentations. Lakewood Publications, 50 S. Ninth St., Minneapolis, MN 55402. USA.

Rice, M. E. and W. Wintersteen . 1995. Postmarked Extension, USA. A Picture is worth a thousand words: Using Photo CD to produce extension publications. Amer. Entomol. 41:2. 72-74.

Syllabus. Syllabus Press Inc., 1307 S. Mary Ave., Suite # 211, Sunnyvale, CA 94087