Utilizing Multimedia Tools for LRAM Project Documentation and Marketing

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August, 1996

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Contents

Figures

Acknowledgments

The authors express gratitude to Stan Zellmer and Ray Hinchman of Argonne National Laboratory and to the Environmental Management Office staff at CMTC Hohenfels for providing material and technical advice for this interactive multimedia project.

This investigation was supported by the U.S. Army Seventh Army Training Command, Directorate of Engineering and Housing, Environmental Management Branch, Combat Maneuver Training Center, Hohenfels, Germany, through U.S. Department of Energy contract W-31-109-Eng-38.

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by

R.G. Sullivan, P.D. Hatton, and A. Böhm

Abstract

Land Rehabilitation and Maintenance (LRAM) program managers at U.S. Army Training Installations must present technical material relating to LRAM projects to a variety of audiences, ranging from installation commanders to installation visitors and environmental interest groups. These audiences may play a role in approving and/or funding LRAM projects. Effective communication to these audiences can facilitate the achievement of LRAM program objectives. The rapid development of computer-based multimedia technology provides LRAM managers with powerful tools for creating highly effective project presentations that can be presented from notebook computers for use in briefings or distributed on CD-ROM for use on desktop computers. This paper presents an example of use of multimedia to document and present an LRAM revegetation project conducted at the Freihölser Forst Local Training Area in Germany. This CD-ROM presentation makes extensive use of digitized photos, video, maps, and text to present a detailed summary of the project, including project justification, background, methods, costs, and results. The application design allows the viewer to select topics of particular interest for detailed examination and to omit other topics or examine them in less detail. Virtually every important revegetation procedure is presented in photographs supplemented by brief video clips and text. Interactive charts allow easy comparison of alternative revegetation procedures that use different combinations of soil amendments, seedbed preparation, and seed mixes. Slide sequences and video clips clearly illustrate differences between conditions before and after the LRAM project was conducted. The presentation will be used to brief commanding officers, installation visitors, and host country officials about this highly successful LRAM project.

1 Introduction

Environmental management at U.S. Army training installations has become increasingly complex as environmental regulations become more numerous and strict, and as the information requirements for the environmental management task increase. Multifaceted environmental programs such as the Integrated Training Area Management (ITAM) Program that address issues such as natural and cultural resource inventories, erosion monitoring and control, pollution prevention, and environmental awareness education have been implemented in an attempt to provide a comprehensive, integrated approach to environmental management. Conducting these multifaceted programs involves the processing, generation, and communication of massive amounts of information, much of it technical in nature.

As the number and complexity of environmental programs has increased, the need to involve organizations and individuals outside of the environmental management organization in the environmental management process has also increased. These organizations and individuals, which may include Army trainers, commanders, regulators, politicians, and public interest groups, must be involved because they provide or use information processed or generated by these programs, or because their involvement in the environmental management process is required to meet program objectives or legal requirements. Because they affect or are affected by environmental management actions, their cooperation is essential to the success of these programs.

Land Rehabilitation and Maintenance (LRAM) project managers must brief such audiences on technical issues relating to LRAM projects and must sometimes present complex information that is critical to understanding the issues involved in a particular decision or course of action. LRAM programs typically involve concepts, procedures, and data that nontechnical audiences may find overly complex, confusing, or simply uninteresting. Failure to communicate LRAM-related information effectively to a critical audience may occasionally have serious consequences for the project in terms of financial support or cooperation.

Research underway at Argonne National Laboratory (ANL) is exploring the use of interactive multimedia technology to assist the Combat Maneuver Training Center Hohenfels Environmental Management Office (EMO) staff in communicating environmentally related technical information (including LRAM project information) more effectively. This recently developed computer technology has significant potential to simplify the presentation of complex environmental information for communication purposes and to make presentations more effective.

For demonstration purposes, ANL created an interactive multimedia application that presents detailed summary information about an LRAM project conducted at the Freihölser Forst Local Training Area (LTA) as part of the ITAM Program. ITAM is a comprehensive

environmental management approach in use at Hohenfels and many other U.S. Army training installations. The multimedia application demonstrates how interactive multimedia can be used to package LRAM information in a format that results in greater information retention by audiences. Multimedia can integrate data from a wide variety of sources, can use multiple sense modalities for information presentation, and can actively engage the audience in the learning process, resulting in a more efficient learning experience.

2 Background

Freihölser Forst LTA is a 138–ha (341–acre) military training area located in the state of Bavaria in southeastern Germany, near the border with the former Czechoslovakia. At the time of the LRAM project (1986-1990), Freihölser Forst LTA was used extensively for military training exercises by armored cavalry units of the U.S. Army, various units of the Federal Republic of Germany's Bundeswehr, and by units of the German border police.

2.1 The Freihölser Forst Local Training Area Rehabilitation Project

By 1986, continued heavy use of Freihölser Forst LTA for military training had resulted in severe environmental damage (primarily vegetative cover loss and soil erosion) that necessitated a rehabilitation project to stabilize the LTA's barren, highly erodible soils, and to provide more realistic terrain conditions for training activities. The Environmental Management Office at Combat Maneuver Training Center (CMTC) Hohenfels, responsible for environmental management at Freihölser Forst LTA, requested assistance from the U.S. Army Corps of Engineers Construction Engineering Research Laboratory (USACERL) in developing a rehabilitation plan for the LTA. Argonne National Laboratory was then selected by USACERL to design and implement the rehabilitation project as part of the LRAM component of the ITAM Program in place at Freihölser Forst. This project, described by Hinchman et al. (1991), provided the source material for the multimedia application entitled "Freihölser Forst Revegetation Project."

The rehabilitation project demonstrated rapid, cost effective revegetation methods to stabilize the LTA's soils. The project was conducted in two phases. Phase I demonstrated and evaluated three different rehabilitation treatments, while Phase II implemented a modified rehabilitation treatment over a large portion of the damaged areas of the LTA. Both phases included site monitoring to evaluate the success of the treatments, as well as cost comparisons between the various treatments.

The Freihölser Forst rehabilitation project was selected for use in the multimedia application for a variety of reasons:

- It was a very successful, high-visibility project, thus its public relations or "marketing" value was deemed sufficiently high to justify the expense of creating the multimedia application.

- The nature of the project and the procedures involved in its execution were well-suited for a presentation that made heavy use of photos, sound, and short video clips.

- Existing photos, maps, and video of suitable quality were readily available, as the original project was well-documented.

- The amount of information and the level of complexity of the project were sufficiently large to justify a non-linear presentation format, without being so large or complex as to become unmanageable for the available resources, both human and financial.

2.2 Interactive Multimedia Technology

Interactive multimedia technology is rapidly emerging as an effective alternative to traditional slide or videotaped presentations. Although there are numerous definitions of "multimedia," most definitions include the following: "any combination of text, graphic art, sound, animation, and video delivered...by computer or other electronic means" (Vaughan 1994:4). Vaughan further defines "interactive multimedia" as multimedia in which the end user (the viewer of a multimedia project) is allowed to control the content and pace of information delivery. Multimedia in which the viewer navigates a predefined structure of linked elements is defined as "hypermedia."

User control and interaction, combined with hypertext, video, and sound capabilities, allow multimedia authors to create presentations that are more likely to hold viewer interest and are therefore more memorable. Multimedia can be very effective for presentation of scientific data that might otherwise be confusing or lacking in interest to nontechnical audiences. Multimedia presentation tools are well suited for integration of disparate types of information, such as maps, photos, and tables, making it particularly useful for presentation of complex scientific projects that involve multiple data types. This interactive multimedia research effort demonstrates the use of interactive multimedia for presentation of complex scientific information in an environmental management context.

3 Objectives and Approach

The goal of this research was to develop an application demonstrating the use of interactive multimedia for presentation of technical information related to ongoing environmental programs at CMTC Hohenfels. To attain this goal, the following specific tasks were required:

- Use existing photos, videotape, maps, and text to develop a multimedia presentation of the Freihölser Forst Local Training Area Rehabilitation Project. The use of existing materials reduced costs, and using the rehabilitation project as the topic provided a realistic context in which to judge the quality and usefulness of the product, as well as providing a product that would serve several practical purposes, such as use in technical briefings and public relations efforts.

- Within the application, provide general information about Freihölser Forst, and describe in detail the environmental problems at the LTA, the purpose of the rehabilitation program, procedures used, monitoring results, the conclusions drawn from the project, and the current state of the LTA's environment.

- Package the multimedia presentation as a CD-ROM product that would run at an acceptable speed and display properly on a Pentium Processor-based desktop computer.

4 Description of Effort

The multimedia application development effort consisted of integrating text, photos, maps, and digital video clips in a single application to present information about the Freihölser Forst Local Training Area Rehabilitation Project. Multimedia authoring software was used to create a user-friendly graphic user interface for the application, to create the logic structure that governed the application's information flow, and to assemble the various media elements that made up its information content.

4.1 Authoring Software

The multimedia authoring software packages chosen for this prototype application were Macromedia® *Authorware® Professional for Macintosh*™ and *Authorware® Professional for Windows*™. *Authorware* is a powerful and versatile authoring program that makes use of object-oriented programming. Object-oriented programming facilitates authoring by non-programmers, an important consideration if the technology is to be transferred to EMO staff, who are not programmers, and may not have time to become proficient at traditional programming.

Authorware was also chosen because it has cross-platform compatibility, allowing development on either Macintosh™ or Microsoft® Windows™ platforms, with easy translation across platforms if needed. This cross--platform compatibility allows packaging applications for both platforms, to ensure compatibility for the maximum numbers of users. The final product for this research was delivered to the EMO in a Windows-compatible format.

Multimedia authoring using *Authorware* typically consists of the following general steps:

1. Various icons that represent a given action, such as the display of a graphic, playing of a sound, or the playing of a digital video clip are arranged in a desired sequence on a flow diagram. Each icon is a symbol for underlying programming code that executes the desired action. When the application is run, events occur in the order specified by the flow diagram, so that as each icon is encountered, the underlying code is executed. Navigational branching operations are executed by users' interactions such as clicking buttons or using pull-down menus.

2. After the icons are arranged to create the desired flow diagram, the contents of each icon are attached to the icon symbol. For example, if an icon on the flowchart indicates the display of a particular graphic, this step links the desired display graphic to the display icon. *Authorware* has a limited set of

tools for creating graphics and sounds, but more typically these graphics and sounds are imported from other software packages, such as paint packages, sound editors, video editing programs, etc.

3. After the icon contents are attached to the icons in the flow diagram, the application is tested and refined as necessary.

4. The last step is to *package* the application. Packaging involves saving the application in a run-time version that can be played as a stand-alone software program that does not require *Authorware* itself in order to run. This step also "locks" the application file, so that the end users cannot alter or edit the application. Packaging is an important step that allows low-cost distribution of the end product without distributing copies of costly authoring software, and that safeguards the finished application and the data it contains from deliberate editing or accidental alteration.

4.2 The Freihölser Forst Revegetation Project Multimedia Application

The *Freihölser Forst Revegetation Project* multimedia application is divided into three main sections. A generalized outline of the application is shown in Figure 1. The first section, entitled "Site Characteristics," presents an overview of Freihölser Forst LTA, describing its geographical and physical characteristics, climate, history, use as a training area, etc. The section includes interactive maps that show where Freihölser Forst is located and, through progressively more detailed views, show features of the installation, such as forestry plots, revegetation areas, roads, and boundaries. Another feature of this section is an optional, user-controlled "electronic slide show" of digitized photographs showing general views of the landscape at Freihölser Forst. The "slide show" graphically illustrates the severity of the vegetation loss and soil erosion. In this section and the other sections of the presentation, the user uses the computer mouse to "press" buttons to select desired topics or to play digitized video clips. Pop-up labels identify "slide-show" and video clip subjects, so that users can make more informed choices about what to view. At all times, pull-down menus available at the top of the screen provide short-cuts to navigate to other sections and topics in the presentation.

The second section of the multimedia application, titled "Phase I: Design and Testing" presents Phase I of the revegetation study. Phase I involved designing a strategy for the project and testing various revegetation treatments at several small experimental plots. Topics in this section that the user may choose to explore include:

- Soils Analysis - an illustrated description of soil testing and results;

- Test Plots - descriptions of each of the revegetation test plots, including maps, photos, and digitized video clips narrated by the principal investigators;

- Revegetation Procedures - detailed descriptions (through text, photos, narrated video, and interactive charts) of each treatment used, including seedbed preparation, soil amendments, seeding mixtures, and treatment cost comparisons;

- Monitoring - a description of the monitoring methods used and results of monitoring;

- Research Summary - a one-screen summary of the section.

The Phase I section of the multimedia application makes considerable use of digitized video clips (approximately 30 seconds average length) to demonstrate nearly every treatment operation, from soil tillage, to seeding, to transect monitoring. For certain key types of information (e.g. seed mixtures, costs analyses), the user has the option to view the text information in either English or German, in order to facilitate understanding by non-native English speakers. An interactive chart facilitates pair-wise comparisons of treatment procedures and costs.

The third section of the *Freihölser Forst Revegetation Project* multimedia application, entitled "Phase II: Implementation" presents Phase II of the revegetation project, as well as information about the long-term results of the study and the conditions at Freihölser Forst today. Phase II involved large-scale revegetation treatment of most of the damaged areas at the LTA. In general, though simpler, the Phase II procedures were similar to the Phase I procedures, so a presentation structure parallel to the Phase I section was employed. This section also makes heavy use of digitized video and features two "slide shows." One simultaneously presents "before-and-after" pairs of photos showing various LTA locations before and after treatment, while the second is a "virtual" tour of Freihölser Forst LTA as it looks today, showing that the beneficial effects of the revegetation project are still evident.

Other minor features of the *Freihölser Forst Revegetation Project* multimedia application include an easily-accessible help screen, a credits screen, and a "for more information" screen that provides contact information for the Environmental Management Office at Hohenfels. All of these screens and the main menus can be quickly accessed by use of pull-down menus and/or keyboard shortcuts.

4.2 The Production Process

In all, the *Freihölser Forst Revegetation Project* multimedia application contains 44 separate screens of information, 10 maps, 15 video clips, 5 interactive charts, 3 "slide shows", 30 menu selections, 60 photos, and hundreds of buttons or other opportunities for user interaction. The effort required about 600 hours of labor, of which approximately 200 hours were staff labor and 400 hours were student labor. Approximately three-quarters of the staff labor was devoted to content development, with one quarter devoted to project

management and supervision. Roughly two-thirds of the student labor involved graphics processing, with one-third devoted to programming and other tasks. The production process was facilitated by the availability of photos and video clips, a well-organized and clearly written project report, and the availability of the principal investigators for consultation during content development.

The design for the application was first sketched out on paper and then converted into a flow diagram that was revised and expanded several times. Mock-ups for key screens were created, and the navigation structure was developed by testing several approaches on naive users. A modular approach was used to create the application, with each section programmed as a unit, then afterward integrated with the other sections. A storyboarding process was used to create content and provide guidance for screen production and programming. A sample screen from the application is shown in Figure 2. A rigorous file–naming scheme was implemented in advance to avoid confusing the many hundreds of graphics files created during the production process.

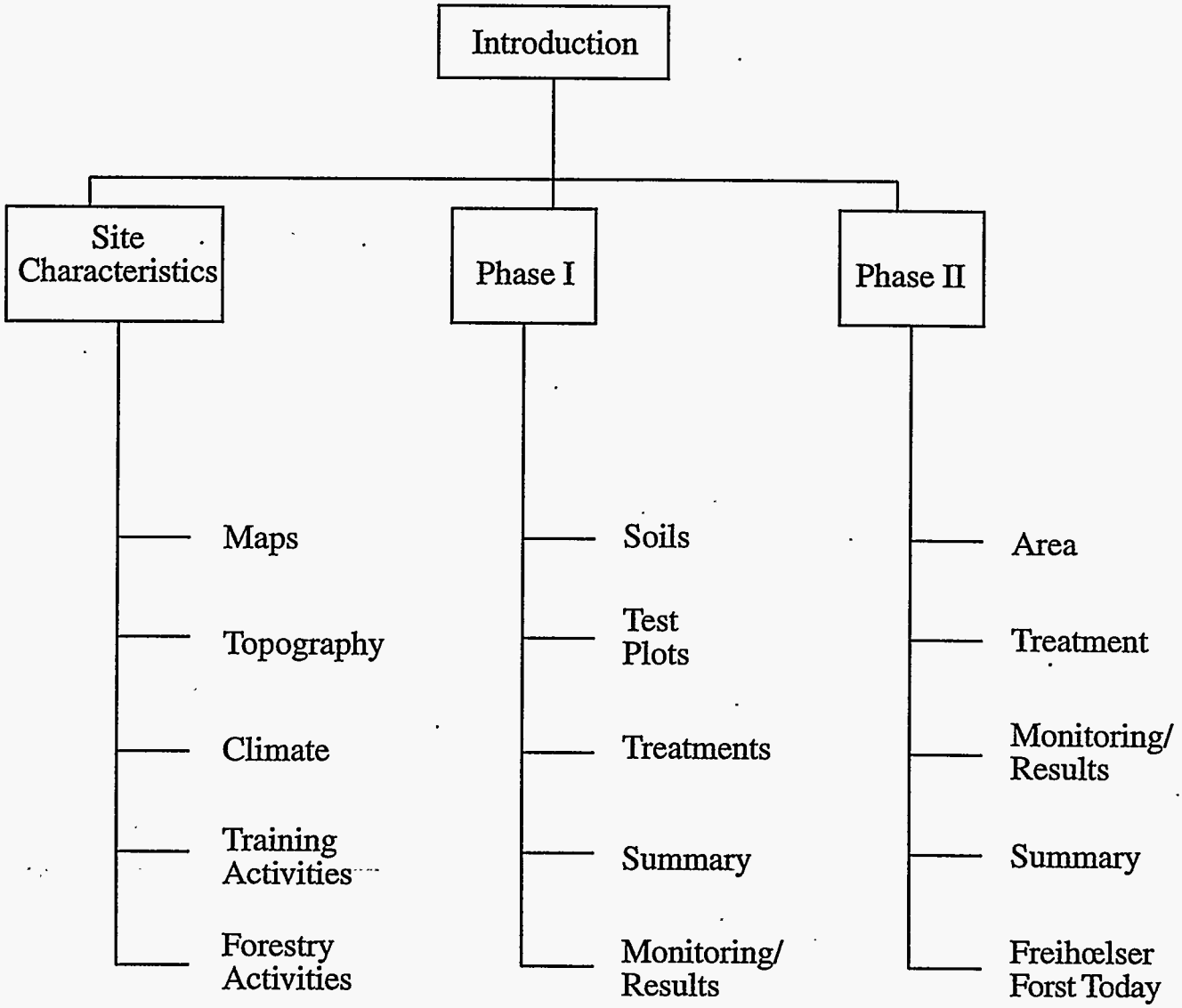

Fig. 1 Generalized Outline of Freihœlser Forst Multimedia Application

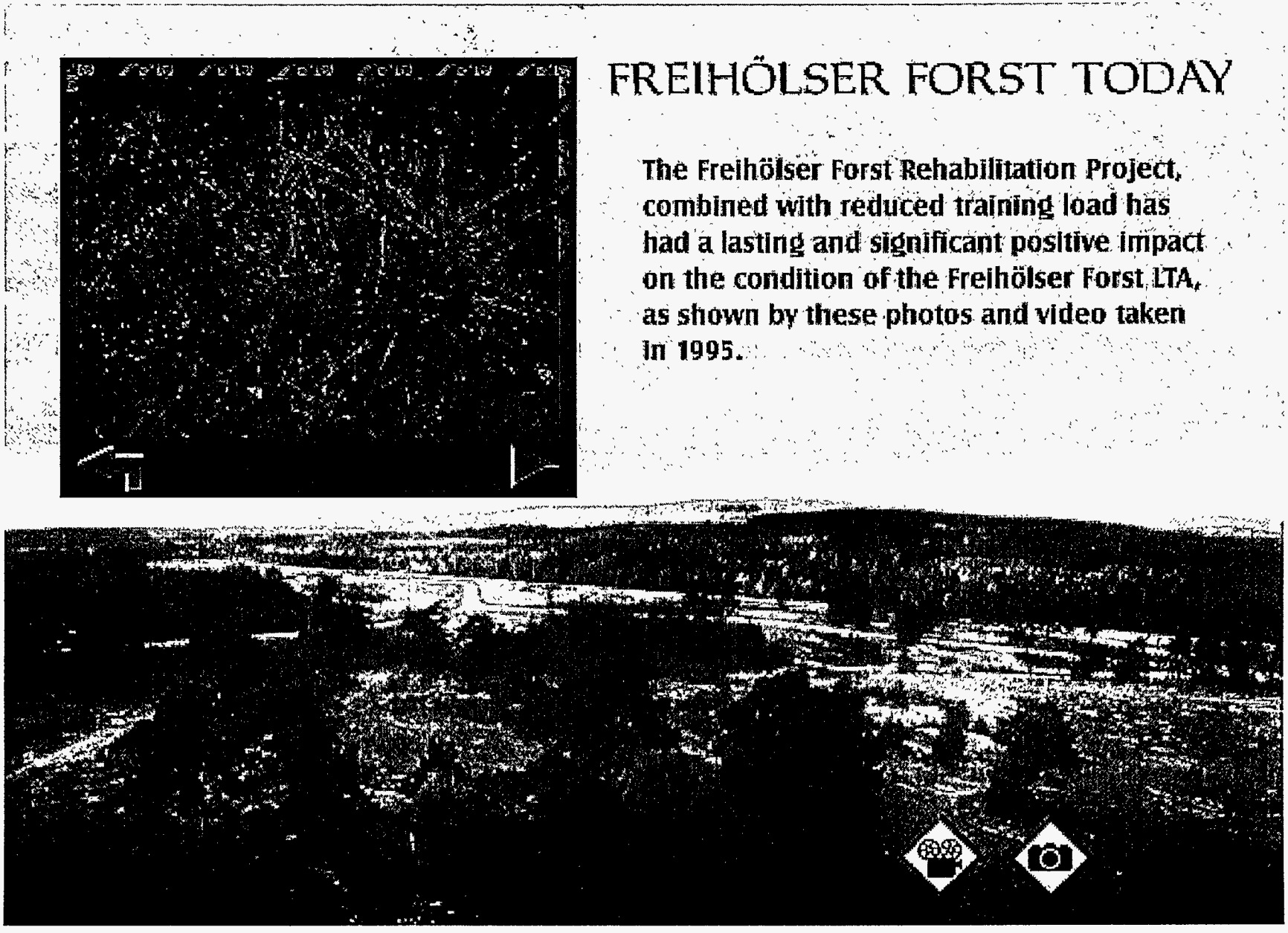

Fig. 2 Freiholser Forst Application Screen Example

5 Discussion

The final multimedia product was delivered on CD-ROM to the Environmental Management Office at CMTC Hohenfels in July 1996. It was installed on a multimedia desktop PC and a notebook computer in the EMO office and is currently used for briefing visitors to the CMTC. The presentation takes approximately 25 minutes to run if every screen is viewed, although typically only a portion of the whole presentation is viewed at one sitting.

The application is currently run using a Pentium PC with 32 Mb RAM, 32-bit color capability, and a sound card with stereo speakers. Performance has met expectations. The program runs at a generally consistent speed, although there is some slight variation in the smoothness of the video clips, that occasionally disrupts the soundtrack. The full-screen graphics are loaded within one or two seconds, eliminating annoying delays.

The application has also been installed on a notebook computer with an Intel 80486 microprocessor. Performance is noticeably slower on the notebook PC than on the desktop PC, because of the slower microprocessor (80486 vs. Pentium), and the slow 8-bit videographics card on the notebook. The application contains 16-bit graphics, and these images must be dithered "on the fly."

Reaction to the multimedia product has been very favorable, both from EMO staff, and from visitors who have seen the presentation. EMO staff feel that the presentation does a very good job of presenting the revegetation project. According to EMO staff, audiences are particularly interested in viewing the digitized video clips. Whether this is because they are more informative than still graphics, or simply more interesting to look at, or both, is open to speculation. While the multimedia application is not as detailed as the paper report, it provides a very good summary of the important aspects of the project and manages to hold viewer interest despite the technical subject material and orientation. It is also a very flexible presentation tool that allows the viewer to customize information content and dissemination rate to match the viewer's learning style and individual preferences.

6 Conclusions and Recommendations

The *Freihölser Forst Revegetation Project* multimedia project undertaken for EMO at CMTC Hohenfels demonstrated that U.S. Army environmental managers can successfully use interactive multimedia technology to communicate technical information about LRAM programs to nontechnical audiences. Multimedia provides a communication medium that is engaging to the viewer, and allows the viewer to customize information content and dissemination rate to match the viewer's learning style and individual preferences. Multimedia is an excellent medium for combining information from a wide variety of sources and formats for an integrated, user-friendly presentation. The *Freihölser Forst Revegetation Project* presentation provides a comprehensive overview of a complicated, multifaceted program and incorporates a variety of map graphics, charts, photos, video, and text. Because multimedia applications can be produced and distributed more quickly and inexpensively than traditional printed material, and because of the advantages of interactivity, multimedia holds significant promise for bridging the communication gaps that may arise in attempting to explain complex Army environmental programs and land management issues to interested parties inside and outside the Army.

Current environmental work at Hohenfels and other training installations is sufficiently complex to justify using multimedia technology (where possible) to ensure that those who interact with the environmental management staff are able to understand the issues involved in environmental management at the installations. Because of the Hohenfels EMO's increasing need for effective communication of environmental activities, we have recommended that in-house multimedia capabilities be developed if staffing limits permit and if the magnitude and/or importance of particular projects justifies the effort and expense.

7 References

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