Evaluating and Communicating Options for Harvesting Young-growth Douglas-fir Forests

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Abstract.—A cooperative project, developed by Washington State Department of Natural Resources (DNR) and the Pacific Northwest Research Station (PNW), provides a framework for managers and scientists to (1) obtain experience with a range of silvicultural options; (2) develop information about public response to visual appearance, economic performance, and biological aspects associated with each option; and (3) demonstrate and communicate the consequences of applying the options (singly or mixes thereof) over the landscape to lay and technical audiences. The project is being installed as part of DNR's timber sale program on a 90,000-acre "working forest."

INTRODUCTION

Silviculturists at the Pacific Northwest Research Station's (PNW) Olympia Forestry Sciences Laboratory have joined with foresters of the Washington State Department of Natural Resources (DNR) to establish a comparison of options for harvesting and regenerating young-growth Douglas-fir forests. This project is an integrated research and development effort with elements of adaptive management and demonstration. It will provide a vehicle for communicating with policy makers and other parties interested in or concerned about silvicultural practices. It has been designed and laid out, and the first replicate block will be harvested in summer 1998. Many scientists from PNW laboratories, technical specialists from DNR, and faculty from the University of Washington and the University of Idaho are currently involved with the project and will participate in evaluation of the options. We expect others to join us in the future.

In this paper, we describe briefly the general setting of forestry in Washington State today and the concerns that stimulated DNR and PNW to work together on this project. We discuss some considerations that shaped our approach to the project design and describe the harvesting options to be compared. We then describe the general nature of evaluations, including use of computer-generated visual images of stand development. Finally, we summarize benefits expected from the project.

FORESTRY IN WASHINGTON STATE

Our project is concerned with forests west of the Cascades. This area, commonly referred to as the Douglas-fir region, contains some of the most productive forest land in the nation. Seventy-five percent of the land is capable of growing more than 120 ft^3 per acre per year (Note: only 13% of forest land in the nation and only 17% of land in the southeast has such high production potential). Of 9.5 million acres of timberland west of the Cascades, 56% is in State or industrial ownership, 21% is in non-industrial, private ownership; the remaining 23% are federal lands, primarily National Forests. Historically, forest products have dominated the region's economy, and they still are very important.

During the past 25 years, human populations have boomed, particularly in and around Puget Sound. Most people are urban and suburban residents; they appreciate the scenic beauty and other values provided in our forests. Many, probably most, of these residents are opposed to clearcutting. Wood supplies contributed by National Forests have diminished substantially during the past decade, but timber harvests and silvicultural issues associated with them are more important than ever—for harvests have accelerated on other lands.

Despite many well-publicized conflicts and legal battles over forest management, we believe that most forest users, managers, and owners are interested in the multiple benefits that forests of our region can provide. And these include wood products and the financial returns derived from timber harvests, which, in most instances, directly or indirectly finance the provision of other values.

CONCERNS OF DNR

DNR is one of the largest forestry organizations in the Pacific Northwest, managing more than 2 million acres of forest land in the State. Management objectives—as defined by law—are to generate income in perpetuity for trust beneficiaries. These beneficiaries consist of educational and other state and county institutions. DNR foresters must manage responsibly, and they must consider financial trade-offs and long-term productivity of the forest resources when they make decisions about harvest options and silvicultural practices. As a government agency, DNR must retain broad citizen support. Public concerns about visual effects of harvesting activities have become major considerations in DNR management decisions, especially along major travel routes. Such concerns have led to limited application of a wide variety of practices, particularly alternatives to conventional clearcutting, for which little management or research experience exists. Even when conflicts over visual appearance are avoided, DNR foresters question whether they are selecting the best approaches. Thus, they want to develop a tool kit of reasonable harvesting alternatives, with sound, quantitative information about public response to visual appearance, economic performance, and biological/ecological aspects associated with each alternative.

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CONCERNS OF PNW SILVICULTURISTS

Silviculturists at PNW Station have long recognized a need to develop and evaluate a range of harvest options (or silvicultural systems) to meet multiple objectives in managed forests. This long-term need has become more urgent because many organizations are now trying different approaches in attempts to satisfy various combinations of owner objectives, societal expectations, and regulatory requirements. In most instances, there is no opportunity to determine what is gained or lost in comparison with conventional clearcutting or even whether the desired objectives are attained. A few experimental projects exist but options tested are limited and, in most cases, do not permit evaluation of all major elements or considerations that are important in assessing trade-offs and making decisions. Although this topic is now a top Station priority, we lack the staffing and funding to carry out a large-scale, long-term effort alone, especially if done as a conventional research study. The need for harvest options and sound information about them is also important for National Forests, but constraints associated with the Northwest Forest Plan and fears of appeals currently limit effective participation of west-side National Forests as partners, especially for projects that require timber sales in the age classes and at the scale needed to evaluate options for managing multi-purpose forests.

OBJECTIVES AND PROJECT AREA

Given the above concerns, an excellent opportunity existed to design an operational-scale project to develop and compare options for harvest and regeneration on Capitol Forest, a State-owned forest managed by DNR. This forest is adjacent to PNW's Olympia Forestry Sciences Laboratory and contains 90,000 acres of highly productive land. Douglas-fir is the predominant species, but smaller amounts of western hemlock, western redcedar, and red alder are present. Most of the stands are 60 to 70 years old and would normally be considered ready for regeneration harvest. But DNR plans to defer regeneration of some stands until they are considerably older, and thus develop a more balanced age class distribution. The forest contains and abuts many scenic areas, is adjoined by many residences, and portions are visible from major travel routes. Much of the forest is surrounded by industrial lands where extensive recent cutting indirectly limits DNR options in many viewsheds. Thus, a specific objective of the project is to provide options that will ease conflicts between aesthetic values and timber harvesting.

STRATEGIES IN PLANNING AND IMPLEMENTING THE PROJECT

Early in the project, we agreed upon several principles that would guide its development. We believe these have contributed to its success to date and have strengthened relationships among participating individuals and organizations. These are:

Joint Design by Managers and Scientists.—Local managers and field foresters identified the driving issue—develop harvesting options that reconcile aesthetic values with economic return and sustained wood production in visually sensitive areas. Research scientists provided guidance in experimental design. Together, we developed (a) rational options (silvicultural systems), (b) ways to implement and test them, and (3) methods to obtain the quantitative data needed for useful comparisons.

Operational and Adaptive in Nature.—We believed that operational scale and feasibility were essential if the project was to provide useful information to managers and was to be effective as a demonstration area. We also agreed that our goal would be developing as well as comparing a range of silvicultural options. This means that some options will receive some silvicultural practices during a rotation that are essential for their success—even though the practices are unneeded and may not be applied in others. Weed control may be an example. The additional costs and complications will become a part of the evaluation.

Financial and Staffing Resources.—This project was not initiated in association with an increase in resources available to either organization, but we were committed to making it happen. It is part of DNR's timber sale program on the Forest; planting and other treatments will be done as components of on-going operational efforts. Similarly, evaluation procedures are planned so that those data which are absolutely essential can be collected within expected funding levels of our silviculture team and within the framework of DNR monitoring efforts. We hope to attract additional partners and funds, but these are not critical to the project's success.

Stand- and Landscape-level Considerations.—Because a major objective of the project was to obtain information for managing in visually sensitive areas, it was essential to design the project so that interpretations could be applied to forest landscapes as well as stands.

FEATURES TO FAVOR LONG-TERM CONTINUITY

Any project installed to compare silvicultural systems must continue beyond the careers of the initial participants. Over the years, we have formed opinions about factors that favor survival of long-term efforts, and have kept them in mind as the project developed:

Wide Range of Options.—Treatments were selected to cover a range that extends beyond that deemed optimum today. Social needs and desires change as do forest conditions. Even in multi-purpose forests, the relative importance of different values in the mix will no doubt differ 10 or 20 years hence.

Large Treatment Areas and Adequate Replication.—Size and the number of treatment areas must be sufficient to

accommodate the "environmental insults"—damage and mortality of various kinds—and still provide useful information. Larger areas are generally required for assessments pertaining to nontimber values such as wildlife habitat than for timber values alone.

Applicability to Major Portions of the Forest Land Base.—Project must be installed in an area representative of major portions of the land base—in this case, land that will be available for multi-purpose forestry.

Minimum Essential Expenses.—We wanted to minimize essential expenses so that the project can survive during the lows of financial cycles and when political interest declines. But we wanted to provide flexibility within the layout and basic data collection to accommodate additional work when resources permit.

Multiple Disciplines and Organizations.—Multiple disciplines and cooperating organizations increase cost-efficiency and permit more comprehensive evaluations. And such diversity in partners also will help buffer the project from the cycles of support that occur within and among disciplines and organizations.

Foster Support and Visibility Throughout the Organization.—Although this project was a grass-roots effort in the truest sense, efforts have been made and continue to be made to build support throughout the hierarchy of the two major cooperating agencies. These efforts have included visits to the site and discussion of the project with top administrators, and preparation of a formal project plan for approval and signature by DNR and PNW managers.

EXPERIMENTAL DESIGN AND OPTIONS

Given the foregoing considerations with overall strategy, including features to foster support and continuity, we decided to implement and evaluate six harvesting options (Figure 1). Each option will be imposed on areas of 35 to 80 acres in size, and will be replicated three times on Capitol Forest. We believe all options are biologically and operationally reasonable. We expect differences among them in public response as well as economic and crop productivity, but none would be ruled out at current stumpage prices. Four treatments are regeneration harvests; the other two extend the rotation age of the present stand (one with thinning; the other, without thinning; the latter "do-nothing" option could be a reasonable short-term solution in certain situations and it also serves as an "experimental" control for some kinds of assessments). The options will lead to even-aged, two-aged, and multi-aged stands, thus creating a wide range of stand conditions, habitat values, and visual appearances.

TECHNOLOGY FOR STAND AND LANDSCAPE VISUALIZATION

Because visual appearance of harvest cuts was a big consideration in the project, we needed an approach to evaluate public response that would be transferable to other situations. Reactions of people to harvesting are influenced by personal factors and by several on-site matters. Some of these on-site considerations include post-harvest appearance, changes over time (stand dynamics), and surrounding conditions, including the nature and extent of harvesting on the landscape.

Except for post-harvest appearance, it is difficult to provide designed comparisons of these considerations in real time and space. Recently, researchers at PNW's Seattle lab developed software to provide images of stands and landscapes from topographic and stand inventory data (McGaughey 1997). This visualization software has been linked with existing growth models (Oliver and McCarter 1996) to provide approximations of stand development over time.

The stand and landscape images shown in Figures 2, 3, and 4 demonstrate the capability of this technology. Topographic and inventory data from the first block (replicate) of our project, coupled with an existing growth model, were used to depict the initial stand conditions, the landscape after the initial harvest (all options) in 1998, and stand development over the next 60 years for the two-aged and group selection options. The software continues to be refined, both for general use and specific application to this project. We believe the technology—even in its present state—is valuable for demonstration and public interaction.

STAND AND LANDSCAPE EVALUATIONS

Tree Growth and Stand Development.—We have already established permanent sample plots to assess damage, survival, growth, and development of the residual stand components and regeneration. A substudy will compare performance of genetically selected stock vs. standard planting stock in some options.

Economics.—DNR foresters are keeping track of planning, sale preparation, and administration costs by harvesting options. Data on quantity and grade of products removed, production rates, and costs of harvest will be collected. This information in combination with other appropriate data and knowledge will be used in an overall economic assessment.

Visual Quality and Public Response.—Landscape architects and sociologists will use photographs, on-site visits, and computer-generated images to assess and understand public reaction to the various harvest options.

Other values.—We are currently examining the opportunities and costs for evaluation of wildlife habitat, fungi, and long-term soil productivity.

EXPECTED BENEFITS

Over the long term, the information and experience gained from the project will permit sound and defensible decisions about harvesting options, and should lead to improved multi-

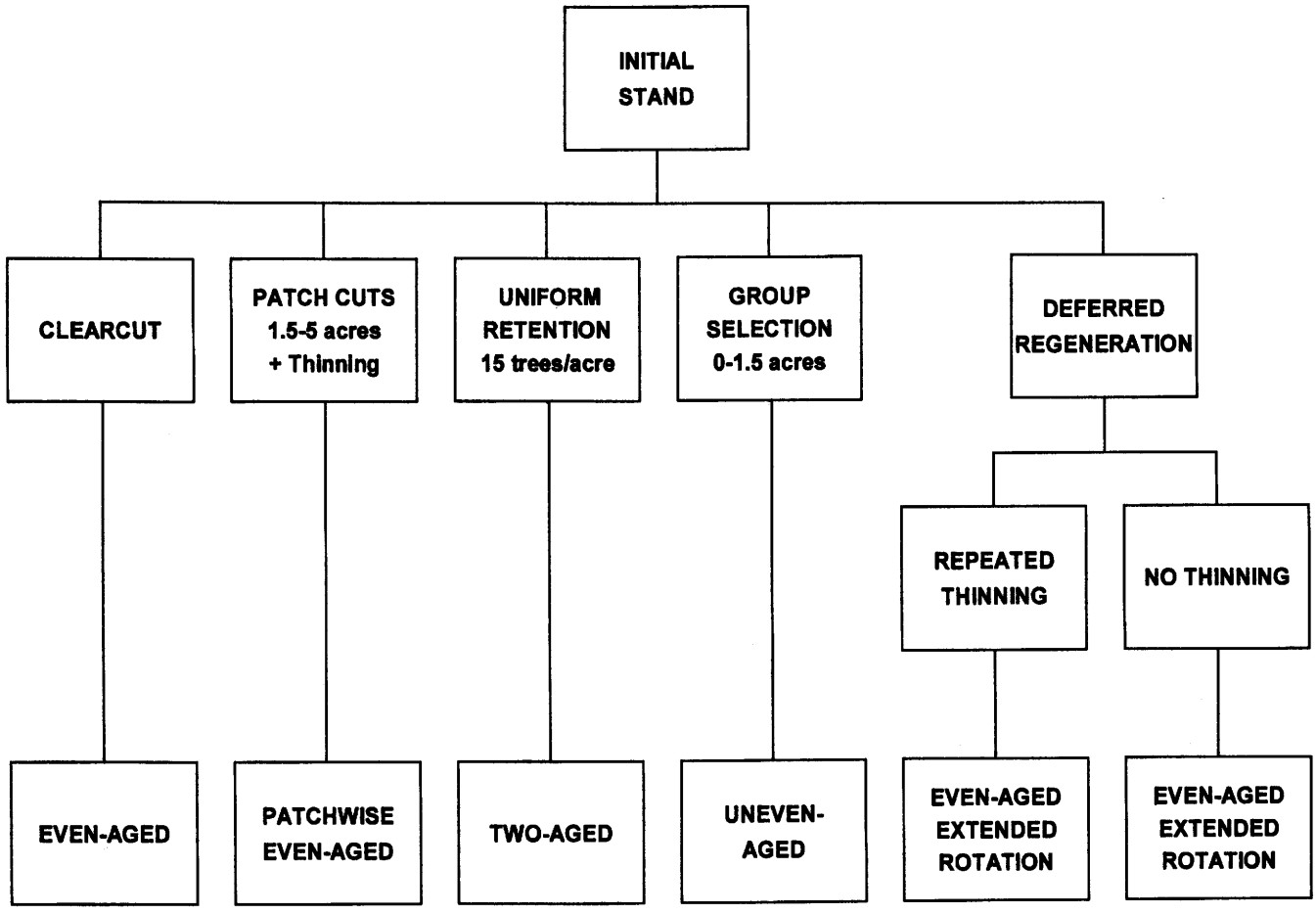
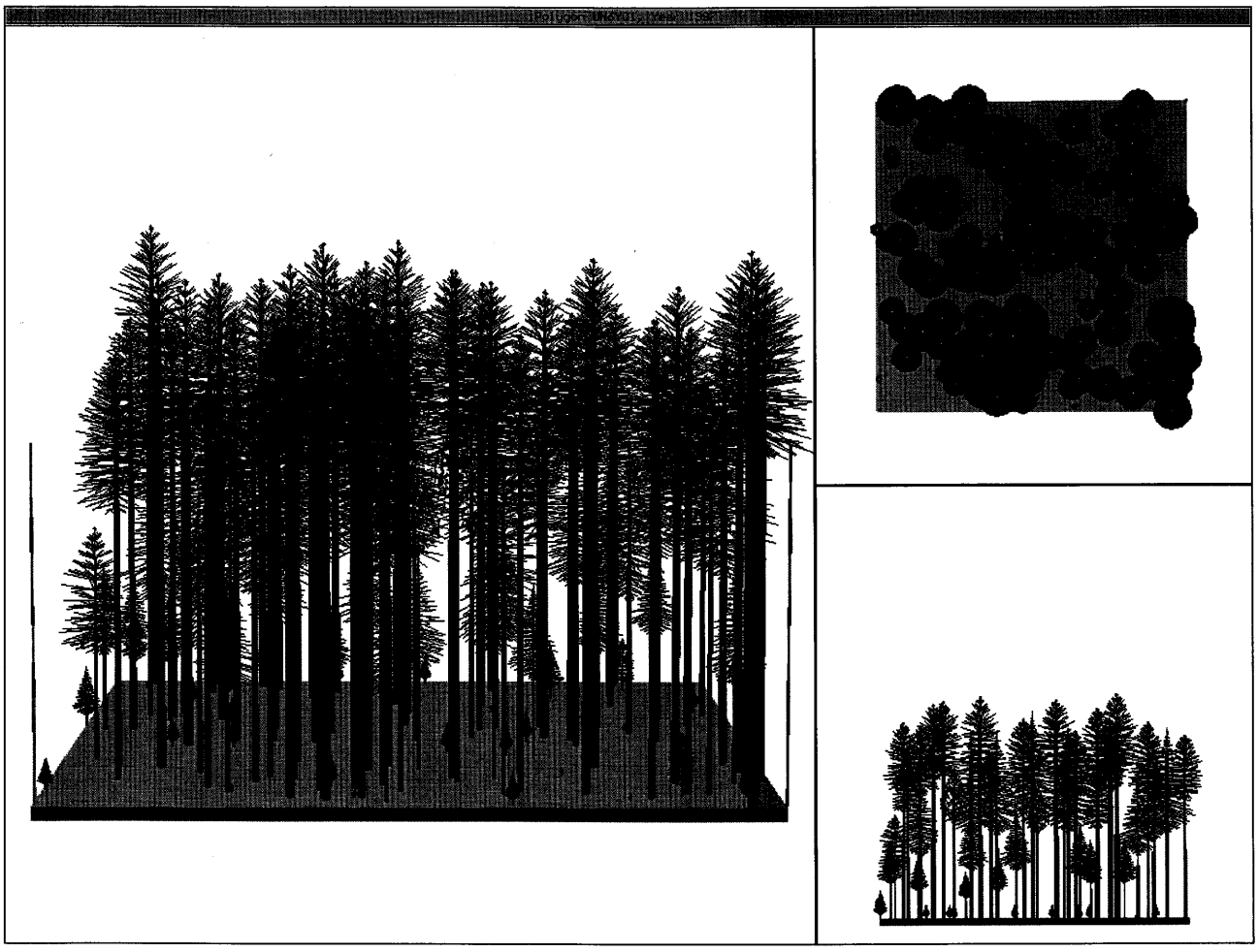
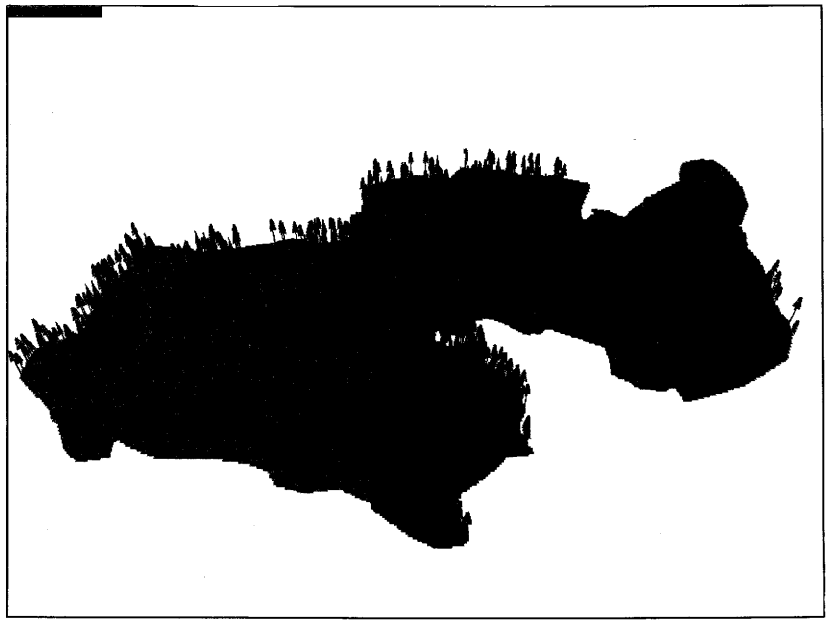


Figure 1.—Harvesting options compared in the projects.



(A)



(B)

Figure 2.—View of forest conditions in the first block of the project: initial within stand conditions (A), and landscape view of all options after initial 1998 harvest (B).

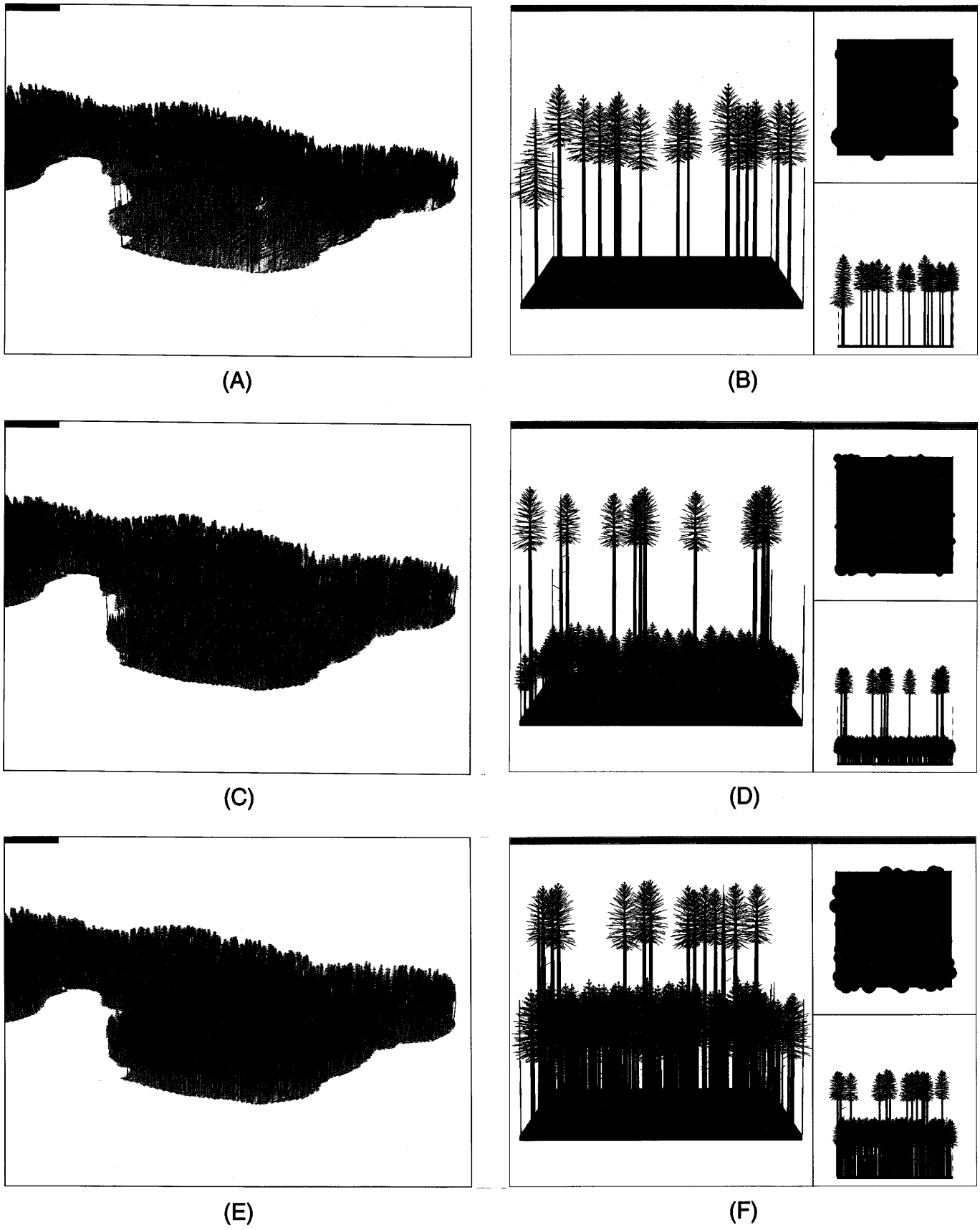


Figure 3.—Views of forest conditions over time for the two-age option: landscape and within stand views (A) and (B), respectively, after 1998 harvest; in 2028, (C) and (D); and in 2058 (E) and (F).

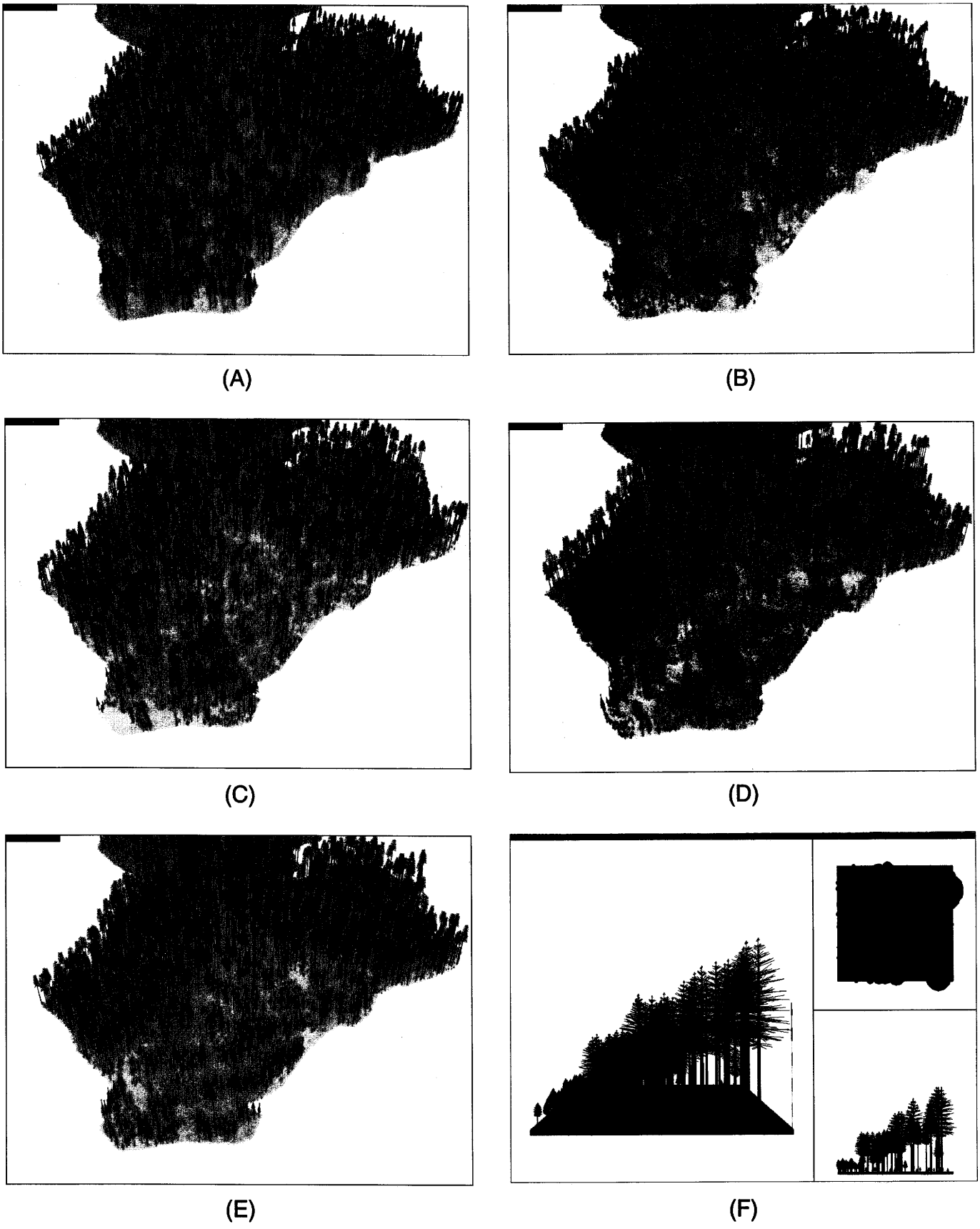


Figure 4.—Views of forest conditions over time for the group selection option: landscape view after harvest in 1998 (A), in 2013 (B), in 2028 (C), in 2043 (D), and in 2058 (E); within stand view illustrating size of reproduction expected in various groups in 2058 (F).

purpose forest management. There are also some near-term benefits:

- Managers and scientists have already obtained experience with adaptive management; that is, we have developed a design—to be implemented as a part of operations—that will provide useful information for modifying and developing harvesting practices.
- By next summer, we will have experience with planning, layout, and harvesting of timber sales, using the different practices. The problems and situations encountered will aid operational foresters and researchers in future work.
- The collaboration of sociologists, landscape architects, visualization modellers, and silviculturists will provide some information even before the area is cut. The visualization technology should be helpful not only in assessing public response, but also in fostering understanding about growth and development of stands and forests—their dynamic nature—and how silvicultural practice may affect them. And the real-life trials will provide a check on use of the simulated scenes, and will indicate changes needed to improve the visualization technology.
- Demonstration—This designed network of harvest units will provide a highly accessible showcase of the options and—with time—information on the costs and benefits associated with each and the trade-offs among them. We also hope to communicate and reinforce the idea that there is no one best approach or option to multi-purpose forest management. The initial emphasis of this project on visual characteristics should help to foster this broad outlook. It seems obvious that even for visual objectives alone, approaches must differ greatly in various situations. The availability of the visualization technology should also stimulate consideration of a wide range of options, and help us see how they can be mixed and matched on the forest landscape to provide the conditions and values desired in our forests.

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