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NOTICE OF FINAL GUIDANCE & CERTIFICATION

Pursuant to ch. 227, Wis. Stats., the Wisconsin Department of Natural Resources has finalized and hereby certifies the following guidance document.

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Forest Aesthetics Handbook

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Forest Economics and Ecology, Applied Forestry Bureau

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DNR CERTIFICATION

I have reviewed this guidance document or proposed guidance document and I certify that it complies with sections 227.10 and 227.11 of the Wisconsin Statutes. I further certify that the guidance document or proposed guidance document contains no standard, requirement, or threshold that is not explicitly required or explicitly permitted by a statute or a rule that has been lawfully promulgated. I further certify that the guidance document or proposed guidance document contains no standard, requirement, or threshold that is more restrictive than a standard, requirement, or threshold contained in the Wisconsin Statutes.

Carmen Hardin

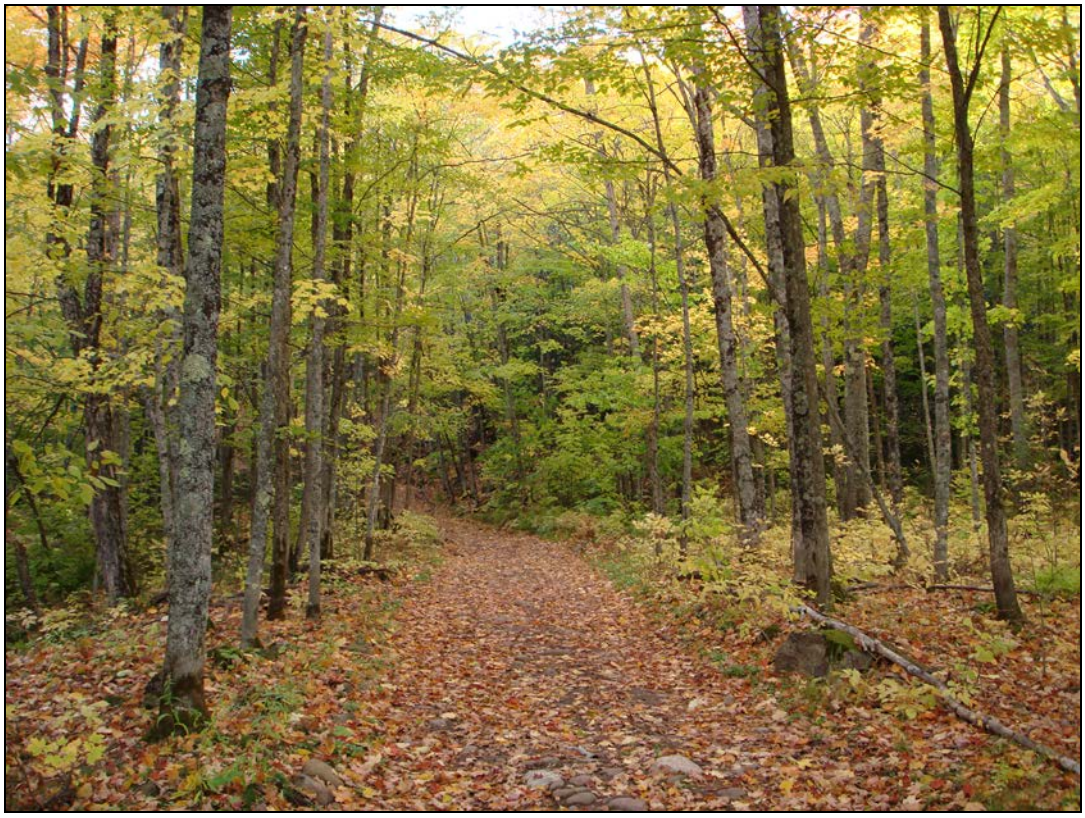
March 27, 2020

Signature

Date

Forest Aesthetics

Management Considerations and Techniques



Adapted from Kenneth R. Sloan's original manuscript and the WDNR Silviculture Handbook, 2431.5.

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INTRODUCTION

In January of 1979, a committee was formed by the Wisconsin Department of Natural Resources, Bureau of Forestry, to develop an aesthetic management program for Department forestry personnel. The goal of the committee was to develop a practical, on-the-ground guide to help foresters meet varying aesthetic management objectives in diverse timber types. The information presented here is the result of that effort.

The ideas and concepts presented here are based on actual field experience. They are not pie-in-the-sky, theoretical solutions. All suggested techniques have been used effectively in the field by department and industrial foresters in Wisconsin.

The considerations and techniques presented will assist foresters in meeting aesthetic management goals with a negligible impact on forest productivity.

In addition, this effort is largely a step toward greater integrated management of the total forest resource. The following comments were made by Sam Moore, a Wisconsin wildlife manager, who assisted in the presentation of this material to Department foresters.

> "The concepts contained herein, when diligently applied, can also dramatically influence the impact of timber harvest operations on wildlife. The suggested strategies emphasizing management toward more eye-pleasing landscapes -- ones with greater visual diversity -- also direct management toward the creation of landscapes more pleasing to wildlife, ones with more diverse habitats providing critters with simultaneous access to more than one environmental type and/or greater richness of border vegetation."

As research provides more knowledge on the effects of edge, types of edge, biological diversity, forest fragmentation, interior and exterior species, that knowledge will be incorporated into this publication.

CHAPTER 1

AESTHETIC MANAGEMENT

AESTHETIC MANAGEMENT ZONES

A. Class A - Aesthetic Management Zone

1. Criteria -- aesthetic management considerations predominate. These are areas where intensive public use occurs because of scenic or aesthetic attractions.

2. Objective -- develop and maintain the forest environment to its greatest scenic potential for public enjoyment.

3. Examples

   a) Park and recreation areas, including access routes.

   b) Special use trails.

   c) Lakes, rivers and streams that have significant value for water-based recreation.

   d) Highways and roads with heavy to medium use, and roads where the use is for the specific purpose of enjoying scenery.

B. Class B - Aesthetic Management Zone

1. Criteria -- no one use predominates. The public use is such that no one value can at all times be considered as the most important. However, because of the intensity and variety of uses, scenic attractiveness must be maintained.

2. Objective -- manage these areas using normal integrated resource management concepts but maintain aesthetic values.

3. Examples

   a) Roads with light to medium use where the majority of traffic is the result of some use of the forest other than for scenic beauty.

   b) Lakes and streams that do not have significant value for water-based recreation.

C. Class C - Aesthetic Management Zones

1. Criteria -- normal integrated resource management concepts apply. Any significant public presence is likely to occur only as a result of a specific use of the forest.

2. Objective -- optimize timber production but using sound integrated resource management concepts. Do not overlook natural opportunities to maintain or enhance biological diversity or scenic quality.

3. Examples -- the majority of the forest is normally zoned Class C.

D. Class D - Special Forest Use Zone

1. Criteria -- designated special use areas.

2. Objective -- manage these areas as outlined in the property's master plan.

3. Examples -- natural, scientific, wild river, and wilderness areas.

STAND TREATMENT METHODS IN AESTHETIC MANAGEMENT ZONES

Wherever possible, aesthetic management should be integrated into commercial logging operations. However, due to the variety of conditions and the special attention demanded in the treatments, it is anticipated that separate small sale contracts or permits will be needed to accomplish the management objective. The development of small-scale jobbers who are interested in and properly equipped to handle aesthetic zone cuttings would be the ideal. Regardless of the method used, certain principles of stand treatment should be followed.

The stand treatments listed below are intended to:

- Maintain aesthetic zones in a healthy, forested, and aesthetically pleasing condition.
- Reduce damage to residual trees.
- Reduce visible evidence of logging.
- Reduce soil erosion.

A. Logging Control

1. All hardwood logging should be done when residual hardwoods are leafless to reduce felling damage and to eliminate persistent foliage in the tops.
2. All tops should be treated so that all slash is within 18 inches of the ground. This may require disposal effort by the sale contractor or by force account.
3. No tops will be left in ditches, on shoulders, or in streams or lakes.
4. Landings for forest products should not be permitted in the aesthetic zone. No debarking equipment should be allowed to operate within sight of traveled thoroughfares.
5. Logging road entrances to public roads should be constructed in a manner that will not detract from scenic values. Entrances should be at an oblique angle rather than perpendicular to public roads, and they should curve so as to screen the road.
6. All skid trails should be well-spaced and on the contour, and lead away from the aesthetic zone. Skidding to public roadsides should be discouraged.
7. Skidding equipment must be of a type approved for use in aesthetic zones. Excessively large equipment that will cause damage should not be allowed. Skidding must be done in a careful manner to protect residual trees.

B. Non-commercial Cuttings

Treatments of a non-commercial nature should be made in a manner that will enhance aesthetic values. This means that slash, cut trees, brush, etc., should be within 18 inches of the ground. Stump heights should be low. Saplings should not be severed high above the ground. Salvage for firewood is encouraged where such removal will not have a detrimental impact on scenic values.

Herbicide treatment should be avoided in aesthetic zones. Although stump treatment to prevent sprouting may be desirable at times, mechanical treatment methods are recommended.

C. Pruning

All pruning should be done according to acceptable standard practices. However, pruning to various heights should be considered to prevent creation of an artificial stand appearance.

D. Plantings

Tree and shrub plantings can be used to screen unsightly dumps, borrow pits, gravel pits, power and gas line right-of-ways, etc. Underplantings and interplantings can often be used to develop long range solutions to aesthetic problems. Plantings should be adapted to the site and performed according to good forestry practices.

Large block type plantings of a single species that create a monotype culture within an area should be discouraged. Plantations should be established to achieve a more aesthetically pleasing appearance and to provide for added diversity of type. Planting should be accomplished by varying the direction of the rows or contouring to create a more natural appearance. Planting on the contour and use shallow furrows where practical. When planting adjacent to a major roadway, the first rows should be parallel to the roadway to meet aesthetic concerns and provide game cover.

SPECIES CONSIDERATIONS

Wisconsin forests are composed of a wide variety of species. Some occur as pure stands, while others occur in association with each other in complex communities. Each species has a unique set of silvical characteristics which result in differing silvicultural requirements. As a result of these differences, each species presents a different aesthetic management challenge. In order to be more effective, the forest manager must carefully evaluate the specific biological requirements of each species. The favorable elements must be identified and used to greatest advantage, and alternative management strategies must be devised to overcome the less favorable elements. In terms of aesthetic management, these considerations fall into the following general categories: silvicultural system, life span, stocking level, and insect and disease considerations.

SILVICULTURAL SYSTEM

A. All-age Selection System

In general, species amenable to all-age selection type cutting can be managed with the least difficulty in aesthetically sensitive areas. The species making up the northern hardwood timber type are prime examples.

- Because of the mixture of species found in this type, a high degree of visual diversity occurs naturally.
- Since only selected trees are removed with each harvest, logging impact and slash accumulations are minimized.
- Regeneration occurs naturally through periodic harvest cuts, precluding the need for intensive follow-up treatments (cutting of residual trees, root raking, prescribed burning, etc.) to ensure adequate regeneration.
- The natural age diversity usually found in this type, combined with the minimal disturbance of selection-type cutting, means that large stands can be treated with little visual impact.

B. Even-age Management System

Species managed on an even-age basis present a greater challenge.

- The need to provide a high degree of sunlight to ensure regeneration necessitates a substantial (shelterwood) or complete (clearcut) removal of the overstory canopy.
- Additional measures necessary to ensure establishment and survival of regeneration (prescribed fire, scarification, root raking, etc.) may further compound the visual impact.
- The regeneration phase may be rather lengthy, especially where artificial regeneration is necessary. This makes the need for advance planning (sale shape, timing of adjacent cuts, and utilization) even more critical.
- The relatively large visual impact of even-age harvests makes it more difficult to deal with large stands. Efforts are required to reduce stand size and increase age diversity through manipulation of harvest dates.

When evaluating the impact of a given silvicultural system, thought must be given to not only the harvest method but also the entire series of activities necessary to regenerate the stand and return it to full production. For example, the clearcut of a given stand may be acceptable in a certain location if natural regeneration can be expected in a very short time. That same clearcut may not be acceptable if prescribed burning, furrowing, and hand planting are required, unless additional measures (reduction in sale size, more imaginative sale shape, etc.) are taken to reduce the overall impact.

Figures 2.1 and 2.2 compare the overall visual impacts of all-age and even-age systems.

LIFE SPAN

The average life spans of the various species encountered by forest managers fall into three general categories:

Short-lived	Medium-lived	Long-lived
Aspen	Paper birch	Sugar maple
Jack pine	Tamarack	Oak
Balsam fir	Red maple	Basswood
	Hickory	Elm
		Ash
		Hemlock
		Yellow birch
		Spruce
		Red pine
		White pine
		Cedar
		Beech

Age span, in terms of aesthetic management, has two important implications:

- The longer the age span, the less frequently it is necessary to regenerate the stand. More low intensity, intermediate selective cuts are possible. Fewer high intensity harvest cuts and less follow-up regeneration will be required.

- In general, when short-lived species reach their pathological rotation age ("break up"), it is on a stand basis. When aspen and jack pine, for example, near the end of their life span, entire stands lose vigor over a relatively short period of time. Prompt, oftentimes drastic, action is necessary to avoid substantial economic losses as well as lost regeneration opportunities. When long-lived species begin to "break up", however, it is generally on an individual tree basis. When dealing with overmature northern hardwood, hemlock hardwood, red pine, or white pine stands, for example, individual trees succumb over a fairly long period of time. This permits recovery of economic values and regeneration of the stand with much less intensive measures.

Insect and disease problems in short-lived and long-lived species follow a similar pattern. When short-lived species are attacked (e.g., hypoxylon canker, jack pine budworm, forest tent caterpillar, etc.), the entire stand is usually affected. When longer-lived species are attacked (e.g., Dutch elm disease, root rot -- *Armillaria mellea*, bark beetles, etc.), usually only low-vigor trees within the stand are affected. Even a heavy Dutch elm disease infestation in a northern hardwood stand, for example, can usually be handled without excessive visual impact.

These life span considerations make advance planning with short-lived species, in particular, absolutely essential. Only through maximum flexibility in sale timing and design can problems be avoided. If problem situations are not identified early, this flexibility is lost.

STOCKING LEVEL

In some cases, departures from normally recommended basal area stocking levels may be desirable for aesthetic purposes. Examples include:

- Reducing basal area
  - Increases visual penetration and reduces "tunnel effect".
  - Provides an opportunity to underplant or enhance understory development.
  - Increases diameter growth -- enhances "big tree" appearance.

- Increasing basal area
  - Reduces frequency of entry.

- Promotes natural "forest primeval" appearance.

- Increases screening value and decreases visual penetration.

The flexibility of a given species in terms of stocking levels varies. Some species (red pine, white pine, aspen, northern hardwoods, oak) can be maintained at levels above or below normally recommended standards without substantial losses in quality or increased mortality. Other species (jack pine, white birch, hemlock, balsam fir, spruce) must be kept very near recommended levels; otherwise insect and disease susceptibility is substantially increased.

INSECT AND DISEASE CONSIDERATIONS

In evaluating any given species for aesthetic management adaptability, insect and disease constraints must be considered. In some cases, a deviation from normal management practices, even if it is silviculturally sound, may not be feasible due to potential insect or disease problems. The forest entomologist should be consulted to avoid unforeseen problems which might result from departures from normal management practices. Some of the departures that result in insect or disease problems include:

- Underplanting in red pine sawlog stands -- Sirrococcis strobilinus.

- Holding overmature clumps in balsam fir and jack pine stands for screening purposes -- budworm.

- Retention of large, well-formed elm when marking road sides -- Dutch elm disease.

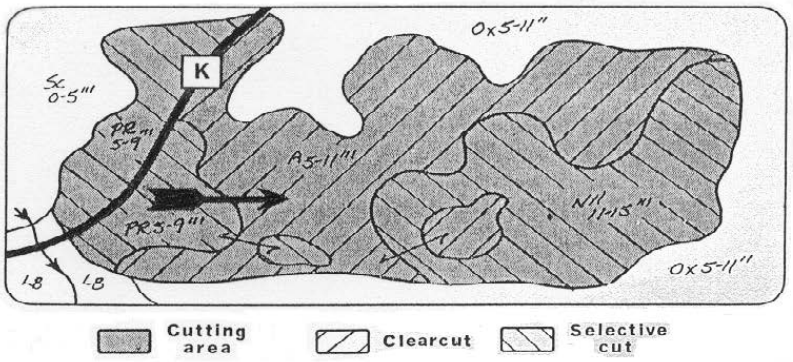
- Holding basal areas excessively high in red pine stands -- bark beetles.

- Excessive basal area reductions in jack pine, hemlock, white birch -- logging shock.

- Retention of scattered red pine sentinels in newly established red pine plantations -- Sirrococcis strobilinus.

- Retention of scattered oak in new pine plantations -- root rot.

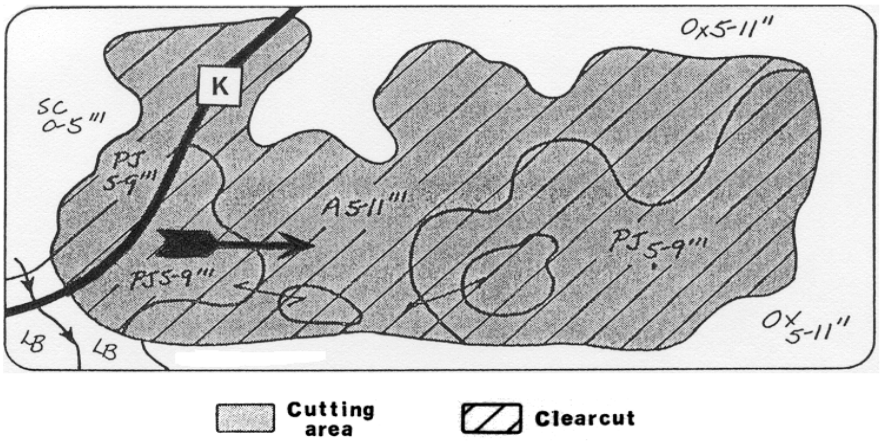
Figure 2.1 **Impact of cutting method on apparent sale size -- selective cut.**



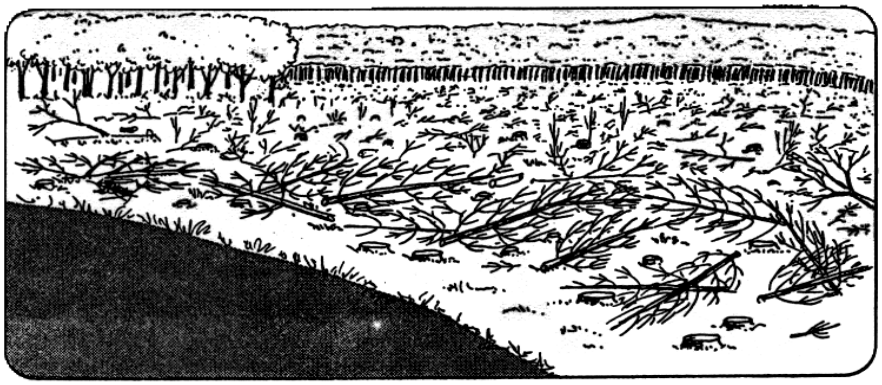
View of sale area looking in the direction indicated.

The silvicultural system needed to ensure adequate regeneration has a major impact on overall visual impact. The timber sales outlined in Figures 2.1 and 2.2 are identical in acreage, but the selective cutting system called for in the red pine and northern hardwoods stands in Figure 2.1 will greatly reduce the visual impact of the overall timber sale.

Figure 2.2 Impact of cutting method on apparent sale size -- clearcut.



View of sale area looking in the direction indicated.



The entire sale area in Figure 2.2 must be clearcut to ensure adequate regeneration. In addition, the jack pine stand along the road will require intensive site preparation and planting efforts over a fairly long period before regeneration becomes evident. The combined effects of both these silvicultural requirements may make the overall visual impact of this sale unacceptable unless additional sale design measures are taken.

CHAPTER 3

STAND CONSIDERATIONS

Just as each species presents a unique set of positive and negative aspects in terms of its silvicultural adaptability to aesthetic management, each stand has a personality of its own. Each aspect of the stand must be carefully examined to identify all positive aesthetic management opportunities.

SPECIES COMPOSITION

Most forest stands consist of a variety of species growing together in various proportions, Even-aged and all-aged species commonly occur together in various proportions.

- Aspen (even-aged) -- northern hardwoods (all-aged)
- White pine (even-aged) -- northern hardwoods (all-aged)

Likewise, short-lived and longer-lived species commonly occur together.

- Aspen (short-lived) -- birch (medium-lived) -- maple, oak (long-lived)
- Aspen (short-lived) -- red pine, white pine (long-lived)
- Jack pine (short-lived) -- oak (long-lived)
- Balsam fir (short-lived) -- spruce (long-lived)

Even in a relatively "pure" monotype, careful field examination will often reveal the presence of a significant component of associated species.

By careful examination of the attributes of the entire species complex within a stand, and an accurate assessment of site potential, it is often possible to utilize the more aesthetically adaptable components of the stand to minimize both short-term and long-term aesthetic impacts.

Retention and enhancement of the more aesthetically flexible component of the stand on all or part of the area is probably the single most valuable tool in aesthetic management. As long as species objective decisions are compatible with site potential, the long-term stand productivity can be maintained while simultaneously reducing the visual impact of management activities.

It is very important that this technique be used with flexibility and imagination. In some cases, the long-lived component of a stand (hardwood, for example) may not be as productive on a given site as its short-lived component (aspen, for example). In these situations, it must be remembered that management of a small portion of a stand for a more aesthetically flexible species will often permit the bulk of the stand to be managed for the more productive species on a more intensive basis. This increased level of intensity will usually more than offset any volume losses in the visual enhancement zones. The keys to success are:

- *Site compatibility*. Even though the aesthetically desirable species may not be the most productive alternative, it should be a silviculturally sound alternative. The visual enhancement zone should be a manageable unit -- and it should be managed -- even if at a reduced level of productivity.
- *Imaginative sale layout*. When dedicating acreage to a less productive species for aesthetic purposes, each acre should have maximum impact. Imaginative sale design, use of topography, and modification of rotation age will help meet visual goals with minimum productivity losses.

A. Total Removal of a Designated Species

In situations where a stand contains a sufficient amount of long-lived, all-aged species, the short-lived, even-aged component can be totally removed. This method can be used to screen sensitive areas as well as reduce the effective size of large harvest areas. See Figure 3.1.

B. Partial Removal of a Designated Species

In many cases, where the long-lived, all-aged component is insufficient to meet minimum aesthetic goals, it can still be used to advantage. Its presence, although not sufficient to permit total removal of the short-lived, even-aged species, will at least permit removal of a substantial portion of that component. This will permit immediate harvest of part of the volume and increase the likelihood of harvesting the remaining volume of short-lived, even-aged species at a later date, since only the most vigorous trees are left to grow. See Figure 3.2.

C. Retention of Selected Individuals

The presence of relatively small quantities of long-lived, all-aged species within a large even-aged block should not be overlooked in timber sale design. Aspen stands, for example, often contain scattered, large, super-canopy white pine. Such trees can be marked on a risk basis with selected vigorous individuals left standing for another aspen rotation. Since these trees are already above the main canopy, losses to windthrow should be negligible. These individuals will often seed in enough individuals to replace themselves and provide future foresters with a similar opportunity. See Figure 3.3.

Selected large oak and maple wolf trees can also be left standing to reduce the visual impact of a large clearcut. The number of trees so left will depend on the quantity available and the degree of visual sensitivity present in the area. In the absence of significant aesthetic sensitivity, the value of these scattered individuals in terms of wildlife habitat should not be overlooked (roosting sites, mast, den trees, etc.). See Figure 3.4.

STAND STRUCTURE

The entire vegetative community occurring in a timber stand should be considered in the development of an aesthetic management plan -- not just that portion being harvested. A well developed understory of white pine, red pine, northern hardwoods, or balsam fir can be used to great advantage in a sale design. Such an understory will not only help screen the impact of an even-aged harvest, it will also greatly shorten or eliminate the wait for regeneration to become evident on the sale area. See Figure 3.5.

When the understory is not yet of sufficient height or density for visual diffusion purposes, thought should be given to a "development cut" prior to the main harvest (Figure 3.6). The goal of this cut would be to thin the overstory and encourage understory height and crown development. This would enhance the future screening potential and allow removal of a greater volume of the overstory when the main sale occurs later.

STAND AGE

As a timber stand grows, it passes through a number of stages in its life cycle. Each of these stages presents differing degrees of aesthetic value and management flexibility. By recognizing the pluses and minuses of each stage, in terms of its management flexibility, we can use each to its best advantage.

A. Seedling Stage

Aside from screening some of the slash and debris resulting from the harvest, stands in the seedling stage offer little in terms of positive aesthetic value.

Foresters often view a stand of seedlings in a positive manner, since it represents the successful beginning of a new forest. The viewing public, however, may not share this perception. This is an important point to remember in planning adjacent harvest cuts. A forester will recognize a tangle of new aspen shoots, for example, as a stand of young trees. A forest visitor, on the other hand, may not recognize this same lush growth as a stand of trees. As a result, the success of the harvest operation may not be at all obvious to the visitor.

The forest manager must remember that the objective in spacing cuts in time is not necessarily to establish regeneration before cutting an adjacent area, but to make regeneration evident before harvesting adjacent areas. Furthermore, the regeneration must not only be evident to the forest manager, but to the forest visitor as well.

When dividing stands into cutting units and determining intervals between cuts, this concept must be kept in mind. Regeneration may become evident in an aspen stand in two to three years, whereas regeneration in a jack pine stand may require five to six years to become evident because site preparation and planting are required.

B. Sapling Stage

While opportunities for timber management activities are limited in this stage, there are some positive aesthetic values. Regeneration is now evident to even the most undiscerning visitor. Sapling stands are generally very dense and provide excellent screening opportunities. Even though sapling stands themselves will not support a harvest, their presence within larger, mature stands lends a great deal of increased flexibility in sale design.

C. Immature but Merchantable

Stands in this stage, although still immature, are physically large enough and have sufficient volume to be operable. Timber in this stage presents the most flexibility in aesthetic management. It is often the only stage in which many of the short-lived, even-aged species can be effectively dealt with when they occur in "pure" stands.

1. Cutting Strategies -- Large Blocks

In dealing with large blocks of even-aged, short-lived species (aspen, jack pine, etc.), the overall goal should be a reduction in stand size and increased age distribution. Exactly what stand size and degree of age distribution will be optimum depends on the aesthetic sensitivity and property objectives. By reducing stand size, the cutting is spread over a longer period, with small portions of the block being cut each year. This has a number of advantages:

- Visual impact is reduced through reduction of sale size.
- By cutting smaller units each year, several large problem areas can be treated simultaneously with minimum impact on sustained yield and work load.
- Post-sale treatment work (shearing, burning, site preparation, planting, etc.) is spread out over a longer period. Workloads are evened out.
- Wildlife habitat is enhanced by spreading out the period during which slash is available for browse, and by increasing age distribution and edge.
- Future sale establishment costs are reduced through re-use of existing sale boundaries, road systems, etc.

Figure 3.7 is a simplified example of a typical large monotype with little or no existing age or species diversity. "Large" refers to any block of timber which cannot be cut all at once without unacceptable visual impact. Depending on the species involved, the aesthetic concerns, and other management considerations, "large" may range from 40 acres on up to thousands of acres. The approach described below is adaptable to any size block.

The following steps are required in the planning process:

- Step one: Determine the harvest period.
- Step two: Determine the number of cutting units.
- Step three: Design the cutting unit boundaries.
- Step four: Assign harvest dates to cutting units.

Each of these steps is examined in detail below:

a) Step one: Determine the harvest period.

The forest manager must first determine the maximum amount of time over which the area in question can be harvested without incurring unacceptable risk of volume or growth loss.

In order to determine this "harvest period", the earliest possible entry date must be established. This is done by estimating the year in which the stand will attain merchantability. If the stand is not already merchantable, analysis of older stands on similar sites can be used to estimate when an operable volume will be achieved.

The forest manager must next establish the latest year in which the stand could be harvested without incurring excessive risk of loss in timber value.

Rotation ages presently in use are geared toward harvest of timber at its maximum rate of return. After rotation age is attained, the growth rate of the stand declines and it should be regenerated to maximize economic return. Even though growth has declined, however, it will be a period of years before an unacceptable risk of catastrophic loss is incurred. This period of time, the estimated realistic period between rotation age and unacceptable risk of catastrophic loss, is the second half of the total harvest period. This estimate can only be made based on intimate knowledge of the stand condition, site potential, insect and disease history, etc., on the part of the local forest manager. It should be a conservative, realistic estimate.

In the example illustrated in Figure 3.7, it will be assumed that the stand is now operable, that it will reach rotation age in 10 years, and that it can be carried five years past the optimum rotation age.

The acceptable leeway in harvest dates is: -10 years to +5 years. Therefore the total harvest period is 15 years.

b) Step two: Determine number of cutting units.

In order to determine the number of cutting units needed, the manager must first determine what the optimum size of the cutting unit should be. This decision is based on aesthetic sensitivity in the immediate area, economic considerations, and property objectives.

When the size of the optimum cutting unit is determined, it can be divided into the total stand acreage to arrive at the number of cutting units needed.

The number of cutting units required is then compared to the number of years in the harvest period to determine how many units will be cut each year.

In the example illustrated in Figure 3.8, the 15-year period would permit harvesting 15 cutting units at a rate of one unit per year. If more than 15 units were needed, two or more separated units would be cut each year. If less than 15 units were needed, a single unit would be cut every other year, or every third year, etc.

In this way, management strategy can be adapted to any size monotype.

c) Step Three: Design the cutting unit boundaries.

The goal of cutting unit design is to attain required aesthetic management goals while still not unduly complicating timber management activities. Units should not all be the same actual acreage, but rather the same effective acreage. The goal is not equal acres, but rather equal impact.

- Unit design considerations:
  - Aesthetic sensitivity in the sale area as a whole, and in each unit in particular.
  - Harvesting system to be employed.

- Road needs; existing roads.
- Regeneration requirements; follow-up activities.
- Topography, drainage patterns, roads and other natural features.

- Unit size considerations:
  - Degree of species diversity. Size can be increased as diversity increases. Reduce the size of other blocks with little or no diversity.
  - Degree of visual sensitivity. Smaller units along roads, streams, etc. Larger units in "back land" areas.

The scheme illustrated in Figure 3.8 is geared toward reduction of visual impact. A plan designed to maximize age distribution on a game property might look totally different. A design devised primarily to facilitate regeneration efforts might look different still. The underlying methods and principles, however, would be the same in each case.

d) Step Four: Assign harvest dates to cutting units.

The goal is to maximize the average time between any two adjacent harvests. As in unit size, the time between all adjacent cuts will not be equal. Time between some cuts will be reduced in order to increase time between other cuts in more sensitive areas.

Harvest date considerations include:

- *Risk-Vigor*. High-risk, low-vigor units should be cut first. Vigor often varies throughout large stands even though age may be constant.
- *Aesthetic sensitivity*. Maximum time should be allowed between adjacent cuts in the most sensitive areas.
- *Size of unit*. Generally the larger the units, the more time should be allowed between cuts.

Obviously, when fewer units are created, greater time will elapse between cuts. However, fewer units will generally be larger and have greater visual impact. There are many things to consider in the development of a cutting strategy of this sort. There are no easy answers!

As cutting proceeds through the cycle, constant monitoring of the uncut unit is necessary to make any harvest year adjustments which may be needed due to changes in stand vigor, etc.

In Figure 3.9, the harvest dates have been assigned to the cutting units in our example. Notice that the time between units varies, with the greatest intervals left between roadside cuts and units without favorable species composition. The average time between adjacent units in this case is seven years.

Depending on the sensitivity of the area, the length of the regeneration period, and other non-timber objectives, seven years may or may not be sufficient. A long regeneration period, or a goal of greater age distribution for habitat purposes, may require that this period be extended.

If this is the case, the same procedure can be followed in subsequent rotations to further enhance the age distribution, as shown in Figure 3.10. By cutting the timber in each unit when it reaches the same age at which it was harvested in the first rotation, the time between any two adjacent cuts, as well as the entire cutting period, will double during the second rotation, triple during the third rotation, and so on, until the desired age distribution is attained. At that time each unit would be cut at its proper rotation age and the existing distribution would be maintained.

During the second rotation, one unit would be cut every other year. During the third rotation, one unit would be cut every third year, and so on.

In this example, the type effectively would be fully regulated after three rotations. The first cut in the third rotation would begin three years after the last cut in the second rotation.

2. Cutting Strategies -- Roadsides

Oftentimes, special efforts are required to reduce the visual impact of large, even-age harvest operations adjacent to travel corridors (roads, trails, streams, etc.). When this is necessary, the roadside treatment should be an integral part of a larger plan to deal with the entire stand. See Figure 3.11. This will help insure that the cut results in a manageable unit in the future.

When developing a roadside visual enhancement area in an immature stand, keep in mind that the stand has not yet reached its full productive capacity. Any removal should involve only enough acreage to result in a manageable unit. The bulk of the stand should be left uncut until its optimum harvest date.

The best alternative in this situation is to harvest a portion of the stand along with the sensitive area as soon as the timber becomes merchantable. This area can then be regenerated and managed as a separate stand to screen the harvest of the residual area at the optimum rotation age. See Figures 3.12.

The early recognition of a potential aesthetic management problem in this stand has permitted the development of a cutting scheme which has met that concern without removing any acreage from full production. If similar future needs are not recognized early in pure, even-aged, short-lived types, these opportunities are lost.

D. Mature Timber

As timber reaches rotation age, the length of time available to break a stand into smaller units to reduce visual impact and enhance age distribution is greatly reduced. In addition, the time that is available has a greater degree of uncertainty. The entire harvest period is now between rotation age and stand deterioration -- a difficult period to accurately estimate.

Since the harvest period is much shorter, the cutting approach used for immature timber would result in insufficient time between cutting units.

In mature timber, a system is needed to reduce the potential impact of the uncertainty involved in estimates of the harvest period, and at the same time, retain the flexibility needed to use all the time that may be available. The system must be capable of reacting quickly to any sudden change in stand risk and vigor.

One approach, called the two-cut system, meets a number of these criteria:

- All the time available is used between adjacent cuts.
- Flexibility is retained, since the second cut can be delayed for a variable period -- based on an annual assessment of stand risk and vigor.
- The impact of sale size is reduced through sale design, while still retaining the economic advantages of large volume.
- Double duty is derived from sale boundaries since both the first and second cuts use the same lines.

1. Cutting Strategies -- Large Blocks

The two-cut system is used (see Figure 3.13).

2. Cutting Strategies -- Roadsides

A similar approach can be used along roads and other sensitive areas. Since the stand is now mature, however, it is best to harvest the bulk of the stand immediately. Timber in the visual enhancement areas is then retained to screen the harvest of the main stand and harvested at a later date as stand vigor dictates. Removal of high risk trees within these areas concurrent with the main harvest will enhance the vigor of the residual timber and allow it to be retained for a longer period. Again, these cuts should be done as part of the systematic treatment of the main stand wherever

practical. See Figure 3.14 and 3.15.

E. Overmature Timber

Overmature stands, by definition, should be cut as soon as possible. Significant delay, particularly in short-lived, even-aged species could result in an unacceptable loss of timber volume and aesthetic values.

A word of caution is in order as to determining when, in fact, a stand is actually overmature. Traditionally foresters have underestimated the longevity of some timber stands, particularly when making aesthetic management decisions. A stand which exceeds the optimum rotation age is not automatically in imminent danger of catastrophic loss. When the realistic harvest period is underestimated, many other aesthetic management options are precluded. The decision as to whether a stand is "mature" or "overmature" is very complex. Site, insect and disease history, and local knowledge of the behavior of similar stands on similar sites must all be considered. The local forester is usually in the best position to make this judgment.

In a stand that is truly overmature, any acreage left uncut in order to reduce the visual impact represents a loss in productivity. Foresters must accept the fact that in large, overmature, even-age monotypes, some timber will have to be sacrificed in order to accomplish aesthetic management goals. The idea is to make the best of a very difficult situation.

One approach to the problem is the use of a visual diffusion area (see Figures 3.16 and 3.17). These areas differ from the more common visual enhancement areas in several important aspects.

Visual Diffusion Area	Visual Enhancement Area
Temporary, one-time solution.	Long-term solution.
Timber is left unharvested.	
	Timber is managed with slight, one-time modifications.
Acreage is kept to a minimum to minimize present losses and facilitate regeneration and rehabilitation in succeeding harvests.	Acreage is kept large enough to form a viable management unit.

A visual diffusion area can take on a variety of forms, depending on the specific situation involved. In general, they consist of narrow corridors (2-3 chains wide) of uncut timber. The number, length, and location of the corridors are tailored to the needs of the particular site in question.

In some cases, a single uncut corridor adjacent to the road can be effective. Indeed, where clearcutting up to the road is not acceptable for some reason (local ordinance, etc.), this may be the only alternative. When this is done, however, it must be remembered that stand deterioration in the near future may well result in more adverse aesthetic impact than the harvest operation itself. Thought should be given to dealing with this future problem (salvage, underplanting, etc.).

To be most effective, a roadside visual diffusion area should be part of a comprehensive stand harvest plan. Such an approach offers a number of advantages:

- The visual impact of future stand deterioration within the diffusion area is reduced. The areas can be set back from the road and still mitigate the impact of the harvest, while the newly regenerated area adjacent to the road softens the appearance of the deterioration within the diffusion area.

- Fewer acres are left unharvested. Full use of topography, scattered long-lived trees, clumps of younger timber, other stands, and other natural features enhance the effectiveness of the diffusion area. The same effect can be achieved with fewer acres.

- Future rehabilitation and regeneration of the uncut area is easier. Visual diffusion areas are a one-time solution. In succeeding rotations, better longer-term solutions should be used (visual enhancement areas, stand size, reduction through increased age distribution, etc.). As a result, thought must be given to getting these areas back into production after they've served their purpose. By using a number of uncut strips throughout the stand to reduce the visual impact, the strips can be made narrower. This is especially important in aspen types. The strips can then be hand cut along with the next aspen harvest and they will restock through sprouting from adjacent areas. If fewer, wider strips are used, sprouting may not extend far enough into the strip to achieve full stocking. Three strips, each two chains wide, will regenerate vigorously, while the regeneration in the center of one strip, six chains wide, might be questionable. The screening value in either case is the same.

AGE DIVERSITY

Age difference within a stand can be used to great advantage in sale design. Such differences may be difficult to detect, especially since many such small age variations within a stand were lumped together in the compartment reconnaissance process. When they can be identified, however, there is an opportunity to enhance the existing difference and increase future age diversity.

In Figure 3.18, portions of the stand were found to be five years younger than the rest of the stand. By cutting the older portions now, five years before rotation age, and holding the younger portions until five years after rotation age, the age difference can be increased to 15 years. Prior planning of the road layout when the older timber is cut will insure access to all parts of the deferred areas without additional disturbance in the newly regenerated stand.

The tendency to "square off" sales boundaries should be resisted, especially in sensitive areas. The squared-off sale design in Figure 3.19a would delay harvesting the fingers of Stand 1 until Stand 2 is cut unlike the design in Figure 3.19b. When sale boundaries are squared-off, excellent opportunities are lost to reduce future sale impact through increased age diversity and more advantageous stand configuration.

STAND SIZE AND CONFIGURATION

Both the size and shape of a stand have an impact on the degree of silvicultural flexibility available in sensitive areas.

Small stands allow much greater flexibility in harvest alternatives. In Figure 3.20, even very intensive treatments in Stand 1 (clearcutting, scarification, etc.) would have minimal impact due to its size. Again, the tendency to cut Stand 1 concurrently with Stand 2 should be resisted. As long as Stand 1 can be harvested economically as a separate unit, any age and species differences between adjacent stands should be enhanced for future use in sale design.

As a stand gets larger, harvest alternatives become more limited. In Figure 3.21, Stand 1 could be selectively harvested, but a clearcut would probably require some modification to be aesthetically acceptable.

Stand distribution or configuration may also have an impact on management flexibility. Stand 1 in Figure 3.22, though large, is distributed in such a way as to minimize visual impact -- even if harvested all at once.

Recognition of these opportunities for natural reduction of visual impact is critical in the planning process. Time, manpower and money are limited.

The forest manager must set priorities in order to focus efforts on the most critical areas. Stand 1 in both Figures 3.23 and 3.24, for example, is identical in total stand acreage, age, and species composition. Figure 3.24, however, is a much more difficult situation to deal with. If efforts to break up the size of this stand are not commenced immediately, the only effective tool available to deal with this situation -- time -- will be lost.

Stand 1 in Figure 3.23, on the other hand, could easily be held to rotation age and cut as one unit with minimal impact. Time spent in this stand, now, could probably be spent more productively in areas which have fewer natural opportunities.

PHYSICAL FEATURES

A. Soil Type

Soil erosion and excessive rutting from logging machinery can be very unsightly. Advance planning and imaginative sale design can reduce these problems considerably. Such considerations include:

- Restricting logging on potential problem soil areas to winter only.
- Locating road entrances on more stable soil types.
- Including in your sale plan a provision for prompt post sale clean-up and seeding of unavoidable problem spots.
- Designing logging road systems that reduce the number of exits onto heavily traveled roadways.

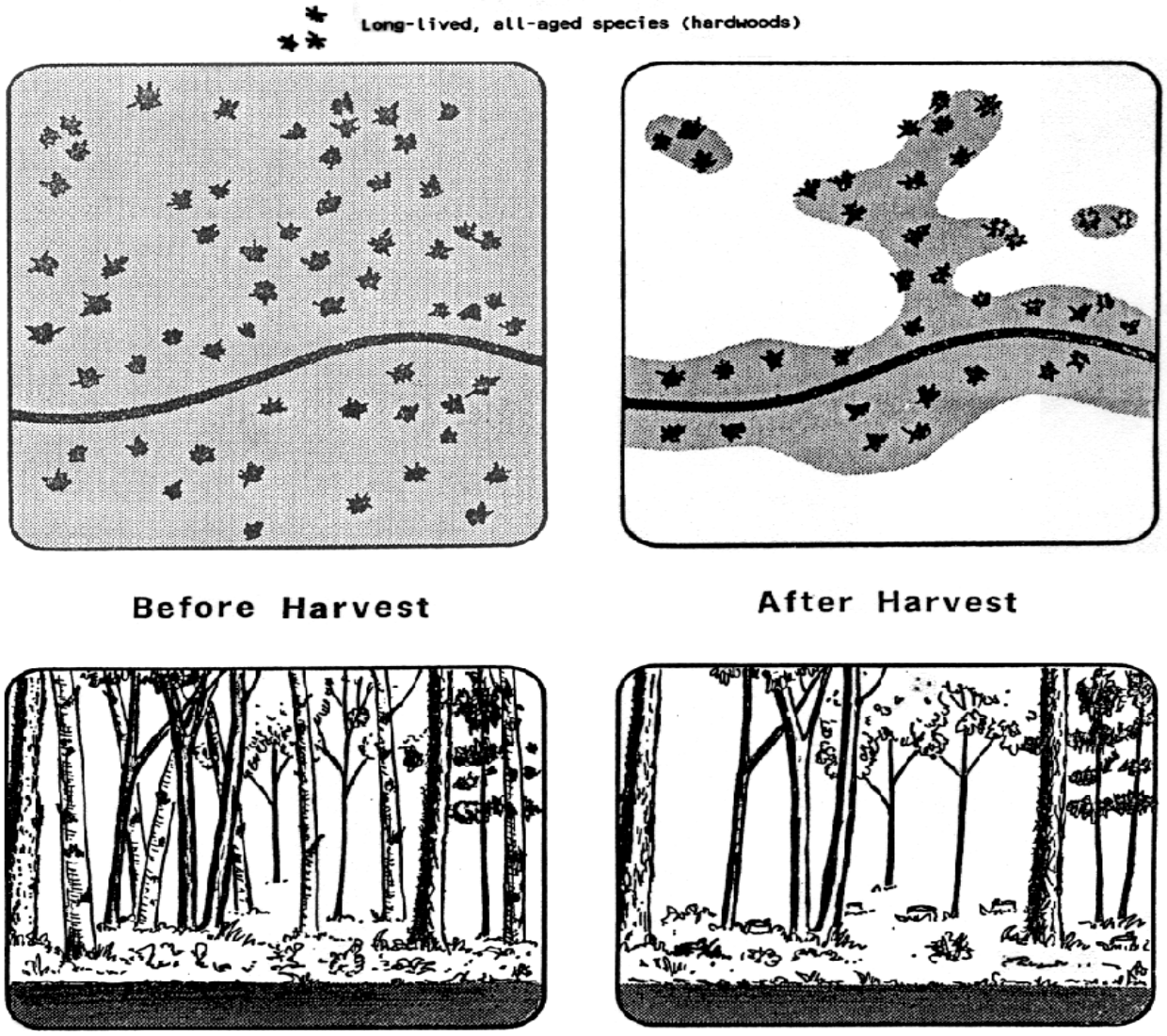
B. Topography and Drainage Patterns

Sale cutting boundaries should be laid out in harmony with existing land features whenever possible. Laying out visual enhancement areas along ridge lines not only results in a more natural appearance, but also increases their screening value. This allows an equally effective reduction in visual impact with fewer acres. See Figure 3.25.

Streams should be incorporated into cutting boundaries whenever feasible (Figure 3.26) for the following reasons:

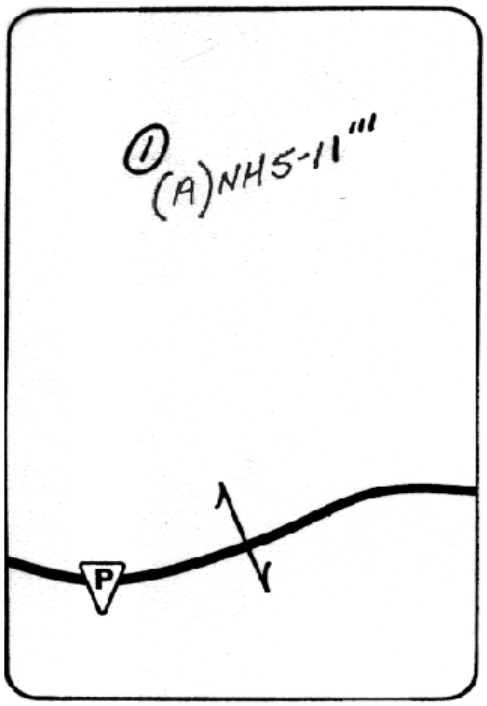
- They generally are associated with bands of lowland brush, swamp hardwood and swamp conifers which have an excellent screening value.
- They form a more or less permanent visual barrier between cutting units. Time between adjacent units separated by such barriers can be decreased and that time used to better advantage between other units without permanent boundaries.
- The need for stream crossings is reduced; erosion and siltation are minimized.

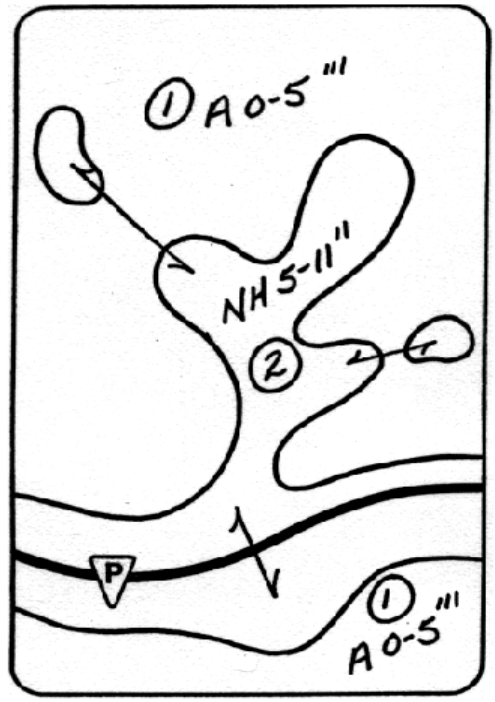
Figure 3.1a Total removal of a designated species.



In the aspen-northern hardwood stand above, the aspen component was designated for total removal. Hardwood was retained along the road and on selected parts of the main sale area to reduce visual impact. The hardwood was removed from the bulk of the stand to ensure adequate regeneration. The new hardwood stand that was created will be managed under the all-aged selection system in the future (see Figure 3.1b).

Figure 3.1b Total removal -- recon update.





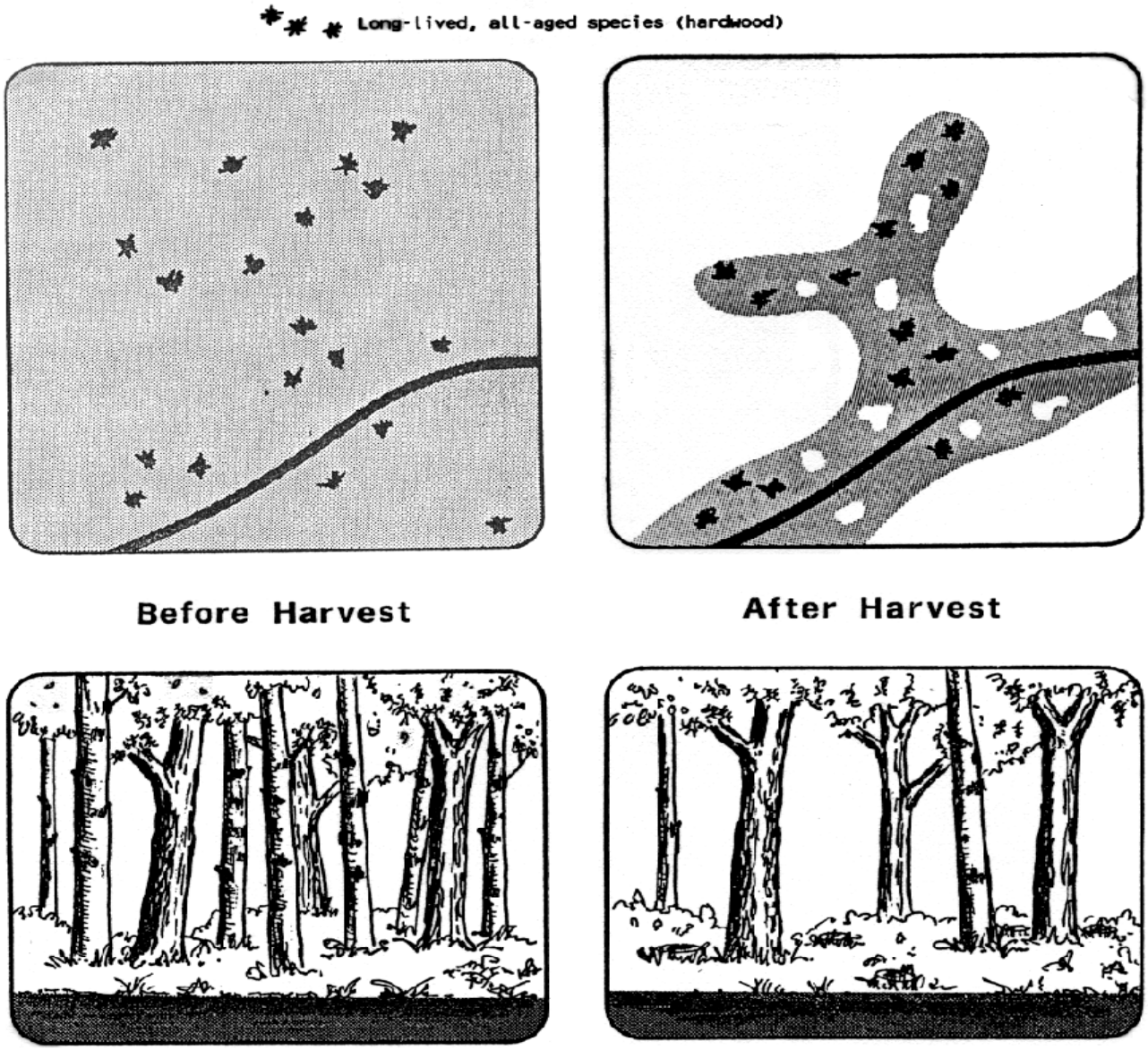
Recon Data
(Before harvest)

Stand number	A1
Primary type	A5-11'''
Secondary type	NH5-11''
Acres	300
Year of origin	1935
Stocking	105 □'
Volume	22 cds
Mgt. objective	Aspen

Recon Data
(After update)

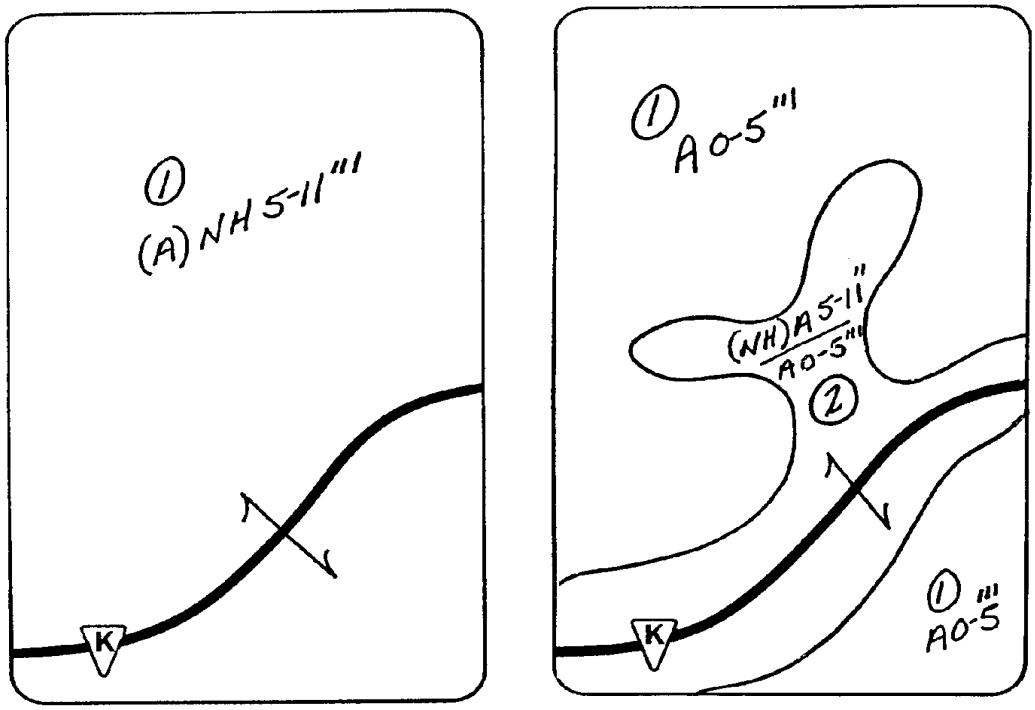
1	A2
A0-5'''	NH5-11''
	A0-5'
225	75
1983	
3	50 □'
0	9 cds
Aspen	NH

Figure 3.2a Partial removal of a designated species.



In cases where the long-lived, all-aged component is insufficient for visual diffusion purposes, a portion of the short-lived, even-aged component can be retained to further reduce the visual penetration. In the example above, selected vigorous aspen were left to enhance the northern hardwood stocking. As the hardwood crowns and the aspen understory develops, more aspen will be removed in later harvests (see Figure 3.2b).

Figure 3.2b Partial removal -- recon update.



Recon Data
(Before harvest)

Stand number	A1
Primary type	A5-11'''
Secondary type	NH 5-11'
Acres	300
Year of origin	1935
Stocking	105 □'
Volume	22 cds
Mgt. objective	Aspen

Recon Data
(After update)

1	A2
A 0-5'''	NH 5-11''
	A 5-11'
225	75
1983	
3	50 □'
0	9 cds
Aspen	(NH) A

NH - SELECTIVE CUT
A - REMOVE ALL MATURE TREES IN 10 YEARS

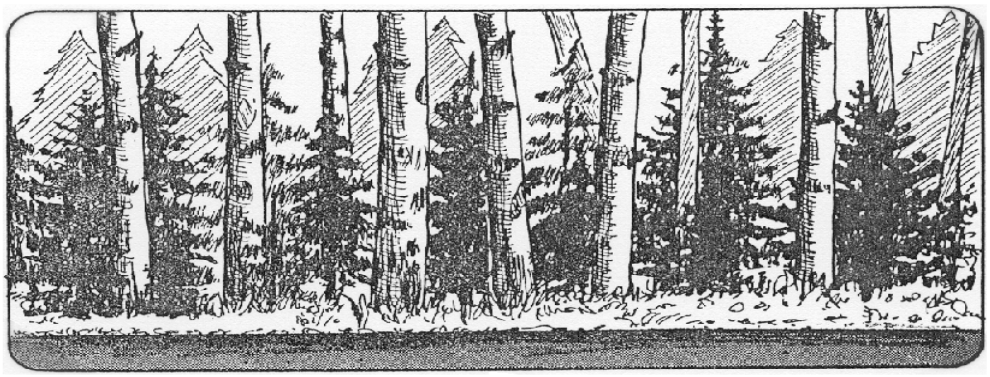
Figure 3.3 Retention of selected individuals -- long-lived species.

When possible, thought should be given to carrying over selected long-lived individuals for another rotation.

Figure 3.4 Retention of selected individuals -- "leave trees".

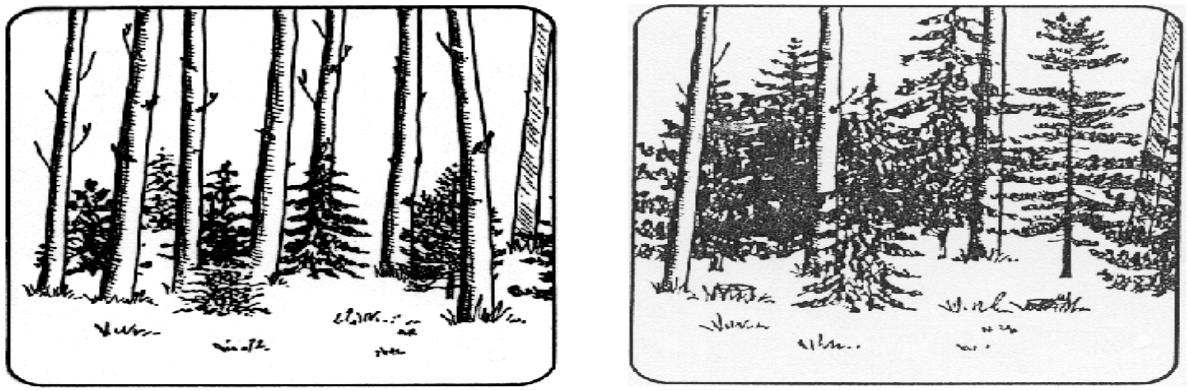
The retention of even small numbers of "leave trees" have a positive effect on the visual impact of a timber harvest. The wildlife benefits of such trees should also be considered.

Figure 3.5 Use of stand structure in aesthetic management.



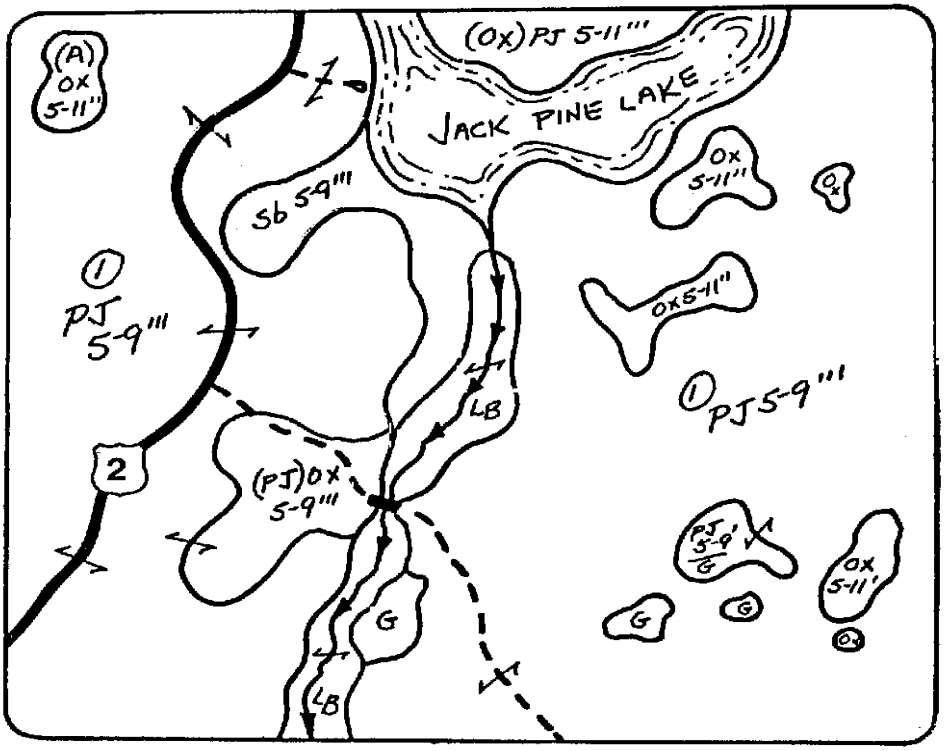
The screening potential of a well-developed understory can make clearcutting acceptable where it normally would not be. The balsam fir understory, above, makes the removal of the aspen overstory much more visually acceptable.

Figure 3.6 Development cut.



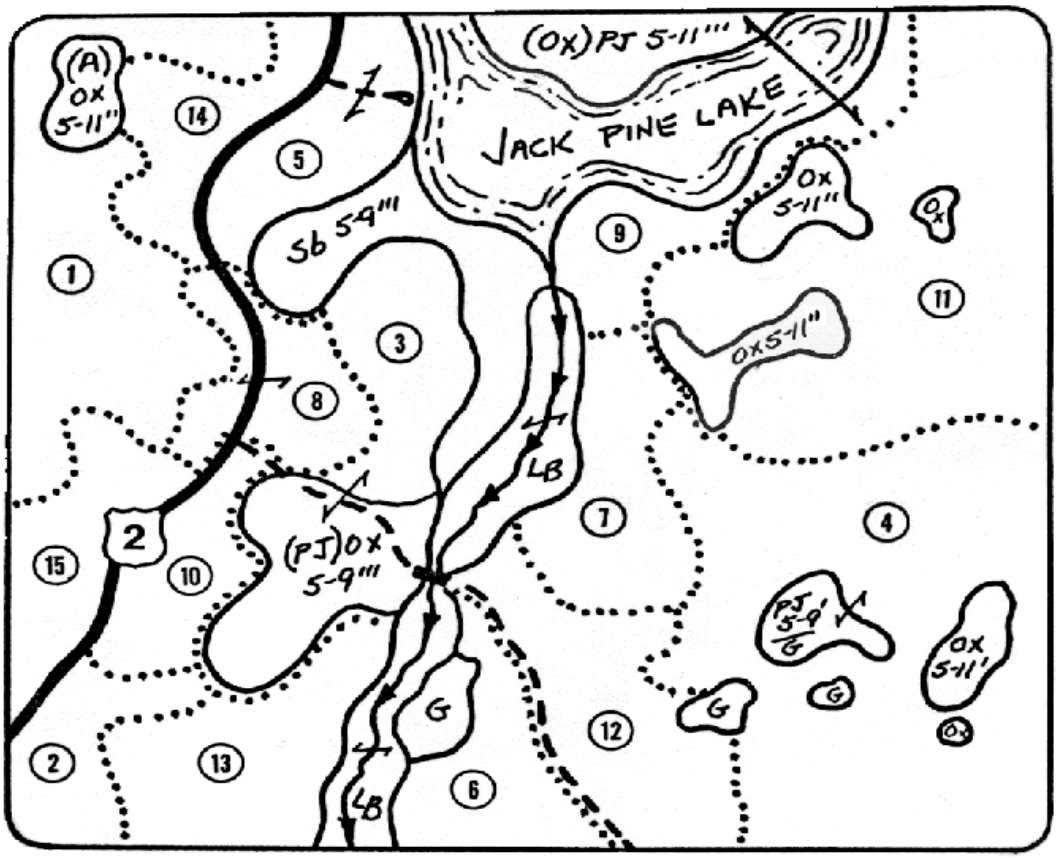
A pre-sale development cut can be used to increase height growth and crown development in the understory, allowing removal of greater overstory volume at rotation age.

Figure 3.7 Large, even-aged monotype -- immature timber.



Stand number	A1
Timber type	PJ 5-9'''
Age	40
Rotation age	50
Mgt. objective	JACK PINE
Mgt. prescription	CLEARCUT
Year of harvest	1990

Figure 3.8 Cutting unit boundary design -- immature timber.



In this example, 15 cutting units were laid out. The units along the main highway and the flowage (5, 7, 8, 11, 12, 13, and 14) were made smaller. These units were also more intensively configured to reduce the line of sight and present a less artificial appearance.

Units along the secondary road (1, 2, 10) are larger and less meandered.

The "backland" units (4, 6, 15) are considerably larger due to reduced visual sensitivity and increased species composition.

Stay flexible! Be adaptable to changing priorities.

Figure 3.9a Assigning harvest dates to cutting units -- first rotation -- immature timber.

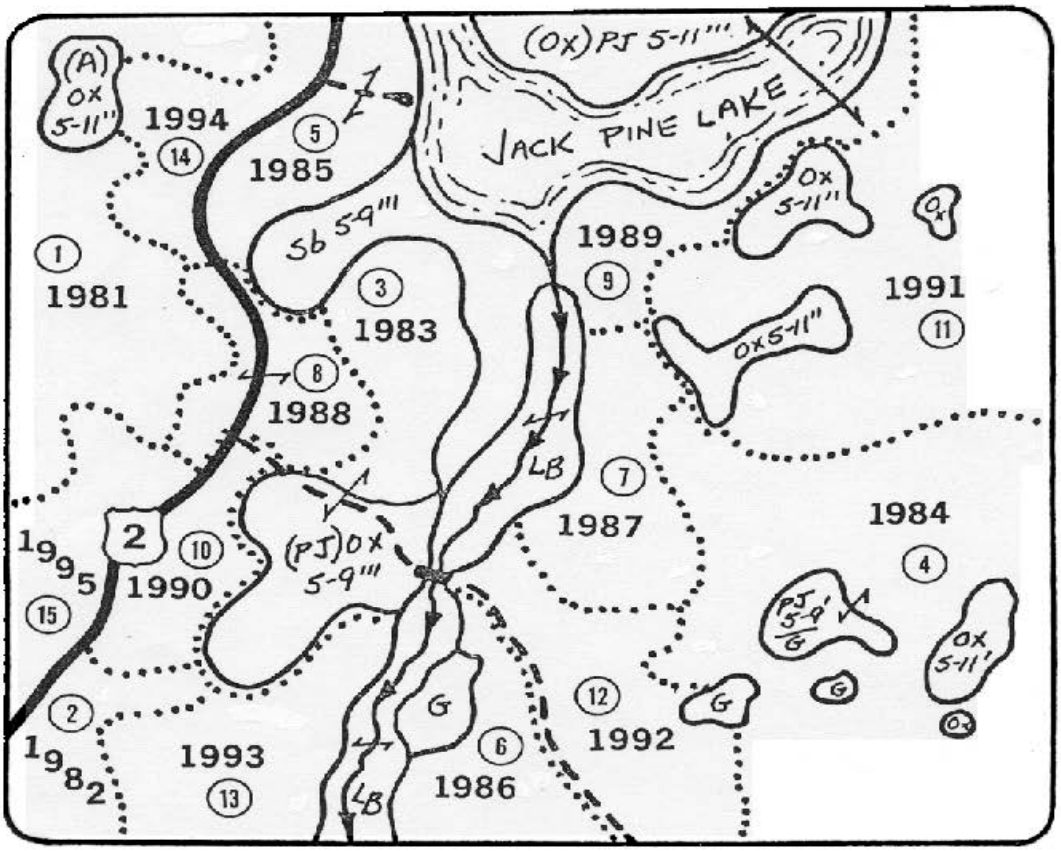


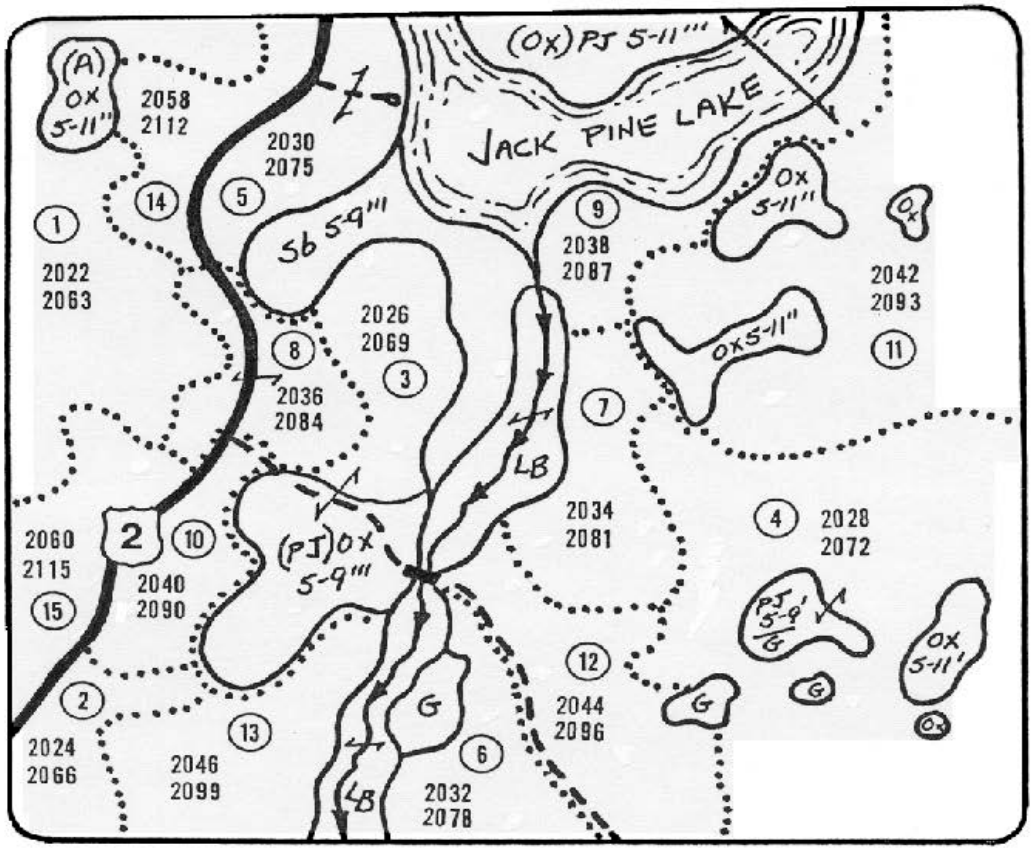
Figure 3.9b Cutting unit harvest dates -- first rotation.

Block no.	Age when cut	No. of years away from optimum rotation age	Year of harvest
1	41	-9	1981
2	42	-8	1982
3	43	-7	1983
4	44	-6	1984
5	45	-5	1985
6	46	-4	1986
7	47	-3	1987
8	48	-2	1988
9	49	-1	1989
10	50	0	1990
11	51	+1	1991
12	52	+2	1992
13	53	+3	1993
14	54	+4	1994
15	55	+5	1995

Total harvest period: 15 years

Average time between adjacent cuts: 7 years

Figure 3.10a Assigning harvest dates to cutting units -- second and third rotations -- immature timber.



Harvest dates

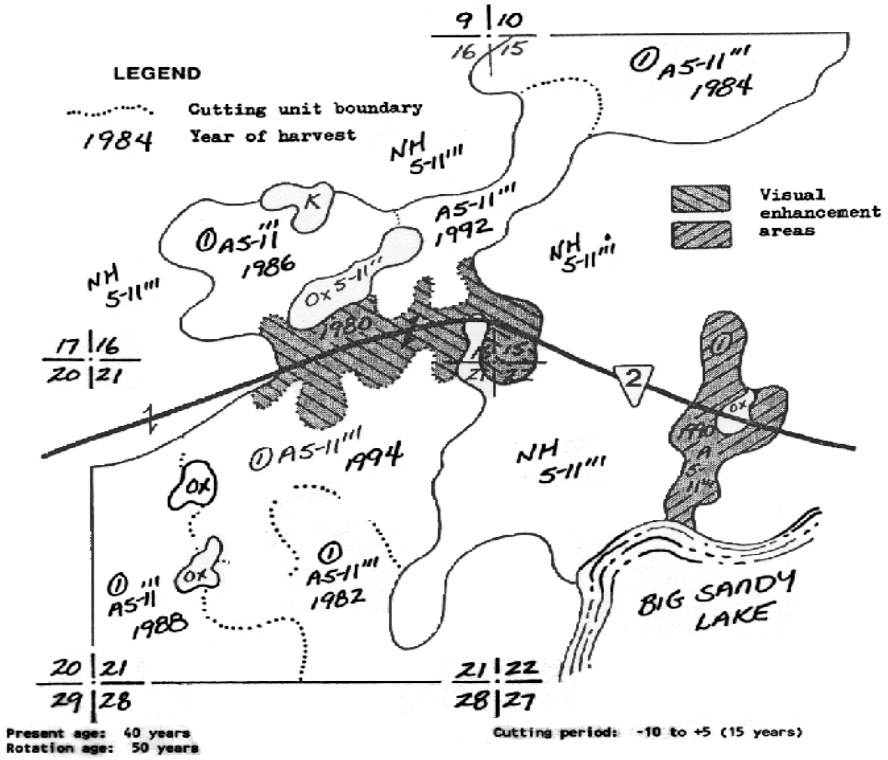
Second rotation -- top number

Third rotation -- bottom number

Figure 3.10b Cutting unit harvest dates -- second and third rotations.

Block no.	Age when cut	No. of years away from optimum rotation age	Year of harvest: First rotation	Second rotation	Third rotation
1	41	-9	1981 + 41=	2022 + 41 =	2063
2	42	-8	1982 + 42 =	2024 + 42 =	2066
3	43	-7	1983 + 43 =	2026 + 43 =	2069
4	44	-6	1984 + 44 =	2028 + 44 =	2072
5	45	-5	1985 etc.	2030 etc.	2075
6	46	-4	1986	2032	2078
7	47	-3	1987	2034	2081
8	48	-2	1988	2036	2084
9	49	-1	1989	2038	2087
10	50	0	1990	2040	2090
11	51	+1	1991	2042	2093
12	52	+2	1992	2044	2096
13	53	+3	1993	2046	2099
14	54	+4	1994	2048	2112
15	55	+5	1995	2050	2115
Total harvest period:			15 years	30 years	45 years
Average time between adjacent cuts:			7 years	14 years	21 years

Figure 3.11a Roadside treatment as part of a total sale design -- immature timber.



In this example, a visual enhancement area has been created along a major highway. Notice that the treatment is an integral part of a larger plan designed to deal with the entire stand.

Eight cutting units were used in this harvest plan. One unit would be cut every other year. The roadside units are cut before or at rotation age to reduce the chance of stand break-up in a sensitive area.

Figure 3.11b Recon data for Figure 81.11a.

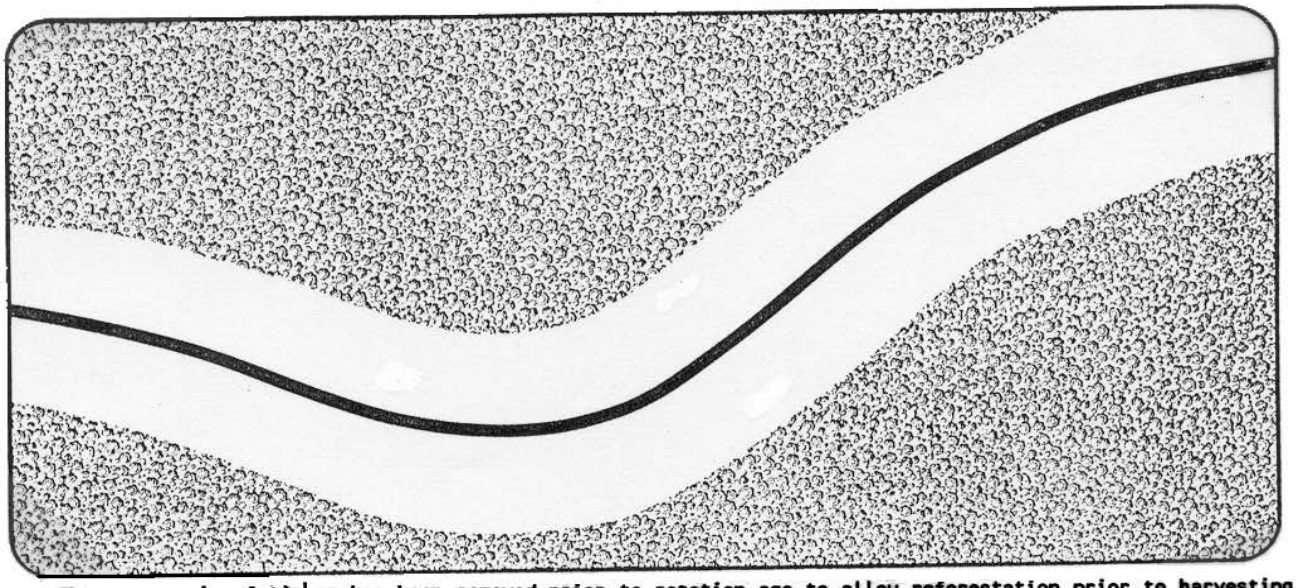
Old Recon Data - 1980

Stand number	A1
Timber type	A5-11"
Acres	810
Age	40
Mgt. objective	Aspen
Mgt. prescription	CLEARCUT
Year of harvest	1990

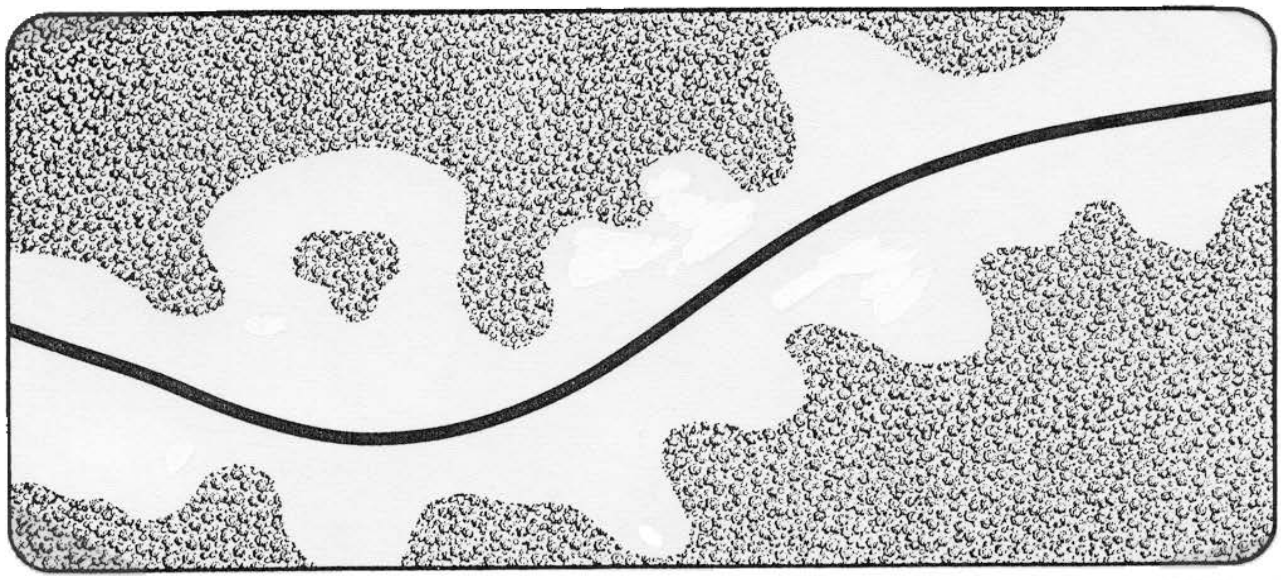
Recon Update Data - 1994

Stand number	A1	2	3	4	5	A6	7	8
Timber type		←	A 0-5"			→		
Acres	75	140	92	85	123	50	95	150
Age	14	12	10	8	6	4	2	0
Mgt. objective		←	Aspen			→		
Mgt. prescription	←		CLEARCUT			→		
Year of harvest	2030	2032	2034	2036	2038	2040	2042	2044

Figure 3.12 Roadside visual enhancement area -- immature timber.

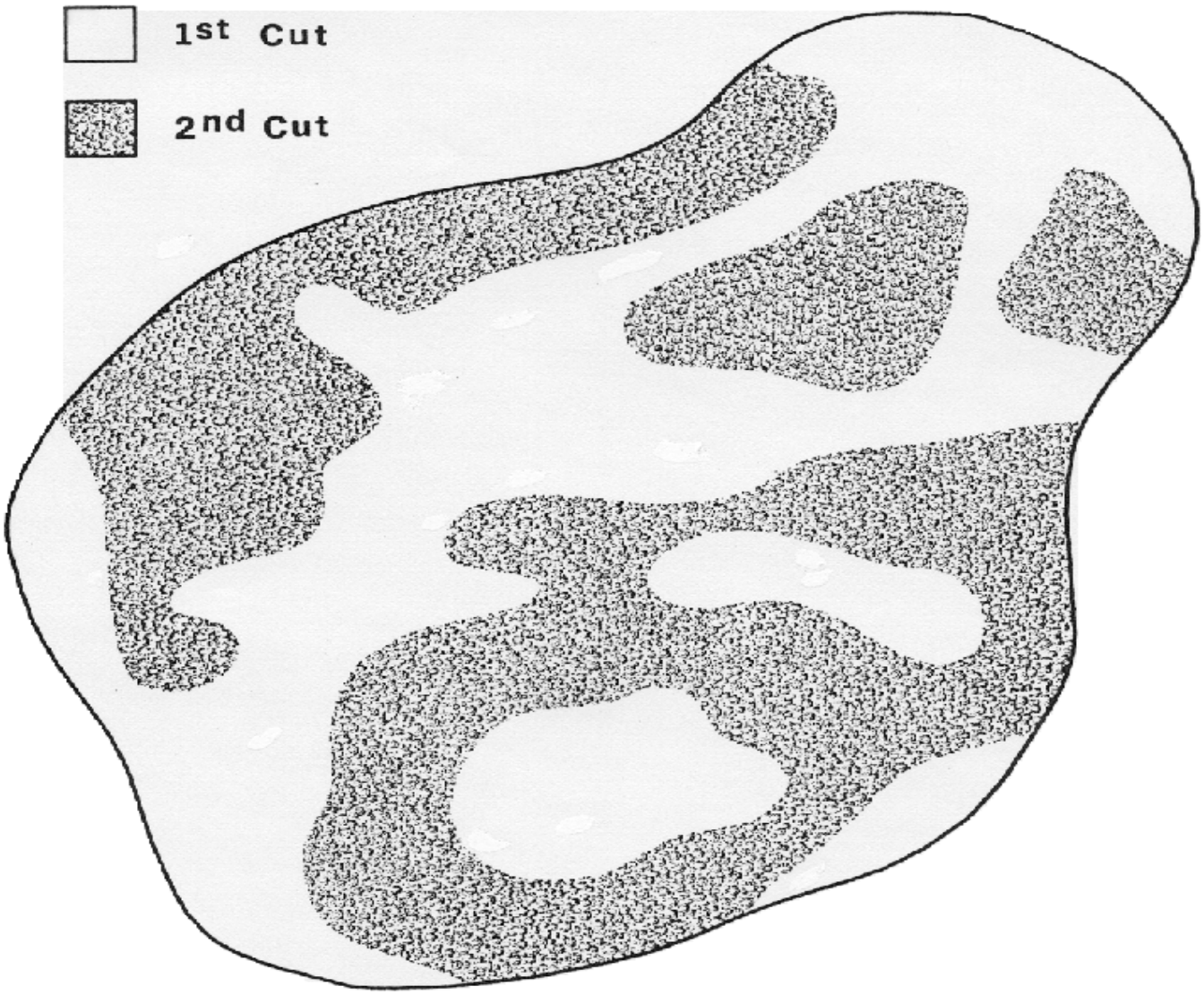


Above, a strip of timber has been removed prior to rotation age to allow reforestation prior to harvesting the main stand. In this way, the vast majority of the timber is harvested at the optimum rotation age. Possible volume losses due to over-maturity are minimized.



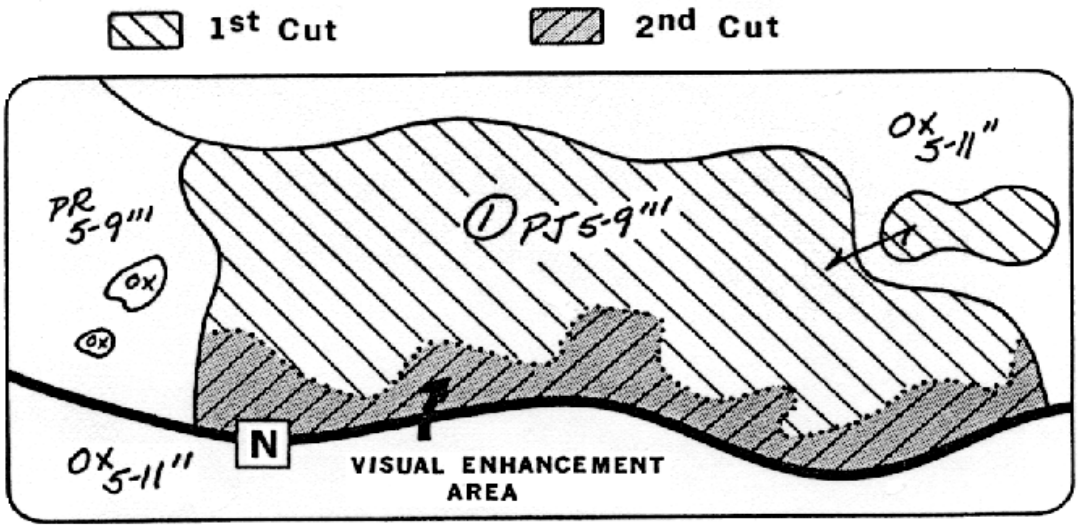
In this example, a strip of timber was also removed prior to rotation age. In this case, however, the edge of the residual stand has been scalloped to present a more natural appearance while the area is reforested. This approach is better suited to timber types with a long regeneration period.

Figure 3.13 Cutting strategies -- mature timber.



The first cut is made immediately, while the second cut is delayed as long as possible, based on an annual assessment of the residual stand risk and vigor. In this way, maximum time is allowed to elapse between adjacent cuts. Visual impact is reduced through imaginative sale design to limit line of sight.

Figure 3.14 Cutting strategies -- mature timber.

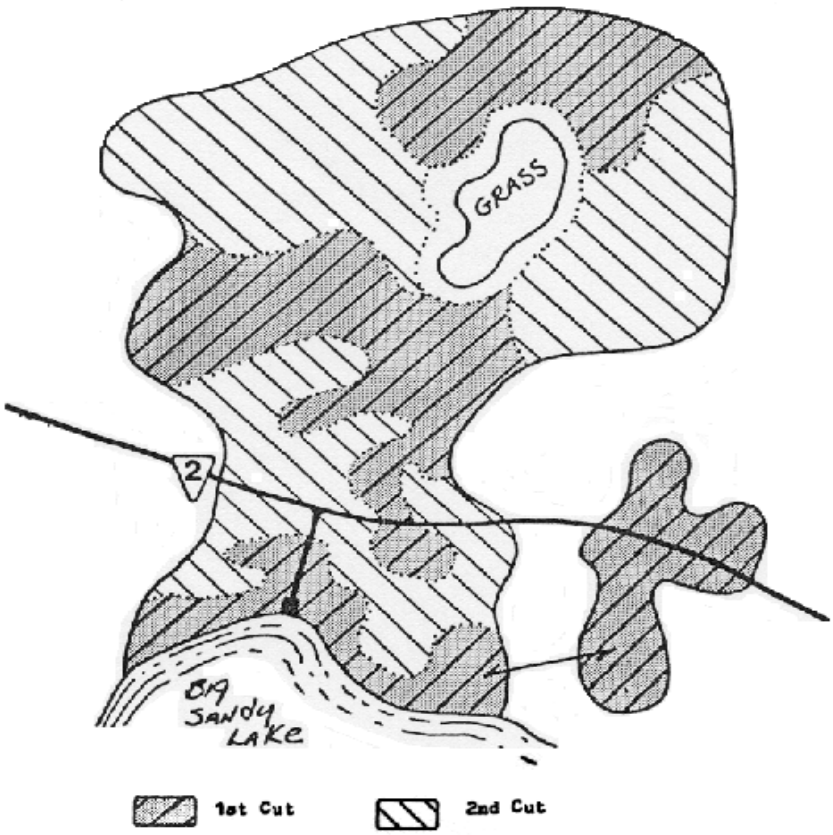


	Recon Data (Before cutting)	Recon Data (After the first cut)	
Stand No.	A1	1	A2
Type	PJ 5-9"'	PJ 0-5"'	PJ 5-9"'
Acres	80	60	20
Age		1	
Rotation Age			
Mgt. Objective	JACK PINE	JACK PINE	JACK PINE
Mgt. Prescription	CLEARCUT	CLEARCUT	CLEARCUT
Year of Harvest	1980	2025	1985+

The bulk of this mature stand is being harvested immediately. A visual enhancement area (VEA) has been created out of a smaller portion of the stand. Harvest of the VEA will be deferred as long as risk and vigor permit. This will allow maximum time to regenerate the harvested area.

If this stand were being converted to a long-lived species, such as red pine, it may be desirable to manage the VEA as an opening after harvest, in order to reduce the "tunnel" or "fiber factory" appearance along this road in the future.

Figure 3.15a Two-cut system incorporating a visual enhancement area -- mature timber.

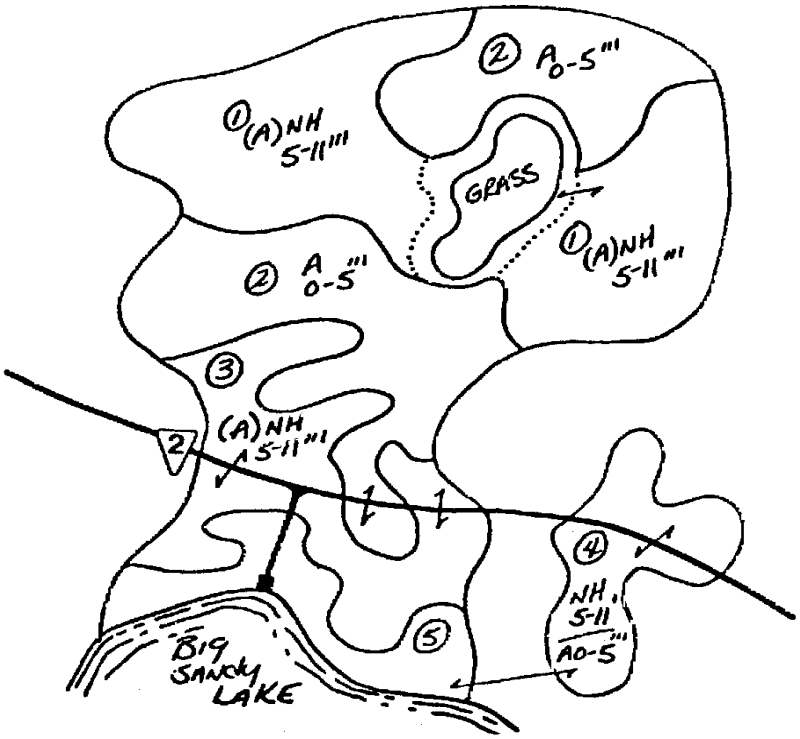


Recon data - before cutting

Stand number	A1
Primary type	A5-11"
Secondary type	NH 5-11'
Acres	505
Age	45
Rotation age	45
Mgt. objective	Aspen
Mgt. prescription	CLEARCUT

Figures 3.15a and 3.15b illustrate the creation of visual enhancement areas in the overall harvest plan for a large stand. The entire stand would be harvested in two cuts.

Figure 3.15b Two-cut system incorporating a visual enhancement area -- mature timber.

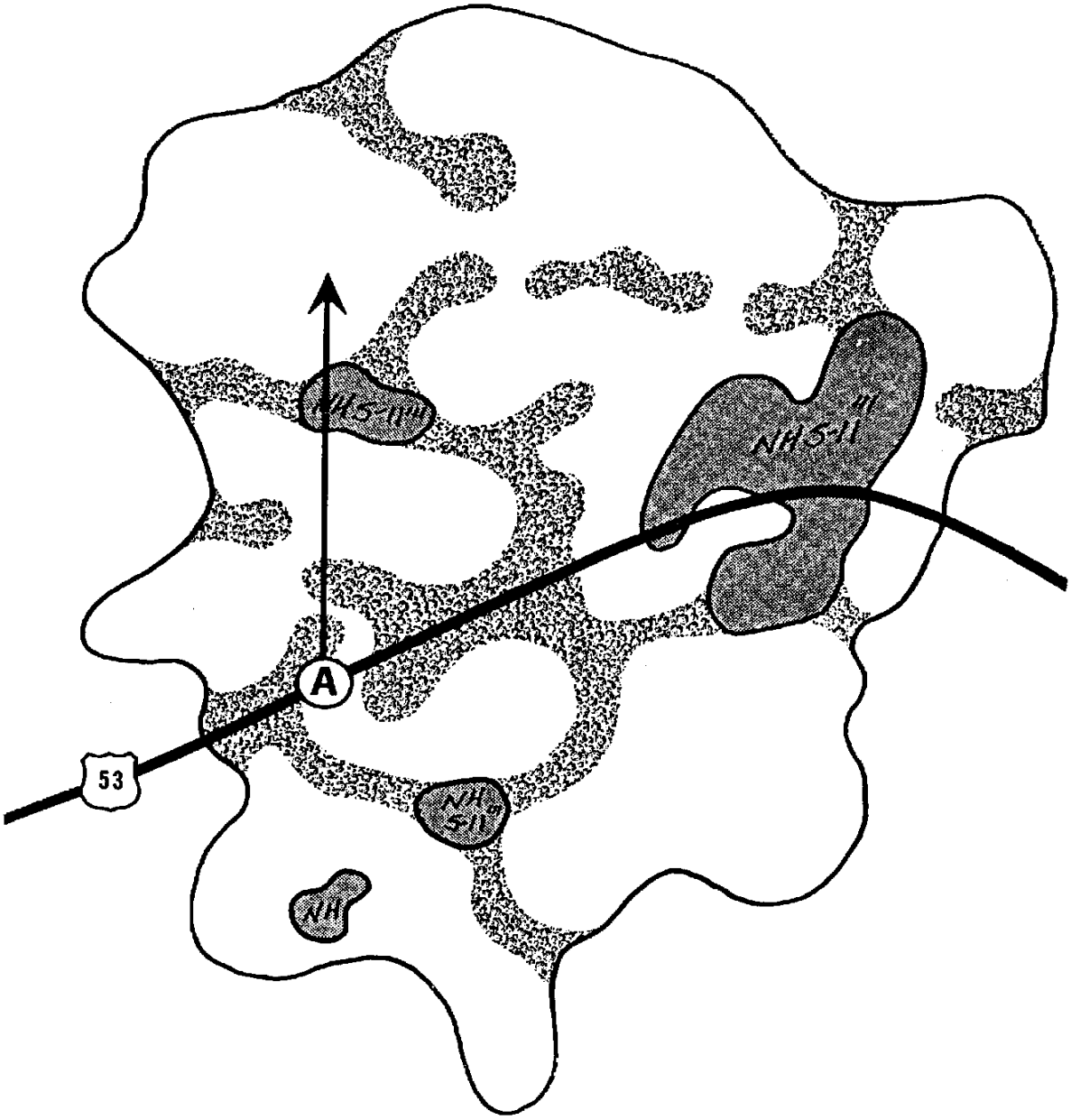


Recon update - after the first cut

Stand number	1	A2	A3	A4	A5
	A5-11'''	A0-5'''	A5-11'''	A0-5'''	NH5-11'
	NH5-11'		NH5-11'	NH5-11'	A0-5'''
	160	170	87	40	48
	45	1	45	1	
	45	45	45	45	
	Aspen	Aspen	(A)NH	(A)NH	NH
	CLEAR CUT	CLEAR CUT	CLEAR CUT Aspen / RETAIN NH IN SELECTED AREAS	CLEAR CUT Aspen / Retain SELECTED NH	PARTIAL CUT IN ASPEN AT ROTATION AGE

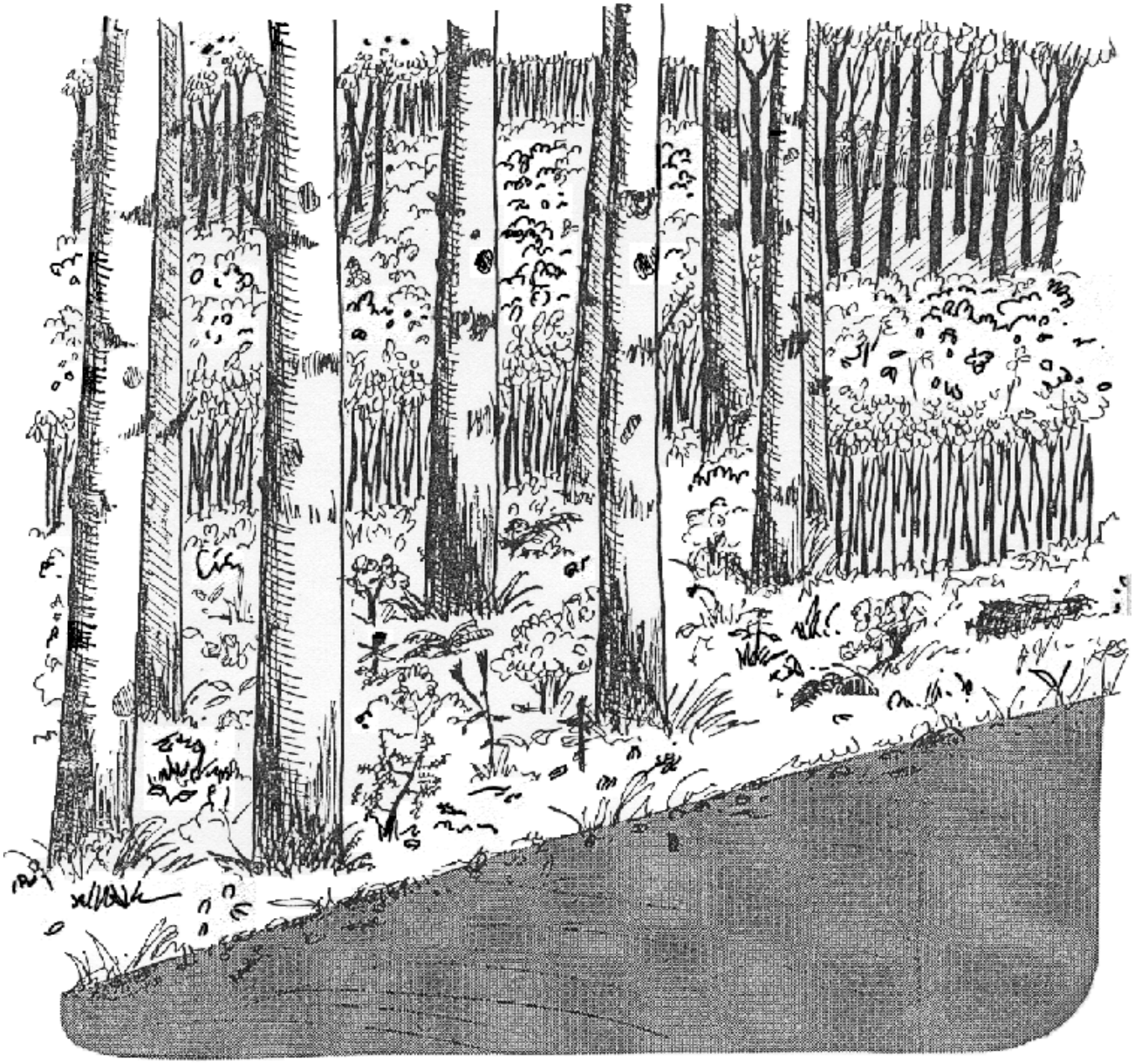
In addition to sale boundary manipulation, selected northern hardwood were left along the road to further reduce the visual impact. All the hardwood was retained in the unit bordering Big Sandy Lake. This unit will be gradually converted to northern hardwood. By doing so, long-term aesthetic management problems along the lake will be reduced.

Figure 3.16 Visual diffusion areas -- overmature timber.



Visual diffusion areas created in a large, overmature aspen stand.

Figure 3.17 Visual diffusion areas -- ground view.



Ground view of Figure 3.16 after the harvest, looking from point "A" in the direction indicated. The goal is not total screening but rather, a reduction of the visual impact.

Figure 3.18 Age diversity within a stand.

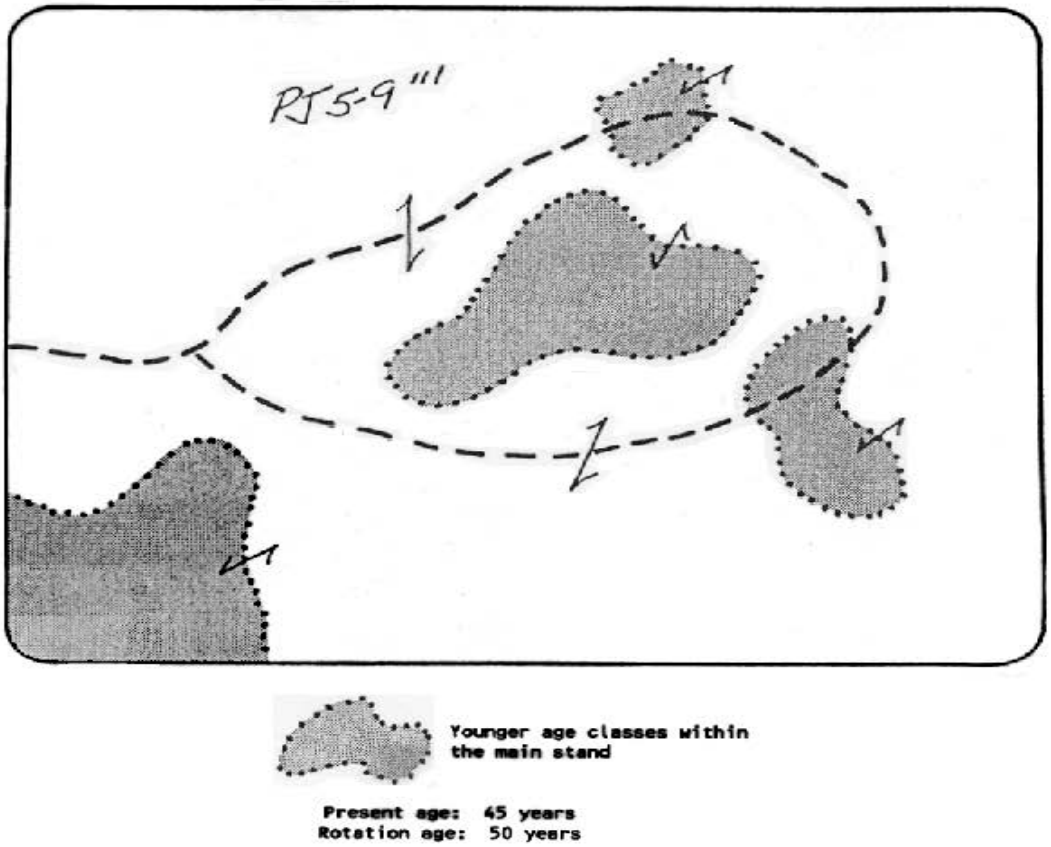
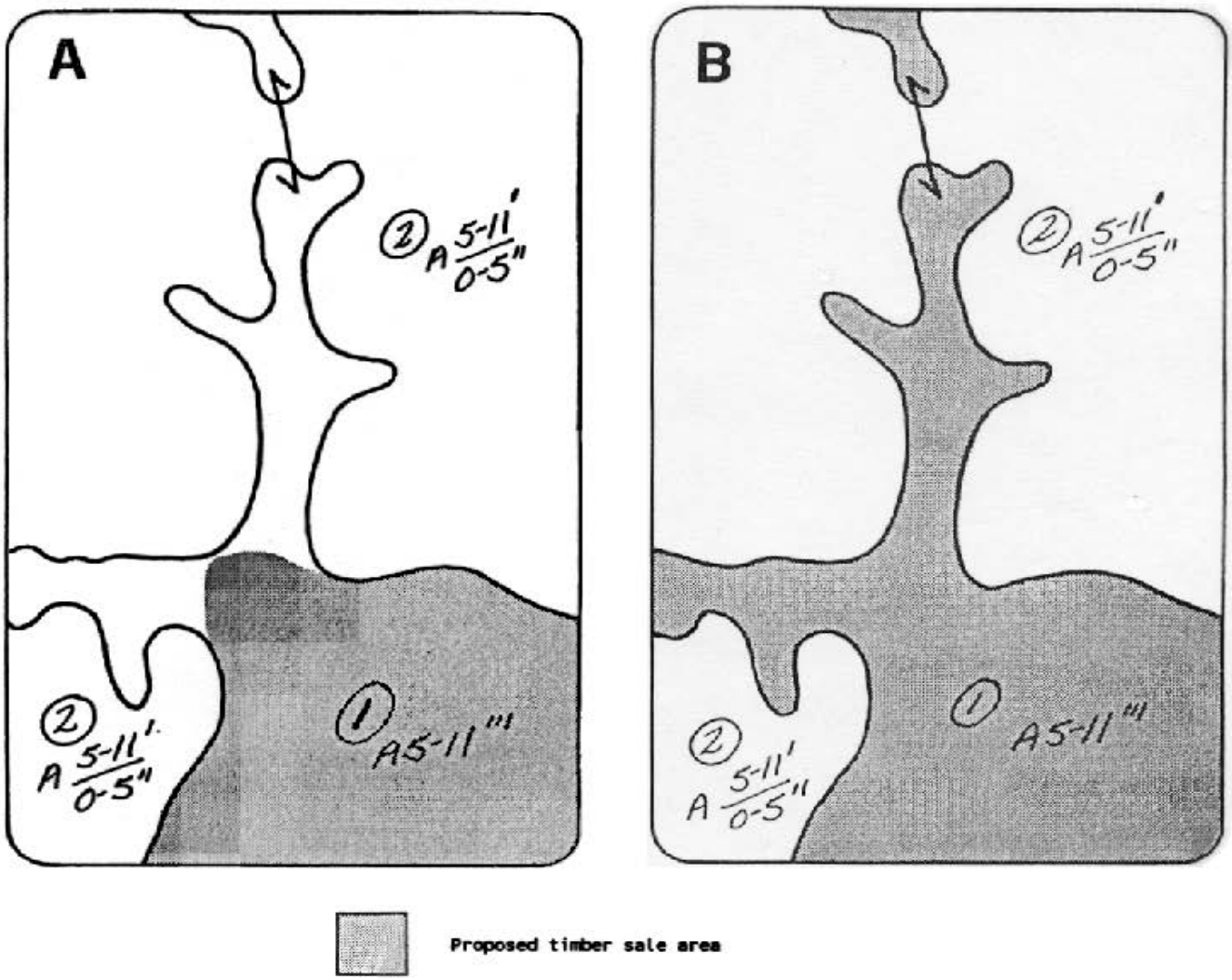


Figure 3.19 Enhancing existing age distribution.



Squared-off sale boundary represents lost opportunity to improve age diversity.

Figure 3.20 Harvest alternatives in small stands.

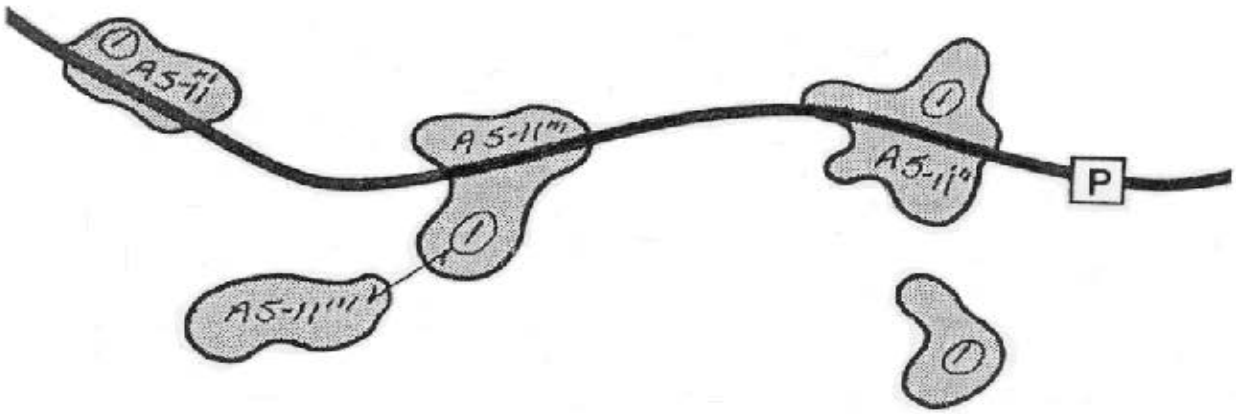


Figure 81.21 Harvest alternatives in large stands.

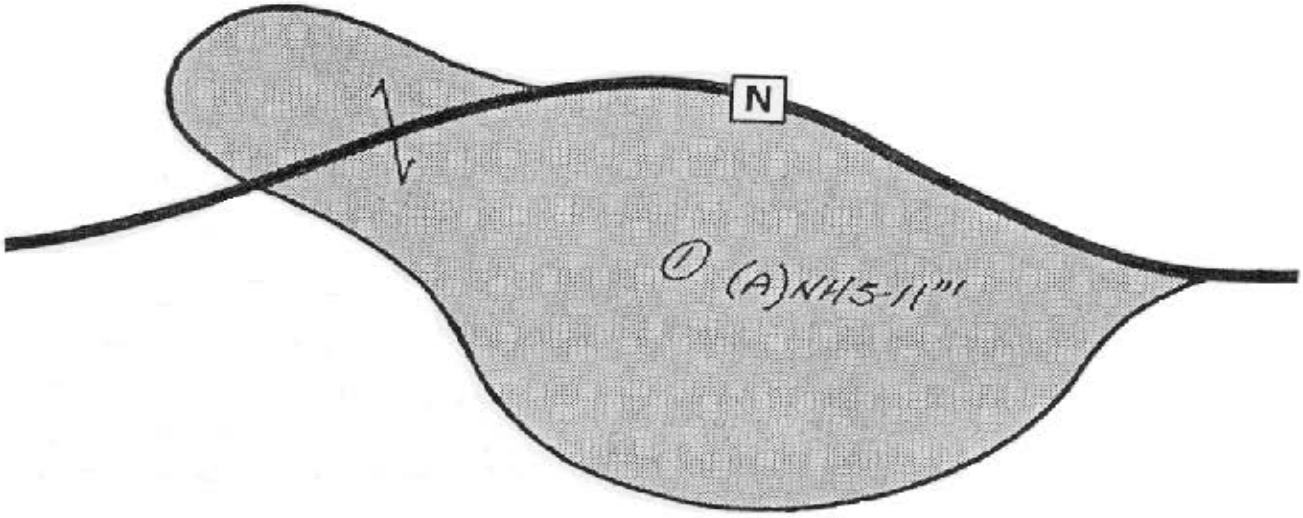


Figure 3.21 Harvest alternatives in large stands.

Figure 3.22 Use of stand distribution in aesthetic management.

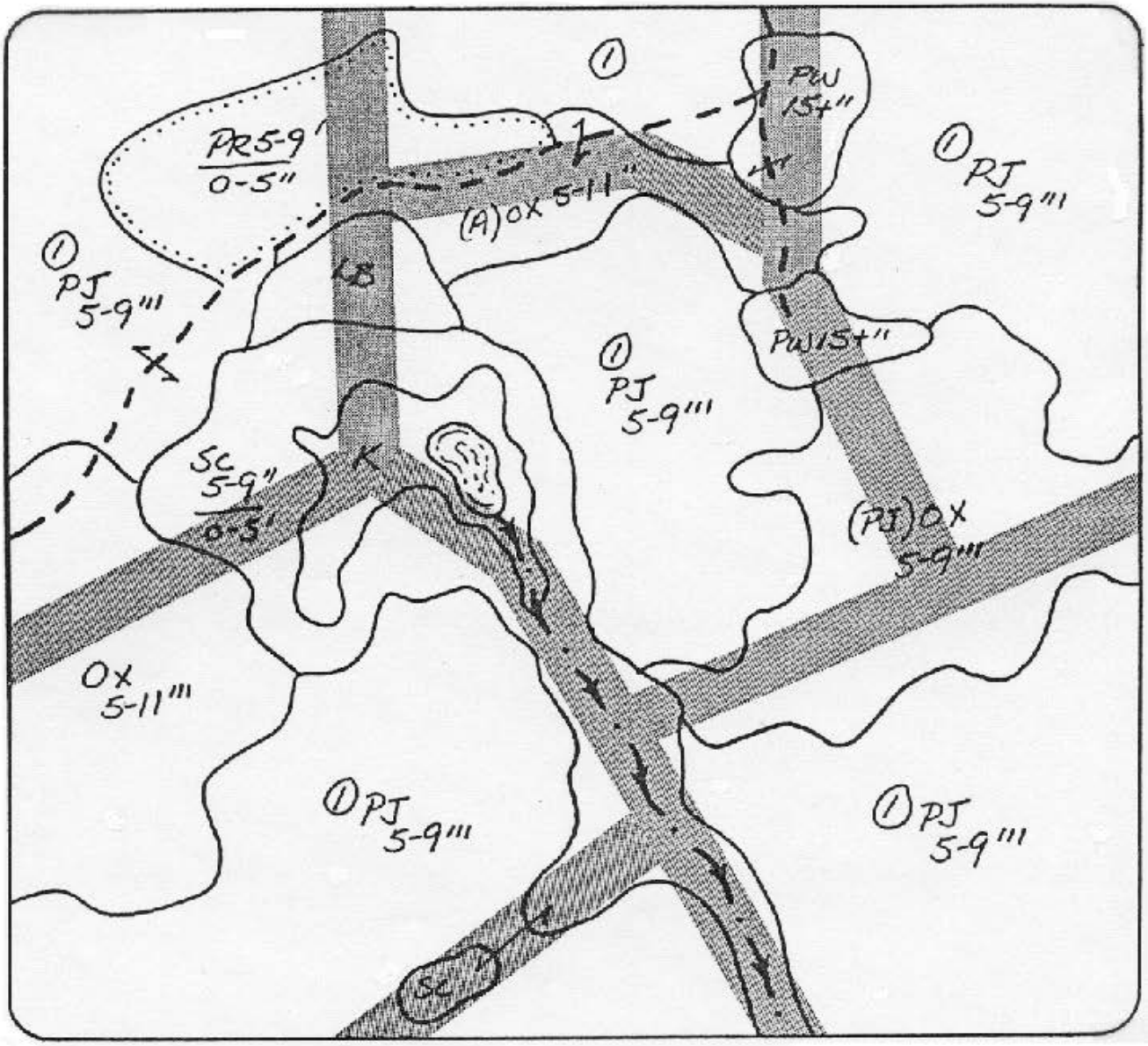
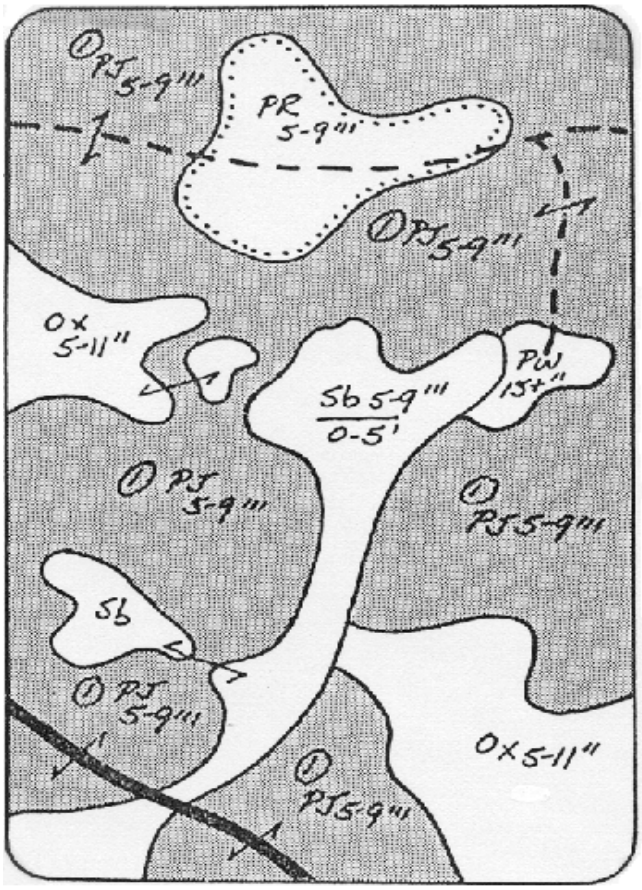
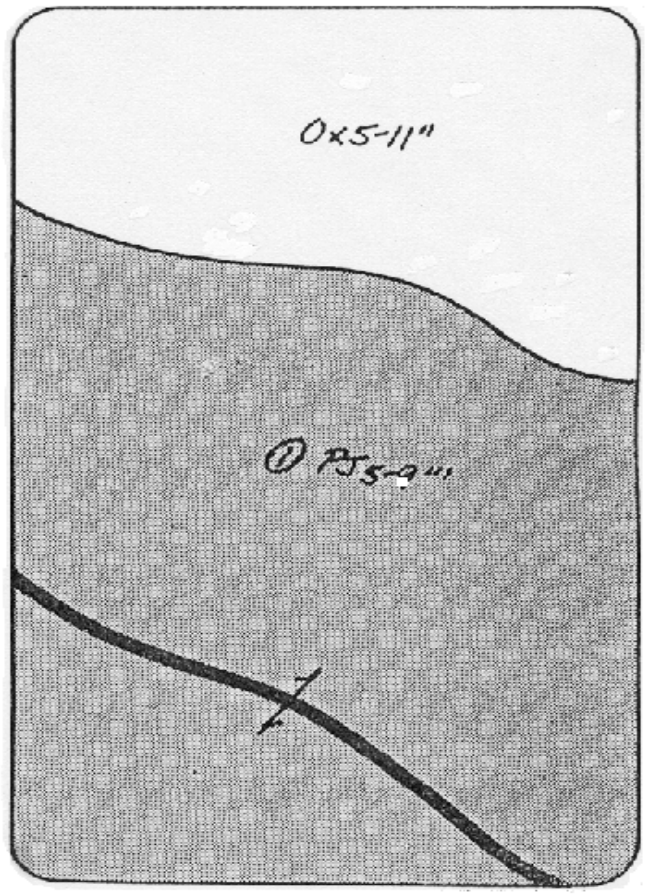


Figure 3.23
Favorable stand distribution.



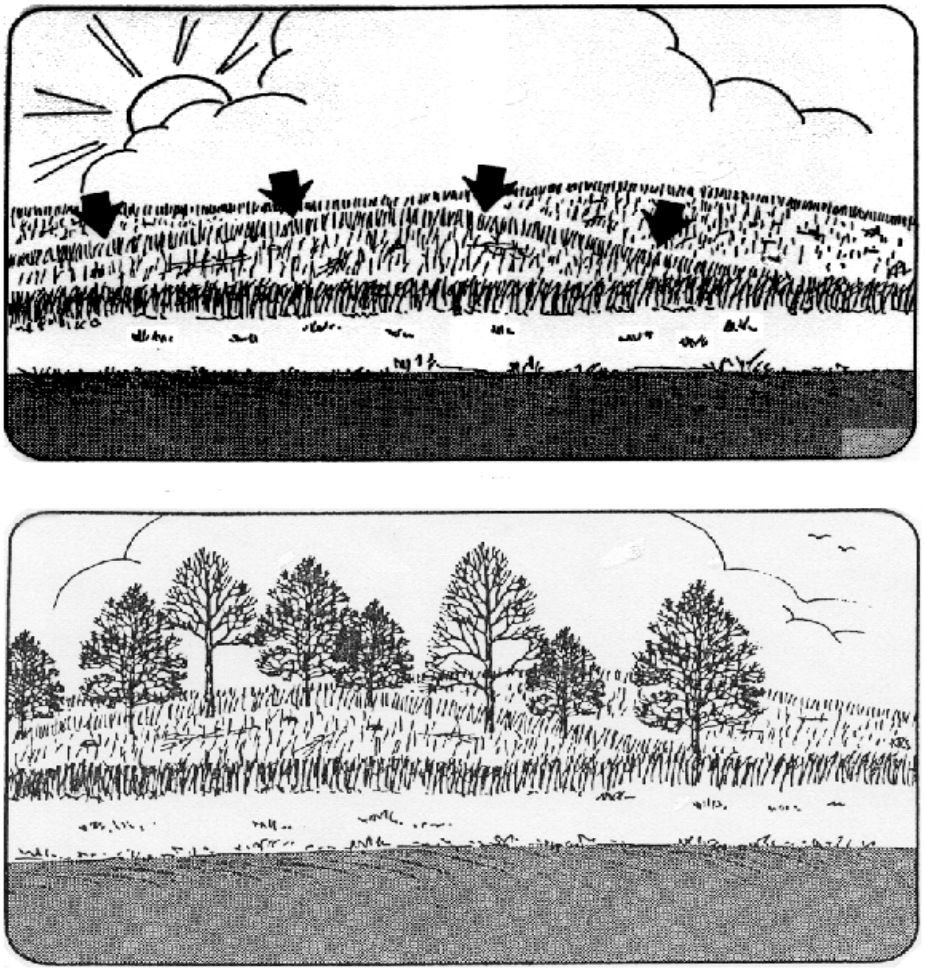
Stand 1: 350 acres
Age: 40 years
Rotation age: 50 years

Figure 3.24
Poor stand distribution



Stand 1: 350 acres
Age: 40 years
Rotation age: 50 years

Figure 3.25 Use of topography in sale design.



By locating this visual enhancement area on a ridge line, its effectiveness is greatly increased.

Figure 3.26 Use of streams as cutting boundaries.

Streams make excellent sale boundaries for a number of reasons and should be incorporated into the sale design whenever possible.

CHAPTER 4

DESIGN CONSIDERATIONS

In addition to the normal silvicultural and economic considerations which go into sale planning, a number of design elements must also be considered in order to minimize:

- The visual impact of the timber harvest and post-harvest activities.
- The amount of time, effort, and cost involved in meeting aesthetic management objectives.
- The amount of acreage managed for less than its total productive capacity.

VISUAL PENETRATION

It must be remembered that the goal of a visual enhancement area (VEA) is moderation of the impact of forest management activity, not its total concealment. In resource management, a series of trade-offs must be evaluated. All values cannot be maximized simultaneously. The goal of any successful sale design is to accomplish the forest management objective while preventing any unacceptable reduction in other resource values.

Visual penetration -- defined as the length of a viewer's unobstructed line of sight -- depends on a number of factors:

- Timber type -- northern hardwood as opposed to spruce-fir, for example.
- Season of the year -- "leaves-off" vs. "leaves-on".
- Topography -- both hills and valleys.
- Land features -- lakes, road right-of-way clearings, power line clearings, etc.
- Average DBH and stand stock levels

In Figure 4.1, for example, it's very apparent that the effective limits of visual penetration would vary considerably.

Obviously, if the aesthetic management goal is to screen all areas of an activity equally, the width of a visual enhancement area will vary considerably, depending on the specific circumstances in each location, as shown in Figure 4.2. This is an extremely important concept to keep in mind. Visual enhancement areas are generally drawn as a parallel corridor along sensitive areas. This is done to simplify mapping and planning only. It is not representative of the shape of the actual enhancement area on the ground. This is an easy trap to fall into and must be avoided.

Not only is the width of the VEA important, its shape and location also have an impact on its effectiveness.

As shown in Figures 4.3 and 4.4, the line of sight is reduced by fingers and islands of the deferred portion of the sale area, doing away with the need for roadside screening. In pure even-aged, short-lived types, the use of sale shape rather than vegetative screening to limit visual penetration has a number of advantages:

- The entire stand is treated in a more systematic fashion. Separate plans need not be developed for "roadside" and "backland" areas.
- There is less tendency to create small unmanageable units.
- Favorable long-term stand size and shape is more quickly realized. Roadside "strips" are generally a short-term solution at best, especially in pure even-aged types.

VIEWING INTENSITY AND DURATION

Intermingled with the concept of visual penetration, is that of viewing duration and viewing intensity. All parts of a sale area are not viewed equally. The orientation of the traveler's vehicle, for example, creates areas of different viewing duration and intensity as they travel along roads and streams. See Figures 4.5 and 4.6.

In general, the greater the viewing intensity, the shorter the visual penetration should be, as shown in Figure 4.7.

DEGREE OF INTENSITY

The intensity of aesthetic management techniques must vary according to need. Cookbook solutions are not possible (or desirable). Each given situation must be analyzed with respect to:

- Degree of aesthetic sensitivity.
- Silvicultural attributes of the timber type in question:
    - Type of harvest needed -- clearcut vs. selective cut.
    - Length of regeneration period.
    - Need for post-sale work.
- Long-term goals, in terms of both aesthetics and timber management:
    - Is present age distribution acceptable?
    - Is present stand size desirable?
    - Will aesthetic sensitivity increase or decrease in the future?

The silvicultural and aesthetic management aspects of the design must be biologically sound and harmonize. The object is to reduce future aesthetic and silvicultural problems. Short-term, easy solutions often perpetuate existing problems into future rotations. See Figures 4.8 through 4.12.

BOUNDARY LAYOUTS

After the aesthetic management needs of a given area are determined, it becomes the task of the forest manager to design a sale boundary that will meet those goals both effectively and efficiently.

At this time, any favorable stand elements (understories, long-lived species, age diversity, topography, etc.) should be identified and incorporated into the boundary layout. It is critical that this be done in the field on the site in question. Many favorable elements do not show up on aerial photos; fewer still appear on timber type maps. Roadsides should be walked over and detailed notes made on the timber type map. When this data has been collected, boundary layout can begin.

Two general approaches to boundary establishment are suggested, depending on the type of management anticipated in the visual enhancement area.

A. Partial Cuts

In these situations, the visual objectives will be met by retention of a portion of the existing stand. The object is to accurately locate that exact area in the critical viewing zone and delineate it for "special treatment". This approach is generally used in linear situations (roadsides, lake and stream buffers, etc.).

To implement this method, two people work together. One person marks in the line, while the other paces him or her with the vehicle. The marker moves into the forest until he/she achieves the desired level of visual screening between marker and vehicle, moving further back in sparse timber and open areas, and moving closer when encountering dense timber and favorable topography.

In cases where a high degree of year-round screening is needed and the boundary is being established in the summer, a second marker may be used. The second marker moves back further in the stand, guiding the first marker, to allow for the decreased screening value after leaf fall. This technique is also useful if substantial removal of selected trees is planned within the strip as part of the sale design.

This approach is also useful for defining areas needing special slash disposal restrictions, and special cutting or skidding specifications.

B. Clearcuts

A clearcut is the removal in one operation of essentially all the trees in a stand. Even-aged regeneration methods that result in clearcuts are: clearcut, coppice, seed tree, overstory removal, and shelterwood (final cut). Reserve trees and islands can be retained to improved aesthetic conditions. A number of factors contribute to decisions on the size and configuration of clearcuts (e.g. access, stand size and shape, wildlife considerations, etc.). As a general guideline for aesthetics, even-aged clearcut patches should not average in excess of 120 acres, unless warranted for forest health emergencies, natural catastrophes, or conservation objectives. This should be considered an annual average for a specific property. Also, regeneration in clearcut areas should consist of trees at least 3 years old or 5 feet tall at the desired level of stocking before adjacent areas are clearcut, except when warranted to achieve conservation objectives.

In these situations, since there is no residual timber, sale shape is the primary method of meeting visual objectives. This approach is applicable on both a linear and area basis. Visual enhancement areas required in these situations are too complex to "ad lib" directly in the field. Instead, they must be carefully laid out on an aerial photograph, after all favorable elements have been identified in a field exam.

A square chainage grid can then be laid over the photo to assist in field installation, as shown in Figure 4.13. The field work is best done in teams, with the lead person establishing reference points for the following marker. The lead person follows cardinal directions on the grid and stops at points where it is intersected by the planned sale boundary. The leader then signals the marker who paints toward the lead person, deviating off course as the planned boundary dictates. Larger, more generally undulating boundaries can be traversed in short segments. In any case, some sort of control is necessary for accurate line location as well as acreage determination for volume calculations.

Sale shape and scale are largely determined by:

- Existing form and scale found in timber types naturally occurring near the sale area.
- The size and shape of the stand being treated.
- Naturally occurring favorable stand elements.

See Figures 4.14 and 4.15 for examples of sale shape and scale determinations.

The use of paint in marking sale boundaries in sensitive areas must be done carefully. On the one hand, it is important that loggers be able to follow complicated sale boundaries without difficulty. On the other hand, paint marks should not be visible after the cutting is finished.

Several alternatives are possible:

- Use green paint.
- Mark on the back sides of trees (may be hard to follow on complicated boundaries).

- Mark trees normally (coming and going) plus a stump mark. Line trees are then harvested.

- Mark trees with flagging plus a painted stump mark. Flagging is then removed after cutting is completed.

ROAD LAYOUT

Road layout should meet aesthetic needs as well as timber management requirements.

As far as possible, road systems should:

- Reduce the need for an excessive number of exits onto sensitive roadways.

- Facilitate later management of deferred harvest zones.

- Be compatible with post-sale treatment plans (firebreak needs, shearing boundaries, etc.).

Road entrances should be laid out so as to provide a straight-on exit for logging trucks, while still reducing visual penetration as much as possible, as shown in Figure 4.16.

Entrances should be cleaned of debris, stumps, and logging slash concurrent with construction.

FIRE MANAGEMENT CONSIDERATIONS

Fire management, both with respect to slash disposal and wildfire control, is an important element of aesthetic management. This is especially true in coniferous timber types.

Prescribed fire can be a very effective method of post-sale slash reduction. Unfortunately, many of the measures taken to reduce the visual impact of a harvest may make burning more difficult. Irregular shapes, scattered residual trees or clumps of trees in the sale area, and adjacent uncut timber will complicate matters. Advance planning is essential.

- Logging road locations should be designated so as to maximize their value as fire breaks. Water points should be developed in high hazard areas. Timber sale contract provisions should ensure that slash is not allowed within the tree line of adjacent stands.

- Slash pile size should be controlled. Large piles are difficult to burn safely and completely.

- Consideration should be given to requiring windrowing of tops, either by the operator, or by post-sale brush raking. Broadcast slash often requires dead vegetation to carry the fire. This means spring or fall burning, when fire control equipment may be tied up. Windrows can be burned in midsummer, when equipment is usually available. The green ground vegetation also reduces control efforts and manpower needs.

- Scattered residual conifers should be avoided if possible. If not, slash should be pulled away from the base of the trees and the lower branches pruned off to avoid scorching or crowning out.

- Slash depths in excess of two feet may make direct attack impossible. Extra pre-burn slash control work may be necessary along control lines.

Visual enhancement areas, created to minimize visual impact, will also affect wildfire control efforts. This impact may be positive or negative, depending on the location of the VEA and the timber type involved.

In heavy conifer areas, a VEA immediately adjacent to a road may act as a "wick" to move the fire up off the ground, into the crowns, and over the heads of fire control personnel. The value of a road as a fire break may be completely negated by poor planning. Location of VEA's in conifer areas should be thoroughly reviewed by the fire management staff.

In hardwood areas, a visual enhancement area may have the opposite effect. By providing slash-free "corridors" for fire line construction, they may aid control efforts considerably. Again, fire management personnel should be consulted in sale design so as to ensure maximum value in wildfire control efforts.

The retention of hardwood clumps in areas being converted to conifers should be considered in light of fire control needs as well as the reduction of visual impact. Such hardwood areas can often be laid out so as to form a more or less permanent fuel break. These breaks can be used to great advantage in fire control efforts. They also have a considerable value in terms of visual and wildlife resources.

Figure 4.1 Impact of timber type on visual penetration.

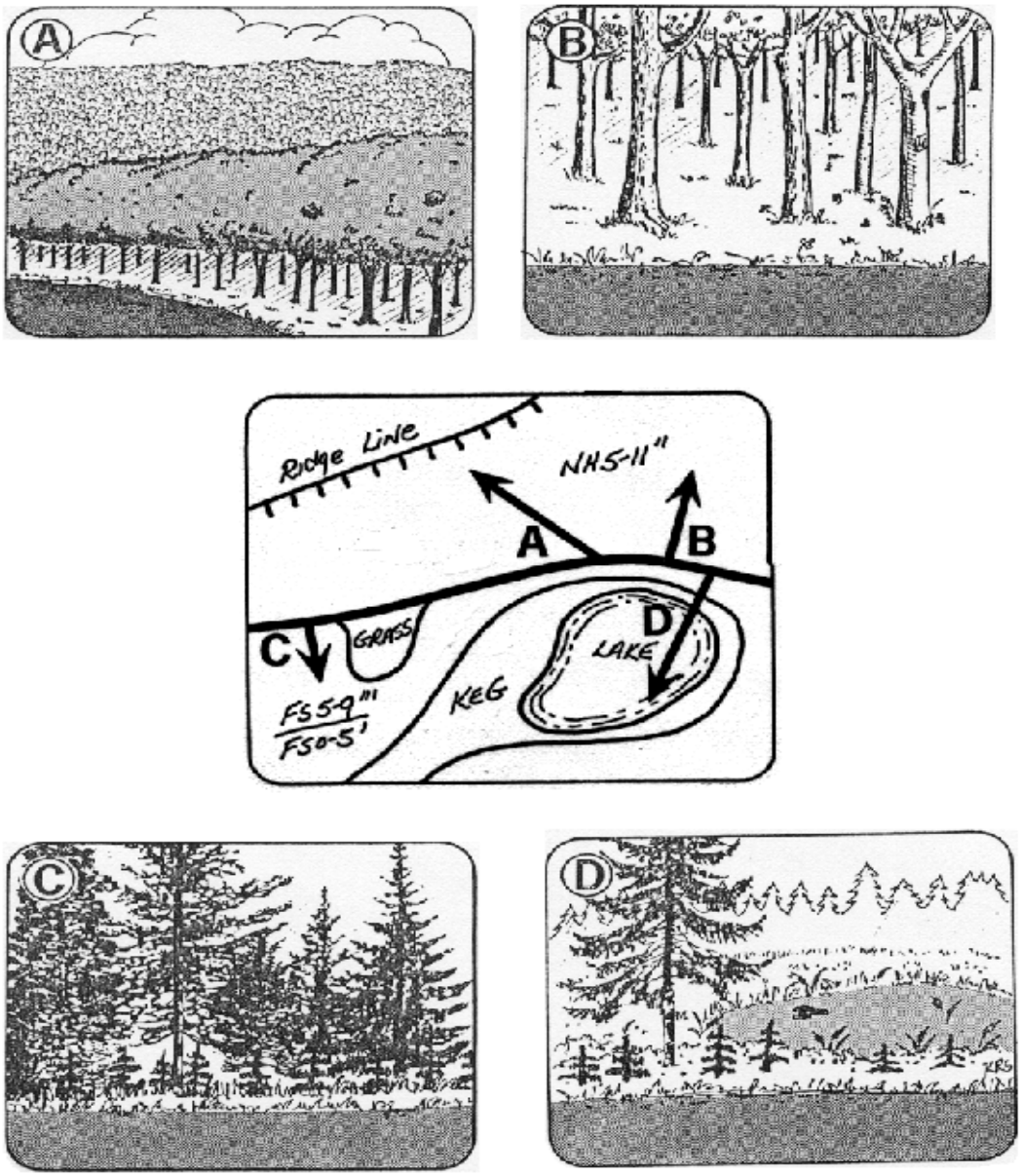
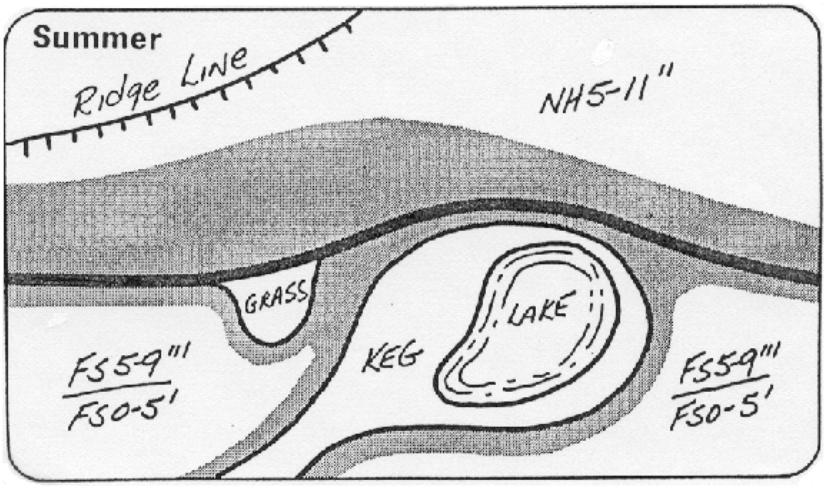
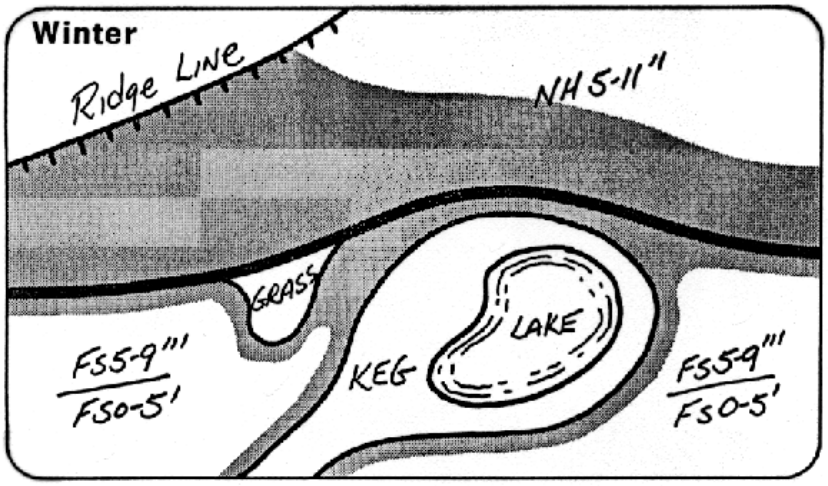


Figure 4.2 Allowing for variations in visual penetration.



Areas of equal visual penetration. Note the influence of timber type, topography, land features, and season. It is essential that the forest manager include these considerations in the sale design in order to minimize costs and maximize effectiveness.



Areas of equal visual penetration. Note the influence of timber type, topography, land features, and season. It is essential that the forest manager include these considerations in the sale design in order to minimize costs and maximize effectiveness.

Figure 4.3 Visual penetration -- a roadside visual enhancement area designed to reduce visual penetration by sale shape rather than by vegetative screening.

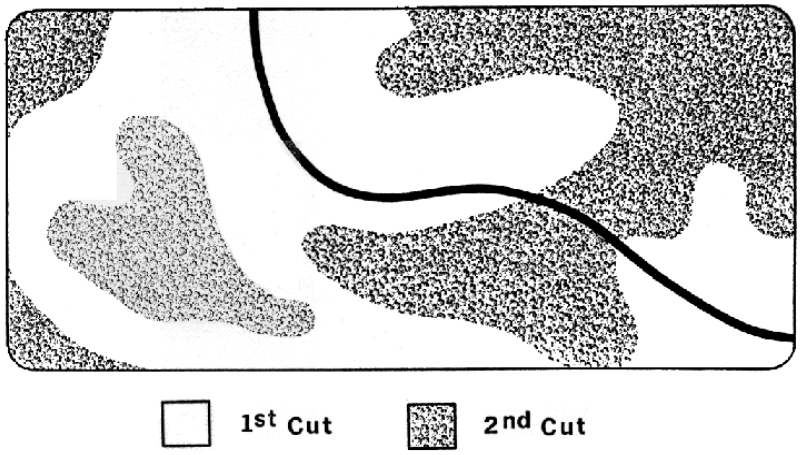
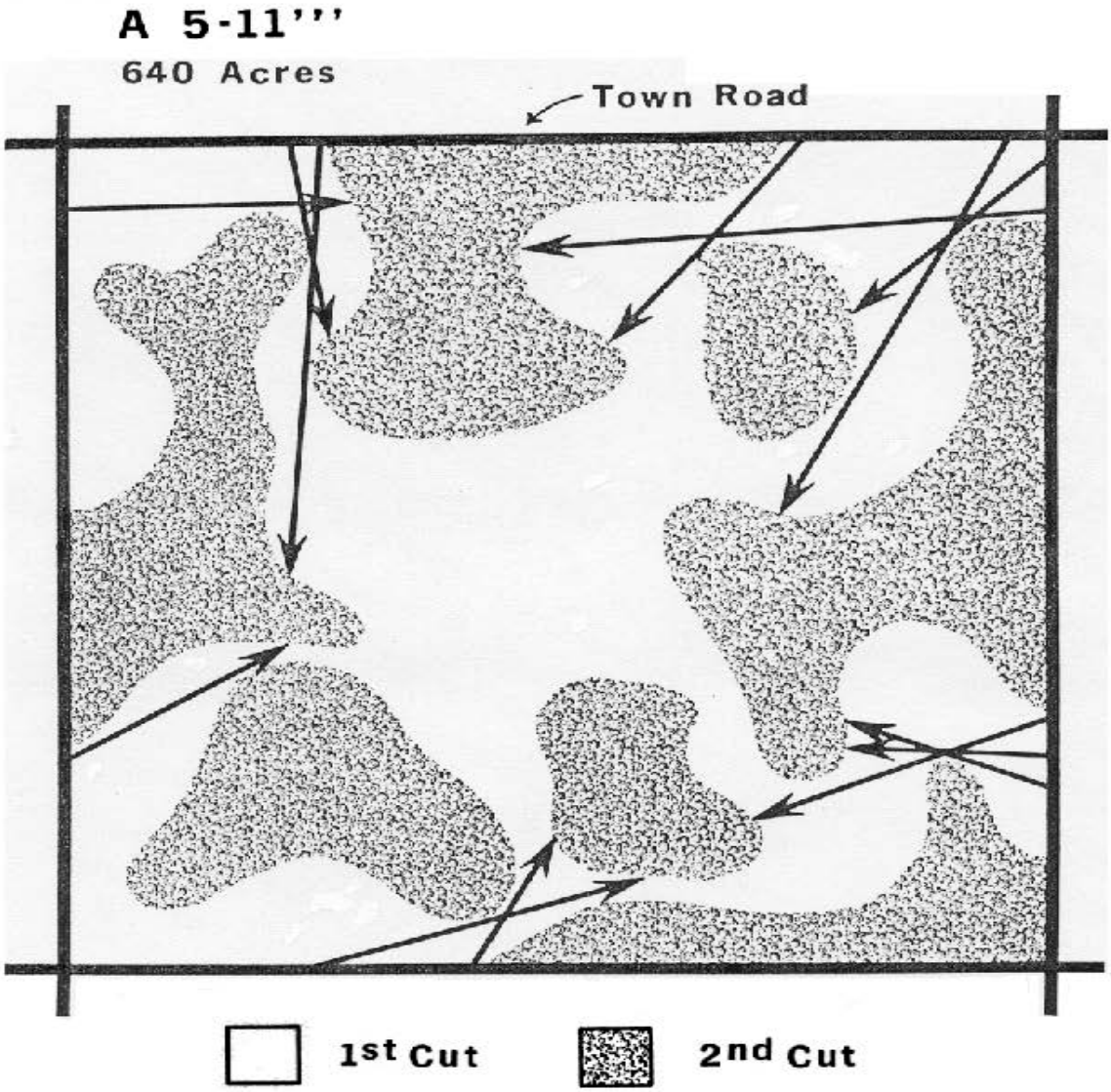
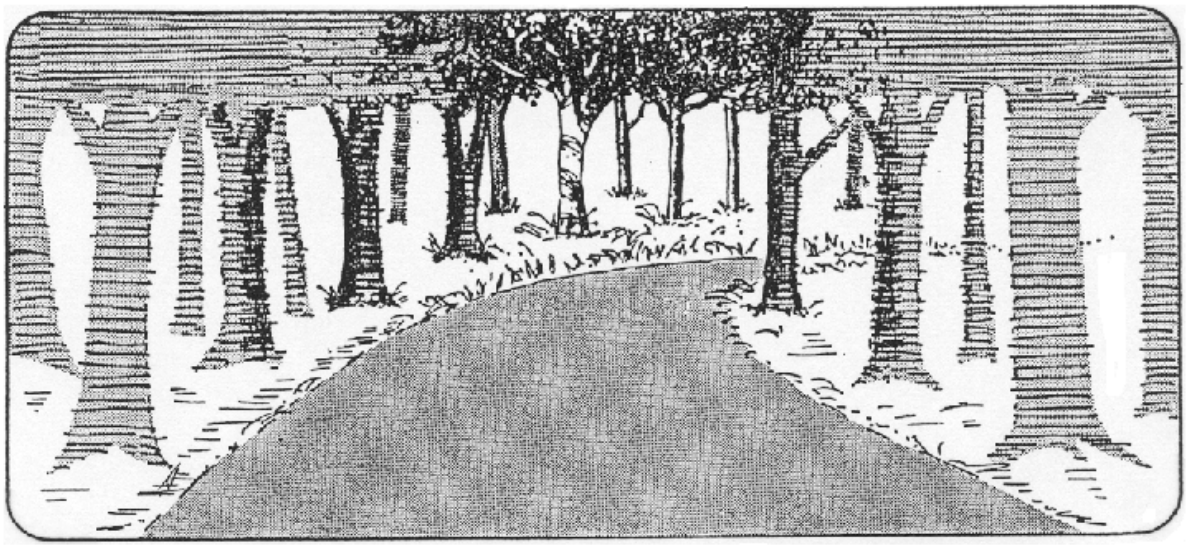


Figure 4.4 Visual penetration and shape of cutting units.



Visual penetration (line of site) has been reduced by the shape of the cutting units. Note that the longest sight distances occur for the shortest duration.

Figure 4.5 Viewing intensity and duration.



As a vehicle travels down a road, the driver tends to view objects off the end of a curve longer, and with greater intensity, than objects directly to the side.

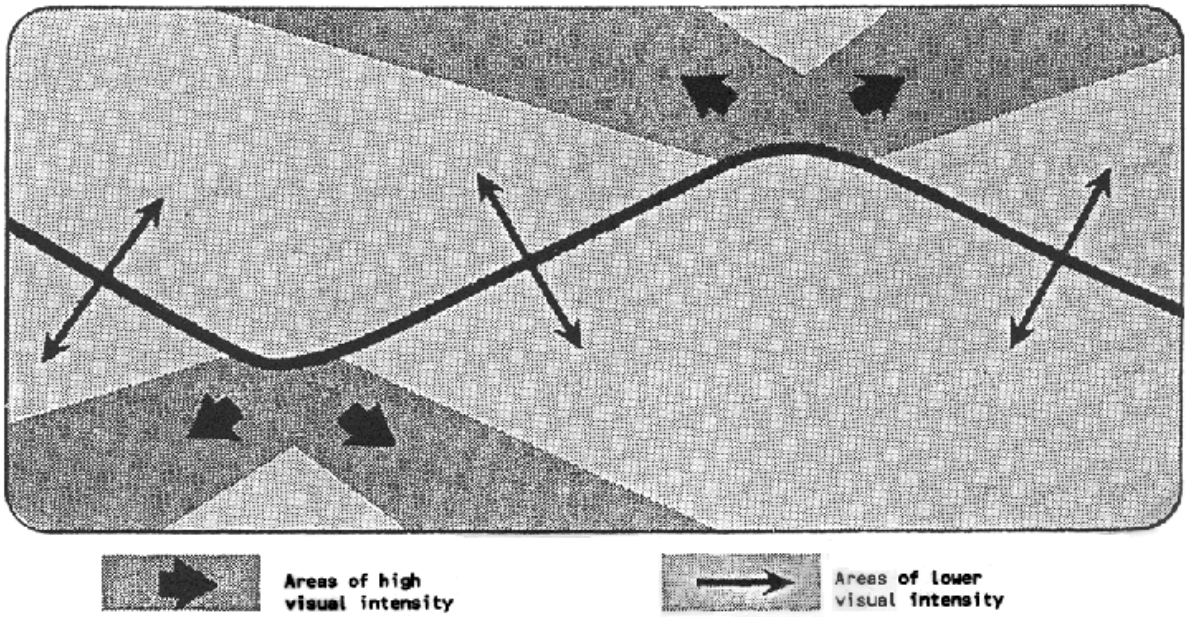
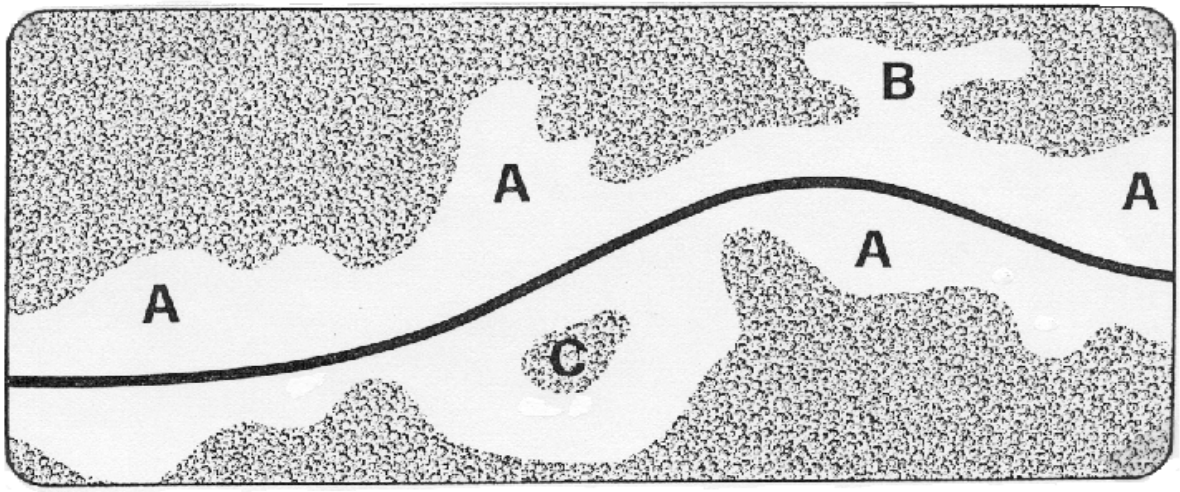
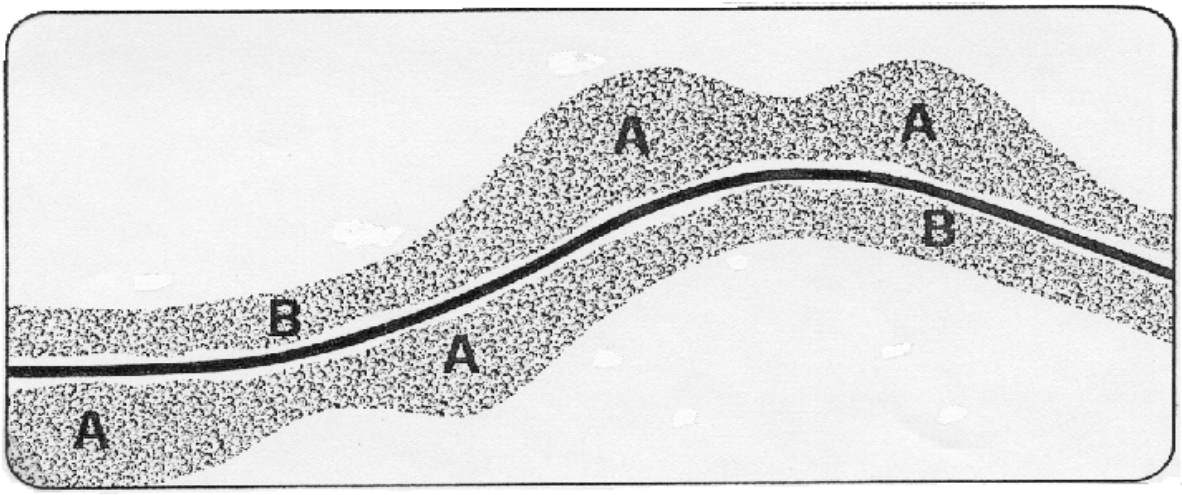


Figure 4.6a Sale design -- cut strips.



In laying out a scalloped cutting boundary, the widest portions are laid out on the straighter sections of the road, (A), or the dead spots on the curves, (B). An island was left at (C) to screen a wider area on a curve.

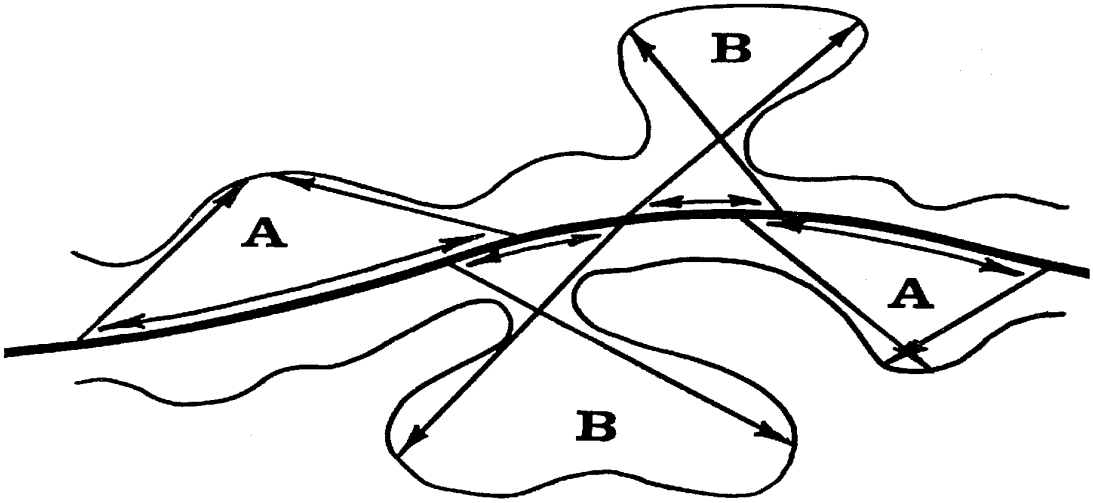
Figure 82.6b Sale design -- leave strips.



When leaving uncut strips along roads, additional width is needed in areas receiving the longest, most direct viewing, (A), with less width needed in other areas, (B), to do the same job.

In laying out a scalloped cutting boundary, the widest portions are laid out on the straighter sections of the road, (A), or the dead spots on the curves, (B). An island was left at (C) to screen a wider area on a curve.

Figure 4.7 Relationship between viewing intensity and visual penetration.

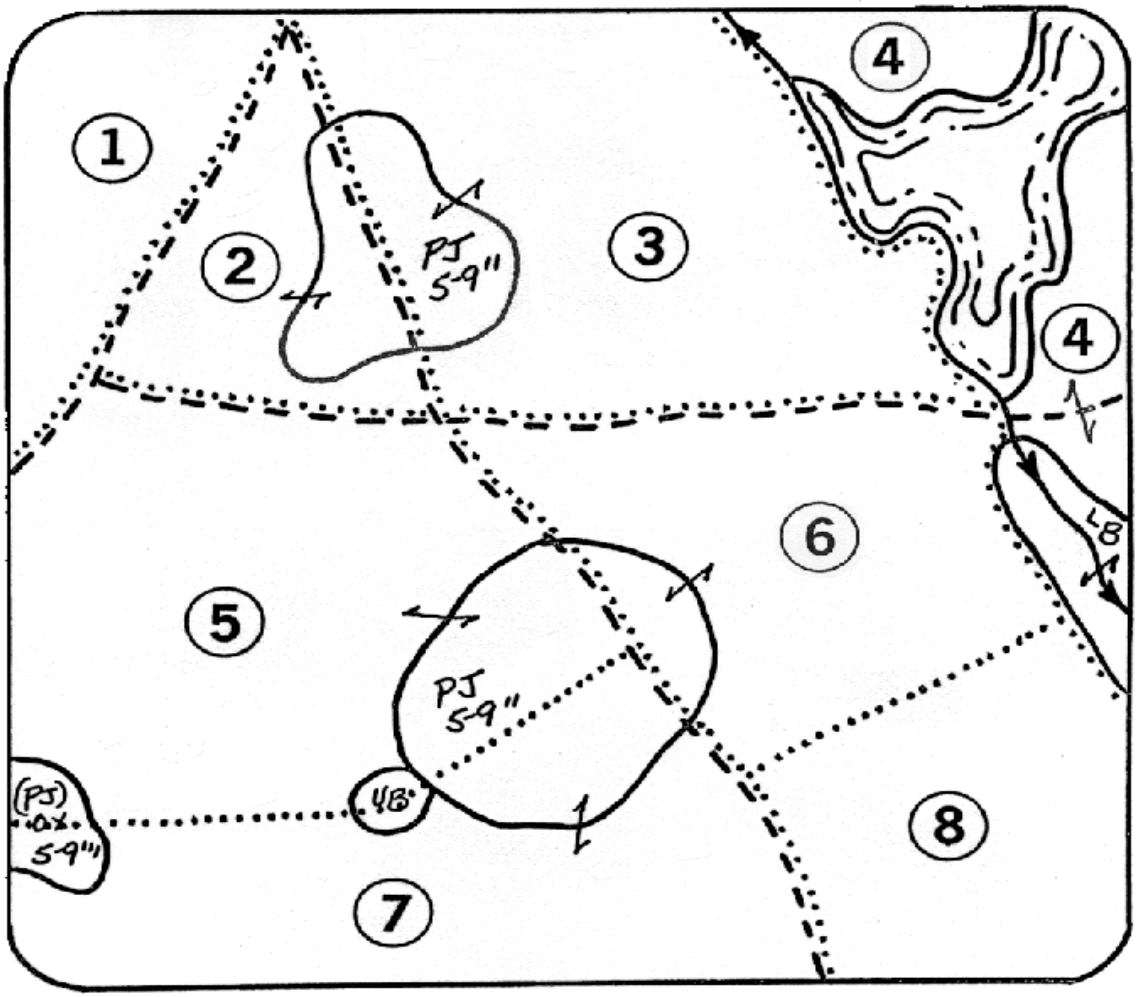


In areas "A" the visual penetration is less, but the viewing duration is longer.

In areas "B" the visual penetration is greater, but the viewing duration is less.

The visual impact of both areas would be approximately the same.

Figure 4.8 Level of intensity -- low level aesthetic sensitivity.



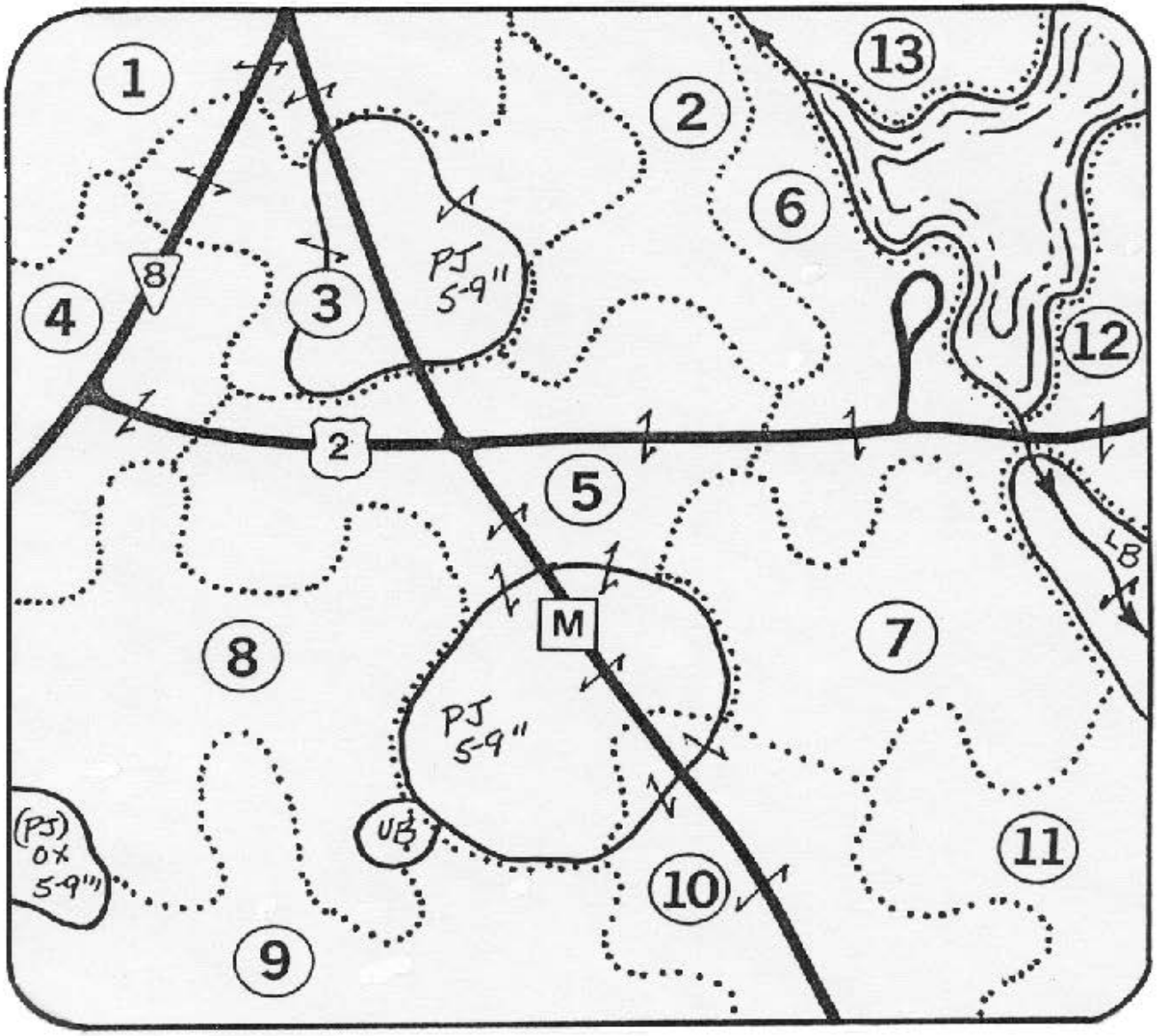
Low level of aesthetic sensitivity:

Fewer blocks.

Larger blocks.

Straighter boundaries.

Figure 4.9 Level of intensity -- higher degree of aesthetic sensitivity.



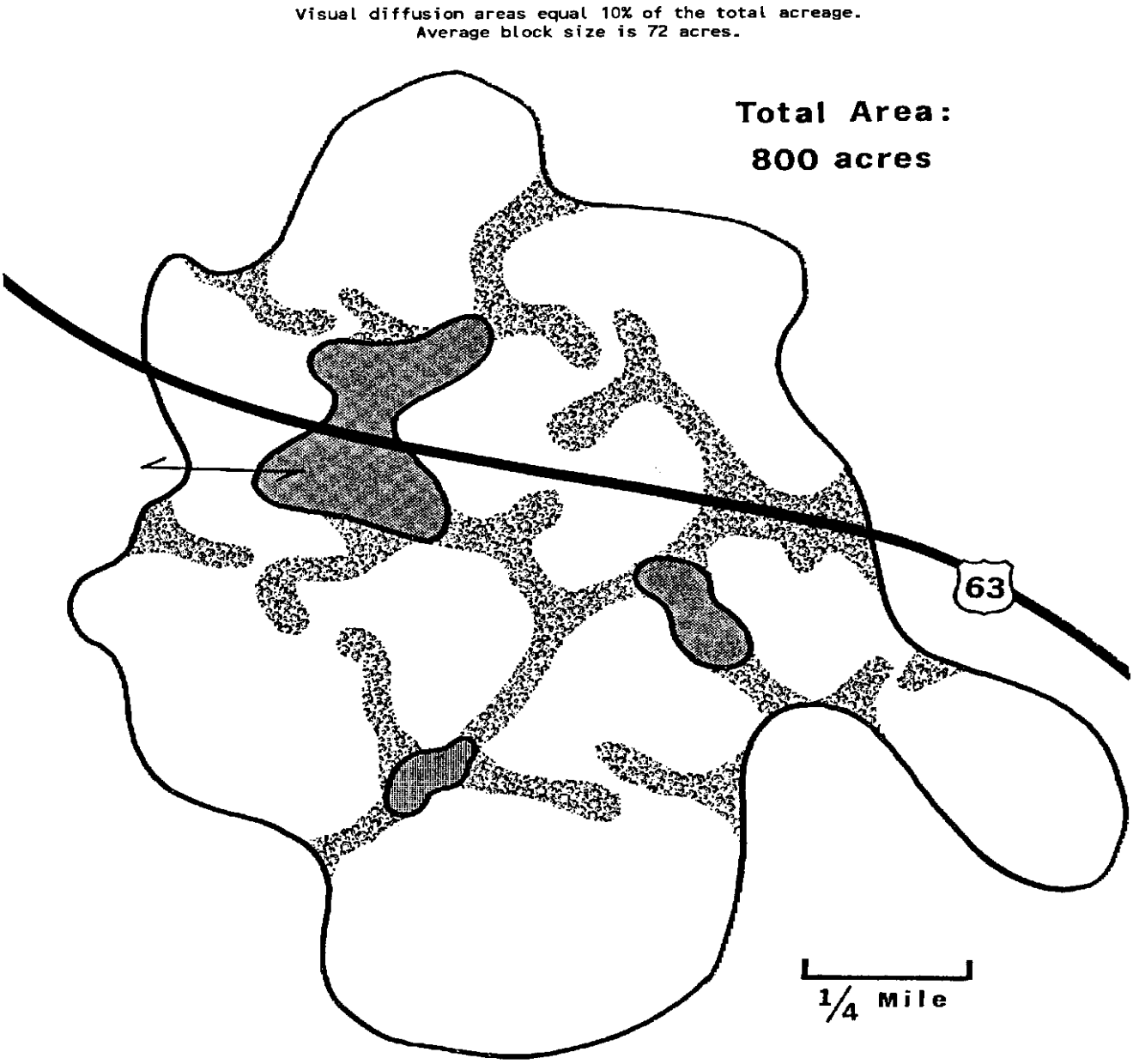
Higher level of aesthetic sensitivity:

More blocks.

Smaller blocks.

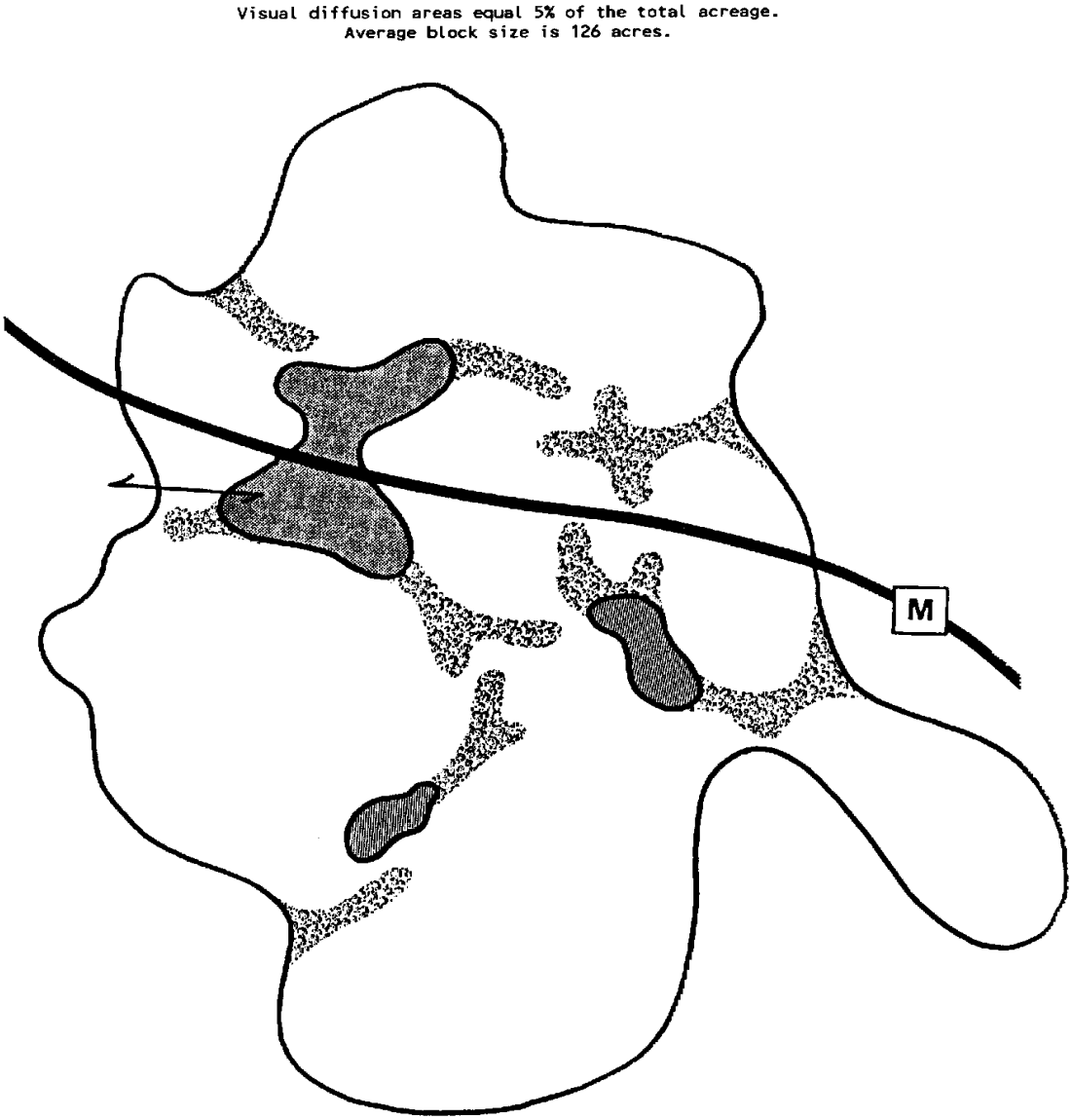
More undulating boundaries.

Figure 4.10 Level of intensity -- example of smaller block size.



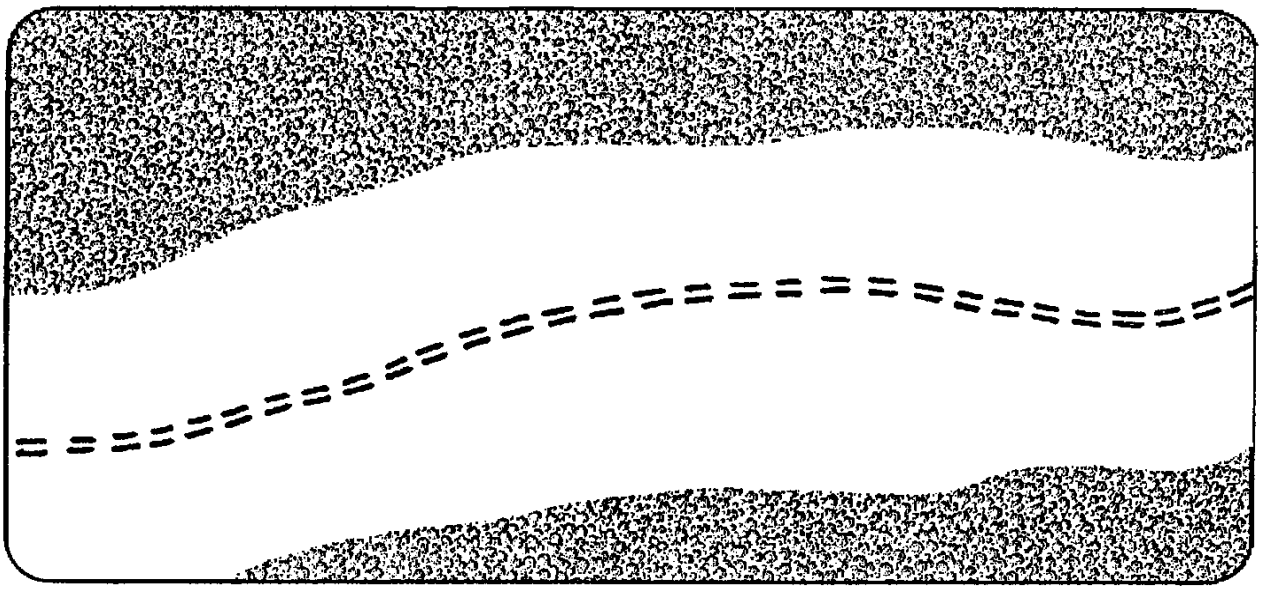
Depending on the need, the acreage devoted to a visual diffusion area can be varied.

Figure 4.11 Level of intensity -- example of larger block size.

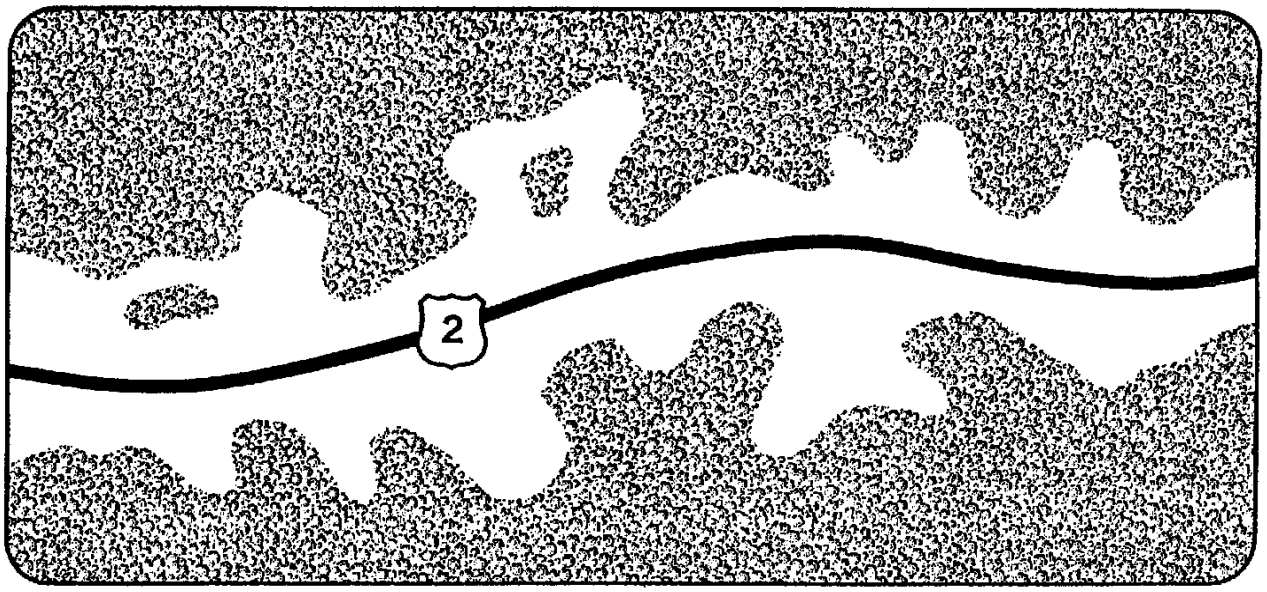


Less aesthetic sensitivity -- fewer corridors.

Figure 4.12 Pre-cut visual enhancement areas -- immature timber.



Lower aesthetic sensitivity.
Shorter regeneration period.
Less intensive.



Higher aesthetic sensitivity.
Longer regeneration period.
More intensive.

Figure 4.13 Boundary location techniques.

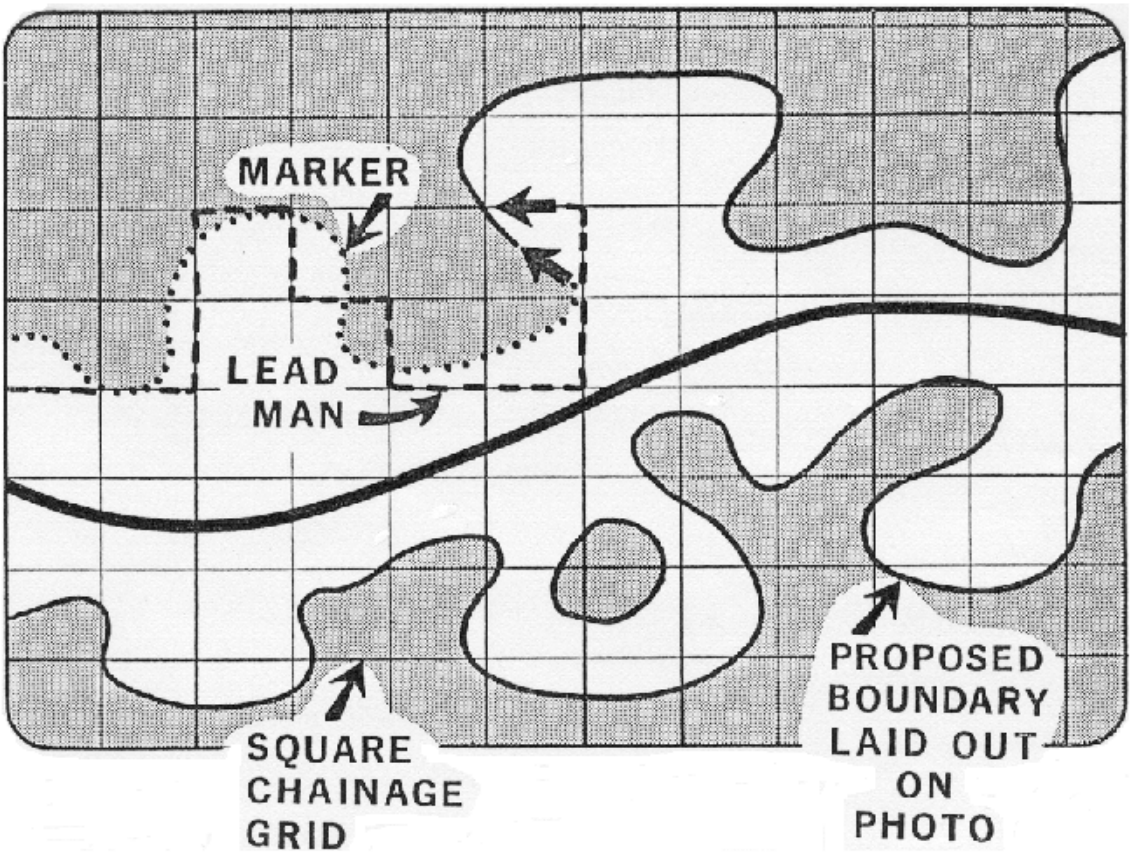
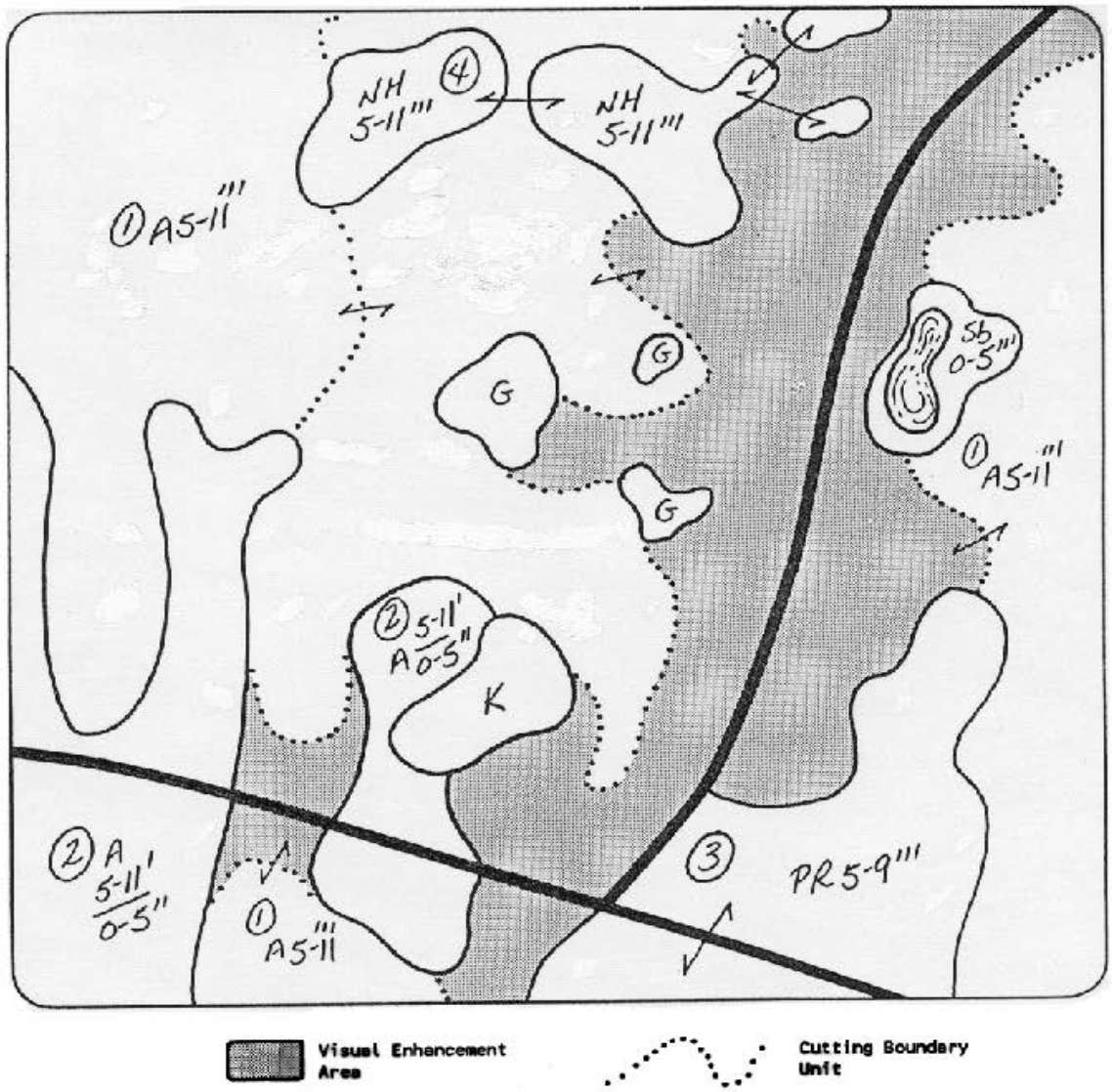
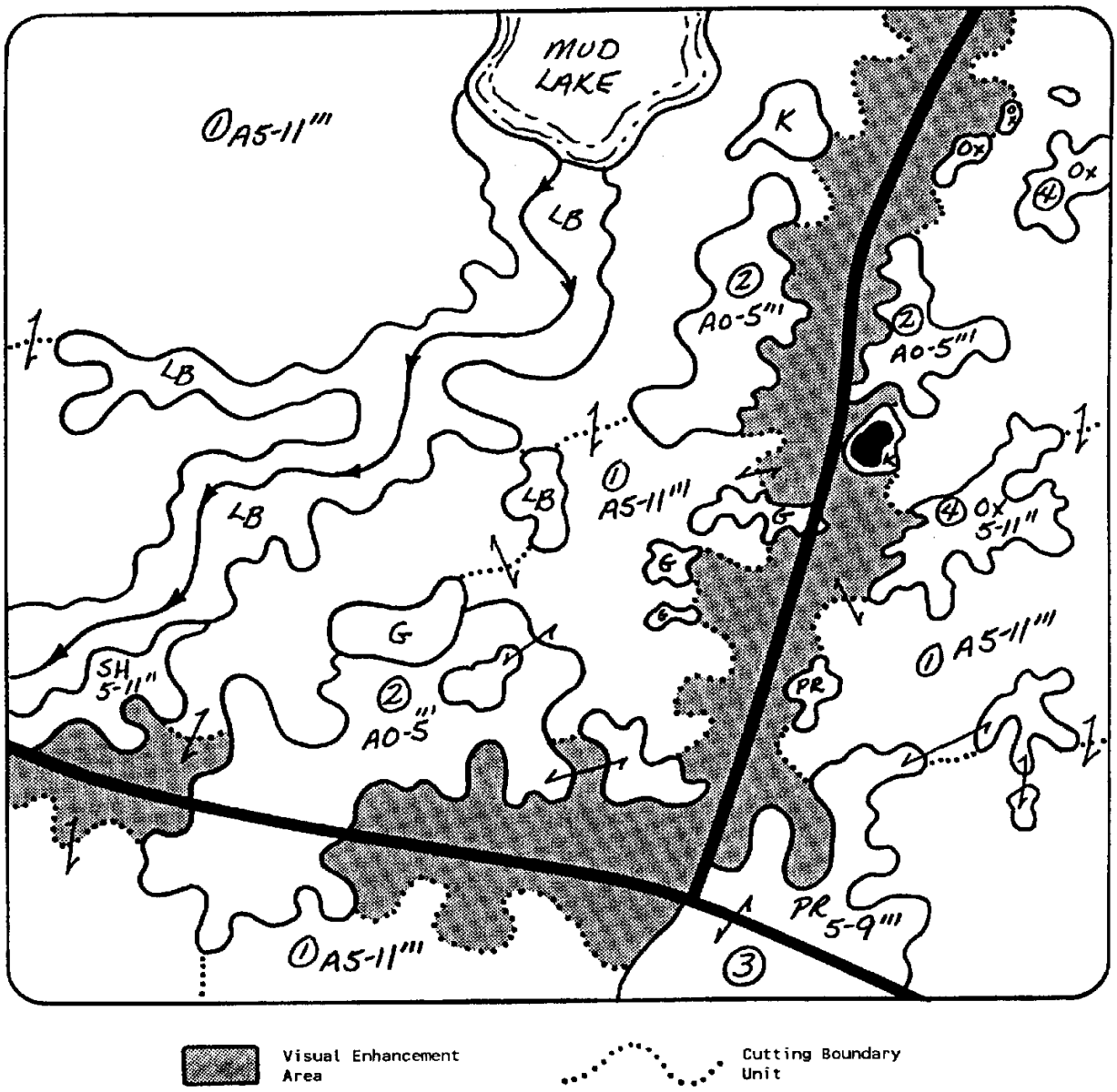


Figure 4.14a Determination of sale shape and scale.



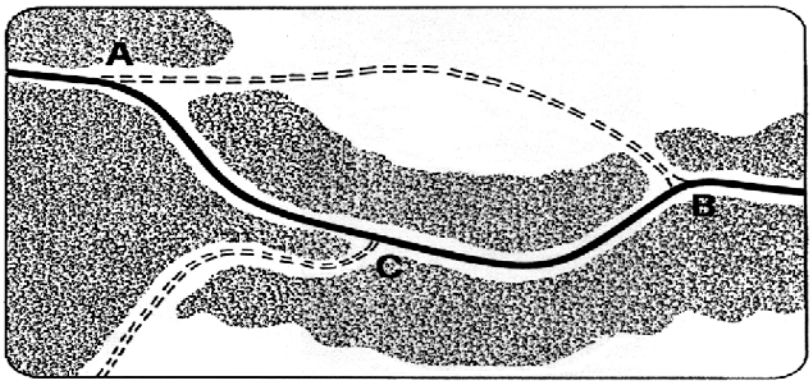
In this example, form and scale were derived from the general shape and scale of stands 2, 3, and 4. Long-lived stands, 3 and 4, were incorporated into the sale design. Where possible, the keg, grass, and swamp types, as well as sapling stand 2, were incorporated into the sale design as well. The boundary between these stands and stand 1 are naturally "feathered" and present a much more natural appearance.

Figure 4.14b Determination of sale shape and scale.



This figure illustrates a situation similar to that in Figure 4.14a, but with a different general form and scale. Each visual enhancement area must be designed to harmonize with specific local circumstances.

Figure 4.15 Logging road considerations.



The logging road entrances at "A" and "B" permit visual penetration directly into the sale area. They also present a safety hazard by joining the main road on curves. The road entrance at "C" restricts the line of sight yet meets the main road at a 90-degree angle in a safe area.

CHAPTER 5

ENHANCEMENT

Most aesthetic management activities are designed to reduce the adverse impact of some timber management project. In some situations, however, management actions can actually enhance the existing level of forest aesthetics.

While it is important that such opportunities not be overlooked, it is equally important that the forest manager limit these activities to areas of actual need. Personal bias should not be satisfied at taxpayer expense.

REDUCTION OF TUNNEL EFFECT

In many heavily forested areas, a continuous tunnel-like condition can be created along roadways. Natural species and size diversity within most stands results in an attractive visual scene. In some cases, however, large single-species monotypes exist, particularly in jack pine areas and where large blocks of red pine have been established. These areas have very little species and size diversity and can become very monotonous. See Figures 5.1 and 5.2.

REDUCTION OF "FIBER FACTORY" EFFECT

Many times plantation rows are oriented perpendicular to the roadway, resulting in an artificial "fiber factory" appearance. This effect is often intensified by row thinning.

As shown in Figure 5.3, by selectively harvesting a strip along the road, the artificial appearance of a plantation can be reduced. Often this can be done in conjunction with a row thinning of the main stand.

In order to avoid creating additional problems of this kind in the future, integrated resource management is paramount in plantation design. One must keep in mind many of the concepts expressed in this chapter and consider the proposed plantation's effect on wildlife habitat, aesthetics, insect and disease problems, etc., and design accordingly.

- Use terrain opportunities to create a more natural appearance. Plant on the contour when appropriate.
- Avoid planting rows perpendicular to roads. Reduction of "fiber factory" appearance occurs when rows are parallel to roads or contoured.
- Frost pockets, odd corners, and other site conditions not readily suitable for forest cover should be left unplanted to improve game habitat, variety, vistas, etc.
- Larger plantations creatively laid out and planted over a period of years will have a more natural appearance and cultural activities will have less impact on the aesthetics due to stand layout and age distribution. Planting over a period of years will also reduce the risk of failure due to weather.

VISTAS

Opportunities to add attractive openings along a roadway, as shown in Figure 5.4, should be considered where opportunities exist, especially in heavily forested areas.

Existing aesthetics can often be improved by opening up small kegs, lakes, rock outcrops, etc., to form small vistas.

Often these projects can be completed in conjunction with normal sale activity with minimal additional effort.

When opening up vistas on large rivers and lakes, caution must be exercised to protect the visual impact for viewers looking back from the water. In such cases, brushing or thinning should be considered.

INCREASING DIVERSITY

For years we have heard that "variety is the spice of life". One of the attributes of the forest that results in its overall aesthetic value is its infinite diversity.

Management activities should, at the very least, maintain the existing level of diversity. Moreover, they should enhance it where feasible. All potential sources of diversity should be considered:

- **Physical diversity.** Timber management work can make any present non-vegetative components (rock outcrops, lakes, small potholes, etc.) a part of the forest scene.

- **Ecotype diversity.** Non-timbered vegetative communities (grass openings, bogs, flowering shrubs, etc.) can also be highlighted by a judicious timber harvest.

- **Timber diversity.**

  - *Type diversity*. Management should reflect the natural scene. All aspen stands along roadsides should not be converted to northern hardwoods, for example.

  - *Species diversity*. Avoid reduction in species diversity, especially in visual enhancement areas (VEA's). Use species designation as a removal tool cautiously. Mark where possible. Where management prescriptions call for a clearcut for regeneration purposes, consider leaving clumps of residual non-objective species (oak clumps, sentinel white pines, etc.). This is illustrated in Figure 5.5.

  - *Form and size diversity*. The tendency to favor well-formed trees of a similar target diameter should be avoided in visual enhancement areas. Cull, and other deformed trees add variety to the stand. Small diameter, understory trees as well as large scattered "wolf" trees may not contribute positively to desired stand structure, but do add diversity in terms of size and scale, thus presenting a more natural scene.

Because of the vastly different objectives and criteria used in tree selection, basal area determination, and understory treatment, it is suggested that VEA's be marked separately and not in conjunction with the main sale area. It is very difficult to shift back and forth between different marking criteria time after time, as one continues to leave and reenter the visual enhancement area, as shown in Figure 5.6.

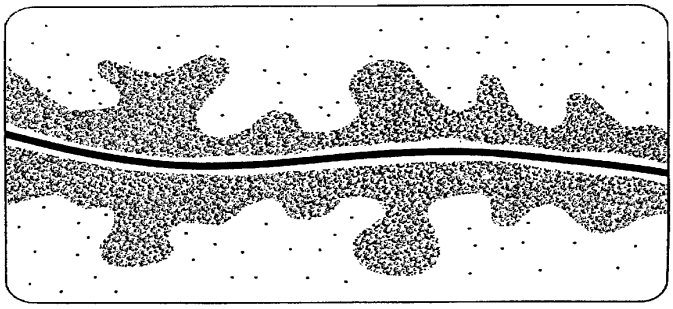
PLANTING

The introduction of a species native to the area, but uncommon in a particular location, may be very effective in a given situation. This may be accomplished as part of a site conversion activity or on a smaller scale to enhance diversity.

The introduction of even one or two pine or spruce trees can greatly enhance the appearance of a campground in a scrub oak monotype. The introduction of a few oak or maple would likely do the same in a campground situated in a red pine or jack pine monotype.

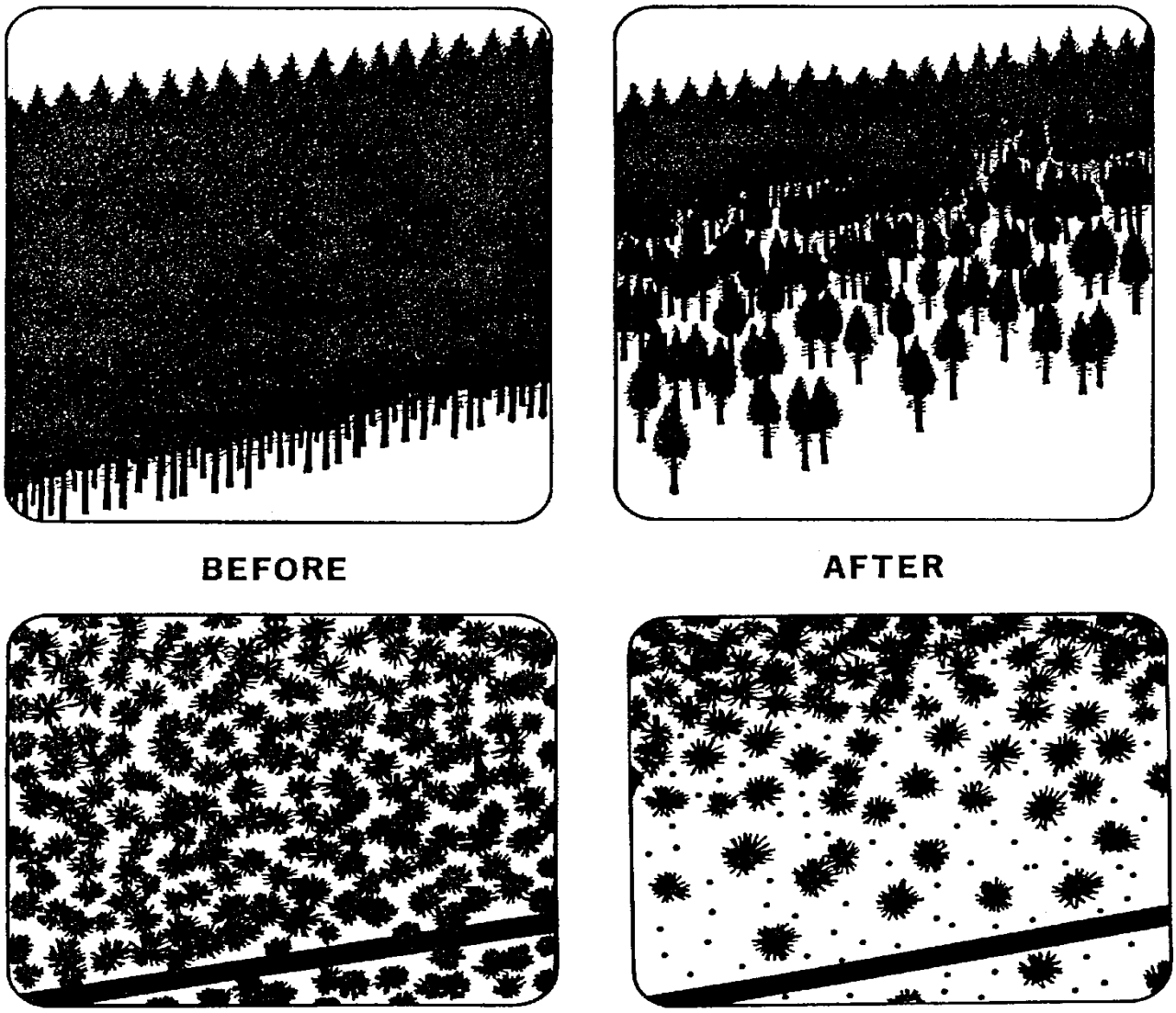
For maximum effectiveness, try to establish as large a tree as possible, using a tree spade or other transplanting device. Planting to increase diversity is very expensive, however, and should be done with careful thought.

Figure 5.1 Reduction of the "tunnel effect".



In this example, a visual enhancement area has been created in an immature stand. The cut area is set back from the road and regenerated with a long-lived species like red pine. When the area is established, the residual strip along the road is cut and managed as an opening. This approach can be used in very sensitive areas where a long-term solution is needed.

Figure 5.2 Reduction of "tunnel appearance".



In order to reduce the "tunnel appearance" of some pine stands, the basal area can be gradually reduced as you approach the road. This will give the stand a "feathered" appearance. The visual penetration will be increased and the "closed-in" feeling will be reduced. The area can then be managed as is to accelerate diameter growth for "big tree management" (e.g., red pine) or underplanted (e.g., jack pine).

Figure 5.3 Reducing the "fiber factory" appearance.

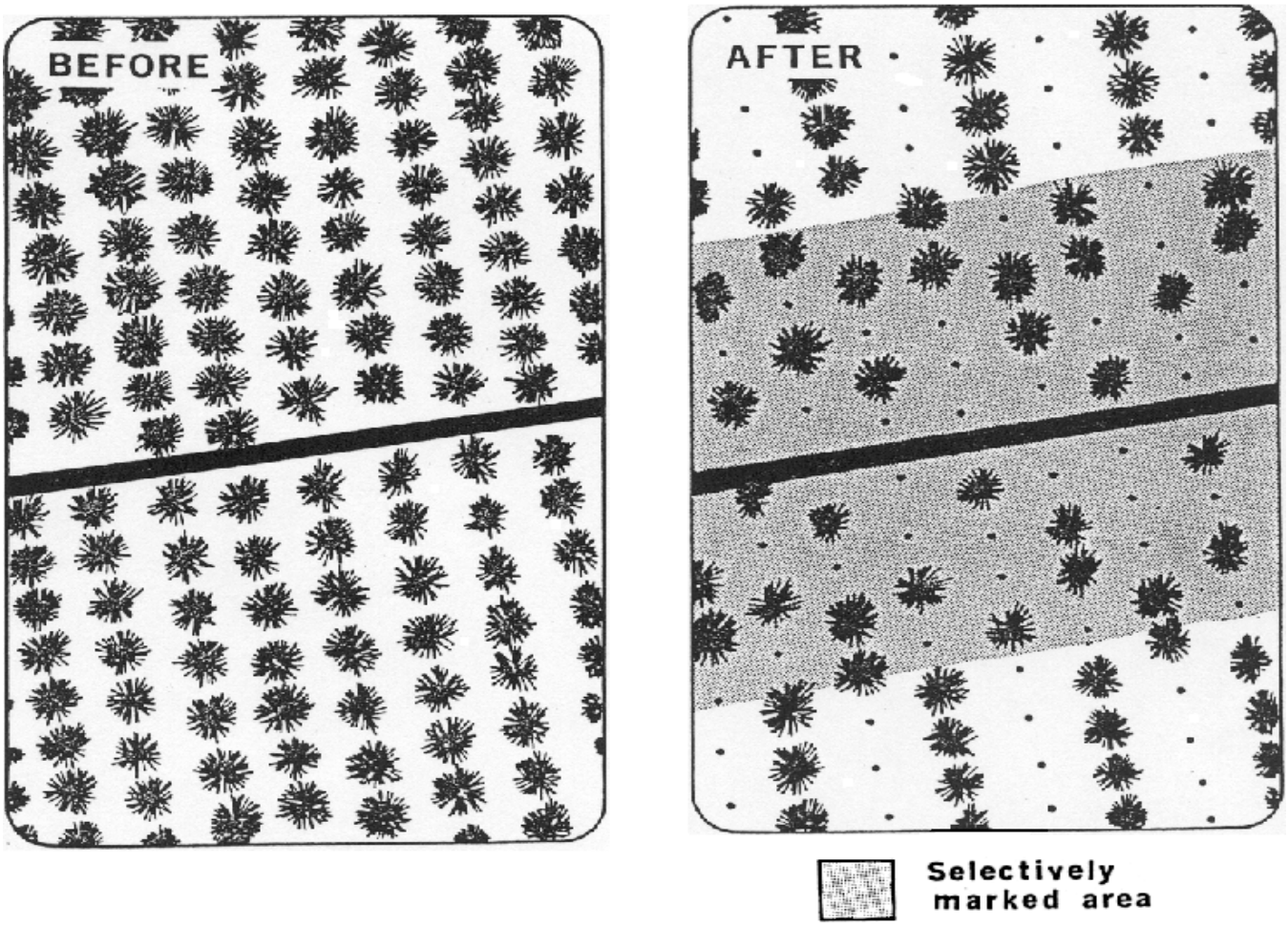


Figure 5.4 Vista creation.

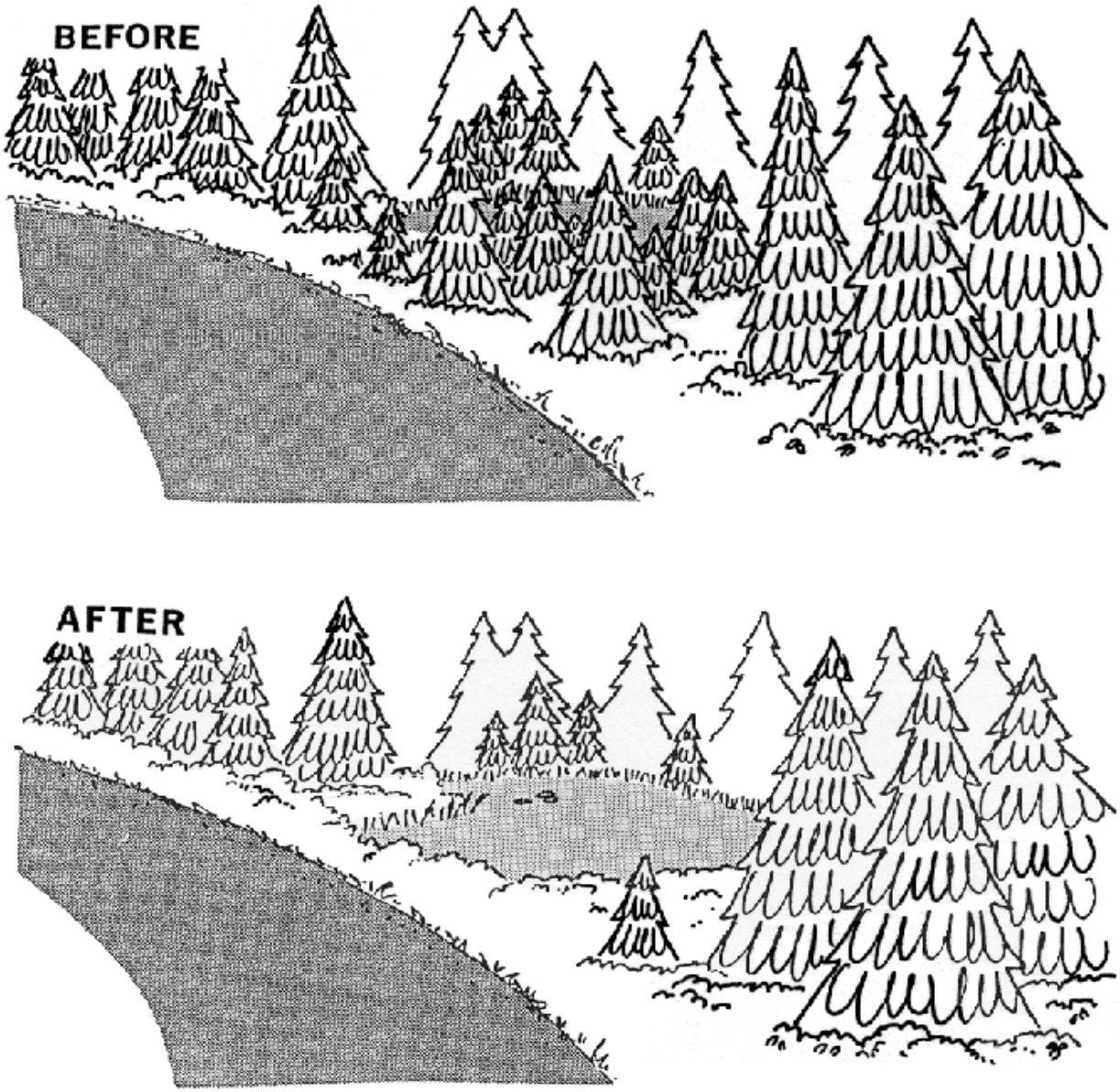
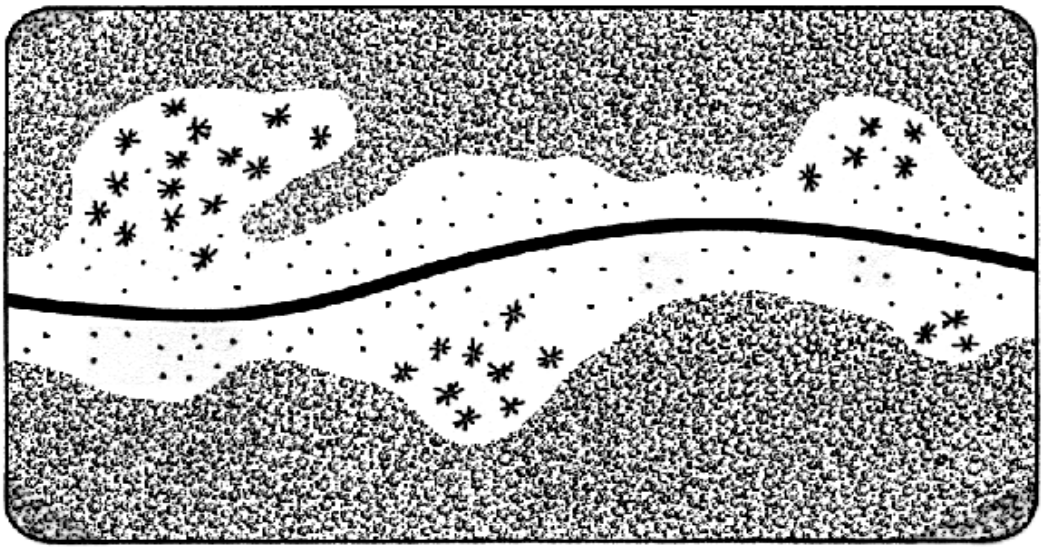
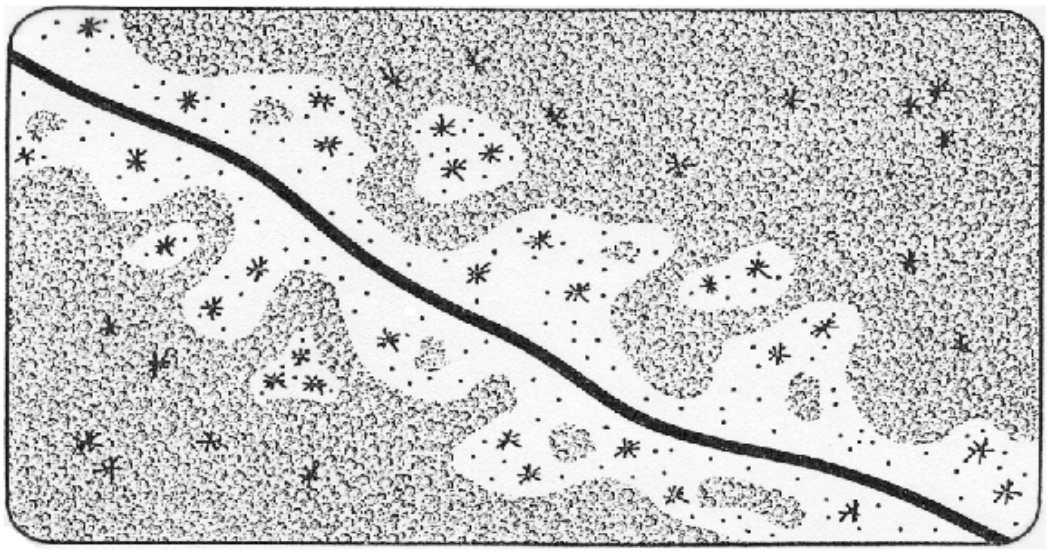


Figure 5.5 Enhancing diversity through marking.

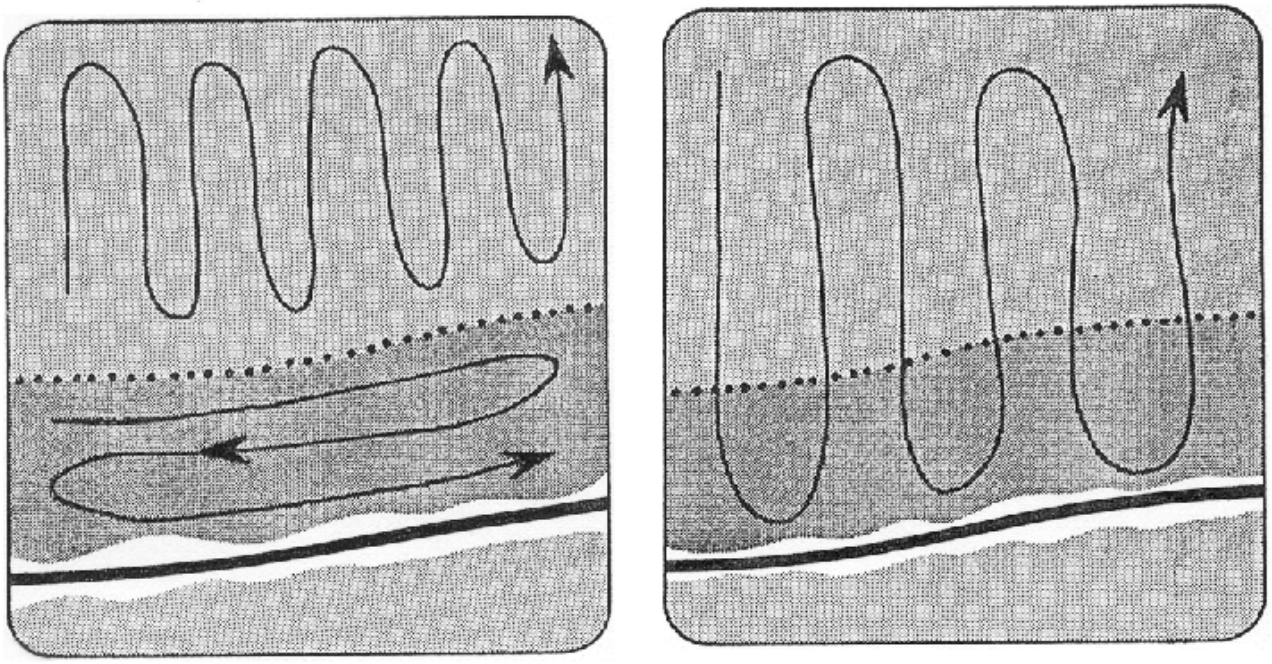


Species diversity can be increased through judicious marking. Above, clumps of long-lived species were retained. Below, individual trees were retained. Both techniques will enhance roadside aesthetics by increasing diversity.



Species diversity can be increased through judicious marking. Above, clumps of long-lived species were retained. Below,

Figure 5.6 Marking techniques.



To avoid problems with constantly changing marking criteria, mark visual enhancement areas separately...

not as part of the same stand.

CHAPTER 6

SALE PLANNING AND ADMINISTRATION

PRE-SALE PLANNING

In addition to ongoing aesthetic management planning on a property basis, a great deal of thought should be given to specific problem areas which may develop on a given timber sale. In this way, contract specifications can be developed to avoid or minimize most problems. With careful planning, harvest activities also can be made more compatible with post-sale treatment and regeneration plans.

Among the things to be considered are the following:

A. Slash Control

A workable plan to deal with timber sale slash is critical. To the forester's eye, slash is the unavoidable unmerchantable residue left after a timber sale. To the visitor's eye, however, slash is a mess. It makes the area look chaotic and wasteful -- words which the visitor may not associate with a specific sale area, but with forestry in general. Visitors do not expect perfection. Most realize that a timber sale must generate a certain amount of slash. They do expect, however, some visual evidence that efforts were taken to prevent needless waste and destruction.

Prior to any cutting, the forest manager should determine:

- Where will slash be a problem?
- How will problem areas be handled?
  - Winter cutting to reduce foliage.
  - Lop and scatter, or removal by contractor.
- Follow-up work with labor crews (prison crews, YCC, etc.). Burning, discing, roller chopping, etc.

B. Residual Stand Treatment

It must be kept in mind that aesthetic management problems do not end with the completion of the timber sale. They begin. Visualize the sale area after cutting. What will need to be done next? How can you design the sale to make that follow-up activity easier?

- Will residual timber be used for screening? If so, will special skidding restrictions be necessary to protect it?
- Will residual timber be removed to enhance regeneration? If so, which will be the most visually acceptable: hand cutting concurrent with harvest, or mechanical shearing?
- How will the area be regenerated? If planting is needed, can additional cutting specifications make the job easier?
  - Slash piled for burning.
  - Snags cut and roads laid out to facilitate prescribed burning and fire breaks.

C. Cutting Methods

In aesthetically sensitive areas, it may be necessary to spell out not only the silvicultural system to be used, but the permissible machinery and cutting techniques as well. While pole skidders, hand peeling, full tree chippers and mechanical debarkers may be perfectly acceptable on the bulk of the timber sale area, they may cause problems in sensitive areas.

D. Public Involvement

While public involvement and information efforts are a continuing part of any forest management program, the importance of specific public involvement efforts on an individual sale basis cannot be over-emphasized. Often people and organizations in support of the general concept of forest management will become less enthusiastic when a timber sale is about to become their neighbor.

To be effective, this effort must be made during the pre-sale planning phase. In sale design, actions taken to "involve the public and reflect their concerns" ring hollow when they are taken after all the decisions have been made.

Consider, for a minute, the town board chairman called on the carpet by a constituent about your timber sale. If he was actively consulted prior to the sale, hopefully he will be aware of management needs and the options available. He will be able to address the constituent's concerns knowledgeably. He will likely direct further questions to the forest manager involved and a dialogue can begin before positions are solidified.

On the other hand, if the town chairman has not been consulted, things may be very different. Since the town chairman was not involved with the management decisions, he will feel no need to explain or defend those decisions. Indeed, he will be unable to explain. The first sign of trouble will be when an organized, irate citizens' group storms into your office.

Seek out town and county officials, residents living in the area, lake associations, hunting clubs, and other interested citizens. Present the problem. Do your homework. Take pictures. Use slides. Identify the alternatives. Ask for input. Be flexible. There is more than one way to get the job done!

Example: In northern Wisconsin, local economies are generally dependent on two major industries, tourism and timber production, which sometimes compete for the same resources. In 1989 a timber sale was made in a county forest (primarily aspen) that adjoins a popular recreational trail used year-round for cross-country skiing, mountain biking, and hiking. According to various media reports, lines of communication had broken down among the forest administrator, the county conservation committee, and the trail foundation, resulting in conflict over the sale among the resource managers themselves.

Following the sale, these resource managers received many letters from skiers who were upset about the clearcuts along the trail. Concerns expressed included the adverse impact on aesthetics (one writer described the open areas along the trail as "moonscapes"), the accelerated deterioration of snow conditions in the unshaded stretches created along the trail (especially in low snow-years), and the loss of critical windchill protection. A flurry of non-productive exchanges between resource managers and trail users ensued, culminating in the formation of yet another committee to develop special forest management strategies and to oversee future forest management activities along the trail.

This controversy, not to mention the real or perceived damage to the trail caused by the clearcutting, could have been avoided by effective advance communication among all the parties affected by forest management practices in this sensitive area. Ultimately, forest management plans will be needed that will eventually replace aspen with longer-lived species along the ski trail. These longer-lived species will allow the use of selective harvest cuts in the future and gradually minimize adverse impacts on the trail from forest management activities.

Remember: public information and education are not substitutes for public involvement and imaginative sale design. Interpretive signs and other informational efforts should be used to augment, not replace an active aesthetic management program.

To be effective, a sign should not only spell out the economic return, but the reasons a specific harvest system was used and what was done to minimize unavoidable impacts.

ADMINISTRATION

A. Contract Administration

Even the best sale design will fail due to lack of vigorous sale administration. Problems must be identified and dealt with early, before they become unmanageable. To be effective, most aesthetic management contract specifications must be carried out concurrently with the cutting operation. Lopping and scattering of slash and cleaning up road entrances, for example, cannot wait until the sale is closed out. This means constant vigorous sale administration.

Camps and pile locations should be monitored to keep them out of aesthetically sensitive areas. Figures 6.1 and 6.2 list timber sale considerations and contract specifications, respectively.

B. Cutting Units

Dividing the sale into a number of cutting units can be a valuable management technique.

- It helps ensure that one area is satisfactorily cleaned up before another is started.
- It can be used to control time of logging on specific parts of the sale (e.g., winter only in sensitive areas).
- They can be used to control types of equipment and harvest methods on various parts of the sale.

C. Sale Maps

Next to the timber sale contract, the sale map is probably the single best tool for effective sale administration. With complex sales, it is absolutely essential. Make lots of copies. Take them along on sale visits. Give them to cutters. The contractor may have the contract, but the cutter has the chain saw!

A good map should be clear, concise, and contain all the information the cutter needs to locate himself and determine what needs to be done. Line locations, private land, paint colors, and cutting specifications should all be spelled out on the map.

Sample sale maps are shown in Figures 6.3 and 6.4, with a variety of map symbols compiled in Figure 6.5.

Figure 6.1 **Timber sale multiple-use check list.**

Special Land Use Considerations

Yes___ No___ Scientific Areas
Yes___ No___ Wilderness, Wild, etc. Areas
Yes___ No___ Endangered Species Nesting Areas:
Eagle_____ Osprey_____ Rookeries_____ Other_____
Distance to nearest above_____
Other_____

Timber Management Considerations

Yes___ No___ Cutting Zones
Yes___ No___ Marking
Yes___ No___ Residual Hardwood Removal
Yes___ No___ Leave Seed Trees
Yes___ No___ Restrict Cutting to Summer Only
Dates_____

Visual Enhancement Areas

Road_____ Lake_____ Stream_____ Corridors_____ Other_____
Yes___ No___ Trees to be Left for Aesthetic Purposes
Species_____
Cutting:
Yes___ No___ Road Zone
Marked_____ Designated_____
Species_____
Yes___ No___ Lake or Stream Zone
Marked_____ Designated_____
Species_____

Wildlife Considerations

Yes___ No___ Deer yard
Yes___ No___ Winter Cutting Only
Dates_____
Yes___ No___ Leave Trees to Benefit Game
Species_____
Yes___ No___ Game Openings
Number_____

Access and Roads

Federal_____ State_____ County_____ Town_____ Private_____
Yes___ No___ Limit Access
Yes___ No___ Landing Restrictions
Yes___ No___ Location Approval Required
Yes___ No___ To Be Marked
Yes___ No___ Culverts Required
Yes___ No___ Road Damage Probability
Yes___ No___ Trails: Snowmobile_____ Other_____
Yes___ No___ Use Restrictions. Specify:_____

Figure 6.2 Sample contract specifications relative to aesthetic management.

1. Slash control

All slash within the (road, lake, etc.) reserve strips will be lopped and/or scattered to lay within _____ inches of the ground and pulled back at least _____ feet inside the cutting line concurrently with the cutting.

Cutting in the (road, lake, etc.) reserve strips will be permitted during the winter months only between (date) and (date).

2. Residual Stand Treatment

All residual hardwood one to five inches in diameter will be cut concurrently with the removal of the merchantable timber.

No residual one to five inch diameter trees will be cut in those areas so designated on the timber sale map.

Short-wood skidding only will be permitted in area so designated on the timber sale map.

3. Roads

All roads must be approved prior to construction.

Roads will be built only in those locations designated on the timber sale map.

Access roads to (name of specific major road) will be built only at designated locations.

4. Cutting Methods

Only (specific species) will be cut in those areas so designated on the timber sale map.

Only trees marked with (color) paint will be cut in the (road, lake, etc.) visual enhancement areas.

No hand peeling or mechanical peeling will be permitted in those areas so designated on the timber sale map.

5. General

The cutting area has been divided into _____ cutting zones. One zone must be satisfactorily completed before cutting can begin in any other zone.

No camps or landings will be permitted within sight of any road or body of water. All camp locations must have prior approval.

No piling will be done along the _____ road.

Figure 6.3 Sample timber sale map (see Figure 6.5 for additional map symbols).

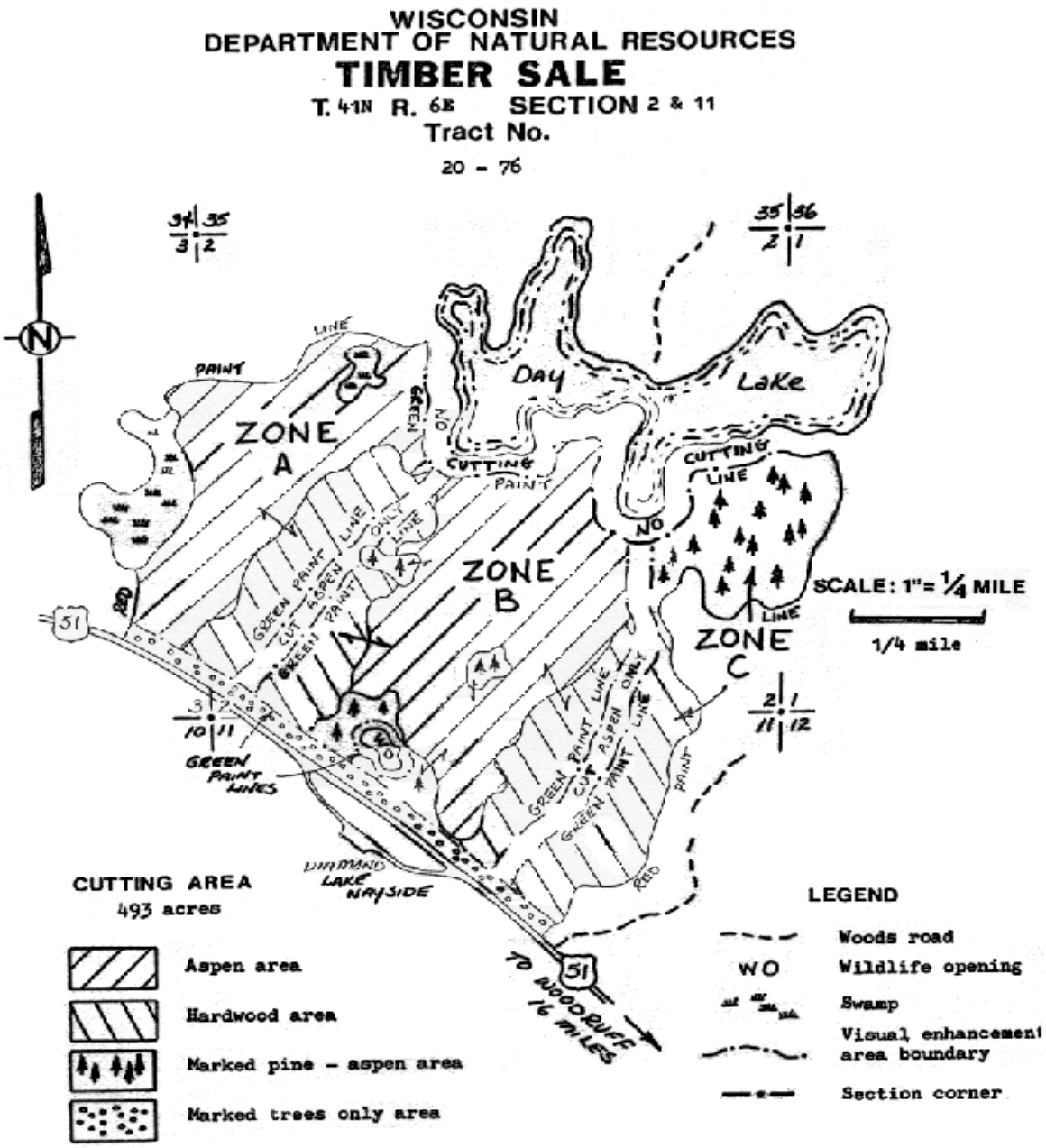


Figure 6.4 Sample timber sale map (see Figure 6.5 for additional map symbols).

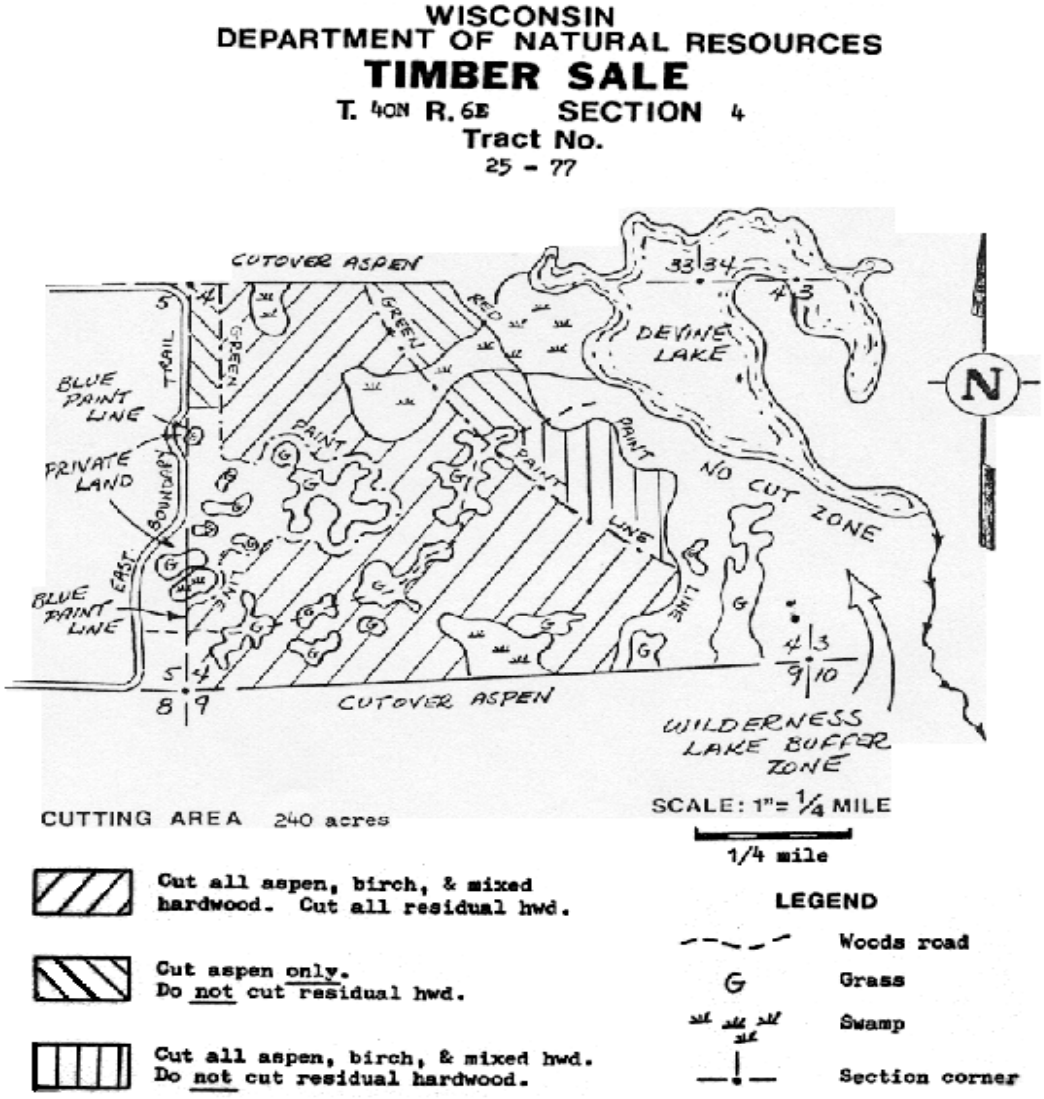


Figure 6.5 Map symbols.

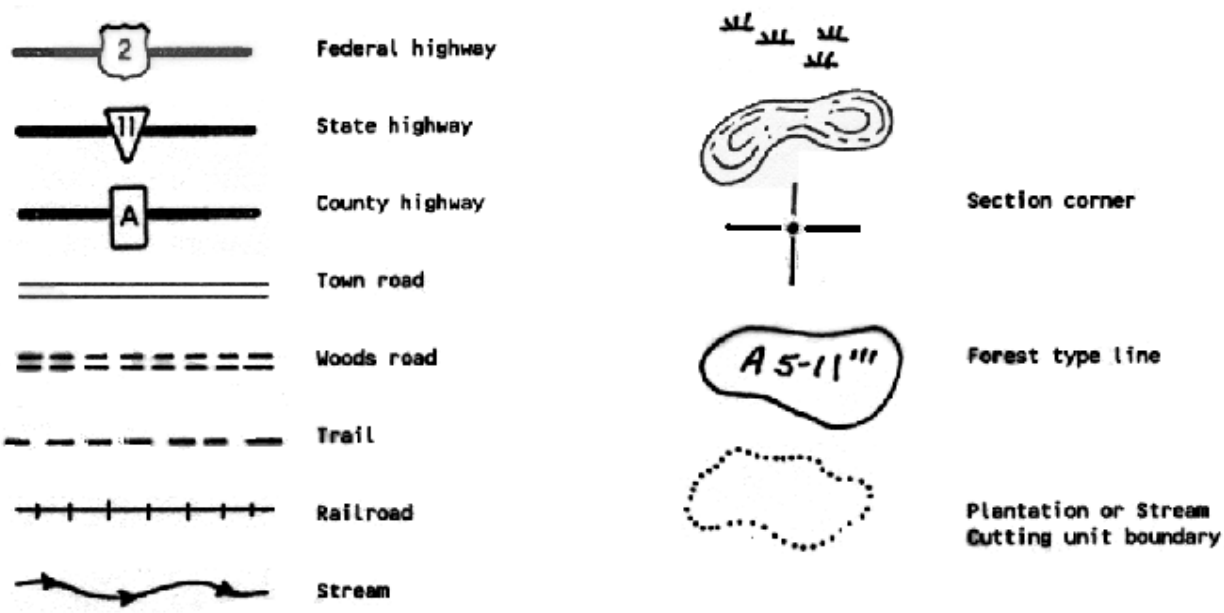
Species:

PW	White pine	O	Oak
PR	Red pine	CH	Central hardwoods
PJ	Jack pine	OX	Scrub Oak
FS	Fir-spruce	SH	Swamp hardwoods
SC	Swamp conifers	BH	Bottomland hardwoods
SB	Black spruce	A	Aspen
T	Tamarack	BW	White birch
C	Cedar	K	Muskeg
HH	Hemlock-hardwoods	G	Grass
NH	Northern hardwoods	LB	Lowland brush

Size Classes:

Symbol	Class	DBH
0-5	Seedling-sapling	0-5"
5-9 or 11	Pole timber	5-9" or 11"
9 or 11-15	Small sawtimber	9 or 11-15"
15+	Large sawtimber	15"+

Stocking classes:

Symbol	Seedling-sapling	Pole timber	Small sawtimber	Large sawtimber
'	Poor	3-7 cds/ac	1.3-2.5 MBF/ac	1.3-4.3 MBF/ac
"	Medium	7-13 cds/ac	2.5-5.0 MBF/ac	4.3-8.5 MBF/ac
'''	Good	13+ cds/ac	5.0+ MBF/ac	8.5+ MBF/ac

Other: