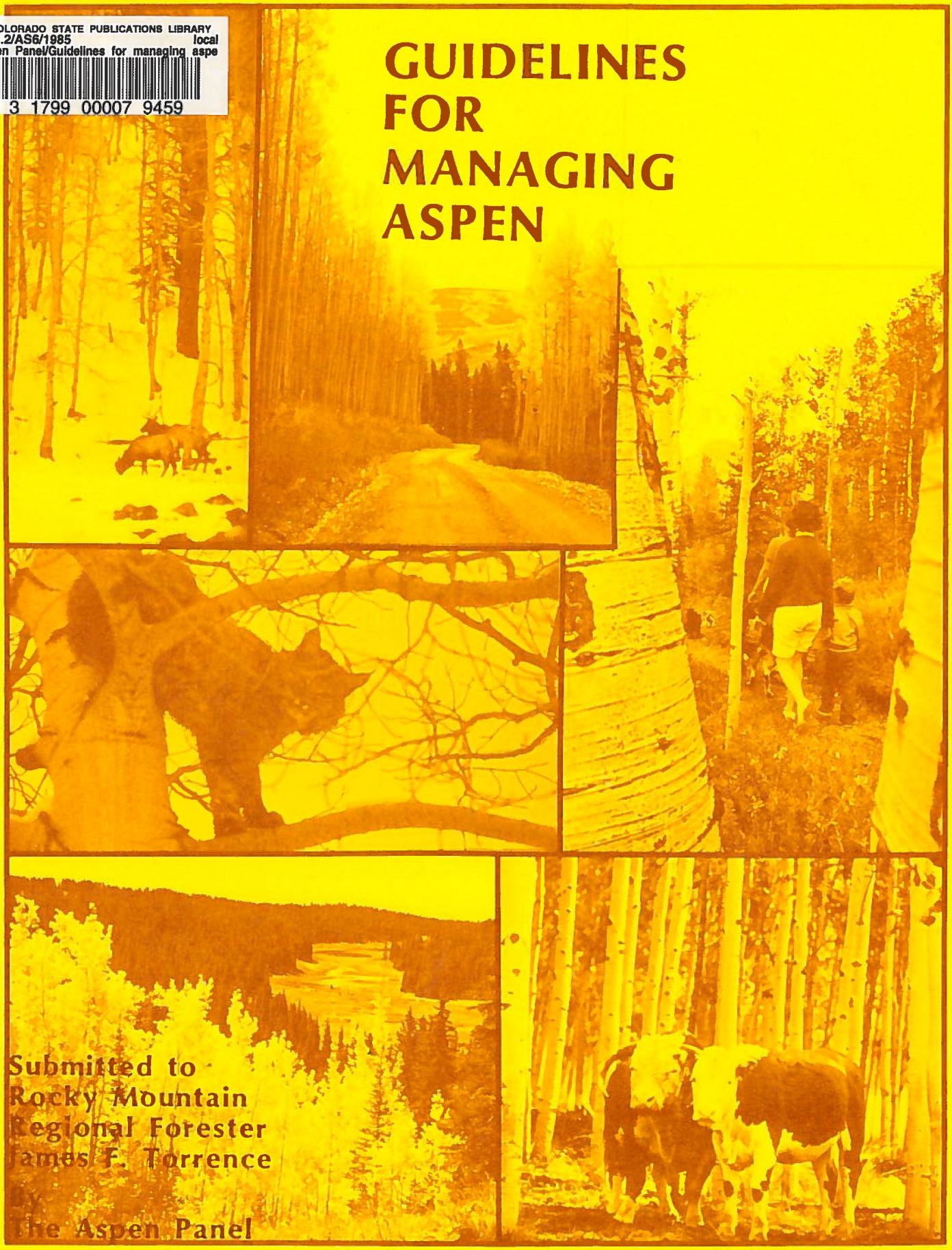
# GUIDELINES FOR MANAGING ASPEN



Submitted to
Rocky Mountain
Regional Forester
James F. Torrence

By
The Aspen Panel

"...THE UBIQUITOUS ASPEN, WITH ITS LIGHT SUMMER FOLIAGE AND BRILLIANT AUTUMN HUES, GIVES GRATEFUL SHADE AND MOISTURE TO WIDE AREAS WHICH OTHERWISE WOULD BE BARREN AND DESOLATE. SOME ABLER PEN THAN MINE SHOULD APOSTROPHIZE THE ASPEN! IT IS NATURE'S RESTORATIVE--THE BALM POURED UPON GRIEVOUS WOUNDS!..."

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# FOR
# MANAGING ASPEN

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## CHAPTER I. INTRODUCTION

As part of an appeal settlement in June of 1984, and in recognition of the tremendous value of the aspen resource in Colorado, the Rocky Mountain Region of the Forest Service and the Colorado Department of Natural Resources agreed to establish an aspen panel. The panel was appointed to provide recommendations concerning field operating guidelines for aspen management on National Forest lands in Colorado to Regional Forester James F. Torrence.

The aspen panel included ten representatives from the State of Colorado, Forest Service, Society for Range Management, Western Colorado Congress and the timber industry. The panel met over a five month period and developed this document which embodies its findings. These findings include:

1. Identification of a planning process to precede aspen treatments; and

2. Identification of resource considerations to be examined within this process.

This document has been written to serve a dual purpose. First, it explains the process for managing aspen to the public. Second, it provides guidance to the Forest Service line officers responsible for implementation.

A draft was made available for public review on April 1, 1985. Forty-six responses from individuals, organizations and public agencies were received. Changes have been made where appropriate to reflect the comments and suggestions received. A separate document has been prepared and is enclosed which responds to public comments.

The Panel recommends these "Guidelines for Managing Aspen" be adopted for Region-wide application rather than just in Colorado.

### A. Use of the Document

The Rocky Mountain Regional Guide, implemented in 1983, contains the Chief's direction for managing National Forest System lands in the Rocky Mountain Region. The Land and Resource Management Plans, developed for each Forest, provide further detail on goals and land use. These documents, along with Forest Service regulations and procedures, provide the basis for land and resource management decisions in the Region.

This document (Guidelines for Managing Aspen) summarizes the aspen planning process for the Rocky Mountain Region. The process incorporates a comprehensive analysis of resource goals and public concerns. By treating multiple resource goals early in the planning process, resource conflicts will be minimized and there will be less controversy when specific projects are formulated. The Guidelines are designed to be used as a companion to Forest Plans whenever management of the aspen resource is contemplated.

The Guidelines are presented in five chapters. Chapter I includes introductory and background material. Chapter II identifies the planning process for aspen management including public input. Chapter III describes aspen silvical characteristics and treatments available for aspen management. Chapter IV defines parameters to be considered in aspen management planning by resource areas, and Chapter V identifies mitigation measures.

## B. U. S. Forest Service, Region 2 Aspen Management Goal

The primary Region 2 goal for aspen management is the perpetuation of the species to protect and enhance the range of uses supported by aspen forests. Because of the high value of aspen forests for other uses, fiber production will not be the primary objective of aspen management. Rather, fiber production will be a byproduct of management for other purposes.

## CHAPTER II. THE ASPEN MANAGEMENT PLANNING PROCESS

### A. Unit of Analysis

The Diversity Unit will be the basic unit of analysis for aspen management. Forest Plans require that structural diversity of vegetation be maintained on units of land 5,000 to 20,000 acres in size or fourth order watersheds. These land areas are called Diversity Units. They are delineated for the purpose of achieving diversity objectives and, since aspen treatments can significantly affect diversity, they are basic units for identifying aspen treatment needs and for analyzing the effects of a treatment or series of treatments. Advantages of using Diversity Units are:

- provides a logical unit for resource analysis of on-the-ground conditions.
- provides an area of suitable size for analysis -- large enough to accommodate resource tradeoffs but small enough to retain the focus on specific projects.
- provides a manageable, understandable unit for display and discussion with the public.
- permits easy aggregation of units for large planning decisions.

Diversity Units will be identified for all areas where aspen management is proposed. Because of topography, road access, or other site specific considerations, treatments on two or more Diversity Units may be combined into a single project. Such combined projects will only be undertaken after analysis is complete on all affected Diversity Units.

### B. Plan Development

This section outlines the process to be followed to develop aspen treatment priorities using Diversity Units as the basis for analysis. The immediate scope of planning will be 10 years and will respond to an analysis of long term goals for the Diversity Unit.

The process consists of six primary steps as outlined below:

- Inventory
- Analysis
- Treatment option development
- Prioritization of options
- Project selection and implementation
- Monitoring and recordkeeping

Each of these steps is briefly outlined in the following text. They will be carried out by an interdisciplinary team (ID team) assigned by the responsible line officer. The makeup of this ID team may be different than that called for in step 5 of this section.

1. Inventory:

Once a Diversity Unit has been defined, inventory data will be assembled and needed additional information will be gathered. Data for each Diversity Unit shall be stored in a consolidated file. Elements of the inventory will include the following:

- Existing data - Stage I and II tree resource inventories, livestock grazing analyses, soil surveys, wildlife habitat surveys, riparian inventories, visual management system data, fuels inventories, pest management data, recreation use surveys, wildfire data, geologic hazard data, and endangered or special concern species inventories;
- Existing facilities - recreation areas, roads, trails, etc.
- Past Management Practices - Previous silvicultural treatments, burning projects, wildlife habitat improvements, weed control, water developments.
- Planned multiple resource management activities.
- Other site specific information such as monitoring data which has been developed for the site.

2. Analysis:

The compiled inventory data will provide the background information needed to do a preliminary analysis of the resource situation in the Diversity Unit.

Using these data the existing aspen situation should be analyzed in relationship to Forest Plan direction and established long-term goals for the Diversity Unit to establish purpose and need for management action. The analysis should include evaluation and discussion of such items as:

- Spatial distribution of aspen stands;
- Stand age, stocking and health;
- Structure of stands;
- Successional status to conifers;
- Identification of ecologically stable aspen stands (self-regenerating);
- Existing horizontal and vertical diversity;
- Existing wildlife species using unit;
- Location of important migration corridors;
- Critical wildlife habitat;
- Endangered and special concern species;
- Distribution and number of snags;
- Fuelbreak needs;
- Livestock forage conditions and productivity;
- Soil stability, erosion problems, and geologic hazards;
- Condition of riparian zones;

- Visual landscape character and imposed modifications;
- Distribution of recreational use, developed and dispersed;
- Cultural and archeologic resources.

3. Treatment Option Development:

As Diversity Unit analyses are developed in Section 2, options for aspen treatment will begin to be formulated. These options will reflect the areas in the Diversity Unit that do not need treatment as well as opportunities to improve conditions or to correct problem situations. This process is specifically designed to identify potential conflicts early so resolution can be achieved. Treatment options will be developed in the context of analyses that encompass the full life cycle of the aspen stands.

These options will be geared to respond to specific existing and desired conditions of the Diversity Unit to achieve goals of the management area prescriptions. Options may be further refined by use of Chapter III of this document which addresses available regeneration methods, and Chapter IV which presents resource considerations for the management of aspen. The options should also be geared to respond to specific public comments and/or issues which have been invited up to this point.

4. Prioritization of Options:

After treatment options have been developed the next task is to prioritize these options in a manner that will best respond to identified needs and budgetary constraints. Because the aspen resource is very large compared to the management opportunities allowed by anticipated budgets, prioritization may best be based not only on Diversity Unit needs, but also on an identification of ecologically stable stands that can take care of themselves, even though improvements could be achieved through management. This approach will ensure stands most in need of immediate attention will be accorded the highest priority.

Factors to be considered in setting these priorities are:

- Stand is self-regenerating;
- Diversity already exists (horizontal, vertical, old growth, etc.);
- Protection of riparian zones;
- Road construction impacts outweigh potential benefits;
- Cumulative viewshed impacts make postponement desirable;
- Treatment is necessary to achieve multiple resource Diversity Unit goals: e.g., wildlife, livestock grazing, recreation, vegetation diversity;
- Potential conflicts with recreational use or cultural and archeological resources;
- Existence of aspen on the site is threatened;
- The desire to favor one species over another in a mixed aspen-conifer stand.

Coordination of these factors will lead to the creation of a prioritized listing of all potential treatment options for the Diversity Unit over the next 10 years. Such a listing, including any information and analysis compiled up to this point, will be available for public review as either a separate public involvement document (such as a scoping document) or as part of the planning record. This will provide participants with prompt feedback summarizing both the scope and the important issues that will be analyzed.

5. Project Selection/and Implementation

Proposed treatments will receive intensive environmental analysis. Depending on the nature of the proposed treatment, the responsible official will designate an ID team and leader. The team may vary in size from one qualified individual to a diversified mix of specialists representing the necessary disciplines.

The team will take a closer look at the nature and significance of the physical, biological, social, cultural, and economic effects of the proposal and its reasonable alternatives. The cumulative impacts of multiple projects within the Diversity Unit will be considered. The team will identify the preferred alternative, measurable effects, and any appropriate mitigating measures which are deemed necessary (see Chapter V). In addition all resource objectives to be met as a result of the proposed action will be quantified as the basis for benefit analysis and future monitoring.

This analysis process, including monitoring needs, will be documented in the appropriate NEPA format, and the public will be given the opportunity for feedback to assure no issues or concerns are overlooked. This will be in the form of an environmental assessment (EA) except when categorically excluded or an environmental impact statement (EIS) is required.

Again, magnitude of proposed treatments which can and will be implemented will be limited by budget availability. Although it may be desirable to treat more acres, in reality only the highest priorities might ever be achieved. This process, however, allows the forests to remain flexible and capable of responding to fluctuating conditions. It also allows the public to see and understand why and how these fluctuations are absorbed and that they are based on land management needs rather than a reaction to economic interests.

6. Monitoring and Recordkeeping

Forest plans include provision for monitoring as required by the National Forest Management Act. Monitoring is a key aspect of aspen management. It provides the decisionmaker with information on the success or lack of success in achieving stated goals and objectives. Aspen management will be monitored to verify that scheduled treatments are implemented as designed and the anticipated outputs are produced. The goals, objectives, and guidelines will be evaluated regularly to assess their validity and accomplishment.

Monitoring will ensure:

- Individual management prescriptions are being applied as directed;
- The aspen guidelines are being followed;
- The Forest is achieving the goals and objectives for aspen management;
- Aspen treatments are responding to public issues and management concerns;
- The effects of implementing aspen management are occurring as predicted;
- Management practices on adjacent or intermingled non-National Forest System lands are also being considered during treatment analysis; and
- Whether implementation of aspen management is affecting other agencies in reaching their objectives.

Current Forest Service direction for monitoring regeneration success is to conduct surveys the third and fifth year following treatment. Because of the many factors which can potentially affect aspen regeneration, additional visual assessments will be made and documented the second and tenth years following treatment.

Other monitoring activities to be required where appropriate include:

- Wildlife habitat condition and use based on requirements of management indicator species.
- Slash treatment alternatives, effects of leaving stems scattered vs. piled.
- Forage production and use in treated areas versus adjacent untreated areas.
- Damaging agents such as wildlife and livestock overuse, vehicles, insects and disease, etc.
- Water yield and quality.
- Achievement of recreation, visual and other quantifiable multiple resource objectives of the project.
- Causes of regeneration failures.
- Comparison of stand characteristics prior to treatment with those following treatment.
- Status of any rare, endangered or special concern species in the treatment area.

Results of monitoring activities will be documented and retained in the Diversity Unit file.

## C. Public Involvement

Public participation is an important key to effective land management. If public issues, concerns, and comments are solicited, and addressed early in the planning process, then surprises are avoided and public confidence in the process is enhanced. Extensive public participation is mandated by the National Environmental Policy Act, the Federal Lands Policy and Management Act, and the National Forest Management Act.

The aspen planning process in these Guidelines closely follows the procedures for environmental analysis and documentation set forth in the Forest Service Handbook, FSH 1909.15, and Forest Service Manual, FSM 1950. This direction implements the Council on Environmental Quality's regulations which emphasize that thorough scoping and documentation is the key to successful environmental analysis. Scoping is the low cost end of the planning process and is the most appropriate time to identify potentially affected and interested agencies and publics, important issues and concerns, and a range of reasonable alternatives.

The FSH 1909.15, FSH 1950, and the Forest Service Public Participation Handbook, FSH 1609.13, all provide clear guidance on obtaining and utilizing public involvement. Some of the methods for obtaining public participation which are suggested in the handbook and by various experts include: media announcements, formal public hearings, open public meetings, citizen representation on interdisciplinary teams, surveys of citizens' opinions and person-to-person communications. It is important to invite participation from all potentially affected Federal and State agencies, groups, and organizations, and individuals who might be affected. The response to the initial invitation is a good guide to how extensive the public participation process will have to be in any particular case. Often, nothing more than consultation will be needed.

The chart on the following page provides an overview of the public involvement process as it is to be applied to aspen management. Five opportunities for public involvement are shown, and these comply with relevant laws and regulations. Also shown are the nature of the public involvement at each opportunity, the relevance of the public involvement to the aspen planning and management process, and the formal documentation involved. The six opportunities are:

| Opportunities For Public Involvement | Nature of Public Involvement | Relevance to Aspen Management Planning | Formal Documentation |
|---|---|---|---|
| Forest Plan Preparation and Revision | Issues, Concerns, Comment | Provides General Direction | Forest Plan and EIS |
| Diversity Unit Scoping (Preliminary) | Issues, Concerns, Comment | Define Management Needs and Purposes | Scoping Documents and |
| Diversity Unit Scoping (Extended) | Issues, Concerns, Comment | Management Options and Priorities | Diversity Unit File |
| Environmental Analysis, Project Alternatives | Review and Comment | Proposed Management Action | Environmental Assessment |
| Decision | Possible Appeal | Management Action Initiation | Decision Notice |
| Monitoring | Field Trips, Observation, Comments | Feedback for Future, Corrective Action | Diversity Unit File, Plan Revisions |

1. Forest Plan Preparation and Revision

   Extensive public participation occurred during the preparation of the Land and Resource Management Plans (Forest Plans) for each of the Forests. Public issues, concerns, and comments were solicited throughout the Forest planning process from scoping through final review. The Forest Plans provide the general direction for forest management (including aspen) and represent a balance among the multiple uses. The Forest Plans will be revised as necessary to reflect changes in information, resource use, and other factors. The public has a continuing opportunity to contribute comments for use at such time as revisions are contemplated. Copies of Forest Plans and supporting Environmental Impact Statements (EIS) are available at all Forest Service offices.

2. Preliminary Diversity Unit Scoping

   This opportunity occurs during the "Analysis" phase of Plan Development as previously discussed. This is the time at which the Forest Service addresses the need for intensive management and is the time at which "no action" is most likely to be selected. For this reason, public participation is especially critical to ensure that no issues or concerns are overlooked.

3. Extended Diversity Unit Scoping

This opportunity occurs during the "Treatment Option Development" and "Prioritization of Options" phases of Plan Development. Public input will be most useful here in response to an array of preliminary treatment proposals. Issues and concerns will be more sharply focused and this feedback will assist in refining the proposals and in the detailed environmental analysis for a particular project proposal.

4. Environmental Analysis Review

The next opportunity for public involvement occurs after completion of an Environmental Assessment.

5. Decision

The Record of Decision initiates the management action. At this point, the only public involvement provided by law is the filing of an Administrative Appeal to stop the project. Such an action is expensive and time consuming for all parties. This undesirable result is best avoided by adequate public participation and resolution of conflicts early in the scoping process, and by keeping the interested public informed and involved throughout the planning and analysis.

6. Monitoring

During and after project implementation, the public can usefully participate in the monitoring program. Participation can be informal through activity and observation in the area or more formally through field trips or symposiums. Comments to the Forest Service can provide feedback to be used in future management activities and to determine the need for additional mitigation. Exposure to on-the-ground management activity can enhance public confidence in the planning and management process. Monitoring data should be available for public review so that the public can compare project objectives with results achieved.

## CHAPTER III. SILVICS AND SILVICULTURE

This chapter provides a general summary of available technical information on the aspen resource including growing conditions, species characteristics and a discussion of regeneration methods. This information should be considered as decisions are made throughout the planning process described in Chapter II. See Appendix for additional information sources.

### A. Aspen Species Characteristics

Aspen typically grows on all aspects and slope positions in the Rocky Mountains and is associated with montane and subalpine vegetation along an elevational gradient from 7,000 to 11,500 feet (2135 to 3505 m).

Productivity and development of aspen in the Rockies is largely dependent upon available water, which in turn is related to weather patterns, elevation, physiographic position, and edaphic characteristics.

Soil characteristics further delineate the development of Rocky Mountain aspen. While aspen can be found on all soil types from loamy sands to heavy clays, rockiness greatly limits stand development. Most productive stands are found on deep, well-developed soils with abundant soil water.

Aspen grows in the Rocky Mountains on sites that receive from 16 to 40 inches (405 to 1015 mm) of precipitation per year, but most stands receive from 20 to 30 inches (510 to 760 mm) per year, primarily from snow.

Aspen is normally a seral species and an aggressive invader following fire, avalanches, beaver activity in riparian areas, or major disturbances in coniferous stands, even in those containing only a few aspen stems. However, if a coniferous seed source is lacking or site conditions are inhospitable to conifers, aspen can occupy a site for hundreds or perhaps even thousands of years, making it essentially a climax species in these cases. Most aspen stands in Region 2 are currently between 80-110 years of age.

Rocky Mountain aspen reproduces almost exclusively by suckering. New stems are produced asexually by adventitious sprouting from a single parent root system to form a clone. A clone is a group of individual trees propagated vegetatively from a single individual tree. All members of a clone are genetically identical.

Natural seedlings do occasionally occur in the West, and they may be responsible for genetic diversity and the colonization of new clones.

Aspen is more intolerant of shade than many other tree species. It demonstrates dominance well and restricts development of understory stems, which in turn contributes to its ability to naturally thin itself. However, understory stems are capable of recovering from suppression where the competitive overstory has been removed.

Aspen is difficult to maintain in any particular stand condition for a long period of time. Old stands succeed to conifers or break up. Dense sucker stands mature to sapling and then pole stands much quicker than conifer stands. Stocking in all aspen stands is continually changing and trees are continually dying. Only when they do so at an inordinate rate without

replacement is there cause to be concerned about the continued presence of the species.

Aspen comprises about 25 percent of forested lands in Colorado, and is a small but critical vegetation component of the forested lands in Wyoming and in the Black Hills of South Dakota. Aspen stands in the Black Hills occur at lower elevations than in the Rockies, often contain paper birch (Betula papyrifera) and are usually seral to ponderosa pine (Pinus ponderosa). However, the silvical characteristics and silvicultural alternatives otherwise discussed in this section should apply to management of aspen in the Black Hills and are in general agreement with aspen management plans which have already been developed on the Black Hills National Forest.

Since clones are the "individuals" of concern in aspen management, they can be expected to behave like individual trees in other forest types, although likely a bit slower. Some will grow in size, others will decline and die, permitting new ones to become established.

Management activities have to allow for the unique clonal character of aspen. The root system must be maintained and kept viable to ensure continuity of aspen on a site. Harvesting, livestock grazing, engineering activities, mineral development, and recreation activities must all be planned with this in mind. If the root system is killed, the aspen will not regenerate. Because a large number of sprouts are required to establish a fully stocked stand, artificial reforestation of aspen is not a viable regeneration alternative. However, artificial regeneration is applicable to reclaim sites disturbed by mining or other activities.

Because aspen stands self-thin (i.e. stocking is reduced over time by natural mortality without stagnating growth), different criteria must be used to assess the success of regeneration activities. It is difficult to verify aspen regeneration as being successful at age five. Only when stems reach sapling size do most Rocky Mountain aspen stands outgrow the climatic and biotic factors which can destroy regeneration. A series of stocking surveys and visual observations should be conducted (see II-B-6). The early surveys will identify problems which can be corrected by protective measures. Later surveys will monitor sucker progress through the critical early growth period and provide valuable information for future management decisions. A photographic record may be useful to accomplish this task.

B. Identification of Treatment Needs

Given the average age and extent of the aspen resource in the Rocky Mountain Region, it is obvious that it is both technically unfeasible and ecologically unsound to regenerate all stands in the mature to overmature age classes. Selection of aspen stands for regeneration or other treatment should be based on the overall resource needs within a Diversity Unit, recognizing that no treatment is also a viable option.

Treatments should be scheduled to establish or maintain the desired mix of stand conditions while allowing for the relatively rapid rate of change that occurs as aspen stands mature. Treatment of self-regenerating and stable stands should be deferred in favor of stands in more critical need of treatment.

Conifer stands with even a minor aspen component should be recognized as having potential to be managed as aspen or mixed conifer-aspen. Management options to perpetuate the presence of aspen in these stands should be included if they coincide with the overall objectives of the Diversity Unit. In some situations it may be desirable to convert a conifer stand to aspen while allowing conifers to succeed aspen elsewhere.

To help identify treatment needs, the following silvicultural standards may be useful:

- Stands in good condition are well stocked, relatively disease and damage free, and have relatively little dominate and codominate mortality in the overstory. Large numbers of conifer seedlings, or overstory conifers present in an aspen stand classify it as seral to conifers.

- Stand age alone is not a determining factor as to stand condition. Neither is stocking. Some old or poorly stocked stands are in good shape. Stem size and form are not valid factors in determining the ability of a stand to persist on a site, but may be indicators of site productivity or genetic capability for fiber production.

- Ecologically stable aspen stands contain only a minor conifer component in the seedling and sapling sizes and may have aspen understories in these size classes.

The following criteria are suggested for use in ascertaining stand conditions described above and identifying the silvicultural need for regeneration. All are available from current inventory information, or can easily be obtained using rudimentary cruising methods. These are intended to evaluate only the aspen itself and do not reflect other resource needs:

Stand age;
Stand structure;
Stocking;
Productivity;
Presence or absence of aspen understory;
Evidence (or the lack thereof) of overstory breakup; and
Successional status to conifers.

C. Regeneration Methods

A number of regeneration techniques have been applied to Rocky Mountain aspen. Chainsaw felling, burning, mechanical treatment, and herbicide application have all been successful in at least some situations. Girdling of overstory stems has produced poor results and is not recommended. Stand conditions and management objectives should dictate the choice of techniques to be used in a given situation.

There are several silvical requirements which should be considered in selecting regeneration methods for Rocky Mountain aspen. Aspen is intolerant of shade, it reproduces through root suckering, it is self thinning, and it is susceptible to disease infections which enter through wounds in the bark.

The clearcutting method is often the most appropriate. This method reduces the chance of residual stem infection from logging damage and promotes suckering. Since seed dispersal is not a factor, the size of cutting units is limited by other resource constraints. The maximum size of openings created by even-aged management silvicultural techniques is limited to 40 acres with some exceptions as provided for in the National Forest Management Act of 1976.

It is not usually necessary to lay out clearcuts along clonal boundaries. Enough suckering to regenerate a clearcut will normally occur if most of each clone within it is cut.

Aspen is a shallow rooted species which can windthrow. The same precautions used with other species need to be followed when laying out units to be treated. Avoid laying out clearcuts which run up slopes parallel with the direction of the wind, on ridgetops, or directly below saddles in ridges, where wind vortexing occurs. Irregular cutting boundaries without sharp wind catching indentions can also reduce blowdown.

It is possible to use other cutting methods in Rocky Mountain aspen stands. Shelterwood cutting methods per se are inappropriate as aspen requires neither seed source, nor shade to regenerate. Some forms of partial cutting can be used if some of the original stems are needed for wildlife habitat, or other purposes. Individual tree or group selection cutting methods could also be used to either maintain or create uneven-aged stands.

There are several drawbacks to using an uneven-aged silvicultural system in aspen. Given that some clones sucker more easily than others, partial cutting methods should be limited to stands which have already shown some regenerative response following a previous disturbance to the overstory. Residual stems left after harvest are likely to be damaged and become infected with disease, causing many to die. A future entry to harvest these stems will damage the new stand, making it susceptible to disease also. Such repeated entries should be avoided, if possible.

Another regeneration alternative is the use of fire. Although pure aspen stands usually do not burn well, prescribed burning can be used to regenerate some stands. Such burning is usually successful only under extremely dry conditions or in stands with sufficient fuel loadings to carry a fire through the stand. Stands on sites with oily shrub understories or those with a heavy conifer component usually burn well. But, weather will often limit the opportunities to burn.

Mechanical methods of regenerating aspen which may be feasible include shearing, or pushing stems with mechanized equipment. Leaving all the stems as slash on treatment areas may severely limit the suckering response. However, use of mechanized equipment should not seriously damage the lateral root system.

Aspen can also be regenerated with herbicides by killing enough of the overstory to stimulate suckering. Aerial application, ground spray, or individual stem injection can be used. Herbicides do not usually kill all the overstory at once. The result is a stand that includes at least two age classes, and provides wildlife habitat and livestock grazing characteristics that are present in naturally occurring multistoried stands.

In cases where natural regeneration is occurring, it may be necessary in some instances to exclude grazing and animal browsing to obtain adequate initial stocking.

D. Other Factors Affecting Regeneration

In spite of the apparent ease of regenerating Rocky Mountain aspen, there are a number of factors which can limit regeneration success. The number of suckers needed to successfully regenerate an aspen stand is determined by the management objectives for the stand. For replacement, only enough suckers are needed to insure a mature stocking of 400-600 stems per acre. On the other hand, the goal should be as many sprouts as possible if the intent is to provide forage for big game on spring, fall, or winter range.

Impacts of animal browsing and grazing on suckers is not fully understood, but heavy damage is possible. This is usually a problem for only two or three years following regeneration until suckers grow beyond reach of the animals, but stands can be wiped out if intensively utilized for several consecutive years. Stand location, animal numbers, season of use, weather conditions, and other available forage can all affect the amount of aspen use. However, it should be noted that properly planned grazing can be a beneficial tool in stand management. Chemical composition of some clones may also influence the preference by animals of some clones over others. Protective measures such as fencing, location of water and salt, or grazing allotment rotation will be necessary in some cases to achieve successful regeneration.

Small animals also are potentially damaging to successful regeneration. Voles girdle suckers and can kill young stands during periodic high populations.

Small animal damage is usually not serious, but can affect successful regeneration in localized areas.

Snow damage has recently been described in regenerated stands. The weight of the snowpack can break stems and strip branches from suckers. Snow damage does not appear to occur every year, or in all locations. Suckers can recover from some damage, but can be seriously affected if damaged repeatedly.

All of the above damaging agents should be monitored carefully in each project area if there is potential for significant resource damage. Future management in the unit must account for any regeneration problems encountered by earlier activities.

E. Additional Information Needs

While much is known about the silvics and silviculture of aspen it is also true that much remains to be learned, especially regarding the effects of intensive, large-scale manipulation of aspen on range, wildlife and other resources. Until sufficient experience has been accumulated to fill these gaps in knowledge, prudence dictates a conservative approach to aspen management.

## CHAPTER IV. RESOURCE CONSIDERATIONS

This chapter presents some of the aspen stand conditions which are desirable or undesirable for various resource uses. Further information is referenced in the appendixed bibliography. These conditions should be used in the context of achieving the desired balance of resource uses. In practice specific plans will present the tradeoffs made between resources in deciding the desired future aspen conditions.

### A. Visuals

#### 1. Foreground (up to 1/2 mile from viewing point): 1/

The foreground is described as that area or distance where individual trees are viewed rather than groups of trees as a forest.

- Groupings of the existing natural vegetation generally produce more visual harmony and interest than when all are evenly spaced throughout the area being viewed. The visual strength of one species should dominate the scene rather than all having co-dominate characteristics that compete for attention. No single part of the landscape by itself provides an amenity or an aesthetic resource.

- Aspen stands that produce the best foreground viewing conditions are the ones that have a variety of age classes and also a good diversity of understory plant species.

- Pure aspen stands that display the best foreground conditions are those that have the full range of growth classes from young suckers to mature trees. These conditions are usually found naturally in self-regenerating stands.

- Careful location of road rights-of-way, or cutting small openings in fore-ground may make aspen stands more visually pleasing.

- The aspen-conifer stand displaying the best foreground condition is one that has a number of naturally spaced conifers in the understory.

#### 2. Middleground (1/4 to 5 miles from the viewing point): 1/

In middleground scenes the scale of the area being viewed will affect the appearance of the vegetation composition. Groups of trees rather than individual trees become significant visually. The patterns created by the juxtaposition of vegetative groups cause visual interest.

- Aspen stands in relation to a variety of other vegetation types will create more visual interest and promote an interesting mosaic on the landscape.

- In most situations pure aspen stands without scattered or grouped conifers for visual relief provide less visual interest than aspen stands that also have some dominate

conifers interspersed throughout the stand or have conifer stands in close proximity to them.

- Contrasting greens of aspen and conifer and especially the fall color of aspen against the contrasting darker green of the conifer stand make landscape scenes of significant importance.

- Clonal differences in spring leaf advancement and fall coloration is an important consideration when removal of a stand is planned. These variations make additional textures and color contrast which are especially important in maintaining variety of pure aspen stands.

- Locating cutting unit boundaries to coincide with old fire paths, clonal boundaries and conifer inclusions helps maintain these desired characteristics. Scheduling future entries to maintain these patterns is also essential.

3. Background (3 miles to infinity from the viewing point): 1/

In background scenery masses of aspen in relation to conifers and landforms become important. Mass color contrast establishes the distinguishable patterns rather than size of vegetation, and the natural configurations of these color patterns will determine how attractive an area is.

- From the visual resource management standpoint, the aspen stand characteristics are most important because they are a major component in the landscape character determination which is used as the basis for determining the visual quality objectives. Silviculturally, the maintenance of pure aspen stands becomes important in the background landscape. Removing all conifers from some stands as they are harvested will ensure large-scale contrasts. Allowing mixed stands to succeed to conifers may also help.

B. Recreation

- Recreation activities such as driving for pleasure, hunting, cross-country skiing, horseback riding, hiking and general forest use constitute most of the landbased people use on National Forest land. The aspen stands of pole through the mature size classes produce good to excellent conditions for the above activities.

- As with foreground scenery, the juxtaposition of aspen to other vegetative types such as conifer and/or grassy meadows tend to give a variety of special relationships that are important to the enjoyment of the forest by recreationists.

1/ Distances are averages and will vary with topography. For instance, the existence of a ridge near the viewing point may limit the foreground viewshed to 1/4 mile or less.

- The aspen stands that have a diversity of conifers, shrubs and grasses along with a full range of aspen age classes will provide the best dispersed recreation opportunity if the conditions are open for easy movement through the type. Dense windfall in overmature aspen-conifer cover types reduces its dispersed recreation value.

- When a crown canopy of the pole to mature stands are in full color, they provide a sheltered feeling with the very exciting motion of the leaves in slight breezes. The color of the leaves also gives a radiance of color to the viewer which is a major attraction in fall.

- Aspen stands are esthetically pleasing for developed recreation areas; however, they are a poor choice and should be avoided whenever possible because of their susceptibility to damage resulting in insect and disease problems. However, it may be desirable to locate recreation areas within view of aspen stands.

- Aspen in recreation areas become weakened from soil compaction, and by campers carving and cutting on the smooth bark. These wounds become infected with canker fungi and often lead to stem death within 5 to 10 years. As the trees die and are removed, the stand becomes more open, creating ideal conditions for insect borers and sunscald. Overall tree vigor declines, mortality increases, and the area is nearly barren of aspen in 15 to 20 years. The average rate of tree loss at aspen campsites in Colorado has been found to be 3.6 $\pm$ 1.0 percent per year over a twenty-one year period.

**C. Wildlife and Fisheries**

Evaluation of wildlife impacts will include both treated and untreated areas by use of the Diversity Unit analyses and the standards and guidelines for wildlife as contained in the Forest Plan.

- The vegetation structure and food resources are major determining factors for small mammal populations. In general, leaving of treatment residue is beneficial to small mammal populations.

- Bird population density is positively related to crown development as measured by density of the crown and volume of the crown area. Bird populations will be impacted by changes in stand composition which reduces crown volume either by stand age modification or stand density.

- Bird densities are positively correlated with grass-forb understory and percent of mature aspen with heart rot. The primary site for cavity nesting species is mature to overmature trees with heart rot. Loss of this component will reduce cavity sites and hence densities. The grass-forb understory is valuable as a structural density component and as a feeding area.

- At least 20% of the aspen cover type in the Diversity Unit should be in old growth in minimum of 20 acre blocks and ideally 50 to 100 acre blocks to provide minimum habitat for species which use old growth conditions.

- Old growth should not be isolated, but connected by corridors of forested land at least 300 feet wide which could encompass stream corridors.

- Deer and elk use can be modified by slash treatment. In general, slash can be used to reduce elk and deer use but will not prevent such use.

- Small isolated treatments can create deer and elk concentration areas depending on the other qualities of the Diversity Unit.

- Simultaneous operations should be confined to limited areas or broadly dispersed to reduce disturbance factors to wildlife.

- Actively used roads of greater than one mile per section can seriously compromise habitat effectiveness for wildlife. Road type, use periods and design must be evaluated in the Diversity Unit based on the objectives for the unit.

- Streamside vegetation should be managed to prevent degradation of water temperature, water quality, water quantity and physical habitat.

- Hiding cover for deer and elk should be at least 5 feet tall with crown cover of at least 75% and a minimum of 2-5 acres in size.

- Aspen is a preferred food for beaver and should be considered in management of riparian zones.

- Created openings should have a Patton's Edge Shape Index of at least 1.4.

- Optimum cover to forage area ratio for big game is 40% cover and 60% forage, well distributed.

- Maintenance of mixed stand conditions are important to many wildlife species due to habitat diversity and edge contrast provided by the characteristics of the mixed plant species.

- Critical wildlife habitats should receive special wildlife management emphasis in all units. This would include migration routes, threatened and endangered species habitats, special habitat components such as old growth or snags, clones used by black bear and so forth.

D. Livestock Grazing

There are several factors operating at the allotment level that could affect the analysis for grazing management: kind and class of livestock, grazing system, slope, intensity of use, size and location and number of allotments or pastures within the Diversity Unit, season and timing of use, and patterns of land and vegetation within the pastures (or allotments).

- Livestock use can be inhibited by large build-ups of slash. Slash placed perpendicular to the slope will have less effect on livestock use.

- Large created openings in areas of widespread aspen stands are desirable for livestock.

- Proximity of water to the site affects utility for grazing.

- Distance of the site from a grazable park, meadow or other large opening will affect amount of grazing use.

- There is higher forage production in regenerating aspen stands between the ages of 1-10 than in existing openings.

- Juxtaposition of stands in the Diversity Unit is more important than the stand characteristics.

- High numbers of regenerating aspen stems can inhibit the use of the increased forage, especially if combined with excessive slash.

- Stands of pure aspen are more beneficial than those with conifer mix.

- Open grown, low stocked stands are more beneficial than heavily stocked stands because of greater species richness in the understory.

- Knowing a stand plant association is most important to predict the effects of treatment on the quantity and quality of livestock forage.

E. Soil and Water

- Some of the most productive aspen in the Rocky Mountains grows on soils derived from silica-poor igneous rocks such as basalt, from limestones, and from neutral or calcareous shales.

- Some of the least vigorous and most diseased aspen are found on soils derived from granite.

- Soils that develop from granite, conglomerate, or siliceous sandstone generally have open herbaceous cover that permits conifer seedling establishment and, ultimately, replacement of aspen by conifers.

- The trees, understory brush, herbacious species and litter of well-stocked aspen stands furnish virtually 100 percent soil coverage. A mixture of herbaceous and woody root systems penetrate and anchor the soil. Erosion-producing overland flow of water is almost nonexistant under stands of this type. Even storms with 5-minute intensities of approximately 6 inches per hour infiltrate porous, humas-rich soil.

- Erosion on ecologically stable aspen-covered slopes is unlikely to occur if the cover of vegetation and litter is approximately two-thirds or more.

- Erosion in the form of mass movement or slumping takes place on many aspen-covered sites. Erosion does not occur because of the aspen cover however, but because of the inherent instability of the landforms. Aspen is one of the few tree species that colonize these unstable slopes. Aspen provides the best natural protection on soils that frequently have high clay content, are plastic and are often quite wet.

- Aspen provides excellent protective cover on mountain sites that yield high-quality water. Aspen receives about 24 inches of precipitation annually. About 14 inches are lost by evapotranspiration, leaving a potential of 10 inches that contributes to streamflow or groundwater.

- Aspen stands on deep, fine-textured soils have the greatest potential for water yield increases, but such increases are not likely to be of the same magnitude as could be expected from coniferous stands. Soil moisture studies indicate a potential increase of up to six inches of water following aspen clearcutting with mean values of around three inches. Aspen sites may also be subject to quick hydrologic recovery following treatment. Some sites may recover in as quickly as 10 to 15 years. Aspen on sites which are historically unstable and capable of mass soil movement should not be cut.

F. Wood Fiber

As noted in Chapter I, fiber production is not a primary objective of aspen management. Rather, fiber production will be a byproduct of management for other purposes. There are, however, some important considerations for fiber production where such use is compatible with the primary objectives.

- Not all clones have the genetic stem form to produce commercial products. Sites which contain a large number of clones of poor form should be excluded from management for fiber production.

- Site quality limits potential growth rates and volume yields. Little can be done to increase the low yields on poor sites. Medium quality sites will produce sub-sawlog size trees of sufficient yield for pure fiber products. Highest yield of both fiber and sawlogs can be expected on the better sites. Wide variations in site quality may occur within a limited area because of differences in aspect, topography and soil. Therefore, sites capable of the highest fiber yield potential should be identified early in the planning process, and if other resources will allow, be considered for fiber production.

- Clearcutting is the preferred method for fiber production. It is important that all stems, including nonmerchantable trees and understory saplings be cut. This should be done to promote the best suckering. If all live stems are not removed, a growth regulator is released by the clone that inhibits suckering. All live stems should also be removed to prevent poor quality residual stems from being released and dominating subsequent reproduction. Uneven-aged stands will not be adequately stocked and are more likely to be pathologically unsound.

- For optimal fiber output expect only one entry per rotation, that being to harvest the stand. Susceptibility to infection and disease prohibits the harvest of aspen fiber in more than one entry, if all available fiber produced in a rotation is to be recovered. The one exception might be an initial thinning in a highly productive sapling stand to enhance ultimate sawlog production.

- Shelterwood cutting methods are inappropriate for fiber management with aspen because a source of seed and protection from the sun is not required. However, grouped openings of a uniform pattern of small clearcuts 1 or 2 tree heights across may be feasible. This system has yet to be tried. Cutting in this manner may have the potential to achieve vertical diversity while maintaining high fiber yield and adequate regeneration. Access must be laid out to avoid damage to young growth during subsequent entries.

## CHAPTER V. MITIGATION

A variety of mitigation measures may be employed to reduce the impacts or enhance the benefits of aspen treatments. A brief summary of common mitigation examples is provided in this chapter, organized by the resource they are designed to protect. Mitigation should be given full consideration whenever aspen treatment is proposed and should be clearly specified during project development.

Under the concept of forest management laid out in the Forest Plan, mitigation is built in for each management activity. However, for any instance there may be many choices for mitigation.

Mitigation measures are laid out in each Forest Plan in Chapter IV of the Plan's Environmental Impact Statement. The chapter contains a section entitled "Mitigation Summary of Envirnomental Consequences" which displays potential impacts and references the General Direction statements and standards and guidelines in the Forest Plan which pertain to that type of impact. A brief summary of common mitigation examples is provided in this document. For more complete mitigation information, refer to Chapter IV of specific Forest Plans.

Examples of Mitigation:

A. Visuals

- Plan, design and locate vegetation treatments in a scale which retains the color and texture of the characteristic landscape, borrowing directional emphasis of form and line from natural features.
- Design future entries over a 10 year period, not just the project at hand to assure the desired visual appearance over time.
- Use the Perspective Plot computer program to ensure aspen management proposals meet Visual Quality Objectives.
- Within 300 feet of visually sensitive roads cut stumps to within 6 inches of the ground, reduce slash to 18-24 inches and remove all rootballs from trees which are pushed over.
- Rehabilitate and revegetate all disturbed soil in retention and partial retention zones within 300 feet of the road within one full growing season after the project is completed.

B. Recreation

- Adhere to visual resource management objectives established for the treatment area, not only for vegetation treatment but for road location, design, construction and maintenance.
- Treat slash as necessary to prevent conflicts with recreation use.
- In areas allocated to semi-primitive non-motorized recreation construct roads to the minimum standards, minimize the density, close roads after intended use, and schedule administrative use during periods which minimize the impact on recreation users.

- Consider relocating existing trails away from project activity areas when feasible.

- Protect existing trails which are located within the treatment area.

- In areas allocated for semi-primitive motorized recreation construct roads to minimum density and minimum standards. For roads to be left open to meet long term transportation needs, locate to enhance recreation opportunities such as making connections with existing roads in adjacent areas to provide loop or extended trip opportunities.

- Use signs where appropriate to explain management practices.

C. Wildlife and Fisheries

The following mitigation is based on the management indicator species within the Diversity Unit when unacceptable impacts are identified:

- Identify critical or limiting habitat factors and write comprehensive treatment prescriptions to resolve or prevent any decline in species numbers or habitat. This might include varying sizes, shapes and quantities of treatment areas, or adjusting the timing of operations.

- If critical or limiting habitat must be reduced, provide compensating habitat. For example, if the limiting factor is associated with road use, close roads in adjacent areas or limit road use and development, or if reduction of snag component would occur, leave 1/4 acre group of trees for snag dependent species.

- Adjust the widths and sizes of untreated areas of aspen to improve the habitat quality for indicator species.

- Schedule treatment activities to avoid critical use periods.

- Adjust project road locations and/or use culverts to reduce sediment production unacceptable to fish.

- Reduce size of treatments, relocate treatments, or schedule them over longer periods of time if anticipated increases in water yield will produce seasonal flows unfavorable to fish.

- Manage to maintain mixed stand conditions in areas of extensive aspen.

D. Livestock Grazing

- Schedule treatments at times when livestock are not present and when access roads are not being used by livestock.

- Ensure protection of livestock management improvements.

- Maintain livestock trails and access to stock ponds.

- Treat or manipulate slash so that it does not impede livestock use of the area.

- Clear trails through dense regeneration to promote livestock utilization.

- Allow adequate grazing in regenerating areas to prevent high densities of stems which will impede long term utilization of forage.

E. Soil and Water

- Reduce erosion caused by management activities to natural erosion rates in the season of disturbance.

- Provide for adequate filter strips between new roads and water bodies.

- Limit the use of chemical agents to times and places where possible transport to or by the surface water has a low probability of occurrence.

- Avoid operation of equipment on sensitive soils during wet periods to prevent soil compaction and root damage.

F. Aspen Regrowth

- Control livestock use until new sucker growth is no longer vulnerable to damage.

- Remove excessive slash to allow new trees to develop.

- Cut all trees in treatment areas to release new stems.

- Close areas to off-road vehicle use.

G. Riparian Areas

- Avoid building access roads in riparian areas. If necessary to cross, locate at a narrow point perpendicular to the drainge.

- Close and rehabilitate roads immediately after intended use.

- If a road must parallel a riparian area locate it outside the riparian ecosystem or far enough away from the water body to reduce undesirable impacts.

- Restrict vehicle use within 50 feet of the stream or water body when treatments occur within a riparian area.

- Do not push or fall trees across a stream or water body.

- Avoid degrading water quality by limiting exposed soil surface.

- Use of alternate watering facilities, livestock herding, fencing, or grazing restrictions can be used to protect critical aspen riparian areas.

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