CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

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4.1 INTRODUCTION

This chapter describes the environmental consequences of implementing each of the six alternatives presented in Chapter 2 (see 2.3.2). Material from Chapter 2 is not repeated here, and it may be helpful to refer to that chapter while considering the environmental consequences described below. Environmental consequences of resources are presented in the same order as Chapter 3 to facilitate locating items of interest. A summary of effects precedes each resource discussion to assist the reader in determining which detailed effects disclosures are important to their interests.

The discussion that follows discloses the probable direct, indirect and cumulative effects of using management direction in each alternative in future project design and implementation. The information presented pertains to those aspects of the biological and physical resources on NFS lands, and the outputs and services projected to come from use of those resources, that are likely to be most directly affected within the geographic scope of the proposed action. The time frame for the disclosures is the life of the amendment, the time period between when the amendment is implemented and forest plans in Utah are revised (projected to be 4 years or less). Longer term effects will be discussed that may result from use of management direction during the life of the amendment, as appropriate.

It should be noted that on its own the management direction adopted through this project would not change the physical environment nor is there irretrievable or irreversible commitment of resources. Any subsequent site-specific action that may change the environment, and which uses the direction adopted to guide project design and implementation is subject to appropriate site-specific analyses required by the NEPA, as well as any other relevant planning regulations.

4.1.1 Incomplete or Unavailable Information

There are less than complete inventories and knowledge about many of the relationships and conditions of wildlife species, forests, and the economy. Management of large forests is a complex and developing discipline. The biology of the northern goshawk prompts questions about population dynamics and habitat relationships. The interaction among resource supply, the economy, and rural communities is also the subject of an inexact science. The ID Team examined the available data and the best available information was used to evaluate the options and alternatives. When encountering a gap in information, the question implicit in the CEQ regulations on incomplete or unavailable information was posed: "Is this information 'essential' to a reasoned choice among alternatives?" [40 CFR §1502.22(a)]. While additional information would often add precision to estimates or better specify a relationship, the basic data and central relationships are sufficiently well established that any new information would be unlikely to reverse or nullify understood relationships. Though new information would be welcome, no missing information was evaluated to be essential to a reasoned choice among the alternatives as they are constituted.

Nonetheless, the precise relationships between the amount and quality of habitat and the future populations of species are far from certain; there is a certain level of risk inherent in the management of forest lands even to standards based on conservative application of those relationships.

All other things being equal, the less the information the greater the risk attributable to incomplete knowledge. That relationship is an impetus for the monitoring, research and adaptive management that is part of these alternatives. Should there be new scientific information on change in habitat conditions not projected under the selected alternative, there are provisions for changing management of the affected national forests to reflect the new information and the management practices for which it calls.

This adaptive management process, which is guided by monitoring, provides additional assurance of compensating for possible catastrophic changes.

4.1.2 Cumulative Effects

Cumulative effects are those impacts on the environment which result from the incremental effects of a proposal added to other past, present, and reasonable foreseeable future actions regardless of which agency or person undertakes them (see 40 CFR §1508.7). The cumulative effects area considered in analyses of biological resources encompasses the majority of Utah and contiguous forested lands in the adjoining States of Colorado and Wyoming (Appendix G*)*. The cumulative effects area represents habitat that goshawks use during their normal life cycle of spring, summer, and fall. No measurable direct or indirect effects were identified for physical resources, therefore no cumulative effects area was identified. The social and economic cumulative effects assessment area was the State of Utah. Though small portions of lands in Wyoming and Colorado may be affected by this action, the area in these states was not believed to be sufficiently large enough where actions taken at this programmatic level would measurably affect their social or economic environment at the state scale. The paragraphs below summarize the key conclusions from the full effects disclosure that follows in the subsequent resource sections.

Summary of Key Conclusions - The Assessment (Graham et al. 1999) is the basis for the effects analyses which indicates that current conditions are sufficient to support viable populations of goshawk in Utah. The discussion here is how the alternatives will affect goshawk habitat, over time and space, and identify the risks and assurances of maintaining the sufficient habitat currently present. Cumulative effects may result from use of any of the proposed goshawk direction (Alternatives B-F) in combination with past, present and reasonably foreseeable actions and policies. Other current programmatic efforts, including the roads policy (currently interim with a final expected by the end of 1999), Utah Fire Amendment (approximately on the same time line as this project) and lynx strategy (USDA Forest Service 1999, affects only the northern Utah Forests) will add more prescriptive management direction for land managers to follow. Cumulative effects from these prescriptive management directions may result in changes in opportunities available to user groups (i.e., ranchers, loggers, recreationists). For example:

- If tighter grazing utilization standards in Alternative D are implemented, ranchers will likely need to find other options for supplemental forage to make up for loss of forage on NFS lands, reduce grazing season or herd size, or both. In some cases, grazing permits will be reduced to a level where it may no longer be economically viable for a permittee to continue to graze livestock. When looked at in combination with restrictions that may result from other programmatic efforts underway, cumulatively the effect will increase the already measurable effect identified for Alternative D at the state scale (i.e., estimated 23% reduction in total permitted AUMs on NFS lands affected).

  Alternative F may affect grazing practices as well though to a lesser degree than Alternative D. Alternative D will impact more areas than Alternative F due to the blanket application of a common utilization standard across all forested acres. Alternative F will change grazing practices only in areas where grazing has been identified as contributing to an at-risk condition relative to goshawk or prey habitat. The grazing practice changed in Alternative F to address an identified problem may or may not affect current and future permits. Cumulatively, when the effects of Alternative F are looked at in combination with those that may result from other programmatic efforts, the effects are also likely to increase. However, unlike Alternative D, the

cumulative effects of Alternative F in combination with other programmatic efforts are not likely to be measurable at the forest or state scales during the interim period of the amendment.

- In all alternatives, there may be shorter time periods to accomplish timber harvest in some areas, given the guidelines regarding protection of goshawk nests and PFAs in combination with other direction protecting lynx habitat. Though nests and PFAs only represent 10% of any given territory, due to overlap of some territories or the location within timber sale areas, restrictions on these acres may indirectly impact activities in other areas due to restrictions on road access or other factors.

- A final example would be recreational use of an ATV trail that may be shortened or rerouted to protect an active goshawk nest. Though this has rarely happened in the past through application of similar restrictions, it may happen on occasion. The most likely effect would be the need to reroute a new trail during construction if an active nest is found.

These effects, when realized, will be disclosed during the site-specific analysis of effects for projects which use direction adopted through this action to guide project design and implementation. As stated in Chapter 1, the adoption of management direction through this project will not change the physical environment; there is no irretrievable or irreversible commitment of resources. Any subsequent site-specific action that may change the environment or result in the use impacts described in examples above will be subject to appropriate site-specific analyses required by NEPA.

Cumulative Effects and Monitoring - Cumulatively, assessment and monitoring are key at the broad scale to testing the effectiveness of prescribed management and validating estimates of results due to that management (or nonmanagement).

Monitoring item m-1 is designed to provide an indication of the effects from planned and unplanned activities on goshawk population trends over time. Monitoring item m-2 (applicable to Alternatives C, D, E, F) is designed to track the effectiveness of mitigation measures in preventing territory abandonment by goshawks during planned fire or mechanical vegetative treatments. Monitoring item m-3 (applicable in all alternatives except A) is designed to track goshawk habitat connectivity. Goshawk habitat connectivity is largely dependent on the spatial dispersion and patch size of mature and old forest groups within a 5th and 6th order watershed. Monitoring items m-4 and m-5 (applicable to all alternatives except A) are designed to track the effectiveness of mitigation measures in maintaining snags and down woody material important to goshawk prey species. And finally, monitoring items m-6 and m-7 (applicable to Alternatives D and F, respectively) are designed to track if mitigation measures for ungulate grazing utilization or other grazing practices are being met and whether they are effectively contributing to the maintenance of forage, mast and seed important to goshawk prey species.

Over time, monitoring items m-3 through m-5 (applicable to alternatives B-F) will contribute to assessing the success of direction adopted in maintaining or restoring habitat needed to support goshawks and their prey. In Alternatives D and F, m-6 and m-7 (respectively) will also contribute to this understanding. Monitoring item m-1 will contribute to assessing the effects of management activities on goshawk population trends over time.

Cumulatively, timber harvest and fire (both unplanned and planned) have annually impacted less than one percent of forested habitat in recent years. This pattern is unlikely to change until plans are revised (projected to be within 4 years). During the interim period it is estimated that less than 4 percent of the forested habitat on Utah's NFs would likely be affected by timber harvest and fire management. Due to the minimal acres estimated to be affected by these activities/events, it is difficult to detect any

measurable cumulative effects at the state scale during the interim period. Long-term trends of risks to goshawk population viability and risks to habitat quality from planned and unplanned habitat changes have been identified within alternative effects disclosures. Other land ownerships and less regulated forest management on State and private lands were considered in assessing these risks.

Alternative A, over time, would increase the risk of population declines at lower goshawk population levels. Current direction in Forest Plans does not provide for the consistent management of forest vegetation which promotes the structural, species and spatial diversity across multiple landscape scales that are key to the maintenance of stable habitat conditions. Promoting stable habitat conditions is important to reducing the risk of goshawk population declines. Monitoring item m-3 (applicable to all action alternatives) would track this diversity as landscape assessments are completed, keying in on the spatial dispersion and patch size of the mature and old forest groups.

Alternative E, because it would prohibit vegetation treatment in older aged timber stands, could result in the loss of future management options if vegetation changes occur in the near future from insect epidemics, diseases or wildfire that might have been prevented with treatment. The current bark beetle epidemics throughout the central and southern portions of the state are resulting in increased mortality that is expected to continue during the next decade. Alternative E may indirectly reduce future management options because the management direction to provide for goshawk habitat would perpetuate vegetative conditions that are not sustainable over time, increasing the risk of a "boom-bust" pattern of succession occurring. Monitoring items m-1 and m-3, described above, would be especially important to track if Alternative E is implemented.

In Alternatives D and F, aspen is predicted to respond with more growth in the understories because, in part, of the tighter restrictions on ungulate grazing utilization or other grazing practices. These changes in ungulate grazing practices would also be expected to increase the fine fuel loadings in aspen and ponderosa pine stands, resulting in a potential trend toward more frequent, low intensity wildfires. In the long-term this would promote conditions that have historically been more prevalent in Utah. In the shorter term, increased understory vegetation would be more noticeable under Alternative D than F due to the broad application of new grazing standards across all forested habitats in Alternative D, where new grazing guidelines in Alternative F would only affect limited areas where at-risk conditions are identified. While the immediate effects of increased understory vegetation would be noticeable during the planning period, the long-term and cumulative effects of more frequent understory fires would not be noticeable for several decades. Site specific changes in understory vegetation and associated ecological processes would likely be more evident under Alternative F due to the emphasis placed on addressing landscapes where grazing is contributing to at-risk conditions. Monitoring items m-6 (Alternative D) and m-7 (Alternative F) are designed to track success of implementation of prescribed adjustments in grazing practices. Successful implementation of prescribed changes in grazing practices will help managers determine if changes made were appropriate to address longer term effects to habitat for goshawk and their prey.

Alternatives C and F provide management direction that, over time, would tend toward more productive, sustainable habitat conditions across multiple landscapes for greater population stability and statewide goshawk abundance. These alternatives address all the key habitat elements identified in the Assessment and HCS as important to supporting viable populations of goshawks, especially as they pertain to the interim period of this amendment. Alternative F would likely provide more measurable short-term gains than Alternative C due to the emphasis in Alternative F to work in areas where key habitat elements are considered to be at-risk.

Alternative B will provide similar conditions to Alternatives C and F, but could cause less stability in desired habitat conditions within smaller scale landscapes due to the allowance of management for

extreme disturbance events (within the full range of historic range of variability). Under all alternatives, extreme disturbance events would occur as a natural part of the ecological process, but only Alternatives B and E would allow land managers to initiate events that mimic these extremes. Management for these extreme events may cause locally undesired conditions in the short-term within smaller scale landscapes. Also, this alternative provides greater flexibility in addressing site specific conditions. However, in some cases this greater flexibility may not provide for the consistent achievement of desired habitat. For instance, the canopy closure guideline in this alternative may not result in the range of canopy closures actually desired in the variety of cover types and habitat areas identified in the Assessment and HCS versus the guideline in Alternatives C and F which indicate the need for a range.

Alternative D closely follows the defined habitat conditions described in the HCS and Reynolds et al. (1992). However, in contrast to Alternative B, Alternative D provides less flexibility to address the variety of conditions encountered at the site-specific scale. This may lead to the application of treatments that will not achieve the desired habitat outcome for some sites. Also, the increase in the amount of prescriptive direction that must be addressed during the project design and implementation phase may actually reduce implementation success due to complexity and inappropriateness to some sites and will likely reduce the number of acres treated that may be at-risk.

4.2 PHYSICAL COMPONENTS

4.2.1 Soil

Effects Summary - Current forest plan direction and Best Management Practices (BMPs) designed to protect the soil resource would not be superceded by any direction proposed under the action alternatives; the no action alternative would continue to use current direction. There would be no negative direct, indirect or cumulative effects to soils. Alternatives D and F may result in some beneficial indirect and cumulative effects, but they are not likely to be measurable in 4 years.

Discussion - Preventive planning is the key to successful maintenance of the soil resource. Prescriptions and forestwide standards and guidelines for soil and water mitigate long-term consequences related to the soil resources. Specifications for conserving the soil are found in contract and permit provisions and guidance on the effects of management activities on the soil resource is found throughout the FSM and various FSHs. And, each of the six affected national forests applies many erosion control procedures (Soil and Water Conservation Practices or BMPs, when they are adopted by the State of Utah and the Forest Service in response to Section 208 of the Clean Water Act). Although designed to protect water quality, BMPs indirectly maintain the watershed and soil resource.

Three major activities impacting soil productivity are vegetative manipulation, livestock grazing, and road construction.

- *Vegetative manipulation* activities have a potential to cause soil disturbance, soil displacement, increase soil compaction and soil loss through erosion. Changes in vegetative ground cover and compacted soils reduce water infiltration and rates of water runoff. High rates of overland runoff increase soil loss as water moves soil particles. The use of fire as a tool to change vegetation successional stages can have detrimental effects on the soil resource if it becomes too hot and consuming, however, when implemented within the proper prescription window of soil moisture, effective results can be achieved. The organic surface horizon of the soil contains most of the nutrients available for plant growth. When this horizon is removed, the soil loses much of its capacity to supply nutrients.

- *Improper livestock management* and improper season of use can result in excessive soil compaction and loss of natural vegetative cover. Water runoff increases, more soil erodes, and nutrients are lost.

- *Road construction* exposes disturbed soil to erosional forces, interrupts drainage patterns, and can intercept subsurface water flows.

The types of management activities, and conditions under which they occur, determine effects on soil productivity. Determining the suitability of specific soils for management practices is an important first step in preventing or minimizing soils-related adverse impacts. This determination is accomplished during the NEPA process each national forest conducts for specific projects.

Effects Common to All Alternatives - When assessing the effects of applying proposed direction under each alternative on NFS lands within the project area no negative direct, indirect or cumulative effects were identified. Applying direction proposed under action alternatives, or use of current plan direction, will maintain the soils resource and related long-term productivity. Current forest plan direction and BMPs designed to protect the soil resource will not be superceded by any direction proposed under action alternatives; the no action alternative continues current direction.

Alternatives D and F -Though no negative effects to the soil resource are anticipated, indirect and cumulative beneficial effects could occur by using direction in these alternatives during future project design and implementation, though unlikely to be measurable within the 4 years this amended direction would be in place.

Overall, soil productivity and watershed condition could improve under Alternative D as a result of applying guidelines for wildlife and livestock utilization of grasses, forbs and shrubs. Where livestock grazing is contributing to problems related to soil productivity, this direction may contribute to meeting restoration objectives. However, if utilization is not the aspect of grazing practices resulting in an identified problem, this alternative would not result in any greater indirect beneficial effects to this resource.

Under Alternative F improved soil productivity and watershed conditions are likely to occur because it sets priority on treatment of landscapes where systems are functioning-at-risk. For instance, if landscape assessments determine grazing is contributing to an at-risk condition related to habitat for goshawk and its prey, modifying grazing practices (i.e., utilization, season of use, grazing system, etc.) to meet habitat objectives may indirectly benefit soil productivity. Other indirect benefits to the soil resource may also be achieved by improving other habitat elements in these at-risk landscapes that are related to maintenance of soil productivity, such as cover, down logs and woody debris. Other action alternatives would also result in these improvements where treatments designed to meet habitat needs overlap areas that could benefit the soils resource. However, by focusing on landscapes at-risk under Alternative F, the greatest indirect benefits to this resource are likely to occur over the next 4 years, compared to other alternatives.

4.2.2 Water

Effects Summary - Current forest plan, FSH and FSM direction and BMPs designed to protect the water resource will not be superceded by any direction proposed under action alternatives; the no action alternative continues current direction. Therefore, there will be no negative direct, indirect or cumulative effects to this resource. Alternatives D and F may result in some beneficial indirect and cumulative effects, but they are not likely to be measurable in 4 years.

Discussion - Prescriptions and forestwide standards and guidelines for soil and water mitigate long-term consequences relating to the water resources. Policies and specifications pertaining to water can be found throughout the FSM, in various FSHs, and in Forest Plans. Current management direction in each of the Forest Plans focuses on water quality and securing favorable conditions of in-stream flows sufficient to maintain the stability of stream channels for favorable conditions of water flow and protection against the loss of productive timber lands adjacent to the stream channels. This includes the volume and timing of flows required for adequate sediment transport, maintenance of stream bank stability and proper management of riparian vegetation.

Effects Common to All Alternatives - When assessing the effects of each alternative on NFS lands within the project area, none of the alternatives will degrade existing uses and waters of high quality. The direction contained in the action alternatives is programmatic and does not supercede any of the direction currently in the Forest Plans concerning BMPs. Future project design and implementation will continue to assess the success of site-specific projects in meeting water quality standards by applying those BMPs.

Alternatives D and F - Though no negative effects to the water resource are anticipated, indirect and cumulative beneficial effects could occur by using direction in these alternatives during future project design and implementation, though unlikely to be measurable within the 4 years this amended direction will be in place. The reasons for this are similar to that discussed under the soil resource for these alternatives.

4.3 BIOLOGICAL COMPONENTS

4.3.1 Vegetation

The following analysis of environmental consequences on vegetation follows the formatting in Chapter 2 (2.3) and discusses environmental consequences in terms of the "Management Direction" categories (2.3.2). Whenever possible, the cover types in Chapter 3 are discussed in total with specific cover types highlighted when appropriate or differing from the overall discussion. The elements of ecosystem process, composition, and structure are discussed throughout the sections and are not limited to the discussions under Native Processes, Forest Composition, and Forest Structure.

Effects Summary

Alternative A: Alternative A allows the widest range of options for managers. Vegetation management could range from remaining within sustainable conditions (as defined by HRV and/or PFC) to falling outside of these criteria. Managers would continue to have the option to balance resource concerns and select which concern would take precedence if conflicts were present.

Alternative B: Alternative B is the most flexible of the action alternatives. It is, however, less flexible than Alternative A and thus would limit decision space, removing the option to manage outside of sustainable conditions, as defined by HRV. The lower canopy closure requirements translate to lower density requirements and thus would allow treated stands to be managed for improved tree growth and vigor. This would allow stands to be managed for lower insect susceptibility, relative to all other action alternatives.

Alternative C: Alternative C is the second most flexible of the action alternatives. Some of the recommended stand densities (which are the same in C and F) are higher than Alternative B, but are more flexible than Alternatives D and E. This alternative contains an upper density limit as well as a lower. By virtue of this flexibility, managers would have greater decision space to balance resource concerns, while managing stands to remain within PFC. PFC remains within HRV, but is a more conservative approach that better allows managers to insure ecosystem elements are sustained (see ''Understanding HRV and PFC'' below).

Alternative D: Alternative D is the second least flexible alternative. Stand density guidelines, although similar to C and F, are substantially more prescriptive in this alternative than in any other, and this may affect the ability to successfully implement the guidelines (see 4.5.7 Administrative Considerations). This alternative and Alternative E contain guidance on roads on all forested acres, which may serve to restrict access to some areas. By virtue of reduced treatment acreage and increased complexity of density management, this alternative is second to Alternative E in its potential to foster stand conditions that may not always be sustainable, due largely to insect susceptibility and uncharacteristic wildland fire.

Alternative E: Alternative E is the least flexible alternative. Through the maintenance of high overstory densities, the elimination of mangers' options to manage VSS 5 and 6 classes, and access restrictions; this alternative would promote stand conditions that would likely not be sustainable over time, largely due to high susceptibility to insect epidemics and uncharacteristic wildland fire. Additionally, Alternative E would promote landscape conditions that would continue along the current trends of increased dominance by late seral communities, a condition that has been identified as outside of PFC (USDA Forest Service 1996) and possibly outside of HRV.

Alternative F: Alternative F is the third most flexible of the action alternatives. While it shares many of the same guidelines as Alternative C, it does restrict management activities to those ecosystems (or portions thereof) where ''at-risk'' conditions can be treated to maintain or enhance ecosystem function. Some of the recommended stand densities (which are the same in C and F) are higher than Alternative B, but are more flexible than Alternatives D and E. This alternative contains an upper density limit as well as a lower. By virtue of this flexibility, managers would have greater decision space to balance resource concerns, while managing stands to remain within PFC. Alternative F focuses management attention on problem or potential problem areas, it does reduce the manager's decision space by removing the option to treat functioning systems when goshawk habitat management is the primary objective.

Assumptions for and Basis of Effects - Some commonalties exist between all alternatives, some between all "action" alternatives, and some between specific alternatives. Commonalities between all alternatives are discussed first, followed by Alternative A ("no-action''), then by all action alternatives, with specific discussions for each alternative following. Where two or more (but not all "action'') alternatives share common environmental consequences, these discussions are placed near the individual discussions for the specific alternatives.

Effects on vegetation are evaluated relative to indicators of sustainability as defined by historic range of variability, properly functioning condition, and insect susceptibility. The potential each alternative has to affect vegetation structure, vegetation composition, and ecosystem process is evaluated in this light. Stand density, intra-tree competition, species composition, seral stage, and successional pathways are considered and alternatives are compared to the Alternative A, No Action, as well as to each other.

Direct, indirect, and cumulative effects of each alternative are discussed; however, separate sections are not provided for these discussions. Direct effects are considered on NFS lands; indirect and cumulative effects are considered for all forested lands within the analysis area. The cumulative effects area for vegetation is the same as that described in the wildlife section and displayed on the Cumulative Effects Map. It includes all or portions of the following ecosections as described in Bailey (1994) (Appendix G): Overthrust Mountains, Uinta Mountains, Bonneville Basin, Uinta Basin, Tavaputs Plateau, Southeastern Great Basin, Utah High Plateaus and Mountains, Northern Canyon Lands, and Grand Canyon Lands Sections.

Without intervention from natural or human-caused disturbance, vegetation structural and compositional changes are relatively slow and unnoticeable within a 4-year period in ecosystems within the Intermountain area, due largely to short growing seasons and relatively slow growth rates.

Effects to vegetation resulting from management, or protection, may be short term, long term, and cumulative. Both short and long-term impacts may be realized where treatments are heavily impactive, such as complete stand removal. Light treatments, such as stand thinning, underburning, and some fire suppression treatments, may have minimal short-term impacts but more subtle long-term and cumulative effects. Species composition and vegetative structure may be modified for long periods. These effects tend to be long-term and cumulative over long time frames, typically in excess of 100 years.

During the 4-year analysis period, effects would occur at the project level. Effects would be unlikely to be noticeable at the State level (the analysis area) due to the limited potential amount of activity that would occur in the next four years. On NFS lands, timber harvest averaged approximately 10,600 acres annually from 1990-1997 or approximately 0.2% of the nonwilderness, forested acres on national forest (exclusive of woodland forests). From 1994-1998 the number of acres in Utah burned in wildland fires averaged 22,500 acres, and the number of acres burned by prescribed fire averaged 20,400 acres per year (these acres include all fires on national forests including wilderness and fires in nonforested habitats). Cumulatively, timber harvest and fire have annually impacted less than 1% of forested habitat during recent years. This pattern is unlikely to change during the planning period (the next 4 years).

Where vegetative management is practiced, reentries into mechanically treated areas are generally not planned for long periods of time (ranging from 15 to 30 years between treatments). Thus any prescriptions initiated during the planning period (four years) would likely carry through until the next entry cycle (15 to 30 years). Cumulative effects may affect treatment areas where the applied management practices continue into future cutting cycles.

Refer to Appendix D for discussions on "HRV and PFC" and "Canopy Closure and Stand Density Index." Concepts described in this discussions lay the foundation for the analysis of effects that follows. A sound understanding of these concepts is needed to fully understand the effects analysis section that follows.

Discussion of Effects

Native Processes

Alternative A: Other than Alternative A, all alternatives recommend that management actions emulate natural disturbance regimes as defined by HRV and/or PFC. Management within PFC gives land mangers their best estimate of maintaining landscapes within sustainable conditions ecosystems while remaining within socially acceptable limits. Management outside of PFC would put ecosystems at greater risk of uncharacteristic disturbance. Recently completed Regional and local PFC assessments

have identified that many of the State's ecosystems are skewed toward late seral conditions and that these conditions are outside of PFC for many areas. Alternative A gives no guidance on the use of either HRV or PFC, thus managers have the option to manage within or outside these parameters.

The current Forest Plans do not give direction regarding natural disturbance regimes nor do they address ecosystem management. In recent years, ecosystem management has become a national emphasis item as part of the Natural Resource Agenda. Implementation of ecosystem management varies by Forest across the State. Under Alternative A, this variability in application would continue, and current direction would continue unless altered by other analysis. One such analysis is currently under consideration. A draft Prescribed Fire Amendment for the national forests in Utah is under development that would likely amend all Forest Plans in the State to increase the use of prescribed and wildland fire, primarily for the reduction of hazardous fuels. This amendment is following recent federal wildland fire policy.

All Action Alternatives: All action alternatives recommend that management actions emulate natural disturbance regimes as defined by HRV. Alternatives C, D, and F add PFC as a criterion. Guidance is for actions to remain within the variability of size, intensity, and frequency of native disturbance regimes characteristic of the subject landscape and ecological processes. Management actions within disturbed ecosystems are to be designed with restoration in mind. The general guidance in these alternatives is applicable across all vegetation cover types.

Due to social, political, and legal constraints, the two guidelines in this portion of the document may not always be attainable at all scales (thus they are "guidelines" and not "standards"). For example, NFMA opening size limitations on even-aged forest management did not take into account natural disturbance regimes and patterns, thus for systems where disturbance patterns were large, legal considerations may not allow for management to fully emulate these larger events. Management direction to emulate the smaller scale events can be achieved.

The current Forest Plans do not give direction regarding natural disturbance regimes nor do they address all components of ecosystem management. In recent years, ecosystem management has become a national emphasis item as part of the Natural Resource Agenda. Implementation of ecosystem management varies by Forest across the State. All action alternatives would similarly provide for greater consistency. The draft Prescribed Fire Amendment for the National Forests in Utah is another analysis currently under consideration that would potentially provide additional direction for the implementation of ecosystem management. It would likely amend all Forest Plans in the State to increase the use of prescribed and wildland fire, primarily for the reduction of hazardous fuels. This amendment is following recent federal wildland fire policy.

Management within HRV provides managers with an estimate of maintaining ecosystems within their natural bounds, which may include broad swings in ecological amplitudes. These broad swings may or may not be socially or economically acceptable within any given landscape. Management within PFC is a more conservative approach and provides managers with their best estimate of managing and maintaining sustainable ecosystems while remaining within socially acceptable limits. To manage outside of PFC would put ecosystems at risk. Risk may be from uncharacteristic disturbance, soil loss, and/or species loss (plant and animal) from within that ecosystem. To manage landscapes outside of HRV may subject ecosystems to irreversible change.

Additional discussion below on the proposed management direction details how actions are consistent with HRV and PFC. See 4.3.1 above for a discussion on the use of HRV and PFC concepts in assessing landscape conditions.

Forest Composition

Alternative A: While it is well recognized within the State that aspen systems are at-risk, treatment acreage remains low, largely due to economic feasibility. It is likely that reductions in aspen cover would continue their current trend. The prescribed burning program has the greatest potential to beneficially impact this type. This alternative allows management for aspen, but does not emphasize the need.

Current Forest Plan direction does not address the use of native vs. nonnative species, with the exception of reforestation guidelines for timber management areas (where native trees of locally adapted seed source are to be used unless Regional variance is granted). Under Alternative A, no emphasis would be added to current management direction, and the use of native or nonnative species would remain at the discretion of the local land manager. National and Regional guidance is currently being developed that would likely result in a native plants policy with recommendations similar to that proposed under Alternatives B-D and F. Nonnative species have the potential to replace or (in some cases) hybridize with natives, and thus could alter ecosystem process, composition, and structure over time. The use of native plants is the most conservative approach to insuring that ecosystem processes are not inadvertently altered. The cover types that have been most impacted are generally in lower elevation areas and usually in closer proximity to human population centers. However, all vegetation types have the potential to be impacted by non-native and exotic species.

Current management direction generally does not discuss seral stages, with one exception. Neither do Plans identify the general need to maintain "early seral species," although most recommend specific species. Forest Plans generally recognize the need to maintain vegetative diversity at the forest scale, however, they are very general in nature and do not discuss the need at a landscape level. Maintenance of a variety of seral stages in each cover type would help insure that all ecosystem components remain on landscapes. As identified in PFC documents, this is needed for ecosystem resiliency to disturbance.

All Action Alternatives: Guidelines recommend maintenance of the full range of seral stages, by cover type, across landscapes with "strong representation of early seral species." This guideline is the same for all alternatives except Alternative A. Maintenance of a variety of seral stages in each cover type would help insure that all ecosystem components remain on landscapes, and would thus help maintain ecosystem resiliency to disturbance.

Alternatives B, C, D, and F: Proposed guidelines recommend using native plants from locally adapted seed sources preferentially over nonnatives when and where they are available. Nonnatives may be used if their use can be justified to maintain or restore treated areas to functioning conditions. Nonpersistent, nonnative species can be used to help address short term, site-specific problems. Justification could include (among other considerations) seed availability, the ability of the seed mix to achieve project goals in a timely manner, and economics.

Alternatives B and C: While it is well-recognized within the State that aspen systems are at-risk, treatment acreage remains low, largely due to economic feasibility. This alternative is unlikely to have an impact on these factors, either positive or negative. The recognition of natural disturbance regimes and the need to manage for seral species may help to emphasize the need to manage for this species. This alternative would allow management for aspen, but does not specifically emphasize the need. The prescribed burning program has the greatest potential to beneficially impact this type.

Alternative D: While it is well recognized within the State that aspen systems are at-risk, treatment acreage remains low, largely due to economic feasibility. Restrictions (opening size and green tree

retention) in this alternative would exacerbate this by reducing management options, and it is likely that reductions in aspen cover would continue. Reduced grazing pressure may benefit aspen regeneration in some areas, and the recognition of natural disturbance regimes and the need to manage for seral species may help to emphasize the need to manage for this species. This alternative would allow management for aspen but restrictions may make mechanical treatments uneconomical. It does not specifically emphasize the need to manage for aspen. The prescribed burning program has the greatest potential to beneficially impact this type.

Alternative E: While it is well recognized within the State that aspen systems are at-risk, treatment acreage remains low, largely due to economic feasibility. Restrictions (opening size, green tree retention, and limitations on management of VSS 5 and 6 classes) in this alternative would exacerbate this by reducing management options. It is likely that reductions in aspen cover would continue their current trend or increase. Under Alternative E, the prescribed burning program would not be available to treat VSS 5 and 6 class aspen. Alternative E allows for the fewest management options in the cover type.

Alternative E differs from B-D and F in that the use of native species becomes a requirement rather than a guideline. The use of native plants from locally adapted seed sources is required. Nonnatives may not be used. The inability to use nonnatives may have some impact on a limited number of projects temporarily and economically. Depending upon the species mix required and the project location, limited native species are generally available though prices are normally somewhat to substantially higher than for nonnatives. Native species may not germinate and grow quite as rapidly as nonnatives, thus disturbed sites (such as road cuts) may be left exposed somewhat longer when using only natives. Under this alternative, the use of nonpersistent, nonnative species to help address short term, site-specific problems would not be permitted.

Alternative F: While it is well recognized within the State that aspen systems are at-risk, treatment acreage remains low, largely due to economic feasibility, and it is likely that reductions in aspen cover would continue. Reduced grazing pressure may benefit aspen regeneration in some areas, and the recognition of natural disturbance regimes and the need to manage for seral species may help to emphasize the need to manage for this species. The prescribed burning program has the greatest potential to beneficially impact this type. Through the focus on ecosystems-at-risk, this alternative would likely emphasize the need to manage for the aspen cover type, thus Alternative F has the greatest potential to stimulate projects beneficial to aspen cover types.

Forest Structure

Alternative A: Other than Alternatives A and E, all alternatives recommend the same distribution of vegetation structural stages. Most current Forest Plans do not contain direction on the maintenance of structural stages, other than general guidance to maintain forest diversity and guidance to maintain 5-10% of the forest in old structures. Where guidance is provided on rotation length, the rotation ages may not provide sufficient time for the development of the desired VSS 6 class structures. This may necessitate that areas be designated for mature and old classes and managed for different rotation lengths than the surrounding forest. This may make it difficult for areas managed for mature and old structures to change spatially across landscapes over time, which is needed to plan for replacement stands.

The ability to maintain large trees is allowable under current Forest Plans. However, current forest plans do not stress the need, and should treatments remove large trees from a landscape or reduce the percentage of area of mature and old below the desired 40%, these VSS classes would likely take years to replace.

All action alternatives recommend the same snag retention guidelines. These guidelines generally exceed the number and size of snags contained in current Forest Plan direction. Under Alternative A, the current guidance would continue. While standing, snags have a neutral effect on vegetation, over time snags contribute to down woody debris and the benefits that debris has to soils and vegetation (as discussed below).

Other than Alternative A, all alternatives recommend the same guidelines for the retention of woody debris. The recommended guidelines in Alternatives B-F exceed that required in most Forest Plans. Several plans have no specific direction on the maintenance of woody debris. Down woody debris is an important component of ecosystems, providing for nutrient recycling, helping to build desirable soil properties, providing erosion control, and providing important microsites for establishment, protection, and growth of forest regeneration. Most current silvicultural prescriptions recognize this and incorporate retention of woody debris to benefit the above attributes without contributing to excessive fuel loadings. Size requirements vary by prescription and may only require that specified in Forest Plans (where Plans specify) or a set number of tons per acre in debris greater than three inches in diameter. Vegetative needs for woody debris may not always be met under current Plan direction, however, the proposed guidance in Alternatives B-F meet these needs without creating excessive fuel loadings.

Other than Alternative A, all alternatives recommend density guidelines for vegetative treatments designed to maintain VSS 4, 5, and 6 classes, using either (1) canopy closure or (2) percent of area covered by clumps of trees with interlocking crowns as the measure of density. No Forest Plan included either measure as a part of forest management criteria. Currently forests are directed by Regional guidance to use SDI (stand density index) in the development of silvicultural prescriptions to manage stand density. Basal area is commonly used in coordination with SDI for field application, as basal area can be measured directly in the field using standard instrumentation and without additional calculations. Under Alternative A, current direction would continue without an added density management guideline. Crown closure would undoubtedly continue to be included in some stand examinations as an important wildlife habitat attribute.

Under current conditions, many of the mature and old stands are susceptible to insect epidemics. While current direction permits management to reduce insect susceptibility, it should be noted that treatments to reduce stand densities and associated susceptibility/risk are too few and scattered to reduce landscape level disturbances. Treatments are often effective at the stand or project scale, however, landscape level disturbances have the potential to override these small scale ecosystem alterations. Where tree diameters and stand densities result in susceptibility ratings of moderate or higher, susceptibility to insect epidemics is further increased when stands are dominated by a single species. This alternative would not modify current guidance and therefore current treatment options would still be permissible. Alternative A allows managers the widest latitude to reduce stand densities and thereby reduce susceptibility/risk. Comparatively for treated acres insect susceptibility increases as follows: Alternative A < B < Alternatives C = F < D < E.

All Action Alternatives: All action alternatives recommend the same snag retention guidelines. These guidelines generally exceed the number and size of snags contained in current Forest Plan direction. The recommended guideline is, by cover type, to maintain snags of a certain number (per 100 acres) and size when initiating vegetation management. This allows for small areas to be deficit if the average is obtained over the treated stand. Sub-stand level treatments would need to provide for snags only if such treatments, without snag retention, would result in a deficit at the stand level. It is allowable to substitute green trees for snags should snags not be available. The guideline does not discuss a preference system for the selection of green trees as snag replacements (using criteria such as tree decadence); this is left up to project planning to determine. This guideline would allow for treatments

such as precommercial or stand-improvement thinning in young stands that may not have the snag characteristics outlined in the guideline. The guideline allows for smaller snags should the desired size class not be available on the site. This allows for variance in younger stands and where site conditions do not produce trees of the desired size. While the snag recommendations for climax ponderosa pine (only) exceed recommendations in the *Region 4 Old Growth Definitions* (Hamilton 1993), research by Graham et al. (1994) has shown that these guidelines are obtainable and are not outside of HRV (Hamilton's work only addressed a per-acre figure). R4's Properly Functioning Condition (USDA Forest Service 1998) does not discuss snags and down woody; thus, it is assumed that remaining within HRV for these factors is appropriate. While standing, snags have a neutral effect on vegetation, over time snags contribute to down woody debris and the benefits that debris has to soils and vegetation (as discussed below).

All action alternatives recommend the same guidelines for the retention of woody debris. The recommended guidelines exceed that required in most Forest Plans. Several plans have no specific direction on the maintenance of woody debris. Down woody debris is an important component of ecosystems, providing for nutrient recycling, helping to build desirable soil properties, providing erosion control, and providing important microsites for establishment, protection, and growth of forest regeneration. The recommended retention guidelines would benefit these attributes without contributing to excessive fuel loadings. The guideline allows for deviation in down log size where the desired minimum is not attainable.

All action alternatives recommend density guidelines for vegetative treatments designed to maintain VSS 4, 5, and 6 classes. There are no density guidelines for VSS 1, 2, and 3 classes. Alternatives B, D, and E use canopy closure as the measure of density. Alternatives C and F use percent of area covered by clumps of trees with interlocking crowns. Using either measure differs from current plan direction as no Forest Plan included these measures as a part of forest management criteria. For Alternatives B, D and E, the recommended densities are considered to be minimums, that which would be present immediately after any vegetation treatment; there are no maximum recommendations. The guideline allows a variance where it can be demonstrated that the recommended densities are not consistent with HRV for the site. This occurs on some climax ponderosa pine sites, where root competition occurs before canopy competition. This may also occur on sites that were not historically forested, such as shrub lands dominated by oak brush that have had a conifer component increase due to fire exclusion (this typically is Douglas-fir or white fir). This variance would allow these areas to be managed for historic patterns and structures.

Percent of area (Alternatives B and F) is roughly equivalent to canopy closure (Alternatives C, D, and E) as measured by the drip-line of trees. In order to assess what the density requirements for each alternative mean to tree growth and vigor and to insect susceptibility, it is necessary to convert the canopy closure guidelines to more traditional measures of density. There is no widely accepted translation between canopy closure and the traditional measures of density, and having to measure canopy closure within each group is unnecessarily time-consuming (Smith and Long 1999). For purposes of this analysis, the Forest Vegetation Simulator (FVS) (Crookston and Stage 1999) is used to develop and display the potential relationships. Tables 6 and 7 following were empirically derived from FVS runs. Foraging areas are represented by all forested habitat, other than post-fledgling and nest areas. Post-fledgling areas comprise approximately 600 acres, or 10% of a goshawk territory. Nest areas comprise a sum of at least 180 acres, or approximately 3% of a territory.

The Region 4 PFC Process recommends that stands should be managed below a maximum of 50% SDI% max (climax ponderosa pine should be managed at 35% SDI%max or lower) in order to maintain properly functioning condition. It also recommends maximum basal areas for each cover type as

follows: ponderosa pine - 120; mixed conifer - 160; spruce-fir - 150; lodgepole pine - 90; and aspen - 140 square feet per acre (1998).

Table 6: Approximate range of stand density indices* (and percent of maximum SDI) for various canopy closures (CC) by cover type.

Cover Type	40% CC	50% CC	60%CC	70% CC	75% CC
Ponderosa Pine	75-125 SDI 16-28% max SDI	140-165 31-37%	190-215 42-48%	245-280 54-62%	290-305 64-67%
Mixed Conifer	80-85 13-15%	110-115 18-20%	150-160 25-27%	185-200 31-34%	210-225 35-38%
Spruce-Fir	110-130 16-20%	145-170 21-25%	200-225 29-34%	260-290 38-44%	305-325 46-48%
Lodgepole Pine	90-110 12-16%	125-150 18-22%	170-200 24-29%	220-250 31-36%	255-280 33-40%
Aspen	65-120 10-20%	100-145 16-24%	115-190 19-32%	175-240 29-40%	215-280 36-47%

*Developed from stand simulation runs using the forest vegetation simulator.

Table 7: Approximate range of basal areas* for various canopy closures (CC) by cover type.

Cover Type	40% CC	50% CC	60% CC	70% CC	75% CC
Ponderosa Pine	50-60 BA	75-90 BA	100-110 BA	140-165 BA	160-170 BA
Mixed Conifer	30-50	45-75	60-115	80-130	100-135
Spruce-Fir	50-75	75-105	110-130	140-180	160-185
Lodgepole Pine	40-50	55-75	80-95	105-130	125-145
Aspen	45-50	55-65	75-90	100-115	115-135

*Developed from stand simulation runs using the forest vegetation simulator.

Alternatives B, C, D, and F: Other than Alternatives A and E, all alternatives recommend the maintenance of a balanced range of structural stages needed to maintain either 40% of the coniferous stands or 30% of the aspen stands in mature and old stages (VSS 5 and 6). Guidance does not extend to the percent of area in the younger VSS classes; this is left up to forest managers to determine what would be appropriate in order to obtain or maintain the VSS 5 and 6 class structures. This direction is consistent with recommendations developed in local and Regional PFC documents. Achievement of these conditions in a landscape would help maintain or improve system stability and sustainability for all forested cover types. All alternatives require the retention of some mature and old trees on landscapes.

Alternative B: Canopy closure guidelines call for 40% canopy closure in foraging areas and 50% in post-fledgling and nest areas in VSS classes 4, 5, and 6. This is consistent in this alternative across all cover types.

A potential problem area (identified using criteria developed in the Region 4 PFC process document for density management) is with climax ponderosa pine in post-fledgling and nest areas (approximately 10% of a goshawk territory) where 50% canopy closure is recommended. FVS runs indicate that ponderosa

pine stands initially thinned to prescription would exceed the PFC recommended 35% SDI%max within 5 to 30 years, depending on site and stand condition prior to treatment. This may occur before the next planned treatment entry. However, where these conditions can be demonstrated to be outside of HRV for climax ponderosa pine, this alternative allows a variance to manage these sites within HRV. Where management activities are proposed on such sites and variance is necessary, documentation would need to be done during the NEPA planning process.

For most coniferous types, susceptibility to insects rates as "moderate" under this alternative. Aspen stands would not be placed at risk from insects due to density guidelines. Where ponderosa pine is managed in excess of 50% SDI%max, it would be more susceptible to mountain pine beetle, with moderate-high or high susceptibility ratings in the VSS 5 and 6 classes. Treatments designed to manage larger size trees (VSS 4, 5 and 6) in small groups may relieve competitive stress, depending on surrounding stand conditions and the absence of environmental stresses. Susceptibility would not be moderated for trees that are on the interior of groups which are not affected by ‘‘edge effect’’ to relieve competitive stress. However, where higher densities are required (post-fledgling and nest areas) susceptibility would remain at least moderate. Managing treatment areas and adjacent landscapes for a mosaic of stand conditions and species mixtures would alleviate insect susceptibility and reduce the likelihood of large scale landscape disturbances. Comparatively for treated acres insect susceptibility increases as follows: Alternative A < B < Alternatives C = F < D < E.

Canopy closure affects understory species mixture and production. Field measurements have shown that understory species (composition and abundance) are reduced once overstory canopy closure reaches 40% (Winward 1999). At this point, shade tolerant species would begin to dominate. One study in the ponderosa pine type in Arizona indicates a sharp drop in understory vegetation production as canopy closure goes from 0% to 20% and a continued drop from 20% to 100% canopy closure (Deiter 1990). High canopy closures would favor the establishment of advance regeneration of shade tolerant tree species beneath the existing canopy. Without management intervention, this shade tolerant regeneration would persist. Other than Alternative A, Alternatives B, C, and F would have the least detrimental effects on understory vegetation as they allow maintenance of the lowest canopy closures. Alternative B does not have an upper canopy closure, which could result in some cases of higher canopy closures than reflected in the guideline. Project planning would determine the mix of desirable canopy closures.

Alternatives C and F: Density guidelines call for a variety of densities ranging from 40% to 70% of the VSS 4, 5, and 6 groups to be composed of clumps of trees with interlocking crowns. Alternatives C and F do not contain the specificity (by cover type and VSS class) of Alternative D, and are therefore somewhat more open to interpretation by managers and may therefore allow somewhat greater latitude to account for differing site conditions when developing management plans.

Potential problem areas (identified using criteria developed in the R4 PFC Process [1998] for density management) are in climax ponderosa pine and spruce-fir stands.

Where climax ponderosa pine in nest areas (approximately 3% of a goshawk territory) is managed for a minimum of 50% canopy closure, FVS runs indicate that stands initially thinned to prescription would exceed the PFC recommended 35% SDI%max within 5 to 30 years and the basal area recommendation within 20 to 25 years, depending on site and stand condition prior to treatment. This may occur before the next planned treatment entry. However, where these conditions can be demonstrated to be outside of HRV for climax ponderosa pine, this alternative allows a variance to manage these sites within HRV. Where management activities are proposed on such sites and variance is necessary, documentation would need to be done during the NEPA planning process.

Where spruce-fir stands are managed for a minimum of 70% canopy cover in nest areas, FVS runs indicate that stands initially thinned to prescription would exceed the PFC recommended 50% SDI%max within 15 to 30 years and basal area recommendations could be exceeded immediately to 5 years after stands reach 70% canopy cover, depending on site and stand condition prior to treatment. This may lead managers to reduce the time frame between treatment entries in order to maintain stands with acceptable risk ratings.

For coniferous cover types (except mixed conifer), susceptibility to insects rates at least "moderate" or "moderate-high" under this alternative in VSS 4-6. For mixed conifer stands, if Douglas-fir comprises a majority of the stand, bark beetle susceptibility would be "moderate-high" for VSS 4-6. Aspen stands would not be placed at risk from insects due to density guidelines. Where coniferous cover types are managed in excess of 50% SDI%max, they would be more susceptible to some species of bark beetles, with moderate-high or high susceptibility ratings in the VSS 5 and 6 classes. Treatments designed to manage larger size trees (VSS 4, 5 and 6) in small groups may relieve some competitive stress, depending on surrounding stand conditions and the absence of other environmental stresses. Susceptibility would not be moderated for trees that are on the interior of groups which are not affected by "edge effect" to relieve competitive stress. However, where higher densities are required (post-fledgling and nest areas) susceptibility would remain at least moderate and perhaps high. Managing treatment areas and adjacent landscapes for a mosaic of stand conditions and species mixtures would alleviate insect susceptibility and reduce the likelihood of large scale landscape disturbances. Comparatively for treated acres insect susceptibility increases as follows: Alternative A < B < Alternatives C = F < D < E.

Canopy closure affects understory species mixture and production. Field measurements have shown that understory species (composition and abundance) are reduced once overstory canopy closure reaches 40% (Winward 1999). At this point, shade tolerant species would begin to dominate. One study in the ponderosa pine type in Arizona indicates a sharp drop in understory vegetation production as canopy closure goes from 0% to 20% and a continued drop from 20% to 100% canopy closure (Deiter 1990). High canopy closures would favor the establishment of advance regeneration of shade tolerant tree species beneath the existing canopy. Without management intervention, this shade tolerant regeneration would persist. Alternatives B, C, and F would potentially have the least detrimental effects on understory vegetation as they allow maintenance of the lowest canopy closures. Alternatives C and F provide a range of canopy closures with upper ends, which may help to reduce project specific impacts over Alternatives B and D. Project planning would determine the mix of desirable canopy closures.

Alternatives D and E: Adds guidelines for ponderosa pine, mixed conifer, and spruce/fir cover types for regeneration opening size (mechanically created) and green tree retention in regeneration treatments (not restricted to mechanical treatments). Mechanical opening size is restricted to 1 acre in size in spruce/fir and 4 acres in ponderosa pine and mixed conifer (lodgepole pine and aspen cover types are not affected by this guideline). Project managers would need to apply this guideline with caution where overstory trees are infected with dwarf mistletoe to avoid causing young regeneration to become infected. Opening width is also restricted by this same guideline in the same cover types. This is consistent with uneven-aged stand conditions often found in these cover types and would promote establishment of regeneration of desirable species in these types. However, the green tree retention requirements in regeneration treatments in spruce/fir and mixed conifer cover types may be counterproductive to obtaining regeneration of early seral species. By requiring groups of mature trees to be left in each opening greater than 1 acre in size (mixed conifer) or 1/2-acre in size (spruce/fir), the establishment of late seral species regeneration would be favored. These two guidelines may not be fully consistent with the even-aged conditions found in many of Utah's mixed conifer (dominated by even-aged Douglas-fir and/or white fir) and spruce/fir stands.

The standards for green tree retention in regeneration treatments do not distinguish between mechanical and fire treatments. It may be difficult to impossible to meet these guidelines if fire treatments are used to create the openings.

Alternatives D and E add a guideline for the retention of mature and old trees when initiating mechanical thinning (nonregeneration treatment). This guideline applies to all forested cover types. This is consistent with uneven-aged conditions found in many of Utah's cover types (ponderosa pine, spruce/fir, mixed conifer, and some "stable" aspen stands). It is not consistent with even-aged conditions and historic patch size found in lodgepole pine and many aspen stands. For all forested cover types, where even-aged conditions exist, such treatment would, over time, result in a conversion to uneven-aged stands.

Alternatives D and E add additional guidance for the maintenance of down woody material following logging. These guidelines identify preferred slash treatments in order of priority. They identify common practices that are currently used throughout the State, although this priority system is not in current Plans. By specifying an order of priority, they serve to emphasize the needs of the goshawk and its prey. These guidelines would be unlikely to alter current slash treatments as they are consistent with current silvicultural prescriptions, BMPs, and Soil and Water Conservation Practices.

Alternative D: Density guidelines call for a variety of canopy closures ranging from 40% to 70% of the VSS 4, 5, and 6 groups. Alternative D contains a very specific table of guidance that delineates canopy closure by cover type, VSS class, and goshawk habitat area. The detail of the guideline may make it impractical to implement, as discussed in 4.5.7.

Areas of concern (potential problem areas) are the same as those discussed for Alternatives C and F, except that Alternative D expands the higher density guidelines from just the nest area (as in C and F) to include the post-fledgling area, thus making the higher density guidelines applicable to 10% (rather than 3%) of a goshawk territory. In some of Utah's landscapes where forests are discontinuous, this could be the majority of the manageable forestlands.

Canopy closure affects understory species mixture and production. Field measurements have shown that understory species (composition and abundance) are reduced once overstory canopy closure reaches 40% (Winward 1999). At this point, shade tolerant species would begin to dominate. One study in the ponderosa pine type in Arizona indicates a sharp drop in understory vegetation production as canopy closure goes from 0% to 20% and a continued drop from 20% to 100% canopy closure (Deiter 1990). High canopy closures would favor the establishment of advance regeneration of shade tolerant tree species beneath the existing canopy. Without management intervention, this shade tolerant regeneration would persist. After Alternative E, Alternative D would potentially have the second highest detrimental effects on understory vegetation as it requires maintenance of high canopy closures. Alternative D does not have an upper canopy closure, which could result in some cases of higher canopy closures than reflected in the guideline. Project planning would determine the mix of desirable canopy closures.

Alternative E: Other than Alternatives A and E, all alternatives recommend the maintenance of a balanced range of structural stages needed to maintain either 40% of the coniferous stands or 30% of the aspen stands in mature and old stages (VSS 5 and 6). Alternative E has a goal to achieve these same percentages, however, it adds a standard that prohibits any treatment of VSS 5 and 6 classes for the planning period. Guidance does not extend to the percent of area in the younger VSS classes; this is left up to forest managers to determine what would be appropriate in order to obtain or maintain the VSS 5 and 6 class structures. Direction to maintain the stated percentage of mature and old is consistent with recommendations developed in local and Regional PFC documents, however, direction that prevents treatment of mature and old structures is not, and over time would tend to result in an increase in mature

and old classes at the expense of the younger structural stages. All alternatives require the retention of some mature and old trees on landscapes.

Alternative E prohibits all vegetative management treatment in VSS 5 and 6 class groups. In the short term, this would inhibit treatment of many forested areas that are deemed at risk of significant structural changes, mostly due to insect epidemics. In some areas this could result in the loss of future options if, by management, insect epidemics could have been prevented and, by inaction, substantive vegetative changes occurred. If continued over time, this type of exclusionary treatment would lead to unbalanced stand structures that are skewed toward the old classes (since as soon as a group developed from VSS 4 to 5, it would become off-limits to management and would remain so until natural disturbance patterns removed the dominating VSS 5 and 6 component). Over time, this could favor the dominance of late seral species in both the understory and overstory, and over time, this type of treatment could push stands and landscapes outside of both HRV and PFC through the reduction and potential loss of early seral species. Comparatively for treated acres insect susceptibility increases as follows: Alternative A < B < Alternatives C = F < D < E.

Under this alternative, the elimination of the option to remove mature and old VSS classes may limit management options in the lodgepole pine type during the 4-year implementation period. Trees 9 inches in diameter and greater would not be available for removal through management (harvest, prescribed fire, or other methods). The lower merchantability limit for sawtimber for lodgepole pine is 7 inches. Post, pole, and house log sales would still be possible, however, it is likely that managers would need to rely primarily on natural disturbance events to regenerate the type.

The elimination of the option to remove mature and old VSS classes may also affect the ability to manage aspen stands. Trees 12 inches in diameter and greater would not be available for removal through management. While the minimum merchantability limit on aspen is 8 inches, trees less than 10 inches in diameter are generally not desirable by industry due to high processing costs vs. low return values. Options may be reduced during the 4-year implementation period should this alternative be selected, and natural disturbance events would likely be the primary regeneration events for aspen.

Canopy closure guidelines for Alternative E call for 60% canopy closure in foraging areas and 75% in post-fledgling and nest areas in VSS classes 4, 5, and 6. This is consistent in this alternative across all cover types. Foraging areas are represented by all forested habitat, other than post-fledgling and nest areas. Post-fledgling areas comprise approximately 600 acres, or 10% of a goshawk territory. Nest areas comprise a sum of at least 180 acres, or approximately 3% of a territory.

Potential problem areas (identified using criteria developed in the R4 PFC Process [1998] for density management) may occur with ponderosa pine (climax and seral stands) in foraging, post-fledgling, and nest areas. And with spruce-fir cover types, potential problems occur in areas managed as post-fledgling and nest areas (approximately 10% of a goshawk territory). While SDI figures do not show potential problems with lodgepole pine, basal area figures do (see Table 7 in Effects Common to All Action Alternatives, Category 4).

Unless a variance is obtained, climax ponderosa pine stands would always exceed the PFC recommended 35% SDI%max. This is thought to be outside of HRV for these types. Where these canopy closures can be demonstrated to be outside of HRV for climax ponderosa pine, this alternative allows a variance to manage these sites within HRV. Where management activities are proposed on such sites, documentation of the necessity of a variance would need to be completed during the NEPA planning process.

Seral ponderosa pine stands or groups within foraging areas managed for at least 60% canopy closures can be expected to exceed 50% SDI%max within 5 to 10 years of treatment and basal area recommendations within 10 to 15 years, as indicated by FVS runs. Stands or groups managed at 75% and greater canopy closures would always exceed basal area recommendations and would exceed 60% SDI%max and thus would be continually stressed by intra-tree competition.

Spruce-fir stands or groups within post-fledgling and nest areas that are managed at minimum canopy closures of 75% can be expected to exceed 50% SDI%max within 5 to 10 years of treatment while basal area recommendations would always be exceeded in these areas, as indicated by FVS runs. Such densities would favor establishment of subalpine fir regeneration at the expense of Engelmann spruce by maintaining conditions with overhead shade.

Alternative E would produce sites that are the most susceptible to bark beetle disturbances for the VSS 4, 5, and 6 spruce/fir and ponderosa pine types. Both high density requirements and the standard that does not allow management treatments in VSS 5 and 6 groups can result in higher susceptibility ratings and a higher probability of insect caused disturbances within landscapes. When coupled with the current spruce bark beetle epidemics occurring within the State, elimination of the option to treat VSS 5 and 6 classes could result in increased tree mortality and a continued rapid shift in structural stages (from old to young) throughout much of the State in the spruce-fir type. Aspen stands would not be placed at risk from insects due to density guidelines. In mixed conifer stands where Douglas-fir dominates the overstory, bark beetle susceptibility would be "moderate" or "high." Treatments designed to manage larger size trees (VSS 4, 5 and 6) in small groups may relieve competitive stress, depending on surrounding stand conditions and the absence of environmental stresses. Susceptibility would not be moderated for trees that are on the interior of groups which are not affected by "edge effect" to relieve competitive stress. However, where higher densities are required (post-fledgling and nest areas) susceptibility would remain at least moderate and perhaps high. Managing treatment areas and adjacent landscapes for a mosaic of stand conditions and species mixtures would alleviate insect susceptibility and reduce the likelihood of large scale landscape disturbances. Comparatively for treated acres insect susceptibility increases as follows: Alternative A < B < Alternatives C = F < D < E.

The reduction in temporary roads in Alternatives D and E may reduce management options which, in turn, could potentially allow insect populations to increase, causing additional mortality. Expanded insect populations could potentially affect adjacent treated areas.

Canopy closure affects understory species mixture and production. Field measurements have shown that understory species (composition and abundance) are reduced once overstory canopy closure reaches 40% (Winward 1999). At this point, shade tolerant species would begin to dominate. One study in the ponderosa pine type in Arizona indicates a sharp drop in understory vegetation production as canopy closure goes from 0% to 20% and a continued drop from 20% to 100% canopy closure (Deiter 1990). High canopy closures would favor the establishment of advance regeneration of shade tolerant tree species beneath the existing canopy. Without management intervention, this shade tolerant regeneration would persist. Alternative E would have the greatest potentially detrimental effects on understory vegetation by requiring the maintenance of the highest canopy closures.

Nest and Post-Fledgling Areas Only

All Alternatives: Current Forest Plan direction does not contain direction on conducting surveys for goshawks and identifying habitat. However, Regional guidance directs Forests to conduct these activities prior to vegetation management project implementation. All alternatives include direction for conducting surveys for goshawk nests and identifying habitat (nest areas). While these guidelines vary

somewhat between alternatives, the effects on vegetation do not. It is unlikely that any direct or indirect effects on vegetation would occur as a result of surveys or habitat identification.

Current Forest Plan direction does not contain direction to protect goshawk habitat; however, all Forest Plans include direction to protect the habitat of sensitive species, and Regional guidance directs forest managers to take measures to protect goshawk habitat. While interpretation and application may vary somewhat across the State, general direction is the same: active nest sites are protected from vegetation treatments and timing restrictions are imposed around nest areas. These restrictions sometimes extend to the post-fledgling area. All alternatives include similar restrictions within and around active nest areas. Alternative E is slightly less flexible with regard to "permitted human activities." All alternatives have similar guidance in regard to allowable opening sizes within post-fledgling areas. Alternatives D and E add opening width guidance. The effects (direct, indirect, or cumulative) on vegetation by these various protection standards and guidelines summarized above would not be measurably different from one alternative to the next, including Alternative A (the current condition). All have similar guidance with regard to the types of vegetative treatments allowable and the timing of treatments.

All alternatives include a guideline recommending the restriction of management activities within post-fledgling areas during the active nesting period. This guideline has been variably applied across the State sometimes restricting activities within the nest area only and sometimes restricting activities within the entire post-fledgling area. Depending upon the on-site application and the size of the area restricted, this may or may not have impacts on vegetative treatment options and the timing of these treatments beyond the nest area. At the extreme, restrictions have the potential to raise the costs of operations or to make portions of a sale or whole sale areas economically inoperable. Alternatives A through F apply this guideline equally.

Other Miscellaneous Areas of Concern

Alternative A: Landscape assessments provide for improved coordination of management activities and improve the analysis of cumulative effects. Current Forest Plan guidance does not require the use of landscape assessments. However, all forests in Utah currently use some form of landscape assessment for some planning processes. Under Alternative A, it is likely that the use of landscape assessments would continue to be inconsistent between Forests and Districts.

All Action Alternatives: All action alternatives contain guidelines recommending the use of landscape level assessments during pre-project planning. Alternative B contains this recommendation for assessing landscape structure only. Alternatives C-F contain this recommendation for assessing landscape process, composition, and structure. Forest Plans do not require landscape assessments, and implementation of guidance to complete landscape assessments before project planning and implementation is a change from current direction. Many projects are currently implemented without the benefit of formal landscape level analysis, and landscape assessments are needed to coordinate project treatments to insure landscape level HRV and PFC parameters are not exceeded. The necessity to complete landscape analyses may increase the time needed to plan projects and may increase administrative costs. Implementation of the guideline would require most national forests in Utah to increase their current database on landscape condition. All national forests in Utah are currently instituting some form of landscape assessments that are designed to help answer this question and others. Forests are currently beginning to do this to better assess cumulative effects and overall ecosystem need.

Implementation of the various guidelines that require the maintenance and knowledge of a variety of structural and seral vegetation stages across landscapes would require most national forests in Utah to

increase their current knowledge base of landscape condition and trend. All national forests in Utah are currently instituting some form of landscape assessments that are designed to help answer these questions. However, implementation of guidance to complete landscape assessments before project planning and implementation is a change from current direction. While forests are currently beginning to do this in order to better assess cumulative effects and overall need, many projects are currently implemented without the benefit of formal landscape level analysis.

Under Alternative B, guidance to do landscape assessments will determine the structural stage class mix across the landscape. While this will help managers conduct improved planning processes, it will not be as beneficial as Alternatives C-F that provide guidance to conduct assessments for ecosystem structure, composition and process.

Alternatives C, D, E, and F: Additional guidance concerning the use and determination of HRV and PFC is added. Managing landscapes to remain within HRV and PFC is a conservative approach that is intended to insure that all ecosystem components remain upon the landscape, thus not eliminating future options while preserving ecosystem resiliency to perturbations.

Alternative D: Implementation of the various guidelines that require the maintenance and knowledge of a variety of structural and seral vegetation stages across landscapes would require most national forests in Utah to increase their current knowledge base of landscape condition and trend. All national forests in Utah are currently instituting some form of landscape assessments that are designed to help answer these questions. Guidance to complete landscape assessments before project planning and implementation is a change from current direction. While Forests are currently beginning to do this in order to better assess cumulative effects and overall need, many projects are currently implemented without the benefit of formal landscape level analysis.

Alternative D and F add grazing utilization guidelines, but the two alternatives differ in their approach. For both, the guidelines would be applied only where grazing coincides with goshawk habitat. This would be applied to forested understories and vegetation in small openings (generally less than 1 acre in size) that are surrounded by forested habitat. The Alternative D guideline reduces utilization from current grazing standards (that generally allow averages of 45-65%) to an average of 20% not to exceed 40% in any one area. In order to accomplish this, managers may have to reduce grazing on adjacent areas where livestock cannot be effectively herded. Alternative D only focuses on utilization guidelines to promote the desired understory forage, seed mast, and cover. Changes in grazing practices such as season of use or grazing system are other tools that in some cases may be more effective than simply focusing on utilization.

Vegetatively, this would reduce some of the grazing impacts to understory vegetation, including grazing/trampling pressure on tree seedlings. Aspen could be expected to respond favorably to reduced grazing pressure. This guidance would promote a reversal of the negative impacts to herbaceous vegetation as noted in Graham et al. (1999). Although some research debates whether livestock grazing would or would not have short and/or long term effects on forest structure and understory vegetation (Latham 1999, Jorritsma et al. 1999, Kienast et al. 1999, Reimoser et al. 1999), in Utah's environment, it is unlikely that substantial changes in vegetation would be notable on drier upland sites within the 4-year planning period. Within riparian sites, improved vegetative conditions could be expected to be measurable within the planning period. Should such practices continue, substantial changes in vegetation composition and structure might be expected where understories had previously been grazed more heavily by livestock. Cumulatively, this could have an effect on fine fuel loadings and fire frequencies, allowing more frequent fires to burn through the understories of affected stands. This effect would be most noticeable in aspen, ponderosa pine, and mid to low elevation mixed conifer cover types.

Alternatives D and E: Add guidelines concerning road management and the use of skid trails. These would not have any direct affect on vegetation. Indirectly they may affect economic viability of potential vegetation treatments by reducing access and may therefore limit management options in some areas. Such areas may go untreated if mechanical treatments are the only option.

Alternative E: Adds a guideline that would eliminate the possibility of conducting vegetation treatments on "unsuited" timberlands for the sole purpose of promoting goshawk habitat. This may serve to limit managers' options should treatment of such areas be desirable for habitat improvement or mitigation for activities in other portions of a goshawk territory. However, it is unlikely that this would affect vegetation treatment proposals, as typical treatment proposals on unsuited lands are done with broader purposes in mind (such as regeneration of seral species, fuels treatments, and/or watershed concerns).

Alternative F: Alternative D and F add grazing utilization guidelines, but the two alternatives differ in their approach. For both, the guidelines would be applied only where grazing coincides with goshawk habitat. This would be applied to forested understories and vegetation in small openings (generally less than 1 acre in size) that are surrounded by forested habitat. Alternative F provides guidance that wildlife needs for forage should be determined through the landscape assessment process and that, if this process determines livestock grazing is contributing to an identified functioning-at-risk or nonfunctioning condition (relative to PFC), modifications to grazing practices should be determined and implemented. In order to accomplish this, managers may have to reduce grazing on adjacent areas where livestock cannot be effectively herded, although this would affect fewer acres than Alternative D. Compared to Alternative D, which only focuses utilization guidelines to promote the desired understory forage, seed mast, and cover, Alternative F allows for managerial decisions to utilize various livestock management tools to address site specific problems and improvements. These may include alteration of grazing systems, alteration of the season of use, or other appropriate management needed to achieve the guideline. This may improve the managers' ability to correct problems.

Vegetatively, this would likely help to identify site-specific grazing-related resource problems and help to correct these. On identified sites, this would reduce some of the grazing impacts to understory vegetation, including grazing/trampling pressure on tree seedlings. Aspen could be expected to respond favorably to reduced grazing pressure. This guidance would promote a reversal of the negative impacts to herbaceous vegetation as noted in Graham et al. (1999). Although some research debates whether livestock grazing would or would not have short and/or long term effects on forest structure and understory vegetation (Latham 1999, Jorritsma et al. 1999, Kienast et al. 1999, Reimoser et al. 1999), in Utah's environment, it is unlikely that substantial changes in vegetation would be notable on drier upland sites within the 4-year planning period. Within riparian sites designated for protection, improved vegetative conditions could be expected to be measurable within the planning period. Should such practices continue, substantial changes in vegetation composition and structure might be expected where understories had previously been grazed more heavily by livestock. Cumulatively, this could have an effect on fine fuel loadings and fire frequencies, allowing more frequent fires to burn through the understories of affected stands. This effect would be most noticeable in aspen, ponderosa pine, and mid to low elevation mixed conifer cover types.

Treatment Prioritization

Only *Alternative F* provides direction on the prioritization of projects. These priorities are stated as objectives. Current Forest Plan objectives are generally focused on goods and services, not on restoration and maintenance of ecosystems. The addition of these objectives focus the six affected national forests on prevention, restoration, and maintenance of ecosystems for properly functioning condition. Application of such a priority system should, over time, have a positive effect on vegetation

and ecosystems. During the 4-year planning period, they would serve to direct these national forests where to concentrate management proposals, which would likely result in the greatest benefits to identified functioning-at-risk and nonfunctioning portions of ecosystems.

Compared to *Alternatives A-E* that allow projects to be implemented in functioning systems, Alternative F strives to implement projects only in functioning-at-risk or nonfunctioning systems, and these projects must be designed to improve ecosystem structure, composition, and process relative to PFC. Thus Alternative F would have the least potential to cause degradation of ecosystems and the greatest likelihood to protect and/or enhance functioning-at-risk and nonfunctioning ecosystems or portions thereof.

Monitoring Requirements

All Alternatives: Alternative A adds no new monitoring requirements over what current Forest Plans contain. Alternatives B-F add several monitoring requirements that are not in current Forest Plans. These requirements are designed to insure that vegetation treatments accomplish desired results and do not cause degradation of goshawk habitat or populations. Even though monitoring varies somewhat by alternative, the requirements would have no direct impact on vegetation. Indirect impacts could occur if monitoring revealed the need to change management direction, thus affecting management practices and their effects on vegetation composition, structure, and process. Alternatives C-F add monitoring requirements for post-treatment occupancy and the requirement to change should projects result in goshawk territory abandonment. Alternatives D and F add monitoring requirements that coincide with the grazing guidelines in the two alternatives. Other than the post-treatment occupancy monitoring, monitoring is to be reported on a 3 to 5-year schedule, and it is unlikely that monitoring would reveal the need for change within the 4-year planning period.

4.3.2 Wildlife

Effects Summary - Alternatives A-F vary in their ability to reduce risk to loss of habitat needed to support the currently viable population of goshawks in Utah. When looking at them in a very broad perspective only, they can be rated from highest to lowest reduction in risk to habitat. The alternative with the highest risk reduction provides the greatest opportunity for maintenance, and possible restoration and enhancements.

Highest reduction in risk <----------> Lowest reduction in risk
Alt. F Alt. C Alt. D Alt. B Alt. E Alt. A

This is a very simplistic comparison of alternatives; detailed disclosures for this rating follow.

Assumptions for and Basis of Effects - The HCS describes the habitat needed to support goshawks and variety of prey species, and provides a good model of habitats used by forest wildlife communities (Utah NFs et al. 1998). The foundation of the HCS was the Assessment (Graham et al. 1999) and the Management Recommendations for the Northern Goshawk in the Southwestern United States (Reynolds et al. 1992). The basis for evaluating the effects of an alternative is a comparison between the desired habitat conditions (DHCs) found in the HCS and management recommendations in the Assessment relative to how well management direction in each alternative provides for consistency in project design and implementation to further the achievement of the DHC described in 2.3.2 and the HCS.

For threatened, endangered, and proposed (TEP), and management indicator (MIS) and sensitive species groupings, the effects disclosure is relative to how using alternative management direction to guide

future project design and implementation will affect habitat associated with these species. Only those species known to be associated with forest habitats that may be affected by changes in management direction are discussed. For TEP species, the habitat for Canada lynx and Mexican spotted owl (MSO) is evaluated. For MIS and sensitive species it is more variable depending on the category (1-7) of management direction (2.3.2); MIS and sensitive species are identified as needed. Appendix H contains the Biological Assessments and Evaluations for TEP and sensitive species, respectively.

The debate in the biological community about the appropriateness of some habitat attributes described in the DHCs and management recommendations in the Assessment is disclosed in Alternative E only, where the debated direction is incorporated.

Cumulative effects are addressed separately in subsection (4). The cumulative effects analysis area (Appendix G) represents areas on the six affected national forests where goshawks are known to occupy in their normal life cycle during spring, summer and fall. Goshawks are occasionally observed during winter months in pinyon/juniper that may overlap adjacent areas; however, little information exists on winter habitat use in Utah. Because information on winter habitat use is very limited, it was not included in this effects analysis.

Although there is no one area that is perfect for all wildlife species, the cumulative effects area used should be sufficient to address effects. Therefore, the same area is used for MIS, sensitive and TEP species.

This analysis addresses cumulative effects in potentially suitable habitat on federally-administered lands and nonfederal lands for the species groupings discussed under direct and indirect effects. The alternatives provide management direction across lands administered by the Forest Service on the six affected national forests including lands in Utah, Colorado and Wyoming. This analysis assumes that all agencies that were signatory to the HCS will be implementing the intent of the recommendations contained therein.

It is my professional judgement that existing data on the number of goshawk young removed by permitted falconers has no biological effect on goshawk habitat or populations in Utah; this judgement is also supported by UDWR (1999). Their removal is not included in the analysis because it is a UDWR permitted action and is not affected by this action.

Effects to Goshawk Population Viability, All Alternatives Including No Action (Alternative A) - None of the alternatives will result in loss of goshawk population viability during the time frame of this amendment (projected to be 4 years). Based on the best information available, the current goshawk population is viable and habitat in Utah is of sufficient quality, quantity and distribution to continue to support this viable population (Utah NFs et al.1998) during the life of this amendment regardless of the alternative selected.

Effects of Exemption Areas and Exempted Uses, All Action Alternatives (Alternatives B-F) - Direction in action alternatives apply to all lands except wilderness, research natural areas (RNAs), national recreation areas (NRAs), special uses, urban interface, and developed recreation sites (see 2.3.2). The alternative direction would be implemented in exemption areas when it does not conflict with primary use. However, where implementation would conflict with the primary designated use in the exempted areas, implementation would not be required.

Wilderness, RNAs, NRAs account for the majority of the acreage in exempted categories (see 2.3.2). The largest NRA in Utah is the Flaming Gorge NRA in northeastern Utah, which is dominated by desert shrub habitats and Flaming Gorge Reservoir. Very little of this NRA is considered to be suitable

goshawk habitat (Paulin 1999). Wilderness and RNA areas often include lands that are suitable habitat for goshawks. Management in these areas is typically designed to allow native processes to be the dominant influence on the landscape, which is consistent with the goal of restoring natural disturbance regimes and other ecological processes on lands that are covered by the geographic range of alternative proposals. The goshawk habitat assessment did not identify any problems or negative trends in lands in the wilderness, RNA or NRA management categories. Overall, habitat and trends within these management categories are presumed to be stable, and would probably continue to be stable even if recommendations in the HCS are not fully implemented in these areas over the interim period of this amendment. However, over the long term, this becomes more uncertain (Graham et al. 1999).

On a statewide basis, acreages of the other exempted areas (#s 3, 4 and 5) are small (less than 4% of the total NFS lands in the project area) when compared to the total available suitable habitat (see 2.3.2). Because such a small amount of forested land is affected by these exemptions that are outside wilderness, RNAs and NRAs, variations in habitat suitability on these lands is not expected to cause a measurable change in goshawk abundance or population trends at the state level over the life of this amendment.

In addition to areas defined above, use related to locatable, mineral material or leasable mineral activities and facilities that have been authorized for such use under existing plans, licenses or permits, or have been leased or authorized for leasing prior to the decision date of this amendment, will not be affected by this amendment. Exempting these uses will not result in any measurable impacts to existing habitat. As documented in the project record (Exhibit P) these uses typically only result in disturbance to approximately 1% of the surface acres under lease or permit. The timing of use of surface facilities are generally of more concern. However, appropriate measures will be taken to protect goshawk habitat and nesting activity to the extent agreed to by the lessee, permittee, or operator and/or within the legal authorities of the responsible agencies. Therefore, little impact to habitat or the viability of the statewide goshawk population is expected to result from existing mineral activities over the life of this amendment.

Discussion of Direct and Indirect Effects - Effects are discussed by the three species groupings found in Chapter 3:

- Goshawk habitat and abundance;
- Sensitive and MIS Species; and
- TEP species.

Under each species grouping effects are described by the seven categories of management direction, including the monitoring requirements described in Chapter 2 (2.3.2).

Goshawk Habitat and Abundance

Native Processes (Goshawk Habitat and Abundance)

Alternative A: Forest plans allow, and in some cases specify, management actions that are not consistent with historic disturbance regimes. Current forest management does not ensure large tracts of mature and old forests scattered across the landscape. This has resulted in landscapes with varying amounts of mature and old forests, which help provide goshawk nesting habitat. In addition, it has created an abundance of mid and late-seral forests and a lack of early seral species. Fire suppression, and to so degree past timber management activities, have been the primary agents contributing to this condition. This has resulted in areas of unstable conditions where large tracts of forests are susceptible to insects, disease and fire and areas where mature and old seral species dominated forests are lacking. Although

these are native processes they are occurring on very large scales. This may create widely varying degrees of goshawk habitat availability across both time and space. Goshawk abundance will be similarly variable with an increased risk of extinction at lower population levels, compared to more stable habitat conditions, such as those described in the regional PFC assessment (USDA, 1996). The effects of this alternative from human caused disturbance events such as prescribed fire and timber harvest are difficult to predict because no specific direction is contained in Forest Plans regarding whether activities should remain within the variability of size, intensity, and frequency of native disturbance regimes characteristic of the subject landscape and ecological processes.

Alternatives B and E: These alternatives differ from the "No Action" in their effects on patch size and distribution of structural stages. They will create a more diverse pattern of habitat patches across landscapes. Where prescribed fire and timber harvest are used, there will be less of a tendency for large areas of forest to follow a ‘‘boom and bust’’ pattern of succession due to large scale insect, disease and/or fire events. This translates to productive, sustainable habitat conditions for both goshawks and their prey, and greater stability in state wide goshawk abundance.

Because HRV will be the base line management direction, ecosystem sustainability will help provide habitat for the goshawk and its prey throughout time. This will help provide the habitat base for sustainable goshawk populations.

Alternatives C, D and F: These alternatives incorporate the Assessment and HCS recommendations to emulate natural disturbance regimes and define a "natural" event or process as one that falls within HRV as defined in PFC. Refer to Appendix D for a detailed discussion of HRV versus PFC.

They differ from the "No Action" in their effect on patch size and distribution of structural stages and species composition. It will create a more diverse pattern of habitat patches at watershed and larger scales. Where prescribed fire and timber harvest are used, there will be less of a tendency for large areas of forest to be in a ‘‘boom and bust’’ pattern of succession due to large scale insect, disease and/or fire events. This translates to productive, sustainable habitat conditions for both goshawks and their prey, and greater stability in the state wide goshawk abundance.

Working within the bounds of HRV as defined by PFC will have an added benefit for goshawk habitat in smaller scale landscapes than may not be realized under Alternatives B or E. Extreme disturbance events that may alter landscapes at a 5th or 6th order HUC or larger scale are not desired within the range of HRV as defined by PFC (refer to Appendix D for a detailed discussion); though they may be within the full range of HRV. Retaining habitats across landscapes as small as 5th or 6th order HUCs (10s to 100s of thousands of acres) will promote a more constant supply of habitat throughout the state of Utah. Retaining a good mix of habitat at these smaller scales will help reduce risks to losing habitat needed to support meta-populations throughout Utah important to sustaining the viability of the population at the State scale through time.

Forest Composition (Goshawk Habitat and Abundance)

Alternative A: The Assessment and HCS recommend active promotion of early seral tree species. A good mix of early seral species in cover types is recommended because of their value to certain goshawk prey species, and because many goshawk nests have been found in cover types dominated by those species. Most of the LRMPs in Utah contain general direction to maintain vegetative diversity and/or to maintain all the habitats needed to support the existing array of wildlife species on the planning unit. Presumably all existing vegetative types will be maintained in order to meet the broad diversity goals. However, the LRMPs do not take into account the range of cover types that may be possible on forested

lands. Therefore, determining what constitutes satisfactory vegetative diversity is rather narrowly defined to the range of conditions currently found on the landscape, and may not represent the full arrangement of cover types that occurred historically. Furthermore, the scale at which diversity is to be maintained is the management area or National Forest. No provision is made for maintaining diversity at the scale of an ecological unit such as a potential vegetation type, watershed or land type.

Management for early seral tree species is permitted but is not a specific objective. This leaves a greater opportunity for differing interpretations and management priorities. This will result in a wide range of seral stages and species, which could result in high fluctuations in goshawk and prey species habitat. Under current management direction, achievement of the forest composition elements of the Assessment and HCS is likely to be inconsistent from forest to forest, and trends in cover type availability and distribution at the state level will be hard to predict. Current direction could result in landscapes dominated by late and/or early seral species; emphasis on early seral species is not provided. Continued trends of landscapes dominated by late seral species are likely to result in unstable habitat conditions, which support goshawks and their prey.

This alternative will allow the use of native plant species, however, no existing forest plan direction exists which recommends the use natives species over nonnative species. Without direction to favor the use of native species over nonnative species the progression towards desired habitat conditions will likely be at greater risk and management options may be reduced.

All Action Alternatives: All action alternatives have direction which promote cover types such as aspen and lodgepole pine, which are of high value to certain goshawk prey species and in which many goshawk nests have been found. Landscapes with early seral communities, such as aspen and lodgepole, tend to be more resilient and less susceptible to large scale mortality events (e.g., insect outbreaks; see vegetation discussion). Thus, landscapes in which early seral species are represented with a mix of mature and old forests will provide valuable habitat for goshawk nesting and prey species. This will support more goshawks, their prey and be a more stable source of habitat over time than landscapes dominated by late seral communities.

Alternative B, C, D and F: These alternatives also contain direction to use native plants rather than nonnative when and where available, thus avoiding disruption of natural successional pathways, unless nonnatives are needed to meet specific restoration or maintenance objectives. The preferred use of native plants in management activities will benefit goshawk habitat by helping to maintain or restore landscape systems back to a functioning condition. This will help support long-term sustainability for goshawks and their prey.

Promoting early seral species and using native species will tend to improve ecosystem resilience and may increase vegetative species diversity over current conditions. This will help provide the habitat base for sustainable goshawk populations.

Alternative E: In addition to the benefits of seral species discussed above, the standard to only use native plant species from locally adapted seed sources in this alternative will likely have short and long term benefits to the overall function of native processes, composition and structure within and among landscapes. Because native processes are very complex and take a considerable amount of time to cycle through a landscape, initiating the use of native species will have short and long-term benefits to the ecosystem. Once nonnative species are established it can be very difficult to change species composition back to natives. This alternative will have short and long lasting effects to goshawk habitat and the sustainability of that habitat over time. However, because native seed from locally adapted seed

sources can sometimes be difficult to obtain, this requirement may not be practicable to achieve all the time.

Forest Structure (Goshawk Habitat and Abundance)

Alternative A: The Assessment and HCS provide specific direction on key structural attributes at the stand level. These components include down woody debris, snags, and canopy closure. At the landscape level the HCS recommends mixes of structural stages by cover type, including 40% mature and old in coniferous forests, and 30% of mature and old in aspen landscapes. All forest plans contain direction on down woody debris and snag retention. However, they differ with respect to the required tons of woody debris as well as snag numbers and diameters per acre. In several cases forest plans recommend lower tons or numbers than described in the HCS. Two of the six forests have identified desired mixes of structural stages. The other forests plans contain no specific direction for structural stages other than mature and old forest structure. No forest plans contained direction on canopy closure.

All forest plans provide for the retention of some mature and old forests, ranging from 5-10% in selected management units. However, several forest plans specify rotation ages for selected forest cover types that may be too short to allow the development of complex mature and old forest stand structures desired. This means that in some active timber management areas mature and old forest structures will not occur outside of the areas designated to meet the minimum retention levels of 5-10%. For example, four of the six forest plans define desired rotation lengths ranging from 80-200 years depending on cover type. The Assessment and HCS indicate that several of these same cover types will take more than 200 years to achieve mature and old forest structure.

Therefore, forest plans permit, but do not ensure, implementation of the recommendations in the Assessment and HCS. Minimal implementation of current forest plan direction will result in smaller diameters and fewer tons of down woody debris, fewer snags, and potentially more open canopies and less mature and old forest than recommended in the HCS. Since these conditions are linked to prey abundance and the occurrence of goshawk nests, failure to implement these recommendations will result in a decrease in goshawk habitat effectiveness and suitability. The lack of these attributes across the landscape may reduce management options in the future. This will result in uncertainties concerning goshawk distribution and abundance. Although these conditions will be difficult to detect over the next four years, habitat conditions will not be trending in a direction to maintain or improve goshawk habitat.

All Action Alternatives: While some aspects of structure vary by action alternatives (i.e., balance of structural stages across landscapes, canopy cover, retention of mature and old live trees and other treatment restrictions/prioritizations), direction for snags, down logs and woody debris are the same in Alternatives B-F. Snags, down logs and woody debris will be managed at levels that are beneficial to prey species and goshawks (Reynolds et al. 1992; Utah NFs et al. 1998; Graham et al. 1999). Incorporating the size and amounts of these habitat elements into future project design and implementation will have short-term positive effects on these species. And, application of this direction across all six Utah NFs in a consistent manner addresses state scale habitat needs with the resulting effect of continuing to support the currently viable population of goshawk (Utah NFs et al. 1998).

Alternative B: In addition to the benefits of snags, down logs and woody debris previously described, Alternative B also promotes forest management practices throughout Utah that will provide at least 40% canopy closure for prey and goshawk habitat and at least 40% mature and old forest in conifer and 30% in aspen. These attributes are all important to goshawks and their prey. Direction in this alternative will help ensure that these structural attributes are consistently available throughout the state. By providing a desired mix of structural stages, Alternative B will provide for continual recruitment of new stands into

the mature and old category. This will tend to create a more constant, sustainable supply of suitable habitat for nesting goshawks. Even though little difference will be apparent in the short term (four years), it is my professional judgement that goshawk habitat effectiveness will gradually improve and statewide goshawk abundance will be more stable over the long-term than with the no action alternative. The retention of at least 40% canopy closure in all cover types will provide habitat for some prey species, however this will not likely provide adequate canopy for some primary prey such as squirrels. Therefore, the canopy closure recommended may not meet all the habitat requirements for some goshawk prey, and may not be adequate in the long term.

Alternatives C and F: In addition to the benefits of snags, down logs and woody debris previously described, Alternatives C and F provide similar direction to maintain at least 40% mature and old forest in conifer and 30% in aspen as discussed under Alternative B. Direction will help ensure that habitat is treated consistently, and that forest management practices throughout Utah will provide the structural attributes important to goshawks.

The key difference in these alternatives compared to other action alternatives is the direction for canopy closure (g-15). It is my professional judgement that the approach for achieving canopy closures through retention of a percentage of acres in 2-9 tree clumps of VSS 4,5, and 6 class trees with interlocking crowns will help create sustainable habitat for goshawk prey species better than Alternatives A, B, and E. Managing for a range of canopy closures, compared to the minimum described in Alternative B, will provide improved habitat conditions for the goshawk and its prey.

The structural attributes promoted by direction under these alternatives will provide a more constant, sustainable supply of suitable goshawk nesting and foraging habitat. It is my professional judgement that goshawk habitat effectiveness will be improved and goshawk abundance will be more stable statewide than under Alternatives A and B.

Alternative D: In addition to the benefits of snags, down logs and woody debris previously described direction in this alternative, like that found in Alternatives B, C and F, provides a desired mix of structural stages that will ensure continual recruitment of new stands into the mature and old category (Reynolds et al 1992). The mix of structural stages desired is that needed to sustain 40% mature and old in coniferous forests, and 30% of mature and old in aspen forests within landscapes.

Direction for variable canopy closures by cover type and habitat area (g-16), retention of groups of mature and old trees with interlocking crowns (g-10, s-3 and s-4), created small openings (g-8), and priority for activity slash treatments (g-12) in this alternative differs from that found in Alternatives B or C. These modifications or additions will provide some enhancements to habitat effectiveness for goshawks and their prey. This alternative may provide a higher quality of structural attributes than that provided for under current plan direction (Alternative A) and slightly higher amounts than Alternatives B, C, and F due to the higher canopy closures desired in some habitat areas.

This alternative includes the most prescriptive direction for specific canopy closures by cover type and goshawk habitat area found in any alternative. Though the canopy covers reflected in this alternative are those desired where achievable, the lack of flexibility in this direction may constrain the ability of the agency to adapt to the variety of site conditions found. Therefore, this may reduce the effectiveness of management actions to promote desired canopy conditions within the capability of a specific site.

Alternative D also includes direction for the retention of at least six live mature and old trees in groups with interlocking crowns, in vegetation treatment areas including regeneration treatments. This will have positive effects on squirrel habitat. As a result of the emphasis on maintaining or restoring clumps of trees with interlocking crown, direction provided in this alternative will provide for the needs of prey,

optimizing habitat conditions for species such as squirrels. This approach to achievement of canopy closure is similar to that found in C and F throughout home ranges, and will provide better habitat than that under Alternatives A and B. It will be better that Alternatives C and F, only in that it may provide for more cover in distinct habitat areas when combined with the direction for canopy closure.

Alternatives B, C, and F contain recommendations on opening size in the nest and PFAs but not in the foraging area (g-25). Alternatives D and E are the only alternatives that recommend opening size guidelines to be applied throughout the home range (g-8). Alternatives D and E also modify the guideline on opening size in nest and PFAs (g-26) to include a width requirement and further cover type breakdowns. Implementation of these guidelines may result in a higher interspersion of structural stages important to several goshawk prey species. Though these guidelines will likely result in enhanced conditions for goshawk prey, these enhancements will be difficult to detect in the life of this amendment. Therefore, it is my professional judgement that these guidelines are not essential over the interim period in order to maintain management options for future actions.

All action alternatives provide direction on retaining woody debris and downed logs. However, this alternative (as well as Alternative E) establishes a list of tools to attain these attributes and the priority for which these tools should be implemented. Fire was identified in this alternative and by Reynolds et al. (1992) as the first priority of treatment to help achieve the desired amounts of woody debris and downed logs followed by mechanical treatments. Although other alternatives do not make recommendations as to the priority of which tools should be used to attain the goal for woody debris and downed logs, it is my professional judgement and experience that the goals and guidelines for down logs and woody debris will be attained regardless of the prioritization through direction in this alternative. Current plans already have direction in place for other resource protection that will meet the same intent. In addition, due to site specific variations and individual site needs, how to achieve the guidelines for down logs and woody debris should be decided at the time of the project.

Alternative E: Structural direction in this alternative differs from Alternative D in two key aspects. First it contains a standard (s-2) that requires the retention of all mature and old forest groups over the next 4 years to provide for the immediate protection of goshawk nesting and foraging habitat. This will have short-term positive effects on goshawks and their prey, and an unknown effect on the long-term sustainability of mature and old forests. Because this alternative does not allow the removal of any mature and old (VSS 5 and 6) forest management induced disturbances (i.e., timber harvest, prescribed fire) will only occur in VSS classes 1-4. Forest composition and structure is not expected to change over the short life of this amendment, however, this may likely create conditions for "boom and bust" events to occur within the mature and old forests. These ‘‘boom and bust’’ patterns could create similar patterns in goshawk populations. Only natural disturbances (i.e., wildfire) will be allowed to occur in these areas to create early seral conditions within the mature and old forests.

The second key difference is that Alternative E provides direction for minimum canopy closures from 60-75% depending on the goshawk habitat area (g-14). The long-term sustainability of landscapes managed with 60-75% canopy closures will create additional unknown risks to habitat due to increased risk and susceptibility to wildland fire, insects and disease. Goshawk habitat effectiveness over the interim period of this amendment may improve, but will not likely be measurable. Like other action alternatives, this alternative, even with its inherent risks, will likely create an opportunity for the maintenance of a stable population of goshawks statewide, more so than the use of current plan direction (No Action) during the life of this amendment.

Measurable differences in effects between this alternative and others will be difficult to detect and monitor over the life of this amendment. However, there is a probability that long-term effects to forest composition and structure could occur, such as those currently being experienced on the Manti-LaSal

and Dixie NFs from bark beetle epidemics. Therefore, it is my professional judgement that goshawk habitat effectiveness will be sustained or improved over the life of this amendment; however, long-term effects regarding habitat and goshawk population sustainability will be a concern. Therefore, this alternative will likely have the greatest risk of the action alternatives for reducing management options in the future, due to habitat sustainability issues.

Nest and Post-Fledgling Areas Only (Goshawk Habitat and Abundance)

Alternative A: None of the forest plans contain specific management direction regarding nest or post fledgling areas. Although existing forest plan direction exists to maintain or enhance habitat for all sensitive species, there is a lack of specific forest plan management direction for the goshawk.

To date, most Utah NFs are implementing the intent of the scientific principals contained in the HCS and other scientific information on goshawks, however, application has been inconsistent. The lack of specific direction to manage habitat for the goshawk and its prey has resulted in an inconsistent application of protection measures, due to differing interpretations and management priorities on the six National Forests in Utah.

Forest Plans in Utah do not contain specific direction regarding recommendations on goshawk territory occupancy surveys. National Forests are currently conducting surveys as the result of a letter sent out by the Intermountain Regional Forester in 1991 which directed forests to conduct surveys in suitable habitat. However, different interpretations and implementation of the Regional Foresters letter as resulted in a lack of consistency in collecting survey information. Consistency is needed to aggregate this information from districts and forests to a statewide database. Thus, though existing survey efforts do accommodate for adequate data collection to provide the necessary information needed to complete a biological evaluation, this information is not easily aggregated up to the state scale to help us assess population trends over time.

Therefore, under this alternative, Utah's NFs will continue to implement goshawk management strategies that draw from the intent of various science publications. This allows the continuation of different interpretations of the existing science, and inconsistent application of protective measures in nest and post-fledgling areas. Inconsistencies in the application of science principles and management interpretations will have a negative effect on these goshawk habitat areas and, most likely, populations in the future. As a result, this alternative may eventually preclude future management options.

Alternatives B, C and F: These alternatives recognize behaviorally important subsets of goshawk home ranges (nest and post fledgling areas) which were not specifically addressed in the no action alternative. These areas are important because they are the principle areas used for nesting and raising young. Direction provided will maintain, restore or enhance habitat for breeding goshawks more effectively than the no action alternative because it provides specific management direction for habitat conditions thought to help protect young goshawks from predators and prevent nest abandonment and promote successful reproduction. Specifically, these alternatives direct that nest areas be composed of mature and old structure with somewhat higher canopy closure than other parts of the home range. Dense understories in nest and PFAs will be provided in order to protect fledglings from predators. It also directs that proposed project areas be surveyed for goshawk nests and their associated post fledgling areas at least one year prior to habitat disturbing activities (s-5, s-6 and g-17). If an active nest is found, then direction is provided to protect this areas from disturbance during critical phases of reproduction. This direction minimizes disturbances that could cause reduced parental care or abandonment. Additional direction also directs that when treatments are proposed in these areas they should be designed to create smaller openings in order to enhance prey populations and habitat, thus providing

foraging opportunities near the nest for the adult female and fledglings. Providing this direction will help ensure consistent application statewide, whereas the no action alternative left protection of the nest and post-fledging areas up to the discretion of the project biologist.

Alternative D: This alternative is similar to Alternatives B and C with the exception of two points. First, direction for surveys (s-5 and s-7) requires 2 years of surveys prior to vegetation treatments; this direction is also found in Alternative E. This survey information will be used to determine territory occupancy prior to project implementation and implement direction designed to minimize potential effects to goshawks in active territories. This information is needed to fully address effects in biological evaluations (BE) supporting project design and implementation. Requirements to do 2 years of surveys will provide some reduction in risk of misidentifying activity in a territory over the 1-year requirement. However, requiring 2 years of surveys could limit a managers flexibility to respond to time dependent events that were not foreseen. It is my professional judgement that the variation between action alternatives is not likely to yield measurable differences in effects over the short life of this amendment.

An additional change is modification to direction concerning created opening size. The guideline (g-26) in this alternative not only requires an overall size limit, but also opening width limit. Though opening width requirements may be an enhancement to this guideline, a standard width may not be applicable to all sites. How openings are configured will be better left to the project decision. Therefore, though this guideline may provide some enhancements, a single value may not be appropriate for all sites and the benefits of this addition are not likely to yield measurable differences with other alternative direction (g-25) over the time frame of this amendment.

Alternative E: While this alternative is similar to Alternative D, it changes the active nest restriction guideline (g-21) to a standard (s-10) and removes some of the flexibility within a guideline (g-23 versus g-22). This removes some flexibility to allow for adapting to the variable site conditions that may be encountered. Without this flexibility progression toward desired conditions may not be as effective, or in some cases possible, over time.

Other Miscellaneous Areas of Concern (Goshawk Habitat and Abundance)

Alternative A: The effects of additional direction in this category, compared to the lack of or differing direction under current plans will be discussed under each action alternative below.

Alternative B: No additional direction is added.

Alternatives C, D, E and F: These alternatives recommend landscape assessments be conducted at the 5th and 6th order HUC or equivalent ecological scale (10's to 100's of acres) to help determine opportunities for habitat maintenance or enhancement for the goshawk and its prey (g-33). These assessments provide information concerning resource conditions, risks, and opportunities in a systematic way, thereby enhancing the agency's ability to estimate direct, indirect, and cumulative effects of management actions that may affect habitat for the goshawk and its prey. With this information in hand, managers have a better opportunity to balance the needs of resources and humans and are less likely to negatively impact far-ranging species such as the northern goshawk. The information gathered at this level will identify opportunities to either move existing vegetative conditions toward the desired habitat conditions, or to leave an area alone and allow time to progress an area towards the desired condition. This will have positive indirect effects on managing habitat for the goshawk and its prey.

Alternatives D and E: While Alternatives B, C and F include direction concerning skid trails (g-31 and g-32) versus roads and road densities for the nest and PFA areas only (g-25), these alternatives expand this

direction to include the entire home range. Currently in Utah a variety of practices regarding skid trails and roads are included in plan direction in order to keep road densities and skid trails at a minimum (i.e., current direction for soil and water and wildlife). Effects vary by forest as projects are designed and implemented. Roads and skid trails themselves have minimal or no effects on goshawks. Effects to goshawks and their prey are the result of the construction of the road or skid trail, the type of use a road or skid trail receives, and the timing of the use or construction. These effects can be substantial if construction or use occurs during the critical breeding or nesting season.

The benefits of minimizing disturbance, including use and construction of small permanent skid trails and roads during vegetative treatments, in nest and PFA areas is important to avoid nest abandonment. However, the benefits of this level of restrictions across the entire home range is less clear and measurable. Use of this direction across the entire home range will likely have an unknown favorable effect on goshawks and their prey. However, these effects will be difficult to monitor and determine in the short four years that this amendment will be in place. Therefore, because most National Forests currently have direction to keep open road densities at a minimum and disturbance caused by roads and skid trails are also accounted for under current direction to protect soil and water, this guideline is not critical to preserve future management options.

Alternative D: Unlike other alternatives, this alternative recommends specific changes in ungulate grazing utilization guidelines (g-27). Little information exists on the effect of grazing practices, including total ungulate utilization, on habitat used by goshawk and their prey.

The utilization guideline in this alternative was based on work done by Reynolds et al. (1992). Reynolds based his recommendations for average and maximum ungulate utilizations on a limited base of information, drawing primarily from the work done by Schmutz (1978) and Wasser (1982). Reynolds and other researchers agree that work in this area is still in its infancy and require more research to fully understand how best to address problems that can be associated with grazing.

Based on the information available, it is my professional opinion that where ungulate grazing occurs in the small openings within forested landscapes, and utilization exceeds those prescribed in this alternative, implementation of the utilization guideline will likely improve habitat for goshawk prey species. However, due to the limited information available it also makes it difficult to assess the degree of benefits to forest composition and structure of reducing utilization by ungulates in forested landscapes used by goshawk and their prey. Although improvements in vegetation will likely occur in areas where utilization was identified as the problem, it will be difficult to monitor and detect any change in prey species abundance, distribution and composition and corresponding changes in goshawk populations over the life of this amendment at the forest or state scale. Changes in wildlife species numbers will be several years behind improvements in the understory vegetation.

Therefore, it is my professional judgement that, though changing utilization direction will likely maintain or enhance habitat for goshawk and their prey in localized areas, by not implementing this guideline is not likely to measurably degrade habitat needed to support currently viable populations of goshawk at the state scale over the time frame of this amendment. Nor will it result in any measurable improvements in reducing risk to loss of management options over the time frame of this amendment than alternatives not addressing grazing.

Alternative E: Over the short life of this amendment, direction concerning treatments on unsuitable timberlands for purposes of achieving goshawk habitat objectives (g-30) is not likely to make a measurable difference. Generally, acres proposed for treatment occur on lands classified as suitable for timber production. However, if treatment were proposed on unsuitable lands and they followed the

intent of direction for goshawk habitat management found in other action alternatives, the goshawk and its prey should not be impacted and in some cases will likely benefit.

Alternative F: This alternative includes ungulate grazing direction *(*g-28 and g-29*)*; however, it focuses on the need to change grazing practices only in those areas where landscape assessments determine grazing is a factor which is putting a landscape at-risk relative to habitat needs of the goshawk and its prey. It also recognizes that there are several aspects of grazing practices that could be causing the at-risk condition; changing utilization (Alternative D) may or may not address the real problem. This alternative allows the manager to approach solutions to problem areas by changing grazing practices that are causing the downward trend (i.e., utilization, fencing, season of use, grazing system, range health, etc.).

With the limited information available, it is difficult to assess the degree of benefits to forest composition and structure of modifying ungulates grazing practices within forested landscapes used by goshawk and their prey. Although improvements in vegetation will likely occur in areas where grazing is identified as the problem in localized areas, it will be difficult to monitor and detect any response in prey species composition, distribution and abundance and corresponding changes in goshawk populations over the next 4 years at the state or forest scale. Changes in wildlife species numbers will likely be several years behind improvements in vegetation.

Therefore, it is my professional judgement that, changing utilization direction may help improve at-risk habitat areas related to the goshawk and their prey. However, not implementing this guideline is not likely to measurably degrade habitat needed to support currently viable populations of goshawk at the state scale. Nor will using it result in maintenance of more management options over the next 4 years than those alternatives not including this direction.

Treatment Prioritization (Goshawk Habitat and Abundance)

Alternatives A, B, C, D and E: The effects of additional direction in this category, compared to the lack of prioritization direction under other alternatives, will be discussed under Alternative F.

Alternative F: Through the landscape assessment process, this alternative looks at all aspects of habitat important to the goshawk and its prey and determines what factors (natural or human-caused) are affecting desired habitat conditions. It then determines if current conditions and activities occurring within a landscape are putting it at-risk of dropping out of what Graham et al. (1999) considered high and optimum goshawk habitat. Based on this assessment, this alternative provides direction that focuses management activities for the remainder of the planning period on those areas at greatest risk.

Prioritization of management in forested landscapes at greatest risk to dropping out of a high or optimum habitat condition (per the Graham et al. assessment process [1999]) is expected to help maintain management options in the future, better than other action alternatives because it will concentrate on the areas identified as a concern first. Though localized benefits will likely be measurable during the interim period of this amendment, measurable improvement in goshawk habitat at the state scale will not be likely in this short time frame. However, this alternative provides the greatest opportunities for gains in risk reduction of all the alternatives.

Monitoring Requirements (Goshawk Habitat and Abundance)

Alternative A: This alternative relies on existing monitoring approaches as written in Forest Plans. A variety of monitoring approaches can be found in existing Forest plans, ranging from no requirements for goshawks to completion of nest surveys and defining minimum viable population numbers or acres of suitable habitat.

This alternative does not provide consistency in goshawk nest occupancy surveys, and does not promote the aggregation of district and forest-level data to a statewide database. Without this consistency a clear pathway for tracking changes in habitat availability and goshawk abundance and distribution over time would not be possible. It will be difficult or impossible to develop a rationale to make inferences on population trends. Therefore, the lack of detailed monitoring will not provide the information feedback loop necessary for validation and adaptive management.

All Action Alternatives: A consistent statewide monitoring approach is proposed under all action alternatives. The consistency in data collection for monitoring item m-1 will allow for aggregation of district and forest-level data to a statewide database. This will allow biologists to track changes in habitat availability, abundance and distribution of goshawks over time and infer trends relating to population viability.

Monitoring requirements m-1, m-3, m-4 and m-5 will provide the information feedback loop necessary for validation over the long term and adaptive management in the short term of items monitored. However, though some localized improvement may be realized, in 4 years changes prompted from monitoring are not likely to result in a measurable improvement to maintaining habitat or populations across the state. Data collected during the amendment period will be added to databases that will be maintained with the UDWR for assessing habitat and population trends over longer periods.

Alternatives C, D, E and F: These alternatives also require post treatment monitoring (m-2) for goshawk territory occupancy. This monitoring will help provide valuable information on the continued use by goshawks of project areas after treatment. Post treatment monitoring is not recommended in Alternatives A, and B, and therefore Alternative A and B will not establish a process to gather this much needed information. This information will be used by wildlife biologists to recommend adjustments to management practices if they are determined to be ineffective. As with the other monitoring requirements already discussed, this monitoring requirement provides an information feedback loop necessary for validation and adaptive management over time.

Alternatives D and F: Alternatives D and F include an additional monitoring requirement relating to impacts of grazing on habitat (m-6 and m-7, respectively). Similar to other monitoring requirements, these requirements may be an improvement and will assist in understanding effectiveness of grazing direction in maintaining habitat over time. However, though some localized improvement may be realized, in the projected 4 years this amendment will be in place, changes prompted from monitoring are not likely to result in a measurable improvement to maintaining goshawk or prey species habitat across the state of Utah.

Sensitive and MIS Species

Native Processes (Sensitive and MIS Species)

Alternative A: Sensitive species that are affected by patterns (patch size and distribution) in forest habitat include boreal, great gray and flammulated owls. All three use small openings within landscapes for

foraging, but are unlikely to occur in landscapes dominated by large openings. Deer and elk (MIS) have some sensitivity to patch size, since larger forest patches provide better thermal and security cover. Deer and elk are also more likely to forage in openings if patches of cover are located nearby. By creating conditions where large disturbance events are more likely, the no action alternative increases the probability that some landscapes will become less suitable for these species over time.

The other sensitive and MIS species associated with forests are less affected by patch size than certain forest structure or composition attributes, such as snags, down woody debris or the presence of certain tree species such as aspen. Likewise, species associated with riparian zones are dependent on specific features such as willows or streamside vegetative communities rather than large, landscape level attributes. However, over the long term, landscape level processes may affect the availability and distribution of these features. Although measurable effects to sensitive and MIS is difficult to measure, the effects of management which does not mimic historic disturbance patterns may result in a downward trend in habitat quality for sensitive and MIS species associated with forested habitats.

Alternatives B and E: Sensitive species that are affected by patterns (patch size and distribution) in forest habitat include boreal, great gray and flammulated owls. All three use small openings within landscapes for foraging. Deer and elk (MIS) are also affected by patch size, since larger forest patches provide better thermal and security cover. Big game species are more likely to forage in openings if patches of cover are located nearby. Therefore management direction in this alternative will ensure projects that alter landscape patterns will be designed with this in mind. By creating conditions where disturbance events are more likely to be within HRV, Alternative B increases the probability that landscapes will remain suitable for these species over time. Over the effective life of this amendment, patterns in forest habitats are unlikely to change substantially. However, reductions in current risk factors will begin a trend toward greater stability in habitat for these species.

The other sensitive and MIS associated with forests are less sensitive to patch size than to certain forest structure or composition attributes, such as snags, down woody debris or the presence of certain tree species such as aspen. Likewise, species associated with riparian zones are dependent on specific features such as willows or streamside vegetative communities rather than large, landscape level attributes. Over the long term, landscape level processes do affect the availability and distribution of these features. The effects of management which mimics historic disturbance patterns in forests will affect a relatively small proportion of Utah's forested lands over the next four years. However, this alternative may establish a more favorable trend in forest conditions than the no action alternative.

Alternatives C, D and F: Working within the bounds of HRV as defined by PFC will have an added benefit for sensitive and MIS species for the same reasons as described for goshawk habitat. Extreme disturbance events that may alter landscapes at a 5th or 6th order HUC or larger scale are not desired within the range of HRV as defined by PFC (refer to Appendix D for a detailed discussion); though they may be within the full range of HRV. Retaining habitats across landscapes as small as 5th or 6th order HUCs (10s to 100s of thousands of acres) will promote a more constant supply of habitat throughout the state of Utah for many species. Retaining a good mix of habitat at these smaller scales will help reduce risks to losing habitat needed to support populations of other MIS and sensitive species across NFS lands affected by this amendment.

Forest Composition (Sensitive and MIS Species)

Alternative A: Under current management direction, achievement of the forest composition elements of the Assessment and HCS is likely to be inconsistent from forest to forest, and trends in cover type availability and distribution at the state level will be hard to predict. However, some forest plans

provide direction to maintain or increase aspen, which will benefit indicator species for this type. Aspen is a seral species on several vegetation types. Management for aspen will be good for a wide array of sensitive and MIS species. For example, warbling vireos, red-naped sapsuckers, and mountain bluebirds are all common in aspen. The effects of these inconsistent habitat conditions will be difficult to evaluate on sensitive and MIS over the next four years, due to the difficulty in monitoring many of these species and the lack of long term trend information. Therefore, it is my professional judgement that this alternative will result in varying compositional conditions for sensitive and MIS species and will not likely create conditions during the short four year life of this document that will be detectable.

All Action Alternatives: Some forests plans provide direction to maintain or increase aspen, which will benefit indicator species for this type. Implementing any of the action alternatives will expand that direction to all forests, and provide additional details on desired conditions in aspen. This will ensure that all forests have similar direction to maintain or restore aspen and will improve the health and distribution of this cover type (and its associated wildlife community) at the state scale. In addition, direction will promote management for other early seral species such as lodgepole pine. No such direction to manage for early seral conifer species is found in existing Forest Plans.

Early seral species such as aspen provide important habitat for a wide array of sensitive and MIS. For example, warbling vireos, red-naped sapsuckers, and mountain bluebirds are all common in aspen. Most woodpeckers, including the sensitive three-toed woodpeckers, do well in lodgepole pine, which is an early seral species on subalpine fir, Englemann spruce, and Douglas fir sites. In general, management, which increases successional stages on a landscape, by ensuring that all seral stages are present, will result in a corresponding increase in wildlife diversity. Sustaining a full range of successional stages will help ensure sustainable habitat for sensitive and MIS species. This diversity will increase habitat effectiveness for these species.

Alternatives B, C, D and F: These alternatives also contain direction to use native plants rather than nonnative when and where available, thus avoiding disruption of natural successional pathways, unless nonnatives are needed to meet specific restoration or maintenance objectives. The preferred use of native plants in management activities will have similar benefits for sensitive and MIS species habitat as described for goshawk and their prey.

Alternative E: The standard to only use native plant species from locally adapted seed sources in this alternative will likely have similar short and long term benefits to other MIS and sensitive species as described for goshawk and its prey. As previously stated, because native seed from locally adapted seed sources can sometimes be difficult to obtain, this requirement may not be practicable to achieve all the time.

Forest Structure (Sensitive and MIS Species)

Alternative A: Primary and secondary cavity nesters such as flammulated and boreal owls and three-toed woodpeckers are dependent on snags. All forest plans contain snag retention guidelines. Current forest conditions in Utah are dominated by unstable stands of late seral species. Late seral stands are typically rich in snags and it is likely that forests are exceeding current forest plan direction in many areas throughout the state. The trend of forest management will likely be to selectively harvest in these unstable stands. This will result in snag densities which are closer to the minimum values in forest plans, with the potential for reduced abundance of snag dependant species in treated areas. Based on limited data, the effects of these treatments on populations of cavity nesting birds will be difficult to measurable. This is due to the overall condition of most of the vegetation types across the state, which contain mature and old forests with snags and down woody debris mixed throughout. It is my

professional judgement that the number of acres that will likely be treated over the next 4 years will not affect population trends.

Forest plans contain direction to maintain or enhance big game habitat effectiveness. Deer and elk populations fluctuate in response to many factors, including hunting. In general, deer and elk populations are stable or increasing throughout the state. Furthermore, most forest service land is used as summer habitat by deer and elk, and summer range is not generally a limiting factor. Therefore, habitat structures promoted by the no action alternative will not measurably affect population trends over the next 4 years.

All Action Alternatives: Primary and secondary cavity nesters such as flammulated and boreal owls and three-toed woodpeckers will benefit from the snag retention guidelines in action alternatives. Current forest conditions in Utah are dominated by unstable stands of late seral species (Graham et al. 1999). Late seral stands are typically rich in snags and it is likely that we are currently meeting the direction outlined in action alternatives concerning snags in many areas throughout the state. The trend over the next four years will be toward reduced snag densities due to harvest and wind throw. However, direction under these alternatives will require that more snags be managed for on average than the no action alternative. This could be accomplished through higher snag retention in harvest units and/or creation of snags where existing densities are below the desired condition.

Alternatives B, C, D and F: Deer and elk will benefit from a mix of structural stages as specified in these alternatives, since many of the younger stand structures provide foraging opportunities. Foraging areas will have to be juxtaposed with cover patches in order to be most effective, as described under the Native Processes section (above). Although the trend toward a better mix of structural stages will be positive for deer and elk, it is not likely to have a measurable effect over the next four years. Most NFS land is used as summer habitat by deer and elk, and summer range is not generally a limiting factor. Managing for these attributes under this alternative will provide positive habitat conditions for sensitive and MIS species.

Alternative D: The variable canopy closures by cover type and goshawk habitat area, created small openings, retention of clumps of large trees with interlocking crowns, and fuels treatment priorities will enhance goshawk and other sensitive and MIS species habitat. This alternative will provide better structural attributes than the no action alternative and slightly better conditions in canopy closure than Alternatives A, B, C, and F. The retention of at least six mature and old trees in groups with interlocking crowns in regeneration treatment areas, will have positive effects on habitat for sensitive and MIS, some of which are prey species for goshawks. This direction will provide optimum habitat conditions for a myriad of wildlife species, some of which are sensitive and/or MIS, more so than all alternatives, except E. The concerns relative to the ability to achieve the prescriptive level of the cover guideline in this alternative expressed under the goshawk discussions would also be true here.

Alternative E: The benefits of this alternative would be similar to that described for Alternative D. However, the risks to long term sustainability previously discussed under the goshawk section due to the key changes from Alternative D (i.e., prohibiting removal of mature and old trees and the higher canopy closures desired) would apply to sensitive and MIS species habitat.

Nest and Post-Fledgling Areas Only (Sensitive and MIS Species)

Alternative A: This alternative continues to manage all sensitive and MIS under current Forest Plan direction, including the goshawk, which is a sensitive species. Without specific management direction for the goshawk, conflicts between goshawks and other sensitive and MIS species may be implemented

differently on each administrative unit. Therefore, this alternative does not address the concern over the lack of management consistency and the use of new science found in the goshawk Assessment and HCS for Utah. It is my professional judgement that this alternative does not provide direction to promote a consistent approach to goshawk habitat management (a sensitive and MIS species in some forest plans), and if current inconsistencies in either habitat or species management are allowed to continue, this alternative may eventually preclude management options for the goshawk as well as other sensitive and MIS species which use forested habitats.

All Action Alternatives: Since management direction in this category only applies to small areas (less than 10% of any home range), it is unlikely to have a measurable effect on populations of any other sensitive species or MIS. Of those species that occur within known nest areas or PFAs, the effect of increased canopy closure and higher percentages of mature and old forest will either be neutral or favorable.

Other Miscellaneous Areas of Concern (Sensitive and MIS Species)

Alternative A: The effects of additional direction in this category, compared to the lack of or differing direction under current plans will be discussed under each action alternative below.

Alternative B: No additional direction was added in this category under this alternative. The effect of additional direction in this category, compared to the lack of the direction in this alternative, is discussed under the other action alternatives below.

Alternatives C, D, E and F: The positive indirect effects of direction for completion of landscape assessments on managing habitat for the goshawk and its prey will be similar for other MIS and sensitive species.

Alternative D: Implementation of the ungulate grazing utilization guideline (g-27) will likely enhance habitat for goshawk prey species, some of which are MIS. However, it will be difficult to assess and detect this change in the 4-year life of this amendment.

The addition of this direction for skid trails in lieu of roads, and road densities (g-31 and g-32*)* will have similar benefits to sensitive and MIS species as discussed for goshawks and their prey.

Alternative E: Over the short life of this amendment, direction concerning treating or not treating unsuitable timberlands for purposes of achieving goshawk habitat objectives (g-30) is not likely to make a measurable difference. Generally, acres proposed for treatment occur on lands classified as suitable for timber production. However, if treatment were proposed on unsuitable lands and they followed the intent of direction found in other action alternatives MIS and sensitive species should not be impacted, and in some cases where habitat needs of the goshawk are similar to that of MIS and sensitive species they will likely benefit.

Alternative F: Although improvements in vegetation will likely occur in areas where ungulate grazing (is identified as the problem in localized areas (g-28 and g-29), it will be difficult to monitor and detect any response in MIS and sensitive species populations during the life of this amendment at the forest or larger scale. Changes in wildlife species numbers will likely be several years behind improvements in vegetation.

Therefore, it is my professional judgement that, though changing utilization direction may help improve at-risk habitat areas related to MIS and sensitive species when they overlap with habitat associated with

goshawks, not implementing this guideline is not likely to measurably effect habitat during the short life of this amendment.

Treatment Prioritization (Sensitive and MIS Species)

Alternatives A, B, C, D and E: These alternatives contain no specific direction concerning treatment prioritization.

Alternative F: Because of similarities in habitat needs between many sensitive and MIS species and goshawks, prioritization of management in forested landscapes at greatest risk to dropping out of a high or optimum habitat condition (per the Graham et al. (1999) assessment process) will be expected to be beneficial to these species.

Monitoring Requirements (Sensitive and MIS Species)

Alternative A: Direct effects from monitoring goshawk habitat currently found in plans on sensitive and MIS species will not occur. Indirect effects are related to the ways monitoring information will be used to validate and adjust implementation of the management direction. Current monitoring efforts will continue to provide a limited amount of information that will be used for sensitive and MIS species.

All Action Alternatives: There will be no direct effects on any sensitive or MIS species as a result of monitoring goshawks and their habitat under this alternative. Indirect effects are related to the ways the monitoring information will be used to validate and adjust implementation of the management direction. However, as has been previously stated, it is not likely that monitoring will result in any measurable change to direction proposed under any action alternative during the projected 4 year life of the amendment. Therefore, there is not likely to be any measurable effect to habitat for these species resulting from changes caused by monitoring.

TEP Species

Native Processes (TEP Species)

Alternative A: Of the TEP species occurring in forest habitats, the Canada lynx and Mexican spotted owls are the species most likely to be affected by the abundance and distribution of structural characteristics recommended in the Assessment and HCS. Although forest plans lack specific direction related to lynx habitat needs, additional guidance is now available through a draft lynx Conservation Assessment and Strategy (USDA Forest Service 1999). Forest management activities in the next four years will likely draw from the science contained within the Strategy during project design and implementation to avoid negative impacts to the lynx.

In Utah, Mexican spotted owls in general depend upon habitat patches of mature and old forest or woodlands for both nesting and foraging. Impacts to nesting habitat for Mexican spotted owls will be slight because they nest in steep walled canyon complexes where little management activity occurs. Forests occurring along canyon rims sometimes serve as foraging habitat. Some of the forested habitat along canyon rims is subject to timber management practices, however, impacts to habitat suitability will be avoided through implementation of the recovery plan during project design.

Alternatives B and E: Of the TEP species occurring in forest habitats, the Canada lynx and Mexican spotted owls are the species most likely to be affected by these moderated disturbance regimes. Impacts to lynx depend on the scale of the event. Lynx can benefit from the creation of early successional

habitats, but only if they are mixed with patches of mature forests suitable for denning. Keeping disturbance events within HRV is more likely to create a favorable mix of habitats for lynx than the no action alternative over the long term. However, it is my professional judgement that these alternatives will not differ substantially from no action over the life of this amendment.

Impacts to Mexican spotted owls will be slight because they nest in steep walled canyon complexes where very little management occurs on the Colorado Plateau. Suitable habitat in these canyons occurs in small, scattered patches so disturbance events are inherently very small in scale.

Alternatives C, D and F: Working within the bounds of HRV as defined by PFC will have an added benefit for TEP species for the same reasons as described for goshawk habitat. Extreme disturbance events that may alter landscapes at a 5th or 6th order HUC or larger scale are not desired within the range of HRV as defined by PFC (refer to Appendix D for a detailed discussion); though they may be within the full range of HRV. Retaining habitats across landscapes as small as 5th or 6th order HUCs (10s to 100s of thousands of acres) will promote a more constant supply of habitat throughout the state of Utah for many species. Retaining a good mix of habitat at these smaller scales will help reduce risks to losing habitat needed to support populations of other TEP species across NFS lands affected by this amendment.

Forest Composition (TEP Species)

Alternative A: For the same reasons previously stated in Native Processes for this alternative, lynx and MSO habitat and numbers would not be impacted through implementation of current forest plan direction related to forest composition.

All Action Alternatives: Young lodgepole pine and mixed lodgepole/spruce/fir stands are examples of early seral communities that are good habitat for snowshoe hares. Hares are one of the primary prey species used by lynx; therefore maintaining representation of these early and mid-seral communities will provide key foraging habitat. Management direction implemented as part of the lynx conservation strategy (USDA Forest Service 1999) will supplement direction in this alternative. Where lynx recommendations overlap with this alternative, the lynx recommendations will take precedence under the ESA. Therefore, there will be no negative effects to the lynx or goshawk, or their habitat under action alternatives, and there may be positive effects due to the creation of a mix of cover types that provide foraging opportunities for lynx.

Mexican spotted owls only nest in steep walled canyon complexes where little management occurs and successional pathways are very limited. Therefore, forest composition does not vary greatly with management. Other TEP species are not strongly influenced by forest composition.

Alternatives B, C, D and F: These alternatives also contain direction to use native plants rather than nonnative when and where available, thus avoiding disruption of natural successional pathways, unless nonnatives are needed to meet specific restoration or maintenance objectives. The preferred use of native plants in management activities will have similar benefits for TEP species habitat as described for goshawk and their prey.

Alternative E: The standard to only use native plant species from locally adapted seed sources in this alternative will likely have similar short and long term benefits to TEP species as described for goshawk and its prey. As previously stated, because native seed from locally adapted seed sources can sometimes be difficult to obtain, this requirement may not be practicable to achieve all the time.

Forest Structure (TEP Species)

Alternative A: For reasons previously stated in Native Processes for this alternative, Native Processes, lynx and MSO habitat and numbers would not be impacted through implementation of current forest plan direction related to forest structure.

All Action Alternatives: Of the TEP occurring in forest habitats, the Canada lynx and Mexican spotted owls are the species most likely to be affected by management for structural characteristics promoted by direction in action alternatives. Overall, the best available information indicates that implementation of direction in these alternatives for down woody debris, down logs and snags should maintain or improve habitat for lynx and its prey species. Similarly, guidelines for the retention of snags and down woody debris under these alternatives will benefit prey species taken by both goshawks and Mexican Spotted Owls, such as squirrels. However, direction in both the goshawk and lynx Assessments and Strategies and Mexican Spotted Owl Recovery Plan will be used during project design and implementation. Where lynx or MSO recommendations overlap with goshawk habitat, the recommendations for these TEP species will take precedence under the ESA. Therefore there will be no negative effects to MSO or lynx , or their habitat under these alternatives. Implementation of the lynx strategy or the MSO recovery plan will not create adverse habitat conditions for the goshawk or its prey. Lynx habitat management as described in the draft Lynx strategy are generally consistent with goshawk strategies.

Alternatives B, C, D and F: Lynx will benefit from the mix of structural stages promoted by these alternatives, since they require young stands for foraging and old stands with abundant woody debris for denning.

In Utah, Mexican spotted owls generally depend upon habitat patches of mature and old forest or woodlands for both nesting and foraging. Earlier structural stages are important as sources of future mature and old habitat, but are rarely directly used by owls. Impacts to nesting habitat for Mexican spotted owls will be slight because they nest in steep walled canyon complexes where little management activity occurs. Forests occurring above canyon rims serve as foraging habitat. Some of the forested habitat along canyon rims is subject to timber management practices. These forested areas along canyon rims are the only places in Utah where both spotted owl management direction (contained in the Mexican Spotted Owl Recovery Plan) and goshawk management direction (contained in the HCS and this alternative) could overlap. However, as with other direction, where goshawk and spotted owl management direction overlap, Recovery Plan recommendations will take precedence under the Endangered Species Act. It is my professional judgement that if areas of overlap occur, it is not anticipated that implementation of the recovery plan will create negative impacts to the goshawk. There will be no negative effects to the spotted owl or its habitat under this alternative.

Alternatives C and F: The range of canopy closures desired under these alternatives will help provide more dense habitat conditions desired by lynx for denning. Canopy closures described in this alternative will increase habitat effectiveness, and will be better for the lynx than Alternatives A and B.

Alternative D: The variable canopy closures by cover type and goshawk habitat area, created small openings, retention of clumps of large trees with interlocking crowns, and fuels treatment priorities will enhance TEP habitat. This alternative will provide better structural attributes than the no action alternative and slightly better conditions in canopy closure than Alternatives A, B, C, and F. The retention of at least six mature and old trees in groups with interlocking crowns, in regeneration treatment areas, will have positive effects on habitat for TEP species.

The smaller created openings promoted by g-8 in Alternative D and E throughout the entire home range (versus nest and PFA areas only in Alternatives B, C, and F) may help distribute some grazing pressure, which may indirectly improve habitat conditions for the lynx and its prey species (USDA Forest Service 1999). In addition, the small created openings recommended under this alternative may help enhance habitat diversity (early seral species mixes across landscapes) needed by lynx prey species.

Alternative E: As previously described, structural direction in this alternative is similar to Alternative D but differs in two key aspects. First it contains a standard that requires the retention of all mature and old forest groups over the next 4 years to provide immediate protection of goshawk nesting and foraging habitat. Secondly, Alternative E provides direction for minimum canopy closures from 60-75% depending on the habitat area.

Similar to that found for goshawks, measurable effect differs to TEP species between this alternative and others will be difficult to detect and monitor over the projected 4-year life of this amendment. However, there is a probability that long-term effects to forest composition and structure could occur that may be adverse to TEP species. Therefore, it is my professional judgement that TEP habitat effectiveness will be sustained or improved over the life of this amendment, however, long-term effects regarding habitat will be a concern.

Nest and Post-Fledgling Areas Only (TEP Species)

Alternative A: As described for the goshawk above, no species-specific management direction exists within current forest plans, however general forest plan direction exists to maintain or enhance TEP species status and habitat conditions. This general direction will be the basis for incorporating the best available scientific information on TEP species during project design and implementation. In addition, Recovery Plans and Conservation Assessments and Strategies will be used in project design and implementation. This will continue to occur regardless of which alternative is selected.

Alternatives B, C, D, E and F: This additional management direction only applies to small areas within known territories (less than 10%). It will have little, if any effect on any TEP species. When a sensitive species such as the goshawk occurs in the same location as a TEP species, management direction for the TEP species will take precedence under the ESA. However, effects from managing for TEP will not likely adversely affect the goshawk or its prey.

Other Miscellaneous Areas of Concern (TEP Species)

Alternative A: The effects of additional direction in this category, compared to the lack of or differing direction under current plans is discussed under each action alternative below.

Alternative B: No additional direction was added in this category under this alternative. The effect of additional direction in this category, compared to the lack of the direction in this alternative, will be discussed under the other action alternatives below.

Alternatives C, D, E and F: The positive indirect effects of direction for completion of landscape assessments (g-33) on managing habitat for the goshawk and its prey will be similar for TEP species.

Alternative D: Implementation of the ungulate grazing guideline *(g-27)* will enhance habitat for prey species for the lynx and MSO; however, it will be difficult to assess and detect this change in the short life of this amendment.

The addition of direction for skid trails in lieu of roads, and road densities (g-31 and g-32) will have similar benefits to TEP species as discussed for goshawks and their prey.

Alternative E: Over the short life of this amendment, direction concerning treating or not treating unsuitable timberlands for purposes of achieving goshawk habitat objectives (g-30) is not likely to make a measurable difference. Generally, acres proposed for treatment occur on lands classified as suitable for timber production. However, if treatment were proposed on unsuitable lands and they followed the intent of direction found in other action alternatives TEP species should not be impacted, and in some cases may benefit.

Alternative F: Although improvements in vegetation will likely occur in areas where ungulate grazing is identified as the problem in localized areas (g-28 and g-29), it will be difficult to monitor and detect any response in TEP species populations at the forest or larger scale over the short life of this amendment. Changes in wildlife species numbers will likely be several years behind improvements in vegetation.

Therefore, it is my professional judgement that, though changing utilization direction may help improve at-risk habitat areas related to TEP species when they overlap with habitat associated with goshawks, not implementing this guideline is not likely to measurably degrade habitat.

Treatment Prioritization (TEP Species)

Alternatives A, B, C, D and E: These alternatives contain no specific direction concerning treatment prioritization.

Alternative F:: Because of similarities in habitat needs between TEP species and their associated prey and goshawks and their prey, prioritization of management in forested landscapes at greatest risk to dropping out of a high or optimum habitat condition (per the Graham et al. assessment process [1999]) is expected to be beneficial to these species.

Monitoring Requirements (TEP Species)

Alternative A: Effects from monitoring goshawk habitat on sensitive and TEP species will not occur. Indirect effects are related to the ways monitoring information will be used to validate and adjust implementation of the management direction. Current monitoring efforts will continue to provide a limited amount of information that will be used for TEP species.

All Action Alternatives: There will be no direct effects on any TEP species as a result of monitoring goshawks and their habitat under this alternative. Indirect effects are related to the ways the monitoring information will be used to validate and adjust implementation of the management direction. However, as has been previously stated, it is not likely that monitoring will result in any measurable change to direction proposed under any action alternative during the projected 4 year life of the amendment. Therefore, there is not likely to be any measurable effect to habitat for these species resulting from changes caused by monitoring from that which has already been described above.

Discussion of Cumulative Effects - Effects are discussed as they relate to both Federal and nonfederal lands under separate subheadings. All wildlife species described in Chapter 3 have been grouped together under these discussions below.

All Species Groupings

Federal Lands:

Alternative A: Over time, a lack of consistent management direction, especially direction that does not emphasize management for large old trees, will likely result in degraded habitat for goshawk and associated sensitive, MIS and TEP species. There will be no assurance that the incremental and interactive effects of site-specific actions on goshawks will continue to be considered. Negative cumulative impacts at the site-specific level may be occurring as a result of vegetative management (timber harvesting and wildland fire use), recreational, and livestock grazing activities, however, they will be difficult to detect and measure at the landscape scale prior to revision of forest plans in Utah.

However, use of current direction could also result in site-specific beneficial effects from small localized projects that were designed to restore DHC's in the future, which are currently lacking existing DHC's. An example of this may be to salvage log an area that had been burned as a result of a fire in a landscape that had already been intensively managed for timber production. While the action to salvage log the area may have negative cumulative effects relative to the fire and past timber management practices, the long-term effects to goshawk habitat will likely be beneficial.

The cumulative impacts that may result from use of current direction in combination with past, present and reasonably foreseeable actions and policies is that greater risks to loss of habitat needed to support goshawks and their prey will be assumed. This greater risk will result from a lack of specific management direction for key goshawk habitat attributes, such as dense canopy closures, and 40% mature and old in conifer and 30% in aspen within and among all landscapes. The lack of coordination among affected national forests and other federal, state and private entities will continue to have unknown effects on goshawks and their habitats. It is likely that this lack in coordination of habitat management will continue to perpetuate unstable conditions and downward trends in habitat over the long term. However, these effects are not presumed to be causing negative effects that will result in the loss of viability of the goshawk population over the short term of the proposed amendment.

Over time, a lack of consistent management direction for the goshawk that will also affect sensitive and MIS species previously discussed, especially direction that does not emphasize management for large old trees, snags and down woody material. A lack of consistent direction will likely result in degraded habitat. Negative cumulative impacts at the site-specific level may be occurring as a result of vegetative management (timber harvesting and wildland fire use), recreational, and livestock grazing activities, however, they will be difficult to detect and measure at the landscape scale prior to revision of Utah's forest plans. The cumulative impacts that may result from use of current direction in combination with past, present and reasonably foreseeable actions and policies is greater risks to loss of habitat needed to support sensitive and MIS species associated with similar habitat needs as the goshawk. This greater risk will result from a lack of specific management direction for key habitat attributes common between the goshawk and these species, such as dense canopy closures, and 40% mature and old in conifer and 30% in aspen within and among all landscapes.

TEP species are not likely to be impacted because of requirements under ESA to follow current Recovery Plans and/or Conservation Strategies during the design and implementation of any actions that may impact species habitat or populations.

All Action Alternatives: Alternatives B-F will provide consistent management direction that will allow for the maintenance and restoration of goshawk habitat, as well as associated sensitive and MIS species. There will be assurances that the incremental and interactive effects of site-specific actions on goshawks

will be considered in the future during project design and implementation. Negative cumulative impacts resulting from timber harvest, recreation, and livestock grazing will be mitigated by the implementation of any of the action alternatives. Negative impacts will further be minimized or avoided by coordination among and between the agencies as the selected alternative is implemented with landscape level analysis and planning. In light of the extremely broad geographic scope of the proposed action and the level of spatial resolution involved, the analysis does not address all possible cumulative effects that may result at the site-specific level. However, all ground disturbing actions will be conducted only after further site-specific environmental analysis. This site specific analysis will also analyze the impacts of the project on adjacent lands and resources within the landscape, enabling managers to design, analyze, and choose alternatives that minimize cumulative environmental effects.

If recovery plan direction or conservation strategy recommendations overlap between Federally listed species, proposed or sensitive species such as the Canada Lynx, and goshawk, precedence will be given to any Federally listed species. The Canada Lynx Draft Conservation Strategy (USDA Forest Service1999) and Recovery Plans for the listed species (described in Chapter 3) that have similar habitat requirements as the goshawk will not be expected to conflict with one another.

Nonfederal Lands

All Alternatives: Nonfederal lands include those owned and/or managed by individuals, corporations, tribes and Native Americans, states, counties, and other agencies. It is important to note that the Forest Service has no authority to regulate any activities or their timing on lands other than those they administer. However, when an action takes place on NFS lands, it may cause direct, indirect, or cumulative effects on nonfederal lands. While there are no discernible environmental effects on nonfederal lands, there are both environmental and economic interactions with adjacent nonfederal forests. Private land owners control limited amounts of suitable vegetation types, with the exception of the white fir, quaking aspen, and Douglas-fir vegetation types where over 26 percent is controlled by private land owners (Graham et al. 1999). Because there are minimal restrictions on the use of private land, there are no assurances that goshawk habitat will be sustained on these lands. These are all endemic processes that can have both positive and negative effects to goshawk habitat. It is likely that these lands will not be managed to reduce natural risks nor will they be managed to perpetuate goshawk habitat.

Nonfederal forests will continue to provide habitat primarily for those species who need early and mid-successional stage forests. When combined with early, mid, and late successional stage federal forests, a mix of successional stages and a diversity of habitat for the ecosystems within the range of the goshawk in Utah will be provided. While this mix of successional stages is affected by the management direction proposed, the overall mix of successional stages varies among the alternatives only by the variation on the lands managed by the Forest Service, BLM, and state lands; the successional mix, snags, down woody debris, and nest site protection on nonfederal lands is not expected to be affected by the alternatives in this document.

4.4 SOCIAL COMPONENTS

In towns adjacent to NFS lands, community well-being may be affected by social factors related to NFS land management. Unique ecosystems and habitats, outdoor recreation, scenic quality, and a sense of place are attributes and activities valued primarily for their social, psychological, and cultural significance. Some alternatives may affect specific social groups' values and beliefs but not have an economic effect on a group. For example, social groups concerned about maintaining optimum habitat

for the goshawk and its relationship to other environmental considerations, such as mature and old forests, may have concerns with any alternative that provides direction that permits habitat change.

In most cases, however, the relative degree of social impacts would follow the same degree of change as the economic impacts experienced by that group. There is a close tie between economic and social factors. For example, Alternatives D requires the greatest change to grazing and could impact some grazing interests economically at the point it is integrated into a grazing permit. This, in turn, could affect the group socially (i.e., values and way of life). As a result, the primary basis for determining the effects to the social environment is the economic changes that may result from each alternative.

4.4.1 Environmental Justice

Discussion

Alternative A: Continuing under the direction of current forest plans would not disproportionately affect minorities or low income groups.

Effects Common to All Action Alternatives: The preponderance of minority and low income groups live in the urban environment of northern Utah. These groups work in highly diverse occupations, mostly in city settings. There may be some minorities, low income residents, and Native Americans that rely on forest products or related forest activities for their livelihood. These individuals probably reside in rural communities adjacent to NFS lands. Some of these groups may be impacted by the alternatives restricting timber or range management options if the groups are economically tied to one of those industries. However, these effects would be localized and are not measurable and would not be disproportionate to low income or minority groups. It is difficult to assess the degree of impact each action alternative presents to these groups due to other variables which allow for a variety of income options. In addition, individuals or groups dependent on income related to NFS lands are considered during site-specific, project level decisions which assess the continual effect to the human environment. For these reasons, the best available information suggests that when assessing the effects of each action alternative on minority and low income groups, the effects are minimal and not disproportionate to these groups when compared to other groups.

4.4.2 Social Groups, Values and Systems

Effects Summary

All Alternatives: There would be no measurable direct, indirect or cumulative effects to these groups. Effects to beliefs and values of some groups may occur to a limited degree as projects using proposed direction begin to implement actions. However, effects are believed to be small considering the small number of acres that may be treated by projects using this direction in design and implementation over the next 4 years.

Discussion - For discussion purposes, the analysis that follows combines all groups discussed in Chapter 3 (3.4.2).

Alternative A: This alternative has the lowest costs, socially and economically as there is no discernible change or disruption to the current condition. Some environmental groups, however, may be affected by this alternative because of their belief that forest practices need to change in order to protect goshawk habitat.

Alternative B: There are no discernible effects to social groups in this alternative because of the minimal degree of change resulting in the short time frame of this amendment. In addition, recreational interests, visual resources, and exempted areas are retained, and other economic relationships with NFS lands remain basically unchanged (see 4.5).

Alternative C: There are no discernible effects to social groups in these alternatives because of the minimal degree of change resulting in the short time frame of this amendment. In addition, recreational interests, visual resources, and exempted areas are retained, and other economic relationships with NFS lands remain basically unchanged (see 4.5). This alternative would require management actions to be designed to keep ecosystems within PFC. Management for PFC is a conservative approach that is designed to help avoid the large scale ecosystem changes that may periodically occur naturally. PFC adds the elements of stability and balance, which are social desires, and would thus better address the social concerns of many of the public (see Appendix D, "Understanding HRV and PFC").

Alternative D: This alternative has the least flexibility and most noticeable effects to the social and economic environment of grazing interests. Some grazing allotments in the home range of goshawks may have to reduce carrying capacity for those allotments (see 4.5.2). Those ranchers dependent on affected lands and operating on a low profit margin may also experience some impacts. Effects would most likely be measurable at local and possibly forest level. Effects will be realized at the forest level when grazing is not allowed on entire allotments or pastures within allotments as a result of applying the utilization requirement. Management for PFC is a conservative approach that is designed to help avoid the large scale ecosystem changes that may periodically occur naturally. PFC adds the elements of stability and balance, which are social desires, and would thus better address the social concerns of many of the public (see Appendix D, "Understanding HRV and PFC").

Alternative E: This alternative would have little effect on most of the social groups with the exception of timber interests where there may be noticeable social and economic changes and effects. Prohibition of vegetative management activities in areas dominated by mature and old forests would measurably affect the economic and social environment of the timber industry on the local, forest, and state level (4.5.1); a potential 30% reduction in average annual volume available from NFS lands). Effects would be likely to be most felt by the family-based operators, who would likely need to travel further from home to maintain the same volume of wood supply or would need to reduce the volumes processed. However, it is difficult to assess the degree of impact based on the variables to this alternative allowing for other options and the time frame (4 years) for this direction.

The greatest beneficial affect would be realized in this alternative by those groups whose belief and values center around the need to minimize habitat disturbance and preserve large trees. However, as with other effects, it is difficult to assess the degree of benefits due the short time frame direction in this alternative would be applied.

Alternative F: This alternative could have slightly higher social and economic effects than Alternatives B and C. However, these effects are not likely to be measurable in 4 years. Grazing practices would change in areas where a goshawk habitat problem is identified and attributed to grazing. However, due to the short time frame of this amendment, the effects on grazing interests would likely be localized only and not measurable at the forest or state scale. Also, management for PFC is a conservative approach that is designed to help avoid the large scale ecosystem changes that may periodically occur naturally. PFC adds the elements of stability and balance, which are social desires, and would thus better address the social concerns of many of the public (see 4.3.1, "Understanding HRV and PFC").

4.4.3 Heritage Resources

Summary of Effects

All Alternatives: Current forest plan direction designed to protect heritage resources would not be superceded by any direction proposed under action alternatives; the no action alternative would continue to use current direction. Therefore, there would be no direct, indirect or cumulative effects to this resource.

Discussion - Cultural resources are formed by natural and cultural processes. For example, early native peoples may have chosen a place next to a creek for a summer camp. At this location, many activities may have taken place, such as making and maintaining stone tools, making campfires, butchering and cooking wild animals, and sleeping inside of a small brush house, are all cultural processes. When the camp was abandoned, the people would have left behind numerous discarded items and the remains of fires, food-processing areas. In the spring, flooding along the creek might deposit sediment over the camp area (a natural process) and bury the discarded artifacts and camp features (a natural process). Over hundreds of years, this process might continue burying the early campsite (and subsequent campsites) deeper in soils. If such sites are located in a stable landform (geomorphic) area, the buried contents of the site could remain protected for a considerable period. However, in an unstable geomorphic setting, natural erosion processes (like stream bank cutting) may cut into the "cultural" soil layers and begin exposing and eroding artifacts from their original context. Historic structures in Utah's NFs are largely built of wood and are subject to natural deterioration, even with maintenance.

Utah's NFs contain a wide variety of cultural resource site types. These site types exist both above and below the ground surface and may contain a variety of artifacts and materials made, used or introduced into sites by past peoples. These include materials made of stone, mineral, wood, bone, clay (fired and unfired ceramics), plants (seeds, charcoal, pollens, plant parts), and other materials. The direction for cultural resource management is provided in law, regulation and policy.

As use of the national forests continues to rise due to increased local populations and nonresident visits, impacts to heritage resources are expected to increase. Unauthorized collecting, theft and illegal excavations are occurring and would continue. Natural erosion and depositional processes would also continue to affect cultural resources. Data collection through excavation to mitigate the unavoidable adverse effects caused by planned activities would occur and most likely would result in some loss of cultural resources.

As surveys are completed and projects implemented, additional cultural resources could be located that would require documentation, evaluation and protection. Some may warrant stabilization and interpretation.

Future management concerns include maintaining compliance with various laws and regulations and protecting sites until they are evaluated and/or nominated for the National Historic Register in Utah's NFs . Law enforcement and public education efforts need to continue in order to minimize unauthorized collection, excavation, theft and other acts of vandalism.

Effects to cultural resource sites include direct, indirect, and cumulative impacts that would result from either intentional or inadvertent damage of cultural resources. Such activities are constrained by forest plan standards and guidelines. Surveys for archaeological resources are accomplished prior to approval of ground-disturbing projects and activities.

Effects Common to All Alternatives: When assessing the effects of each alternative on all of the NFS lands within the project area as a whole, none of the alternatives have any direct, indirect or cumulative effects to cultural resource sites. The direction contained in the action alternatives is programmatic and does not supercede any of the direction currently in the Forest Plans to protect sites.

4.5 ECONOMIC COMPONENTS

Demand for natural resources, such as recreation opportunities, wood products, and special forest products has steadily increased on the six affected national forests. In towns adjacent to NFS lands, community well-being may be affected by economic factors related to NFS land management. Market goods such as timber, special forest products, livestock grazing, mineral leases, and commercial recreation, generate income for local economies. The focus of the economic effects discussion is to identify the incremental effects that may be expected as a result of this short-term direction. Most of the effects in the following section are described qualitatively because most are not measurable as physical or monetary impacts and are difficult to measure quantitatively because the broad scale of the analysis precludes collection of site-specific data outputs.

4.5.1 Wood Products/Timber Industry

Effects Summary

All Alternatives: Cumulative effects (i.e., volume and product size reductions) may occur under any alternative as Forests begin using direction in project design and implementation. This is due primarily to effects of other national policies such as the interim roads policy (USDA Forest Service 1999a) and the Lynx conservation strategy (USDA Forest Service 1999). Volume reductions on national forests may increase logging pressure on nonfederal lands. With the exception of Alternative E, which would have measurable effects, cumulative effects as a result of this management direction are not likely to be measurable over the next 4 years.

Alternative A: No direct or indirect effects on volume offer and product are anticipated with this alternative.

Alternatives B, C, and F: Direct effects may include a change in product size, product type, and lengthened rotations. Short-term volume reductions are not predicted. Long-term reductions are possible.

Alternative D: Direct effects may include a change in product size, product type, and lengthened rotations. Road restrictions and complexity of density prescriptions may result in short and long-term volume reductions.

Alternative E: Direct effects may include a change in product size, product type, and lengthened rotations. High stand density requirements, road restrictions, and restrictions on management of mature and old structural stages would likely cause substantial reductions in volume offer during the short and long-term.

Discussion

Alternative A: No direct effects on volume and product offer over current are foreseen with this alternative.

The interim roads policy (USDA Forest Service 1999a) and Lynx strategy (USDA Forest Service 1999) could result in reduced volume offer; however, selection of the no action alternative is unlikely to add

directly to these cumulative effects due to the flexibility in current direction which guides vegetative management project design and implementation. However, indirect effects could result by not implementing new guidance for management of goshawk habitat as there is a high potential of resulting lawsuits against the Forest Service. This in turn could affect the Forest Service's ability to offer wood products.

Alternatives B and C: Direct effects may include change in product size and lengthened rotations. Lengthened rotations may reduce the amount of volume to be offered over time. These items may have some affect on local industry and their markets.

Cumulative effects are possible when these changes are added to potential volume reductions and product changes caused by the inteirm roads policy (ibid.) and Lynx strategy (ibid.).

Alternative D: Direct effects may include change in product size and lengthened rotations. Lengthened rotations may reduce the amount of volume to be offered over time.

Dependent upon many factors (product value, terrain, cutting practices, skid method, etc.), replacing temporary roads with skid trails may reduce treatment acreage due to economic considerations. The two most costly items in logging contracts are the skid and the haul (Paroz 1999). To increase the skid distance, would necessarily increase logging costs and thereby reduce receipts or eliminate portions of harvest units from treatment. Thus, reductions in temporary road construction would likely result in reduced treatment acreage and corresponding volume reductions. Volume reductions cannot be readily quantified on a programmatic level, as they are dependent upon sale configuration and current road patterns. This may have cumulative effects on adjacent non-Forest Service timber lands by placing additional logging pressures on these lands as purchasers attempt to supplement volume. It should be noted that pressure to log is already high on private lands within the project area. Implementation of this alternative may result in purchasers needing to travel farther for raw products if they wish to maintain their current production level.

Additional cumulative effects are possible when these changes are added to potential volume reductions and product changes caused by the interim roads policy (ibid.) and Lynx strategy (ibid.), which could result in reduced volume offer.

Alternative E: In addition to the effects noted in Alternative F, the elimination of harvest from mature and old VSS class groups and stands would substantially reduce timber volume production. Based on harvest figures from the past 5 years (1994-1998) and assuming future offer would be similar, the following reductions (live only) could be anticipated by appraisal group:

Table 8: Volume reductions by wood product appraisal group for Alternative E.

Engelmann spruce, Douglas-fir, Ponderosa pine, Subalpine fir:	14% reduction
Aspen:	45% reduction
Lodgepole pine:	99% reduction
Overall:	**30% reduction**

This equates to a value reduction of approximately $2.4 million per year and the corresponding payments to the counties. In addition to the above, 98% of dead volume could potentially be affected (Paroz 1999).

These reductions would affect local industry. Local industry would either need to find other sources for their mills, reduce production, or switch to other business operations. Implementation of this alternative

may result in purchasers needing to travel farther for raw products if they wish to maintain their current production level.

These reductions in Forest Service volume may have cumulative effects on adjacent non-Forest Service timber lands by placing additional logging pressures on these lands as purchasers attempt to supplement volume. It should be noted that pressure to log is already high on private lands within the project area.

Additional cumulative effects are possible when these changes are added to potential volume reductions and product changes caused by the interim roads policy (USDA Forest Service 1999a) and Lynx strategy (USDA Forest Service 1999), which could result in reduced volume offer.

Alternative F: Direct effects may include change in product size and lengthened rotations. Where Alternative F focuses management in ecosystems that are "at-risk" or "nonfunctioning" (from a PFC viewpoint), wood quality and species may also be affected over that currently offered. It could be expected that more emphasis would be placed on aspen management. It could also be expected that more emphasis would be placed on restoration of degraded systems as well as preventing epidemic insect outbreaks. Restoration objectives could place more dead and/or bug-infested wood on the market. Prevention could place more green on the market. These items may have some affect on local industry and their markets.

Cumulative effects are possible when these changes are added to potential volume reductions and product changes caused by the interim roads policy (ibid.) and Lynx strategy, which could result in reduced volume offer.

4.5.2 Grazing

Effects Summary

Alternative A, B, C and E: No effects, does not change utilization direction currently found in Forest Plans.

Alternative D: Changes estimated to result, if alternative management direction is adopted, is an average 23% reduction in currently permitted AUMs across NFS suitable rangelands on the six Utah National Forests. This reduction reflects what may occur as an average across acres affected by this alternative, based on assumptions stated below. Localized (allotment) effects are expected to be highly variable due to varying site conditions and may be more or less than this average. However, the effect is expected to be measurable at the localized, forest and state scales.

Alternative F: Management direction in this alternative allows the manager to approach the cure to the problem by changing the aspect of grazing practices that is causing the downward trend (i.e., utilization, season of use, grazing system, range health, etc.). Though some localized effects to grazing permits, including reductions in AUMs, may occur they are not expected to be measurable at the forest or state scale.

Discussion - Graham et al.'s Assessment (1999) identifies the nonforest understory vegetation in and/or associated with several forest cover types as being important goshawk prey-base habitat. The alteration by management of both structure and species composition of the grass, forb and shrub understory layers in the forested habitats is of concern with regard to effects on goshawk habitat. This Assessment noted that the majority of NFS lands are grazed by both domestic livestock and wildlife, with 27% of the high-value forest habitat on NFS lands being managed with a livestock grazing emphasis.

Available forage in nonforest and some forested habitats classified as suitable rangelands is what is used to calculate permitted AUMs. Generally speaking coniferous forest cover types, other than ponderosa pine, are typically classified as unsuitable. However, some coniferous forest may be classified as suitable rangeland depending on canopy cover and intermixing with nonforest cover types or aspen. Aspen forests are typically classified as suitable rangeland throughout the Utah NFs. In terms of forage production the aspen cover type is considered one of the most productive of any of the forest or nonforest cover types.

Forested cover types classified as suitable rangeland found within current range allotments on national forests can range from 0 to nearly 100% of the acres on an allotment. The effect of a change in utilization standards, or other grazing practices, that may result from proposed management direction primarily depends on how many forested acres are classified as suitable range within an allotment. In some cases, from an administrative standpoint, if an allotment contains a high mix of forest cover types intermingled throughout the allotment, direction for utilization in forest cover types may have to be applied to both the forest and nonforest areas to successfully meet the utilization requirement. Essentially, if it was not applied to both, in some cases there is no practical way to apply it only to the forested acres and provide reasonable assurance of compliance through current administration procedures.

Alternatives A, B, C and E: These alternatives do not include any management direction that will affect or supercede current forest plan management direction pertaining to livestock or wildlife grazing utilization on NFS lands. Therefore, there will be no direct, indirect or cumulative effect of using alternative management direction in future project design and implementation.

Alternative D: This alternative includes wildlife and livestock grazing guidelines imposing a single average and maximum utilization standard for forage (20% and 40%, respectively) and shrubs (40% and 60%, respectively) across all forested acres on Utah's NFs. Current average utilization on forage generally ranges from 45% to 55% on forage, and 30 to 60% on shrubs. The effect of this guideline will primarily be to forage utilization in forested habitats only, in areas that fall outside the exemption categories described in 2.3.2. Effects of changes in shrub utilization will not be expected because they are within the range that is currently accepted. Changes in forage utilization will be the focus of the effects disclosure.

Effects to domestic livestock grazing on NFS lands is the focus of the following analyses. The amount of domestic livestock grazing permitted on NFS lands on Utah's NFs was estimated at 634,000 animal unit months (3.52) in 1997 and 1998. Changes in permitted AUMs will result from any change in utilization requirements of nonforest vegetation beneath the forest cover types, including small openings within these forested cover types. The vegetative section of Chapter 3 (3.3.1 and 3.3.2) describes in detail these cover types.

There is not complete data available for all allotments on the six affected national forests to assess which ones have suitable range that is forested and how much is contained within an allotment to know what the effect will be. Therefore, a more simplistic approach has been taken based on the data that is available for the six Utah Forests. Assumptions for the effects analysis follows:

- Approximately 68% of the total NFS lands (8.1 million acres) is suitable rangeland, or 5.4 million acres (Johnson 1989).
- Only acres dominated by aspen and ponderosa pine will be affected by this change. Of the 5.4 million acres of suitable rangeland on these six national forests, 10% is in an aspen cover type and 2% in ponderosa pine; 540,000 acres of aspen and 108,000 acres of ponderosa pine (FIA, 1993; USDA, 1996).
- The percentage of land affected outside exemption areas (85% of the total) is the same as that found in the total acres; 85% of 540,000 or 459,000 acres of aspen; 85% of 108,000 acres or 91,800 acres of ponderosa pine.
- The number of animal unit months (AUMs) that will have to the reduced at the state scale is based on the following:
  - Currently allow an average of 50% utilization on 459,000 aspen acres and 91,800 ponderosa pine acres;
  - Average estimated total forage production in aspen is 1000 pounds/acre; on ponderosa pine is 400 pounds/acre (Grider 1999).
  - Total allowed forage used under current utilization requirements (50%): (459,000 acres X 1000 pounds/acre X 50% use) + (91,800 acres X 400 pounds/acre X 50% use) = 247,860,000 pounds
  - Total allowed forage used under proposed utilization requirements (20%): (459,000 acres X 1000 pounds/acre 20% use) + (91,800 acres X 400 pounds/acre X 20% use) = 99,144,000 pounds
  - Total forage use lost = 247,860,000 pounds (used now) - 99,144,000 pounds (proposed use) = 148,716,000 pounds lost.
  - 1000 lbs forage = 1 AUM; therefore, total AUM loss is 148,716 AUMs.
  - Total AUMs currently permitted on six Utah NFs is 634,000; a loss of 148,716 AUMs represents a potential 23% loss. This represents an estimated average loss across all NFS acres affected; any one allotment on a Forest may vary substantially from this.
- Several variables may come to play where the affected acres may decrease or increase due to administration issues. Because these variables are specific to each localized situation and highly variable, it will not be used in the comparison.
- Livestock grazing permits will be adjusted by term grazing permit modification following approval of the amendment (Alternative D). Procedures for permit modification found in FSM 2230 will be followed. Permittees will have the right to appeal any decision to adjust current term grazing permits under 36 CFR §251.8 following notification of a pending adjustment through permit modification procedures.

If this direction is adopted and permits adjusted to reflect a reduction to an average utilization of 20% by dry weight on acreage not exempt from application of direction in this alternative, it will likely cause one of the following:

1. Affected permittees will have to find other options for supplemental forage to make up the difference. In Utah, most of the grazing land base is federally owned and not competitively leased. The average cost for grazing on federal lands is currently $1.35/AUM. The average grazing fee paid in 1998 on private, nonirrigated lands in Utah was $10.00/AUM. Finding supplemental forage will likely have a measurable effect (loss) to the profitability of the current operation affected.

2. Reduced forage availability may mean a shorter grazing season and the need to sell livestock early for less than optimum price. This will also reduce profitability of an operation.

3. In some cases, grazing permits will be reduced to a level where it will no longer be economically viable for a permittee to continue to graze livestock.

Any of these consequences will likely result in measurable localized impacts, and likely Forest, multiple forest and possibly state level impacts to this economic sector.

Alternative F: Unlike management direction in Alternative D, this alternative focuses the need to change grazing practices only in those areas where landscape assessments determine grazing is a factor in putting a landscape at-risk relative to habitat needs of the goshawk. It also recognizes that there are several aspects of grazing practices that could be causing the at-risk condition; changing utilization (Alternative D) may or may not address the real problem. This alternative allows the manager to approach the cure to the problem by changing the aspect of grazing practices that is causing the downward trend (i.e., utilization, season of use, grazing system, range health, etc.).

Where grazing is determined to be contributing to an at-risk condition, grazing practices will be changed to initiate correction of the identified problem. However, this change may or may not result in a measurable change locally, forestwide or statewide because:

1. A change in total permitted AUMs will not always be the best or only solution to the problem attributed to current grazing practices. Changes in season of use or grazing system only may occur. Also, if a change in AUMs is required, it may or may not be substantial in terms of economic viability of an operator.
2. Changes to current permits would only occur in those landscapes where grazing can be attributed as a causal factor to an at-risk condition. Annually, only one to two landscape assessments (at the 5th to 6th order watershed, or equivalent scale) are completed in sufficient detail on each forest that may identify potential problems associated with grazing. There are several 5th to 6th order watersheds (tens to hundreds of thousands acres each), in part or in whole, on the six affected national forests. As a result, the number of allotments likely to be affected in 4 years is a small percentage of the total 539 active allotments on the six Utah NFs (4.5.2). Similar to Alternative D, livestock grazing permits will be adjusted by term grazing permit modification as needed. Procedures for permit modification found in FSM 2230 will be followed. Permittees will have the right to appeal any decision to adjust current term grazing permits under 36 CFR §251.8 following notification of a pending adjustment through permit modification procedures.

Therefore, the degree of change in terms of acres or permits affected in the 4 year life of this amendment will not likely to be measurable except possibly at a localized level (i.e., allotment or group of allotments). Broader scale effects at the forest or state scale will not be expected in 4 years.

4.5.3 Mineral Resources

Effects Summary

Alternative A: There would be no effect. Current practices would continue as allowed under current forest plans.

Effects Common to All Action Alternatives: The direction adopted through this amendment will not apply to forested habitats in areas currently managed or allocated for mining (refer to exemptions in Chapter 2, section 2.3.2). In these areas, the direction adopted through this amendment will be applied only where it does not affect the exercise of existing rights granted by special use permit, plan of operations, lease, forest plan allocation or valid, prior existing mineral right.

The effect of the alternatives on future mineral and energy resources is directly related to the constraints placed on the development of those resources, e.g., the mitigation measures attached to mineral leases

and plans for locatable mineral development designed to protect habitat for the northern goshawk and its prey. The Forest Service is limited in its authority to restrict development of outstanding and reserved mineral rights. Resource protection measures must be reasonable and not foreclose exploration or development activities. For that reason implementation of standards and guidelines adopted through this amendment is not expected to significantly affect valid prior existing mineral rights and locatable mineral activities.

Future leasable and mineral material exploration and development could be limited by the application of the direction adopted through this amendment. Leases would be limited by stipulation restricting vegetative manipulation in specific locations (active nest and PFA area) and time period (the nesting period, usually March 1-September 30). Within a goshawk home range of 6,000 acres, the nest areas are only 3% of the home range and active nest areas are only one-half of one percent of the home range. PFAs are typically another 7-8%. The effect of such prescriptions on the ability to explore for and develop leasable minerals and mineral materials are discussed in more detail below.

Discussion of Effects

Mineral Materials

Alternative A: There would be no effect. Current practices would continue as allowed under current forest plans.

Effects Common to All Action Alternatives: Future development of mineral materials could be affected to some extent but the majority of such development is adjacent to existing roads so the impact is expected to be minimal.

Leasable Minerals

Alternative A: There would be no effect. Current practices would continue as allowed under current forest plans.

Effects Common to All Action Alternatives: New exploration activities or leases may experience some restrictions. If the proposed exploration or leasing area is outside the area covered by the exemption, a site specific analysis must consider this direction. This does not mean exploration or lease will not be approved. However, it is possible that if the proposed mineral area is in goshawk habitat, modifications or realignment of location, or additional mitigation or stipulations to fully protect goshawk and its habitat will be required. This could have a resulting effect of higher project costs, and in combination with other restrictions (winter range restrictions) could severely delay or preclude prospecting, exploration and development in some areas.

Oil and Gas

Mineral activity on existing leases is exempt from the application of standards and guidelines adopted through this amendment where it would interfere with the exercise of exploration and development rights already granted by lease. It should be noted that the more recent leases contain provisions for protection of sensitive species like the northern goshawk, through the application of a Controlled Surface Use stipulation. This stipulation requires that any necessary surveys be conducted and site specific mitigation identified prior to approval of surface disturbing operations. However, this current stipulation did not specifically address the size of area or length of time that may be affected and only

applies to operations conducted by the lessee or lease operator. Older leases have been issued without such stipulations.

If/when operations such as exploratory wells are proposed on an existing lease, additional NEPA analyses will be completed as required by 36 CFR §228.107 with additional mitigation measures for protection of the goshawk and its habitat. Any additional measures must be reasonable and consistent with the terms and conditions of the existing lease.

New oil and gas activities could be affected to a greater extent by standards and guidelines for protection of the goshawk and its habitat adopted through this amendment.

Geophysical exploration for oil and gas typically precedes the drilling of wells and occurs across relatively large areas to help define geologic structures and potential reservoir traps for hydrocarbons. The proposed guidelines could have a direct effect on these activities by precluding oil and gas surveys in areas of an active nest during the time period from March 1 through September 30. This would necessitate that the survey be done during winter months or wait until the following season when the nest may not be active. This could potentially increase the cost and delay exploration plans to the point of making them unfeasible. Also, cumulatively, when timing restriction for such things as elk and moose winter range, elk calving areas, and foreseeable winter restrictions for the lynx, the overall restriction may make exploration extremely difficult if not impossible in some specific areas.

When lease proposals are received from the BLM, the Forest will conduct required reviews to determine if leasing of proposed areas is consistent with the Forest Plan and to determine if there is any significant new information that was not considered in the Oil and Gas Leasing FEIS.

The application of the proposed standards and guidelines to new leases could temporarily preclude proposed activities in specific areas; since cumulative time constraints for various species could eliminate a sufficient time window in which to conduct operations. The time constant for vegetative manipulation, which is typically required for construction of well pads and access roads, may require such activities to occur during the late fall or winter months. Cut and fill construction with frozen material makes it difficult to maintain a level drill pad and often results in high sediment loads when the pad thaws in the spring.

If proposed access roads lie within goshawk protection areas and construction cannot be delayed, it could be necessary to identify alternative road routes to avoid the protection area. This could result in trade-offs regarding impacts to other resources and cost of operations. Alternative routes could involve more road distance and associated disturbance, greater effects to other resources, and higher cost to the operator.

Coal and Phosphates

All of the coal mining done on NFS lands in Utah is by underground methods. Surface activities and facilities needed to support underground mining are described in Chapter 3 (3.5.3) and only involve 1% of the area under permit for underground mining.

Due to the exemptions which recognize valid existing rights granted by leases, permits, and licenses, impacts would be limited to activities and facilities proposed in or directly related to leases issued after the decision for this action. If coal exploration or development activities such as drilling and geophysical surveys are proposed within the nest protection area of an active goshawk and cannot be relocated, these activities would be delayed to the period between September 30 and the onset of winter

weather conditions. At the higher elevations, this could occur any time after October 1. In most cases, there would be sufficient reasonable weather to conduct operations in the goshawk nest protection area, but it is possible that they would be delayed to the next year or prohibited, even though not likely.

If a needed ventilation breakout/emergency escapeway lies within a canyon slope in a goshawk nest protection area, it might be required that the breakout construction be delayed or relocated and/or replaced by a much more costly ventilation shaft in the interior of the plateau above. This could cause increased cost and trade-offs regarding the amount of surface disturbance needed and impacts to other resources. For example, breakouts can usually be constructed from within the underground workings, not requiring construction of an access road. If the breakout cannot be relocated to another canyon area, drilling of a ventilation shaft could be necessary, requiring construction of an access road for drilling equipment.

There will be no measurable effects on exploration or development of phosphate resources on existing NFS leases as a result of adopting direction from any action alternative. The effects on potential future exploration and development of phosphate resources on NFS lands is also minimal. Future activities would likely occur on existing leases, and would fall under the exemption described in Chapter 2 (2.3.2). Issuance of new leases or prospecting permits could be affected, but Forest Service authority over phosphate permits and leases is limited to recommending resource protection measures to the BLM.

4.5.4 Recreation/Tourism

Discussion - Economic effects resulting from a reduction in outdoor-related recreation would have similar effects to economic downturns related to other sectors. The economic effects of adopting any of the alternatives would be manifested in a variety of ways, depending on the amount of reduction in recreational resources available to the public.

Effects Common to All Alternatives: No negative direct, indirect or cumulative effects to recreation and tourism were identified under any alternative.

Effects Common to All Action Alternatives: Some action alternatives may have some indirect and cumulative beneficial effects (i.e., more naturally appearing landscapes, more large trees), though these are not likely to be measurable economically in 4 years.

The current developed recreational sites are exempt from direction in this amendment, providing for no change in the current management and use of the sites. In addition, real change in recreational resource use during the 4-year period would be relatively small due to the planning and implementation time needed. No negative affects are expected to scenic resources in any of the alternatives because of the benefits of the protection of goshawk habitat. In fact, implementation of Alernatives B-F may actually improve scenic resource because of additional protection or improvement to the natural landscape.

Planned new developed recreational sites may experience some modifications in design, restricted use, or location due to goshawk habitat limitations, but these modification would not stop the site from being developed or used by the public. Modifications in management practices affecting habitat conditions would be on a project by project basis and would only gradually change. For a more detailed discussion of expansion options for developed recreational sites, see 4.5.6 below.

For reasons stated above, adoption of any of the action alternatives considered in this environmental assessment on planned or future projects relating to recreation would likely be inconsequential during the interim 4 year period.

4.5.5 Transportation/Access

Discussion - The goal of road system development and management is to provide Forest users safe, cost-effective transportation facilities consistent with land and resource management objectives. Timber production and recreation use place the heaviest demands on national forests' transportation systems. The six affected national forests maintain separate transportation systems to accommodate traffic needs and to prevent resource damage. In March, 1999, the Chief of the Forest Service announced an 18-month interim roads policy (USDA Forest Service 1999). Each road project would be evaluated on a case-by-case basis to determine whether the proposed temporary suspension applies or if the project qualifies under an exemption.

Effects Common to All Alternatives: No negative direct, indirect or cumulative effects to transportation or access were identified under any alternative.

Effects Common to All Action Alternatives: The direction contained in the alternatives analyzed is programmatic and does not supercede any of the current Forest Plan direction concerning transportation planning or access. Thus, when assessing the effects of each action alternative over the next 4 years, on all of the NFS lands within the six affected national forests, the effects are anticipated to be minimal.

The only direction in action alternatives that restrict access pertains to active nest and PFA areas during the breeding period only, typically between March 1 and September 30. Also, restrictions would only apply to forest service permitted uses (does not include permitted livestock grazing). It would not apply to general dispersed recreation or personal use firewood collection.

The nest and PFA areas where access is restricted is small compared to the total forest acres. Within a goshawk home range of 6,000 acres, the nest areas are only 3% of the home range and active nest areas are only one-half of 1 percent of the home range. PFAs are typically another 7-8%. Together this is approximately 10% of a total home range, or 600 acres, where restrictions would be applied during the active breeding period. If all forested acres were occupied 10% of the total acres may have restrictions applied. However, all acres are not occupied currently nor expected to be within 4 years. Therefore greater than 90% of the total forested acres would still be open for permitted uses.

Therefore, while all of the action alternatives include a guideline restricting access, there is no expectation that forest users issued permits for a specific type of use would be denied access to the national forest. The restriction in guidelines is limited to a specific location and time period. For example, one permitted use this guideline may affect is commercial firewood permits. If someone with a commercial firewood permit has a preferred area and that area is in an active nest and PFA area and the permittee wants to gather firewood during the nesting period (usually March 1-September 30), access to that location would likely be denied during the breeding period. However, if the permittee does not want to wait until after the breeding period to exercise the terms of the permit, the permit could likely be reissued for another area on the 90% or more of the forested acres not occupied by active nests and PFAs. Another example would be commercial timber sales. Activities would be restricted during the breeding period in that part of a sale area that overlaps PFAs and active nest areas, however, remaining areas within the sale boundary would remain open. These scenarios would hold true for similar types of permitted uses. Overall, access for permitted use would still be provided to meet expected demands and for the services and outputs described under current forest plans.

4.5.6 Special Uses

Discussion

Effects Common to All Alternatives: Overall, when assessing the effects of each alternative over the next 4 years on special uses on all NFS lands within the six Utah NFs, it is anticipated that the effects would not be measurable.

Effects Common to All Action Alternatives: The effect of the action alternatives on existing special uses is minimal. The direction would not apply to forested habitats in areas currently managed or allocated for special use permits allowing vegetative disturbance or treatments. In these areas current Forest Plan direction would still apply. Managing these areas consistent with current management direction is important to meeting other goals and objectives in the individual forest plan and that doing so would not result in the loss of habitat needed to maintain viable populations of goshawk in the State of Utah. While many special use permits were issued before the northern goshawk was listed as a sensitive species in Utah, current special use permits require contact with the Forest Service before any vegetation manipulation occurs.

The action alternatives contained herein could have an effect on new special use permits if the area is not managed or allocated for special use permits. For example, proposals for ski area expansions on the Wasatch-Cache NF. If the proposed expansion area is not currently allocated for this use, the site specific analysis must consider this direction. This does not mean that the expansion won't be approved. However, it is possible that if the proposed expansion is in goshawk habitat, modifications or realignment of location, or additional mitigation would be required. This could have a resulting effect of higher project costs.

4.5.7 Administrative Considerations

Discussion of Effects

Cost of Using Standards and Guidelines in Project Design and Implementation

Alternative A: This alternative can be implemented under current technology, training, and abilities of the implementation crews. Monitoring and evaluation will continues as currently planned and not result in any increase in costs over what is currently required.

Alternatives B, C, E and F: These alternatives can be implemented under current technology and abilities of the implementation crews. Some additional training would be necessary to implement canopy closure requirements.

Improved inventory methods would likely need to be developed. Current inventory methods typically track stand characteristics, not groups within stands. The emphasis these alternatives place on managing groups (and clumps of trees within groups) would require a finer level of detail in inventories.

At the same time, the emphasis on landscape level conditions would require a greater level of knowledge of conditions at the landscape level during the planning process. Current inventory methods allow aggregation of stand level data. This methodology, in combination with geographical information system (GIS) technology, can be used to aggregate watershed level information for VSS class groups. A current limitation is that GIS data bases do not track "groups," and the smallest map-size delineation is normally

5 acres. In order to implement guidance for the management of goshawk habitat at the group level, it may be necessary to modify the parameters within current data bases.

Alternative D: The highly complex canopy closure requirements may not be fully implementable or achievable under current abilities of implementation crews. Extensive training would be necessary. In order to retain trained employees (which would be necessary to make this alternative feasible), Forest Service hiring practices would have to change to allow hiring permanent implementation crew leaders.

Improved inventory methods would likely need to be developed. Current inventory methods typically track stand characteristics, not groups within stands. The emphasis these alternatives place on managing groups (and clumps of trees within groups) would require a finer level of detail in inventories.

At the same time, the emphasis on landscape level conditions would require a greater level of knowledge of conditions at the landscape level during the planning process. Current inventory methods allow aggregation of stand level data. This methodology, in combination with GIS technology, can be used to aggregate watershed level information for VSS class groups. A current limitation is that GIS data bases do not track ''groups,'' and the smallest map-size delineation is normally 5 acres. In order to implement guidance for the management of goshawk habitat at the group level, it may be necessary to modify the parameters within current data bases.

Cost of Incorporating Monitoring Requirements

Alternative A: Monitoring will continue as presently scheduled in the six Utah forest plans. The commitment by the Regional Forester to establish monitoring protocols with the State of Utah (i.e., UDWR) for habitat and population monitoring will not result in measurable increases in monitoring cost to the agency. The majority of information for these items are already being collected by field units. The primary increase in costs will be associated with developing protocols for common methods of data collection and aggregation, and then adjusting current collection methods to meet protocols. The evaluation of data will be periodically accomplished by the State of Utah based on agreements made as part of the HCS (Utah NFs et al 1998); therefore, evaluations will not result in any measurable increase in costs to the agency over what is presently incurred in ongoing coordination efforts.

Alternative B: Of the action alternatives, Alternative B results in the least increase in costs for monitoring (refer to Table 9 at the end of this section). Alternative B does not include monitoring item m-2 which is common to all other action Alternatives. Nor does it include monitoring items m-6 and m-7 concerning grazing practices found in Alternatives D and F, respectively.

Monitoring costs associated with m-1, m-3, m-4 and m-5 are reasonable and within the anticipated budgetary and personnel limitations of the agency. It is anticipated that all these monitoring items can be integrated into monitoring activities presently occurring on forests with out substantial increases in costs.

Alternatives C and E: These alternatives have the same monitoring requirements as Alternative B, plus adds requirement m-2. Additional costs that will be incurred with the addition of m-2 will vary depending on the number of activities implemented in a given year that involve areas with active goshawk nests. Based on past experience it is expected that 1-5 nests would require monitoring per year on each forest. This would result in an additional cost of $300 to $1500 per year on each forest.

Monitoring costs associated with m-1, m-3, m-4, m-5 with the addition of m-2 are still considered reasonable and within the anticipated budgetary and personnel limitations of the agency. It is anticipated that all these monitoring items can be integrated into monitoring activities presently occurring on forests.

Requirements under m-1 are already occurring on most forests at levels required in m-1. However, protocols for a consistent approach will have to be refined to allow for data aggregation and evaluations at the state level. Costs to accomplish m-3 and m-4 will be minimized by integrating them with existing activities already occurring (i.e., timber sale administration activities; current field inventories). The variable costs associated with m-5 are already partly incurred through current broad scale assessment efforts and integration of these assessments with spatial and tabular data systems. As consistency in these current efforts evolve some forests may experience an increase in costs and others may see a decrease. In all cases the costs will not be unreasonable considering current and anticipated budgetary and personnel limitations.

Alternative D: This alternative contains all the monitoring requirements of Alternatives C and E, plus adds m-6 which addresses implementation and effectiveness of grazing utilization requirements. This alternative has the highest associated costs with monitoring of all the alternatives.

The addition of monitoring item m-6 will increase monitoring requirements on each forest by $7100 per year. Though the agency believes funding will likely be available to accomplish this requirement, each forest may have to shift some current funding priorities for grazing permit administration to accomplish the monitoring requirements.

Alternative F: Like Alternative D, this alternative contains all the monitoring requirements of Alternatives C and E, plus adds a monitoring requirement to address implementation and effectiveness of grazing practices. However, unlike Alternative D the grazing monitoring requirement in this alternative (m-7) addresses an identified grazing practice that is contributing to an at-risk landscape condition. The annual cost for completing this requirement is expected to range from $150 to $3550 per allotment per year, or a maximum cost of $7100 per year per forest. Though the costs to complete this requirement could be as high as $7100 per year, it is expected that over time the average would be less per year. The $7100 cost would be to complete utilization studies similar to that completed under Alternative D. This is the most intensive type of monitoring that would have to occur. In some cases, utilization will not be the identified grazing practice that requires adjustment to address the problem. Other practices such as season of use that may be changed will require less intensive monitoring to determine implementation and effectiveness in addressing identified problems. Therefore, costs of Alternative F should be lower than Alternative D. However, like Alternative D, though the agency believes funding will likely be available to accomplish this requirement, each forest may have to shift some current funding priorities for grazing permit administration to accomplish the monitoring requirements.

Table 9: Alternative comparison of increased monitoring costs over that which is currently required in existing forest plans on the six affected national forests.

	m-1	m-2	m-3	m-4	m-5	m-6	m-7
Alt A*	$0	$0	$0	$0	$0	$0	$0
Alt B	$300 per nest plus $300 for evaluation	$0	$100-500 per 100 acres, plus $250 for evaluation	$5-10 per 10 acres, plus $250 for evaluation	variable depending on data and size of landscape	$0	$0
Alt C	$300 per nest plus $300 for evaluation	$300/nest	$100-500 per 100 acres, plus $250 for evaluation	$5-10 per 10 acres, plus $250 for evaluation	variable depending on data and size of landscape	$0	$0

Table 9: (continued)

	m-1	m-2	m-3	m-4	m-5	m-6	m-7
Alt D	$300 per nest plus $300 for evaluation	$300/nest	$100-500 per 100 acres, plus $250 for evaluation	$5-10 per 10 acres, plus $250 for evaluation	variable depending on data and size of landscape	$7100 per forest per year	$0
Alt E	$300 per nest plus $300 for evaluation	$300/nest	$100-500 per 100 acres, plus $250 for evaluation	$5-10 per 10 acres, plus $250 for evaluation	variable depending on data and size of landscape	$0	$0
Alt F	$300 per nest plus $300 for evaluation	$300/nest	$100-500 per 100 acres, plus $250 for evaluation	$5-10 per 10 acres, plus $250 for evaluation	variable depending on data and size of landscape	$0	$150 to $3550 per allotment per year if a problem has been identified; maximum cost of $7100 per year

* Refer to discussion under the Alternative A discussion for a qualifier concerning costs of monitoring.