Appendix P - Risk and Uncertainty

The purpose of this appendix is to provide readers a qualitative summary of differences among all eight alternatives. Specifically, principal focus, strategy, risks, uncertainties, and likely tradeoffs required to achieve desired future conditions. The information supplements text in the DEIS that explains the alternatives.

Appendix P includes five tables, one for each problem area; 1) old forests, 2) aquatic, riparian and meadow ecosystems, 3) fire and fuels; 4) noxious weeds; and 5) lower westside hardwoods. Each of the tables has five columns: principal focus, strategy, risks, uncertainties, and likely tradeoffs required to achieve desired future conditions.

Principal focus characterizes the socio-economic or ecological element of greatest consequence or concern for the alternative. In many cases, the principal focus is a statement of the underlying principles or philosophies guiding stewardship under a given alternative. Other times the principal focus is a description of goals for the alternative.

Strategies describe the management approach to accomplishing the goals or desired conditions. Strategies are reflected in the choice of management practices.

Major tradeoffs describe key social or natural resource values favored and the resource values largely foregone in each alternative as a result. Because ecosystem processes have limits to production, forests cannot accommodate the values or desires of all individuals. People must collectively set priorities for resource uses that are reflected in the tradeoffs.

Major risks are additional social or ecosystem values that may be at risk because of the principal focus and strategies associated with an alternative.

Major uncertainties identify assumptions about social or ecosystem responses about which we lack sufficient experience or scientific data to predict with a high degree of certainty. (DEIS Chapter 3 provides more detail about risks in the discussion of consequences of the alternatives.)

Table P.1. Summary of differences among alternatives related to social concerns about old forests and old-forest dependent species in the Sierra Nevada Region national forests

Alt	Principal Focus	Strategies	Major Tradeoffs	Major Risks	Major Uncertainties
1	Meeting people's needs for forest resources. Retaining a representative sample of old forests.	Use interim CASPO* guidelines. Manage carnivore mammals individually by national forest.	Timber production and forest-based recreation favored over protection of old-forest ecosystems. Local discretion favored over regional consistency.	Inadequate protection to sustain old-forest dependent species. No protection for Eastside Sierra old forests.	Desired future conditions for old-forest ecosystems will be achieved through independent actions varying by national forest.
2	Preserving old forests. Reducing active management.	Set aside intact old-forest ecosystems as reserves. Suppress wildland fire.	Improved protection for old forests favored over developing ecosystem resilience to disturbances and over predictable production of commodities and services. Regional consistency favored over local decision-making.	Wildland fires burning key habitats. Economic viability of some Sierra Nevada communities.	Fire suppression will be sufficient to protect old forests and their associated species in periods of severe drought.
3	Applying local ecosystem knowledge to forest ecosystem management.	Use the Areas of Late Successional Emphasis (ALSE) strategy presented in SNEP (1996) to delineate a network of old forest emphasis areas.	Improved protection and habitat creation favored over timber production.	Prescribed fires escaping and spreading. Economic viability of some Sierra Nevada communities.	Mechanical treatments as an effective tool for restoring old-forest conditions.
4	Meeting people's needs for wood products. Preventing resource losses from natural disturbances. Promoting ecosystem resiliency to natural disturbances.	Consider all land as potential habitat for old forest-dependent species. Manage vegetation for the range of historical variation of natural disturbances. Protect the best old-forest habitat in the short term.	Timber production, forest-based recreation, and ecosystem resilience favored over protection of old-forest ecosystems. Local discretion favored over regional consistency.	Adequacy of protection to sustain viable populations of old forest dependent species.	Mechanical treatments as an effective tool for restoring old-forest conditions. Range of historical habitats not known for many old-forest species.

Alt	Principal Focus	Strategies	Major Tradeoffs	Major Risks	Major Uncertainties
5	Assuring continued resource protection through prescriptive planning. Enhancing ecological processes.	Set aside best old forest habitats as emphasis areas. Base desired future conditions for emphasis areas on historic conditions of wildlife habitats.	Improved protection for old forests favored over sustained timber production and ecosystem resilience to disturbances. Regional consistency favored over local decision-making.	Wildland fires burning key habitats. Economic viability of some Sierra Nevada communities.	Effects of prescribed burning on old-forest ecosystem function and associated species. Range of historical habitats not known for many old-forest species.
6	Managing near-natural disturbance regimes throughout the Sierra Nevada for resilience to large-scale disturbances. Reducing risk of catastrophic fire in old forests most at risk.	Combine old forest emphasis areas and ecosystem approach. Reduce risk of severe wildland fire in old forests. Base desired ecosystem conditions on historical ranges of old-forest-dependent species.	Intact ecosystem processes, resilience to disturbances, and old-forest restoration favored over timber production. Regional consistency favored over local national forest management flexibility.	Wildland and prescribed fires burning key habitats. Reduced population viability for old-forest-dependent species.	Effects of mechanical treatments on old-forest ecosystem function. Range of historical habitats not known for many old-forest species.
7	Distributing near-natural old-forest conditions in patches throughout the Sierra Nevada.	Manage vegetation for a mosaic of old forest patches that resemble the structure of currently occupied California spotted owl habitats	Local decision-making and collaboration favored over regional consistency. Timber production balanced with habitat conservation.	Local knowledge, skills, and administration may not be adequate to determine population viability and maintain habitat connectivity of wide-ranging species.	Mechanical treatments as an effective tool for restoring old-forest conditions. Appropriate spatial scale for restoring species habitats.
8	Researching habitat requirements for conservation management of old forest-dependent species. Adapting ecosystem management to new knowledge about habitat requirements.	Study effects of ecosystem management on old-forest-dependent species. Accelerating adaptive management to meet habitat requirements of species. Map vegetation and habitat structure in the Sierra Nevada Region consistently.	Improved protection for old forests favored over sustained timber production and ecosystem resilience to disturbances. Regional consistency favored over local decision-making.	Wildland fires burning key habitats in the next decade while research on habitat requirements for species of concern is underway. Economic viability of some Sierra Nevada communities.	Costs of treatments to restore old forests. Time needed to acquire enough knowledge.

[*] *CASPO – California spotted owl Sierran Province Interim Guidelines (USDA 1993)*

Table P.2. Summary of differences among alternatives related to social concerns about riparian, aquatic, and meadow ecosystems and their dependent species in the Sierra Nevada Region national forests

Alt	Principal Focus	Strategies	Major Tradeoffs	Major Risks	Major Uncertainties
1	Managing for multiple-uses to meet society's needs. Relying on knowledge of local FS staffs.	Follow Best Management Practices (BMPs) in Stream Management Zones. Meet Threatened, Endangered and Sensitive (TES) species requirements.	Local national forest decisions favored over Forest Service strategic regional decisions. Multiple-use management favored over ecosystem management.	Inconsistent standards among Sierra Nevada national forests. Increasingly severe wildland fires in aquatic, riparian and meadow ecosystems.	Desired future conditions for aquatic, riparian and meadow ecosystems will be achieved through independent actions varying by national forest. Effect of BMPs on water quality, sediment flows, and species survival.
2	Preserving aquatic, riparian and meadow ecosystems and their ecological processes. Reducing active management except for fire suppression.	Use Critical Aquatic Refuges, emphasis areas, Important Bird Areas. Protect known occupied habitats for willow flycatcher and TES amphibian species*	Ecosystem protection favored over multiple human uses.	Limited local management options. Increasingly severe wildland fires in aquatic, riparian and meadow ecosystems.	Fire suppression and reserves as long-term tools to protect habitat. Effects on conserving ranchland open space.
3	Protecting aquatic, riparian and meadow ecosystems with measures tailored to each site.	Use landscape/watershed analysis on 10,000-acre units to establish desired future conditions, projects, monitoring, and research.	Investments in planning and analysis favored over rapid implementation of activities.	No regional standards for delineating aquatic, riparian and meadow ecosystems. Complete landscape/watershed analysis before management can begin.	Time needed for landscape/watershed analysis. Consistent protection for aquatic, riparian and meadow ecosystems.
4	Balancing opportunities for multiple uses. Relying on knowledge of local FS staffs.	Use landscape/watershed analysis with the public to establish desired future conditions, projects, monitoring and research programs. Following BMPs to protect water quality and aquatic, riparian and meadow ecosystems. Use KV funds for restoration aquatic, riparian and meadow ecosystems.	Local decision making favored over strategic region wide approaches to improve aquatic, riparian and meadow ecosystems. Economic uses favored over restoring aquatic, riparian and meadow ecosystems and aquatic, riparian and meadow ecosystems -dependent species.	Cumulative effects from fuel reductions may exceed thresholds. Region wide consistency of local decisions for aquatic, riparian and meadow ecosystems and their dependent species.	Consistent protection of aquatic, riparian and meadow ecosystems dependent species region wide. Effects of grazing and fuel treatment in aquatic, riparian and meadow ecosystems. Implementation of inventorying and monitoring.

Alt	Principal Focus	Strategies	Major Tradeoffs	Major Risks	Major Uncertainties
5	Protecting biological diversity and habitat quality of Aquatic, riparian and meadow ecosystems and their ecosystem processes.	Complete landscape/watershed analysis before projects. Reduce forest fuel loads in aquatic diversity areas and critical refuges. Plan with 30,000-acre units.	Ecosystem protection favored over management flexibility and economic uses. Landscape/watershed analysis favored over limited active management.	landscape/watershed analysis may slow management projects. Areas with untreated fuels may become more susceptible to severe wildland fire. Regional standards and guidelines may not produce desired conditions locally.	The need to complete landscape/watershed analysis would delay measures to reduce forest fuels. Wildland fire frequency without fuels treatments. Long-term effectiveness of a reserve system. Effects on conserving ranchland open space.
6	Balancing reducing forest fuels and protecting ARM-dependent species. Providing for diverse human values, including economic uses.	Protect and expand Aquatic, riparian and meadow ecosystems with Critical Aquatic Refuges and emphasis areas. Apply fuel treatments in Aquatic, riparian and meadow ecosystems cautiously. Plan with 100,000-acre units.	Consistent regional management for Aquatic, riparian and meadow ecosystems favored over local public involvement and FS management flexibility.	Cumulative effects from management may exceed thresholds during efforts to reduce fuels.	Effects of fuel treatments on amphibians in uplands.
7	Planning collaboratively with NF staffs and the public at the local level for protecting and enhancing Aquatic, riparian and meadow ecosystems.	Flexibility to meet site-specific needs of Aquatic, riparian and meadow ecosystems. Plan with 100,000-acre units.	Watershed management based on local decisions and regionally consistent watershed management.	TES protection based on local decisions may not be adequate regionally.	Scheduling and documenting recovery programs for TESs.
8	Using adaptive management to conserve ARM species, habitats, and ecosystem processes.	Protect and expand Aquatic, riparian and meadow ecosystems with Critical Aquatic Refuges and emphasis areas. Apply fuel treatments in Aquatic, riparian and meadow ecosystems cautiously. Plan with 100,000-acre units.	Protecting key TES favored over prescribing fire to treat forest fuels. Conserving ecosystems favored over human uses.	Severe wildland fire may destroy critical Aquatic, riparian and meadow ecosystems. Regional standard and guidelines may not produce desired conditions locally.	Rate for reducing fuels may not prevent severe wildland fires and may not protect downstream resource in Aquatic, riparian and meadow ecosystems. Effects on conserving ranchland open space.

** foothill yellow-legged frog, mountain yellow-legged frog, California red-legged frog, and Yosemite toad.*

Table P.3. Summary of differences among alternatives related to social concerns about fire and fire management in the Sierra Nevada Region national forests

Alt	Principal Focus	Strategies	Major Tradeoffs	Major Risks	Major Uncertainties
1	Suppressing fire to protect people and ecosystems. Investing in people and infrastructure to suppress fire rapidly.	Devise strategy for fuels management separately for each national forest. Use lightning fires in wilderness areas.	High cost for managing fir risk favored over social costs in the aftermath of catastrophic wildfire.	Increase in acres burned by wildland fire. No strategic effort to reduce wildland fire. Increased exposure of wildland fire fighters.	Effects on tree vigor in dense, drought-prone stands.
2	Suppressing wildland fire is the best way to protect forests. Hands-off is the best ecosystem management.	Use prescribed fire only in urban interface zones with local decision-making. Use lightning fires in wilderness areas.	Forests left unmanaged are favored over a large increase in the number of acres burned under severe conditions.	Increase in acres burned by wildland fire. No strategic effort to reduce wildland fire. Increased exposure of wildland fire fighters.	Effects on tree vigor in dense, drought-prone stands.
3	Recreating a near natural fire regime based on historical fire frequencies.	Promote fire regimes of frequent low and moderate intensity fires by using prescribed fire. Prescribed fire only in urban interface zones with local decision-making. Enlist local residents to support fuels reduction. Use lightning fires in wilderness areas.	Prescribed fire is favored over a mixture of fuel treatments. Increased on impact air quality is favored over a large increase in the number of acres burned under severe conditions.	No strategic effort to reduce wildland fire. Increase of in escaped prescribed burns. Large amounts of smoke from both wildland fires and prescribed fire. Increased exposure of wildland fire fighters.	Impacts on air quality from wildland fires. Cost of combining mechanical treatments and prescribed burning. Enough opportunities to use prescribed burning. Do we have the institutional capacity?
4	Develop stands resilient to fire.	Wildland fires allowed burning only in wilderness areas. Extensive fuel treatments in defensible fire protection zones & urban-interface zones. Treatments strategically prioritized by risks to people and resources. Use lightning fires to meet resource benefits.	Large increase in to current fire management infrastructure over other ecosystem management areas.	Prescribed fire escaping. Increased on impact air quality	Mechanical treatment as a suitable surrogate for fire. Ability to control prescribed fire.

Alt	Principal Focus	Strategies	Major Tradeoffs	Major Risks	Major Uncertainties
5	Suppressing fire and restoring near natural/historic fire regime.	Use mechanical treatments in the urban-interface and prescribed fire to reduce fuel hazards in the general forest. Use lightning fires in wilderness areas.	Moderate increase in the current fire management infrastructure is favored over Increased impacts on air quality	Prescribed fire escaping.	Impacts on air quality from wildland fires. Ability of prescribed fire to reduce catastrophic fire. Economic and social feasibility. Enough opportunities to use prescribed burning.
6	Fire protection by suppressing fire, restoration of stands and recreate a near natural/historic fire regime.	Extensive urban-interface fuels mgmt. with both fire and mechanical treatments. Treatments strategically prioritized by risks to people and resources. Use lightning fires to meet resource benefits.	Moderate increase in the current fire management infrastructure. Increased on impact air quality	Prescribed fire escaping.	Cost of combining mechanical treatments and prescribed burning. Enough opportunities to use prescribed burning. Reduced wildland fire through prescribed burning programs. Will the urban intermix treatments be sufficient to the social mission?
7	Protection people and resource from fire by suppressing wildland fire, and restoring stands to a near natural/historic fire regime.	Manage urban-interface fuels extensively with both fire and mechanical treatments prioritized by risks to people and resources. Use lightning fires to meet resource benefits.	Moderate increase in the current fire management infrastructure versus likely increases in impacts on air quality	Prescribed fire escaping.	Suitability of mechanical treatments as a surrogate for fire. Reduced wildland fire through prescribed burning programs. Sufficiency of the urban intermix zones social goals and FS management objectives.
8	Suppressing fire	Extensive urban-interface fuels mgmt. with both fire and mechanical treatments. Use lightning fires to meet resource benefits. Take a cautious approach to restoring stands and a near natural/historic fire regime.	Waiting until people have a better understanding of habitat requirements for birds and mammals before starting active management is favored over implementing adaptive management now.	Prescribed fire escaping. Increased exposure of wildland fire fighters. A moderate increase in the number of acres burned under severe conditions.	Costs of combining mechanical treatments and prescribed burning. Compatibility of prescribed fire treatments with requirements for spotted owl management. Sufficiency of opportunities to use prescribed burning to achieve habitat and species conservation goals.

Table P.4. Summary of differences among alternatives related to social concerns about hardwood forests and hardwood-forest dependent species in the Sierra Nevada national forests

Alt	Principal Focus	Strategies	Major Tradeoffs	Major Risks	Major Uncertainties
1	Sustaining production of multiple goods and services. Conifers are more valuable than hardwoods.	Emphasize commodity production, stand type conversion to conifers, and habitat development for game species.	Expanded conifer forests is favored over natural, fire-dependent distribution of hardwood forests and woodlands.	Loss of biological diversity from loss of hardwood habitat.	Extent of original and existing hardwood forests.
2	Biological diversity and ecological function of hardwood forests.	Maintain connectivity between low-elevation and high-elevation hardwood forests.	Habitat and ecosystem integrity are favored over fuelwood and sawlog supplies	Loss of biological diversity from loss of hardwood habitat.	Natural disturbance sufficient to maintain hardwood ecosystems
3	Biological diversity and ecological function of hardwood forests.	Base maintenance and enhancement on local conditions and wildlife habitat needs.	Habitat and ecosystem integrity are favored over fuelwood and sawlog supplies	Loss of biological diversity from loss of hardwood habitat.	Extent of original and existing hardwood forests.
4	Ecosystem resiliency. Late-seral hardwood forests and woodlands.	Maintain resiliency by maintaining sustainable mosaic of hardwood forest distributions.	Stable hardwood ecosystems are favored over expanded hardwood ecosystems.	Management insufficient to maintain hardwood ecosystems	Effects of management on sustainability of hardwood ecosystems
5	Biological diversity and ecological function of hardwood forests. Expand Information about hardwood ecology and natural range.	Rely on habitat connectivity and habitat protection with reserves for hardwood-forest dependent species. Promote hardwoods in reforestation.	Habitat and ecosystem integrity are favored over fuelwood and sawlog supplies	Loss of biological diversity from loss of hardwood habitat	Is natural disturbance sufficient to maintain hardwood ecosystems
6	Maintain and enhance hardwood ecosystems. Expand information about hardwood ecology and natural range.	Base maintenance and enhancement on local conditions and wildlife habitat needs. Integrate hardwood with conifer management.	Expanded hardwood ecosystems are favored over expanded conifer ecosystems and hardwood fuelwood and sawlog supplies	Loss of biological diversity from loss of hardwood habit	Extent of original and existing hardwood forests.
7	Ecosystem resiliency. Late-seral hardwood forests and woodlands.	Maintain resiliency by maintaining sustainable mosaic of hardwood forest distributions. Integrate hardwood with conifer management	Stable hardwood ecosystems are favored over expanded hardwood ecosystems.	Management insufficient to maintain hardwood ecosystems	Effects of management on sustainability of hardwood ecosystems
8	Maintain and enhance hardwood ecosystems. Expand information about hardwood ecology and natural range.	Enhance growth and expand presence of native hardwoods. Integrate hardwood with conifer management	Expanded hardwood ecosystems are favored over expanded conifer ecosystems and hardwood fuelwood and sawlog supplies.	Finalizing habitat management for old-forest species before severe wildland fires destroy portions of existing old hardwood forests.	Extent of original and existing hardwood forests.

Table P.5. Summary of differences among alternatives related to social concerns about noxious weed species in the Sierra Nevada national forests

Alt	Principal Focus	Strategies	Major Tradeoffs	Major Risks	Major Uncertainties
1		Each Forest develops weed mgt. plans to conform to the Forest Service Manual.	No action cost savings vs. high social and environmental costs associated with lack of consistent direction across Sierra Nevada National Forests	High costs result from duplication of efforts because of lack of regional coordinated planning.	
2	Biological diversity of native species and function of native ecosystems.	Noxious Weed Strategy			Costs of eradicating noxious weed populations in reserves.
3		Noxious Weed Strategy			Costs of measures to stop the spread of noxious weeds.
4	Natural biodiversity. Resilient range conditions.	Noxious Weed Strategy. Promptly complete NEPA documents to allow use of herbicides.	Effective weed control through herbicides vs. uncertain non-chemical control measures.	Spread of noxious weeds without effective control measures	Effects of herbicides on water quality and human health.
5	Natural biodiversity.	Noxious Weed Strategy. Use herbicides as a last resort and with risk minimization.	Less risk of accidental harm to non-target organisms, water quality, and human health.	In some cases, weed populations may reach uncontrollable levels if herbicides are not used	
6		Noxious Weed Strategy			
7		Noxious Weed Strategy			
8		Noxious Weed Strategy. Prevent disturbances such as timber harvest and prescribed fires which allow noxious weeds to become established.			