Appendix 16

Science Advisory Group Assumptions for Modeling the Supplemental Draft EIS Alternatives

Contents

Introduction

Background

As in any analysis predicting the effects of management direction, judgements must be made about the logic that links objectives and direction with actions implemented, monitoring undertaken, and effects projected. The judgements are simpler in small analyses of single, specific projects; judgements grow more complicated when the analysis encompasses millions of diverse acres and when subsequent analyses and decisions will be made before projects are implemented and effects realized. Assumptions about implementation of direction contained in this Supplemental Draft EIS were developed to reflect consequences of subsequent decisions and effects. As in the analysis of the Draft EIS alternatives, assumptions constitute a given and important facet of the environmental analysis of effects.

The projection of effects by the Science Advisory Group (SAG) was based, in part, on a variety of assumptions about future management conditions that were coordinated with the EIS Team. This subset of assumptions is included in the first part of this appendix (Appendix 16).

In addition, the SAG made assumptions regarding relationships among ecosystem components where definitive empirical studies do not exist, and concerning probable outcomes from implementing management activities or from succession / disturbance processes. These additional assumptions are presented in the last part of this appendix. The models that were used by SAG also have inherent assumptions. Some of those assumptions are included in this appendix, and the rest are documented in the *Science Advisory Group Effects Analysis for the SDEIS ALternatives* (Quigley 1999).

Included in this appendix are those assumptions that clarified interpretation of direction, intent, and / or rationale; provided enough detail to derive outcomes for viability determinations for species of broad-scale concern; and described reasonable implementation for elements not fully described in the supplemental Draft EIS, such as implementation strategy, step-down processes, monitoring strategy, data management, and technology transfer.

The EIS Team provided storylines, budget estimates, and allocation priorities that were not part of the Supplemental Draft EIS direction but were key to the modeling exercise. The assumptions draw directly from the intent; process descriptions; specific standards, objectives, goals, guidelines; and storylines associated with each Supplemental Draft EIS alternative. The intent of assumptions is not to artificially restrict management to achieve the most favorable of outcomes; rather, it is to establish the clarity necessary for analysis purposes in the evaluation of the alternatives.

Because of the full suite of assumptions necessary to project effects (including those presented here and those documented in the *SAG Effects Analysis*), a level of uncertainty is associated with the projected effects. As in any analysis, there is risk associated with the projections of effects if the assumptions are in error and / or if the assumptions do not hold into implementation. Adaptive management and monitoring (particularly validation and effectiveness monitoring) are designed to ensure that managers are able to adjust if effects were not accurately portrayed for a variety of reasons, including errors in assumptions.

Methods for Evaluation of the Supplemental Draft EIS Alternatives

The Science Advisory Group (SAG) used a series of models to simulate the management direction as it would reasonably be implemented during the next decade and the next century. Many models had been developed as a part of the *Assessment of Ecosystem Components in the Interior Columbia Basin and portions of the Klamath and Great basins* (Quigley and Arbelbide 1997) or the *SIT Evaluation of EIS Alternatives* (Quigley, Lee, and Arbelbide 1997). Some new models were developed specifically for the *Science Advisory Group Effects Analysis of the SDEIS Alternatives* (Quigley 1999). The SAG conducted this complex evaluation within tight timelines. In some instances time became the limiting factor in the derivation of effects.

The primary model simulations were for vegetation, disturbances, management activities, and key variables related to landscape conditions. These outcomes and variables were then used as input into other analyses directed toward aquatic, terrestrial, and socio-economic outcomes. The implementation strategy, monitoring strategy, and step-down details have not yet been completed and will not be fully completed until after the signing of the Record of Decision. Some clarity was needed, therefore, to understand how implementation would reasonably

occur. The SAG developed a set of assumptions working with the EIS team. Where empirical relationships did not exist linking inputs to outcomes, assumptions about those relationships were developed.

The effects analysis focused primarily on impacts associated with the Forest Service- and BLM-administered lands of the interior Columbia Basin. Effects were presented at the basin level (to gain some insights into potential cumulative effects), the ICBEMP project area (all Forest Service- and BLM-administered lands to which the Supplemental Draft EIS would apply), the RAC/PAC area, and areas designated for specific purposes (for example, evolutionarily significant units for anadromous fish). The simulations assumed continuation of existing management direction and activity levels across non-Forest Service and BLM-administered lands in the basin. Thus, changes reflect only the effects from implementing the direction contained in the Supplemental Draft EIS.

Supplemental Draft EIS Alternatives Effects Analysis Assumptions

This section contains the specific assumptions coordinated with the EIS team. The document includes the following sections:

- Brief Description of the Process Used to Develop Assumptions
- General Assumptions
- No-action Alternative (Alternative S1) Landscape Modeling Assumptions
- Action Alternatives (Alternatives S2 and S3) Modeling Assumptions
- Landscape Assumptions
- Assumptions About Landscape Integrity and Management Approaches
- Terrestrial Assumptions
- Assumptions for Modeling Effects on Aquatic Species and Habitat
- General Restoration Assumptions for Evaluation of Supplemental Draft EIS Alternatives.

Brief Description of the Process Used to Develop Assumptions

These brief descriptions are not intended to provide sufficient detail to be self-explanatory, and they are not intended to be a complete listing of all the assumptions made in the *SAG Effects Analysis of SDEIS Alternatives* (Quigley 1999). These descriptions are brought together here to assist in the further discussions related to alternatives, to assist in clarification on assumptions, and as general background on the interpretation of assumptions. Some assumptions taken out of context of the full discussion could be misinterpreted. It should be recognized that every model is built on a set of relationships with imperfect knowledge and uncertainty. Each SAG staff area has used models in one form or another. The documentation for each SAG staff area's modeling is not completely repeated here. Rather, this document assembles the major assumptions regarding interpretation of direction in the Supplemental Draft EIS and how it plays into the evaluation. Relationships among parameters in models drawn from experts or the literature are not repeated here.

The assumptions draw directly from the EIS the intent; process descriptions; specific standards, objectives, goals, and guidelines; and storylines associated with each alternative. The intent of the assumptions is NOT to artificially restrict management to achieve the most favorable of outcomes; rather, the intent is to establish the clarity necessary for analysis purposes in the *SAG Effects Analysis of SDEIS Alternatives*.

General Assumptions

Regulatory agencies will be staffed with adequate expertise and resources to participate in a timely and effective manner as interagency partners in implementation and monitoring.

The manner in which available funds are allocated across the project area and among possible treatments affects the degree to which the achieved outcomes reflect the outcomes projected in Chapter 4 of the Supplemental Draft EIS. Implementation of the action alternatives presumes funds are focused on the restoration work that has been identified as priority, through management direction (such as specific objectives) or designation (such as in an A2 subwatershed). It is assumed that changes from

current practices for handling funding allocations will occur, with priorities for funding requests and allocations collaboratively set at the regional and subregional scales. Any projected improvements in ecological conditions associated with Alternatives S2 and S3 presume a change to a more broad-scale approach that considers priorities among and between administrative units.

The outcomes projected for each alternative presume funding levels and distribution as per those used for modeling the alternatives. The increased budget emphasis on the high restoration priority subbasins in Alternatives S2 and S3 is evident when all the priorities, objectives, standards, and assumptions are taken together. Translating all these elements into budgets for modeling purposes resulted in funding increases of 37–40 percent per acre for the high restoration priority subbasin areas in Alternatives S2 and S3, compared to the average cost per acre in these same areas in Alternative S1.

BLM and Forest Service administrative units will have appropriate expertise and experience available to them in-house, through service centers, or through contracting to implement and monitor the ICBEMP direction effectively. Line officers will ensure necessary training, including technology transfer, is provided in a timely manner and as needed, through mechanisms such as those already in place (certification programs, RIST teams) or through new mechanisms designed to fill training gaps.

Practices used to implement Alternatives S2 and S3 of the Supplemental Draft EIS are to be based on ecological goals and objectives. Current practices (Alternative S1) have moved toward more ecological practices but still are more focused on traditional practices.

Subbasin review / analysis and / or ecosystem analysis will be the primary vehicle for setting landscape and project goals and objectives, although in some cases similar results can be achieved through programmatic processes such as range allotment planning or large scale prescribed fire plans. Subbasin review / analysis and ecosystem analysis combined with NEPA processes will be used to determine acceptable practices to achieve the objectives.

An implementation strategy will provide more definitive guidance to the field regarding the alternative that is selected.

A monitoring strategy will be developed to accompany the implementation strategy. It will include a hierarchical approach.

The prescription (Rx) emphasis as brought forward in the Landscape Ecology modeling for the alternatives represents a reasonable simulation of the alternatives. This modeling was based on the Chapter 3 direction package and the EIS Team storylines (found in Appendix 14). The resulting landscape variables should be used as an indicator of trends among alternatives and should not be reported at a level lower than the subbasin or groups of subbasins.

It is estimated that very little change in road density classes will result for any of the alternatives for the first decade. This assumption is due to the large amount of road closures or new roads it would take to move a road density class from the current class. Trends of change (stable, up, down) estimated for the first decade and the long term (100-year estimates) show both a trend and a predicted road density class. An increasing trend can be interpreted as road increases that would be expected to affect ecological outcomes.

Road density classes were modeled as a dominant class by subwatershed. It was estimated by ownership (BLM- and Forest Service-administered, other) within each subwatershed using the 1 km pixel predicted road density data. Non-federal lands are assumed to remain in static (unchanged) trend and density class in the short and long terms.

No-action Alternative (Alternative S1) Landscape Modeling Assumptions

The project compiled activity-level data (prescribed fire, wildfire, timber harvest, timber volume and authorized AUMs) for each administrative unit in the basin for 1988 through 1997. These data were used to assign a base landscape modeling prescription (Rx) to calibrate the models to the current level of activity by administrative unit. These data are asssumed to adequately reflect current management levels based on individual administrative land use plans, gray wolf recovery plan, and the Eastside Screens.

The 1988–1997 activity level data are not assumed to fully reflect changes in activity levels by administrative units that are attributed to adoption of : PACFISH / INFISH requirements; Biological Opinions for bulltrout, steelhead and chinook salmon; the recovery plan concerns for caribou and grizzly bear; and the Healthy Rangelands initiative for the BLM.

Therefore, additional consideration was taken to address these initiatives in the SAG landscape modeling:

- The Landscape simulation prescription (Rx) assignments reflect lower activity levels for timber, range, and prescribed fire to account for the limitations of the 1988–1997 data to address: (1) EAWS and RCAs as required within priority watersheds (steelhead, bulltrout, chinook salmon); (2) RCAs (PACFISH / INFISH area) outside the priority watersheds ; and (3) caribou and grizzly bear recovery plan area requirements (road reductions and human activities that affect habitat or animals) outside priority watersheds.
- Healthy Rangelands for the BLM are assumed to have a long-term decrease on authorized AUM levels, and the CRBSUM prescription (Rx) assignments were modified accordingly.

Road Management and Road Density

Road Policy

It was assumed that the current national process for road policy being conducted by the Forest Service will be brought to a conclusion in the next several years. The outcome will be analysis requirements and the need for additional justification for constructing new roads. The SAG assumed it will slow the rate of growth of new roads on Forest Service-administered lands in both the short and long terms. The SAG also assumed the existing minimal level of road construction on BLM-administered lands will continue.

Road Increases

Areas assigned the following prescriptions (Rx) would show an increasing trend in road density classes for the short term, and in the long term they would increase one road density class (for those currently classified as extremely low, and low) outside priority watersheds: Forested PVGs: N3, N8, C2, C3, P3 (see Table 1 for brief description).

Unroaded Areas

Areas currently unroaded (predicted road density of none) would remain unroaded (trend and density class) for the short term and the long term on BLM- and Forest Service-administered lands. It is recognized that road entry is not prohibited, but it will be rare to deal with hazards, risks, and property. Some existing land use plans allow for entry into unroaded areas but this is expected to be limited.

Priority Watersheds

Areas within the bulltrout, steelhead, and chinook priority watersheds with high and extremely high road densities will be reduced in the short term and the long term (declining trend), and no increases in road density classes in priority watersheds will occur on BLM- and Forest Service-administered lands.

Recovery Plans

Forested areas within grizzly bear recovery areas with high and extremely high road densities will be reduced in the short term (declining trend) and will be reduced by one road density class in the long term on BLM- and Forest Service-administered lands.

Forested areas within the caribou recovery area with high and extremely high road densities will be reduced in the short term (declining trend) and the long term but not enough to reduce road density classes on BLM- and Forest Service-administered lands.

Action Alternatives (Alternatives S2 and S3) Modeling Assumptions

In Alternatives S2 and S3, Healthy Rangelands standards and objectives are to be applied to both BLM and Forest Service lands. It is assumed that these requirements will decrease authorized AUMs through time, improve exotic weed control, and speed up restoration of rangelands approximately 20 percent faster in the long term than current management (or the recent trend in activity levels). The SAG attempted to model this. However, accelerated restoration on areas dominated by cheatgrass and wildfire disturbance regimes will require more restoration emphasis, and the changes may be slower.

- For modeling purposes, Base Level direction prescription (Rx) assignments in rangelands dominated by wildfire disturbance regimes (base Rx assignment of P2) were modeled with a restoration emphasis prescription only where there were base funding levels to treat an entire subwatershed with a restoration emphasis prescription (A1, A2 or A3).

- Chapter 3 direction indicates that Ecosystem Analysis at the Watershed Scale (EAWS) will occur in areas where it is triggered (approxi-

mately 62 percent of the Forest Service- and BLM-administered lands). For modeling purposes, EAWS is assumed to be completed within 5 years in 50 percent of the triggered areas and in the remainder of this area within 13 years for Alternative S2. It is also assumed for Alternative S2 that other EAWS priorities as identified through Subbasin Review will occur on 50 percent of the area outside areas that are triggered (an additional 19 percent of Forest Service- and BLM-administered lands) within a 13-year period. Thus, within 13 years EAWS will occur on approximately 81 percent of the Forest Service- and BLM-administered areas for Alternative S2. For Alternative S3 there are no triggered areas. It is assumed that EAWS priorities will be generated within 10 years through the Subbasin Review process on approximately one-third (33 percent) of the areas where Subbasin Review is to occur.

Road Management and Road Density

Assumptions for modeling road densities for the action alternatives are the same as the no-action alternative (Alternative S1) except for the following:

Roads

It is assumed that analysis requirements and additional justification for constructing new roads will exist for both the Forest Service and the BLM. It is assumed that this will slow the rate of growth of new roads on Forest Service-administered lands in the short and long terms, and it will maintain the minimal road construction on BLM lands in the short and long terms.

Areas assigned the following landscape modeling prescriptions (Rx) would show an increasing trend in road density classes for the short term and the long term, with no changes in net road density class (for those currently classified as extremely low, and low): Forested PVGs: N3, N8, C2, C3, P3, A2, A3.

A1 and T Areas

No increases in trend or net increases in road density for the short and long terms in A1 and T areas.

A2 areas (outside)

No net increases in road density for the short term.

In the short term, there will be a decreasing trend in areas with greater than or equal to moderate road density and no net increase in road density.

In A2 subwatersheds in the long term, there will be a decreasing trend for extremely low, low, moderate, high, and extremely high road density areas. In A2 subwatersheds at the lower end of high and extremely high, road density classes would reduce one density class. *For modeling purposes it was assumed all pixels in high and extremely high in A2 areas (outside A1 and T) would reduce a class in the long term.*

Aquatic Restoration Priority Subbasins (outside A1, T, and A2)

For the long term, there will be a decreasing trend in moderate, high, and extremely high, and a decrease in class for extremely high.

Other Areas (outside those mentioned here)

There will a decreasing trend and no net change in density classes in high and extremely high road densities in the short and long terms.

Landscape Assumptions

Because no complete implementation plan existed within the Supplemental Draft EIS, it was essential that assumptions be made regarding reasonable implementation processes in order to estimate effects on landscape parameters. A mix of landscape modeling prescriptions across the basin simulates the implementation of each alternative. For the landscape analysis, the SAG developed a set of assumptions concerning the types of management that would most likely result in positive trends in landscape integrity. These assumptions enabled the SAG to understand how outcomes might be related to the conservation of productivity and native habitats. It was assumed that the more the alternatives use implementation processes similar to these or others that SAG thought would result in similar outcomes, the more likely the alternative would result in positive trends for landscape integrity on the Forest Service- and BLM-administered lands.

There is no specific direction for prioritization of management-ignited fires in wilderness areas (MAC 1) for any of the alternatives. The direction that is in Alternatives S2 and S3 in Chapter 3, as well as the storylines (Appendix 14), either indicates only wildland fire use for resource benefit (natural ignitions) or does not distinguish between ignition types under the prescribed fire storylines. Consequently, it is assumed that the level of management-ignited fires in wilderness areas will be small relative to the area

available within wilderness areas. However, when management-ignited prescribed fire does occur, it is assumed that individual hydrologic units will be managed as a whole.

There is strong direction (standards and storylines) in both Alternatives S2 and S3 for low amounts of integrated landscape-scale (hydrologic unit) restoration in the A1 subwatersheds and T watersheds, and moderate to high amounts in the A2 subwatersheds (levels depend on integrated restoration assignment). For Alternatives S2 and S3, the SAG assumed that Subbasin Review will occur and result in a context for this type of restoration in the A1, T, and A2 hydrologic units within the subbasin for treatment. For Alternative S2, it is assumed that landscape-scale (appropriate hydrologic unit) integrated risk/opportunity step-down assessment and restoration pattern design would occur via EAWS, or as part of site-specific analysis in order to step-down integrated risks and opportunities. This supports the assignment of landscape-scale restoration prescriptions (N1, N4, A1, A2, A3). With the lower level of EAWS in Alternative S3, it is assumed that this type of restoration may be less effective. Instead, the SAG assumed that smaller scale patches (N6, N5) of restoration would occur in forests, and that management on rangelands would implement Healthy Rangelands on both BLM- and Forest Service-administered lands.

There is direction (objectives and storylines) in both Alternatives S2 and S3 for integrated landscape-scale (hydrologic unit) restoration in the urban–rural–wildland interface areas using aggressive prescribed fire and mechanical activities. The SAG assumed this direction cannot be met without a landscape-scale (appropriate hydrologic unit) integrated risk/opportunity step-down assessment and restoration pattern design. Consequently, for both Alternatives S2 and S3 it is assumed that Subbasin Review will occur and result in a prioritization of hydrologic units within the subbasin for treatment. The SAG assumed that the hydrologic units picked for treatment would have a landscape step-down assessment completed as part of EAWS or project analysis in order to step-down integrated risks and opportunities. This supports the mapping of aggressive restoration prescriptions (A1, A2, A3) for modeling purposes in the high and very high risk areas within the urban–rural–wildland interface. With the lower level of EAWS in Alternative S3, it is assumed that this type of restoration may be less effective.

Storylines

It is assumed that the written rationale of Objective R-O4, with associated storyline table and written interpretation, will be used to guide implementation of management on Forest Service- and BLM-administered lands in the ICBEMP project area. Without this assumption, it is not clear how the rationale and storylines would play into prioritizing activities as appears to be the intent of the storylines. The storylines include a hierarchy for modeling and an inference to activity levels by priority areas. This information provides more specificity than could actually be simulated in the broad-scale landscape ecology models. The activity information and suggested landscape modeling prescriptions (Rx) were used in a general sense to guide how prescriptions were allocated to the landscape. To the extent that storylines or management direction are at finer detail than can be modeled (for example, if storylines describe more specificity than was modeled with broad-scale data), the SAG qualitatively (and quantitatively to the extent possible) considered the finer details in determining and documenting effects.

Budget

It is assumed that the modeling of the Base Level direction will be limited to the current BLM and Forest Service costs provided by the EIS Team, and that additional restoration funds for Alternatives S2 and S3 would be prioritized within the high restoration priority subbasins as described in the storylines (Appendix 14) using the percentage of restoration targets by subbasin provided by the EIS Team. Landscape level restoration prescriptions (Rx) were used in the assignment of Base Level prescriptions for wildland fire risk areas, A2 subwatersheds, and high restoration priority areas (from storylines and Objective R-O4) where base funding allowed.

Implementation Organization Structure

It is assumed that there will be an organizational structure in place for implementation of the Record of Decision (ROD). The actual structure is yet to be defined, but it will be based on the preliminary decisions of the ICBEMP Executive Steering Committee (ESC). It is expected to include structures appropriate to address basin oversight, monitoring, data management, subregional analysis, coordination, dispute resolution, science advice, and technology transfer. Details on location, membership, and duties of implementation teams are assumed to be developed prior to beginning actual implementation. The subregional organization is expected to align with modified RAC/PAC areas.

Landscape Integrity and Management Approaches

The landscape integrity and management approaches are mostly the same as for the original Landscape Ecology *Evaluation of Alternatives* (see Hann, Karl, Jones, et al. 1997). Two important measures of landscape integrity at all scales are: (1) productivity and associated processes, and (2) diversity of habitats and associated processes. Generally, in wildland environments, native communities are more productive and more resilient to disturbances such as fire, drought, and insects / disease, than are communities that have been modified by traditional agricultural, forest, or range management, or by conversion to exotic communities. As native habitats are modified or converted to exotics, there is typically a decline in the native fauna and flora that depend on these habitats. Management that conserves native habitats is more likely to avoid further declines in native species.

The following assumptions describe what the SAG views as implementation and management approaches that are most likely to result in high landscape integrity from the broad perspective. They are intended to outline the concepts of landscape integrity that cross the biophysical, social, and economic boundaries at the broad scale and will be used to summarize and compare alternatives. These are assumptions that the SAG feel will vary in the degree of implementability between alternatives.

Landscape Approach to Management

It is assumed that through time the management of BLM- and Forest Service-administered lands will shift increasingly toward a landscape approach under all alternatives. Under this assumption, BLM- and Forest Service-administered lands are managed as a whole within watersheds and as connected lands between watersheds. Forests and rangelands intermingled within or between watersheds are managed on an integrated basis for both resources and habitats. Hydrologic and riparian regimes within watersheds are managed as integral networks of forests and rangelands. Managers will increasingly recognize that ownership pattern strongly affects implementation of a landscape approach. Watersheds dominated by continuous BLM and Forest Service ownership would be more likely to achieve long-term desired patterns, while watersheds with mosaic or mixed ownership would be less likely.

Successful Ability to Resemble/Represent Processes

It is assumed that managers will develop the ability to assess and implement landscape management to more closely resemble native landscape, community conditions, and processes over space and time for all alternatives. The level at which this will be implemented varies among alternatives. This does not infer that these conditions are always representative of the historical range of variability (HRV), which is the variability of regional or landscape composition, structure, and disturbances during a period of time for several cycles of the common disturbance intervals and for similar environmental gradients. Understanding and managing within the limitations and options of the biophysical environment would conserve processes associated with native composition and structure.

Hierarchical Assessment, Implementation, Monitoring, and Evaluation

It is assumed that Forest Service and BLM inventory programs and methods will be based on landscape processes and gradients to integrate ecological conditions and resource values. It is assumed in Alternatives S2 and S3 that there will be a hierarchial assessment for implementation, monitoring and evaluation through the step-down process (Subbasin Review, EAWS, and land use planning). The level of assessment in this manner will be less in Alternative S3 than in Alternative S2, because EAWS is not triggered in certain areas and is determined necessary only through the Subbasin Review process.

Prioritization and Integration of Activities

It is assumed that through time, activities that produce commodities and restore landscape conditions will be implemented in a prioritized manner with emphasis on achieving an integrated landscape and maintaining ecological integrity and socio-economic resiliency. The level at which this will be implemented varies among the alternatives. In Alternative S1, subbasin assessments and EAWS will assist in providing a process for prioritization of aquatic restoration activities and management in limited areas and functions. It is assumed in Alternatives S2 and S3, that there will be an assessment of status, risk, and opportunities as well as prioritization of activities and

restoration through the step-down process (Subbasin Review and EAWS). The level of prioritization in this manner will be less in Alternative S3 than in Alternative S2, since EAWS is not triggered in certain areas and is determined necessary only through the Subbasin Review process.

It is assumed that these priorities are set regionally using information at the 4th-field Hydrologic Unit Code (HUC) level. These priorities are placed in context with priorities at higher levels (such as international air quality agreements or biodiversity agreements or national agreements among states). Priorities are setor smaller watershed areas within the 4th-field HUC by considering integrated information when conducting ecosystem analysis at the landscape or watershed scale.

Concentration of Activities Temporally and Spatially

It is assumed that through time, the implementation of activities such as access for timber harvest, use of prescribed fire, and road access management will be concentrated in time and space to better reflect the biophysical environment. The level at which this will be implemented varies among the alternatives. In Alternative S1, subbasin assessments and EAWS will assist in providing a hierarchial assessment for planning activities with an aquatic focus. It is assumed for Alternatives S2 and S3 that there will be a hierarchical assessment for status, risk, and opportunities as well as prioritization of activities and restoration through the step-down process (Subbasin Review and EAWS). The level of assessment in this manner will be less in Alternative S3 than in Alternative S2, since EAWS is not triggered in certain areas and is determined necessary only through the Subbasin Review process.

Road Management

It is assumed for all alternatives that new road construction will be prioritized for low sensitivity land types and 6th-field code HUC watersheds within the context of objectives specifying reductions in adverse road-related effects. Road management prioritizes reductions in road density in moderate-to-high sensitivity watersheds and land types. Drainage systems and culverts will be reconstructed, as needed, and maintained to minimize delivery of sediment into streams. Bridges and culverts are reconstructed, as needed, in locations that reduce impacts on the river and stream channel systems.

Fire Management

It is assumed the fire suppression and fuels programs will be managed to attain landscape conditions within the capabilities of the biophysical environment for all alternatives at varying levels. Less emphasis on this will occur within Alternative S1. It is assumed for Alternatives S2 and S3 that there will be a hierarchial assessment for status, risk, and opportunities as well as prioritization of activities and restoration through the step-down process (Subbasin Review and EAWS). The level of assessment in this manner for management of fire will be less in Alternative S3 than in Alternative S2, since EAWS is not triggered in certain areas and is determined necessary only through Subbasin Review process.

Forest and Range Integrated Landscape Management

It is assumed that management activities will be designed and implemented to integrate planning, implementation, and monitoring for ecological integrity, while considering social and economic resiliency for Alternatives S2 and S3. To a much lesser degree, Alternative S1 is assumed to address integrated landscape management because subbasin assessment and EAWS are only conducted where required by the aquatic component of the ecosystem. Management emphasis will shift toward managing landscape processes to provide the most effective “fit” with the biophysical environment and associated pattern of succession / disturbance regimes.

Management of Different Potential Vegetation Groups (PVGs)

It is assumed that management of potential vegetation groups is done in a landscape context in all alternatives. The level at which this will be implemented varies among the alternatives except Alternative S1. There will be emphasis to avoid both the introduction and spread of exotic and noxious weeds. Any seeding that is deemed absolutely necessary would use native species whenever possible; any non-native species used should, when possible, be ones that do not produce viable seed. Non-native species are used for restoration only if there are no native species that can compete with undesirable exotics or that will stabilize the site.

Terrestrial Assumption

Where domestic sheep allotments overlap bighorn sheep occurrence: in 10 years, 10 percent of the allotments will be closed to domestic sheep; in 100 years 100 percent of the allotments will be closed to domestic sheep.

Assumptions for Modeling Effects on Aquatic Species and Habitat

Many assumptions are inherent in the development of the model structure and the estimates for the conditional probability tables (cpts) and are not captured in this list. Some will be evident in the documentation of the model. In some cases, particularly where the aquatic staff used expert judgment to develop cpts, those assumptions are essentially expert opinion and are captured in the model but are not described here or in the model documentation. Changes in any of these assumptions could change the cpts and the resulting outcomes for habitat and species status.

Assumptions Related to Interpretation of the Alternatives

Although monitoring and adaptive management are important considerations in the evaluation of the alternatives, they were assumed to not differ substantially across the alternatives. That is, the SAG aquatic staff did not specifically model adverse or improved conditions based solely on the way monitoring or adaptive management would be applied in any one alternative.

It is assumed that the interpretation of the Supplemental Draft EIS and resulting predictions of landscape characteristics and disturbance provided by the SAG landscape team are generally accurate in value and spatial representation. It is also assumed that information generated in the *Assessment* (Quigley and Arbelbide 1997) and available in existing basin coverages is generally accurate in value and spatial location. It is known that errors exist in the data and in some cases the relative magnitude of the error is not quantified. The SAG is essentially assuming that those errors do not meaningfully compromise the results of the analysis.

The aquatic team assumes that the landscape modeling/interpretation of the Supplemental Draft EIS activity and disturbance levels does not fully account for the effects of mitigation or restoration from the aquatic management direction reflected in the objectives, standards, and guidelines. The scale of the mitigation or restoration guided by the direction is too fine to be fully accounted for in the landscape modeling. This degree of detail is accounted for in the effects analysis through the aquatic models.

It is assumed that the influence of management direction and the function of riparian areas are essentially the same in forested and range areas. A functional (or non-functional) riparian area in rangeland is equivalent to a functional (or non-functional) riparian area in forested land as far as the fish are concerned.

The SAG assumed that decreases in road density reflect the actual removal of roads and most of their related adverse effects on the landscape. It is recognized that removal may not include re-contouring if inappropriate, but does include re-vegetating and no vehicular use and the restoration of hydrologic function. It is also recognized that some road removal projects will not fully eliminate all the related adverse effects.

It is not assumed that disturbance necessarily adversely affects aquatic habitat or that habitat conditions would always be high if there were no management-related history or activity. The nature of sediment, hydrologic, and riparian-related processes and the nature, extent, and distribution of states or conditions resulting from those processes can be altered from those expected in the absence of management activities. Thus, aquatic conditions can be adversely affected by natural events or management activities.

Effects of T watershed and old-forest management on aquatics would be expected to be more similar to A2 subwatersheds than Base Level. However, the area within a subwatershed that would be managed for T watershed or old-forest objectives is uncertain. The aquatic team assumed Base Level management objectives and standards for aquatics would apply to T and old-forest areas. Any differences in activities in those areas would be reflected in the landscape prescriptions affecting related landscape variables (for example, bare ground or grazing).

Areas outside of designated wilderness areas included in MACs 1 and 2 (for example, wilderness study areas), which were assigned the same conditional probabilities as designated wilderness areas, will not be used for activities that could reduce their capacity or function as aquatic habitat.

Priority watersheds (Alternative S1 only) include those designated for Snake River steelhead and chinook, upper Columbia steelhead, and a proxy

for bull trout using the complete current distribution. Priority watersheds for mid-Columbia steelhead and upper Columbia chinook have not yet been designated.

Short-term vs. Long-term Landscape Restoration Risk

Short-term risks of restoration activities are greatest in subwatersheds needed to maintain strong and fringe populations and populations in areas with high genetic and aquatic community integrity and where depressed populations are important to recover threatened, endangered, and proposed (TEP) species or to maintain broader distribution of the taxa. Landscape restoration can have long-term beneficial effects on aquatic species. Although there will be higher levels of landscape restoration and resulting higher risks of short-term effects on aquatics in high restoration priority subbasins, management area designation (that is, A2 and TEP) and analysis and planning prior to restoration will reduce that risk compared with non-A2, non-TEP, or non-high-restoration-priority subbasins. There is also higher probability of restoration being effective when preceded by subbasin review / analysis and EAWS or equivalent.

For Alternatives S2 and S3, it is assumed that implementation of the water quality protocol would correspond with occurrence of EAWS and with the required roads analysis.

Field units will be staffed with adequate aquatic expertise to effectively implement analysis, conservation, and restoration direction.

Probabilities for high restoration priority subbasins reflect uncertainty about the level of increased aquatic restoration and the specific subwatersheds where it will occur. Probabilities for benefits to aquatic species and habitats in high restoration priority subbasins will be higher in subbasins identified as priorities for aquatic restoration.

There is greater uncertainty regarding the effectiveness of restoration in A2 subwatersheds and other aquatic restoration priority areas compared to conserving existing high quality aquatic habitat (for example, A1 subwatersheds). That is, maintaining high quality habitats is easier than restoring degraded habitats.

Except for EAWS triggers, management direction for TEP species outside of the A1 / A2 network does not differ substantially from Base Level (that is, no additional BO requirements for Alternatives S2 and S3 are assumed).

Mining could adversely affect aquatic habitat condition under all alternatives, but data were inadequate to determine its potential effects in a spatial context.

Subwatersheds managed under Base Level (Alternatives S2, S3), PACFISH / INFISH Key Biological Opinions, INFISH, and BLM scenarios will tend to have predominately moderate-low current habitat conditions since areas managed under the wilderness, roadless, and A1 scenarios will be more likely to have higher quality current habitat conditions. Habitats that are currently low quality will be more difficult to restore and take substantially longer to restore than habitats that are currently in moderate condition and still retain the components of functional watersheds. Forested subwatersheds can generally be restored more rapidly and extensively than more arid rangeland habitats.

Interim Forest Service direction for roadless areas will be replaced by comparable long-term direction for Forest Service-administered lands. That direction primarily restricts road building but does not change the management allocation. For example, timber harvest and other uses could still occur but would rely on access not dependent on new roads. Base level (Alternatives S2, S3) or existing standards (such as PACFISH / INFISH) would apply to activities other than road building that occur in roadless areas. It was assumed the existing minimal level of road construction on BLM lands will continue.

Increased conservation and restoration are anticipated in some areas outside of Forest Service- and BLM-administered where listed species occur (for example, the Oregon Plan).

Fifth-field HUCS occupied by listed Klamath Basin, Lost River, and short nose suckers; recently listed mid Columbia steelhead and upper Columbia chinook; and other listed species were modeled as PACFISH Key / INFISH Priority BO watersheds under Alternative S1.

General Restoration Assumptions

The Supplemental Draft EIS includes goals to sustain and where necessary restore the health of forest, rangeland, aquatic, and riparian ecosystems. Alternatives S2 and S3 specifically define restoration strategies as one component of the overall risk management approach within the alternatives.

No explicit definition of restoration is provided in the Supplemental Draft EIS. The assumption made regarding the definition of restoration was to adopt the definition used by the Society for Ecological Restoration: "Ecological restoration is the process of assisting the recovery and management of ecological integrity. Ecological integrity includes a critical range of variability in biodiversity, ecological processes and structures, regional and historical context, and sustainable cultural practices." (Society for Ecological Restoration web site http://ser.org/definitions.html)

The SAG assumed restoration strategies in the Supplemental Draft EIS are generally aimed at combining actions with protection of resources in such a way as to maintain or restore ecological integrity in forest, rangeland, aquatic, and riparian ecosystems. Thus, restoration includes passive as well as active approaches to achieving desired conditions in ecosystems in the project area. Examples of restoration treatments can include:

Thinning vegetation to reduce fuel loadings, thereby reducing stress on the system and creating an environment within which ecological processes are more likely to operate in ways characteristic to the area;

Obliterating roads, thereby restoring many of the ecological processes to the area;

Prohibiting some management actions in some critical areas, thereby limiting the possibility that ecological processes will be interrupted; or

Modifying grazing in riparian areas, thereby increasing the possibility that riparian vegetation will increase and provide more protection to aquatic resources as well as enhanced habitats for terrestrial species.

The degree to which restoration objectives will be met depends on planned as well as unplanned events.

Effectiveness of Ecological Restoration

It is assumed that restoration of ecosystems can involve passive as well as active approaches. Given the interrelationships among ecosystem components, the strong interconnections that exist among components, the dynamic nature of the ecosystems, and the high degree of variability that exists within the interior Columbia Basin, it is not expected that all systems will respond similarly to either active or passive restoration approaches. The SAG relied on models that reflect changing conditions based on activities, succession, and disturbances. The SAG recognizes that restoration treatments will not be 100 percent effective, no matter how well planned, how well installed, or how strong the intent to design and implement a successful project. When preceded by context-setting analysis (such as Subbasin Review and EAWS), watershed or landscape level restoration objectives are more likely to be achieved for some restoration activities (for example, prescribed fire, road obliteration, thinning, integrated weed management). Example reasons why restoration treatments may fail to meet the intended objective include:

- Planning may not recognize an important interaction that ultimately negates the objective (for example, a seeding was not expected to attract large numbers of ungulates to the area, yet off-site conditions result in a large increase in ungulate use and the seeding fails; a road removal project was designed to reduce adverse effects caused by sediment delivery but context was not fully considered and upland conditions caused sediment to increase for the watershed rather than decrease after the road obliteration; an integrated weed management restoration project was planned to reduce the spread of weeds into an area following thinning but the weed management efforts failed to consider context and weed seed from up-slope areas spread rapidly to the treated area negating the weed management efforts).

- Funding for subsequent maintenance may not be forthcoming (for example, culverts are installed that require periodic cleaning of woody debris, yet funding was not forthcoming to allow the cleaning to occur and the result may be to wash some culverts away).

- Climatic conditions such as several years of above or below normal rainfall or warmer temperatures may affect the project in unplanned ways (for example, a prescribed burn is conducted with a seeding to follow, yet drought is experienced the following two growing seasons and the seeding fails).

- Unanticipated rain storm, flood, ice flow, snow storm, or other event may negate the positive aspects of the project (for example, a riparian rehabilitation project is undertaken that includes planting willow species near the stream, yet an unusual winter rain-on-snow event results in an ice flow that scours the area of the planting).

- Vegetation treatment may fail to meet the planned objective (for example, thinning from below to encourage large older trees and reduce potential fire that fails to consider context within the landscape or watershed may not be effective in the face of a conflagration type fire; a prescribed fire was planned to reduce fuel loading and risk of uncharacteristic fire effects but the prescribed fire planning failed to consider context within the watershed and fuel connectivity within the watershed caused severe fire effects across a large portion of the watershed following wildfire).

- Removal of livestock as a restoration treatment may have unintended outcomes (for example, the build-up of herbaceous vegetation following livestock removal may result in a ridge top fire spreading to the riparian area where undergrowth and ladder fuels are substantial and the entire riparian area burns with an uncharacteristic fire).

- Leaving an unroaded area with no fuels treatments may result in unplanned outcomes to old-growth habitats (for example, patches of old growth interspersed within a forested unroaded area may be affected by bark beetle outbreaks initiated in dense multi-story stressed forests within the unroaded area).

- Road obliteration to reduce road densities may result in unplanned outcomes (for example, removing roads without reducing fire risk may make suppression activities ineffective, resulting in fires that kill the structural habitat components of the species the treatment was intended to benefit).

Additional Assumptions Used in the SAG Analysis

The following assumptions were necessary for the analysis process and were developed by the SAG after the previously mentioned assumptions that were coordinated with the EIS Team.

Landscape Assumptions

Uncharacteristic Soil Disturbance

The landscape restoration and maintenance management landscape modeling prescriptions (N1, N4, A1, A2, A3) are assumed to produce 20 to 80 percent less uncharacteristic soil disturbance than their comparable traditional management modeling prescriptions (C1/N6/P1 for N1/A1, N2/N7/N5/P2 for N4, N3/N8/C2/C3/P3 for A2/A3). This assumption is important for estimating effects of the Supplemental Draft EIS alternatives on aquatic and terrestrial habitats and populations. Disturbance of the soil surface—particularly exposure of bare soil, displacement, churning, and compaction—can result in increased erosion, loss of soil productivity, and increased sediment production. Roads, skid trails or access trails along drainages or down slopes can become conduits for sediment delivery to streams and can decrease soil productivity through erosion and compaction. Excessively hot prescribed fires that burn in accumulated ground fuels during dry soil surface conditions can reduce soil surface cover, burn out large wood and roots, and cause hydrophobic soil surface conditions. "Wildland fire use for resource benefit" may cause similar effects in wilderness and roadless areas, although the risk is less since fuel loads are less likely to exceed historical ranges. Any of the modeled prescriptions could cause uncharacteristic soil disturbance if they are not consistent with natural disturbance regimes and biophysical site conditions.

On-the-ground samples of soil disturbance (Hann, Jones, Karl, et al. 1997) indicate that "wildland fire use for resource benefit" in fuel conditions similar to historical patterns exposed only 2 to 5 percent bare soil and consumed 0 to 100 percent of soil litter (mean ranged from 15 to 35 percent). In contrast, tractor or dozer skidding with dozer piling and burning generated 25 to 75 percent bare soil. Activities that used low impacts methods such as forwarders, horse logging, helicopter logging, or complete log lift cable yarding, combined with broadcast prescribed fire, produced soil disturbance levels similar to those considered typical of natural systems.

The amounts of the restoration harvest, thinning, and prescribed fire increase by 2 to 10 times in restoration and maintenance areas of the high restoration priority subbasins. Yet, depending on the area and type of management prescription, soil disturbance is pro-

jected to decrease, stay the same, or increase by only a small amount. This is because the design and implementation of restoration and maintenance treatments are assumed to produce effects that are similar to those occurring in the natural system and mitigate risks generated by past fire exclusion and traditional management activities. It is also assumed that monitoring and adaptive management would result in adjustment of treatments to reduce soil disturbance to levels no higher than those from natural wildfire.

The SAG did not include the substantial influence of hierarchical landscape step-down (that is, Subbasin Review to EAWS to project analysis) in modeling uncharacteristic soil disturbance. The effects of step-down were purposely excluded so that differences in alternative objectives and standards, as well as levels of influence of hierarchical landscape step-down, could be assessed in a separate variable. Uncharacteristic soil disturbance would decline in response to increased amount and quality of step-down, including Subbasin Review, EAWS, and project analysis. Decreased soil disturbance should result from increased step-down analysis because activities would be more integrated and the resulting conditions would better fit local disturbance and biophysical conditions.

Some lands under Forest Service and BLM administration do have high levels of uncharacteristic soil disturbance. Cumulative effects on these areas could be much higher than the average annual values indicate.

Terrestrial Vertebrates Assumptions

Explicit modeling assumptions included the following:

Trends in livestock grazing effects departure and in historical range of variability (HRV) departure variables derived for each 6th-field HUC provide an accurate measure of the direction in trend for riparian vegetation quality in each 6th-field HUC, as long as large collections of 6th-field HUCs are evaluated (such as across a RAC/PAC or basin). Riparian vegetation quality is defined as the degree to which historical composition and structure of native trees, shrubs, grasses, and forbs are present in the riparian area at a specified time point. Magnitude of the trends in livestock effects departure and HRV departure for each 6th-field HUC, however, will not accurately measure magnitude of effect of the trend on riparian vegetation quality, since negative effects will typically be stronger in the riparian areas than in the uplands. Livestock effects departure may also index the direct effects of trampling on vegetation and nesting structures. Thus, 6th-field HUC estimates of livestock grazing effects and HRV departure that have negative trends will typically underestimate the magnitude of this negative trend in riparian areas.

Trends in snag density and log density estimated for each 6th-field HUC follow the same logic in terms of how such trends index snag and log density trends in riparian areas as stated above under assumption number 1. That is, snag and log density trends for a 6th-field HUC will accurately measure the direction in trend but not the magnitude of trend for the riparian areas in each 6th-field HUC, and direction in trend will be accurate only when assessed across a large set of 6th-field HUCs.

A large number of the terrestrial vertebrates that depend on riparian habitats also are negatively affected by a variety of road-associated factors. Trends in these factors can be indexed by trends in road density class for each 6th-field HUC under the assumption that 6th-field HUC road density trends index a similar direction in trend for roads within riparian areas. This assumption is logical because most larger riparian areas (such as third order and larger stream systems) contain roads, and road density is typically higher in these larger riparian areas compared with upland environments.

Plants Assumptions

Key ecological and implementation assumptions include:

The most favorable current state for a taxon would be to have its current distribution meet or exceed the taxon's historical range and be of sufficient quality to support the type and degree of within-population and metapopulation interactions that the taxon would characteristically engage in if it were not habitat-limited. When conditions are below this state, taxa are at some risk, varying from a low degree of risk to a high degree of risk for taxa that are very rare and isolated. Because SAG does not have current information on the distribution of each taxon, they were not able to estimate the current state.

It is assumed that existing conservation strategies and agreements that have been adopted will continue to be implemented under all alternatives.

It is assumed that existing agency policies, laws and regulations, and Forest and Resource Management Plans will be adequate for managing taxa that have a

local or fine-scale distribution, exist on only one administrative unit, and are designated as agency sensitive or have special status.

Projections of persistence trend are based on the direction in the Supplemental Draft EIS and the known effectiveness of implementation of conservation strategies. The lack of details regarding step-down processes and implementation procedures leaves some risk to taxa even though they may be rated as stable into the future.

Existing policies and regulations under the National Forest Management Act (NFMA) and the Federal Lands Policy and Management Act (FLPMA) or in land use plans provide sufficient direction for the conservation and protection of taxa that occur on only one administrative unit.

Information on the distribution and status of rare plants within the ICBEMP is dynamic. At the completion of each field season, it is assumed that this new information is incorporated and considered in new decisions. Following this process will help to minimize the risks to rare plants. Given the nature of the data, a list of species of concern can be a moving target, quickly outdated and in need of revision. The conservation of rare plants is better addressed through processes and criteria rather than through species-specific direction. Objectives, standards, and guidelines, in combination with appropriate step-down processes, can be used to ensure long-term viability of plants of conservation concern.

Conservation strategies are the most efficient method of long-term conservation and management for rare plants, since they meet the NFMA and Endangered Species Act (ESA) requirements for managing across the range of a species. Those taxa occurring in several administrative units are at the greatest risk of extirpation if not managed consistently range-wide through the development of conservation strategies. Providing direction to develop them is a positive step forward. Ensuring viability will depend on implementation and monitoring strategies as well as a step-down process that addresses risks to these species. The long-term viability of these taxa will depend on the completeness of this forthcoming direction. It is assumed that existing conservation strategies and agreements that have been adopted will continue to be implemented under all alternatives.

Aquatics Assumptions

In the A1/A2 subwatershed network, SAG assumed that migrant survival will strongly influence the future status of anadromous salmonids. They also assumed that migrant survival is strongly dependent on the number of mainstem dams in the migratory corridor. Because status is so strongly linked to the corridor, it is possible that the effects of dams may mask the potential benefits associated with the conservation and restoration efforts in each alternative. To consider that possibility, SAG analyzed an additional scenario with the networks where it was assumed the influence of several dams was removed from the Snake River. In essence all subwatersheds that were associated with low migrant survival (more than five dams) in the original analysis were considered to have moderate migrant survival (three to five dams) in this scenario. All other inputs for the model remained the same for each alternative.

Assumptions about the influence of dams on the status of anadromous salmonids did not influence the interpretation of the trends among alternatives.

The SAG definition of aquatic habitat capacity implies that a range in habitat conditions is likely at any point in time and recognizes that these conditions will vary through time in response to natural disturbance and vegetation succession. It is not assumed that optimum conditions always will exist in the absence of human activity. However, SAG did assume that a subwatershed in which sediment input, riparian habitat, and hydrologic regime have not been substantially altered by human activity will be more likely to contain aquatic habitat conditions that are closer to optimum for indigenous salmonid species than in a subwatershed where one or more of these components have been considerably altered by human activity.

Even though the states in the belief networks are couched in probabilities, SAG did not assume that they are accurate estimates of true probabilities or "risks." Rather, they represent the strength of SAG's belief in the status or trends for particular elements of the system.

Where SAG parameterized portions of the networks using experts, it is assumed that the inconsistencies among experts represent uncertainty in outcomes resulting from inherent variability in the system and uncertainty in our understanding of nature. Differences or confusion in the interpretation of or the definition of states of nature reflect the limitations of our understanding.

It is known that the predicted results of management activities and alternatives at 10 years and at 100 years will influence the system into the future. For the sake of the evaluation, however, the SAG assumed that the biological response is only to the conditions at the

point of evaluation (that is, 0, 10, 100 years). For conceptual purposes, the SAG selected 50 years from the point of evaluation as a reference for estimates of the conditional probabilities in fish status. This is equivalent to a traditional population viability analysis that provides a probability of persistence to some point in the future but assumes static conditions in the environment throughout that period.

Where a subwatershed is a composite of a high order main stem reach and low order tributaries (order > 0) rather than a true watershed (order = 0), it is assumed that habitat conditions for fish in the subwatershed being evaluated are best represented by the mean of conditions in all contributing subwatersheds up to a threshold order. The SAG assumed that where subwatersheds are of an order higher than 20 for chinook and steelhead, 10 for redband and Yellowstone cutthroat, and 5 for westslope cutthroat and bull trout, then all spawning and rearing are associated primarily with the tributary streams and not the main stem part of the stream network. Thus, for subwatersheds that are higher order than this threshold, the analysis does not include the contributing subwatersheds.

The SAG assumed that effects of federal land management activities on salmonid fishes will be most influential and measurable in spawning and rearing habitats.

It is assumed that the status and trends of salmonids and their habitats are the most representative indicators of the responses in aquatic ecosystems related to federal land management.

It is assumed that the effects of climate change do not vary among the alternatives. Climate change may play a role in status or trends of fishes or habitats, but it is not incorporated in the model.

SAG assumed that factors influencing the condition of habitats for fishes that are not contained in the A1 / A2 subwatershed network used for the evaluation simply add to the uncertainty about the likely future status.

Activity levels other than grazing are assumed not likely to strongly influence riparian condition. In other words, future riparian condition is viewed as the result of current condition, grazing levels, and riparian management direction that may influence grazing or other activity within the buffer but not the magnitude of that other activity. This may result in a more pessimistic assessment of the condition of riparian areas where riparian management direction is weaker but little activity is expected; however, the SAG assumed that is a minor error.

For subwatersheds with multiple ownership or management direction, it is assumed that the net effect of the mix of prescriptions across the different management areas will simply be the average of the probabilities for the various areas weighted by their aerial extent. This will increase the uncertainty of the effects, which the SAG thinks is appropriate in this case because they do not know the spatial pattern of the management areas or their existing cumulative disturbance effects.

It is assumed that the uncertainty associated with each estimate of subjective probability in the cpts is trivial compared to the overall uncertainty in the model; hence, each of these probabilities is treated as a point estimate. Furthermore, the SAG did not assign an equivalent sample size (ess; in Netica terminology) to each of the subjective probability estimates, so the SAG assumed that all experts contributing to a given cpt had the same level of relevant knowledge.

Current data on "known" distribution and status of salmonids are assumed to be a reasonable representation of the true distribution for purposes of the analysis. It is known that the distributions can be updated with new information or reinterpretation from biologists across the region. The SAG did not use recent updates for Region 1 or 4 because similar updates were not available for the entire basin.

Explicit standards based on ecological performance measures are assumed to provide greater certainty that direction will be understood and implemented consistently. Performance measures include quantifiable biological or physical processes or capacities related to riparian composition and structure or water quality, for example. If the overall goal is to maintain or restore natural ecosystem processes, then some performance measures are needed that can be used to indicate if the current trend is moving in the desired direction (Sedell et al. 1997). Outcome-based direction provides greater flexibility to tailor management to the situation and potentially greater ownership of the means to achieve objectives, but it requires increased oversight and monitoring to ensure compliance and consistency. The SAG assumed specific, explicit standards would be more readily understood initially and, therefore, initial compliance would be higher and ecological objectives achieved more rapidly.

Adverse effects of activities in wilderness areas on aquatic habitats are primarily limited to recreation, fire management, and light livestock grazing in some areas. The SAG assumed effects of fire and grazing management would be captured in the landscape

variables used to model the fire / flood and grazing effects on habitat condition.

Probabilities of habitat maintenance / restoration were lower for A1 subwatersheds than for wilderness areas because of higher levels of ongoing activities and uncertainties concerning how those areas were initially identified and subsequently adjusted. Designation of A1 / A2 subwatersheds under Alternative S3 is subject to an arbitrary acreage limitation. If the acreage of subwatersheds that meet the criteria for A1 / A2 designation exceeds the limitation, no direction is provided in the Supplemental Draft EIS for selecting those included in the network. The SAG assumed that subwatersheds managed as A1 / A2 would be accurately assigned and meet the criteria as described.

Subbasin Review and EAWS would be necessary to effectively manage and integrate a strategic approach to sustaining or restoring the complex resource, landscape, and socio-economic conditions within a subbasin. The SAG considered that the information developed through Subbasin Review and EAWS provides the strategic focus and transparent logic from which multiple projects would be coordinated.

Socio-economic Assumptions

Critics contend that economies are dynamic and that interactions at regional, national, and international scales may overwhelm or offset any impact of Forest Service and BLM decisions. Because of these concerns, the SAG was more concerned about the impact of Forest Service and BLM decisions on the ability of an economy to adapt to change.

Recreation jobs are assumed to remain constant for each of the alternatives. The SAG made this assumption because the various projections of the distribution of Recreation Opportunity Spectrum (ROS) acres remains the same in all alternatives (other than for a small shift in Alternative S1). Crone and Haynes (in press) discuss the development of the revised estimates of recreation jobs based on revisions in the recreation response coefficients, or number of jobs per visit, for each of 12 recreation activities.

Direct lumber and wood products jobs were calculated using the same approach that was used in FEMAT (1993): by multiplying the estimates of timber harvest by the number of jobs (7.75) per million board feet. The SAG assumed no offsetting increases in harvests from non-federal lands. Initial estimates of the average annual timber harvest summed to RAC / PACs was projected for the first and tenth decades using the CRBSUM model calibrated to current harvest levels.

As in FEMAT, the SAG assumed no job changes for the pulp and paper industry (Standard Industry Code [SIC] 26) because this sector would not be directly affected by changes in timber volumes harvested from Forest Service- and BLM-administered lands. This is not to suggest that there will not be impacts on the pulp and paper industry, only to suggest that the industry will respond to supply-induced changes in ways different from the solid wood products sector.

The number of forestry workers (SIC 08) required for the pre-commercial thinning and fuel management assumed in the CRBSUM runs was estimated using one job per 500 acres treated. Range restoration jobs were also calculated based on one job per $43,125 of expenditures.

The assessments of socio-economic resiliency assume that the counties and BEA areas within the basin will continue (in the next decade) to experience the economic and demographic patterns of the recent past. The future, however, may hold surprises that will result in different outcomes than assumed here. It is known, for example, that the basin has experienced periods of both in-migration and out-migration. (In the 1980s, for example, the basin experienced net out-migration as the United States underwent periods of severe recession, structural changes in the economy that diminished the role of resource-based [including agriculture] sectors, and booms in other economic sectors and regions.) Despite these risks, history has shown that humans are highly adaptive creatures in the basin's ecosystems; the SAG assumed that faced with risks, people will continue to adapt and demand ecosystem goods and services from Forest Service and BLM-administered lands in the basin.

Table 1. Management Prescriptions to Simulate the Supplemental Draft EIS Alternatives

Rx	Description of Management Prescription Sets (Rx) for Modeling the SDEIS Alternatives.
HI	Prescription set to model 100-year and 400-year simulations of HRV.
Ecological Restoration Prescriptions	
A1	Prescription set with moderate levels of ecological restoration. Generally designed for areas that have moderate to high departure from HRV, in roadless or conservation areas.
A2	Prescription set with moderate levels of ecological restoration. Generally designed for areas that have mod erate departure from HRV, in areas with road access.
A3	Prescription set with moderate levels of ecological restoration. Generally designed for areas that have high departure from HRV, in areas with road access.
N1	Prescription set with low levels of ecological restoration. Generally designed for maintenance of areas that have low departure from HRV.
N4	Prescription set with low levels of ecological restoration typically for use in visually sensitive areas or where the objective has mixed traditional and ecological restoration objectives. Generally designed for areas that have low departure from HRV.
Traditional Reserve Management Prescriptions (wilderness and semi-primitive roadless areas)	
C1	Prescription set for traditional wilderness, park, and semi-primitive area management with minimal ecological mitigation.
N6	Prescription set for traditional wilderness and semi-primitive area management with minimal ecological mitigation.
P1	Prescription set for traditional reserve management with low probability of successful wildfire suppression.
Traditional Commodity Management Prescriptions	
C2	Prescription set for traditional commodity and resource value production at high levels with some ecological mitigation.
C3	Prescription set for traditional commodity and resource value production at high levels with no ecological mitigation.
N3	Prescription set for traditional commodity and resource value production at moderate levels and some ecological mitigation with higher livestock grazing than N8, and low probability of successful wildfire suppression.
N5	Prescription set for moderate level traditional commodity and resource value production with low emphasis on exotic weed control on rangeland.
N8	Prescription set for traditional commodity and resource value production at moderate levels and some ecological mitigation.
P3	Prescription set for traditional commodity and resource value production at very high levels with no ecological mitigation.
Traditional Management in Visually or Environmentally Sensitive Areas Prescriptions	
N2	Prescription set for moderate level traditional commodity and resource value production in visually sensitive areas with somewhat higher livestock grazing than N7 and minimal ecological mitigation.
N7	Prescription set for moderate level traditional commodity and resource value production in visually sensitive areas with minimal ecological mitigation.
P2	Prescription set for minimal levels of management in visually sensitive areas with no ecological mitigation and low probability of successful wildfire suppression.

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