Science Advisory Group Effects Analysis for the SDEIS Alternatives

Draft
March 2000

(With Revisions through November 14, 2000 and adapted for electronic presentation)

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Introduction

This document describes the projected biological, ecological, and socioeconomic effects of the SDEIS alternatives for the ICBEMP. The purpose of this document is to provide effects of the SDEIS management alternatives for the use by the EIS team in writing the environmental consequences (Chapter 4) of the SDEIS. We are aware that portions of this will be shared with other groups interested in understanding the effects of the SDEIS alternatives. Understanding that this document was not prepared as a publication that could stand alone or be understood by itself is important. We were provided a draft of the Chapter 3 SDEIS management direction before starting the effects analysis. To comprehend what is documented here requires understanding of or at least access to the management direction for the alternatives contained in Chapter 3. This document will become part of the project administrative record and portions of it may be summarized in a series of upcoming professional journal articles documenting the major findings and results of the analysis of the SDEIS alternatives.

Methods

We 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 were developed as a part of the Assessment of Ecosystem Components in the Interior Columbia Basin (Quigley and Arbelbide 1997) or the Evaluation of EIS Alternatives (Quigley and others 1997). Some new models were developed specifically for this analysis (see individual sections of this report for more details). We necessarily accomplished this very complicated task within very tight timelines. In some instances time became the limiting factor in the derivation of effects. For example, we developed methods to project smoke for each alternative, but did not have sufficient time to complete the analysis before our deadline. We are continuing to pursue developing a few of the effects as the EIS Team is preparing the SDEIS and writing Chapter 4.

The primary simulations were for vegetation, disturbances, 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 socioeconomic 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. We developed a set of assumptions that was shared with the EIS Team (see the assumptions section of this document). Where empirical relationships did not exist linking inputs to outcomes, we also developed assumptions about those relationships (see individual sections of this report for more details).

Our focus was primarily on effects associated with the FS/BLM administered lands of the Basin. Detail presented is at the Basin level (to gain some insights into potential cumulative effects), the ICBEMP management region (all FS/BLM lands to which the SDEIS would apply), the RAC/PAC area, and areas designated for specific purposes (for example, evolutionarily significant units for anadromous fish). Our simulations assumed continuation of existing management direction and activity levels across non-FS/BLM

administered lands in the Basin. Thus, changes reflect only the effects from implementing the direction contained in the SDEIS.

Document Organization

The material is prepared to aid the EIS Team in understanding the outcomes and assist in preparation of Chapter 4 of the SDEIS. The material follows the general outline: introduction, assumptions, landscape outcomes, aquatic outcomes, terrestrial outcomes, socioeconomic outcomes, and integrated effects.

Assumptions

As in any analysis predicting the effects of management direction, judgments must be made about the logic linking objectives and direction with actions implemented, monitoring undertaken, and effects projected. The judgments are simpler in small analyses of single, specific projects. Judgements grow more complicated when the analysis encompasses millions of diverse acres and subsequent analyses and decisions will be made before projects are implemented and effects realized. Assumptions about implementation of direction contained in this SDEIS were developed to reflect consequences of subsequent decisions and effects. The projection of effects by the Science Advisory Group (SAG) is based on a variety of assumptions about future management conditions developed jointly with the EIS Team. The EIS team provided storylines, budget estimates and allocation priorities that were not part of the SDEIS direction, but were key to the modeling exercise. The assumptions draw directly from the SDEIS the intent, process descriptions, specific standards, objectives, goals, guidelines, and storylines associated with each alternative. The intent of the assumptions is not artificially to restrict management to achieve the most favorable of outcomes; it is to establish the clarity necessary for analysis purposes in the Evaluation of SDEIS Alternatives.

Background

The SAG developed their analyses using a set of assumptions that clarified interpretation of direction, intent 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 SAG also made assumptions about relationships among ecosystem components where definitive empirical studies do not exist, and about probable outcomes from implementing management activities or from succession/disturbance processes. In addition, the models used have inherent assumptions that are documented in the individual staff area discussions later in this document.

Due to the suite of assumptions necessary to project effects, a level of uncertainty is associated with the

projected effects. As in any analysis, risk is 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 can adjust if effects were not accurately portrayed.

The Science Advisory Group 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 were developed as a part of the Assessment of Ecosystem Components in the Interior Columbia Basin (Quigley and Arbelbide 1997) or the Evaluation of EIS Alternatives (Quigley and others 1997). Some new models were developed specifically for the analysis of the SDEIS alternatives. The SAG accomplished this complex evaluation within tight timelines. In some instances time became the limiting factor in the derivation of effects. For example, methods were developed to project smoke outputs for each alternative, but time was insufficient to complete the analysis within established deadlines.

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 socioeconomic 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 linking inputs to outcomes did not exist, assumptions about those relationships
were developed.

The evaluation focus was primarily on effects associated with the FS/BLM administered lands of the Basin. Effects were presented at the Basin level (to gain some insights into potential cumulative effects), the ICBEMP management region (all FS/BLM lands to which the SDEIS 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-FS/BLM administered lands in the Basin. Thus, changes reflect only the effects from implementing the direction contained in the SDEIS.

SDEIS Evaluation of Alternatives Assumptions

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

- General Assumptions
- No Action Alternative (S1) Landscape Modeling Assumptions
- Action 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 SDEIS Alternatives

These brief descriptions are not intended to provide full detail, nor are they intended to be a complete listing of all the assumptions made in the Evaluation of SDEIS Alternatives. They are meant to assist in 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 section assembles the major assumptions regarding interpretation of direction in the SDEIS 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, guidelines, and storylines associated with each alternative. The intent of the assumptions is NOT artificially to restrict management to achieve the most favorable of outcomes. It is to establish the clarity necessary for analysis purposes in the Evaluation 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 SDEIS. Implementation of the action alternatives presumes funds are expended to focus on the restoration work identified as priority, through management direction, such as directed through specific management 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. The projected improvements in ecological conditions, presume a more broad-scale funding allocation approach, that considers priorities among and between administrative units.

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- The outcomes projected for each alternative presumes funding levels and distribution as per that used for modeling the alternatives. The increased budget emphasis on the integrated 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% per acre for the integrated restoration priority subbasin areas in alternative S2 and S3, as compared with the average cost per acre in these same areas in alternative S1.

- BLM and FS 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 EISs 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/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 selected.

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

- The modeling 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 X). The resulting landscape variables should be used as an indicator of trends between 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) were 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/FS, 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 short- and long-term.

No Action 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 1988-1997. 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 BLM. Therefore additional consideration was taken to address these initiatives in the SAG landscpe 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 impact habitat or animals) outside priority watersheds.
- Healthy Rangelands for 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 FS 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. We assume it will slow the rate of growth of new roads on FS lands in both the short- and long-term. We assume the existing minimal level of road construction on BLM lands will continue.

Road increases --

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

Unroaded areas--

- Areas currently unroaded (predicted road density of none) would remain unroaded (trend and density class) for short-term and long-term on BLM and FS administered lands. It is recognized that road entry is not prohibited, but 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 short-term and long-term (declining trend), and no increases in road density classes in priority watersheds will occur on BLM- and FS-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 1 road density class in the long-term on BLM- and FS-administered lands.
- Forested areas within the caribou recovery area with high and extremely high road densities will be reduced in short-term (declining trend) and long-term but not enough to

reduce road density classes on BLM- and FS-administered lands.

Action Alternatives S2 and S3 Modeling Assumptions—

- In alternatives S2 and S3, healthy rangelands standards and objectives are to be applied to both BLM and FS 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% 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 EAWS will occur in areas where it is triggered (approximately 62% of the FS/BLM-administered lands). For modeling purposes, EAWS is assumed to be completed within 5 years in 50% of the triggered areas and 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% of the area outside areas that are triggered (an additional 19% of FS/BLM-administered lands) within a 13 year period. Within 13 years EAWS will occur on approximately 81% of the FS/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%) of the areas where subbasin review is to occur.

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

Roads—

- It is assumed that analysis requirements and additional justification for constructing new roads will exist for both FS and BLM. It is assumed that this will slow the rate of growth of new roads on FS lands in the near and long-term, and maintain the minimal road construction on BLM lands in the near and long-term.

- Areas assigned the following landscape modeling prescirptions (Rx's) would show an increasing trend in road density classes for short-term and 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 short and long-term in A1 and T areas.

A2 areas (outside A1 and T) –

- 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 areas in the long-term, there will be a decreasing trend for extremely low, low, moderate, high and extremely high road density areas. In A2 areas 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 A and T) would reduce a class in the long-term.*

High aquatic functional priority subbasins (outside of A1, T and A2) –

- For 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-term.

Landscape Assumptions—

Because no complete implementation plan existed within the SDEIS, 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 we thought would result in similar outcomes, the more likely the alternative would result in positive trends for landscape integrity on the FS/BLM lands.

- There is no specific direction for prioritization of management ignited fires in wilderness (MAC 1) for any of the alternatives. The direction that is in S2 and S3 in chapter 3, as well as the storylines, 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 will be small relative to the area available within wilderness. 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 S2 and S3 for low amounts of integrated landscape-scale (hydrologic unit) restoration in the A1 and T subwatersheds and moderate to high amounts in the A2 subwatersheds (levels depend on integrated restoration assignment). For 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 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 smaller scale patches (N6, N5) of restoration would occur in forests, and management on rangelands would implement healthy rangelands on both BLM- and FS-administered lands.

- There is direction (objectives and storylines) in both S2 and S3 for integrated landscape scale (hydrologic unit) restoration in the urban 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 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 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 R-O4, with associated storyline table and written interpretation, will be used to guide implementation of management on FS and BLM 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's) 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 can be appropriately 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 FS costs provided by the EIS team, and that additional restoration funds for alternatives S2 and S3 would be prioritized within the high priority integrated restoration areas as described in the storylines using the percentage of restoration targets by subbasin provided by the EIS team . Landscape level restoration prescriptions (Rx's) were used in the assignment of base level prescriptions for wildland fire risk areas, A2 core areas, and restoration priority areas (from storylines and 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 ROD. The actual structure is yet to be defined, but will be based on the preliminary decisions of the ESC. It is expected to include structures appropriate to address Basin oversight, monitoring, data

management, sub-regional 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 sub-regional organization is expected to align with modified RAC/PAC areas.

Landscape Integrity and Management Approach Assumptions—
The landscape integrity and management approaches are mostly the same as for the original Landscape Ecology Evaluation of Alternatives (see Hann and others 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 through time, the management of BLM- and FS-administered lands will shift increasingly toward a landscape approach under all alternatives. Under this assumption, the BLM- and FS-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 FS 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 Mimic/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 between 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 FS 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/analysis, EAWS, and land use planning). The level of assessment in this manner will be less in alternative S3 than in S2 as EAWS is not triggered in certain areas and is determined necessary only through 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 socioeconomic resiliency. The level at which this will be implemented varies between 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 S2 as EAWS is not triggered in certain areas and is determined necessary only through subbasin review process.
- It is assumed that these priorities are set regionally using information at the 4th 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 set for smaller watershed areas within the 4th HUC by considering integrated information when conducting ecosystem analysis at the landscape or watershed scale.

Concentration of Activities Temporally and Spatially—

- It is assumed 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 between 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 in 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 S2 as EAWS is not triggered in certain areas and is determined necessary only through 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 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 S1 alternative. It is assumed in 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 S2, as 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 as 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 between the alternatives except 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 nonnative species used should, when possible, be ones that do not produce viable seed. Nonnative 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% of the allotments will be closed to sheep; in 100 years 100% of the allotments will be closed to sheep.

Aquatic Species and Habitat Effects Modeling Assumptions—

There are many assumptions inherent in the development of the model structure and the estimates for the conditional probability tables (cpts) that 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.

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 nor 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 SDEIS 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 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 SDEIS activity and disturbance levels does not fully account for the effects of mitigation or restoration from the aquatic management direction reflected in the "standards and guides." 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 nonfunctional) riparian area in rangeland is equivalent to a functional (or nonfunctional) 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 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 that 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 than base level. However, the area within a subwatershed that would be managed for T 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 (e.g., bare ground, grazing).

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

- Priority watersheds (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 versus 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 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 to aquatics in priority restoration subbasins, management area designation (i.e., A2 and TEP) and analysis and planning prior to restoration will reduce that risk compared with non-A2, non-TEP or non-restoration priority HUCs. There is also higher probability of restoration being effective when preceded by subbasin review/analysis and EAWS or equivalent.

- For 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 (4/21/99 memo from S. Kozel).

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

- Probabilities for integrated 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 integrated restoration 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 (e.g., A1). That is, maintaining high quality habitats is easier than restoring degraded habitats.

- Except for EAWS triggers, management direction for TEP species outside of the A network does not differ substantially from base level (i.e., no additional BO requirements for S2 and S3 are assumed).

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

- Subwatersheds managed under base level (S2, S3), PACFISH/INFISH Key Biological Opinion, and 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 FS direction for roadless areas will be replaced by comparable long-term direction for FS 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 (S2, S3) or existing standards (e.g., 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 FS/BLM where listed species occur (e.g., Oregon Plan).

- Fifth code 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 SDEIS includes goals to sustain, and where necessary, restore the health of forest, rangeland, aquatic, and riparian ecosystems. The S2 and S3 alternatives 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 SDEIS. The Society for Ecological Restoration defines ecological restoration as: "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 SDEIS 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 Basin. 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 to respond similarly to either active or passive restoration approaches. We have relied on models that reflect changing conditions based on activities, succession, and disturbances. The SAG recognizes that restoration treatments will not be one hundred percent effective, no matter how well planned, how well installed, nor how strong the intent to design and implement a successful project. When preceded by context setting analysis (e.g., subbasin review and EAWS), watershed or landscape level restoration objectives are more likely to be achieved for some restoration activities (e.g., 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 (e.g., 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 (e.g., 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 (e.g., 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 (e.g., 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 (e.g., 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 (e.g., 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 (e.g., patches of old growth interspersed within a forested unroaded area may be affected by bark beetle outbreaks initiated in dense multistory stressed forests within the unroaded area).
- Road obliteration to reduce road densities may result in unplanned outcomes (e.g., 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).

Management prescription sets (Rx) for modeling the SDEIS Alternatives

Rx	Description
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 moderate 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.

List of Terms Used in the SDEIS Assumptions

TERM	DESCRIPTION
A1	Aquatic A1 Subwatersheds (6th Field HUCs)
A2	Aquatic A2 Subwatersheds (6th Field HUCs)
AUM	Animal Unit Month - a measure of livestock grazing
BLM	Bureau of Land Management
BO	Biological Opinion - provided as a part of the Endangered Species Act consultation process
BO Priority Watersheds	Watersheds identified as priority for listed fish species through the Biological Opinions
CPT	Conditional Probability Table - used in modeling ecological relationships
CRBSUM	Columbia River Basin Succession Model - used to model future succession and disturbance
DEIS	Draft Environmental Impact Statement
EAWS	Ecosystem Analysis at the Watershed Scale
EIS	Environmental Impact Statement
ESC	Executive Steering Committee of the ICBEMP
FS	Forest Service
HRV	Historic Range of Variability
HUCs	Hydrologic Unit Codes (4th Field HUCs are subbasins averaging 850,000 acres; 6th Field HUCs are subwatersheds averaging 18,000 acres)
ICBEMP	Interior Columbia Basin Ecosystem Management Project
INFISH	Inland Native Fish Strategy
MAC	Management Area Categories as mapped in the ICBEMP
NEPA	National Environmental Policy Act
PAC	Provincial Advisory Committee
PACFISH	Strategies for Managing Anadromous Fish-producing Watersheds
PVG	Potential Vegetation Group
R-04	SDEIS objective within the restoration direction section
RAC	Resource Advisory Council
RCA	Riparian Conservation Area
RIST	Regional Implementation Support Team
ROD	Record of Decision associated with the NEPA process
Rx	Prescription - a set of management actions modeled as a suite
S1	SDEIS Alternative S1 - No Action
S2	SDEIS Alternative S2 - Alternative with greater emphasis on minimizing short-term risk from management activities
S3	SDEIS Alternative S3 - Alternative with greater emphasis on addressing long-term risk from management activities or disturbance events
SAG	Science Advisory Group of the ICBEMP
SDEIS	Supplemental Draft Environmental Impact Statement
SEIS	Supplemental Environmental Impact Statement
T	Terrestrial T Watersheds (5th Field HUCs) designated in the SDEIS
TEP	Threatened, Endangered, or Proposed Species

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