Soil, Water, Riparian, and Aquatic Resources

INTRODUCTION

Management of soil, water, riparian, and aquatic resources includes some of the more significant issues, opportunities, and challenges for the three forests of the Southwest Idaho Ecogroup (Ecogroup). The Ecogroup has a variety of landforms, climates, and disturbance processes that over time have resulted in a complex array of landscapes. These landscapes offer a diversity of soils, streams, lakes, riparian, wetland, and aquatic ecosystems.

Aldo Leopold (1949) described the need to develop a science of land health and stated: "Health is the capacity of the land for self renewal". Managing for high quality soils, water, and soil-hydrologic function is fundamental in maintaining and restoring watershed health. Soil is the primary medium for regulating the movement and storage of energy and water, and for regulating cycles and availability of plant nutrients (ICBEMP 1997a). The physical, chemical, and biological properties of soils determine biological productivity, hydrologic response, site stability, and ecosystem resiliency.

The Ecogroup's diverse lithology, structure, and climate over time have resulted in a spatially complex pattern of landforms and associated soils of different physical and biological properties and processes that respond differently to management activities. Most management activities and natural disturbance processes—such as recent wildfires—stress soil resources to various extents. Impacts or indicators of stress include: surface erosion, compaction, and nutrient loss through removal of coarse woody debris, severe burning, flooding, and landslides. These effects may be of concern both onsite within the watershed uplands, offsite to aquatic resources within streams, or increase the post-wildfire risk to life, property and/or municipal supply watersheds associated with potential floods and landslides. Soil effects or stresses are not always detrimental or long lasting. In order to maintain and, where necessary, restore the long-term quality and productivity of the soil, detrimental impacts to the soil resource must be managed within tolerable limits.

The Forest Service commonly evaluates how proposed management activities meet requirements of the Clean Water Act (CWA) from a holistic perspective that considers land management activities occurring throughout the watershed and their effects on water quality and aquatic habitat integrity. The goal of the CWA is to "restore and maintain the chemical, physical, and biological integrity of the nation's waters." The increased listings of CWA Section 303(d) water quality limited water bodies (WQL Water Bodies) and development of Total Maximum Daily Loads (TMDLs) are symptomatic of the effects from historical and some ongoing management activities. Maintaining healthy watersheds and restoration of degraded watersheds will contribute towards the de-listing of impaired water bodies and to the survival and recovery of sensitive and listed aquatic species.

Productivity of soil and vegetation, proximity to water, and the general attractiveness of riparian and aquatic systems continue to make these areas ideal for many land uses managed by the Forest Service. Conflicts between these uses and the resources dependent on healthy, relatively undisturbed, riparian conditions may continue unless management provides for sufficient land use constraints and resource protection. It is the intent of Forest Plan revision to provide direction to minimize, if not resolve, these conflicts.

The variety of landscapes and associated aquatic ecosystems support an array of different aquatic, terrestrial, and botanical species. Population sizes and distribution of a number of these species have declined in recent decades, with several fish species afforded special protection under the Endangered Species Act (ESA). Aquatic species viability is dependant upon maintaining an array of well-connected, habitat conditions. Past management activities have contributed to fragmentation and degradation of habitat for fish and other riparian-dependent species. Humans have caused major changes in habitat conditions through such activities as timber management, livestock grazing, road and facility construction, mining, dams, recreation and introductions of hatchery and other non-native species. Future management activities have the potential for both additional impacts and restoration of these species and their habitats.

For aquatic species, the analysis looks at how the management alternatives for Forest Plan revision either contribute to or mitigate common threats to factors of decline within the influence of Forest Service management activities. Particular attention is paid to those species whose viability may be affected by the alternatives and their associated activities. Federal regulation 36 CFR 219.19 requires that viable populations of all native and desirable non-native vertebrate species be maintained at the planning area level. For a complete list of all native and non-native fish species that are common to the affected area, refer to the SWRA Technical Report. Species with a viability concern in this analysis include those listed or proposed for listing under the Endangered Species Act, those on the Regional Forester's sensitive species list, species at risk, and Forest Management Indicator Species for which populations and habitat conditions may be a concern. The degree that MPCs emphasize aquatic restoration or conservation and how well potential management effects are addressed will be central to the viability analysis.

Issues and Indicators

Issue Statement 1 – Forest Plan management strategies may affect the loss of soil-hydrologic function and long-term soil productivity from uncharacteristically lethal wildfire within highly vulnerable subwatersheds.

Background to Issue 1 - The *Preliminary AMS for the Southwest Idaho Ecogroup* (USDA Forest Service 1997) identified a need for management direction and emphasis that address important soil-hydrologic processes and natural and management-related disturbance processes (erosion rates, landslides, infiltration, nutrient cycling, etc.) as they relate to desired conditions and management of other resources. New information from the Interior Columbia Basin Ecosystem Management Project, and new research (Meyer et al. 2001, Moody and Martin 2001a and 2001b, Rieman and Clayton 1997, Benda and Dunne 1997) have linked accelerated soil erosion, loss of nutrient base, and triggering of floods, landslides, and debris flows uncharacteristic of their normal pattern and frequency, to uncharacteristically large and lethal stand replacing wildfires. This analysis looks at potential effects from such fires in subwatersheds that have high to extreme uncharacteristic vegetation hazards and high inherent vulnerability ratings. It is assumed that management strategies that reduce extreme or high vegetation hazards, thus lowering risk to uncharacteristic or lethal wildfires, would help reduce the potential for accelerated soil erosion, loss of nutrient base, and triggering of floods, landslides, and debris torrents.

Effects to coarse woody debris, an important contributor to soil productivity, are fully disclosed in the Vegetation Diversity section of this chapter.

Indicators for Issue 1 – The following analysis components were used to indicate and compare potential effects to this issue by alternative:

- Highly vulnerable subwatersheds that have high or extreme uncharacteristic forest vegetation hazard (PVG and current stand structure, density and composition)

- Management prescriptions (MPCs) that emphasize vegetation restoration treatments to reduce the risk of uncharacteristically lethal wildfire (2.4, 3.2, 4.1c, 4.2, 4.3, 5.1, 5.2, 6.1, 6.2)

- MPCs that would likely have limited or no vegetation restoration treatments to reduce the risk of uncharacteristically lethal wildfire (1.1, 1.2, 2.0, 2.1, 2.2, 4.1 a, 4.1b)

Alternative MPCs were overlaid on subwatersheds having both high or extreme uncharacteristic forest vegetation hazard and high vulnerability to compare how the alternatives may potentially affect the risk of uncharacteristically lethal wildfire in these subwatersheds. The main analysis assumption was—the lower the risk, the lower the post-wildfire-related potential for soil erosion, loss of nutrient base, floods, landslides, and debris torrents over the long term.

Issue Statement 2 - Forest Plan management strategies may affect the number of subwatersheds considered at risk to post-wildfire floods and debris flows with potential effects to human life and property following uncharacteristically lethal wildfire.

Background to Issue 2 - Subwatersheds that have been identified as a potential risk to human life, property, and/or municipal supply watersheds from post-wildfire floods, landslides, and debris flows would likely require Burned Area Emergency Response (BAER) if an uncharacteristically lethal wildfire were to occur within them. One of the main objectives in implementing BAER measures is to alleviate emergency conditions following wildfire to mitigate significant threats to health, safety, life, or property (FSM 2523).

Recent information and research identifies the potential for post-wildfire accelerated soil erosion, flooding, and triggering of landslides uncharacteristic of their normal pattern and frequency following large uncharacteristic wildfire (Meyer et al. 2001, Moody and Martin 2001a and 2001b, Benda and Dunne 1997). Moody and Martin 2001b also identify that the geomorphic effects and responses to wildfire can be life threatening and may cause economically damaging floods, coupled with sediment impacts on recreation, aquatic biota, and water-supply systems. These potential impacts are especially a concern in subwatersheds that have a combination of high to extreme uncharacteristic vegetation hazards, high inherent vulnerability ratings, and the presence of human habitation, property, and/or municipal water supply watersheds. Management strategies (prescribed fire or mechanical vegetation treatment) that reduce these risks help reduce the post-wildfire threats and associated rehabilitation costs to these subwatersheds. The potential for using these types of strategies can be inferred from the MPCs that have been assigned to these subwatersheds by alternative.

Indicators for Issue 2 – The following analysis components were used to indicate and compare potential effects to this issue by alternative:

- Subwatersheds that have a combination of high to extreme uncharacteristic vegetation hazards, high inherent vulnerability ratings, and potential risk to human life, property, and/or municipal supply watersheds from post-wildfire floods, landslides, and debris flows.

- MPCs that emphasize vegetation restoration treatments to reduce the risk of uncharacteristically lethal wildfire (2.4, 3.2, 4.1c, 4.2, 4.3, 5.1, 5.2, 6.1, 6.2)

- MPCs that would likely have limited or no vegetation restoration treatments to reduce the risk of uncharacteristically lethal wildfire (1.1, 1.2, 2.0, 2.1, 2.2, 4.1 a, 4.1b)

MPCs were overlaid on these subwatersheds to compare how the alternatives may potentially affect the risk of uncharacteristically lethal wildfire in these areas. The main analysis assumption was—the lower the risk, the lower the fire-related potential for soil erosion and landslides to affect human life, property, and/or municipal supply watersheds over the long term.

Issue Statement 3 – Forest Plan management strategies may have potential effects on soil productivity, accelerated soil erosion and sedimentation, water quality, riparian function, Total Maximum Daily Load (TMDL) water bodies, and listed Section 303(d) Water Quality Limited (WQL) water bodies.

Background to Issue 3 – Forest management strategies have the potential for producing both negative and positive effects to soil, water, and riparian resource conditions. Although the Forest Plans do not implement any specific activities, they do set the stage for them by assigning MPCs to Forest-administered lands that provide management emphasis, direction, and tools for future activities. These MPCs differ by alternative in this analysis. The Forest Plans also provide management direction in the form of standards and guidelines that are designed to protect and promote watershed resources. This analysis looks at both the potential impacts that could occur from management activities based on MPC allocation by alternative, and the potential benefits that could occur from watershed restoration emphasis inferred by the MPCs.

Potential Negative Effects - Land-disturbing management activities such as road construction, timber harvest, livestock grazing, recreation, fire use, and mining can decrease soil productivity through increased erosion and soil compaction, accelerate sedimentation and other pollutants, reduce riparian vegetation and coarse woody debris, damage stream banks, and alter water quantity, quality and temperature. All of these impacts can, in turn, negatively affect soil, water, and riparian conditions. Even though Forest Plan management direction would reduce the potential for impacts under all alternatives, there are different risks to these resources associated with varying amounts of land management activities by alternative. The management strategies for soil, water, and riparian resources are intended to prevent unacceptable impacts to these resources while allowing for appropriate levels of land management activities needed to achieve multiple resource goals and objectives.

Most negative effects associated with recreation, lands and special uses, non-native plants, and mineral activities are not anticipated to vary significantly by alternative and are addressed in the Effects Common to All Alternatives discussion of this analysis. The negative effects from rangeland resources, timberland/vegetation resources, road-related activities, motorized trail use, and fire management would vary by alternative. Therefore, specific issue indicators for these management strategies are outlined below.

Potential Positive Effects - Since the development of the original Forest Plans, numerous 303(d) water quality limited (WQL) water bodies have become listed as impaired under the Clean Water Act, and new assessments have been and are being developed to help determine appropriate water quality restoration plans. Watershed restoration is applied at various intensities under the Forest Plan alternatives to improve soil, water, and riparian conditions and help de-list subwatersheds with TMDLs or 303(d) WQL water bodies. There are approximately 50 subwatersheds within TMDL plans and 190 subwatersheds identified as containing portions of 303(d) WQL water bodies within the Ecogroup area.

Improvements in water quality and increased support of beneficial uses will assist in de-listing subwatersheds that have TMDLs or 303(d) WQL water bodies. These improvements should be more likely to occur when management direction is applied that emphasizes the appropriate watershed and aquatic restoration or conservation strategies. This analysis examines how management strategies considered would contribute to de-listing of TMDLs, 303(d) WQL water bodies by improving soil productivity, water quality, and beneficial uses.

Indicators for Issue 3 – The following indicators are used to measure potential effects to soil, watershed, and riparian conditions from selected management activities that may occur at different amounts and intensities, based on the MPCs assigned by alternative.

- *Potential Effects from Vegetation Treatments, Roads, and Fire Use*. Potential effects to soil, water, and riparian resources are analyzed through relative comparison by alternative of: (1) acres of MPCs that have suited timberlands by subbasin, and (2) the Equivalent Replacement Treatment (ERT) acres that are greater or less than thresholds of concern (TOC) by subbasin.

- *Potential Effects from Livestock Grazing*. Potential effects to soil, water, and riparian resources are analyzed through relative comparison by alternative of: (1) the amount of suitable rangeland acres by subbasin, and (2) the acres of MPCs that would result in less restrictive and more restrictive grazing management by subbasin.

- *Potential Effects from Watershed Restoration*. The following indicators are used to compare the potential beneficial effects of watershed restoration or conservation strategies in improving soil, water, and riparian conditions to fully support beneficial uses and assist in the de-listing of TMDLs and 303(d) WQL water bodies.

- Comparison of subwatersheds identified as a high WARS priority or ACS that have 303(d) water quality limited water bodies, and MPCs that emphasize the appropriate restoration/conservation strategies to assist in attaining full support of beneficial uses, thereby assisting in the de-listing of those water bodies.

- Comparison of subwatersheds identified as a high WARS priority or ACS priority subwatersheds that have TMDLs assigned, and MPCs that emphasize the appropriate restoration/conservation strategies to meet the intent of the TMDL plans.

Determination of appropriate restoration/conservation strategies is based on two general assumptions/criteria:

(1) The subwatershed's dominant type of restoration/conservation strategy identified by the Watershed and Aquatic Restoration Strategy (WARS) is appropriate, or a "good match" with the MPC restoration emphasis that is applied to that subwatershed, and/or

(2) The subwatershed has been identified as an ACS priority subwatershed that serves as an emphasis to initiate the appropriate watershed restoration identified for that subwatershed regardless of the MPC applied.

- *Potential Effects from Motorized Trail Use*. This indicator compares the potential effects from motorized trail use in recommended wilderness areas by alternative. Alternatives 4 and 6 would prohibit motorized use in these areas, but the other alternatives would allow current motorized use to continue. Other recreational uses would remain essentially the same for all alternatives.

Issue Statement 4 – Forest Plan management strategies may have potential effects on aquatic habitat and species, including species that are listed or proposed for listing under the Endangered Species Act, Region 4 sensitive species, species at risk, and Forest Management Indicator Species.

Background to Issue 4 - Forest management strategies have the potential for producing both negative and positive effects to aquatic species and habitat conditions. Although the Forest Plans do not implement any specific activities, they do set the stage for them by assigning MPCs to Forest-administered lands that provide management emphasis and direction for future activities. These MPCs differ by alternative in this FEIS. The Forest Plans also provide management direction in the form of standards and guidelines that are designed to protect and promote aquatic resources. This analysis looks at both the potential impacts that could occur from management activities based on MPC allocation by alternative, and the potential benefits that could occur from watershed and aquatic habitat restoration emphasis inferred by the MPCs. MPC indicators are intended to show relative differences between alternatives, rather than to represent the actual acres of disturbance or treatments that are expected to occur.

Potential Negative Effects - Land-disturbing management activities such as road construction, timber harvest, livestock grazing, recreation, fire use, and mining can decrease soil productivity through increased erosion and soil compaction, accelerate sedimentation and other pollutants, reduce riparian vegetation and coarse woody debris, damage stream banks, and alter water quantity, quality and temperature. All of these impacts can, in turn, negatively affect aquatic habitat and native and desired non-native fish species. Even though Forest Plan management direction would reduce the potential for impacts under all alternatives, there are different risks to these resources associated with varying amounts of land management activities by alternative. The management strategies for aquatic resources are intended to prevent unacceptable impacts to these resources while allowing for appropriate levels of land management activities needed to achieve multiple resource goals and objectives.

Most negative effects associated with recreation, lands and special uses, non-native plants, and mineral activities are not anticipated to vary significantly by alternative and are addressed in the Effects Common to All Alternatives discussion of this analysis. The negative effects from rangeland resources, timberland/vegetation resources, road-related activities, motorized trail use, and fire management will vary by alternative. Therefore, specific issue indicators for these management strategies are outlined below.

Potential Positive Effects - Since the development of the existing plans, several fish species have become listed under ESA, and interim land management strategies protecting anadromous (Pacfish) and resident (Infish) fish species have been amended into existing plans. Subsequent biological opinions (BOs) for bull trout, steelhead, and chinook have also amended the plans. The U.S. Fish and Wildlife Service has also developed draft recovery plans and proposed critical habitat for bull trout. Existing plans do not consistently support these new events and mandates. Watershed and aquatic restoration are applied at various intensities under the Forest Plan alternatives to pursue meeting the above direction.

Five species of native fish have been listed as Threatened or Endangered under the ESA. There are also two fish species on the Regional Forester's Sensitive Species List, and one species of special concern for the State of Idaho. These fish at risk are listed in Table SW-1, and they will be used in the effects analysis to represent effects to all aquatic species.

Improvement of TES and other native fish and aquatic habitat should occur when management direction is applied that emphasizes the appropriate watershed and aquatic restoration or conservation strategies. The analysis examines how restoration management strategies considered would positively affect the status of TES, fish species of special concern, and the distribution of populations and quality of habitat for MIS by improving water quality, beneficial uses, and various key habitat components.

Table SW-1. Listed and Sensitive Fish Species Within the Ecogroup Area

Fish Species	Status	Location by Forest
Sockeye salmon	Listed as endangered	Sawtooth
Spring/summer chinook salmon	Listed as threatened	All three Forests
Fall chinook salmon	Listed as threatened	Payette
Steelhead trout	Listed as threatened	All three Forests
Bull trout	Listed as threatened	All three Forests
Westslope cutthroat trout	Region 4 sensitive	All three Forests
Wood River sculpin	Region 4 sensitive	Sawtooth
Yellowstone cutthroat	Species of Special Concern in Idaho	Sawtooth

Indicators for Issue 4 – The following indicators are used to measure potential impacts to aquatic habitat conditions from selected management activities that may occur at different amounts and intensities, based on the MPCs assigned by alternative.

- *Potential Effects from Vegetation Treatments, Roads, and Fire Use*. This indicator compares the amount of suited timberland acres by subbasin, and the percentage of ERT acres with thresholds of concern (TOC) in subbasins for selected fish species by alternative. Those alternatives and subbasins with a higher amount of suited acres and ERT acres that exceed the TOCs would have greater potential for temporary and short-term impacts to matrix pathways.

- *Potential Effects from Livestock Grazing*. This indicator compares the amount (percent) of suitable rangeland acres, and the percent of each subbasin that allow less restrictive (4.1, 4.2, 5.1, 5.2, 6.1, 6.2) and more restrictive (1.1, 1.2, 2.1, 2.4, 3.1, 3.2, 4.3) MPC grazing strategies, in subbasins for selected fish species by alternative. Those alternatives and subbasins with a higher amount of suitable rangeland acres and MPCs with less restrictive grazing strategies would have a greater potential for temporary and short-term impacts to matrix pathways.

- *Potential Effects From Wildfire Vs. Treatments to Reduce Wildfire Hazard*. Potential effects to listed, sensitive, and special concern fish species were analyzed by comparing the MPCs (3.2, 4.1 c, 4.2, 4.3, 5.1, 5.2, 6.1, and 6.2) that have a high emphasis and more tools available to treat subwatersheds with high and extreme risks from uncharacteristic wildfire to MPCs (1.1, 1.2, 2.0, 2.1, 2.2, 3.1, 4.1a, and 4.1b) that have a limited emphasis and fewer tools available. This information was overlaid with the population status (e.g. strong, depressed, and isolated populations) of cutthroat, bull, and steelhead trout, Wood River sculpin, and chinook salmon to examine risks to those populations of treating vs. not treating vegetation. Specifically, the following scenarios were analyzed:

    - Potential impacts and benefits from management treatments in subwatersheds with uncharacteristic wildfire risks and depressed/isolated fish populations where assessed by subbasin. Under this condition, the risk of uncharacteristic wildfire in short-term is greater than the risk of mechanical and prescribed fire to treat vegetation in some situation where depressed or isolated local fish populations are present.

- Potential effects from the lack of management treatments in subwatersheds with uncharacteristic wildfire risks and depressed/isolated populations where assessed by subbasin. Under this condition, the risks from uncharacteristic wildfires would remain high potentially putting some depressed or isolated local fish populations at greater risk.

- Potential effects from management treatments in subwatersheds with uncharacteristic wildfire risks and stronghold fish populations where assessed by subbasin. Under this condition, the risks of mechanical and prescribed fire treatments are greater than the risk of uncharacteristic wildfire where strong populations are present.

- *Potential Effects from Aquatic Restoration*. This indicator is used to measure the potential beneficial effects of applying the appropriate active or passive watershed and aquatic habitat restoration or conservation strategies in improving aquatic habitat conditions and the status of TES, MIS, and fish species of special concern. It is also used to compare the potential negative effects from the lack of restoration to TES, MIS, and fish species of special concern in specific subbasins. Specifically, the following scenarios were analyzed:

  - Comparison of subwatersheds identified as a high WARS priority or ACS and MPCs that emphasize the appropriate restoration/conservation strategies. Those alternatives and subwatersheds with the appropriate or "good match" active restoration and passive restoration/conversation would have greater potential for improvement of fish habitat and populations over the long term.

  - Comparison of subwatersheds identified as a high WARS priority or ACS that have stronghold and depressed populations for sockeye and chinook salmon, and steelhead trout, and MPCs that emphasize the appropriate or "good match" active restoration and passive restoration/conservation of habitat and interconnectivity.

  - Comparison of subwatersheds identified as a high WARS priority or ACS that have stronghold, depressed, and isolated local populations for native westslope and Yellowstone cutthroat and bull trout, and MPCs that emphasize the appropriate or "good match" active restoration and passive restoration/conservation of habitat and interconnectivity.

  - Comparison of subwatersheds identified as a high WARS priority or ACS that have stronghold, depressed, and isolated local populations for Wood River sculpin, and MPCs that emphasize the appropriate or "good match" active restoration and passive restoration/conservation of habitat and interconnectivity.

  - Comparison of subwatersheds that have strong fish populations (chinook, steelhead, etc.) in high-risk (low Geomorphic Integrity and Water Quality Integrity) subwatersheds, with high or moderate priority for active restoration (WARS), but having a low MPC emphasis for active restoration.

- *Potential Effects from Motorized Trail Use*. This indicator compares the potential effects from motorized trail use in recommended wilderness areas. Alternatives 4 and 6 would prohibit motorized use in these areas, but the other alternatives would allow current motorized use to continue. Other recreational uses would remain essentially the same for all alternatives.

Affected Area

Issues 1, 2, and 3 - The affected area for direct and indirect effects to soil, water, and riparian resources are the lands administered by the three National Forests in the Ecogroup. This area represents the National Forest System lands where changes may occur to the soil, water, and riparian resources as a result of management activities or natural disturbance events. Some soil, water, and riparian issues and their indicators are analyzed at different spatial scales (subwatersheds or subbasins) and are then aggregated for the Ecogroup. Some issues and their indicators pertain to certain sets of subwatersheds while some pertain to all subwatersheds and are discussed at the subbasin scale to assist in the discussion of current conditions and effects of alternatives on fish species.

Subwatersheds are natural divisions of the landscape and the basic functioning units of hydrologic systems. Hydrologic watersheds are hierarchal, smaller ones nest within larger ones. Stream channels nest within subwatersheds, and their formation and function are in large part controlled by subwatershed physiography and geomorphic processes. Thus, the affected area for soil, water and riparian resources is not limited to just the hillslopes, stream channels, lakeshores, and defined riparian areas, but includes the whole subwatershed or subbasin. Management activities in one part of a subwatershed often influence other parts of that subwatershed, and to varying degrees, subwatersheds downstream of their respective subbasin.

Information for the description of the current condition and subsequent effects analysis was collected at the subwatershed scale and specific data and spatial map locations may be found in the SWRA Technical Report. This information can be aggregated to show relative conditions for the larger watershed, subbasin, Forest, or Ecogroup scales. Similarly, it can be stratified at the subwatershed or subbasin scale to show conditions or effects in specific drainages of interest, such as the South Fork Salmon River or Middle Fork Salmon River.

The affected area for soil, water, and riparian cumulative effects varies by Issue. For Issue 1, the affected area for cumulative effects includes the lands administered by the three National Forests in the Ecogroup and lands of other ownerships within the National Forest boundaries. The cumulative effects to soils are generally limited to the immediate area of any management activity.

For Issue 2, the affected area for cumulative effects increases to include those portions of subwatersheds not wholly within and downstream of the National Forest boundaries. Management activities occurring on NFS lands may have downstream effects within subwatersheds that extend off-Forest. These effects may change the post-wildfire risks to human life, property, and municipal supply watersheds on both the on-Forest and off-Forest portions of these subwatersheds. For Issue 3, the affected area for cumulative effects increases to include those portions of subwatersheds and subbasins not wholly within and downstream of the National Forest boundaries. Management activities occurring on NFS lands may have downstream effects within subwatersheds and subbasins that extend off-Forest. These effects may change the water quality status related to 303(d) water quality limited water bodies or TMDLs on both the on-Forest and off-Forest portions of these subwatersheds and subbasins.

Issue 4 - The affected area for direct and indirect effects to aquatic species is land administered by the three National Forests that make up the Southwest Idaho Ecogroup. The Forests contain waters that are part of the Salmon River Basin and the Snake River Basin upstream of the Salmon River confluence, which contains the Boise, Payette, Weiser, Wood, and Raft River systems and the Hells Canyon, Brownlee Reservoir, Upper Snake-Rock, Goose Creek and Salmon Falls Creek subbasins. Potential effects to aquatic fish species and their habitat would originate within the Forest boundaries in these drainages.

The affected area for cumulative effects varies by species. For anadromous species (sockeye, spring/summer and fall chinook, steelhead), the affected area encompasses all areas in the Salmon River Basin and Hells Canyon subbasin potentially affected directly or indirectly by the Federal Action and adjoining subbasins where there is a high potential for straying and recolonization by fish originating within the Ecogroup. The Pahsimeroi, Lemhi, and Middle Salmon-Panther subbasins are included in the environmental baseline for this reason.

For Columbia River bull trout the affected area encompasses all areas in the Salmon River Basin (Salmon Basin Recovery Unit), Weiser, Payette, and Boise River Basins (Southwest Idaho Recovery Unit), Brownlee Reservoir subbasin (Hells Canyon Recovery Unit), and Hells Canyon subbasin (Imnaha Recovery Unit) potentially affected directly or indirectly by the Federal Action and accessible adjoining subbasins within where there is a high potential for straying and recolonization by fish originating within the Ecogroup.

For westslope cutthroat, the affected area encompasses all areas in the Salmon River Basin potentially affected directly or indirectly by the Federal Action and adjoining subbasins within where there is a high potential for straying and recolonization by fish originating within the Ecogroup. The Pahsimeroi, Lemhi, and Middle Salmon-Panther subbasins are included in the environmental baseline for this reason.

For Wood River Sculpin, the affected area encompasses all areas in the Camas, Big Wood and Little Wood subbasins potentially affected directly or indirectly by the Federal Action.

Finally for Yellowstone cutthroat, the affected area encompasses all areas in the Upper Snake-Rock, Raft River, and Goose Creek subbasins potentially affected directly or indirectly by the Federal Action and accessible adjoining subwatersheds within each subbasin where there is a high potential for straying and recolonization by fish originating within the Ecogroup.

Figure SW-1. Affected Area Boundaries for Analyzed Fish Species

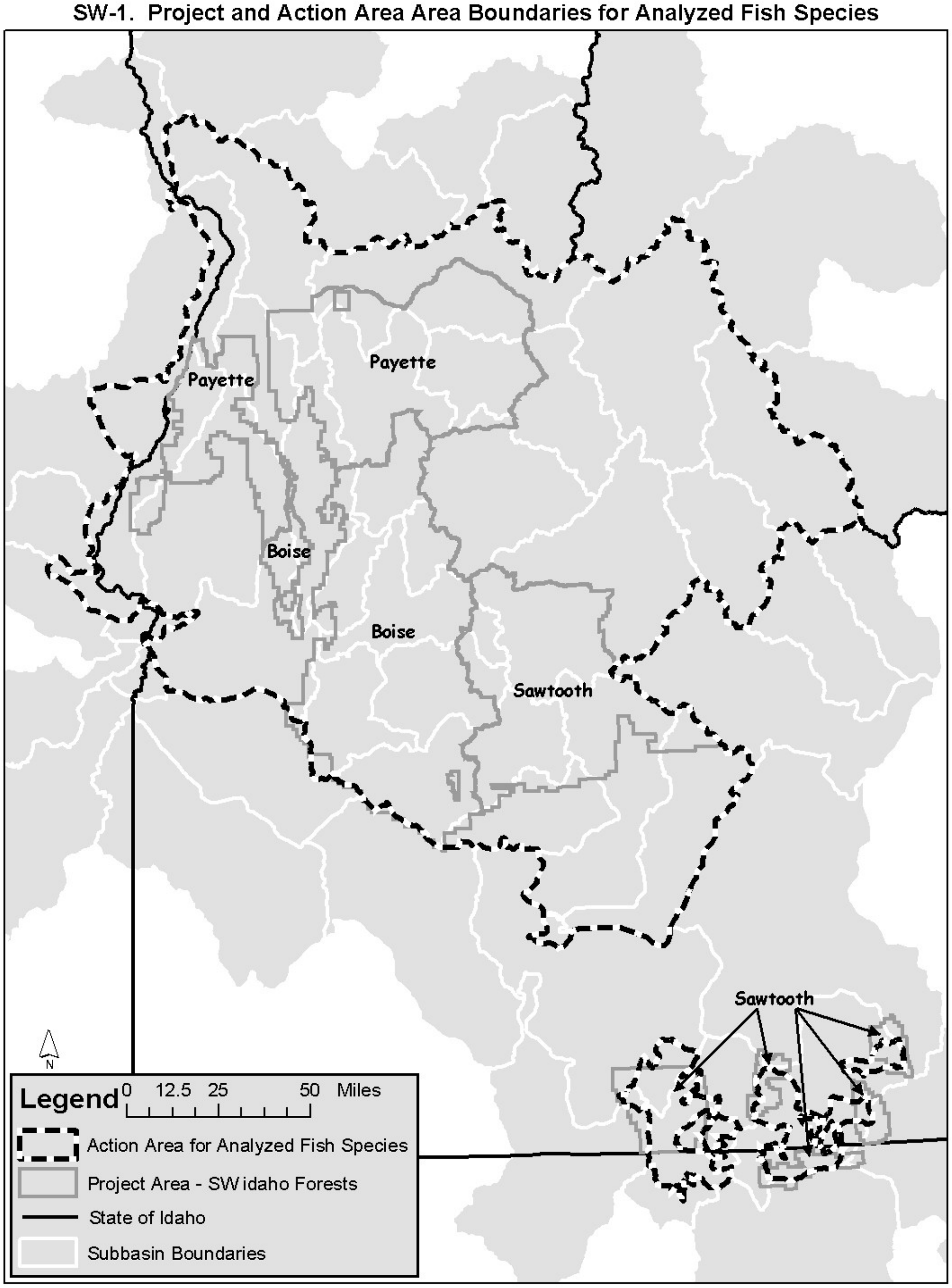
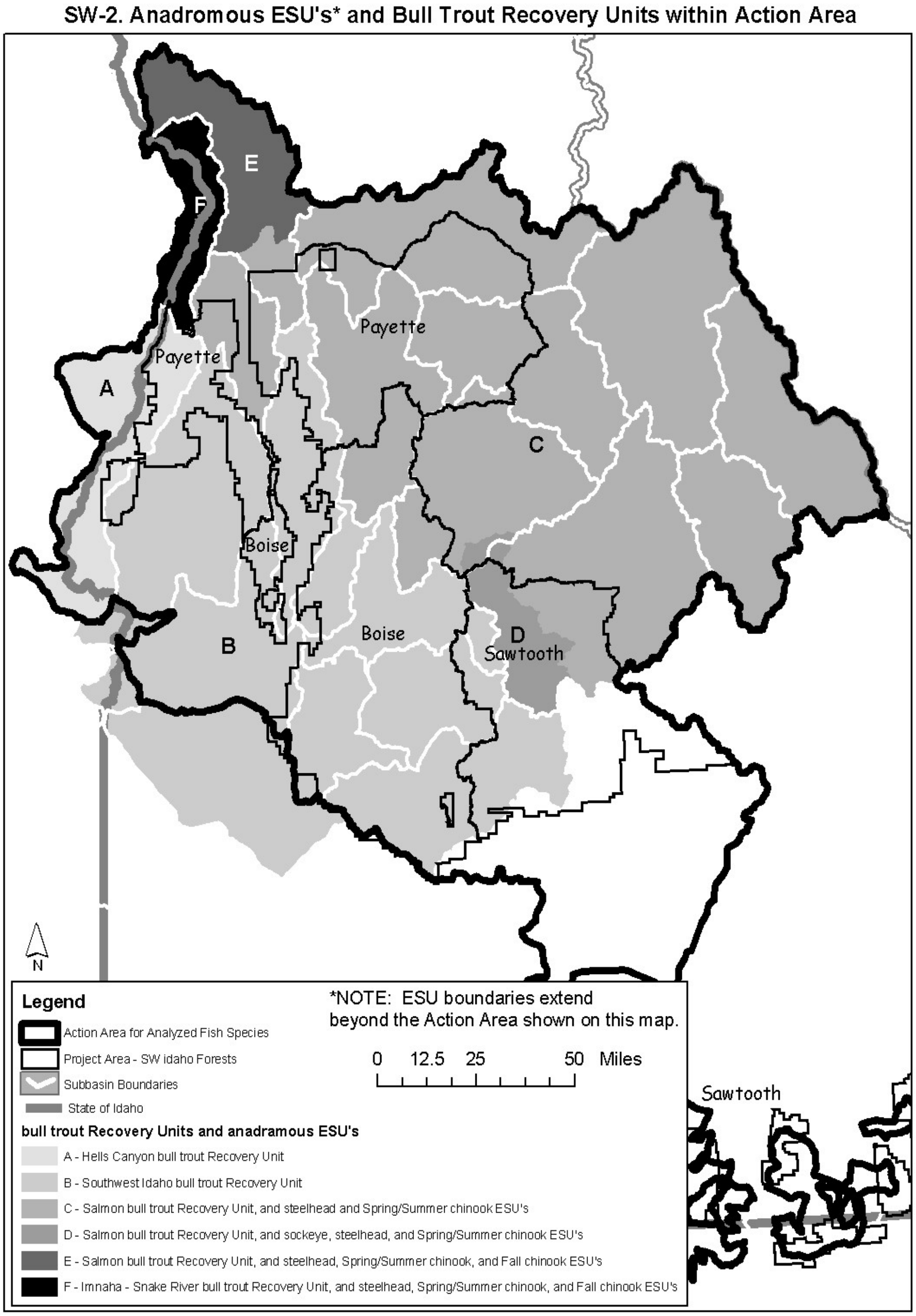


Figure SW-2. Anadromous ESUs and Bull Trout Recovery Units Within the Affected Area



CURRENT CONDITIONS

Overview

Land and Watershed Stratification

Biophysical conditions within the Ecogroup area are tremendously varied, dynamic, and complex. To assess terrestrial and aquatic systems, it is important to consider the past, current, and future states of the physical and biological components of the landscape comprising these systems. To gain such knowledge requires that terrestrial and aquatic physical and biological patterns at different spatial scales be characterized to meet forest-planning needs. This approach allows the evaluation of broader-scale influences on finer-scale conditions and processes, and uses finer-scale information to determine the significance of broader-scale influences.

The ecological linkage between the terrestrial (land) unit and aquatic unit (watershed) characterizes and assesses watersheds on the basis of geoclimatic setting in which they are found. Understanding the relationships that exist between land and aquatic systems is key to predicting their response to natural or anthropogenic disturbance and their rate of recovery. Hierarchical delineation of watersheds provide a systems approach that includes not all of the constituent parts, but also the links, relations, interactions, consequences, and implications among these parts (USDA Forest Service 2000).

The Ecogroup area has been stratified into progressively smaller land units of increasingly uniform ecological processes and potentials following the National Hierarchical Framework of Ecological Units adopted by the Forest Service (USDA Forest Service 1993). The stratification system uses seven levels. The first two levels called Domains and Divisions are largely based on global and continental climate patterns. The third level, called Provinces, is based on broad vegetation zones that conform to continental climate patterns and similar soil orders. Geomorphic processes, geology, topography, soil groups, and potential natural communities are used to stratify the fourth and fifth levels, called Sections and Subsections. There are 6 sections and 51 subsections partially or wholly within the Ecogroup area. The next two levels are landtype associations and landtypes. General topography, geomorphic processes, surficial geology, soil and potential natural community patterns, and local climate are used to stratify these levels. These factors affect biotic distributions, soil-hydrologic function, natural disturbance regimes, and general land use. At this level, terrestrial features and processes may have a strong influence on ecological characteristics of aquatic habitats (USDA Forest Service 1993, Platts 1979). The landtype association and landtype scales were the main land units used to assist in describing the current condition and effects analysis for the SWRA resources. There are 98 landtype associations and 465 landtypes partially or wholly within the Ecogroup area.

The Ecogroup has been stratified into progressively smaller watershed units of increasingly uniform ecological processes and potentials following the Hierarchical Framework of Aquatic Ecological Units in North America (Maxwell et al. 1995). The stratification system has eleven levels, from a very large scale (subzones) down to a very fine scale (channel units). This analysis mainly used three scales: river basins, subbasin, and subwatershed. River basins are defined by the presence of unique species assemblages, and often one or more endemic aquatic species. Each basin has barriers to species dispersal caused by climate change, oceans, hydrographic divides, or other factors. River basins may be divided into subbasins based on criteria that define different physical-chemical patterns in the habitats of distinct species groups. Subbasins are divided into smaller watershed and subwatershed units using hydrographic criteria. Subwatersheds were used to reduce the variability in describing natural and anthropogenic disturbance, inherent vulnerabilities, and current conditions for the SWRA resources. Where appropriate, the subwatersheds were aggregated to describe their respective subbasin conditions and effects from the alternatives. There are 29 subbasins and over 650 subwatersheds partially or wholly within the Ecogroup.

Soils and Soil Productivity

For the thousands of years prior to Euro-American settlement, disturbances to soils were limited to climatic and wildfire changes leading to natural-occurring surface erosion and landslide processes, or increased erosion after wildfires. Fires set by Native American Indians also had an influence on the soils resource, although this is assumed to have had a relatively small effect within the Ecogroup area. Following these events, elevated erosion rates decreased relatively rapidly through natural revegetation. The soil was compacted or kept bare in only very small areas, such as village sites or heavily used trails. After Euro-American settlement of the Ecogroup area, human-caused activities resulting in soil disturbance and accelerated erosion increased and included hydraulic and other mining activities, livestock grazing, timber harvest, road construction, and more recently, increased uncharacteristic large and lethal wildfire.

Mining has caused severe but localized impacts to soil and water, particularly where some streams were dredged, or hillsides adjacent to streams were deliberately eroded to expose gold deposits. Early timber harvest, and any associated soil disturbance, was generally limited to areas surrounding settlements because of limited methods to transport logs. Later, with railroads used to transport logs, soil disturbance due to logging extended further into the surrounding forests. Livestock grazing through the late 1800s and early 1900s caused extensive loss of protective vegetative ground cover that led to accelerated soil erosion. These effects were more prominent on rangelands and high-elevation broad ridges. Generally, most of the more resilient north-to-east aspects have revegetated, while many of the south-to-west aspects with vulnerable soil types have accelerated soil erosion due to a lack of protective vegetative ground cover.

After World War II, the area harvested for timber increased dramatically within more accessible areas of the Ecogroup. In some areas, road densities and ground-based harvest operations contributed to accelerated soil erosion, landslides, loss of coarse woody debris, and soil compaction. Since the 1970s, best management practices implemented to reduce loss of soil productivity and to maintain water quality have increased in amount, variety, and effectiveness. More recently, the Intermountain Region of the Forest Service established Soil Quality Standards to address protection and maintenance of long-term soil productivity.

In the past 10-15 years, there has been an increase in uncharacteristically large and lethal wildfires within certain potential vegetation groups of the Ecogroup (USDA Forest Service 1996). In many severely burned areas, soil productivity and other SWRA resources have been extensively degraded. This has led to an increase in post-fire soil erosion and flooding, as well as loss of coarse woody debris needed for nutrient recycling. These effects are of particular social concern within urban-rural wildland interface areas and in subwatersheds that have been identified as having potential impacts to human life, property, and/or municipal supply watersheds from post-wildfire floods, landslides, and debris flows. The cost of suppressing these wildfires and rehabilitating watersheds to reduce the post-wildfire threat to life, property and/or municipal supply watersheds, loss of long-term soil productivity, and deteriorated water quality has greatly increased (USDA Forest Service 2000, Pacific Watershed Associates 1998, State of Idaho 1997).

Recent scientific research supports the concern that altered vegetation conditions within certain vegetation types poses an increased risk to soil-hydrologic processes and overall watershed condition. However, scientific debates continue as to the trade-offs and associated risks of reintroducing fire and mechanical vegetation treatments to reduce ecological risks to vegetation and potential effects to other soil-hydrologic and aquatic resources (Meyer et al. 2001, Moody and Martin 2001a and 2001b, Gresswell 1999, Rieman and Clayton 1997, Benda and Dunne 1997). These tradeoffs will be discussed later in this analysis.

Water and Riparian Resources

Of all aquatic habitats, streams show the greatest and most intensive interaction with their terrestrial forestland (Hynes 1975). Streams are products of their catchments, and their environmental conditions and biotic communities are strongly influenced by the nature and state of the surrounding lands within a catchment or basin (Naiman et al. 2000). The adjacent streamside (riparian) environment is the principal interface between the terrestrial uplands and streams.

Riparian areas, wetlands, and associated floodplains comprise a relatively minor percentage of the total Ecogroup land base, but are more productive in terms of plant and animal diversity and biomass per unit area than the remainder of the land base combined (USDA Forest Service 1992). Healthy and properly functioning riparian areas, wetlands, and floodplains are physically and biologically diverse and highly productive environments. These land-water interfaces are generally very dynamic and support complex associations of plant and animal communities. They also help purify water, moderate impacts of flooding, collect rain and snow runoff, and replenish water needed to sustain vegetation and other riparian functions. These areas are also attractive for recreation, livestock management, roadways, and other human uses.

The importance of properly functioning riparian, wetland, and floodplain systems cannot be overstated. With the right composition and condition of vegetation, properly functioning riparian areas, wetlands, and floodplains stabilize and rebuild streambanks, capture sediments and other pollutants, store water to be released during low-flow times of the year, create pools and undercut banks for fish, keep water temperatures within acceptable ranges, provide large woody debris for pool development and sediment entrapment, provide for a diversified range of succession and plant species, and contribute to nutrient cycling. By filtering sediments and other impurities, these systems greatly contribute to high-quality water. Also, properly functioning riparian, wetland, and floodplain systems are dynamic and more resilient to disturbances from natural and human-caused events than impaired systems.

An estimated 25,000 miles of perennial and intermittent streams occur within the Ecogroup, of which essentially all perennial and some intermittent streams are fish bearing. There are an estimated 34,000 acres of lakes and reservoirs occurring within the Ecogroup. Forest streams comprise the headwaters of several important river systems, including the Snake, Salmon, Boise, Payette, Raft, Big Wood, and Weiser Rivers. Annual water yield for the Ecogroup is estimated at 10.4 million acre-feet (see the SWRA Technical Report for more detailed information).

Water originating on and moving through the Ecogroup area provides for many, often conflicting, uses. Many people depend on the Ecogroup Forests to provide water for irrigation, municipal supply use, recreational, and hydropower. Water bodies, riparian areas and wetlands also provide prime recreation sites for fishing, rafting, camping, municipal supply watersheds, and other uses. These same areas provide habitat for a variety of aquatic and riparian-dependant resources, including TEPS aquatic and wildlife species.

One of the primary missions of the Forest Service is to provide high-quality water in sufficient quantities and quality to meet all needs of natural resource and human requirements (Organic Act, 1897; Federal Water Pollution Control Act and Clean Water Act as amended, Endangered Species Act 1973, National Forest Management Act of 1976; USDA Forest Service 2000). Because many stream and river systems within Idaho originate within the Ecogroup boundaries, it is imperative that the Forests emphasize proper management to ensure that an appropriate quantity of good, clean water is provided to meet these needs. Ecogroup water bodies currently vary from pristine condition to heavily polluted from human activities and from disturbances associated with ecological processes, such as wildfire and landslides. Certain water bodies have been listed by the State as impaired under Section 303(d) of the Clean Water Act, and the Forest Service is obligated to work with the State to reduce pollutants (often sediment) so that these water bodies can eventually fully support their beneficial uses and be de-listed by the State of Idaho DEQ.

Aquatic Species

Fish are the dominant aquatic vertebrates and constitute a key component of aquatic ecosystems within the Ecogroup. Fish are a critical resource to humans and have influenced the development, status, and success of social and economic institutions. Fish are sensitive to disturbance to soil and water related resources and may be directly or indirectly effected. The diversity and integrity of native fish communities provide useful indicators of aquatic ecosystem structure, function, and health.

Many aquatic fish species have evolved in concert with the dynamic nature of stream channels and the watersheds in which they flow. They have developed traits, life-history adaptations, and propagation strategies that allow for their persistence and success within the varied landscapes and associated disturbance regimes. The varied characteristics and distribution of native fishes mirrors the diverse and dynamic geoclimatic setting within the Ecogroup. Native fish fauna habitat within the Ecogroup is composed of portions of 29 subbasins and over 650 associated subwatersheds. As many as 50 different native and non-native species of fish inhabit the Ecogroup rivers, streams, and lakes (see Watershed and Aquatic Technical Report for entire list).

In addition, the Forests manage habitat for a number of fish species listed under the ESA, or designated by the Regional Forester as sensitive species. There are five listed fish species within the Ecogroup area. These include bull trout, steelhead trout, and spring/summer chinook, fall chinook, and sockeye salmon. Bull trout, listed as threatened under the Endangered Species Act, has been selected as a management indicator species for the revised forest plans for each Forest (see Appendix F). Westslope cutthroat and Wood River sculpin also occur within the Ecogroup area and are identified by the Forest Service as sensitive species.

SWRA Resources Analysis Components

The following descriptions of key terms and concepts are crucial in understanding both the descriptions of SWRA current conditions and the SWRA Environmental Consequences Section. Many of these key terms and concepts are used as indicators or components of indicators used for describing and evaluating effects of the Issues. The key terms and concepts will also be identified as to which issue or issues they are associated.

Data Information And Sources

Data and information sources included the results from the Ecogroup multi-scale subbasin and subwatershed PFC assessments. This analysis centered on obtaining current conditions and causes for SWRA resources while integrating the soil-hydrologic function, dynamic stream equilibrium, associated aquatic habitat, and status of listed and native fish populations for each subbasin and their respective subwatersheds. The subwatershed conditions were then aggregated up to and compared at the subbasin. The watershed and aquatic recovery strategy database incorporates most of the data collected and analyzed as part of the multi-scale PFC assessments. The multi-scale PFC assessments laid the groundwork for the development of the comprehensive Aquatic Conservation Strategy that was used in the development of management direction to support the objectives and requirements of the ESA, CWA, and other fish and water quality statutes.

Soil, water, riparian, and aquatic information from the ICBEMP was used to help develop the Need For Change topics, issues, reference conditions, restoration strategies, and management direction in the revised Forest Plans. The ICBEMP data for the soil, water, riparian, and aquatic resources for the Ecogroup was also reviewed for use in describing current subwatershed and subbasin conditions. However, revision team specialists were able to obtain more site-specific, local, and recent data for the Ecogroup that were more appropriate than the lower resolution data sets used in the ICBEMP project.

Fisheries databases used in this analysis are at the same scale as those used by the ICBEMP, but the revision team had more recent data at the subwatershed and subbasin scales than the fisheries data compiled and used by the ICBEMP. Soil and watershed databases used by the ICBEMP were on a much broader scale than data available to the revision team. Data used for the Revision, for instance, include more specific landtype and landtype association data, and a more recent updated list of 303(d) impaired water bodies. Additional sources—including road inventories and landslide-prone area mapping—also utilized more specific, local data. Field specialists in the soil, water, riparian, and aquatic resource areas were integral in identifying data for determining current subwatershed conditions, some of which were available through the Inland West Watershed Initiative.

Data from the watershed and aquatic recovery strategy database were used to identify fish strongholds, presence/absence, spawning/rearing habitat, migratory habitat, and bull trout and cutthroat isolated local populations at the subwatershed scale. This information was compiled for the database over the course of developing the revised Forest Plans from surveys and through discussions with biologists at the District and Forest levels. Where previous BAs exist and provide information on presence, status, trends and threats regarding the listed fish, they were used to supplement the multi-scale analyses. The information in these BAs generally came from Forest surveys and inventories. In cases where information was limited, other sources—for example, the FWS bull trout draft recovery plan (USDI FWS 2002)—were used. Refer to the SWRA Technical Report for more detailed discussion on the data and information sources.

Subwatershed Vulnerability Rating (Issues 1, 2, 3, and 4)

Subwatershed vulnerability ratings characterize the natural inherent sensitivity of subwatershed to disturbance, also called vulnerability. The vulnerability is correlated to a threshold of concern (TOC) based upon relative ranges of sensitivity. The more vulnerable a subwatershed or subbasin is to disturbance (natural or anthropogenic), the lower the TOC (Menning et al. 1996). In highly vulnerable subwatersheds, disturbances pose a higher risk of degrading soil-hydrologic, stream dynamic equilibrium, and riparian functions or ecological processes compared to subwatersheds with low vulnerability ratings. Subwatershed vulnerability also relates to the natural resiliency or ability for renewal (restoration) once the subwatershed experiences disturbance. The more inherently stable and highly productive the soils in the subwatershed, the better suited it is for self-recovery of watershed conditions. Highly vulnerable subwatersheds have a high percentage of sensitive lands. Sensitive lands are defined as having combinations of inherently highly erodible soils, high natural sediment yields, and high percentages of landslide prone areas. See the Aquatic Biological Assessment and the SWRA Technical Report for more detailed information on data and analysis methods.

High and Extreme Forest Vegetation Hazard Rating (Issues 1 and 2)

Uncharacteristic wildfire hazard is defined as the effect of wildfire on the vegetative conditions when it burns (rather than if it will burn) described by potential vegetation group (PVG), size class, and canopy closure for forested vegetation, or cover type and canopy cover for non-forested vegetation, relative to the historical effect. Hazard is based on the vegetative conditions that influence fire behavior and potential effects (Bachmann and Allgöwer 1999, Deeming 1990). The hazard ratings are low (0), moderate (1), high (2), and extreme (3). Subwatersheds that have a hazard rating of high or extreme were used in the analysis for Issues 1 and 2. Further discussion on uncharacteristic wildfire hazard ratings is located in the Vegetation Hazard section in Chapter 3 of this FEIS.

Municipal Supply Watersheds (Issues 2, 3, and 4)

Several communities depend on water from subwatersheds within the Ecogroup. The objective of the three National Forests within the Ecogroup is to mange for multiple uses by balancing present and future resource use with domestic water supply needs (Forest Service Manual 2542). The definition of a municipal supply watershed is one that serves a public water system as defined in Public Law 93-523 (Safe Drinking Water Act); or as defined in State safe drinking water regulations. The definition does not include communities served by a well or confined ground water unaffected by Forest Service activities (Forest Service Manual 2542.05).

Subwatershed Geomorphic Integrity (Issues 3 and 4)
Current conditions for soils at the subwatershed scale were determined through geomorphic integrity ratings. Geomorphic integrity ratings (GIR) for each subwatershed are intended to judge the current condition of the upland soil-hydrologic processes and functions and stream-dynamic equilibrium based on past and current (natural or anthropogenic) disturbances as compared to historical conditions (pre-euro-American settlement). Rating determinations are based on the ability of subwatershed soil-hydrologic conditions to function as a sponge-and-filter system to absorb and store inputs of water, and on geomorphic resilience of streams, and riparian and wetland areas. Both natural and anthropogenic disturbances were used to estimate existing geomorphic conditions of each subwatershed.

Geomorphic integrity conditions were assigned three relative ratings (high, moderate, and low). These ratings equate to the properly functioning condition terms used in the Matrix of Pathways and Watershed Condition Indicators in Appendix B of the revised Forest Plans. The ratings may also be expressed in terms of the baseline condition. In other words, a high integrity represents a good condition or one that is functioning appropriately. The following descriptions are designed to help the reader understand these relationships. The individual subwatershed GIR were aggregated up to their respective subbasin to assist in determining the overall subbasins' watershed condition for the soils resource.

- **High Integrity** - the subwatershed is in good condition, near or at properly functioning condition, and has low risk from further disturbance. Rating is Functioning Appropriately.

- **Moderate Integrity** - the subwatershed is in fair condition, functioning at risk, and has moderate risk from additional disturbance. Rating is Functioning at Risk.

- **Low Integrity** - the subwatershed is in poor condition, not properly functioning, and has high risk from additional disturbance. Rating is Functioning at Unacceptable Risk.

Data to determine GIR by subwatershed were (see the SWRA Technical Report for description of data sources and maps used to display GIR):

1. Total miles of road (classified and unclassified) per square mile of subwatershed
2. Ratio of LSP area (Moderate and High Landslide Potential): to roads on LSP (density)
3. High Intensity Historic Fires (include fires since 1980 over 300 acres)
4. Timber Harvest History
5. Determination of percent of Equivalent Clearcut Acres (wildfires, and timber harvest)
6. Professional judgment and local knowledge (Mining, Grazing, Recreation, Landslides/debris torrents etc).

Subwatershed Water Quality Integrity (Issues 3 and 4)
Current conditions for the water and riparian resources were determined through water quality integrity (WQI) ratings at the subwatershed scale. A WQI rating is largely based on past and current (natural or anthropogenic) disturbances. Ratings result from the cumulative effects of localized physical problems—such as poorly constructed roads, mineral activities, failed culverts, and landslides—or dispersed sources such as areas of extensive grazing, timber harvest, road

construction or wildfire. The ratings determine the streams and riparian water quality relative to their potential, or if damage to stream segments is extensive or intensive enough such that any designated beneficial use is not fully supported or any resource value is seriously degraded. Stream segment conditions include physical, chemical, or biological impacts, including the following categories: bank damage, sediment loads, channel modification, flow disruption, thermal changes, chemical contamination, and biological stress.

Damaged stream segments are those in which physical, chemical, or biological impacts associated with natural or anthropogenic disturbances have caused any designated beneficial use to be not fully supported or any water-related resource value to be substantially degraded. It is important to note that this determination is based on direct or indirect effects within or affecting the stream channel, just as the Geomorphic Integrity is associated with the hillslopes and processes of the surrounding subwatershed outside of the stream channel.

Designated beneficial uses are any of the various uses which may be made of the water of an area, including, but not limited to 1) agricultural water supply; 2) industrial water supply; 3) domestic water supply; 4) cold water biota; 5) primary contact recreational use; 6) secondary contact recreational use; 7) salmonid spawning, over-wintering, emergence, and rearing; and 8) warm water biota.

Water quality integrity conditions are assigned three relative ratings (high, moderate, and low) previously discussed in the section on Subwatershed Geomorphic Integrity. Data to determine WQI ratings by subwatershed are identified below (see the SWRA Technical Report for more description of data sources and maps used to determine water quality integrity):

1. Miles of road (classified and unclassified) within subwatersheds RCA (both intermittent and perennial streams)
2. Number of road stream crossings (classified and unclassified and both intermittent and perennial streams)
3. Occurrence of any identified damaged stream segments
4. Identification of a 303(d) impaired water body
5. Professional judgment and local knowledge (roading, timber harvest, mining, grazing, recreation, landslides/debris torrents etc).

Watershed and Aquatic Recovery Strategy (WARS) (Issues 3 and 4)

The process of choosing a restoration or conservation strategy begins with a determination of whether the subwatershed components are functionally intact, or whether the components are damaged by management activities and/or natural processes to the extent that it cannot restore itself to regain its former characteristic functions and processes within an acceptable time period (Wissmar and Beschta 1998). Restoration prioritization was largely based on the principles identified by the interagency restoration team described in Restoration Task Team (2000).

Appropriate Type of Subwatershed Restoration/Conservation - The use of subwatershed geomorphic integrity (GI), water quality integrity (WQI), and subwatershed vulnerability ratings served as a basis for determining if subwatershed components are damaged and if so, whether it has the capacity to restore itself naturally (resiliency) to a desired condition and within an acceptable time period (rate of recovery). These ratings are used to determine the dominant type of restoration or conservation strategies most suitable for each subwatershed. The aquatic integrity (AI) information also assists in determining the subwatersheds restoration prioritization.

SWRA resource restoration is viewed overall as the movement of subwatershed functions, ecological processes, and structures toward desired conditions. The intent of the watershed restoration direction is to recognize the variability of natural systems while: (1) securing existing habitats that support the strongest populations of wide-ranging aquatic species and the highest native diversity and geomorphic and water quality integrities; (2) extending favorable conditions into adjacent subwatersheds to create a larger and more contiguous network of suitable and productive habitats; and (3) restoring soil-hydrologic processes to ensure favorable water quality conditions for aquatic, riparian, and municipal beneficial uses that will fully support beneficial uses and contribute to the de-listing of fish species and 303(d) water quality limited water bodies.

For this process, restoration approaches were divided into two categories: restoration (two types: active or passive) or conservation. For each subwatershed, a determination was made about the appropriate type of approach: active restoration, passive restoration, or conservation. This was done based on the assessment of the biophysical components and other information in the WARS database. Determining the type of approach does not infer that it is the only type of restoration needed; rather it is the dominant most appropriate restoration within a given subwatershed.

Subwatersheds with GI and WQI rated as Functioning Appropriately are appropriate for either a passive restoration or conservation approach, as these subwatersheds are estimated to be in very good geomorphic and water quality condition. However, the conservation approach was assumed to be more appropriate for subwatersheds with strongholds of threatened or endangered fish species. Subwatersheds with GI and WQI rated as Functioning At Risk or Functioning At Unacceptable Risk are appropriate for an active restoration approach, as these subwatersheds are estimated to be in fair to poor geomorphic and water quality condition. Some adjustments in determining the type of restoration were made based on the subwatershed's vulnerability rating (resiliency). See the SWRA Technical for further descriptions on how these adjustments were determined.

Subwatershed Restoration Priority - Findings in the ICBEMP Assessment identified there were more restoration needs than reasonably foreseeable levels of budgets, activities, and staff. In order to make a difference at a landscape scale, a strategically focused restoration effort is needed (Restoration Task Team 2000, USDA Forest Service 2000). The Ecogroup Forests developed a restoration prioritization process to accomplish this strategic need.

Subwatershed restoration prioritization was largely based on the social values identified with beneficial uses serving as surrogates for this indicator, specifically the following:

- *High Priority Subwatersheds* are those that contain: (1) part of stronghold for chinook salmon, sockeye salmon, steelhead trout, bull trout, or native cutthroat trout, OR (2) anadromous fish spawning or rearing habitat, OR (3) a highly isolated local population of bull trout or native cutthroat trout, OR (4) a TMDL in place.

- *Moderate Priority Subwatersheds* are those that contain: (1) any current presence of anadromous species and bull trout, including migratory habitat, OR (2) any current presence of native cutthroat trout species, OR (3) Designated Critical Habitat for Snake River sockeye and chinook salmon, OR (4) a 303(d) water quality impaired water body, OR (5) all or portions of a municipal supply watershed.

- *Low Priority Subwatersheds* are all remaining subwatersheds.

ACS Priority Subwatersheds - High priority subwatersheds were further prioritized to focus recovery efforts and provide a "blue print" as to which should be the highest priority for restoration or conservation during the planning period (next 10-15 years). ACS priority subwatersheds were identified for each subbasin to represent the "highest of the high" in terms of applying management direction and restoration prioritization, especially for short-term recovery objectives. This process is designed to focus management direction and restoration prioritization for the recovery of listed fish species, their habitats, and 303(d) impaired water bodies, and other SWRA resources. Criteria used to select ACS priority subwatersheds were as follows:

- Subwatersheds identified for a "conservation" restoration strategy automatically became ACS priority subwatersheds.
- ACS priority subwatersheds had to be hydrologically linked to either a strong or depressed population of listed species (except in the subbasins without listed fish species; then selection incorporated native cutthroat trout, wood river sculpin or redband trout).
- In subbasins where listed fish species have limited distribution or are absent entirely, emphasis was placed on identifying the subwatersheds with the best aquatic habitat adjacent to those occupied by listed or sensitive fish species.
- There was a conscious attempt to develop a network of well-dispersed ACS priority subwatersheds within the subbasin to help limit the potential impacts of stochastic events on listed fish populations.
- Where appropriate incorporate needs for listed fish species with needs for 303(d) water quality impaired water bodies or municipal supply watersheds.
- Recognition that restoration would be more effective if a full spectrum of activities were focused on a feasible amount of subwatersheds (2-5 per subbasin) within the planning period (10-15 years).

Aquatic Species Characterizations (Issues 3 and 4)

Data from the WARS database were used to identify fish presence/absence, spawning/rearing habitat, and bull trout isolated local populations at the subwatershed scale. This information was compiled for the database over the course of developing the revised Forest Plans from surveys and through discussions with biologists at the District and Forest level. Where previous BAs exist and provide information on presence, status, trends and threats regarding the listed fish, they were used to supplement the multi-scale analyses. The information in these BAs generally came from Forest surveys and inventories. In cases where information was limited, other sources, such as the FWS bull trout draft recovery plan (USDI FWS 2002) and Idaho Department of Fish and Game information, were used.

Information on the status of each population provides a basis for assessing risks from population dynamics associated with replication and synchrony. Replication refers to how many populations occur within a metapopulation. The number of populations that exist within a potential metapopulation, allows for a variety of management options to reestablish populations if one goes extinct. Widespread replication of populations reduces the possibility that a single uncharacteristic event will cause the population to go extinct, while geographically close populations allow metapopulation dynamics to function (McElhany et al. 2000).

Synchrony refers to a populations' spatial component. To best provide for the long-term survival of populations within a subbasin, environmental variation needs to be low and habitats complex. Populations that are in close proximity will likely respond to the same environmental variations (e.g., floods, droughts, etc.) and may be affected in a similar manner. When populations within a metapopulation fluctuate together, their ability to persist amid environmental change decreases. If watershed conditions provide habitat complexity that allows populations to respond differently to the same environmental change, the ability of the metapopulation to persist increases. If watershed conditions provide habitat such that populations are sufficiently distributed to require response to environmental change for only portions of the metapopulation at any given time, the ability for at least a portion of the metapopulation to persist at all times increases as well.

Aquatic Species Categorization (Issue 4)

The following is a brief discussion on how aquatic fish species were categorized within the Ecogroup area for subwatershed restoration prioritization.

Resident Fish Populations - Local resident populations of bull trout were identified and mapped using current species distribution from the most recent data (IWWI, local presence/absence surveys, etc.). Once identified and mapped, they were categorized into stronghold populations, isolated local populations, and depressed populations in marginal habitat as defined below.

Stronghold Populations – Applied to subwatersheds that support populations of fish that are considered by district biologists to be strong based on metapopulations that appear to have stable or increasing populations, all major life stages still present, and populations within a watershed, or within a larger region of which the watershed is a part, that contain at least 5,000 individuals or 500 adults. Stronghold populations probably only apply to resident fish in the Ecogroup. Anadromous subpopulations may not presently meet the definition due to depressed numbers and because not all of their life-stages occur within the Ecogroup. Data for stronghold populations are derived from IWWI and local Forest Service aquatic information; from presence/absence data; and personal knowledge of Forest Fish Biologists.

Isolated Local Populations - These have been defined as a local population (subwatershed scale) of resident fish that does not appear to be able to re-colonize the subwatershed if lost to a stochastic event. This determination is based on: (1) the local population is not hydrologically connected to other local subpopulations within the subbasin, such as where off-Forest stream dewatering has occurred; (2) linkage to other populations is now missing through habitat degradation or barriers; or (3) the only remaining local population that is connected has been rated a presence code of "4" (present, unknown status) in WARS. Isolated local populations can include both strong and depressed subpopulations. For the viability analysis, most isolated local populations were treated as depressed populations because they are at a high risk of decline from natural or management-caused activities and/or eventual inbreeding. Isolated populations were derived by overlaying current fish presence data with the most recent Watershed Advisor Group (WAG) metapopulation delineation from the State of Idaho. Where the local populations met the above definition of being highly isolated, they were so described.

Depressed Populations (Marginal Habitat) - These are areas that currently support depressed populations of resident fish or are currently vacant areas that could conceivably be re-occupied, either because they are naturally fringe habitat or because of past or current habitat degradation. Marginally occupied habitat is important for species recovery in that it can provide room for existing strongholds to expand into, and be used as a conduit between strongholds for providing genetic interchange and opportunity for recruitment if one of the strongholds loses its population

Marginal habitat subwatersheds that support populations of fish that are considered by district biologists to be depressed because the number of individuals is declining; the species occupies less than half of its historic range; a major life-history component (e.g., migratory or resident form) has been eliminated; and/or the population or metapopulation in the subwatershed, or in the larger region of which it is a part, is less than 5,000 individuals or 500 adults.

Anadromous Fish Subpopulations - Subpopulations were identified and mapped using current distribution for the species from the most recent data (IWWI, local presence/absence surveys, etc.). Once identified and mapped, subpopulations were tracked according to IWWI categories as defined below. Most of these fish species, especially the Snake River sockeye salmon, are at very low numbers within the Ecogroup and generally do not qualify as strongholds. However, IWWI data does categorize a few anadromous subwatersheds as strongholds. The IWWI categories include:

- Currently Strong
- Currently Depressed
- Currently Migration
- Currently Absent, Historically Present
- Subwatersheds rated “unknown” and “never present” were not used.

Subwatersheds rated “unknown” and “never present” were not assessed because recovery for theses species may not necessarily emphasize introducing these native fish in watersheds where they historically did not occur. Although those subwatersheds rated as “unknown” may indeed have fish present (or historically supported them), this analysis took a conservative approach and assumed they never supported them.

Descriptions of Matrix Pathways for Subbasin Characterizations (Issues 3 and 4)

Subbasin baseline conditions are described through the use of matrix pathways (see Appendix B in the revised Forest Plans, Matrix of Pathways For Watershed Condition Indicators, for more information). These pathways, and the information sources used for them, are described below. Refer to the Fish Biological Assessment and the SWRA Technical Report for more detailed information on data and analysis methods.

Population Characteristics (Issue 4) – This matrix pathway includes indicators that help describe the overall status of bull trout based on the size, life histories, connectivity, and genetic purity of populations in each subbasin. This pathway applies only to bull trout because indicators were specifically designed in the matrix to reflect key elements needed to characterize the distribution and abundance of bull trout populations as directed by the U.S. Fish and Wildlife Service.

Watershed Conditions (Issues 3 and 4) – Current conditions for soils at the subbasin scale were determined by estimating the "watershed condition" which is one of the Matrix Pathways described in Appendix B of the revised Forest Plans. To characterize overall watershed conditions, the habitat elements and watershed conditions pathways of the matrix were combined under this heading. Road densities and locations, and disturbance history as reflected by Equivalent Clearcut Area (ECA), act to influence habitat parameters such as large woody debris, pool quality and frequency, substrate conditions, riparian quality, etc. Information was available in the WARS database for road densities, and ECA values (harvest history and wildfire) were calculated for all subwatersheds within the Ecogroup Forest administrative boundaries, and were used as a basis for rating overall watershed conditions. Geomorphic integrity ratings for subwatersheds within their respective subbasin were also used in determining the overall subbasin watershed condition.

Subwatershed vulnerability is a criterion developed through the course of Forest Plan revision and provides an indication of the inherent sensitivity (soil erosion and sediment yields) of disturbance on watershed conditions and resiliency or natural ability for restoration. Subwatershed vulnerability (located in the WARS database) was assessed for each subwatershed within the Ecogroup, and was used as an indicator of overall watershed conditions.

Water Quality (Issues 3 and 4) - This matrix pathway encompasses indicators that help describe the overall water quality based on a number of parameters including temperature, sediment in spawning gravels, turbidity, and chemical contamination in each subbasin.

The WARS database was used to tally the number of subwatersheds with 303d listed, water quality limited water bodies (from the IDEQ 1998 list), and TMDLs as a surrogate for the above indicators. This is fairly straightforward and provided the most consistent assessment of water quality across the subbasins. The IDEQ documents identify known pollutants as well.

Where TMDLs are in place, the IDEQ sometimes had subbasin assessments, TMDL plans, and findings that were used to evaluate water quality and to draw conclusions for the basis of the rating. Other information sources used were Forest Service BAs, subbasin plans and watershed assessments, State of Idaho DEQ Beneficial Use Reconnaissance Project data, and local knowledge of impairments to water quality. Water quality integrity ratings for subwatersheds within their respective subbasin were also used in determining the overall subbasin Water Quality.

Habitat Access (Issue 4) - An assumption was made that an unknown number of road/stream crossings in each subbasin at least hinder or impair access because of impassable culverts, fords, collapsed bridges, etc. The WARS database was used to count the number of road crossings in each subwatershed on both perennial and intermittent streams (from a GIS exercise) associated with classified and non-classified roads. The database does not identify how many crossings are actually limiting access, but by identifying subwatersheds with high occurrences of crossings, an indication of those most likely to have fish passage problems can be estimated.

In addition to the database, existing BAs, and knowledge of other crossing or access problems (e.g., dams and diversions) were used to arrive at an evaluation of access conditions.

Channel Conditions and Dynamics (Issues 3 and 4) - This matrix pathway encompasses indicators that help describe the overall status of stream channels based on the average wetted width/depth ratios, streambank condition, and floodplain connectivity in each subbasin.

Damaged stream segments were identified as part of the multi-scale assessment that also included information from the Inland West Watershed Initiative (IWWI) assessment and these data were used as a surrogate for the above indicators to assist in evaluating channel conditions and dynamics. Damaged stream segments are those in which physical, chemical, or biological impacts have caused serious damage to water-related resource values. Seven types of impacts were chosen because they represent nearly all types of damage to water and aquatic related resource values that may occur within the Ecogroup area. The seven types of impacts are: 1) bank damage; 2) sediment loads; 3) channel modification; 4) flow Disruption; 5) thermal change; 6) chemical contamination; and 7) biological stress. Data was obtained from an extensive list of sources, some which include: first screen State-listed impaired or threatened segments from their 319(a) report, 303(d) list, or current 305(b) reports, local forest water and aquatic databases, State DEQ subbasin assessments; ICBEMP data, individual watershed analyses, site-scale NEPA projects, Idaho Department of Water Resource's River Plans, existing BAs and BO's etc. These were used as indicators of altered stream channel conditions.

Where more specific data were available they were included, though broad conclusions across the entire subbasin would not be meaningful based on width-to-depth ratios, bank stabilities, etc. because these can vary widely across the subbasin. Other sources were used (BAs, watershed assessments, etc.) to supplement this information and evaluate channel conditions and dynamics.

Flow/Hydrology (Issues 3 and 4) - This matrix pathway encompasses indicators that help describe the overall hydrology based on changes in peak/base flows and drainage networks within each subbasin.

ECA and road densities can affect flow and hydrologic characteristics and were used as a surrogate of alterations to flow and hydrologic patterns. The damaged segments listed for flow disruptions were used as well. The ECA of a subwatershed affects the streamflow regime of a subwatershed. Stream network increases, as a result of road construction, may have a large impact on the amount and timing of water reaching the stream channel.

Other known disruptions to flow from dams, diversions, and water withdrawals as documented in BAs, IDEQ documents, other Forest Service documents were used to evaluate the level of disruption of normal flow patterns and arrive at a basis for a rating.

Integration of Species and Habitat Information (Issue 4) - At the subbasin scale, general conclusions were made based on all the above information in an attempt to rate each subbasin regarding the overall condition of pathways. Although this sometimes was based on limited information, it was important to establish a general idea of baseline conditions at the subbasin scale, in order to have a benchmark for effects discussions relative to Forest Plan-related actions. An attempt was made to relate baseline conditions to known causes, and their resultant effects. Ratings are general and do not reflect local conditions in all parts of each subbasin.

Current Conditions of SWRA Resources

Soils Resource

Determining the status of soil conditions for the affected area is difficult because of the large variability of inherent conditions and the lack of Ecogroup-wide inventory and monitoring data. In general, greater declines in soil productivity are directly associated with greater loss of soil from erosion and displacement, loss of soil organic matter, changes in vegetation composition, removal or whole trees and branches, and increased bulk density from compaction. Historical factors for declining soil productivity are described above. More recently, large-scale and lethal uncharacteristic wildfires have increased the number of landscapes with declining soil productivity through reduction in effective vegetative ground cover and loss of soil-root strength, which has resulted in increased soil erosion rates. Soil productivity may be higher in areas where wildfire has been suppressed and where organic matter and vegetation have not been removed. However, the unnaturally high amounts of vegetation and large woody debris put these subwatersheds at risk for uncharacteristic wildfire intensity and severity, which can lead to decreased soil productivity because of high rates of erosion, landslides, loss of organic matter, woody debris, and nutrient reservoirs.

The current condition of soils and soil productivity was determined using both the subwatershed and subbasin scales. For example, determination of the subwatershed inherent vulnerability rating and the "geomorphic integrity rating" utilized the subwatershed scale. Ratings were calculated for all of the subwatersheds partially or wholly within the Ecogroup. Description of the overall soil resource condition is depicted using the Matrix Pathway for "watershed condition", which utilized the subbasin scale (see section below, titled "Soil Water Riparian and Aquatic Conditions for Subbasins by Matrix Pathway"). Conditions were estimated for all subwatersheds and 29 subbasins partially or wholly within the Ecogroup area.

Subwatershed Vulnerability and High and Extreme Forest Vegetation Hazard Ratings

Based on criteria described above, there are 169 highly vulnerable subwatersheds within the Ecogroup area. Of these subwatersheds, there are an estimated 82 highly vulnerable subwatersheds that have high or extreme uncharacteristic forest vegetation hazard ratings. Vegetation hazard was based on the potential vegetation group and the current stand structure, density, and composition. See the SWRA Technical Report for more information and maps describing subwatershed vulnerability, and refer to the FEIS, Chapter 3 Vegetation Hazard section for more discussion on vegetation hazard ratings.

Municipal Supply Watersheds
There are an estimated 37 subwatersheds with portions of municipal supply subwatersheds that are partially or wholly within the Ecogroup area. Table SW-2 displays the number of subwatersheds by their respective subbasin. See the SWRA Technical Report for data sources and maps used to identify municipal supply watersheds.

Table SW-2. Ecogroup Municipal Supply Watersheds and Associated Subbasins

Subbasin Name	Number of Municipal Supply Watersheds
Boise-Mores	6
Lower Boise	1
Middle Fork Payette	9
North and Middle Fork Boise	1
North Fork Payette	8
Payette	7
South Fork Payette	2
South Fork Salmon	1
Weiser River	2
Total	**37**

Subwatershed Geomorphic Integrity and Water Quality Integrity
Geomorphic Integrity and Water Quality Integrity ratings are displayed by percent of subwatersheds within Ecogroup subbasins in Table SW-3.

Table SW-3. Ecogroup Subwatershed Geomorphic and Water Quality Integrity Ratings by Percent of Subbasin

Subbasin Name	Geomorphic Integrity			Water Quality Integrity		
	L	M	H	L	M	H
Big Wood River	44	47	9	28	66	6
Boise-Mores	33	57	10	29	65	6
Brownlee Reservoir	68	32	0	14	83	3
C J Strike Reservoir	0	100	0	0	38	62
Camas Creek	0	93	7	33	67	0
Curlew Valley	13	62	25	0	75	25
Goose Creek	23	77	0	35	62	3
Hells Canyon	0	100	0	0	67	33
Lake Walcott	8	75	17	0	75	25
Little Salmon River	58	23	19	15	62	23
Little Wood River	75	25	0	50	50	0
Lower Boise	40	60	0	0	71	29
Lower Middle Fork Salmon	4	7	89	4	18	78
Lower Salmon	22	56	22	0	56	44
Middle Fork Payette	25	50	25	25	67	8
M. Salmon-Chamberlain	7	9	84	7	41	52

Subbasin Name	Geomorphic Integrity			Water Quality Integrity		
	L	M	H	L	M	H
North Fork Payette	47	41	12	19	78	3
North and M. Fork Boise	26	45	29	32	61	7
Northern Great Salt Lake	50	50	0	25	75	0
Payette	71	29	0	17	72	11
Raft River	5	95	0	4	94	3
Salmon Falls Creek	0	100	0	100	0	0
South Fork Boise River	32	66	2	18	82	0
South Fork Payette	12	35	53	6	74	20
South Fork Salmon	36	31	33	24	47	29
Upper Middle Fork Salmon	8	42	50	0	56	44
Upper Salmon	12	76	12	0	88	12
Upper Snake-Rock	0	100	0	50	50	0
Weiser River	73	27	0	30	38	32

H = High, M = Moderate, L = Low

Currently, 21 percent of all the subwatersheds have high Geomorphic Integrity (functioning appropriately, 49 percent have moderate integrity (functioning at risk), and 30 percent have low integrity (functioning at unacceptable risk). For Water Quality Integrity, 19 percent have high integrity, 63 percent have moderate integrity, and 18 percent have low integrity

303(d) Water Quality Limited Water Bodies and TMDLs

As previously identified, determination of both the water quality integrity rating and determination of the subwatershed restoration priority, including ACS priority subwatershed designation, is partially dependent on the presence of either a 303(d) water quality limited water body or TMDL. The following identifies the current condition for these indicators.

Section 303(d) of the Clean Water Act requires states to identify waters not meeting state water quality standards. This list is commonly known as the 303(d) Water Quality Limited Water Bodies. The prescribed remedy for these water bodies is for the states to determine the Total Maximum Daily Load (TMDL) for pollutants, and to develop a plan to reduce these pollutants. The TMDL process has three distinct steps: (1) subbasin assessment, (2) loading analysis, and (3) an implementation plan.

A loading analysis is needed only for those water bodies and their watersheds that were documented in the subbasin assessment to be water quality limited and only for those pollutants causing impairment. In addition to a loading capacity and allocations, a loading analysis sets out a general pollution control strategy and an expected time line for meeting water quality standards. The combination of subbasin assessment and loading analysis constitute the TMDL as required under Section 303(d) of the Clean Water Act.

Currently, there are six subbasins partially or wholly within the Ecogroup with TMDLs approved or waiting approval by the Environmental Protection Agency. They are: South Fork Salmon River, Cascade Reservoir, Middle Fork of the Payette River, Lower Boise River, Lake Walcott, and the Upper Snake-Rock subbasins. There are 75 subwatersheds partially or entirely within these subbasins with TMDLs. The main pollutant source identified is sediment, although nutrients, temperature, and other sources are also noted. Several other TMDLs are in the process of development, and additional TMDLs are expected over the coming decade.

There are currently an estimated 186 subwatersheds partially or entirely within the Ecogroup that contain 303(d) WQL Water bodies listed by the State of Idaho, Department of Environmental Quality (DEQ), as having impairment of designated beneficial uses. A variety of beneficial uses are designated for the water bodies within the Ecogroup. The dominant source of pollutant listed for these impaired water bodies is sediment, although nutrients, temperature, and other sources are also noted [State of Idaho DEQ 1998 303(d) list]. Validation of these streams as being impaired is currently being conducted by the State DEQ, and a number of streams are being considered as not warranted as a 303(d) water quality limited water body. Additional information and a map identifying subwatersheds with TMDLs and 303(d) water quality limited water bodies and their identified pollutant source(s), are in the SWRA Technical Report.

Table SW-4 identifies subbasins and their respective subwatersheds within the affected area with TMDLs or 303(d) water quality limited water bodies. Not all subwatersheds within a TMDL-assigned subbasin have a 303(d) water quality limited water body. Thus, in Table SW-4 some subbasins have more subwatersheds with TMDLs than 303(d) water quality limited water bodies.

Table SW-4. Subbasins and Subwatersheds with TMDLs and 303(d) Water Bodies

Subbasin	Number of Subwatersheds with TMDLs*	Number of Subwatersheds with 303 (d) Water Quality Limited Water Bodies*
Big Wood River	0	11
Boise-Mores	0	9
Brownlee Reservoir	0	5
C J Strike Reservoir	0	1
Camas Creek	0	2
Curlew Valley	0	0
Goose Creek	0	5
Hells Canyon	0	2
Lake Walcott	12	1
Little Salmon River	0	5
Little Wood River	0	2
Lower Boise	5	3
Lower Middle Fork Salmon	0	1
Lower Salmon	0	0
Middle Fork Payette	12	6
Middle Salmon-Chamberlain	0	22
North and Middle Fork Boise	0	3
North Fork Payette	13	9
Northern Great Salt Lake	0	0
Payette	0	0
Raft River	0	1

Subbasin	Number of Subwatersheds with TMDLs*	Number of Subwatersheds with 303 (d) Water Quality Limited Water Bodies*
Salmon Falls Creek	0	3
South Fork Boise River	0	24
South Fork Payette	0	11
South Fork Salmon	19	30
Upper Middle Fork Salmon	0	8
Upper Salmon	0	13
Upper Snake-Rock	14	3
Weiser River	0	6
Totals	**75**	**186**

*Subwatersheds included are either partially or wholly within the Ecogroup

Watershed and Aquatic Recovery Strategy

The ACS priority subwatersheds along with the subwatershed identification of restoration type and priority are spatially identified on the WARS Map (see map packet). This map includes: National Forest Administrative boundaries; subbasins, subwatersheds; and their identification as priority subwatersheds (ACS Priority Subwatersheds; Conservation, High, Moderate, and Low Priorities for Restoration); and appropriate type of restoration (Active, Passive, or Conservation). Table SW-5 identifies by Subbasin the Number of Subwatersheds by Restoration Type, Priority and ACS Priority Subwatersheds.

Table SW-5. Number of Subwatersheds by Restoration Type, Priority and ACS Priority Subwatersheds by Ecogroup Subbasin

Subbasin Name	Active High	Active Moderate	Active Low	Passive High	Passive Moderate	Passive Low	ACS Priority Subwatershed
Big Wood River	0	11	19	0	0	2	3
Boise-Mores	0	17	11	1	0	1	1
Brownlee Reservoir	3	7	18	0	0	0	2
C J Strike Reservoir	0	0	2	0	0	0	0
Camas Creek	0	2	12	0	0	0	1
Curlew Valley	0	0	5	0	0	3	0
Goose Creek	4	6	15	0	0	1	2
Hells Canyon	2	0	0	0	0	0	1
Lake Walcott	8	0	0	4	0	0	0
Little Salmon River	7	14	0	3	0	0	6
Little Wood River	0	2	6	0	0	0	2
Lower Boise	5	0	0	0	0	0	0
Lower M. Fork Salmon	2	0	0	25	0	0	4
Lower Salmon	4	2	0	3	0	0	3
Middle Fork Payette	10	0	0	2	0	0	3
Middle Salmon-Chamberlain	14	3	0	23	5	0	4
North and M. Fork Boise	2	21	1	4	2	0	4
North Fork Payette	12	11	7	2	0	0	1

Subbasin Name	Active High	Active Moderate	Active Low	Passive High	Passive Moderate	Passive Low	ACS Priority Subwatershed
Northern Great Salt Lake	0	0	8	0	0	0	0
Payette	1	9	6	0	0	1	2
Raft River	5	8	29	0	1	0	1
Salmon Falls Creek	0	3	4	0	0	0	0
South Fork Boise River	4	44	11	0	1	0	12
South Fork Payette	4	16	2	2	9	0	5
South Fork Salmon	46	3	0	20	1	0	8
Upper M. Fork Salmon	6	0	0	5	0	0	4
Upper Salmon	32	10	0	6	0	0	18
Upper Snake-Rock	14	0	0	0	0	0	2
Weiser River	2	12	28	1	0	6	3
Totals	**187**	**201**	**184**	**101**	**21**	**14**	**92**

Aquatic Species

Threatened or Endangered Species - Special management emphasis is given to species for which there is a documented viability concern. Species listed under the ESA fall into four categories based on viability concerns: Threatened, Endangered, Proposed, and Candidate. The Forest Service has a legal requirement to maintain or improve habitat conditions for threatened, endangered, and proposed species under the ESA. Administrative direction also exists to maintain or improve conditions for species on the Regional Forester's sensitive species list, and for Management Indicator Species, which are addressed in Forest Service Manual 2670, and Handbook 2609.

Columbia River bull trout were listed as threatened by the FWS on June 10, 1998 (63 FR 31647). The bull trout occurring in the Ecogroup area are part of the Columbia River distinct population segment and are in the Salmon River (entire Salmon River Basin), Southwest Idaho (Boise, Payette and Weiser River Subbasins), Imnaha-Snake River (includes Deep Creek on the Payette NF), and Hells Canyon (includes a small portion on the far western side of the Payette NF) draft FWS recovery plan units. Resident and migratory forms of bull trout occur in streams on all three Ecogroup Forests. In the fall of 2002, the U.S. Fish and Wildlife Service (USFWS) proposed to designate critical habitat for the Klamath River and Columbia River DPS' of bull trout pursuant to the ESA [Federal Register, November 29, 2002 (67 FR 71236)]. Proposed critical habitat includes bull trout habitat across the species' range in Idaho, Montana, Oregon, and Washington. Twenty-five Critical Habitat Sub Units (CHSU) have been delineated.

Snake River sockeye salmon were listed as endangered by NMFS on November 20, 1991 (56 FR 58619). Snake River spring/summer and fall chinook salmon were listed as threatened by the NMFS on April 22, 1992 (57 FR 14653). Snake River steelhead were listed as threatened by the NMFS on August 18, 1997 (62 FR 43937). The NMFS designated critical habitat for Snake River spring/summer and fall chinook salmon and Snake River sockeye salmon on December 28, 1993 (58 FR 68543). Essential Fish Habitat (EFH) has been designated for chinook salmon habitat (67 FR 2343). In the Ecogroup area, EFH overlaps with, and is identical to, designated critical habitat for fall and spring/summer chinook salmon. The effects analysis for critical habitat addresses any potential effects to Essential Fish Habitat.

The salmon and steelhead addressed in this assessment are part of the Snake River Basin Evolutionarily Significant Units (ESUs) for each species. These ESUs are distinctive groups of salmon or steelhead and include multiple spawning populations, some of which occur on the three Forests. The Snake River Basin ESUs for each species contain considerable diversity in their genetic and life history traits, and in habitat features, and extend across a geographic area considerably larger than the Ecogroup. Maintaining the genetic, life history, and habitat feature diversity found within an ESU is critical to maintaining the overall health of the ESU populations. The Federal Register designation of critical habitat specifically defines geographic areas and essential habitat elements.

Biological Opinions have been developed for threatened and endangered species by both regulatory agencies. Biological Opinions have been issued by both regulatory agencies for effects of management actions that include the existing Forest Plans on threatened and endangered fish species. In the absence of recovery plans, these Biological Opinions provide interim goals and actions to recover species. Threatened, endangered, proposed, or candidate species that occur within the Ecogroup area, their locations, and important consideration for management are described in Table SW-6.

Table SW-6. Locations and Factors of Decline for Threatened, Endangered, Proposed, or Candidate Species in the Ecogroup

Common Name	Forest - Subbasins*	Global Rank^	Listing Under ESA	Factors of Decline+ within Some Level of Forest Service Influence
Sockeye salmon	Sawtooth – Upper Salmon subbasin	G5T1	E	Destruction, modification, and fragmentation of habitat and inadequate regulatory mechanism
Spring/summer chinook salmon	All 3 - All subbasins in the Salmon River Basin & Hells Canyon subbasin	G5T1	T	Same as above
Fall chinook salmon	Payette – Lower Salmon and Hells Canyon subbasins	G5T1	T	Same as above
Snake River steelhead	All 3 - All subbasins in the Salmon River Basin & Hells Canyon subbasin	G5T1	T	Same as above
Columbia River bull trout	All 3 - All subbasins in the Salmon River Basin, Boise River Basin, Payette River Basin, and Weiser, Brownlee Reservoir, & Hells Canyon subbasin	G3T2	T	Destruction, modification, and fragmentation of habitat, introduced species, and inadequate regulatory mechanism

* Forests and subbasins in the Ecogroup where this species occurs.
^ Global Rank is a system of ranking the range-wide status of species maintained by State Conservation Data Centers and Natural Heritage Programs throughout North America and several other countries. Numerical rankings range from G1 to G5, where G1 species are considered critically imperiled at the global scale, and G5 species are considered globally widespread, abundant, and secure, although there may be concerns for the viability of local populations. Rankings from T1 to T5 indicate the status of subspecies, varieties, and populations, with T1 species being the most imperiled. Information at the subspecies level is not available for all species. Many researchers believe that species ranked G1-G3 need special consideration or mitigation for management activities that may negatively affect their habitat because their long-term viability is currently a concern (Andelman et al. 2001).
+Factors of decline have been listed for each species under Section 4(a)(1) of the ESA.

Snake River Sockeye Salmon (Oncorhynchus nerka) - Escapement of sockeye salmon to the Snake River has declined dramatically in the last several decades. Adult counts at Ice Harbor Dam declined from 3,170 in 1965 to zero in 1990 (ODFW and WDFW 1998). At Redfish Lake Creek, adult counts dropped from 4,361 in 1955 to fewer than 500 after 1957 (Bjornn et al. 1968). A total of 16 wild sockeye salmon returned to Redfish Lake between 1991 and 2000.

Historically, Snake River sockeye salmon were produced in the Salmon River subbasin in Alturas, Pettit, Redfish, and Stanley Lakes, and in the South Fork Salmon River subbasin in Warm Lake. Sockeye salmon may have been present in one or two other Stanley Basin lakes (Bjornn et al. 1968). Elsewhere in the Snake River Basin, sockeye salmon were produced in Big Payette Lake on the North Fork Payette River (Evermann 1896, Toner 1960, Bjornn et al. 1968, Fulton 1970). Access to the Payette Basin was eliminated in 1923 with the construction of Black Canyon Dam near Emmett, ID. Within the Ecogroup, sockeye salmon migrate through the main Salmon River, and spawn and rear only in Redfish Lake in the Sawtooth NRA on the Sawtooth National Forest. These are the only remaining sockeye salmon in the Snake River Basin.

An intensive recovery program is underway in an attempt to restore sockeye salmon in the upper Salmon River drainage. Although not specifically designated in the 1991 listing, Snake River sockeye salmon produced in the captive broodstock program are included in the listed ESU. Given the dire status of the wild population (16 wild and 264 hatchery-produced adult sockeye returned to the Stanley Basin between 1990 and 2000), NMFS considers the captive broodstock and its progeny essential for recovery. Under their interim policy on artificial propagation (58 FR 17573), the progeny of fish from a listed population that are propagated artificially are considered part of the listed species and are protected under the ESA.

Snake River Spring/Summer Chinook Salmon (Oncorhynchus tshawytscha**)** - Hydropower development in the Columbia River Basin has resulted in migration blockage and inundation of habitat, predator populations have increased due to hydroelectric development that has created ideal foraging areas, and water withdrawal and storage, irrigation diversions, grazing, logging, mining and other activities have modified and destroyed habitat and curtailed the range of these species. Ocean and river harvest, and inadequate regulatory mechanisms are other factors affecting chinook salmon abundance.

In the Ecogroup area, spawning and rearing spring/summer chinook salmon occur in a wide range of streams across the Salmon River Basin. Bevan et al. (1994) estimated the number of wild adult Snake River spring/summer chinook salmon in the late 1800s to be more than 1.5 million fish annually. By the 1950s, the population had declined to an estimated 125,000 adults. Escapement estimates indicate that the population continued to decline through the 1970s. Estimated annual numbers of adult, natural-origin Snake River spring/summer chinook salmon returning to Lower Granite Dam since 1979 varied through the 1980s, but there have been further declines in recent years. Record low returns occurred in 1994 (1,721 fish) and 1995 (1,116 fish). Dam counts were modestly higher from 1996 through 1998, reaching about 8,400 fish in 1998, but declined in 1999 to 3,276 fish.

Snake River Fall Chinook Salmon (Oncorhynchus tshawytscha) - Construction of dams on the Snake River inundated fall chinook spawning habitat and prevented upstream passage to primary production areas for this species in the upper Snake River because fish passage facilities at the dams proved to be inadequate. The distribution of Snake River fall chinook has been dramatically reduced and now represents only a fraction of its former range. Natural fall chinook salmon spawning now occurs primarily in the Snake River below Hells Canyon Dam and in the lower reaches of the main Salmon River.

The distribution of fall chinook in the Ecogroup area is limited. Fall chinook salmon are late spawners (October - November) that generally use large mainstem rivers and tributaries. There is evidence they historically existed in the lower South Fork Salmon River on the Payette National Forest, but they have not been sighted there for twenty years (Burns 1992). Fall chinook salmon do not occur on the Boise or Sawtooth National Forests.

Snake River Steelhead (Oncorhynchus mykiss) - In the Ecogroup area, the range of spawning and rearing steelhead encompasses streams across the Salmon River Basin. Snake River steelhead spawning areas are well isolated from other steelhead populations and include the highest elevations for spawning (up to 2000m) as well as the longest migration distance from the ocean (up to 1500km). Snake River steelhead are summer steelhead, meaning they enter fresh water in a sexually immature condition and require several months to mature and spawn. They are often further classified into A-run and B-run groups based on migration timing, ocean age, and adult size. A-run steelhead are believed to occur throughout the Snake River Basin. B-run fish are thought to be produced only in the Middle Fork Salmon and South Fork Salmon River subbasins in the Ecogroup area. These two subbasins have wild steelhead that are unaffected by hatchery production and are considered strongholds for genetically unique, B-run steelhead populations (Quigley and Arbelbide 1997).

Counts of fish passage at Lower Granite Dam and redd counts conducted annually in Idaho document declines in steelhead numbers. In general, Snake River steelhead abundance declined sharply in the early 1970s, rebuilt modestly from the mid-1970s through the 1980s, and declined again during the 1990s. Total (hatchery + natural) run size for Snake River steelhead has increased since the 1970s, but the increase has resulted from increased production of hatchery fish and there has been a severe recent decline in natural run size. Downward trends and low parr densities indicate a particularly severe problem for B-run steelhead, the loss of which would substantially reduce life history diversity within the ESU.

Forestry, agriculture, mining, and urbanization are listed as factors that have degraded, simplified and fragmented habitat. Water diversions for agriculture, flood control, domestic and hydropower purposes are noted as having greatly reduced or eliminated historically accessible habitat. Loss of habitat complexity has also contributed to the decline of steelhead. Sedimentation from land use activities was specifically mentioned as a primary cause of habitat degradation in the range of this species.

Columbia River Bull Trout (Salvelinus confluentus) - The Columbia River bull trout DPS is represented by relatively widespread subpopulations that have declined in overall range and numbers of fish. Bull trout presently occur in about 45 percent of their historic range in the interior Columbia Basin. Numerous extirpations of local populations have been reported throughout the Columbia River Basin. The Snake River basin is considered a bull trout stronghold by the USFWS, as it is a large area of contiguous habitats.

In the Ecogroup area, resident and migratory forms of bull trout occur on streams across the Salmon River, Boise River and Payette River Basins, and Weiser, Brownlee Reservoir, and Hells Canyon subbasins. Bull trout habitat generally extends beyond other listed fishes. Bull trout have more specific habitat requirements compared to other salmonids (Rieman and McIntyre 1993). Water temperature, cover, channel form and stability, valley form, substrates and migration corridors act to influence bull trout distribution and abundance. Bull trout exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993).

The decline of Columbia River bull trout is primarily due to habitat degradation and fragmentation, blockage of migration corridors, poor water quality, past fishery management practices and the introduction of non-native species (63 FR 31647). Grazing, road construction and maintenance, past over-harvest, inadequacy of existing regulatory mechanisms, and isolation and habitat fragmentation have played a part in the decline of bull trout and their habitat. Widespread introductions of non-native fishes have caused local bull trout declines and extirpations. Negative effects from interactions with introduced non-native species may be the most widespread threat to bull trout in the Columbia River Basin.

In the Ecogroup area, bull trout passage and migration are prevented or inhibited by hydroelectric, flood-control, or irrigation dams. For example, historically, bull trout in the Boise River likely functioned as a single subpopulation, with migratory adults moving among areas that are now isolated because of the construction of Arrowrock and Anderson Ranch Dams. The long-lasting negative effects from past timber management activities and roads are a continuing threat to bull trout because of their impacts on habitat conditions. Although harvest practices have been altered recently to improve protection of aquatic resources, the consequences of past activities continue to affect bull trout and their habitat.

Sensitive Species - At present, two aquatic species within the Ecogroup are on the Forest Service, Intermountain Region sensitive species list. The list is evaluated annually to see if species need to be added or removed. This list has not changed since 1995, and it was used in this analysis because it has strongly influenced past and recent management action conducted under the current Forest Plans.

Species are designated as "sensitive" by the Regional Forester because their population or habitats are trending downward, or because little information is available on their population or habitat trends. The primary purpose of the sensitive species program is to conserve or restore habitat conditions for species that are assumed to be at risk and to prevent them from becoming federally listed under the ESA. Regional and Forest Plan direction is designed to restore, protect, and enhance sensitive species habitat and population viability. The sensitive species, their locations, and important consideration for management are described in Table SW-7.

Table SW-7. Locations and Management Considerations for Sensitive Species and Species of Special Concern in the Ecogroup

Common Name	Forests - Subbasins*	Global Rank	Forest Service Sensitive Species	Management Considerations within Some Level of Forest Service Influence
Westslope cutthroat trout	All 3 – All subbasins in the Salmon River Basin & Hells Canyon subbasin	G4T3	Y	Destruction, modification, and fragmentation of habitat, introduced species, and inadequate regulatory mechanism
Wood River sculpin	Sawtooth – Big Wood, Little Wood and Camas Creek subbasins	G2	Y	Destruction, modification, and fragmentation of habitat and inadequate regulatory mechanism
Yellowstone cutthroat	Sawtooth – Goose Creek, Raft River, and Upper Snake-Rock subbasins	G4T2	N	Destruction, modification, and fragmentation of habitat, introduced species, and inadequate regulatory mechanism

* Forests and subbasins in the Ecogroup where this species occurs.

<u>Westslope Cutthroat Trout (*O. clarki lewsi*)</u> - In the Ecogroup, the range of spawning and rearing westslope cutthroat trout encompasses streams across the Salmon River Basin and portions of the Hells Canyon subbasin. Most strong populations are associated with roadless and wilderness areas. Quigley and Arbelbide (1997) state that remaining populations may be seriously compromised by habitat loss and genetic introgression through hybridization. Local extirpations are evident in some areas. Construction of dams, irrigation diversions, or other migration barriers have isolated or eliminated westslope cutthroat trout habitats that were once available to migratory populations in some areas (Rieman and Apperson 1989). Other factors attributed to the decline of cutthroat include introduction of non-native fish, angler harvest, and habitat degradation from water diversions, grazing, mineral extraction, timber harvesting, and road construction.

Locations of remaining pure-strain populations of westslope cutthroat trout have not been identified within the Ecogroup area. It is assumed that many genetically pure populations occur; however, stocking of high mountain lakes and many stream systems with rainbow and Yellowstone cutthroat have undoubtedly introgressed the native westslope cutthroat populations to varying degrees in many areas. The current state fish management plan (IDFG 2001) notes that sterile fish will be stocked to eliminate potential interbreeding with native fish. A high proportion of high lakes have received sterile trout in the past year.

Westslope cutthroat trout are currently listed as federal and state (Idaho) species of concern and sensitive species by the USFS. This species was petitioned for listing under the Endangered Species Act in 1997, with no finding from the U.S. Fish and Wildlife Service, and again in 1998, with a warranted and initiation of a status review. On April 5, 2000, the United States Fish and Wildlife Service announced their 12-month finding, concluding that after review of all scientific and commercial information, the listing of the westslope cutthroat trout was not warranted. As a result of a U.S. District Court ruling on September 3, 2002, the U.S. Fish and Wildlife Service initiated a new status review for westslope cutthroat, which has not yet concluded.

<u>*Wood River Sculpin (Cottus leiopomus)*</u> - The Wood River sculpin, a small narrowly endemic fish, is known to only occur in the Big and Little Wood River, and Camas Creek subbasins within the Ketchum and Fairfield Ranger Districts of the Sawtooth National Forest. Although its distribution is not extensive, this sculpin appears to be doing well in many of the streams where it occurs, although Simpson and Wallace (1982) feel its existence could be threatened by additional habitat degradation.

The Wood River sculpin was first collected from the Little Wood River near Shoshone, Idaho in 1893 (Gilbert and Evermann 1895). Historically, the range of Wood River Sculpin consisted of all permanent, interconnected waters from the falls on the Malad River upstream into the Little Wood and Big Wood Rivers and their tributaries (Simpson and Wallace 1982). It is likely that the Wood River sculpin was the only sculpin present in the drainage. The Wood River sculpin was more widely distributed in the drainage historically than at present. However, no basin-wide inventories have been conducted to accurately determine its present range.

Wood River sculpin are found in clear, highly oxygenated stream systems with clean rock or gravel substrates. They require cool temperatures and are intolerant of water pollution; thus, their presence in a stream usually indicates high water quality. Bottom dwellers, they often hide under rocks and debris when not active.

Past and present activities on Forest Service administered lands--such as livestock grazing, mining, road building, and timber harvesting--have adversely affected the sculpin wherever sedimentation and water temperatures have been measurably increased above their natural ranges. Off-Forest impacts include sedimentation and dewatering, with irrigation diversions often isolating subpopulations to headwater streams, such as in the East Willow Creek drainage of the Fairfield Ranger District.

Management Indicator Species (MIS) - Management Indictor Species (MIS) can be selected for several reasons, one of which is, "…because their populations are believed to indicate the effects of management activities" (36 CFR 219.19(a)(1). By monitoring and assessing habitat conditions of MIS, managers can estimate effects on other species within similar habitats. However, monitoring of current MIS has indicated that some may not be good indicators for Forest habitat conditions and management activities. Some MIS were selected because they were thought to be good biological indicators, but monitoring has shown this not to be the case (see Preliminary AMS and Forest Five-year Monitoring Reports). Also, some of the MIS migrate off Forest and may be influenced by non-federal activities. For migratory species, a change in population may not represent changes in local Forest habitat conditions. Additional analysis and rationale for changing MIS is contained in the Aquatic MIS process paper in Appendix F to the FEIS.

<u>*Columbia River Bull Trout*</u> - A description of this species and its habitat needs and trends is in the Threatened and Endangered Species section, above. This species is identified as an MIS for the Boise, Payette, and Sawtooth National Forests because of extensive past habitat reduction, and the potential for additional habitat modification in the future.

Species of Special Interest – The following species is addressed in this analysis due to concerns about the low number of pure-strain populations in the Ecogroup area and the known threats to their limited habitat.

<u>*Yellowstone Cutthroat Trout (Oncorhynchus clarki bouvieri)*</u> - This subspecies is the only native trout above Shoshone Falls on the Snake River (Quigley and Arbelbide 1997). It was historically limited to this drainage above the falls (Behnke 1992). Raft River and Goose Creek on the south end of the Sawtooth National Forest, along with their tributaries, historically supported this subspecies (Behnke 1979). Yellowstone cutthroat are now limited to only a few perennial stream systems of the south end of the Sawtooth National Forest, with Eightmile Creek on the Black Pine Division supporting the only laboratory-confirmed pure-strain population remaining (Behnke 1984). According to local IDFG biologists, slightly introgressed populations (an estimated 90-99% pure) are found in most subwatersheds. Many decades of Yellowstone cutthroat stocking, however, have extended some populations out of their historical range. Introduced Yellowstone cutthroat are now well distributed in the central Idaho mountains within the Ecogroup area.

Decline of this subspecies is attributed to introduction of non-native fish, angler harvest, and habitat degradation from water diversions, grazing, mineral extraction, timber harvesting, and road construction. Cutthroats do not compete well with exotic trout, especially where their habitat has been disturbed or if angler pressure is extreme (Quigley and Arbelbide 1997). This is especially true where brook trout introductions have occurred.

<u>Subbasin Baselines - Matrix Pathways for Ecogroup</u>

The Matrix in Appendix B of the revised Forest Plans was used as a template for displaying existing environmental conditions relative to specific pathways. The pathways represent ways by which actions can potentially affect TEPC fish species and SWRA resources. Matrix pathways were previously developed as a tool in making effects calls by the NMFS (1996). Their intent is to provide a simple, yet holistic suite of pathways (and indicators) to characterize environmental baseline conditions. This approach was used to provide a level of uniformity and standardization in the subbasin baseline descriptions.

Fourth-field hydrologic units as delineated by USGS were used to define each subbasin; then baseline conditions were assessed for each subbasin and their respective subwatersheds (6^{th} field HUs) in the action area. There are differences in the amount of information presented for those subbasins within the Ecogroup and those partially or wholly outside the Ecogroup because of a lack of readily available information for portions of the subbasins outside the Ecogroup.

The current environmental conditions in the affected area are not solely due to actions authorized or administered by the Ecogroup Forests. In some cases, land and water uses managed by other entities, and other factors exclusive of the Forests, including natural disturbances, have had a greater effect on pathway conditions at the subbasin scale. This influence can correspond to the type of ownership (state, private, etc.). In addition, factors outside the affected area--such as

Snake River and Columbia River hydropower projects, ocean and river harvest, hatchery influences, and downstream habitat conditions--play a role in determining the status of migratory fish populations that spawn and rear in streams within the Ecogroup area. These factors are recognized as contributing to the decline in numbers of the listed fish.

Subbasin baseline descriptions are organized under their respective River Basins to assist in evaluating current conditions for an entire river basin. Because of the large number of subbasins in the action area, a template was developed that incorporated appropriate baseline information common to all, and available for all, subbasins. The template was also an attempt to impose some consistency in the baseline descriptions. Subbasin baseline conditions are described through the matrix pathways (refer to current condition methodology section). A summary for the baseline conditions for each subbasin is presented below.

Table SW-8. Summary of Baseline Conditions for Subbasins within the Affected Area

River Basin and Subbasin (4th level HUC and Name)	Pathways						
	Population characteristics[1]	Watershed conditions	Water quality	Habitat access	Channel conditions and dynamics	Flow/ hydrology	Integration of species and habitat conditions
Boise River – 17050111, North & Middle Fork Boise	FR	FR	FR	FUR	FR	FR	FR
Boise River – 17050112, Boise-Mores	FUR	FR	FR	FUR	FR	FR	FR
Boise River – 17050113, South Fork Boise River	FR	FR	FR	FUR	FR	FR	FR
Boise River – 17050114, Lower Boise	FUR	FR	FR	FUR	FR	FR	FR
Payette River – 17050115, Middle Snake-Payette	FUR	FR	FUR	FUR	FUR	FUR	FUR
Payette River – 17050120, South Fork Payette	FR	FR	FR	FUR	FR	FR	FR
Payette River – 17050121, Middle Fork Payette	FUR	FR	FUR	FUR	FR	FR	FUR
Payette River – 17050122, Payette River	FUR	FR	FR	FUR	FR	FR	FUR
Payette River – 17050123, North Fork Payette	FUR	FR	FUR	FUR	FR	FR	FUR
Weiser River – 17050124, Weiser River	FR	FR	FR	FR	FR	FR	FR
Upper Middle Snake – 17050201, Brownlee Rsvr.	FUR	FR	FR	FR	FR	FA	FR
Hells Canyon, Snake – 17060101, Hells Canyon	UNK	FA	FR	FR	FA	FA	FR
Lower Middle Snake – 17050101, CJ Strike	--	FR	FR	FA	FR	FR	FR
Salmon River – 17060201, Upper Salmon	FUR	FR	FR	FUR	FR	FR	FR
Salmon River – 17060202, Pahsimeroi	FR	FR	FR	FUR	FR	FUR	FR

River Basin and Subbasin (4th level HUC and Name)	Pathways						
	Population charac-teristics[1]	Water-shed condi-tions	Water quality	Habitat access	Channel conditions and dynamics	Flow/ hydrology	Integration of species and habitat conditions
Salmon River – 17060203, Middle Salmon-Panther	FR	FR	FR	FR	FR	FR	FR
Salmon River – 17060204, Lemhi	FUR	FR	FR	FR	FR	FUR	FUR
Salmon River – 17060205, Upper Middle Fork Salmon[2]	FR	FR	FR	FA	FR	FR	FR
Salmon River – 17060206, Lower Middle Fork Salmon[2]	FR	FR	FA	FA	FR	FR	FR
Salmon River – 17060207, Middle Salmon-Chamberlain[2]	FR	FR	FR	FA	FR	FR	FR
Salmon River – 17060208, South Fork Salmon	FR	FR	FR	FR	FR	FR	FR
Salmon River – 17060209, Lower Salmon	FR	FR	FR	FA	FR	FR	FR
Salmon River – 17060210, Little Salmon River	FR	FR	FUR	FR	FR	FR	FR
Upper Snake – 17040219, Big Wood River	--	FA	FR	FR	FR	FUR	FR
Upper Snake – 17040221, Little Wood River	--	FR	FR	FR	FR	FR	FR
Upper Snake – 17040220, Camas Creek	--	FR	FR	FR	FR	FR	FR
Upper Snake – 17040211, Goose Creek	--	FR	FR	FUR	FR	FUR	FUR
Upper Snake – 17040212, Upper Snake-Rock	--	FR	FUR	FUR	FR	FUR	FUR
Upper Snake – 17040210, Raft River	--	FUR	FR	FUR	FR	FUR	FUR
Upper Snake – 17040213, Salmon Falls	--	FUR	FUR	FUR	FUR	FUR	FUR
Upper Snake – 17040209, Lake Walcott	--	FR	FR	FR	FR	FR	FR
Great Salt Lake – 16020309, Curlew Valley	--	FR	FUR	FUR	FUR	FUR	FUR
Great Salt Lake – 16020308, Northern Great Salt Lake	--	FUR	FR	FR	FR	FUR	FR

[1] For bull trout only.
[2] Ratings are for non-wilderness portions of these subbasins only. The wilderness portions are all considered to be functioning appropriately.
FR = functioning at risk
FA = functioning appropriately
FUR = functioning at an unacceptable risk

When taken together, the pathway ratings for the subbasins generally reflect the environmental conditions of the affected area as a whole, though they do not reflect actual conditions in each stream in the affected area. Few subbasins were found to have any pathways functioning appropriately across an entire 4th field HU, outside of the wilderness. While human impacts occur in the wilderness and can influence the function of pathways in site-specific instances, they were not considered to have a broad enough influence to alter a pathway at the subbasin scale.

Soils Resource - Subbasin Matrix Pathways
Watershed Condition - Most subbasins are functioning at risk for watershed condition (see Table SW-8). Two subbasins (Hells Canyon and Big Wood River) are functioning appropriately and three subbasins (Raft River, Salmon Falls and Curlew Valley) are functioning at an unacceptable level of risk. Watershed conditions in the Raft River, Salmon Falls and Curlew Valley are largely influenced by actions on non-federal land. Livestock grazing, irrigation dams and ditch networks, dispersed recreation, wood gathering, road construction and maintenance, and timber harvest have influenced conditions. These actions have resulted in degraded soil-hydrologic process, reduced protective ground cover, accelerated surface erosion and sediment delivery to streams, altered riparian vegetation, loss potential wood sources, and altered stream channels and flows.

Water and Riparian Resource - Subbasin Matrix Pathways
Water Quality - Water quality degradation generally relates to land disturbances and associated increased erosion and sedimentation. Water quality is functioning at risk in most subbasins. Most subbasins are functioning at risk for watershed condition (see Table SW-8). One subbasin (Lower Middle Fork Salmon) is functioning appropriately and seven subbasins (Salmon Falls, Curlew Valley, Middle-Snake Payette, Middle Fork Payette, North Fork Payette, and Little Salmon) are functioning at an unacceptable level of risk. All of the subbasins identified as functioning at an unacceptable risk (with the exception of the Middle Fork of the Payette River) are largely influenced by actions on non-federal land. Road construction and location, livestock grazing, mining, irrigation dams and ditch networks, dispersed recreation, and timber harvest have influenced water quality conditions. These actions have resulted in degraded water quality negatively affecting beneficial uses and aquatic habitat.

All but three subbasins contain 303(d) water quality limited water bodies. Six subbasins contain subwatersheds associated with TMDLs. Sediment is the main pollutant source contributing to degraded water quality; however, elevated temperatures play a role as well. Heavy metals, nutrient loading, and chemical contamination contribute to degraded water quality in some subbasins.

Channel Conditions and Dynamics **-** This pathway is functioning at risk in all subbasins, with the exception of the Middle-Snake Payette, Curlew Valley, Salmon Falls, and Upper Snake-Rock, where it is functioning at an unacceptable level of risk, and the Hells Canyon subbasin, where it is functioning appropriately. All subbasins have damaged stream segments and all have roads within RCAs. Both of these factors contribute to degraded channel conditions and dynamics in Ecogroup area streams. Hells Canyon is the exception. Some subbasins have high width/depth ratios and bank stabilities less than 80 percent, contributing to risks in the function of the pathway. Human activities, primarily timber harvest, road construction, and grazing, have reduced linkages between flood plains, wetlands, and main channels in Ecogroup subbasins.

Flow/Hydrology **-** The greatest effect to this pathway is the presence of water diversions, impoundments, and channel dewatering. These factors affect this pathway on private land more than on Ecogroup lands, and they seem to influence flows more than ECA and roads, although many subbasins include ECA and road densities/locations as rationale for an “at risk” rating.

Extensive irrigation in some subbasins (e.g., North Fork Payette) is dewatering channels, but this is outside of the Forests' influence. In some subbasins (e.g., the South Fork Salmon River, Lower Middle Fork Salmon River, Big Wood, Upper Snake-Rock, Goose Creek, Curlew valley, Great Northern Salt Lake Desert, and Raft River), there are known flow alterations from water withdrawals that do not generate an effect at the subbasin scale but locally affect flow patterns.

Aquatic Species - Subbasin Matrix Pathways
Population Characteristics (Bull Trout Only) - Dams such as the Hells Canyon Complex, Diversion Dam, Lucky Peak, Arrowrock, Anderson Ranch, Deadwood, and Black Canyon have removed the migratory component of bull trout populations, eliminated connectivity, and fragmented habitat (and eliminated anadromous fish presence) in all but the Salmon River system and a small segment in the Snake River below Hells Canyon, resulting in isolated remaining populations. Smaller dams, diversions and water withdrawals on private land also fragment habitat and decrease connectivity for remaining fish.

In the Salmon Basin, habitat degradation contributes to population characteristics functioning at risk. In this basin, migratory forms are present and connectivity generally exists. However, migration and connectivity impairments--again related to irrigation, dams, and diversions on private land--occur in parts of the Salmon Basin.

Brook trout, and in some cases other non-native fishes, hinder recovery of bull trout populations and put the species at risk in nearly all the subbasins. Generally the assumption was made that if brook trout were present they were a risk to bull trout even if no documentation existed as to displacement or hybridization with bull trout.

Watershed Conditions **-** This pathway includes a number of factors. Most watershed conditions are functioning at risk in all subbasins. Two subbasins (Hells Canyon and Big Wood River) are functioning appropriately and two subbasins (Raft River and Curlew Valley) are functioning at an unacceptable level of risk. Watershed conditions in the Raft River and Curlew Valley are largely influenced by actions on non-federal land. Livestock grazing, irrigation dams and ditch networks, dispersed recreation, wood gathering, road construction and maintenance, and timber harvest have influenced conditions. These actions have resulted in sediment delivery to streams, altered riparian vegetation, loss potential wood sources, altered stream channels and flows, and elimination of connectivity and access.

Continued effects from past land use activities--such as mining, grazing, road construction and locations, and timber harvest--degrade overall watershed conditions. Road densities and road locations often contribute to degraded watershed conditions in Ecogroup subbasins, because of their effect on LWD, riparian conditions, and sediment delivery. Generally, cumulative impacts for past and (less often) present factors are contributing to degraded watershed conditions and a functioning at risk condition. Overall watershed conditions are a result of mostly past activities that have degraded overall conditions, primarily in riparian areas.
Water Quality - Water quality degradation generally relates to land disturbances and associated increased erosion. Mining, and agricultural uses that occur primarily off-Forest degrade water quality as well. Water quality is functioning at risk in most subbasins. The water quality in the Middle Fork and North Fork Payette, Middle-Snake Payette, Curlew Valley, Upper Snake-Rock

subbasins, and the Little Salmon River is functioning at an unacceptable level of risk. One subbasin, the Lower Middle Fork Salmon, has water quality functioning appropriately. All but one or two subbasins contain stream segments listed as impaired in IDEQs 1998 303d list. Seven subbasins contain waters associated with TMDLs. Sediment is contributing to degraded water quality; however, elevated temperatures play a role as well. Heavy metals, nutrient loading, and chemical contamination contribute to degraded water quality in some subbasins.

Habitat Access - Habitat access is the pathway found to most often be functioning at an unacceptable level of risk. Interestingly, it was also the pathway with the most functioning appropriately ratings. Aside from the obvious large dams (mentioned above under population characteristics), there are numerous physical passage impairments and barriers to fish movement in Ecogroup subbasins. In the Boise and Payette Basins, where migration has been eliminated by large dams downstream, the connectivity and access situation is further exacerbated by small dams and impoundments, diversions, numerous road stream crossings, and dewatering of channels in the basins. With the exceptions of road stream crossings, most of these facilities are on private land. Dams that are not under the authority of the Forest Service largely influence the overall condition.

Channel Condition and Dynamics - This pathway is functioning at risk in all subbasins, with the exception of the Middle-Snake Payette, Curlew Valley, and Upper Snake-Rock subbasins, where it is functioning at an unacceptable level of risk, and the Hells Canyon subbasin, where it is functioning appropriately. All subbasins have damaged stream segments (identified through IWWI) and all have roads within RCAs. Both of these factors contribute to degraded channel conditions and dynamics in Ecogroup area streams. Hells Canyon is the exception. Some subbasins have high width/depth ratios and bank stabilities less than 80 percent, contributing to risks in the function of the pathway. Human activities, primarily timber harvest, road construction, and grazing, have reduced linkages between flood plains, wetlands, and main channels in Ecogroup subbasins.

Flow/Hydrology - The greatest effect to this pathway is the presence of water diversions, impoundments, and channel dewatering. These factors affect this pathway on private land more than on Ecogroup lands. These factors seem to influence flows more than ECA and roads, although many subbasins include ECA and road densities and locations as rationale for an “at risk” rating. Extensive irrigation in some subbasins (e.g., the Pahsimeroi) is known to dewater channels but this is outside of the Forests’ influence. In some subbasins, there are known, local flow alterations from water withdrawals that do not generate an effect at the entire subbasin scale but locally affect flow patterns (e.g., the South Fork Salmon River, Lower Middle Fork Salmon River, Big Wood, Upper Snake-Rock, Goose Creek, Curlew valley, Great Northern Salt Lake Desert, and Raft River).

Integration of Species and Habitat Conditions - This composite pathway is found to be functioning at an unacceptable level of risk in subbasins within the Payette River Basin, and Lemhi, Upper Snake-Rock, Goose Creek, Curlew Valley and Raft River subbasins, and is functioning at risk in all other subbasins. Ratings generally repeated the findings for the preceding pathways of effects, with similar rationale. The overall depressed status of listed fish populations contributes to the functioning of this pathway. A cumulative degradation of individual habitat pathways, leading to an overall decrease in the suitability of the habitat to support listed fish species, causes this pathway to be functioning at risk as well.

ENVIRONMENTAL CONSEQUENCES

Effects Common to All Alternatives

Resource Protection Methods

Resource protection has been integrated into soil, water, riparian, and aquatic management direction at various scales, from broad scale (laws, regulations, policies) to Forest-wide (Forest Plan direction) to site-specific (Forest Plan implementation). This protection and direction has been designed to maintain or improve these resources and associated beneficial uses, depending on their current conditions. Land management activities on federally managed lands are conducted only after appropriate site-specific NEPA analysis has been completed. Such analysis is required to describe the direct, indirect and cumulative impacts of the site-specific alternatives on adjacent lands and resources, including watersheds. Subsequent NEPA analysis will provide opportunities to detect and minimize direct, indirect, and cumulative environmental effects that cannot be specifically determined at the large scale of this EIS.

Laws, Regulations, and Policies - Numerous laws, regulations, and policies govern the use and administration of soil, water, riparian, and aquatic (SWRA) resources on National Forest administered lands. Congress has passed legislation to protect and manage these resources, and these laws influence the Forest Service's authority and compliance for management of resources on National Forest System lands. Some key legislation—such as the Clean Water Act, Executive Orders 11988 and 11990, and the Endangered Species Act—is briefly described in Appendix H to the revised Forest Plans.

These laws are interpreted into National and Regional regulations and policies to help federal agencies follow the intent of the laws. Regulations and policies developed from the laws that most influence the management of Forest wildlife resources are 36 CFR 219.19 Planning regulations, 1500 NEPA regulations, and the 2500, 2600, and 3500 sections of Forest Service Manual and Handbook direction. Agency direction, in turn, influences finer-scale analysis, biological assessments, inventories, and monitoring. The intent of these fine-scale activities is to make better management decisions based on local information to maintain or improve watershed conditions and habitats for species with identified concerns. All land management activities occurring on National Forest System lands must comply with these laws, regulations, and policies, which are intended to provide general guidance for the implementation and management of SWRA resources.

Forest Plan Direction – Management direction generally takes three forms in the Forest Plans: (1) Forest-wide direction that applies to the entire Forest, (2) Management Area direction that applies to specific Management Areas, and (3) MPC assignment that provides prescriptive emphasis and direction for each area where a particular MPC is applied across the Forest. Together, these components provide a layered set of direction and emphasis for resource management.

Forest Plan direction is different for the no action alternative (1B) than it is for the action alternatives (2-7). The no action alternative would continue management strategies under the original Forest Plans (USDA Forest Service 1987, 1988, 1990), as amended to include prescriptive standards and conservation measures in Pacfish, Infish, and Biological Opinions for listed fish species. These prescriptive standards and conservation measures provide a very high level of temporary and short-term SWRA resource protection aimed at halting further degradation from specific management activities, but they have been inconsistently implemented as in some cases they lack clear direction and definitions of key terms. Furthermore, as identified in the 1995 and 1998 BOs, they generally lack direction for long-term resource restoration or recovery. The reason for this is that the measures were specifically designed as short-term interim protection until long-term strategies could be put in place, either through Forest Plan revision or similar planning methods. The measures were applied to the original Plans without any attempt at integration with the existing Plan direction. Thus, the Forests have subsequently found that original plan direction is often contradicted by these conservation measures.

For example, although the original plans have long-term goals and objectives for SWRA resources, these goals and objectives have not always been aggressively pursued or achieved because of the strict short-term protection measures. Indeed, the Forests have found the implementation of any ground-disturbing project or activity, including SWRA restoration, to be at times problematic under these conservation measures because the measures have been written and interpreted in such a way that they often do not allow for measurable temporary or short-term impacts in order to achieve long-term management goals and objectives.

Forest plan direction for the action alternatives, found in Chapter III of the revised Forest Plans, was developed to address the shortcomings in the current direction while providing a very high level of SWRA resource protection. The action alternatives have been designed to allow for some temporary or short-term impacts in order to achieve long-term resource restoration or maintenance goals and objectives. Examples of this are found in SWRA Standards 1 and 4:

> 1) Management actions shall be designed in a manner that maintains or restores water quality to fully support beneficial uses and native and desired non-native fish species and their habitat, except as allowed under SWRA Standard 4 below. Use the MATRIX located in Appendix B to assist in determining compliance with this standard.
>
> 4) Management actions will neither degrade nor retard attainment of properly functioning soil, water, riparian, and aquatic desired conditions, except:
>
> - Where outweighed by demonstrable short- or long-term benefits to watershed resource conditions; or

- Where the Forest Service has limited authority (e.g., access roads, hydropower, etc.). In these cases, the Forest Service shall work with permittee(s) to minimize the degradation of watershed resource conditions.

Use the MATRIX located in Appendix B to assist in determining compliance with this standard.

These standards protect SWRA resources by restricting actions that would degrade properly functioning conditions, while allowing actions to occur that would benefit but not degrade SWRA resource conditions over the long term. This management strategy has been integrated throughout revised management direction at the Forest-wide, MPC, and Management Area levels. Management prescriptions and other resource areas have similar direction to help avoid, minimize, or mitigate potential management activity impacts to SWRA resources. A TEPC Species section has also been added to the Forest-wide direction to provide special emphasis and protection for aquatic and terrestrial species of concern across all resource areas.

Another significant Forest Plan difference between the no action and the action alternatives is found in the management emphasis associated with MPCs. Special management prescriptions have been developed for the revised plans to emphasize management for passive (MPC 3.1) and active (MPC 3.2) restoration and maintenance of aquatic, terrestrial, and hydrologic resources. These MPCs have associated standards and guidelines that are designed to provide additional protection for these resources. In particular, the first standard for each MPC states:

MPC 3.1
Standard - Management actions, including salvage harvest, may only degrade aquatic, terrestrial, and watershed resource conditions in the temporary time period (up to 3 years), and must be designed to avoid resource degradation in the short term (3-15 years) and long term (greater than 15 years). Degrade and degradation are defined in the glossary.

MPC 3.2
Standard - Management actions, including salvage harvest, may only degrade aquatic, terrestrial, and watershed resource conditions in the temporary (up to 3 years) or short-term time periods, and must be designed to avoid resource degradation in the long term (greater than 15 years).

Different combinations and amounts of these two MPCs were applied to the action alternatives to indicate shifts in management emphasis related to aquatic, terrestrial, and hydrologic resources. However, these MPCs and their associated emphasis and direction are not found in, and do not apply to, the no action alternative (1B).

Besides more comprehensive and integrated direction and emphasis for SWRA resources, the revised Plans—and therefore the action alternatives—provide a blueprint for long-term restoration, recovery, and maintenance of soil, water, riparian, and aquatic resource conditions. This blue print is called the Aquatic Conservation Strategy (ACS) and it is described in the ACS section, below.

Forest Plan Implementation - Appropriate management and restoration of SWRA resources generally depends on current and site-specific information about existing biophysical conditions, historical conditions, desired conditions, and social needs. These factors are not easily addressed at the programmatic level, or may be similar to all alternatives. Land management activities with the potential for disturbing or restoring these resources will be assessed through a combination of mid-scale watershed-based analyses, development of water quality restoration plans, biological evaluations and assessments, inventory and monitoring, and site-specific NEPA analysis. Through this process, which is the same for all alternatives, management decisions for SWRA resources would be made to address concerns in a timely, effective, and site-specific manner that involves the Forest Service, other agencies, governments, tribes, permittees, contractors, and the public in land management actions.

Aquatic Conservation Strategy (ACS) - The ACS has eight components that provide direction to maintain and restore characteristics of healthy, functioning watersheds, riparian areas, and associated fish habitats. How the ACS components are applied at the subwatershed and site-specific levels will affect the types and outcomes of management actions and will therefore be an overriding factor that influences potential effects for SWRA resources.

Because the ACS was developed for the revised Forest Plans, it applies to the action alternatives (2-7) but not to Alternative 1B, no action. However, there are elements of the ACS (management direction, monitoring plans, multi-scale analysis, RHCA delineation) that also occur in the original Forest Plans as amended, and therefore Alternative 1B. This section briefly describes the eight components of the ACS and how they help provide for recovery and restoration of SWRA resources. This section will also briefly describe those ACS components that exist under the interim Pacfish and Infish strategies and listed fish species Biological Opinions for Alternative 1B. For more detailed descriptions of the ACS components, see Section III.E in the Biological Assessment for the Southwest Idaho Ecogroup Forest Plan Revision (2003). A more detailed discussion of the ACS under Alternative 1B can be found in the SWRA technical report.

The ACS is a long-term strategy to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within lands administered by the Ecogroup Forests. Embedded within the ACS, Forest Plan direction provides policy guidance and requirements. The eight ACS components are identified below.

Component 1: Goals to Maintain and Restore SWRA Resources – Numerous Forest-wide and Management Area SWRA resource goals and objectives have been created that spatially and temporally identify restoration prioritization based on the long- and short-term recovery needs of listed fish species and the de-listing of water quality impaired water bodies. These goals have been developed to achieve the desired conditions described in the TEPC Species, SWRA Resources, and Desired Conditions Common to All Resources sections in Chapter III of the Forest Plans. SWRA resource goals have been coordinated and integrated with the goals of other resource areas to establish a vision of management direction that reduces threats and promotes healthy, functioning ecosystems, watersheds, riparian areas, and fish habitats.

Resource goals of the Pacfish and Infish strategies are similar to the SWRA and TEPC goals under the action alternatives. These goals give general direction to maintain and restore characteristics of healthy, functioning watersheds, riparian areas, and associated fish habitats. However, goals under Alternative 1B have not been integrated with other resources and have not created a common vision to reduce threats and promote healthy, functioning ecosystems.

Component 2: Watershed Condition Indicators (WCIs) for SWRA Resources - WCIs, detailed in Appendix B of the Forest Plans, identify various biological and physical components of aquatic systems and terrestrial uplands that influence riparian functions and ecological processes. The WCIs are organized into eight Pathways that represent conditions or processes related to SWRA resources. Together, they provide a process to identify how management actions may influence the condition and trend of SWRA resources, and a decision framework to help ensure that management actions will not retard or prevent attainment of properly functioning SWRA conditions. The WCIs can also be used as a tool in making ESA determinations of effects to listed fish species, and as a benchmark by which changes to SWRA conditions from management activities can be measured over time.

Interim Riparian Management Objectives (RMOs) were included in Pacfish and Infish to halt degradation of aquatic resources. These indicators were intended to serve as default "target" values that, when achieved, would provide a high level of habitat diversity and complexity to meet the needs of the fish community inhabiting a watershed. Effective indicators of stream habitat condition would provide criteria against which progress toward attainment of riparian goals could be measured.

Component 3: Delineation of Riparian Conservation Areas (RCAs) - RCAs contribute to the integrity of aquatic ecosystems by (1) influencing the delivery of coarse sediment, organic matter and woody debris to streams; (2) providing root strength for channel stability; (3) shading the stream; and (4) protecting water quality. Because riparian areas are so important for protecting the integrity of aquatic ecosystems, an entire suite of RCA-related management direction has been developed for the revised Forest Plans. Delineation of these key areas is described in Appendix B to the Forest Plans, "Guidance for Delineation and Management of Riparian Conservation Areas." This delineation will help ensure that site-specific riparian function and ecological processes are maintained or restored.

Under Infish and Pacfish, protection and management of RHCAs is a principal means by which the riparian goals and RMOs may be attained. As with the RMOs, default widths of RHCAs identified in the strategies can be modified using watershed or site-specific analysis. However, these strategies provide little guidance on the level of documentation and rationale required to redefine RHCA boundary widths or justify activities within RHCA boundaries.

Component 4: Objectives, Standards, and Guidelines for Management of SWRA Resources, including RCAs - The objectives, standards, and guidelines to maintain and restore SWRA resources provide protection necessary to conserve listed fish species and water quality, and direction to maintain or restore priority subwatersheds. Together, this direction provides the operating sideboards for management activities designed to achieve SWRA and other resource goals described in the Forest Plan (see ACS Component 1). SWRA objectives, standards, and guidelines were coordinated and integrated with direction for other resource areas to ensure compatibility and consistency in implementation.

Objectives, standards, and guidelines under Infish and Pacfish provide a similar level of protection as management direction under the action alternatives. However, these interim strategies provide virtually no allowance for short-term impacts. The RHCA can be so restrictive that it is very difficult to implement long-term restoration activities without violating some protection standards.

Component 5: Determination of Priority Subwatersheds within Subbasins – ACS priority subwatersheds have been identified that provide a pattern of protection and restoration across the Forest for the recovery of threatened and endangered fish species, the full support of beneficial uses and subsequent de-listing of 303(d) water quality impaired water bodies, and the restoration and maintenance of SWRA resources. The process used to identify ACS priority subwatersheds for the ACS is described in Section III (E)(6) of the BA for the SWIE Forest Plan Revision. ACS priority subwatersheds have the highest priority for restoration, monitoring, and future multi-scale assessments. In addition, each ACS priority subwatershed is identified in its respective management area, and management area direction provides specific restoration objectives and management consideration during the planning and implementation of management actions.

Infish and Pacfish interim strategies designate key and priority watersheds. However, the current list of designated key and priority watersheds does not include nor prioritize all high quality areas that are needed to adequately conserve and recover bull trout. The key and priority watershed network identified in Pacfish and Infish is based on direction to complete watershed analysis for project-related work. The interim strategies also lack a step-down process to identify priority subwatersheds, the type of restoration needed, and subwatershed restoration prioritization.

Component 6: Multi-Scale Analyses of Subbasins and Subwatersheds - The Forests completed multi-scale Properly Functioning Condition (PFC) assessments that provide a multi-scale connectivity between each subbasin and its subwatersheds, and identify current and potential population status, upland and aquatic conditions and restoration needs, and management risks and opportunities to meet broad-scale and mid-scale goals through site-specific management actions. Assessments show how each subwatershed contributes to recovery of a listed species or impaired water bodies within a subbasin. As such, they provide interim recovery strategies until formal listed fish species recover or TMDL plans are issued. The results of the multi-scale assessment have been incorporated into the revised Forest Plans in the form of Forest-wide objectives, standards and guides, and management area objectives for restoration and recovery.

To effectively prioritize key watersheds and prioritize/coordinate restoration activities within those watersheds across the range listed fish species, NFMS and FWS identified the need for subbasin assessments and watershed analysis. To address this need, the NMFS and FWS 1998 BOs for steelhead and bull trout called for completion of at least one subbasin assessment and watershed analysis per National Forest per year. The purpose of the subbasin assessment was to identify where to prioritize subsequent watersheds for watershed analysis in support of implementing watershed restoration projects. The Ecogroup determined that in order to develop a watershed and recovery strategy for the forest plan revision, a more timely and comprehensive multi-scale assessment was needed. This multi-scale assessment was completed and the results incorporated into the forest planning process as identified above.

Component 7: Determination of the Appropriate Type of Subwatershed Restoration and Prioritization – This component identifies active, passive, and conservation restoration strategies based on subwatershed geomorphic integrity, water quality integrity, aquatic integrity, and vulnerability ratings. Together, these ratings provide the information needed to identify the current condition of a subwatershed and the capacity of a subwatershed to restore itself naturally to a desired condition. The ratings also indicate the acceptable or needed time period for restoration in order to determine the type of approach (restoration or conservation) to be used. Recovery and restoration activities are prioritized based on the presence and sensitivity of listed fish species, impaired water bodies, municipal supply watersheds, and the resiliency of ecosystem processes within the subwatershed. This process consistently applies appropriate restoration prioritization to all subwatersheds across the Ecogroup area.

Neither Pacfish nor Infish include a restoration plan or a process to develop a restoration plan, given the expected short time period for implementation of these interim strategies. Both strategies assume no additional funding would be available for watershed restoration, but that some existing funds may be targeted to initiate a watershed restoration program. No specific guidance, however, is given on how to prioritize restoration efforts. Both strategies assume that watershed analysis would be used to establish restoration priorities for each watershed, and that key and priority watersheds would have the highest priority for restoration efforts.

Component 8: Monitoring and Adaptive Management Provisions – The monitoring plans and adaptive management found in the revised Forest Plans provide a feedback loop that gives managers the information necessary to make appropriate adjustments to Forest activities and programs. If monitoring finds that restoration or mitigation is ineffective, or desired conditions are not being maintained, changes to management practices can be implemented to correct the situation. Adaptive management provides the mechanism to modify management actions in response to monitoring and evaluation, changes in laws or regulations, or new information—including the ability to make appropriate modifications to restoration direction, mitigation measures, budgets, and monitoring approaches. See Chapter IV in the revised Forest Plans for more detailed information.

Pacfish and Infish were interim strategies and thus did not place a high emphasis on monitoring. Monitoring to assess if protective measures were effective to attain RMOs was a lower priority due to the short time frame of the interim direction. However, the NMFS and USFWS BOs led to the development of a coordinated monitoring effort (Integrated Implementation Monitoring Module, or IIT) over the Pacfish and Infish areas. This monitoring effort provides similar feedback loops as the action alternatives, which incorporate the IIT monitoring strategy that can be used to modify management activities.

<u>Summary</u> - The eight components of the ACS are designed to work in concert to maintain and restore the productivity and resilience of watersheds and their associated aquatic ecosystems. The ACS provides a scientific basis for protecting aquatic ecosystems; promoting a comprehensive short and long-term recovery of listed fish species; restoring aquatic habitats and surrounding terrestrial uplands; restoring beneficial uses leading to the de-listing of 303(d) water quality impaired water bodies; and planning for sustainable resource management. In essence, this strategy integrates many of the goals and objectives of both the Endangered Species Act and the Clean Water Act.

<u>General Effects</u>

Although the Resource Protection Methods above would greatly reduce or minimize any potential effects from Forest Service management activities that may occur in the next planning period, this analysis assumes that some level of effects would still occur when and if these activities or uses occur. Put another way, certain activities or uses produce certain effects to SWRA resources. For example, ATVs crossing through streams have effects on the streams. The Forest Service can mitigate those effects to acceptable levels by designating ATV trails, prohibiting use in sensitive areas, providing bridges at certain crossings, relocating trails, and other methods, but the agency cannot guarantee that no ATV will ever cross a stream, especially when ATV use is allowed on the Forests. As long as the use is occurring, it will have some level of impacts to water quality and fish habitat, regardless of the resource protection methods applied. The ESA, CWA, and other SWRA resource-related protection methods (see above) recognize that some level of unavoidable impacts will occur on federal lands, and they provide measures for addressing those impacts.

General types of expected or unavoidable impacts are described by resource area, below. The following also identifies the issues to which these effects apply and when the potential level of these effects may vary by alternative, which are analyzed in the section on Direct and Indirect Effects by Alternative. The effects descriptions focus on management activities or uses as they relate to SWRA resources.

Natural events are not addressed here, except where events are directly influenced by management activities, such as uncharacteristic wildfire. Natural disturbance events—such as wildfire, landslides, windstorms, floods, and drought—may result in temporary, short, or long-term effects on SWRA resources. However, these sorts of effects from natural events also create the diversity and dynamics for healthy and fully functioning habitats. When resources and ecosystems are resilient and within HRV, they can absorb these effects and recover in shorter periods of time. However, when SWRA resources have been chronically disturbed by ongoing management activities, effects can be substantially greater and last longer

A more detailed discussion of how specific Forest-wide and MPC management direction addresses general effects can be found in Chapter VI of the Biological Assessment (BA, Chapter VI, Fisheries, *Effects Analysis*).

Rangeland Resources - Livestock grazing, particularly over-grazing, can lead to a reduction of soil structure, soil compaction, less soil-water storage, accelerated soil erosion, and damage or loss of vegetative cover. Roberson, 1996, identifies that excessive surface soil erosion has profound effects on soil productivity and riparian function and processes. This can lead to changes in the composition of riparian species from plants with deep soil-holding roots to less desirable, shallow-rooted species. Loss of streamside vegetation can increase stream temperature, and decrease sediment filtration capability. Soil compaction, changes to riparian vegetation, and channel widening or down cutting can cause changes to water infiltration, retention, and base flows. These conditions can cause less water to be available to instream habitat during low flow conditions.

Increased sedimentation from grazing, particularly streambank trampling, can lead to increased bank erosion and channel widening. Grazing can also compact spawning substrates, collapse undercut banks, destabilized stream banks, and cause localized reduction or removal of herbaceous and woody vegetation along stream banks and within riparian areas (Platts 1991). If delivered in sufficient quantities, grazing-related sedimentation can fill interstitial spaces in stream bed material, impeding water flow through redds, reducing dissolved oxygen levels, and restricting removal of wastes from redds. These conditions may lead to increased embryo and fry mortality (Bjornn and Reiser 1991). Sedimentation, especially in low-gradient channels, can also lead to the filling of rearing habitat (e.g., pool, glides, etc.).

All the Resource Protection Methods would mitigate these types of general effects under all alternatives. However, it is assumed that temporary impacts (disturbance or trampling of redds, localized bank erosion, channel widening, and pool filling) would still occur where grazing use and activities are allowed due to the continued presence of cattle or sheep.

Potential Effects from MPCs and Uses – Impacts from grazing may vary by alternative, depending on the amount of suitable rangeland acres and the grazing management strategies used on those acres, as reflected by MPC assignments. These indicators are used to display effects by alternative for Issues 3 and 4 in the Direct and Indirect Effects section below.

Recreation Resources - General effects from recreational use, construction, and maintenance to SWRA resources can include undesirable changes to: (1) upland and riparian soil and vegetation conditions, causing increased erosion and runoff, decreased soil-hydrologic function, loss of vegetative cover and wood recruitment, and reduced water quality; (2) stream morphology, water quality, streamflow, and substrate; and (3) water quality from spills of fuel, oil, cleaning materials or human waste associated with equipment, and the pumping of toilets. Other specific effects are described below.

Non-motorized and motorized watercraft use can "disturb" or "stress" adult and juvenile fish. Typical activities associated with non-motorized use include floating, wading, and swimming in areas where fish are holding, rearing, or spawning. Studies conducted on the Rogue River have shown that juvenile salmon and steelhead passed by non-motorized watercraft exhibited both behavioral and physiological signs of stress (Satterthwaite 1995). The energy expended by juvenile salmonids reacting to passing watercraft may result in a reduction in energy available for growth and development. A decrease in available energy stores may also reduce their effectiveness in competing for food, defending territories, or spawning.

Streambank trampling, camping along the stream's edge, heavy fishing, and off-road vehicle use usually result in the loss of vegetation within riparian areas. Loss of vegetation from shorelines, wetlands, or steep slopes can cause erosion and pollution problems (Burden and Randerson 1972, Gilliom et al. 1980, Quigley and Arbelbide 1997).

Trail maintenance can affect large wood recruitment and function that influences stream channel morphology and aquatic habitat. Bucking out fallen trees can reduce the tree's length and sever the bole from its root wad. Smaller tree lengths are not likely to contribute as much to stream channel stability and are more likely to be washed out during high stream flow events. Smaller instream wood will also delay the recovery of channel features needed to maintain habitat for aquatic species, including overhead cover and low-velocity refugia during high-flow events.

All the Resource Protection Methods would mitigate these types of general effects under all alternatives. However, it is assumed that temporary and short-term impacts to fish, riparian vegetation, woody debris, and water quality would still occur where recreation use and activities are allowed. Existing recreational facilities and actions within or affecting RCAs may need to be modified, discontinued, or relocated if they are not maintaining fully functional aquatic/riparian conditions and processes, or improving conditions and processes. Modification or relocating facilities may cause temporary affects to the above-mentioned indicators. Where facilities cannot be located outside of RCAs, effects would be minimized to the greatest extent possible, but not completely eliminated.

Potential Effects from MPCs and Uses – This level of use is generally not expected to vary much by alternative, as described in the Recreation Resources section of Chapter 3. The exception to this is motorized recreation use, which would be prohibited in recommended wilderness areas under Alternatives 4 and 6. This indicator is used to display effects by alternative for Issue 4 in the Direct and Indirect Effects section below.

While impacts do not vary by alternative significantly, they do vary between subbasins. Subbasins with more recreational sites, trails, and roads in RCAs have a greater potential for impacts to SWRA resources. Subbasins with the highest recreational activities in RCAs are displayed in the table below. Effects in high activity subbasins have the potential to be in conflict more with SWRA resources. Furthermore, where there is greater use, there is a greater potential for temporary and short-term effects from disturbance to fish/redds, stream bank trampling, wood, sediment, and loss of riparian vegetation.

Table SW-9. Existing Recreational Use in Each Subbasin by Level of Activity

High Activity Subbasins	Moderate Activity Subbasins	Low Activity Subbasins
Big Wood River	Brownlee Reservoir	CJ Strike Reservoir
Boise-Mores	Lake Walcott	Camas Creek
Middle Fork Payette	Little Salmon River	Curlew Valley
Upper Snake-Rock	Little Wood River	Goose Creek
North and Middle Fork Boise	Lower Middle Fork Salmon	Hells Canyon
North Fork Payette	Lower Salmon	Lower Boise
South Fork Boise	Middle Salmon-Chamberlain	Northern Great Salt Lake
South Fork Payette	Payette	Salmon Falls Creek
South Fork Salmon	Raft River	Upper Middle Fork Salmon
Upper Salmon	Weiser River	

Lands and Special Uses - It is difficult to assess the effects that may occur within this category because of the large variety of projects that may be permitted under the lands program. Therefore, this effects discussion only touches upon some permitted activities. Forest Service permits can also lead to interrelated and interdependent effects on private lands that are enabled by issuing a road use permit or right-of-way grant. However, a discussion of these effects is beyond the scope of this document.

Special-use permits can allow for hatchery facilities or fish stocking by State fish and game agencies. Stocking can have many biological effects, including increased competition to aquatic organisms and hybridization with native fish. High fish densities from stocking can attract heavier fishing pressure, which can lead to over-harvest of wild fish (Quigley and Arbelbide 1997).

Accelerated soil erosion, loss of long-term soil productivity, stream sediment, and turbidity can increase due to increased road activity from issuance of road use permits or granting of right-of-ways. Road-related effects are discussed under "Timberland/Vegetation Resources" below.

Permitted water diversions can entrain fish if they are not properly screened, and fish can be impinged against screens. Water diversion can weaken juvenile fish as they try to escape higher velocities and redirected flows. This can also lead to mortality of fish as they are exposed to higher water temperatures or dewatering in irrigation ditches. Water diversions can also inhibit the passage of adult and juvenile fish by redirecting flows, dewatering streams, or entrainment.

Water withdrawals can affect summer stream temperatures by ponding water, reducing water depth and volume, and transferring water to an open ditch. Water withdrawals can also increase sediment delivery to streams by changing stream hydrology, causing bank erosion and structural failures of ditches or pipes, which can result in gullying or erosion.

Permitted power and telephone lines require vegetation to be cleared, usually 10 to 50 feet either side of the lines. Clearing brush and trees in riparian reserves may increase solar radiation to streams and the forest floor. The precise effects to water temperature will depend on how close to the stream trees are treated, how many trees are treated at a given site, and how much vegetation is currently available to shade the stream at the site and at upstream reaches. The limbing, topping, or removal of hazard trees near utility lines can also reduce in-channel wood.

All the Resource Protection Methods would mitigate these types of general effects under all alternatives. However, it is assumed that temporary and short-term impacts would still occur where special uses are allowed or mandated. Actions may also occur where the risk of short-term effects is worth taking because there would be significant benefits to watershed resource conditions over the long term. Existing facilities and actions within or affecting RCAs may need to be modified, discontinued, or relocated if they are not maintaining or improving fully functional aquatic/riparian conditions and processes. Modification or relocation of facilities may cause temporary affects. Where facilities cannot be located outside of RCAs, effects would be minimized to the greatest extent possible, but not completely eliminated.

There would also be other circumstances where the Forest Service has limited authority under the Federal Power Act for hydroelectric facilities and ANILCA access authorizations. Effects from these actions would likely to continue due to limited discretion to fully mitigate effects.

Potential Effects from MPCs and Uses – The type of activity associated with special uses is typically of a low and dispersed nature, and it is not expected to vary by alternative. Predicting where future permits may be issued is also problematic because permits are dependent on requests made by Forest users. Therefore, this analysis will not further address effects from lands and special uses.

Soil, Water, Riparian, and Aquatic Restoration - A wide variety of restoration projects can be covered in this category. Given the wide array of channel types and baselines that a project designer may face, the scenarios for potential effects are numerous. Therefore, this effects discussion only touches upon some of the potential effects.

Properly designed and maintained road treatments can decrease sediment loading to streams and over time improve habitat conditions. However, before such improvements can be realized, temporary, short-term, and long-term changes in soil productivity, sediment and turbidity increases can occur from project implementation, as well as from post-project stabilization. Turbidity and sediment increases could result from the construction of restoration access roads, channel excavation, some types of structure placement, culvert replacement, and hauling materials to sites over native surface roads.

Road treatments can upgrade or remove problem culverts, which can provide substantial benefits to aquatic systems by allowing sediment and wood to move downstream, and by providing greater connectivity for native aquatic species. However, correcting culvert barriers can also allow introduced species greater access to tributary habitat. These species can increase competition, hybridization, and the displacement of native salmonids. Projects with these potential effects should be analyzed carefully.

Removal or closure of valley bottom roads can have a short and long-term positive effect on soil-hydrologic function, soil productivity, and stream water temperature. Trees and other riparian vegetation can re-colonize a ripped roadbed and help provide shade. How much temperature improves depends on the existing stream shade and water temperature, the stream's size, and how much riparian road is removed or closed.

Aggrading substrate behind placed stream-structures can reduce the low-flow wetted channel width and the width-to-depth ratio, increase sinuosity and meander pattern, and over time restore floodplain connectivity. Structures can stabilize stream channels over the long term and make them more resistant to erosion by dissipating stream energy during periods of high runoff. Gravel bars typically re-vegetate with riparian species such as alder, willow, or maple, ultimately leading to channel narrowing and stabilization. Restoration of floodplain connectivity over time will result in more frequent inundation of the floodplain, fostering the creation of side channels, seasonally flooded potholes, and other kinds of off-channel habitats.

Placement of large wood can improve sediment routing while creating more physically complex fish habitat. The stability or longevity of this wood within streams is strongly linked to its size, orientation to flow, channel dimensions, watershed area above the structure, and the percentage of the log that is in the active channel. Eventually some movement downstream will take place. Pieces that move can become incorporated in larger wood complexes or hang up on streamside trees or other channel features.

SWRA restoration effects can be of a positive or negative nature. All the Resource Protection Methods would mitigate the general negative effects described above under all alternatives. However, it is assumed that temporary and short-term impacts to fish, stream channels, water quality, etc. from culvert removals, in-channel restoration, and habitat surveys will still occur. It is also assumed that long-term positive effects would occur from these restoration activities.

<u>*Potential Effects from MPCs and Uses*</u> – Both positive and negative effects may vary by alternative, depending on their restoration emphasis as reflected by MPC assignments. This indicator is used to display effects by alternative for Issues 3 and 4 in the Direct and Indirect Effects section below.

Timberland/Vegetation Resources (Including Road and Fire Use Related Activities) - Timber harvest and road-related activities (felling, yarding, skidding, landing construction, road construction/reconstruction) can reduce soil productivity by removing snags, downed logs and coarse woody debris, accelerating soil erosion, and increasing the frequency and distribution of landslides. Organic matter, both above and below the ground, is an important component for maintaining soil productivity. Organic matter is important for soil water retention, nutrient exchange and cycling, and erosion control (Graham et al. 1994 and Page-Dumroese et al. 1991). Loss of soil productivity may result from removal of snags, downed logs and coarse woody debris material. Accelerated surface erosion, landslide potential, and increased levels of sedimentation decrease over time from initial disturbance, but often remain above natural levels for many years. Negative effects can increase when activities occur on inherently sensitive terrain with steep slopes composed of highly erodible soils that are subject to climatic stresses. Vulnerable watersheds generally have steeper slope gradients, high inherent soil erodibility, and high potential for landslide activity. Soil and site disturbance that occur from timber harvest and road-related activities are often responsible for increased rates of erosion and sedimentation, and modification and disruption of water quality, and riparian and aquatic habitats. Physical changes can affect runoff events, bank stability, sediment supply, large woody debris retention, and stream temperature. Increased sediment delivery, especially fine sediments, can be associated with timber harvest. As deposition of fine sediment in salmonid spawning habitat increases, mortality of embryos, alevins, and fry rises.

Timber harvest has the potential to affect stream temperatures primarily through reducing streamside canopy levels. The potential for riparian vegetation to mediate stream temperatures is greatest for small to intermediate size streams and diminishes as streams increase in size (Spence et al. 1996). Harvest actions can also influence stream temperature by changing the volume and timing of peak flows, elevating suspended sediment levels, and altering channel characteristics (Chamberlain et al. 1991, Spence et al. 1996).

Timber harvest has the potential to affect habitat by reducing large woody debris recruitment, altering pool quality, and reducing pool frequency and depth. Riparian area timber harvest has a direct effect to the amount of large woody debris that is recruited into the stream, which is important to cover, shade, and in-channel sediment storage.

Timber harvest affects watershed conditions as measured through the indicators of disturbance history and regimes. Disturbance regime conversion through past vegetation management practices or fire exclusion has altered tree stand density, composition, and age.

Hydrologic and sediment regimes can be altered by vegetation removal, site disturbance, and soil compaction associated with timber harvest. Harvest and site preparation that disturbs soils—such as tractor skidding, cable yarding, prescribed fire, and scarification—can alter the ability of soils to accept water, increasing the potential for overland flow, and altering normal pathways for water entry to streams (Chamberlain et al. 1991). Canopy removal also alters the amount, frequency, and intensity of precipitation delivery to forest floors (Stednick 1996, Megahan et al. 1995 and Troendle and Olsen 1993). These disturbances may also lead to increased amounts of water yield and sediment introduced into streams and altered sediment routing.

All the Resource Protection Methods would mitigate these types of general effects under all alternatives. However, it is assumed that temporary and short-term impacts to soil productivity, water quality, watershed conditions, and flow/hydrology would still occur where timber harvest, road-related activities, and fire use take place. Actions may also occur where the risk of short-term effects is worth taking because there would be significant benefits to watershed resource conditions over the long term. For example, relocating a road located within an RCA, which is causing accelerated sediment to spawning areas downstream, may cause degrading effects over the temporary and short term, but would provide significant benefits to watershed resource conditions over the long term. Impacts resulting from the construction, reconstruction, maintenance, and decommissioning of roads, even the most cautious construction methods, would also likely to yield some degree of impact.

Potential Effects from MPCs and Uses – The level of impact may vary by alternative, depending on the amount of suited timberland acres and Equivalent Replacement Treatment (ERT) acres there are, as reflected by MPC assignments. These indicators are used to display effects by alternative for Issues 3 and 4 in the Direct and Indirect Effects section below.

Fire Management - Fire contributes to a host of functions and processes in ecosystems. Fire reduces accumulations of organic material, which in turn reduces wildfire hazard (Harrington 1996). Fire recycles nutrients and alters soil chemistry, aids in decomposition, and influences soil structure and stability (Covington et al. 1997, Arno et al. 1995, and Kaufmann 1990). Fire effects can vary depending on fire intensity, severity, and frequency, the primary factors that define fire regimes. Wildfires are defined as an "unwanted wildland fire" that can affect water chemistry, water quantity, and stream channel structure through changes in transpiration, infiltration, ground water recharge, erosion and mass wasting, riparian shading, and the recruitment and delivery of coarse debris (Meyer et al. 2001, Moody and Martin 2001a and 2001b, Moody 2001, Wondzell 2001, Gresswell 1999 and Benda and Dunne 1997). Potential post-wildfire risks from floods, landslides, and debris flows to human life, property, and/or municipal supply watersheds are an increasing concern (Moody and Martin 2001b).

Wildfires can have important direct and immediate effects on native fishes or their habitats, but the ultimate effects on aquatic organisms and fishes may be apparent only some time after the wildfire has occurred (Reeves et al. 1995). Effects will depend on a variety of conditions, including: 1) the nature of the fire (patchiness, intensity) and subsequent precipitation; 2) the prior conditions of the watershed and riparian communities; 3) the potential for demographic support or recolonization of fish communities as influenced by proximity and location of refugia; 4) the expression of complex life history patterns and overlapping generations (Warren and Liss 1980, Rieman and Clayton 1997), and 5) the nature of fire suppression and post-fire management (Gresswell 1999, McIver and Starr 2000).

Temporary, short term, and long term effects of fire usually result from erosion associated with climatic events that trigger surface erosion or an increase in subsurface mass failures (landslides), which in turn can alter stream channel structure and function. The intensity and scale of these effects are related to the current vegetation hazard condition, size and intensity of the wildfire, vulnerability, size of watershed, and climatic triggering event. Riparian vegetation is consumed and shade is reduced, but increased streamflow heating may be offset by increases in cooler water from subsurface flow and reduction of evapotranspiration.

Wildfire suppression tactics can affect watershed resources through fire line and large fuel-break construction, use of fire retardant, soil disturbance, and vegetation removal. Fire treatments can directly disturb fish when water is withdrawn from pump and dipping points, and from location of fire camps and other activities. Fish can also be entrained into improperly screen pumps, causing injury or mortality. Prescribed fire can help reduce effects from uncharacteristic wildfire by moving fuels toward a range of natural variability and reducing the severity of wildfire when it occurs. These controlled fires are often set when and where impacts to important fish habitat and populations would be minimal. Management-ignited fire would have the same general effects as wildfire, but these effects are assumed to be much less in intensity and extent.

Ground-disturbance from wildfire suppression, as well as the ground-exposing effects of wildfire, can result in a decrease in effective ground cover, leading to an increase in sediment delivery to streams. In addition, prescribed burning may result in an increase of nutrients and fine sediment into streams. Increased fine sediments affect developing eggs by filling interstitial spaces within stream substrate, and reducing or eliminating the supply of oxygen to developing eggs and the removal of waste products. Sediment can also be sufficient to reduce or eliminate the ability of juvenile fish to emerge from redds.

Chemical fire retardants used in wildfire suppression can have impacts to bull trout, anadromous, and other aquatic species. Retardants can have direct and indirect effects on salmonids. Large quantities of retardant can cause direct mortality. Indirect effects of retardants include mortality of invertebrates and eutrophication of downstream reaches (Spence et al. 1996).

Not all disturbances have the same effects on soil productivity and function. For example, wildfire can reduce soil productivity, but unless a substantial amount of the organic matter, grass residue, needles, and branches are consumed, loss of soil productivity may not be as high as it would be if soils were disturbed through displacement and compacted and whole trees were removed from harvesting activities. Because of the mosaic pattern wildfire produces, and the residual wood that is left on site, disturbance from wildfire usually has fewer implications for loss of soil productivity and function than disturbances that remove soil organic matter and increase bulk density. However wildfire often affects a much larger area as compared to mechanical harvest.

The effects of prescribed burning were identified as generally insignificant with regard to a wide range of hydrologic and water quality variables, (USDA Forest Service 1997). Severe wildfire can result in water-repellent soil conditions, and increased soil erosion can occur during intense rainstorms. Both water-repellent soil conditions and compacted soils can decrease soil-hydrologic functions (such as water infiltration, nutrient uptake, and biological activity) and increase erosion. The severity and longevity of declining soil productivity is generally greater under compacted soil conditions; however, the extent of area affected by wildfire is typically much greater.

All the Resource Protection Methods would mitigate general fire management effects under all alternatives. However, it is assumed that temporary and short-term impacts to fish, water quality, watershed conditions, channel conditions, and flow/hydrology would still occur where fire management activities take place. Impacts to RCAs and habitat may still occur in certain circumstances when no other suitable locations for incident bases, camps, heli-bases, staging areas, etc., exists. Delivery of chemical retardant, foam, and other additives near or on surface waters may occur when there is imminent threat to human safety and structures or when a fire may escape causing more degradation to RCAs, than would be caused by addition of chemical, foam or additive delivery to surface waters in RCAs. Conversely, where management treatments are used to reduce wildfire hazard, positive long-term effects may be realized.

Potential Effects from MPCs and Uses – Management treatment varies by alternative, depending on the amount of vegetation restoration emphasis, as reflected by MPC assignments. This indicator is used to display effects by alternative for Issues 1, 2, 3, and 4 in the Direct and Indirect Effects section below.

Non-native Plants - Noxious weeds are often treated using an integrated approach, with a combination of control methods that include mechanical, biological, and chemical. The effects of some of these methods are discussed here.

Effects from herbicide application depend on the type, extent, and amount of herbicide that is used, the sites' proximity to a stream or wetland, a stream's ratio of surface area to volume, and whether transport from the site is runoff or infiltration controlled. Chemical persistence in the soil profile and surface water depends on the potential for the chemical to leach through groundwater, the size of the treatment area, velocity of streamflow, and hydrologic characteristics of the stream.

Direct effects require that an organism and the chemical come in contact. Once in contact, the chemical must be taken up by the organism in an active form at a concentration high enough to cause a biological effect. Most direct effects of herbicides on listed salmon and steelhead are likely to be sublethal, rather than outright mortality. However, sublethal effects of chemicals and pesticides can play a significant role in reducing the fitness of natural salmonid populations. Scholz et al (2000), and Moore and Waring (1996) indicate that environmentally relevant exposures to diazinon can disrupt olfactory capacity needed for survival and reproductive success, both of which are key management considerations under the ESA (Scholz et al. 2000). The ecological significance of sublethal effects depends on the degree to which they influence behavior that is essential to the viability and genetic integrity of wild populations.

Indirect effects can include decreases in terrestrial or aquatic insects that result in a decrease in the food supply for fish, and reductions in cover and shade from riparian resources. It is assumed that many chemicals used will be benign. For example, glyphosate without surfactants (e.g., Rodeo®, Accord®) has little effect on fish. Some chemicals like picloram, which is highly soluble and readily leaches through the soil, may not be benign.

Mechanical treatments can result in localized soil disturbance as plants are pulled. Increased sediment to streams along road cuts and fills within riparian areas is possible, but the increase would likely be undetectable due to several factors. First, not all vegetation in a treated area would be pulled, so some ground cover would still be in place. Second, not all sediment from pulling weeds along roads would reach a stream because many relief culverts divert ditch flow onto the forest floor away from streams. Finally, hand pulling is very labor intensive and costly. Thus only a few acres per year could be treated using this technique across a watershed.

All the Resource Protection Methods would mitigate these types of general effects under all alternatives. However, it is assumed that temporary impacts would still occur where non-native plants are established and spread. Although many threats to water quality from chemical application may be reduced, they cannot be eliminated. This is in part due to the uncertainty surrounding sub-lethal effects to salmonids and other aquatic organisms. As discussed above, there are gaps in the scientific knowledge of how pesticides interact with the biology of migratory salmonids. Effects to salmonids may occur that are not readily apparent.

Noxious weeds can replace natural vegetation causing increased erosion, loss of shade, and less ground cover. For a more detailed discussion of these effects refer to the Non-Native Plant effects analysis.

Threats to water quality from fuel spills are greatly reduced, but are not completely eliminated. This is because some storage and use will still occur in RCAs or along roads where there is no other alternative. Spills and accidents may occur from this use, affecting aquatic resources.

Potential Effects from MPCs and Uses – The rates of establishment and spread are not expected to vary significantly by alternative (see Non-native Plants section in Chapter 3). Therefore, this analysis will not further address effects from non-native plants.

Impacts from noxious weeds treatments would most likely occur in those subbasins with extensive amounts of trails, roads, and other forest facilities (MPCs 3.2, 4.2, 4.3, 5.1, 5.2, 6.1, 6.2). This is because the more sources of exposure, the higher the likelihood of infestation and the better access to detect and treat these infestations. Subbasins with the potential for more noxious weed treatments are Boise-Mores, South Fork Boise, South Fork Payette, Middle Fork Payette River, Payette River, North Fork Payette, Little Salmon, Brownlee Reservoir, Weiser River, Big Wood River, Upper Snake-Rock Rock, Goose Creek, and Raft River. Subbasins with large amounts of roadless and/or undesignated low road density areas (MPCs 1.1, 1.2, 2.1, 2.2, 2.4, 3.1, 4.1a, 4.1b, 4.1c) would likely only have localized infestation associated with access points. These subbasins are Hell Canyon, North Fork/Middle Fork Boise, Upper Salmon, Upper Middle Fork Salmon, Lower Middle Fork Salmon, Middle Salmon Chamberlain, South Fork Salmon River, Lower Salmon River, Camas Creek, and Little Wood River.

Minerals Management - An array of effects can occur with mineral management related to mineral extraction or facilities to process or transport the mined material. Effects are discussed for those mineral activities that typically occur within the Ecogroup area.

Hard rock mining can affect soil productivity and water quality through disturbance of varying amounts of surface and subsurface soil and the potential for the addition of large quantities of sediments, the addition of solutions contaminated with metals or acids, and the changes in channel formation and stability. Fine inorganic particles (like clays) settle slowly and may travel great distances from the point of their introduction and therefore may have a greater effect on water bodies such as lakes further from mining activities. Fine suspended material reduces the amount of light available for bottom-dwelling algae and plants, and thereby, biomass and primary production are diminished.

Acidification of surface waters mobilizes toxic metals naturally embedded in soils and streambeds. As surface water (including rain) washes through waste piles left from mining operations, it is acidified via iron oxidation and then flows into streams where metals are released and converted to forms which are available to aquatic life (Nelson et al. 1991). Acidification of surface waters can directly affect aquatic organisms through reduced egg viability, fry survival, growth rate, and other ills, or indirectly through toxic metals or substances that can affect growth, reproduction, behavior, and migration (Spence et al. 1996).

Suction dredging can increase turbidity. Where small amounts of fine sediment are worked and stream flows are high, only small increases in turbidity occur and effects are of small scale and short duration. Where large amounts of fine sediments are mobilized and stream flows are low or moderate, detectable increases in turbidity can be expected at the reach scale. Here, turbidity plumes can extend hundreds of feet downstream. In areas of concentrated suction dredging, the amount of fine sediment deposition is cumulative. Mobilized fine sediment settles downstream within slow water areas such as pools.

Suction dredging can cause streambank erosion by creating tailing piles that re-direct stream currents into streambanks. Suction dredging can also alter pool dimensions through removal or addition of stream sediment and wood. When pool size is greatly reduced or wood is removed from otherwise high-quality pools, overall pool quality is reduced. When sufficient amounts of sediment are removed from around large rocks, boulders, and wood that help form pools, their locations shift and individual pool stability is reduced. Suction dredging often increases pool depth and volume, increasing rearing habitat for some salmonids. However, bedload usually fills these pools during winter peak flows.

Some camping occurs in association with suction dredging that may involve a few individuals to groups for days to weeks at a single location. Since much of the camping occurs along streambanks outside of designated campgrounds, some loss of riparian vegetation and streambank hardening occurs. Campers may also collect firewood in the stream recruitment zone, reducing wood available for streambank stabilization and other stream processes.

All the Resource Protection Methods would mitigate these types of general effects under all alternatives. However, it is assumed that temporary and short-term impacts to soil productivity, water quality, watershed conditions, channel conditions and flow/hydrology would still occur where minerals activities take place. Actions where the Forest Service has limited discretion to influence management actions because of existing laws (1872 Mining Law, Mining and Mineral Policy Act of 1970, etc.) would also be more likely to have impacts to aquatic species and SWRA resources.

Potential Effects from MPCs and Uses – The level of activities is impossible to predict, but is not expected to vary significantly by alternative. Mining operations are more of a function of market values for mining products than from opportunity provided by the alternatives. The only variable between alternatives that may influence mining is the acreage that might be removed from mineral exploration due to wilderness recommendation and designation, but designation would require Congressional decisions, which are beyond the scope of revision. Therefore, this analysis will not further address effects from mineral activities.

While impacts do not vary by alternative significantly, they do vary between subbasins. The following subbasins are expected to have a high potential for continued mining activity due to mineral deposits. These subbasins include: South Fork and Middle Fork Boise River, Boise-Mores Creek, South Fork Payette River, South Fork Salmon River, Lower Middle Fork Salmon, Middle Salmon-Chamberlain, Big Wood River, Goose Creek, and Raft River.

Effects Methodology and Assumptions

This section presents key methods and assumptions that were used in the effects analysis for the issues and indicators.

Effects Indicator Determination Screens

A screening process was used to determine the indicators for effects that are analyzed by alternative. The first screen involved identifying the threats or potential impacts that could affect SWRA resources. The potential impacts were then screened through the filter of management direction under all alternatives to identify what effects would remain after all mitigation from that direction is applied. These effects are described in the General Effects section, above. The next screen looked at which of these effects would differ significantly by alternative and why. Typically, the potential for differences in effects was tied to the different allocation of MPCs by alternative. Each MPC represents a different management emphasis, and has a different set of associated standards and guidelines. The MPCs were also allocated by alternative in different combinations.

General Assumptions

A key assumption in this screening process was that, although effects from management activity are largely mitigated by management direction, those MPCs that emphasize active management (e.g., mechanical harvest, road construction, etc.) still have a higher potential for temporary and short-term risks to SWRA resources for two reasons. First, as more active treatments are applied, more protective measures may be needed to mitigate potential effects. It is assumed with the application of more protective measures, the risks of measures not being implemented directly increases. Second, it is assumed that the more management activities are applied to a specific location, the more the risk there is of impacts from those management disturbances, regardless of mitigation measures.

Another key assumption is that MPCs provide an indication of the management goals (i.e., desired outcomes) that subsequent site-specific projects would strive to meet or move toward. Neither the Forest Plans, or the EIS alternatives, or the MPCs authorize implementation of management activities described in the effects analyses. Thus, the mix of MPCs allocated under each alternative is more appropriately used in the EIS effects analyses as a means to differentiate between and compare alternatives. The MPC-based effects analyses compare potential effects from various management activities that could occur under various combinations of MPCs represented by the alternatives. These effects are modeled based on assumptions about the type, amount, and intensity of management activities that would be allowed or emphasized under each MPC. As stated above, the modeled effects in the EIS are designed to show relative differences in alternatives—not to accurately predict the amount or location of management activities that would occur during the planning period should that alternative be selected for implementation.

Another key assumption is that for other native aquatic species management for their habitats would be addressed by management for water quality to meet beneficial uses and for aquatic habitat in general, with the potential effects being the same as for Issues 3 and 4, respectively.

Issue and Indicator Methodology and Assumptions

Issues 1 and 2, Methodology - Based on Issue 2 being similar to Issue 1, the description of their methodologies and assumptions are discussed together. The subwatersheds identified in Issue 2 are a subset of Issue 1. The criteria for identifying the subwatersheds analyzed for Issue 1 are the same except that Issue 2 has the following additional criterion: subwatersheds that have been identified as a potential post-wildfire risk to human life, property, and/or municipal supply watersheds from post-wildfire floods, landslides, and debris flows.

Effects of the alternatives for Issue 1 were evaluated using the amount (percentage) of subwatersheds with high and extreme wildfire vegetation hazard rating and that are also highly vulnerable subwatersheds. Effects for Issue 2 were evaluated in the same way as Issue 1, but the set of subwatersheds used was more selective, as described above.

The subwatersheds for both Issues 1 and 2 were then compared to the assigned MPCs by alternative that had an emphasis and vegetation management tools (fire and mechanical treatments) available to reduce the uncharacteristic wildfire hazard, thereby lowering the risk of uncharacteristic wildfires. See the SWRA Technical Report for more detailed discussion on how this effects analysis was completed and the assumptions that were used.

The analysis by the SPECTRUM model provided only a general assessment of potential risks and effects from fire and mechanical vegetation management activities at the subbasin scale. It was not detailed enough to evaluate potential risks/effects at the subwatershed scale. Therefore, mechanical and fire use, based on MPCs, were instead used to evaluate relative risks from vegetation management activities at the subbasin scale. MPCs 2.4, 3.2, 4.1 c, 4.2, 4.3, 5.1, 5.2, 6.1, and 6.2) were considered to have a relatively high emphasis and more tools available to treat subwatersheds with high and extreme risks from uncharacteristic wildfire. MPCs 1.1, 1.2, 2.0, 2.1, 2.2, 3.1, 4.1a, and 4.1b were considered to have a limited emphasis and fewer tools. Percentages of subwatersheds with high treatment emphasis were compared to percentages of subwatersheds with limited treatment emphasis for the entire Ecogroup area.

Issues 1 and 2 Assumptions - Fire is a natural and an important ecosystem process. Effects from fire can vary depending on fire intensity, severity, and frequency—the primary factors that define fire regimes. Wildfires are defined as an “unwanted wildland fire” that can affect water chemistry, water quantity, and stream channel structure through changes in transpiration, infiltration, ground water recharge, erosion and mass wasting, riparian shading, and the recruitment and delivery of coarse woody debris. During the past century, fire suppression has altered fire regimes in some vegetation types and consequently, the probability of uncharacteristically larger and more severe lethal wildfires.

New information from the Interior Columbia Basin Ecosystem Management Project, and recent research (Meyer et al. 2001, Moody and Martin 2001a and 2001b, Rieman and Clayton 1997, Benda and Dunne 1997) have linked accelerated soil erosion, loss of nutrient base, and triggering of floods, landslides, and debris flows uncharacteristic of their normal pattern and frequency, to uncharacteristically large and lethal stand-replacing wildfires. Meyer et al. (2001) identify two contrasting erosional mechanisms and temporal periods over the post-wildfire period. Within the first few years, high rates of soil erosion, sediment delivery, and stream-channel-changing events can result following intense precipitation (typically in brief summer convective storms). Several or more years following wildfires, as soil tree-root strength declines from root decay, saturation of the soil profile can result in increased landsliding during prolonged, heavy, winter-spring rainfall and snowmelt. Data from Gray and Megahan (1981) suggest that it may require up to 20 years for root strength to be regained following wildfire.

These types of effects are especially a concern in subwatersheds that have high to extreme uncharacteristic wildfire hazard and high inherent vulnerability ratings. Uncharacteristic wildfire hazard is defined as the effect of wildfire on the vegetative conditions when it burns (rather than if it will burn) relative to the historical effect. Effects are dependent on potential vegetation group, size class, and canopy closure for forested vegetation, or cover type and canopy cover for non-forested vegetation. The hazard index ratings are low (0), moderate (1), high (2), and extreme (3). Additional information is located in the FEIS Chapter 3 in the Vegetation Hazard section.

Urban areas and rural developments continue to encroach on wild lands, even as wildfire risk in some areas increases. As wildfires become more intense and uncharacteristically large, the hazards to life, property, and/or municipal supply watersheds, both during and after wildfire, increase. Subwatersheds with these hazards in many instances are similar to wildland-urban interface subwatersheds (see Chapter 3, Fire Management). However, wildland-urban interface subwatersheds are different in that they may or may not be highly vulnerable and/or have a post-wildfire risk to life, property, and/or municipal supply watersheds from floods, landslides, and debris flows.

It was also assumed that these subwatersheds would likely require Burned Area Emergency Response (BAER) if uncharacteristically lethal wildfire were to occur within them. One of the main objectives in implementing BAER measures is to alleviate emergency conditions following wildfire to mitigate significant threats to health, safety, life, or property (FSM 2523). It was further assumed that wildfire suppression and BAER costs would increase significantly in subwatersheds with these conditions.

Management strategies (prescribed fire or mechanical vegetation treatment) that reduce these risks would help decrease the post-wildfire threats and associated BAER costs within these subwatersheds.

For this programmatic analysis the following additional set of assumptions were made:

- The main analysis assumption was—the lower the uncharacteristic wildfire hazard, the lower the wildfire-related potential for soil erosion, loss of nutrient base, floods, landslides, debris torrents, and the lower the threats to human life, property and/or municipal supply watersheds.

- Several communities depend on water from subwatersheds within the Ecogroup. The objective of the three National Forests within the Ecogroup is to manage for multiple uses by balancing present and future resource use with municipal water supply needs.

- Uncharacteristic lethal wildfire can profoundly reduce soil-hydrologic function, long-term soil productivity and riparian function and ecological processes when high intensity and high severity wildfire occur on a large percentage of these subwatersheds. However, when fire regimes are in balance with vegetation, landform, and climate, ecosystems are more resilient after disturbance and sustainable in the long term.

- Vegetation restoration activities that move vegetation toward historical ranges of variability will provide favorable conditions for soil-hydrologic functions and watersheds processes (ICBEMP 2000a).

Issues 3 and 4, Methodology and Assumptions - Shared indicators for Issues 3 and 4 are discussed below.

Effects From Livestock Grazing, Methodology **-** Effects were evaluated using the amount (percentage) of suited rangeland acres and the type of MPC (Less or More Restrictive) management strategy occurring within subbasins of concern.

There are generally three accepted grazing principles that affect plant physiology and succession. They are grazing frequency, intensity, and timing. Plant physiology, ecology, and response to grazing are key aspects to determining the effects of livestock grazing on rangeland vegetation and therefore on soil, water, riparian, and aquatics resources. The two grazing management strategies group MPCs with similar management approaches for these three livestock grazing principles as follows.

- *MPCs where Livestock Grazing Management Practices are More Restrictive* (MPCs: 1.1, 1.2, 2.1, 2.4, 3.1, 3.2, 4.3) - In general, these MPCs are more constraining on the timing, frequency, and intensity of livestock use, thereby affording more temporary and short-term threat reduction in moving the rangeland vegetation toward desired conditions. There are potentially less temporary or short-term risks of loss of vegetation, soil compaction, sedimentation, nutrient loading, loss of bank stability, and loss or disturbance of aquatic habitat. Also, the rate of recovery for vegetation, soil, watershed concerns, riparian resources, and aquatic habitat and subpopulations would be quicker.

- *MPCs where Livestock Grazing Management Practices are Less Restrictive* (MPCs 4.1, 4.2, 5.1, 5.2, 6.1, 6.2) - In general, these MPCs are less constraining on the timing, frequency, and intensity of livestock use, potentially increasing temporary and short-term risks to moving the rangeland vegetation toward desired conditions. There are potentially more temporary and short-term risks of loss of vegetation, soil compaction, sedimentation, nutrient loading, loss of bank stability, and loss or disturbance of aquatic habitat. Also, the rate of recovery for vegetation, soil, watershed concerns, riparian resources, and aquatic habitat and subpopulations is not expected to occur as quickly as it would be for the more restrictive approach.

Effects From Livestock Grazing, Assumptions - Standards and Guides provide protection to TEPC fish species and SWRA resources from grazing activities. However, the "less restrictive" grazing approach could have greater potential for negative impacts than the "more restrictive" approach due to less emphasis on protecting SWRA resources and maintaining natural processes.

These two grazing management strategies may have differing temporary and short-term effects based on their effects of grazing on rangeland vegetation and riparian functions and ecological processes. If the rangeland vegetation is managed toward desired conditions, it should provide favorable conditions for most soil-hydrologic and watershed processes. With the addition of proper timing of grazing seasons and management practices to protect stream banks and other riparian components, unfavorable conditions to aquatic resources can be kept to an acceptable minimum. Short-term restoration usually occurs only through implementation of more restrictive grazing management strategies. Either grazing management strategy provides for long-term restoration, but the more restrictive grazing strategy should provide for a higher degree of long-term recovery.

Effects From Motorized Trail Use, Methodology – The miles of motorized trail within recommended wilderness in Alternatives 4 and 6 were summarized by subbasin to determine where the most closures would occur. Once summarized, the location of remaining, opened trails were determined. The miles of trail in and outside of RCAs were summarized by subbasin.

Effects From Motorized Trail Use, Assumptions – It was also assumed that the more motorized trails and use in recommended wilderness areas (particularly RCAs within those areas), the greater the potential for impacts to SWRA resources and aquatic species. It was also assumed that subbasins that have more trails closed in recommended wilderness subbasins would have increased use of remaining motorized trails in and adjacent to those subbasins.

Effects of TMDL and 303(d) Restoration (Issue 3) and Effects from Aquatic Restoration (Issue 4), Methodology - The evaluations for these two separate but related indicators have many similar methods and assumptions. The similarities will be discussed first followed by identification pertaining to the respective water quality restoration issue/indicator and Aquatic Restoration issue/indicator. Refer to the SWRA Current Conditions section for a detailed discussion of determining the appropriate subwatershed restoration type, subwatershed restoration priority and determination of ACS Priority subwatersheds.

The degree that MPCs emphasized restoration or conservation was central to analyzing the benefits of restoration for Issues 3 and 4 or potential effects from the lack of restoration associated with Issue 4. The number of subwatersheds recommended as high priority by WARS for active and passive restoration, and conservation were compared to the MPC assignments for each subwatershed within their respective subbasin. Only the high priority subwatersheds identified by WARS, or ACS priority subwatersheds, were considered because these subwatersheds have the highest likelihood of having water quality and aquatic restoration in order to concentrate restoration/recovery efforts into meaningful areas, given existing and potential future staffing and funding limitations.

Subwatersheds where active restoration was recommended by WARS, and where a 3.2 MPC was assigned, were considered to provide the highest emphasis and most appropriate type of restoration. This is because the 3.2 MPC emphasizes active restore of degraded aquatic, terrestrial and watershed conditions. Table SW-10 displays the MPCs and their relative management emphasis and available tools to perform the type of restoration or conservation.

Table SW-10. Watershed and Aquatic Restoration and Conservation Strategies and Tools by MPC - Likelihood that Assigned MPC has the Most Appropriate Management Emphasis to Achieve or Maintain Desired Conditions

MPC	WARS Recommendation		
	Active Restoration	Passive Restoration	Conservation
1.1, 1.2	Low	High	High
2.1	Low	High	Moderate
2.2	None	High*	High**
2.4	Moderate	Moderate	Low
3.1	Low	High	High
3.2	High	High	Moderate
4.1a, 4.1b	Low	High	High
4.1c	Low	High	High
4.2	Moderate	Low	Low
4.3	Moderate	Low	Low
5.1/6.1	Moderate	Moderate	Low
5.2/6.2	Moderate**	Moderate	Low
8.0	Moderate	Low	None

*Because RNAs are usually very small, these restoration ratings are not expected to influence the overall subwatershed very much.
**Some restoration anticipated in terms of K-V and mitigation funding from timber receipts and range betterment funding.

Effects of TMDL and 303(d) Restoration (Issue 3) and Effects from Aquatic Restoration (Issue 4), Assumptions - Regardless of the restoration/conservation MPCs and how they were applied, all subwatersheds with listed 303(d) water bodies, TMDLs, and aquatic species would receive special emphasis to improve watershed and habitat conditions under all alternatives due to the Forest Service's legal obligation to meet requirements under the Clean Water and Endangered Species Acts. For the action alternatives, this obligation has been addressed by specific Forest-wide and Management Area direction in the revised Forest Plans to: (1) restore 303(d) water bodies, (2) implement TMDL plans, (3) restore or maintain habitat for listed fish species, and (4) protect SWRA resources. This direction would help improve water quality and assist in de-listing 303(d) water bodies, TMDLs, and threatened and endangered fish species by helping to achieve conditions needed for these subwatersheds to fully support their beneficial uses.

In areas where the SWRA restoration emphasis (as identified by MPC) was lower, the potential for SWRA resource restoration was considered lower because the existing watershed restoration needs would not be as high a priority for treatment. This risk is related more to the rate of recovery than it is to potential impacts, particularly for areas in need of active restoration. All areas in need cannot be treated simultaneously due to a finite amount of funding, personnel, and equipment required for active treatments. Therefore a system of prioritization is needed to help ensure that active treatments occur in the appropriate areas in a timely manner. Passive restoration or conservation strategies and areas are not as much of a concern, as it is assumed that current conditions in these areas are typically functioning appropriately or functioning at relatively minor risk.

Subwatersheds designated as an ACS priority were considered a high priority for SWRA restoration or conservation regardless of the MPC designation. It was assumed in subwatersheds with moderate or low aquatic restoration emphasis MPCs that the ACS priority designation would still result in watershed and aquatic restoration or conservation being completed, but at a slower rate of recovery. However, the ACS designation would not necessarily implement the appropriate type of restoration recommended by the WARS. For example, the WARS may recommend active restoration, but the MPC may emphasize passive restoration or conservation. Restoration in ACS priority subwatersheds with moderate or low SWRA restoration emphasis MPCs may also have to compete more with other resource priorities. On the other hand, other resource priorities, such as timber harvest, may also provide additional funding and incentive for watershed restoration where it is most needed. It is assumed, however, that enough restoration would be completed so that current conditions would be either maintained or slowly trend toward desired conditions of SWRA resources.

Only the high priority subwatersheds identified by WARS, or ACS priority subwatersheds, were considered in the analysis because these subwatersheds have the highest emphasis for having water quality and aquatic restoration in order to concentrate restoration/recovery efforts into meaningful areas, given existing and potential future staffing and funding limitations. However, the appropriate restoration or conservation strategy could also be applied as needed in any area under any given project because, as mentioned above, the Forest Service must meet its legal obligations under the Clean Water and Endangered Species Act.

For Issue 3, restoration actions leading to beneficial use attainment and the delisting of subwatersheds that have TMDLs or 303(d) water quality limited water bodies, should be more likely to occur with a faster rate of recovery where a management prescription is applied that emphasizes the appropriate watershed and aquatic restoration or conservation strategies. Determination of “appropriate” restoration/conservation strategies is based on two general assumptions/criteria:

- The subwatershed’s dominant type of restoration/conservation strategy identified by the Watershed and Aquatic Restoration Strategy (WARS) is appropriate or “a good match” with the MPC restoration emphasis that is applied to that subwatershed, and/or

- The subwatershed has been identified as an ACS priority subwatershed that serves as an emphasis to initiate the appropriate watershed restoration identified for that subwatershed regardless of the MPC applied.

For Issue 4, these two general assumptions also apply. In addition, the following assumption related to aquatic species applies and was used in the analysis.

- Those alternatives and subwatersheds with the appropriate restoration and conversation emphasis would have greater potential for fish habitat and population recovery over the short and long term.

Effects From Timber/Vegetation Activities (Including Roads and Fire Use), Methodology **–** This indicator compares two aspects of both Issue 3 and Issue 4. The first aspect is the amount of suited timberland acres by subbasin. The second aspect is the use of the Cumulative Watershed Effects model (CWE) similar to that described in (Menning et al. 1996), which analyzed forest vegetation management activities (mechanical harvest, fire use, and road-related activities) by alternative for each subbasin to determine their potential effects on soil, water, riparian conditions, and selected fish species.

Suited timberland acres were assigned by MPC. MPCs 4.2, 5.1, 6.1, 5.2, and 6.2 contain suited timberlands, while the remaining MPCs do not. Each alternative has a different amount and distribution of these MPCs with suited timberlands. Refer to the Timberland Resources section in Chapter 3 for more information on suited timberlands within MPCs.

The CWE model was specifically developed for use with the SPECTRUM and RELM models to assist in analyzing mid-scale (subbasin) effects associated with forest vegetation management activities by alternative. The CWE model estimated each alternative's relative amount of potential disturbance associated with forest vegetation management activities required to meet forest vegetation desired conditions. The CWE model evaluated an array of forest vegetation management-disturbing activities as a common currency termed "equivalent replacement treatment" (ERT) acres. The disturbance associated with an acre of mechanically harvested clearcut served as the common denominator. This acre of mechanical clearcut harvest was given the unit of measure of 1 ERT. All other forest vegetation management activities were measured in ERT units relative to one ERT equal to one acre of mechanical clearcut. Each forest vegetation management disturbance activity has a coefficient based upon the associated type and intensity of activity.

The SPECTRUM model estimated (for 10 year averages) the amount and timing of forest vegetation management activities based on a complex data set, including the eleven potential vegetation groups (PVG), current vegetation conditions (early successional, late seral, etc), MPC assignment, and desired conditions of forest vegetation. Arrays of type and amount of forest vegetation management activities, or ERTs, were then summed up by the SPECTRUM model per Forest and displayed as decadal acre averages. The SPECTRUM results were not spatially sufficient to identify CWE at a subbasin scale to assess associated risks to SWRA resources. In order to improve the CWE model, the RELM model was used to spatially disaggregate the SPECTRUM outputs/activities (ERT acres) to individual subbasins over time. Each subbasin had the total number of ERT acres determined for each alternative. An estimate of the amount of

ERT acres was determined and averaged for the two and five decadal time periods for each subbasin. These decadal averages were used to coincide with the fish viability assessments at 15- and 50-year intervals and approximate short- and long-term effects for other SWRA resources.

Average decadal amounts are assumed to provide good relative estimates of the potential implementation of forest vegetation resource programs by alternative. The RELM model prorated the SPECTRUM vegetation management outputs/activities to each subbasin based on the individual subbasin's PVGs, current vegetation conditions, MPC assignments, and desired conditions for forest vegetation. See Appendix B to this EIS, "Forest Vegetation Modeling Desired Conditions", for more information on the SPECTRUM and RELM models. See the SWRA Technical Report for more detailed discussion and descriptions of the CWE analysis.

The relative importance and sensitivity of a subbasin to disturbance from forest management activities was addressed by assigning one of three sensitivity classes that set a threshold on the amount of ERT acres allowed per decade. The percent ERT threshold serves as a "Threshold of Concern" (TOC) used as a relative evaluation of the amount of forest vegetation management activities occuring within each subbasin.

The sensitivity class decadal percent ERT values for the subbasins are as follows: Sensitivity Class I = 6 percent ERT, Sensitivity Class II = 8 percent ERT, and Sensitivity Class III = 13 percent ERT. Subbasins with a lower sensitivity class value required less ERT acres to surpass the TOC. Determination of the baseline ERT TOC was based on two criterions. The first was the use of Equivalent Clearcut Area Watershed Condition Indicator found in Appendix B of the revised Forest Plans, and the second was Regional guidance and revised Forest-wide direction (Standard SWST02) that limits detrimentally disturbed soil conditions.

The ERT threshold (TOC) percentages vary by sensitivity class. The following criteria were used to determine each subbasin's sensitivity class (See the SWRA Technical Report for more detailed information on the Sensitivity Classes and how they were developed):

Sensitivity Class I = ERT TOC of 6 percent

a. ACS priority subwatersheds
b. TMDLs within subwatershed
c. Strong populations of bull trout or anadromous (not including migratory habitat for bull trout or anadromous) and isolated local populations of bull trout within the subwatershed.

Sensitivity Class II = ERT TOC of 8 percent

a. Designated Critical Habitat of Sockeye and Chinook salmon within subwatershed
b. Presence of any listed fish species (including migratory)
c. Presence of listed 303(d) water quality limited water bodies
d. High subwatershed vulnerability rating

Sensitivity III Class = ERT TOC of 13 percent

a) All remaining subwatersheds.

Sensitivity class values were assigned to each subbasin, based on subwatershed values pro-rated and aggregated up to the subbasin scale. The individual sensitivity class value became the subbasin's threshold of concern (TOC), against which the ERT decadal acreage percentages were measured to determine whether the ERT activity would exceed the TOC.

The total ERT acres for each subbasin were then divided into the total acres within the subbasin to determine a percent of ERT acres. The subbasin ERT percent was then divided into the assigned sensitivity class ERT percent, resulting in a percent TOC estimated for each subbasin. These TOC percents were then calculated as averages for both two and five decades. TOC values below 100 percent are below a level of any level of concern for the SWRA resources.

For example, if a subbasin of 400,000 acres has a total of 5,000 ERT acres for the 2-decade average, this equates to 1.25 percent ERT acres. If the sensitivity class for this subbasin is 6 percent, then the TOC is 1.25 percent divided by 6 percent, which equals 21 percent. This value of 21 percent is well below the threshold of concern of 100 percent, and should therefore not represent any appreciable effect to the SWRA resources.

The CWE model used at the mid-scale is a useful method for evaluating the effects for forest vegetation management strategies for a number of reasons. First the CWE method provides a quantitative accounting and analysis process. The SPECTRUM and RELM models account for most of the forest vegetation management outputs/activities, and the outputs can be used to estimate relative risks/effects dispersed in time and space. Second, the CWE is similar to the correlations with some ecological measures of instream effects (Spence et al. 1996, McGurk and Fong 1995, Reid 1993). Third, there is some theoretical basis for linking CWE to measures of risks/effects (Menning et al. 1996). Fourth, the CWE methodology has greater consideration of the effects of fire use than do other models and is similar to other commonly used models used at finer scales. Fifth, for this size analysis (a large mid-scale programmatic plan), other assessments were either a great deal coarser (no spatial or temporal scale) or non-existent.

Effects From Timber/Vegetation Activities (Including Roads and Fire Use), Assumptions – For the suited timberland analysis, MPCs 4.2, 5.1, 5.2, 6.1, and 6.2 with suited timber acres that can contribute to the allowable sale quantity are considered to have a higher level of threat to SWRA resources than other MPCs. The suited timber MPCs are assumed to have more management tools to treat vegetation, and therefore a higher potential for ground-disturbing management activities to be implemented. It is assumed that nearly all road construction is closely aligned with the management of lands in the suited timber base. Thus, road density may increase during efforts designed to help achieve timber or restoration objectives under 5.2 and 5.1 MPCs. Increases may be temporary or combined with road restoration treatments. Subbasins with these MPCs are assumed to have more management tools to treat vegetation and thus more potential effects to SWRA resources. MPCs 3.2, 4.1c, and 4.3, while not having suited timber base, are assumed to have similar vegetation management tools (although road construction is more constrained) as those MPCs that have suited timber base and therefore the same level of potential effects to SWRA resources.

For the ERT analysis, it was assumed that subbasins with less than 100 percent ERT acres represent a low risk to SWRA resources, as 100 percent represents the threshold of concern (TOC). At less than TOC, the amounts of forest vegetation management activities are assimilated within the subbasin, with very low risks for negative effects. The alternatives and subbasins that exceed TOC (100 percent ERT acres) would have an increased concern for temporary and short-term risks to SWRA resources. This potential would be mitigated greatly by management requirements designed into the alternative; however, potential effects would still exist and vary by alternative.

For Forest Plan Revision (a mid-scale programmatic planning effort), a mid-scale CWE method was needed that used with the Forest Vegetation Model (SPECTRUM) to assist in identifying potential effects associated with a variety of forest vegetation management activities (mechanical harvest, road and fire use related activities). The CWE method also needed to be reproducible over large areas, spatially and temporally adaptable, and consistent. The modeled effects in this analysis are designed to show relative differences in alternatives—not to accurately predict the amount or location of management activities that would occur during the planning period. Other appropriate analyses would be conducted at the project level.

This CWE method was designed to provide a screening tool for identifying subbasins with the potential for concentrated forest vegetation management activities and associated risks to listed fish species, their habitats, and other SWRA resources. The method is similar (but less specificity based on the mid-scale programmatic nature of Forest Plan Revision) in concept to other models such as the Equivalent Roaded Area (ERA), Equivalent Clear-cut Area (ECA), BOISED Sediment Yield Model, and the Cumulative Watershed Effects Process for the State of Idaho. These various models have been used throughout the National Forests (at finer scales) and are similar in that they account for a variety of management activities correlated to a common unit, and measure effects from those activities on watershed functions and aquatic systems.

Issue 4, Methodology and Assumptions
Effects from Wildfire Vs. Management to Reduce Wildfire Hazard, Methodology - The SPECTRUM model analysis provided only a general assessment of potential risks and effects from fire management activities at the subbasin scale. It was not detailed enough to evaluate potential risks/effects at the subwatershed scale. Therefore, mechanical and fire use, based on MPCs, were instead used to evaluate risks from management activities.

Potential effects to aquatic resources were analyzed by comparing the MPCs (3.2, 4.1 c, 4.2, 4.3, 5.1, 5.2, 6.1, and 6.2) that have a high emphasis and more tools available to treat subwatersheds with high and extreme risks from uncharacteristic wildfire to MPCs (1.1, 1.2, 2.0, 2.1, 2.2, 3.1, 4.1a, and 4.1b) that have a limited emphasis and fewer tools. Acres of high treatment emphasis were compared to acres of limited treatment emphasis for each subbasin.

High and limited emphasis MPCs in subwatersheds with high and extreme risk from uncharacteristic wildfire were also overlaid with the population status (e.g., strong, depressed, and isolated local population) of bull trout, steelhead trout, and chinook salmon. This was done to evaluate the risks and or benefits from management treatments. It also assessed the risks from limited treatments that would maintain a high risk from uncharacteristic wildfires.

Effects from Wildfire Vs. Management to Reduce Wildfire Hazard, Assumptions - It is assumed that potential effects from management activities are greatest in those subwatersheds with a high risk from uncharacteristic wildfire and high emphasis MPCs that require both mechanical and prescribed fire treatments, moderate in those subwatersheds with limited emphasis MPCs requiring mechanical and fire treatments, and lowest in subwatersheds with limited emphasis MPCs requiring only prescribed fire. However, it is recognized these effects are more complex than these general assumptions portray. Effects will vary as site conditions change and with the intensity of each treatment. For example, helicopter harvest to thin vegetation and reduce fire risk would create relatively little risk to SWRA resources compared to harvest involving roads and skid trails.

Where depressed or isolated fish populations are present, it is assumed that the risk of uncharacteristic wildfire in the short term is greater than the risk of mechanical and prescribed fire to treat vegetation in some situations.

The influence of fire on persistence of native salmonid populations is highly variable. However, several elements appear to be critical for populations to persist fire and other types of disturbances. First, available evidence suggests fish populations are more likely to occur, and thus persist, in larger, less isolated habitats (Dunham et al. 1997, Rieman and McIntyre 1995, Dunham and Rieman 1999, Dunham et al. 2002). Populations that occupy a greater number of watersheds are more likely to occur in a broader diversity of habitat conditions allowing them to better survive disturbances. Second, populations that have complex life histories provide temporal and spatial hedges against local extinction following catastrophic disruption. Third, in larger interconnected systems, fish populations appear to be more resilient to the effects of fire. The importance of connectivity was evident in studies of salmonids responses to fires that burned through two tributary streams in the Boise River basin in the early 1990s (Rieman et al. 1997). In one stream, a local population of bull trout was probably extirpated, at least temporarily, following a severe burn and associated channel disturbances. The population was reestablished within a year through spawning returns of migratory individuals that were presumably outside of the system during the fire and related disturbances. Finally, larger populations are more likely to persist than smaller populations from disturbance events.

In watersheds where the threat of large fires is high, local populations of sensitive aquatic species may be at risk because they are isolated or are very small (Kruse et al. 2001). Fires burning over large areas are likely to influence more habitats simultaneously, compromising the spatial and temporal diversity in habitat conditions and population dynamics believed to be important to the stability and persistence of species and populations. Such effects might be particularly important where populations and habitats are already degraded. Because many of the remnant populations of fishes are already depressed, small or isolated, they lack the resilience, diversity, or demographic support to rebound from disturbance (Rieman and Dunham 2000). In some cases, local extinctions have been observed in response to fire, particularly in areas where populations of fishes have been isolated in small headwater streams (Rieman et al. 1997).

The risk from large, uncharacteristic wildfires could lead to long-lasting effects that may further stress isolated and depressed populations. It is believed that prescribe fire and select mechanical treatments can reduce some of these risks. It is also realized that past timber harvest activities have contributed to degradation in aquatic ecosystems, and that emphasis on timber harvest and thinning to restore more natural forests and fire regimes represents a threat of extending these problems. Our coarse assessment of benefits from management treatments is not an endorsement of full-scale treatments, over thousands of acres. At some point management actions would pose too great of a risk to populations. This is why careful analysis at the project scale will be required to determine the best course of action in any subwatershed. However, because many depressed populations lack the numbers to rebound quickly and isolated populations lack the connectivity to re-colonize burned areas, some level of management treatments, combined with other restoration, is appropriate to reduce fire risks in certain circumstance. Brown et al. (2001) and Rieman et al. (in press) have come to similar conclusions stating that active management to reduce the impact of fires and fire suppression actions could be an important short-term conservation strategy. Mealey and Thomas (2002) also have concluded that reducing the threat of uncharacteristic wildfires could be critical to short-term survival of some fish population.

Where strong fish populations are present, it is assumed that the risks of mechanical and prescribed fire treatments are greater than the risk of uncharacteristic wildfire.

Strong populations are believed to retain many of the population characteristics and occupy watershed with the habitat characteristics to withstand the effects of large, uncharacteristic fires. In particular, strong populations generally have good connectivity that allows them to re-colonize habitat that is altered from large fires. Many of the remaining strong populations within the Ecogroup also occur in unroaded or lightly managed subwatersheds. It is assumed that effects from treatments in these areas may be too great to the last remaining strongholds, even with following forest-plan management direction. Attempts to minimize the risk of large fires by expanding timber harvest, risks expanding the well-established negative effects on aquatic systems. The perpetuation or expansion of existing road networks and other activities can erode the ability of populations to respond to the effects of fire and large storms and other disturbances that we cannot predict or control (National Research Council 1996). Our assumptions should not be interpreted as an endorsement of no treatments in stronghold subwatersheds. Certain circumstances may warrant limited treatments in specific areas. This is again why careful project level analysis will be required to determine the best coarse of action.

For this programmatic analysis the following set of assumptions were made:

- The risk of uncharacteristic wildfire in short-term is greater than the risk of mechanical and prescribed fire to treat vegetation in some situation where depressed or isolated local fish populations are present. Depressed and isolated populations could be vulnerable to the effects of intense or very large wildfires. Risks of fire are likely most important for aquatic ecosystems that have been seriously degraded, fragmented, and to species that have very specific habitat requirements.

- The risks of mechanical and prescribed fire treatments are greater than the risk of uncharacteristic wildfire where strong populations are present. Watersheds that support healthy populations may be at greater risk through disruption of watershed processes and degradation of habitats caused by intensive management than through the effects of fire.

- Short term effects from treatments will be mitigated to the fullest extent possible.

- If threats are too great to a fish population, projects will be deferred until conditions that limit fish populations are addressed.

- Where treatments to reduce fire risk occur, temporary or short-term effects from treatments will be mitigated to meet the intent of SWRA Standards 1 and 4. This mitigation may include completing needed aquatic restoration prior to fire management treatments being implemented.

- The fewer management tools available to restore natural vegetative conditions, the greater the risk to depressed and isolated local populations from uncharacteristic wildfire.

Cumulative Effects – Issue 4 Only

The relative level of risk associated with cumulative effects was evaluated for TEPC fish species and SWRA resources. Those subbasins that potentially have more vegetative activities (ERT acres above TOC), grazing (high amount of suited rangelands with less restrictive management direction), and fire/mechanical treatments (high percentage of stronghold subpopulations that may be treated), less aquatic restoration, degraded baselines, and limited federal ownership are likely to have more risks of cumulative effects. Each of these indicators was assigned a relative risk based on a rating scale of 1 (low) to 3 (high) and key effects analysis assumptions (Table SW-11). Indicators were totaled for each subbasin and alternative. A maximum score of 18 was possible for subbasins where all indicators applied. Eighteen represents the maximum relative amount of cumulative effect potential, and 6 represents the minimum amount. Subbasins and alternatives with higher scores have a greater potential for cumulative effects. Scores in the 6 to 10 range generally represent a relatively low potential for cumulative effects.

Table SW-11. Projected Level of Risk by Resource Activity

Cumulative Effects Criteria	Level of Risk		
	High (3)	Medium (2)	Low (1)
SWRA Restoration Good Matches	<33% of subwatersheds are good matches	34-66% of subwatersheds are good matches	>67% of subwatersheds are good matches
Rangeland Suitability and Less/More Restrictive Grazing Strategies	Higher % suitability and higher amount of less restrictive grazing strategy	Higher % suitability and lower amount of less restrictive grazing strategy	Lower % suitability and lower amount of less restrictive grazing strategy
ERT acres vs. TOC values at 20 yrs.	>100%	N/A	<100%
Risk of Fire Treatment to Strongholds	Any Stronghold Treated	NA	No Strongholds Treated
Amount of On-going State, Private, and Federal Activities (Based on landownership and CWE write-up)	<33% of subbasin in Federal Ownership	34-66% of subbasin in Federal Ownership	>67% of subbasin in Federal Ownership
Baseline Condition	Majority of pathways FUR	Majority of pathways FR	Majority of pathways FA

Fish Species Viability

Fish Habitat Analysis - Benefits to fish habitat varies according to the probability for active restoration in subwatersheds functioning at unacceptable risk; passive restoration for areas that are at, or very close to, functioning appropriately with no fish strong local subpopulations; and conservation management for those functioning appropriately supporting strong local subpopulations. The types of restoration are:

- *Conservation* - All key ecosystem components are at desired conditions and functioning appropriately. Management is solely protection and nothing changes from status quo. No land disturbances or temporary risks to fish habitat or local subpopulations would occur. Long-term active maintenance may be necessary to keep most of the resource values within desired conditions, as systems are typically dynamic in nature.

- *Passive* - Some risk is noted as components are not at desired conditions and only land management direction changes are used to correct degradation problems. Restoration occurs at a natural rate of recovery. Very little land disturbances and temporary risks to aquatic resources would be anticipated. Long-term risks to vegetation and soils may be evident.

- *Active* - Enough risk is apparent to where capital investments are deemed necessary to encourage recovery. It is judged that natural rates of recovery are not sufficient and require assistance through deliberate mitigation. Temporary risks of impacts to fish habitat and subpopulations can occur. Long-term risks to other resource values (vegetation, soils, etc.) are minimized.

After a functioning risk was determined for each subwatershed (geomorphic integrity, water quality integrity, and aquatic properly functioning condition), the subwatershed was evaluated through assignment of MPCs which have either a low, moderate, or high likelihood of being managed to attain desired conditions during the short term through either active or passive restoration or; maintaining existing conditions through conservation measures. The higher the relative restoration value, the better the chance habitat would support fish subpopulations at viable levels. A high likelihood of managing for DFC attainment in the short term through active management would encourage high risk aquatic habitat to recover much faster than a low or moderate likelihood of DFC attainment would, or for that matter, than if passive restoration or conservation management was assigned.

Active restoration assigned to subwatersheds functioning appropriately would inefficiently use limited funding and could produce unnecessary temporary risks of impacts to fish habitat or local subpopulations. Passive restoration or conservation management assigned to habitat requiring active restoration would not move habitat conditions toward desired conditions in the short term. Therefore, the most effective way to analyze fish population viability is to see how active restoration is applied to those watersheds that are not properly functioning or functioning at risk, and how passive restoration or conservation practices are applied to those subwatersheds that are functioning appropriately.

Emphasizing conservation practices for resident fish strong local subpopulations within watersheds that are at desired conditions, coupled with emphasis for active restoration for resident fish strong local subpopulations within more risky watersheds, will increase the chance of meeting viability needs for resident fish. The high likelihood of managing for desired conditions during the short term through restoration for highly isolated resident local fish subpopulations, will also help protect and restore resident fish.

It is assumed that as existing subpopulations increase in numbers, population density will force some individual fish to vacate their existing habitat and seek suitable unoccupied habitat elsewhere, therefore expanding distribution. This should also improve genetic drift and recruitment to prevent stochastic events from threatening population survival. It should be noted, however, that because bull trout exhibit a patchy distribution even in pristine habitats, these fish should not be expected to simultaneously occupy all available habitats even after restoration has occurred (USDI FWS 2002).

By managing aquatic habitat to provide for viability of the selected representative fish species, the habitat should also be capable of supporting viability for other native and desired non-native fishes. Revision is also assuming that the standards and guidelines that are designed to protect riparian resources will be adequate to maintain viability for the non-fish aquatic species (amphibians, mollusks, etc.). Also standards and guidelines should protect those non-fish aquatic species occurring in high mountain lakes by controlling indiscriminate stocking of exotic fish that could prey upon these native organisms.

Fish Population Analysis - Discussions with Kerry Overton (Rocky Mountain Research Station) revealed that addressing fish populations at the metapopulation scale is most appropriate for determining population survival. McElhany et al. (2000) defines a metapopulation as a population of populations, or a set of populations that is spatially structured fundamentally depending on habitat quality, spatial configuration and dynamics, and the dispersal characteristics of individuals within the population. Metapopulations provide a mechanism for spreading risk of extirpation because the loss of all subpopulations is unlikely. For resident fish, Overton correlates metapopulation with the subbasin, which we have also correlated with "core area" used by the FWS. For anadromous species, the subbasin is more akin to a subpopulation. Consequently, this BA used the subbasin scale as the spatial level to address metapopulations for resident species. The subbasin was also used for anadromous species.

Four fish species were used in the viability analysis. These species are spring/summer chinook salmon, steelhead trout, Yellowstone cutthroat trout, and bull trout. These species will represent other at risk species (e.g. sockeye salmon, fall chinook, and westslope cutthroat) due to similar habitat requirement, threats to each species, and overlap in distribution. Only those subbasins where these species currently occur (strong, depressed, migration) were considered. Each species was addressed individually in the process.

Two timeframes were used for population rehabilitation—15 years and 50 years. The former represents the typical Forest Plan lifecycle, and the latter is the five decadal period used in planning analyses. Fifty years should be a long enough period to reflect habitat and population responses to restoration efforts.

The degree that MPCs emphasized restoration or conservation was central to the viability analysis. Relative risk of extinction was assessed for each species by comparing spatial distribution of that species to habitat risks to assess where emphasis for restoration is most needed. By overlaying the

MPC restoration assignment, it was determined if the appropriate type (conservation, passive, or active) and management emphasis of the MPC to attain PFC (low, moderate, and high) would occur and the results discussed.

Although Forest-wide and MPC direction provide a high level of protection, this protection alone does not eliminate all threats to subwatersheds. A lack or delay of restoration where needed may also pose a threat to depressed fish populations. If a WARS high-priority subwatershed has an MPC with a low or moderate restoration emphasis, it is considered to be a higher risk to fish populations than if the MPC has a high restoration emphasis. This is because some threats (e.g., undersized culverts or poorly constructed roads) can only be addressed through active restoration. If not addressed, these problems will continue and may become worse with time.

Remaining effects from grazing, timber harvest, roads, recreation, uncharacteristically wildfire, etc., were evaluated for each subbasin and summarized by alternative to determine if these activities reduced the benefit of restoration or conservation practices in regards to overall species viability at the subbasin scale. Potential effects from lethal fires were also considered.

The only population risk used in this analysis will be the past stocking of brook trout as they may affect bull trout. IWWI data showing distribution of brook trout in bull trout habitat indicate threats to the bull trout from exotic introduction. If brook trout are present, bull trout populations may be limited by these population risks and most likely would not strengthen in 50 years even if the habitat improved. Rainbow trout has been stocked so widespread that we are assuming that most cutthroat trout populations in the Ecogroup could be threatened by this exotic fish introduction.

All of the subwatersheds within subbasins with listed fish populations were evaluated to determine if those now absent of fish could be readily re-colonized. For subwatersheds now absent of listed fish species, four conditions had to be met before a subwatersheds could be re-colonized. First, a subwatershed must have habitat restoration highly emphasized by the selected alternative. Second, it must be hydrologically linked to allow re-colonization to adjacent subwatersheds within the same subbasin. Third, it must have historically supported these species. Finally, adjacent subwatersheds must currently support the listed fish species. Recolonization applies mainly to bull trout, but could include anadromous species where habitat degradation is the cause for local extirpation and ocean access still remains.

Habitat improvement should make these areas more attractive for adjacent local populations to re-colonize. It was also assumed that, as existing populations increase, population density would force some individual fish to vacate their existing habitat and seek suitable unoccupied habitat elsewhere, thereby, expanding their distribution.

Those subwatersheds experiencing depressed or absent subpopulations, but that have properly functioning watershed conditions, may not show improvements to subpopulation trends in this analysis. The assumption is that habitat is probably not the limiting factor to the population, and therefore habitat improvement would not restore fish numbers. Some of these areas, such as wilderness, may inherently only support depressed populations. Also, population risks (exotic fish stocking, diseases, harvest, predation, etc.) may be limiting population recovery. For anadromous species population recovery may be more limited by off-Forest migration impediments or other impacts.

This viability analysis does not determine subpopulation numbers that will be attained by each alternative. However, it does qualitatively estimate how subpopulations may respond to restoration, conservation, and other management actions. Although many subpopulations are predicted to increase, declines could still occur for some species regardless of future land management activities. Past management activities in some subwatersheds may have so altered watershed or habitat conditions that risks to listed fish species could not be reduced in the short term. Subpopulations that are stable, but small are also vulnerable to chance environmental events such as floods, fires, etc. Isolated subpopulations in high quality habitats could be vulnerable to permanent extinction through inbreeding and loss of genetic fitness.

Methods for Assessing MIS Species

Potential population increases or decreases, modeled by the viability analysis, were used to make inferences on changes to the spatial patterns of bull trout. As watershed conditions improve, existing bull trout populations would also improve and unoccupied habitat could be recolonized. In time, stronger populations would result in more dispersed and resilient metapopulations across each subbasin. Bull trout populations in larger, less isolated, and less disturbed habitats may be more likely to persist (Rieman and McIntyre 1995). Smaller patches are likely to support smaller local populations and fewer or less diverse habitats (Rieman and McIntyre 1995). The change in spatial pattern and population size over time would be an important way to determine the success of restoration efforts and minimization of project effects for this MIS species.

Direct and Indirect Effects By Issue and Alternative

Effects on Soil Water and Riparian Resources - Issue 1

High levels of uncharacteristic wildfire hazard within highly vulnerable subwatersheds increase the risk of large, uncharacteristic wildfires and their potential for loss of soil-hydrologic function and long-term soil productivity. Alternatives that have a higher emphasis and tools available to lower the wildfire hazard reduce this risk. Reductions in uncharacteristic wildfire hazard increase opportunities to move toward or maintain the desired vegetative conditions over time. They also reduce the risk of undesirable impacts to soil-hydrologic function and long-term soil productivity. Table SW-12 displays the Ecogroup total number of highly vulnerable subwatersheds with the potential for uncharacteristically lethal wildfire (high or extreme uncharacteristic wildfire hazard), and the number and percentage of these subwatersheds with MPCs that would have the most management emphasis for restoring uncharacteristic forest vegetation hazard toward the non-lethal forest vegetation conditions that historically occurred.

Table SW-12. Highly Vulnerable Subwatersheds With Uncharacteristic Lethal High and Extreme Fire Hazard and the Most Management Emphasis for Reducing that Hazard, by Alternative

Area	Highly Vulnerable Subwatersheds with High or Extreme Uncharacteristic Lethal Fire Hazard	Subwatersheds With Management Emphasis for Reducing Hazard						
		Alt 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Ecogroup Total	82	51	50	58	28	72	9	55
Percent With Mgt. Emphasis For Hazard Reduction		62%	61%	71%	34%	88%	11%	67%

Alternative 5 has the most benefit in reducing uncharacteristic wildfire negative effects by emphasizing vegetation restoration treatments on 88 percent of the 82 highly vulnerable, high-risk subwatersheds. This alternative would have the highest likelihood of reducing the extent of wildfire severity on most of the subwatersheds. This restoration would help reduce the size, severity, and intensity of uncharacteristic wildfires, and associated risks and impacts to soil, water, and riparian resources. Alternatives 3, 7, 1B, and 2 would emphasize long-term risk reduction on well over half (71, 67, 62, and 61 percent, respectively) the subwatersheds with uncharacteristically lethal wildfire hazard. Alternatives 4 and 6 would emphasize vegetation restoration treatment on a minor amount (34 and 11 percent, respectively) of the subwatersheds.

Effects on Soil Water and Riparian Resources - Issue 2

Management strategies (prescribed fire or mechanical vegetation treatments) can help reduce the potential for post-wildfire effects and associated BAER costs to highly vulnerable subwatersheds that are at high or extreme risk to uncharacteristically lethal wildfire. The potential for using these types of strategies can be inferred from the MPCs that have been assigned to these subwatersheds by alternative. This MPC determination is based on the availability to use mechanical and or fire management activities to move toward or maintain forest vegetation conditions within their historical range of conditions. Vegetation restoration activities that move vegetation toward historical ranges of variability will provide favorable conditions for soil-hydrologic functions and watersheds processes (ICBEMP 2000a), thereby reducing risks to human life, property, and municipal supply watersheds.

Table SW-13 displays the effects of the alternatives on the highly vulnerable subwatersheds identified with post-wildfire floods and debris flows with potential effects to human life, property, and/or municipal supply watersheds.

Table SW-13. Highly Vulnerable Subwatersheds Considered at Risk to Post-wildfire Floods and Debris Flows that Have Management Emphasis for Reducing Post-wildfire Watershed Risks, by Alternative

Indicator	Alt 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Total highly vulnerable subwatersheds in Ecogroup with high or extreme risk of uncharacteristic lethal wildfire and post-wildfire watershed risks	27	27	27	27	27	27	27
Number of these subwatersheds with MPCs that would emphasize vegetation restoration treatments to reduce risks	21	22	23	14	27	5	23
Percent of subwatersheds with MPC treatment emphasis compared to total Ecogroup subwatersheds at risk	78%	81%	85%	52%	100%	19%	85%

Within the Ecogroup there are 27 highly vulnerable subwatersheds identified with the potential for post-wildfire floods and debris flows that could affect human life, property, and/or municipal supply watersheds. Alternative 5 has MPCs that would emphasize vegetation restoration on all of these subwatersheds, thereby reducing the post-wildfire risks to human life, property, and/or municipal watersheds in all these subwatersheds. Alternatives, 7, 3, 2, and 1B have MPCs that would emphasize vegetation treatments on a relatively high amount of these subwatersheds (85, 85, 81, and 78 percent, respectively). Alternative 4 has MPCs that would emphasize vegetation restoration treatments in a moderate amount (52 percent) of these subwatersheds. Alternative 6 has MPCs that would emphasize vegetation restoration treatments on a small amount (19 percent) of these subwatersheds, resulting in a fairly large number of subwatersheds that would remain at risk to post-wildfire floods and debris flows. Under Alternative 6, over 80 percent of the subwatersheds at risk would continue to pose a threat to human life, property, and/or municipal watersheds from uncharacteristically lethal wildfire.

Effects on Soil Water and Riparian Resources – Issue 3

Indicator 1: Effects From Vegetation Treatments, Roads, and Fire Use – This issue is addressed in two parts, below: (1) suited timberland acres, and (2) ERT Acres Compared to Subbasin TOCs.

Suited Timberland Acres – Based on suited timberland acres assigned by MPC, Alternative 5 has the greatest potential for impacts from commercial timber harvest and associated road activities. This alternative is followed in descending order by Alternatives 1B, 2, 3, 7, 6 and 4 (Table SW-14). Suited acres vary considerably by alternative, from an estimated 2,801,563 in Alternative 5 to only 32,940 in Alternative 4. Alternatives that have more acres available for commercial harvest and associated road activities have a higher potential for temporary and short-term impacts to soil productivity, watershed condition, water quality and aquatic habitat. Alternative 5 proposes a substantial increase above the current condition, represented by Alternative 1B. All other alternatives are substantially below Alternative 1B. The new Alternative 7 has approximately 750,000 fewer acres suited timber acres compared to Alternative 1B. Much of this difference occurs within the following subbasins: South Fork Salmon, Upper Salmon, and South Fork Payette.

Table SW-14. Acres of Suited Timber Base within Ecogroup Subbasins, by Alternative

Subbasin	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Big Wood River	104505	29492	57942	0	155744	2360	31779
Boise-Mores	107748	110498	97382	5903	125555	42142	91355
Brownlee Reservoir	71845	68542	72331	0	99843	52434	66763
C J Strike Reservoir	212	213	212	209	218	144	157
Camas Creek	15086	16607	18203	451	24035	3144	4175
Curlew Valley	3266	3335	3266	808	4004	314	821
Goose Creek	18148	15286	15244	4365	20816	1511	14875
Hells Canyon	564	0	0	0	5965	0	564
Lake Walcott	10792	10854	10792	6672	12375	1607	8273
Little Salmon River	55551	45737	39749	0	106844	34799	49374
Little Wood River	7407	6935	6735	0	14167	1394	6735
Lower Boise	2737	3154	2737	6	3587	2246	2737
Lower Middle Fork Salmon	733	0	0	0	12359	0	0
Lower Salmon	14321	4040	15650	0	65907	3705	7965
Middle Fork Payette	85695	76071	69912	0	142349	40328	52532
M. Salmon-Chamberlain	42602	46708	69053	0	89132	10284	18885
Upper Snake-Rock	9329	10521	10446	3442	12842	7608	9433
North Fork Payette	106879	115648	89018	0	164301	60882	88205
North and M. Fork Boise	104294	103624	64427	0	188269	65068	77439
Northern Great Salt Lake	440	468	440	420	556	44	78
Payette	55062	57584	67463	0	80407	45154	53310
Raft River	27338	26107	26006	7452	36257	2724	21037
Salmon Falls Creek	5377	5380	5377	0	6014	3818	5377
South Fork Boise River	172151	178055	168038	3212	263070	62349	106213
South Fork Payette	180187	195491	165692	0	303980	53268	98633
South Fork Salmon	225154	10939	10415	0	393402	2655	20836
Upper Middle Fork Salmon	44360	0	0	0	79965	0	0
Upper Salmon	113446	1021	1018	0	178545	0	1018
Weiser River	165038	164839	162974	0	211055	117228	162721
Totals	**1,750,267**	**1,307,149**	**1,250,522**	**32,940**	**2,801,563**	**617,210**	**1,001,290**

<u>*ERT Acres Compared to Subbasin TOCs*</u> **-** Most alternatives have ERT acres substantially below the TOC for each subbasin after both 20 and 50 years. The shaded boxes in Table SW-15 indicate alternatives and subbasins where the TOC could potentially be exceeded based on MPC modeling assumptions. Actual treatment acres would depend on site-specific proposals, analysis, consultation, and mitigation, which would no doubt modify the numbers presented below.

Table SW-15. Percent of ERT Acres Relative to the Threshold of Concern (100) within Subbasins for the Ecogroup, by Alternative, After 20 and 50 Years

Subbasins Name	Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.
Northern Great Salt Lake	35	30	6	10	0	0	4	40	25	20	30	20	36	33
Curlew Valley	51	42	18	11	6	4	11	38	52	45	38	19	53	41
Lake Walcott	1	4	2	2	2	1	1	28	9	6	8	6	7	11
Raft	21	25	8	11	3	11	18	28	44	29	31	21	27	32
Goose	59	42	20	29	10	6	25	46	78	46	59	30	107	92
Upper Snake-Rock	23	22	16	10	11	6	34	49	23	15	39	19	28	49
Salmon Falls Creek	3	2	83	40	75	40	13	13	4	17	42	38	57	36
Big Wood	9	7	55	36	38	31	16	27	20	19	24	18	66	45
Camas Creek	9	13	11	14	8	7	9	26	15	16	19	18	30	28
Little Wood	6	7	34	32	30	30	13	27	20	21	25	21	53	44
C J Strike Reservoir	10	17	4	11	33	33	5	12	12	13	10	20	6	10
North and M. Fork Boise	38	37	21	28	19	23	18	24	26	31	20	24	34	36
Boise-Mores	36	38	18	31	18	22	18	26	33	37	16	26	26	40
South Fork Boise River	34	24	22	23	18	18	15	23	21	23	19	20	43	36
Lower Boise	68	56	19	29	16	25	36	31	58	48	31	32	24	29
South Fork Payette	64	56	35	34	33	31	31	28	49	47	40	33	62	51
Middle Fork Payette	93	77	41	38	39	34	38	32	76	67	47	37	68	63
Payette	63	58	64	43	48	38	30	22	52	48	46	34	72	58
North Fork Payette	63	57	69	47	46	35	38	26	56	45	50	33	79	56
Weiser River	35	36	25	22	22	18	22	20	30	34	31	26	37	38
Brownlee Reservoir	44	40	27	23	16	15	24	20	32	33	30	25	39	35
Hells Canyon	107	105	45	37	36	26	48	29	90	84	136	67	39	31
Upper Salmon	42	26	119	70	86	49	67	51	43	33	62	39	125	75
Upper Middle Fork Salmon	112	83	61	46	55	37	50	31	61	51	61	38	90	66
Lower Middle Fork Salmon	40	39	36	27	28	16	31	15	48	36	32	21	51	39
Middle Salmon-Chamberlain	61	45	33	30	23	18	32	23	57	44	82	46	46	36
South Fork Salmon	72	56	66	43	44	33	35	25	63	50	52	33	78	53
Lower Salmon	77	52	62	42	34	30	51	31	64	52	91	52	52	41
Little Salmon	58	45	43	30	32	20	29	18	50	38	42	25	44	33

Only the Hells Canyon, Upper Middle Fork Salmon, Upper Salmon and Goose Creek subbasins have ERT acres above the 100 percent TOC in select alternatives (Table SW-15). Many of the higher acre percentages are due to potential management activities to reduce wildfire risks and move forest vegetation toward desired conditions using mechanical and fire treatments. Because modeled ERT values exceed the threshold of concern (100 percent), the potential effects to soil, water, and riparian resources are relatively high in the short term in Hells Canyon for Alternatives 1B and 6, Upper Middle Fork Salmon in Alternative 1B, Upper Salmon in Alternatives 2 and 7, and Goose Creek in Alternative 7. Remaining effects (see Effects Common to All Alternatives, General Effects) to water quality, watershed condition, and flow/hydrology have a higher probability of occurring, depending on the type and intensity of activities that may be allowed under each alternative, based on MPCs. For Alternative 7 the amount of suited timber base acres in these subbasins are relatively low to no suited timber base acres as follows: Upper Salmon, no suited timber base acres; Upper Middle Fork Salmon, no suited timber base acres; Goose Creek, 15,000 suited timber base acres. Most of these affected pathways are also currently "functioning at risk" in the Hells Canyon, Upper Middle Fork Salmon and Upper Salmon subbasins. This suggests some subwatersheds within these subbasins may be more sensitive to the forest vegetation management activities. Forest-wide management direction would greatly reduce any potential negative effects, and potential effects would likely be further reduced through project-level mitigation and consultation.

Issue 3, **Indicator 2: Effects From Livestock Grazing** - This issue is addressed in two parts, below: (1) suitable rangeland acres, and (2) Less Restrictive vs. More Restrictive Grazing Management.

Suitable Rangeland Acres – The percents of suitable rangeland acres are somewhat less under Alternatives 2, 3, 4, 6 and 7 across the Ecogroup, as compared to the current forest plans, represented by Alternative 1B (Table SW-16). Alternative 5 is similar to Alternative 1B. Alternative 7 would have approximately 100,000 acres less suited rangeland acres as compared to Alternative 1B. For all alternatives, suitable rangeland acres are less than 20 percent of the total subbasin within 15 of the 29 subbasins. The Goose Creek, Little Wood River, Northern Great Salt Lake, Salmon Falls Creek, Raft River, and Upper Snake-Rock subbasins have the highest percentages of suitable rangelands for all alternatives.

Table SW-16. Percent of Suited Rangeland within Ecogroup Subbasins, by Alternative

Subbasin	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Big Wood River	20%	20%	20%	19%	20%	4%	20%
Boise-Mores	27%	26%	26%	26%	27%	26%	26%
Brownlee Reservoir	27%	27%	19%	19%	27%	19%	27%
C J Strike Reservoir	9%	9%	9%	9%	9%	9%	9%
Camas Creek	20%	20%	20%	19%	20%	4%	20%
Curlew Valley	6%	6%	6%	6%	6%	6%	6%
Goose Creek	67%	67%	47%	47%	67%	47%	47%
Hells Canyon	12%	12%	4%	4%	12%	0%	2%
Lake Walcott	17%	16%	16%	16%	17%	16%	16%
Little Salmon River	19%	19%	19%	19%	19%	19%	19%
Little Wood River	37%	37%	37%	37%	37%	37%	37%
Lower Boise	7%	7%	7%	7%	7%	7%	7%
Lower Middle Fork Salmon	0%	0%	0%	0%	0%	0%	0%
Lower Salmon	19%	19%	19%	19%	19%	19%	19%
Middle Fork Payette	24%	20%	20%	20%	24%	20%	20%
Middle Salmon-Chamberlain	1%	1%	1%	1%	1%	1%	1%
Upper Snake-Rock	76%	76%	44%	44%	76%	38%	44%
North Fork Payette	11%	11%	11%	11%	11%	11%	11%
North and M. Fork Boise	22%	21%	21%	21%	22%	21%	21%
Northern Great Salt Lake	65%	65%	65%	65%	65%	65%	65%
Payette	32%	32%	32%	32%	32%	32%	32%
Raft River	38%	38%	38%	38%	38%	38%	38%

Subbasin	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Salmon Falls Creek	80%	80%	80%	80%	80%	80%	80%
South Fork Boise River	22%	22%	22%	22%	22%	22%	22%
South Fork Payette	7%	4%	4%	4%	7%	4%	4%
South Fork Salmon	2%	2%	2%	2%	2%	2%	2%
Upper Middle Fork Salmon	1%	5%	5%	1%	5%	5%	1%
Upper Salmon	8%	8%	8%	8%	8%	8%	8%
Weiser River	32%	32%	32%	32%	32%	32%	32%

Less Restrictive vs. More Restrictive Grazing Management - MPC emphasis and management direction also needs to be considered in addition to suited rangeland acres. Those alternatives and subbasins with a higher amount of suited rangeland acres and MPCs with more restrictive grazing direction have less of a potential for temporary and short term effects to the soil and water quality associated matrix pathways. The combination of less suited rangeland acres and reduced percentages of more restrictive grazing strategies suggest there is a greater chance for temporary effects to soil, water and riparian resources. In particular, the Brownlee Reservoir, Boise-Mores, Middle Fork Payette, North Fork and Middle Fork Boise, Payette, South Fork Boise, Weiser, Little Salmon, Lower Salmon, Raft River, Goose Creek, Upper Snake-Rock, Salmon Falls Creek, and Camas Creek subbasins could have more grazing impacts due to a higher percentage of the suited rangeland acres having less restrictive MPCs (Table SW-17).

Table SW-17. Percent of Less and More Restrictive Grazing Strategies within Ecogroup Subbasins, by Alternative

Subbasins	Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	L	M	L	M	L	M	L	M	L	M	L	M	L	M
Big Wood River	90	10	76	24	76	24	34	76	100	0	35	65	80	20
Boise-Mores	100	0	95	5	87	13	90	10	96	4	96	4	95	5
Brownlee Reservoir	100	0	100	0	99	1	0	100	100	0	100	0	98	2
C J Strike Reservoir	100	0	100	0	100	0	100	0	100	0	100	0	100	0
Camas Creek	100	0	100	0	100	0	61	39	100	0	100	0	100	0
Curlew Valley	100	0	100	0	100	0	23	77	100	0	100	0	23	67
Goose Creek	100	0	94	6	93	7	40	60	100	0	93	7	88	12
Hells Canyon	100	0	99	1	98	2	97	3	100	0	55	45	98	2
Lake Walcott	100	0	100	0	100	0	100	0	100	0	100	0	100	0
Little Salmon River	97	3	88	12	49	51	18	82	84	16	89	11	58	42
Little Wood River	45	55	43	57	43	57	8	92	100	0	46	54	43	57
Lower Boise	100	0	100	0	100	0	100	0	100	0	100	0	100	0
Lower M. Fork Salmon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lower Salmon	97	3	74	26	17	83	0	100	97	3	94	6	11	89
Middle Fork Payette	100	0	94	6	94	6	51	49	100	0	100	0	100	0
Middle Salmon-Chamberlain	39	61	100	0	93	7	0	100	100	0	100	0	54	46
Upper Snake-Rock	100	0	100	0	100	0	92	8	100	0	100	0	100	0
North Fork Payette	79	21	78	22	48	52	8	82	100	0	78	22	52	48
N. and M. Fork Boise	83	17	82	18	68	32	13	87	93	7	88	12	78	22

Subbasins	Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	L	M	L	M	L	M	L	M	L	M	L	M	L	M
N. Great Salt Lake	100	0	100	0	100	0	100	0	100	0	100	0	56	44
Payette	100	0	100	0	100	0	51	49	100	0	100	0	100	0
Raft River	100	0	100	0	100	0	49	51	100	0	96	4	78	22
Salmon Falls Creek	100	0	100	0	100	0	92	8	100	0	100	0	100	0
S. Fork Boise River	100	0	95	5	89	11	29	71	100	0	99	1	94	6
South Fork Payette	76	24	94	6	93	7	27	73	100	0	94	6	89	11
South Fork Salmon	79	21	40	60	1	99	0	100	85	15	62	38	8	92
Upper M. Fork Salmon	88	12	18	82	0	100	0	100	100	0	53	47	0	100
Upper Salmon	78	22	10	90	1	99	16	84	100	0	42	58	1	99
Weiser River	79	21	100	0	100	0	0	100	100	0	100	0	52	48

L = Less restrictive grazing strategies; M = More restrictive grazing strategies

Issue 3, **Indicator 3: Appropriate Restoration for 303(d) WQL Water Bodies -** All ACS priority subwatersheds identified by WARS would have a high emphasis for restoration of subwatersheds identified with 303(d) water quality limited water bodies in all the action alternatives. Alternative 1B (as amended by Infish, Pacfish, and the BOs) did not identify priority areas for restoration and would not receive this added emphasis (refer to Effects Methodology section in this Chapter). Alternative 3 has MPCs that emphasize the most appropriate restoration and conservation in 45 percent of the high priority subwatersheds identified by the WARS (Table SW-18). The Alternative 3 percentage is followed in descending order by Alternatives 7, 2, 6, 4, 1B, and 5. Subwatersheds with the appropriate restoration MPC assigned would likely experience a faster rate of recovery. The MPC emphasis would contribute to efforts to restore 303(d) water bodies in support of their beneficial uses, which should eventually assist in their de-listing.

Regardless of the restoration/conservation MPCs and how they were applied, all subwatersheds with listed 303(d) water bodies would receive special emphasis to improve watershed conditions under all alternatives due to the Forest Service's legal obligation to meet requirements under the Clean Water Act. For the action alternatives, this obligation has been addressed by specific Forest-wide and Management Area direction in the revised Forest Plans to restore 303(d) water bodies, and to protect SWRA resources. This direction should help improve water quality and assist in de-listing these water bodies and achieving conditions needed for these subwatersheds to fully support their beneficial uses. It is, therefore, assumed that subwatersheds with 303(d) water bodies that do not have the most appropriate restoration MPC assigned would still recover, but at a slower rate than those that do.

Table SW-18. Percent of Subwatersheds with High Priority 303(d) Water Quality Limited Water Bodies Receiving Most Appropriate Restoration or Conservation Emphasis or Identified as an ACS Priority Subwatershed, by Alternative

303(d) Water Quality Limited Water Bodies	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Ecogroup Total	12%	42%	45%	27%	7%	30%	43%

Issue 3, **Indicator 4: Appropriate Restoration for TMDLs -** Currently there are six subbasins partially or wholly within the Ecogroup with TMDLs approved or waiting approval by the Environmental Protection Agency. All ACS priority subwatersheds with subbasins that have a TMDL assigned would have a high emphasis for restoration in all the action alternatives. Alternative 1B (as amended by Infish, Pacfish, and the BOs) did not identify priority areas for restoration and would not receive this added emphasis (refer to Effects Methodology section in this Chapter). Alternative 3 has MPCs that emphasize the most appropriate restoration and conservation in 32 percent of the high priority subwatersheds identified by the WARS (Table SW-19). The Alternative 3 percentage is followed in descending order by Alternatives 7, 2 and 4, 6, and 1B and 5. Subbasins with the appropriate restoration MPC assigned would likely experience a faster rate of recovery. The MPC emphasis would contribute to efforts to restore TMDL subbasins in support of their beneficial uses, which should eventually assist in their de-listing. Percentages vary considerably by subbasin, as illustrated in Table SW-19.

Table SW-19. Percent of High Priority TMDL Subwatersheds Receiving Appropriate Restoration or Conservation Emphasis or Identified as an ACS Priority Subwatershed within Subbasins Within the Ecogroup, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Lake Walcott	0%	0%	0%	0%	0%	33%	0%
Lower Boise	0%	0%	0%	60%	0%	0%	0%
Middle Fork Payette	0%	17%	17%	17%	8%	17%	17%
Upper Snake-Rock	0%	0%	0%	0%	0%	0%	0%
North Fork Payette (Cascade Rsvr.)	15%	15%	62%	46%	8%	15%	31%
South Fork Salmon	16%	63%	74%	26%	16%	32%	68%
Totals	**7%**	**21%**	**32%**	**21%**	**7%**	**19%**	**25%**

Regardless of the restoration/conservation MPCs and how they were applied, all subbasins with assigned TMDLs would receive special emphasis to improve watershed conditions under all alternatives due to the Forest Service's legal obligation to meet requirements under the Clean Water Act. For the action alternatives, this obligation has been combined with specific Forest-wide and Management Area direction in the revised Forest Plans to restore 303(d) water bodies, and to protect SWRA resources. This direction should help improve water quality and assist in de-listing these TMDLs and achieving conditions needed for these subbasins to fully support their beneficial uses. It is therefore assumed that subbasins with TMDLs that do not have the most appropriate restoration MPC assigned would still recover, but at a slower rate than those that do.

Issue 3, Indicator 5: Effects From Motorized Trail Use - Trails currently open to motorized use would be prohibited within recommended wildernesses under Alternatives 4 and 6.

Under Alternative 4, an estimated 1,316 miles of motorized trail could be affected. The South Fork Salmon and South Fork Boise subbasins both have over 200 miles of motorized trails in recommended wilderness areas. The Big Wood, Little Salmon, Middle Fork Payette, South Fork Payette, and Upper Salmon subbasins have between 80-120 miles of motorized trails. The Brownlee Reservoir, Lower Salmon, North and Middle Fork Boise, North Fork Payette, and Weiser subbasins have between 40-70 miles. Nine other subbasins have minor amounts of motorized trails in recommended wilderness under Alternative 4. Under Alternative 6, an estimated 216 miles of motorized trail in recommended wilderness could be affected. The South Fork Salmon, Upper Salmon, and the South Fork Payette subbasins have between 40-70 miles of motorized trails. Five other subbasins have minor amounts of motorized trails. (Table SW-20).

Table SW-20. Miles of Summer Motorized Trails Within Recommended Wilderness, by Subbasin

Subbasin	Miles of Motorized Trail	
	Alternative 4*	Alternative 6*
Big Wood River	117	0
Brownlee Reservoir	48	0
Camas Creek	11	0
Curlew Valley	3	0
Goose Creek	4	0
Hells Canyon	1	0
Little Salmon River	86	0
Little Wood River	20	7
Lower Salmon	72	0
Middle Fork Payette	93	0
Middle Salmon-Chamberlain	13	<1
North and Middle Fork Boise	64	8
North Fork Payette	58	18
Payette	4	0
Raft River	15	0
South Fork Boise River	216	0
South Fork Payette	107	49
South Fork Salmon	211	66
Upper Middle Fork Salmon	9	4
Upper Salmon	122	64
Weiser River	44	0
Totals	**1,316 miles**	**216 miles**

*Subwatersheds included are either partially or wholly within the Ecogroup

Where these trails are within RCAs in the subbasins noted above, reduced motorized use is likely to reduce sediment delivery and improve streambank stability. These effects would assist in improving soil-hydrologic function, water quality, and riparian functions and ecological processes. Similar benefits would likely occur, although to a slighter extent, in subbasins with lesser amounts of prohibited motorized trail use.

All current motorized trails would remain open under Alternatives 1B, 2, 3, 5, and 7. Effects to aquatic species and SWRA resources would be similar under these Alternatives. Trail use would not be concentrated, but localized impacts to riparian vegetation and stream channels near crossings would be anticipated. Management direction would help to minimize most potential impacts under all alternatives. However, impacts to riparian vegetation and stream banks from authorized and unauthorized ATV use may still occur from increased trail use.

Effects on Snake River Sockeye Salmon, An Endangered Species - Issue 4

Direct and Indirect Effects to Sockeye Salmon

Issue 4, **Indicator 1: Effects From Vegetation Treatments, Roads, and Fire Use** - This indicator is addressed in two parts, below: (1) suited timberland acres, and (2) ERT Acres Compared to Subbasin TOCs. This applies to all fish species sections that follow.

Suited Timberland Acres – Based on suited timberland acres assigned by MPCs, Alternatives 5 and 1B have the greatest potential (345,943 and 171,102 acres) for impacts from commercial timber harvest and associated road activities (Table SW-21). These alternatives have a higher potential for temporary and short-term impacts to previously identified matrix pathways (water quality, habitat condition, etc.) and to sockeye salmon. The remaining alternatives have no more than 1,018 suited acres (less than 1 percent of the subbasin) within the Sockeye ESU, which means they have a very low potential for timber- and road-related impacts. Alternative 7 would have far fewer (143,234) suited acres than Alternative 1B, no action.

Table SW-21. Acres of Suited Timber Base within Subbasins in the Snake River Sockeye ESU and Migratory Corridors, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Migratory Corridor Only							
Lower Middle Fork Salmon	733	0	0	0	12,359	0	0
Lower Salmon	14,321	4,040	15,650	0	65,907	3,705	7,965
Middle Salmon-Chamberlain	42,602	46,708	69,053	0	89,132	10,284	18,885
Sockeye ESU Only							
Upper Salmon	113,446	1,021	1,018	0	178,545	0	1,018
Migratory and ESU Totals	**171,102**	**51,769**	**85,721**	**0**	**345,943**	**13,989**	**27,868**

Alternatives 3 and 5 would have the greatest potential for impacts from commercial timber harvest and roads to subbasins in the sockeye migratory corridor, followed by Alternatives 1B, 2, and 7 with moderate potential for impacts, and Alternatives 4 and 6 with the lowest potential. Timber-related activities would not be expected to have significant effects to the sockeye migratory corridor under any alternative for several reasons. First, effects would have to be quite large (changes in water quality, excessive sediment that temporary blocks passage, etc.) to disrupt sockeye migration. Management direction (SWRA Standards 1, 4, etc.) would not allow effects of this severity to occur. Second, suited timberland acres for most alternatives represent a very small amount (less than 9 percent) of the lands administered by the Ecogroup Forests within the three migratory subbasins. Thus, impacts from timber-related activities would not be widespread. Only Alternative 5, which represents 19 percent of the Ecogroup area, could have widespread effects. Finally, not all identified suited acres would be treated over the life of each forest plan for many reasons, including funding and personnel constraints, other project priorities, and the probability that portions of the land may not need treatment at this time.

ERT Acres Compared to Subbasin TOCs **-** Most alternatives, with the exception of 2 and 7, have ERT acres between 42 to 85 percent of the TOC for each subbasin in the first 20 years (Table SW-22). Subbasins with ERT acres less than 100 percent represent a low risk of associated impacts to sockeye and its critical habitat, as the potential impacts from vegetation management actions are assumed to be easily assimilated within each subbasin. Vegetation management and roads have the potential to affect most matrix pathways. Thus, those subbasins with a lower percentage of ERT acres relative to the TOC should have less potential for those effects outlined under the Effects Common to All Alternatives.

Table SW-22. Percent of ERT Acres Relative to the Threshold of Concern (100) within Subbasins in the Snake River Sockeye ESU and Migratory Corridors, by Alternative

Subbasins	ERT Acre Percentage Relative to Threshold of Concern													
	Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.
Migratory Corridor Only														
Lower M. Fork Salmon	40	39	36	27	28	16	31	15	48	36	32	21	51	39
Lower Salmon	77	52	62	42	34	30	51	31	64	52	91	52	52	41
Middle Salmon-Chamberlain	61	45	33	29	24	18	32	23	57	44	82	46	46	36
Sockeye ESU Only														
Upper Salmon	42	26	120	70	85	50	69	52	42	36	62	38	125	75

Alternatives 2 and 7 have ERT percents after 20 years of 120 and 125, respectively. They would pose a higher risk in the short term to sockeye and its habitat from forest vegetation management. These relatively high percentages occur because the Upper Salmon subbasin is a high priority for reducing wildfire risks to wildland urban interfaces using fire and mechanical thinning. Much of the projected treatments would occur outside of occupied sockeye subwatersheds, with the exception of Redfish Lake. Impacts (see Effects Common to all Alternatives) to water quality, watershed condition, and flow/hydrology could occur depending on the intensity of activities proposed. Each of these affected pathways are also currently “functioning at risk” for the Upper Salmon subbasin (see Environmental Baseline). This suggests some subwatersheds may be more sensitive to proposed management actions. Alternatives that would have the highest ERT percentages over the short term (20 years) in this subbasin are, in descending order: 7, 2, 3, 4, 6, 5 and 1B. Over the long term (50 years), the highest percentages would occur, in descending order for Alternatives 7, 2, 4, 3, 6, 5, and 1B; however no alternative would exceed the subbasin TOC.

None of the subbasins with a sockeye migratory corridor has ERT acres above the TOC in the first 20 years. Thus, the potential impacts from timber-related activities would be expected to be low to the migratory corridors and would be easily assimilated within each subbasin.

Issue 4, **Indicator 2: Effects From Livestock Grazing** - This indicator is addressed in two parts, below: (1) suitable rangeland acres, and (2) Less Restrictive vs. More Restrictive Grazing Management. This applies to all fish species sections that follow.

Suitable Rangeland Acres - Suitable rangeland acres are the same for all alternatives, 41,367 acres, or 8 percent of the Ecogroup area in the Upper Salmon subbasin and ESU (Table SW-23). Suitable rangeland acres would also remain the same for all subbasins that include a sockeye migratory corridor. Suitable rangeland acres are absent in the Lower Middle Fork Salmon subbasin, and comprise only 1 percent of the Middle Salmon Chamberlain subbasin. The Lower Salmon subbasin consistently has a higher potential for grazing impacts due to a higher amount of suitable rangeland acres (19 percent).

Table SW-23. Percent of Suitable Rangeland within Subbasins in the Snake River Sockeye ESU and Migratory Corridors, by Alternative

Subbasin	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Migratory Corridor Only							
Lower Middle Fork Salmon	0%	0%	0%	0%	0%	0%	0%
Lower Salmon	19%	19%	19%	19%	19%	19%	19%
Middle Salmon-Chamberlain	1%	1%	1%	1%	1%	1%	1%
Sockeye ESU Only							
Upper Salmon	8%	8%	8%	8%	8%	8%	8%
Migratory and ESU Totals	**12%**	**12%**	**12%**	**12%**	**12%**	**12%**	**12%**

Less Restrictive vs. More Restrictive Grazing Management **-** MPC emphasis and management direction also needs to be considered in addition to suited rangeland acres. Those alternatives and subbasins with a higher amount of suited rangeland acres and MPCs with less restrictive grazing management have a greater potential for temporary and short-term effects to matrix pathways. In the Lower Salmon subbasin, suitable rangeland acres in Alternatives 1B, 2, 5, and 6 could have more effects, due to less restrictive grazing strategies, than Alternatives 3, 4, and 7, which have more restrictive strategies (Table SW-24). Strategies could also have indirect effects (increased turbidity, sediment, nutrients, etc.) to the sockeye migration corridor because allotments occur upstream of the Salmon River.

Table SW-24. Percent of Less and More Restrictive Grazing Strategies within Subbasins in the Snake River Sockeye ESU and Migratory Corridors, by Alternative

Subbasins	Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	L	M	L	M	L	M	L	M	L	M	L	M	L	M
Migratory Corridor Only														
Lower Middle Fork Salmon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lower Salmon	97	3	74	26	17	83	0	100	97	3	94	6	11	89
M. Salmon-Chamberlain	100	0	100	0	93	7	0	100	100	0	100	0	2	98
Sockeye ESU Only														
Upper Salmon	78	22	10	90	1	99	16	84	100	0	42	58	1	99
Migratory & ESU Totals	**81**	**19**	**32**	**68**	**11**	**89**	**11**	**89**	**99**	**1**	**59**	**41**	**7**	**93**

L = Less restrictive grazing strategies; M = More restrictive grazing strategies

Overall, grazing management would be more restrictive on a significant percentage of the migratory and ESU subbasins in Alternatives 2, 3, 4, and 7, with a 19 to 68 percent increase over Alternative 1B (Table SW-24). Although the amount of suitable acres would not change, the change in management direction would help to reduce threats and achieve TEPC fish and SWRA resource objectives when compared to the current plans, represented by Alternative 1B.

For the Alternative 7, grazing management would change significantly from the current forest plans, with 99 percent under more restrictive grazing strategies in the Sockeye ESU (Table SW-24). Grazing would be managed under more restrictive direction to meet the objectives for TEPC fish and SWRA resources. As a result of the low overall acres of suitable rangelands and more restrictive grazing strategies, potential grazing risks to sockeye would be low for Alternatives 2, 3, 4, and 7. Risks would be slightly higher, with more potential localized impacts, under the other alternatives due to the less restrictive grazing strategies.

Issue 4, **Indicator 3: Effects From Wildfire Vs. Treatments to Reduce Wildfire Hazard** - There are no subwatersheds identified at high risk from uncharacteristic wildfires in the Ecogroup portion of the Upper Salmon subbasin. Migratory corridors along the Salmon River are also not at high risk because only a few subwatersheds, far upstream of the Salmon River, are at high risk.

Issue 4, **Indicator 4: High Priority Subwatersheds Receiving Appropriate Restoration and Conservation Emphasis** - Because sockeye have critically low population numbers and habitat is at some risk, passive restoration was determined to be the most appropriate restoration to improve habitat over the short term, while minimizing management impacts. It was assumed that MPCs that provide the most passive restoration of sockeye habitat would do the best job of both maintaining population levels in the short term, while making both short-term and long-term improvements to sockeye habitat.

All ACS priority subwatersheds identified by WARS would have a high emphasis for aquatic restoration in all the action alternatives. Alternative 1B (as amended by Infish, Pacfish, and the BOs) did not identify priority areas for restoration and would not receive this added emphasis. Alternatives 3, 2, 7, and 6 have MPCs that emphasize the most appropriate restoration or conservation in 85, 78, 73, and 58 percent of the high priority subwatersheds, respectively, identified by the WARS in the Upper Salmon subbasin (Table SW-25). This restoration emphasis, coupled with management direction, should make great strides in reducing existing effects and improving watershed and habitat conditions.

Table SW-25. Percent of High Priority Subwatersheds Receiving Appropriate Restoration or Conservation Emphasis within Subbasins in the Snake River Sockeye ESU and Migration Corridors, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Migratory Corridor Only							
Lower Middle Fork Salmon	93%	96%	96%	93%	89%	93%	96%
Lower Salmon	38%	63%	38%	38%	0%	38%	38%
Middle Salmon-Chamberlain	56%	56%	49%	61%	49%	59%	61%
Sockeye ESU Only							
Upper Salmon	18%	78%	85%	18%	15%	58%	73%
Migratory and ESU Totals	50%	74%	72%	52%	43%	65%	72%

Alternatives 1B, 4, and 5 have MPCs that emphasize the appropriate restoration and conservation in only 18, 18, and 13 percent, respectively, of the high priority subwatersheds identified by WARS within the Upper Salmon subbasin. Some subwatersheds, not receiving the appropriate restoration emphasis, fall within ACS priority subwatersheds. It is anticipated that the ACS designation would place a greater emphasis on aquatic restoration so that current conditions would be either maintained or slowly trend toward recovery. However other subwatersheds that do not fall within ACS priority subwatersheds may not have restoration applied in the short term. Localized effects to water quality, channel condition, watershed condition, and flow/hydrology pathways may continue to occur where problem sites are not addressed in the short term. These effects could place already depressed sockeye subpopulations at greater risk in portions of each subbasin.

There are 38 subwatersheds (in the Lower Salmon, Lower Middle Fork Salmon, Middle Salmon-Chamberlain, and Upper Salmon subbasins) with migration corridors for sockeye along the Salmon River that could be affected by aquatic restoration. Most alternatives, with the exception of Alternative 5, have MPCs that emphasize the appropriate restoration for high priority subwatersheds identified by the WARS in the sockeye migration corridor. Restoration of these adjacent subwatersheds would be expected to provide an indirect benefit to sockeye by helping to restore water quality (temperature, sediment, etc.) in the main stem Salmon River.

Effects of Aquatic Restoration in Subwatersheds with Strong and Depressed Populations **-** There are no stronghold sockeye subpopulations in the Upper Salmon subbasin, so there would be no potential effects to this indicator under any alternative.

Four subwatersheds in the Upper Salmon subbasin are occupied for spawning and rearing by depressed sockeye subpopulations. Alternatives 2, 3, 6 and 7 have MPCs that emphasize the appropriate restoration recommended by the WARS in all the subwatersheds containing depressed sockeye subpopulations (Table SW-26). These alternatives have the potential to improve habitat and watershed conditions in all of the depressed sockeye subpopulations. Alternatives 1B, 4, and 5 have the potential to improve habitat and watershed conditions in 75 percent of the subwatersheds with depressed sockeye subpopulations.

Table SW-26. Percent of Depressed Sockeye Subwatersheds Receiving Appropriate Restoration or Conservation Emphasis within Subbasins in the Snake River Sockeye ESU, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Upper Salmon	75%	100%	100%	75%	75%	100%	100%

Issue 4, Indicator 5: Effects From Motorized Trail Use - Trails currently open to motorized use would be prohibited within recommended wildernesses under Alternatives 4 and 6. The Upper Salmon subbasin would have the least potential impacts from motorized trail use under these alternatives. Trail restrictions could result in more concentrated use on remaining motorized trails, a few of which are in subwatersheds occupied by sockeye. Subwatersheds with more motorized trails in RCAs potentially could also see more impacts to sockeye and their habitat. Management direction for the action and no action alternatives would help to minimize most of these potential impacts. However, impacts to riparian vegetation and stream banks from authorized and unauthorized ATV use may still occur from increased trail use.

All motorized trails would remain open under the remaining alternatives. Effects to aquatic species and SWRA resources would be similar under Alternatives 1-3, 5, and 7. Trail use would not be concentrated, but localized impacts to riparian vegetation and stream channels near crossings would be anticipated.

Cumulative Effects to Sockeye Salmon

Non-federal actions are likely to continue affecting listed species. Effects to sockeye salmon from non-federal lands would be low overall in the Salmon River Basin when compared to other areas in the Ecogroup Forests. Non-federal lands comprise only 13 percent of the sockeye ESU. However, effects to sockeye habitat from non-federal lands would be expected along the mainstream Salmon River and lower-elevation, valley bottoms in the ESU. As described in the Cumulative Effects Common to all Alternatives section, non-federal actions and a degraded baseline would continue to stress populations.

The level of risk associated with cumulative effects was evaluated for sockeye in the Upper Salmon subbasin and migratory corridor. Alternative 3 would have a slightly lower combined risk from cumulative effects than all other alternatives, which would have the same risk of cumulative effects (Table SW-27). The Lower Salmon could see a slightly higher risk of cumulative effects under Alternatives 1B, 2, 5, and 6 due primarily to more grazing with less restrictive management direction, combined with degraded baselines.

Table SW-27. Relative Risks* from Cumulative Effects within the Ecogroup Portion of the Snake River Sockeye ESU, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Migratory Corridor Only							
Lower Middle Fork Salmon	6	6	6	6	6	6	6
Lower Salmon	10	10	9	9	11	10	9
Middle Salmon-Chamberlain	7	7	7	7	7	7	7
Sockeye ESU Only							
Upper Salmon	8	8	6	8	8	7	8
Migratory and ESU Totals	8	8	7	8	8	8	8

***** Relative risk rating based upon a maximum total of 18 possible points. Refer to Methodology section to see how ratings were assigned.

Viability Analysis for Sockeye Salmon

A viability analysis was not run for sockeye salmon because the analyses for spring/summer chinook salmon, steelhead, and bull trout were thought to adequately represent potential watershed condition changes for this species. Chinook, steelhead, and bull trout populations are all predicted to improve in 50 years under all alternatives because of the greater restoration emphasis and continued adjustments to grazing and recreation activities. Sockeye habitat would also be expected to improve.

How much sockeye populations respond to this habitat improvement, however, is dependent on downstream influences in the Salmon River and Columbia River Basins. Additional high quality habitat alone is no guarantee of increased persistence without a comprehensive approach that addresses all mortality factors acting upon the population, including those outside the Ecogroup Forests' jurisdiction (ICBEMP 1997a).

Effects on Snake River Spring/Summer Chinook Salmon, A Threatened Species -Issue 4

Direct and Indirect Effects to Spring/Summer Chinook Salmon

Issue 4, Indicator 1: Effects From Vegetation Treatments, Roads, and Fire Use

Suited Timberland Acres – Based on suited timberland acres assigned by MPCs, Alternatives 1B and 5 have the greatest potential (496,731 and 932,119 acres) for impacts from commercial timber harvest and associated road activities. Alternatives 2, 3, and 7 would have a moderate potential, and Alternatives 4 and 6 would have a low potential for impacts from timber harvest and associated road activities (Table SW-28). In particular, the South Fork Salmon and Little Salmon subbasins, which contain chinook stronghold subwatersheds, could see a greater risk of impacts under Alternatives 1B and 5 than other alternatives that propose far less suited timberland acres. Alternative 7 would have far less suited timber base than Alternative 1B, with the greatest differences occurring in the Upper Salmon, South Fork Salmon, and Lower and Upper Middle Forks of the Salmon River subbasins.

Table SW-28. Acres of Suited Timber Base within Subbasins in the Snake River Spring/Summer Chinook ESU, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon	564	0	0	0	5,965	0	564
Little Salmon River	55,551	45,737	39,749	0	106,844	34799	49,374
Lower Middle Fork Salmon	733	0	0	0	12,359	0	0
Lower Salmon	14,321	4,040	15,650	0	65,907	3705	7,965
Middle Salmon-Chamberlain	42,602	46,708	69,053	0	89,132	10284	18,885
South Fork Salmon	225,154	10,939	10,415	0	393,402	2655	20,836
Upper Middle Fork Salmon	44,360	0	0	0	79,965	0	0
Upper Salmon	113,446	1,021	1,018	0	178,545	0	1,018
Entire ESU	496,731	108,445	135,885	0	932,119	51,443	98,642

<u>*ERT Acres Compared to Subbasin TOCs*</u> **-** Most alternatives have ERT acres between 24 to 90 percent of the TOC for each subbasin in the first 20 years (Table SW-2). Shaded boxes in the table indicate alternatives and subbasins where the TOC could be exceeded based on MPC modeling assumptions. Actual treatment acres would depend on site-specific proposals, analysis, consultation, and mitigation, which would no doubt modify the numbers presented below.

Table SW-29. Percent of ERT Acres Relative to the Threshold of Concern (100) within Subbasins in the Spring/Summer Chinook ESU, by Alternative, After 20 and 50 Years

Subbasins	Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.
Hells Canyon	107	106	45	37	36	26	48	29	90	84	136	67	39	31
Little Salmon River	58	45	43	30	32	20	29	18	51	38	42	26	44	33
Lower M. F. Salmon	40	39	36	27	28	16	31	15	48	36	32	21	51	39
Lower Salmon	77	52	62	42	34	30	51	31	64	52	91	52	52	41
Middle Salmon-Chamberlain	61	45	33	29	24	18	32	23	57	44	82	46	46	36
South Fork Salmon	72	56	66	43	44	33	35	25	63	50	52	33	78	53
Upper M. F. Salmon	112	90	61	46	55	37	50	31	61	51	61	38	90	66
Upper Salmon	42	26	120	70	85	50	69	52	42	36	62	38	125	75

Only the Hells Canyon, Upper Middle Fork Salmon and Upper Salmon River subbasins have ERT acres above the 100 percent TOC in select alternatives (Table SW-29). Many of the higher acre percentages are due to potential management activities to reduce wildfire risks and move vegetation toward desired conditions using fire reintroduction and mechanical thinning. Because the modeled ERT value exceeds the threshold of concern, the potential effects to chinook salmon and critical habitat would be high in the short term in Upper Middle Fork Salmon in Alternative 1B, and Upper Salmon in Alternatives 2 and 7. Although ERT values exceed the threshold of concern under Alternatives 1B and 6 in Hells Canyon, lands managed by the Ecogroup comprise only 3 percent of the subbasin. Therefore any impacts are expected to be localized and pose little risk to chinook. Remaining effects (see Effects Common to All Alternatives, General Effects) to water quality, watershed condition, and flow/hydrology could occur depending on the intensity of activities proposed in each alternative. Most of these affected pathways are also currently "functioning at risk" for the Upper Middle Fork Salmon and Upper Salmon subbasins. This suggests some subwatersheds may be more sensitive to proposed management actions.

Issue 4, Indicator 2: Effects From Livestock Grazing
Suitable Rangeland Acres – Suitable rangeland acres are slightly less under Alternatives 3, 4, 6 and 7 in the spring/summer chinook ESU from the current forest plans, represented by Alternative 1B (Table SW-30). Alternatives 2 and 5 are the same as 1B, or 6 percent suitable rangeland acres across the ESU. Suitable rangeland acres are less than 10 percent in the majority of subbasins in the ESU. Only the Little and Lower Salmon subbasins consistently have a higher potential for grazing impacts due to a higher amount of suitable acres (19 percent). Hells Canyon would also have potential for more impacts under Alternatives 1B, 2, and 5 (12 percent).

Table SW-30. Percent of Suitable Rangeland within Subbasins in the Snake River Spring/Summer Chinook ESU, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon	12%	12%	4%	4%	12%	0%	2%
Little Salmon River	19%	19%	19%	19%	19%	19%	19%
Lower Middle Fork Salmon	0%	0%	0%	0%	0%	0%	0%
Lower Salmon	19%	19%	19%	19%	19%	19%	19%
Middle Salmon-Chamberlain	1%	1%	1%	1%	1%	1%	1%
South Fork Salmon	2%	2%	2%	2%	2%	2%	2%
Upper Middle Fork Salmon	1%	5%	5%	1%	5%	5%	1%
Upper Salmon	8%	8%	8%	8%	8%	8%	8%
Entire ESU	**6%**	**6%**	**5%**	**4%**	**6%**	**5%**	**4%**

Less Restrictive vs. More Restrictive Grazing Management - MPC emphasis and management direction also needs to be considered in addition to suited rangeland acres. Those alternatives and subbasins with a higher amount of suited rangeland acres and MPCs with less restrictive grazing direction have a greater potential for temporary and short-term effects to matrix pathways. In the Lower Salmon subbasin, Alternatives 1B, 2, 5, and 6 could allow more potential grazing impacts because they have less restrictive grazing strategies than Alternatives 3, 4, and 7 (Table SW-31). In the Little Salmon subbasin, Alternatives 1B, 2, 5, 6, and 7 could have more impacts due to a higher percentage of less restrictive grazing strategies than Alternatives 3 and 4.

Most matrix pathways in the Little Salmon subbasin are currently "functioning at risk" (refer to Environmental Baseline in Current Conditions). This suggests that this subbasin may be more sensitive to grazing activities and effects. Alternatives that would have the most restrictive grazing strategies in this subbasin are, in descending order: 4, 3, 7, 5, 2, 6, and 1B.

Table SW-31. Percent of Less and More Restrictive Grazing Strategies within Subbasins in the Snake River Spring/Summer Chinook ESU, by Alternative

Subbasins	Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	L	M	L	M	L	M	L	M	L	M	L	M	L	M
Hells Canyon	100	0	99	1	98	2	97	3	100	0	55	45	98	2
Little Salmon River	97	3	88	12	49	51	18	82	84	16	89	11	58	42
Lower M. F. Salmon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lower Salmon	97	3	74	26	17	83	0	100	97	3	94	6	11	89
Middle Salmon-Chamberlain	100	0	100	0	93	7	0	100	100	0	100	0	2	98
South Fork Salmon	79	21	40	60	1	99	0	100	85	15	62	38	8	92
Upper M. F. Salmon	88	12	18	82	0	100	0	100	100	0	53	47	0	100
Upper Salmon	78	22	10	90	1	99	16	84	100	0	42	58	1	99
Entire ESU	**85**	**15**	**47**	**53**	**17**	**83**	**12**	**88**	**93**	**7**	**66**	**34**	**23**	**77**

L = Less restrictive grazing strategies; M = More restrictive grazing strategies

Overall, grazing management strategies would change significantly from the current forest plans in Alternatives 2, 3, 4, and 7, from 15 percent to 53 percent or more with more restrictive grazing strategies. The Lower Salmon, South Fork Salmon, Upper Middle Fork Salmon, Middle Salmon-Chamberlain, and Upper Salmon subbasins would see the greatest change in MPC grazing strategies from the current forest plans, represented by Alternative 1B. The change in management strategies would help reduce threats and achieve TEPC fish and SWRA resource objectives. In the Hells Canyon, Lower Middle Fork Salmon, and Middle Salmon-Chamberlain subbasins, the effects from grazing to chinook salmon and their habitat would be low due to the low suitable rangeland acres.

Issue 4, Indicator 3: Effects From Wildfire Vs. Treatments to Reduce Wildfire Hazard
Effects of Wildfire vs. Managing Wildfire Hazard in Subwatersheds with Depressed Populations – Upper Salmon and Upper Middle Fork Salmon subbasins do not have high-risk subwatersheds and are therefore absent from the tables below. The other six ESU subbasins with chinook salmon have subwatersheds at high risk from uncharacteristic wildfire. In these subbasins there are 46 subwatersheds with depressed chinook populations at high risk (Table SW-32). Each alternative assigns MPCs that aggressively treat vegetation to reduce fuel loading. Alternatives 3 and 5 have the most aggressive MPCs, potentially treating more than 50 percent of all subwatersheds where depressed chinook subpopulations occur within the Ecogroup across the ESU. In some subbasins, under these alternatives, all subwatersheds with depressed populations could see treatment. Alternatives 1B, 2, and 7 potentially could treat 38 to 45 percent of the depressed chinook subpopulations within the Ecogroup portions of the ESU. Alternatives 4 (5 percent) and 6 (13 percent) would treat the least amount of subwatersheds with depressed subpopulations.

Table SW-32. Percent of Depressed Chinook Subwatersheds Where Risks from Uncharacteristic Wildfires Could be Reduced within Subbasins in the Snake River Spring/Summer Chinook ESU, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon	0%	100%	100%	100%	100%	0%	100%
Little Salmon River	25%	50%	100%	0%	100%	50%	75%
Lower Middle Fork Salmon	0%	0%	0%	0%	0%	0%	0%
Lower Salmon	75%	75%	100%	0%	100%	25%	50%
Middle Salmon-Chamberlain	50%	50%	67%	0%	67%	17%	50%
South Fork Salmon	46%	25%	33%	4%	71%	4%	38%
Entire ESU	**45%**	**38%**	**53%**	**5%**	**75%**	**13%**	**45%**

Risks from uncharacteristic wildfires to depressed chinook subpopulations would remain high for whose alternatives that treat the least amount of acres and have fewer management tools available to reduce wildfires. If wildfires occurred in high risk from uncharacteristic wildfire subwatersheds, it is believed that some depressed populations could decline further depending on the severity of each fire. Risk from uncharacteristic wildfires would remain high across 88 to 95 percent of the depressed chinook subpopulations within the Ecogroup area and ESU under Alternatives 4 and 6 due to the lack of potential treatments (Table SW-33). These alternatives would be followed by Alternatives 1B, 2, 3, and 7, with 48 to 63 percent of the depressed chinook subpopulations still having a high risk from uncharacteristic wildfires, and Alternative 5 with 25 percent still having a high risk from uncharacteristic wildfires.

Table SW-33. Percent of Depressed Chinook Subwatersheds Where Risks from Uncharacteristic Wildfires Would Remain High within Subbasins in the Snake River Spring/Summer Chinook ESU, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon	100%	0%	0%	0%	0%	100%	0%
Little Salmon River	75%	50%	0%	100%	0%	50%	25%
Lower Middle Fork Salmon	100%	100%	100%	100%	100%	100%	100%
Lower Salmon	25%	25%	0%	100%	0%	75%	50%
Middle Salmon-Chamberlain	50%	50%	33%	100%	33%	83%	50%
South Fork Salmon	54%	75%	67%	96%	29%	96%	62%
Entire ESU	**55%**	**63%**	**48%**	**95%**	**25%**	**88%**	**55%**

<u>Effects of Wildfire vs. Managing Wildfire Hazard in Subwatersheds with Strong Populations</u> **-** There are nine subwatersheds considered as strongholds for spring/summer chinook salmon in the Ecogroup area and ESU (Table SW-34). Six of the chinook subpopulations are at high risk from uncharacteristic wildfires (Little Salmon River and South Fork Salmon subbasins). Based on MPC emphasis, treatments to reduce uncharacteristic wildfire risks in two chinook strongholds in the Little Salmon subbasin could vary by alternative. All (100 percent) of the strongholds could be treated under Alternatives 3 and 5; one third could be treated under

Alternatives 2 and 6; and no strongholds would be treated under Alternatives 1B, 4 and 7. In the South Fork Salmon subbasin, all of the strongholds could be treated under Alternative 7; two thirds could be treated under Alternatives 1B, 2, 3, and 5; and one third could be treated under Alternative 6.

Table SW-34. Percent of Strong Chinook Subwatersheds Where Risks from Management Treatments for Uncharacteristic Wildfires Would be Higher within Subbasins in the Snake River Spring/Summer Chinook ESU, by Alternative

Subbasins*	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Little Salmon River	0%	33%	100%	0%	100%	33%	0%
South Fork Salmon	67%	67%	67%	0%	67%	33%	100%
Entire ESU	**67%**	**67%**	**67%**	**0%**	**67%**	**33%**	**100%**

*The other subbasins in this ESU do not have any chinook stronghold subwatersheds.

Because high emphasis treatments occur in some of the last remaining strongholds, management activities in the Little Salmon and South Fork Salmon may pose a greater risk to spring/summer chinook than if an uncharacteristic wildfire occurred for all alternatives. Management direction for the action alternatives would help to minimize many potential management effects (see Effects Common To All Alternatives). However, there would still be some risk of impacts to stronghold subwatersheds in each alternative from roads and vegetation treatments.

Issue 4, **Indicator 4: High Priority Subwatersheds Receiving Appropriate Restoration and Conservation Emphasis** - All ACS priority subwatersheds identified by WARS would have a high emphasis for aquatic restoration in all the action alternatives. Alternative 1B (as amended by Infish, Pacfish, and the BOs) did not identify priority areas for restoration and would not receive this added emphasis. Alternatives 2, 3, 7, and 6 have MPCs that emphasize the most appropriate restoration and conservation in 71, 70, 68, and 58 percent, respectively, of the high priority subwatersheds identified by the WARS (Table SW-35).

Table SW-35. Percent of High Priority Subwatersheds Receiving Appropriate Restoration or Conservation Emphasis within Subbasins in the Snake River Spring/Summer Chinook ESU, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon	0%	0%	0%	0%	0%	0%	0%
Little Salmon River	42%	75%	67%	50%	17%	67%	42%
Lower Middle Fork Salmon	93%	96%	96%	93%	89%	93%	96%
Lower Salmon	38%	63%	38%	38%	0%	38%	38%
Middle Salmon-Chamberlain	56%	56%	49%	61%	49%	59%	61%
South Fork Salmon	30%	64%	66%	34%	25%	43%	67%
Upper Middle Fork Salmon	18%	82%	82%	82%	18%	82%	73%
Upper Salmon	18%	78%	85%	18%	15%	58%	73%
Entire ESU	**43%**	**71%**	**70%**	**47%**	**34%**	**58%**	**68%**

Under these alternatives, the Upper Salmon, South Fork Salmon, Lower Middle Fork Salmon and Upper Middle Fork Salmon have the potential for a faster rate of aquatic restoration, given their MPCs and number of ACS priority subwatersheds. This restoration emphasis, coupled with more restrictive management direction, should make great strides in reducing existing impacts and improving watershed/habitat conditions. Effects from roads, degraded riparian, poor habitat access, and unstable stream channels should decrease as restoration is implemented. Restoration would slowly reduce the number of water quality limited streams and damaged stream segments identified in the environmental baselines. It would also indirectly benefit chinook by helping to restore subwatersheds that influence migratory corridors.

Not all subbasins under Alternatives 2, 3, 6, and 7, however, have MPCs with the same restoration emphasis as WARS. In the Lower Salmon and Little Salmon subbasins, less than half of the high priority subwatersheds would have the appropriate restoration MPC recommended by the WARS under Alternative 7. While, for the Lower Salmon subbasin, less than half of the high priority subwatersheds would have the appropriate restoration MPC under Alternative 3. Many of these areas, however, fall within ACS priority subwatersheds. It is anticipated that the ACS designation would place a greater emphasis on aquatic restoration so that current conditions would be either maintained or trend toward recovery. Yet, some areas that do not fall within ACS priority subwatersheds may continue to see localized effects to water quality, channel condition, watershed condition, and flow/ hydrology pathways where problem sites are not addressed in the short term.

In contrast, Alternatives 1B, 4, and 5 have MPCs that emphasize the appropriate restoration and conservation in little more than a third (34 to 44 percent) of the high priority subwatersheds identified by WARS in the Ecogroup in the ESU. Under these alternatives, the Lower Middle Fork Salmon and Middle Salmon-Chamberlain subbasins have the potential for prioritized aquatic restoration. Again, some areas that do not fall within ACS priority subwatersheds may continue to see localized effects to water quality, channel condition, watershed condition, and flow/hydrology pathways where problem sites are not addressed in the short term.

Effects of Aquatic Restoration in Subwatersheds with Strong and Depressed Populations **-** Alternatives 2, 3, 6 and 7 have MPCs that emphasize the appropriate restoration and conservation recommended by the WARS to more subwatersheds containing stronghold and depressed chinook subpopulations (Tables SW-36 and SW-37) than other alternatives. These alternatives have the potential to improve habitat and watershed conditions in 70 percent or more of the stronghold chinook subpopulations and 59 percent or more of the depressed chinook subpopulations. Most subbasins in the Ecogroup area with chinook subpopulations would see improved habitat and watershed conditions as restoration is implemented. In contrast, Alternatives 1B, 4, and 5 have the potential to improve habitat and watershed conditions in only 50 percent or less of the subbasins with stronghold chinook subpopulations, and 47 percent or less of the subbasins with depressed chinook subpopulations.

Table SW-36. Percent of Chinook Strongholds Receiving Appropriate Restoration or Conservation Emphasis within Subbasins* in the Snake River Spring/Summer Chinook ESU, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Little Salmon River	50%	75%	100%	50%	0%	75%	50%
South Fork Salmon	0%	67%	67%	0%	0%	33%	67%
Upper Middle Fork Salmon	67%	100%	100%	100%	0%	100%	100%
Entire ESU	**40%**	**80%**	**90%**	**50%**	**0%**	**70%**	**70%**

*The other subbasins in this ESU do not have chinook stronghold populations.

Table SW-37. Percent of Depressed Chinook Subwatersheds Receiving Appropriate Restoration or Conservation Emphasis within Subbasins in the Snake River Spring/Summer Chinook ESU, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon	0%	0%	0%	0%	0%	0%	0%
Little Salmon River	33%	67%	33%	33%	0%	67%	33%
Lower Middle Fork Salmon	93%	96%	96%	93%	89%	93%	96%
Lower Salmon	33%	67%	33%	33%	0%	33%	33%
Middle Salmon-Chamberlain	61%	61%	56%	64%	56%	64%	61%
South Fork Salmon	31%	64%	66%	36%	27%	44%	67%
Upper Middle Fork Salmon	38%	75%	75%	75%	25%	75%	63%
Upper Salmon	17%	78%	86%	17%	14%	58%	75%
Entire ESU	**43%**	**71%**	**69%**	**47%**	**37%**	**59%**	**69%**

Issue 4, Indicator 5: Effects From Motorized Trail Use - Trails currently open to motorized use would be prohibited within recommended wildernesses under Alternatives 4 and 6. Under Alternative 4, the South Fork Salmon, Little Salmon, Lower Salmon, and Upper Salmon subbasins would see the most restrictions on motorized use in recommended wilderness. Under Alternative 6, the South Fork Salmon and Upper Salmon would see the most restrictions. All motorized trails would remain open under remaining alternatives. Trail restrictions in these subbasins could result in more concentrated use on remaining motorized trails. Subbasins with more motorized trails in RCAs potentially could also see more impacts to chinook salmon and their habitat. Management direction for the action and no action alternatives would help to minimize most of these potential impacts. However, impacts to riparian vegetation and stream banks from authorized and unauthorized ATV use may still occur from increased trail use. Effects to aquatic species and SWRA resources would be similar under Alternatives 1-3, 5, and 7. Trail use would not be concentrated, but localized impacts to riparian vegetation and stream channels near crossings would be anticipated.

Cumulative Effects on Spring/Summer Chinook Salmon

Non-federal actions are likely to continue affecting listed species. Effects to spring/summer chinook from non-federal lands would be low overall in the Salmon River Basin when compared to other areas in the Ecogroup. Non-federal lands comprise only 10 percent of the Salmon River Basin. However, cumulative effects from non-federal lands would be high in individual subbasins such as the Lemhi, Little Salmon and Lower Salmon. As described in the Cumulative Effects

Common to all Alternatives, degradation and loss of habitat from non-federal actions would continue. Degraded baseline conditions and threats from hatchery fish also would continue to stress populations in most subbasins.

The level of risk associated with cumulative effects was evaluated for each subbasin in the spring/summer chinook ESU within the Ecogroup. Alternatives 1B and 5 would have a slightly higher risk of cumulative effects based on greater timber, grazing, etc. management and less aquatic restoration, than the other alternatives (Table SW-38). In particular, the Little Salmon, Lower Salmon, and South Fork Salmon could see more cumulative effects under these alternatives. Alternative 6 has slightly lower risk of cumulative effects than Alternatives 1B and 5. However, several subbasins still have a high risk of cumulative effects, specifically due to MPCs emphasizing less aquatic restoration and more vegetation management in Hells Canyon, more grazing with less restrictive management direction in Lower Salmon, and potential treatments to reduce fire risk in chinook strongholds in the South Fork Salmon, combined with degraded baselines. Under the Alternative 7, only the Little Salmon subbasin faces greater risk from cumulative effects due to more grazing with less restrictive management direction.

Table SW-38. Relative Risks* from Cumulative Effects within the Ecogroup Portion of the Snake River Spring/Summer Chinook Salmon ESU, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon	10	8	8	8	8	10	8
Little Salmon River	10	9	8	9	11	9	10
Lower Middle Fork Salmon	6	6	6	6	6	6	6
Lower Salmon	10	10	9	9	11	10	9
Middle Salmon-Chamberlain	7	7	7	7	7	7	7
South Fork Salmon	10	10	10	10	10	10	9
Upper Middle Fork Salmon	10	6	6	6	8	6	6
Upper Salmon	8	8	6	8	8	7	8
Entire ESU	**9**	**8**	**8**	**8**	**9**	**8**	**8**

***** Relative risk rating based upon a maximum total of 18 possible points. Refer to Methodology section to see how ratings were assigned.

Viability Analysis for Spring/Summer Chinook Salmon

Projected trends for spring/summer chinook salmon over the first 15 years show that the number of stronghold subpopulations would remain unchanged. This is because it will take time for subpopulations to respond to restoration and passive/conservation measures. The number of depressed subpopulations would change slightly (Table SW-39) for those alternatives that have active restoration MPCs within currently absent, but “linked” subwatersheds. It is assumed in these subwatersheds that fish habitat functioning at unacceptable risk is due to poor Geomorphic and/or Water Quality Integrity. Active restoration could begin to improve these limiting factors in 15 years so that fish could re-colonize from adjacent areas. Large numbers of fish would not be expected to re-colonize each subwatershed initially. Thus, these recolonized subwatersheds would at first be depressed, increasing the number of depressed subpopulations in the first 15 years. Restoration again would not improve enough of the overall subwatershed condition to trend existing depressed populations to strong ones in 15 years.

Table SW-39. Number of Stronghold and Depressed Spring/Summer Chinook Subwatersheds at 15 Years within Subbasins in the Snake River Spring/Summer Chinook ESU, by Alternative

Subbasins	Current		Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D
Hells Canyon	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	3
Little Salmon River	4	10	4	10	4	13	4	13	4	11	4	11	4	12	4	10
Lower M.F. Salmon	0	28	0	28	0	28	0	28	0	28	0	28	0	28	0	28
Lower Salmon	0	9	0	9	0	9	0	9	0	9	0	9	0	9	0	9
Middle Salmon-Chamberlain	0	44	0	44	0	44	0	44	0	44	0	44	0	44	0	44
South Fork Salmon	3	67	3	67	3	67	3	67	3	67	3	67	3	67	3	67
Upper M.F. Salmon	3	12	3	12	3	12	3	12	3	12	3	12	3	12	3	12
Upper Salmon	0	44	0	44	0	46	0	48	0	44	0	44	0	45	0	46
Totals	**10**	**217**	**10**	**217**	**10**	**222**	**10**	**224**	**10**	**218**	**10**	**218**	**10**	**220**	**10**	**219**

S = Stronghold Subpopulations; D = Depressed Subpopulations

Projected trends over the long term indicate a positive trend from current conditions for stronghold subpopulations under all alternatives. These predictions are based upon populations responding favorably to active and passive restoration and conservation measures. However, these predictions do not reflect changes in migration corridor survival from downstream influences in the Columbia River Basin, non-native species, harvest trends, etc. It is assumed that the temporary and short-term effects from Ecogroup activities would not compromise the benefits of restoration and conservation due to new and existing management direction. Alternatives 3, 2, 7, and 6 show the greatest increase in the number of stronghold subpopulations due to having more MPCs that emphasize the appropriate restoration and conservation within high priority subwatersheds identified by the WARS (Table SW-40).

Table SW-40. Number of Stronghold and Depressed Spring/Summer Chinook Subwatersheds at 50 Years within Subbasins in the Snake River Spring/Summer Chinook ESU, by Alternative

Subbasins	Current		Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D
Hells Canyon	0	3	0	3	1	2	0	3	2	1	0	3	0	3	0	3
Little Salmon River	4	10	6	8	11	6	9	8	7	8	5	10	10	6	6	9
Lower M.F. Salmon	0	28	26	2	27	1	27	1	26	2	25	3	26	2	27	1
Lower Salmon	0	9	2	7	4	5	2	7	2	7	0	9	2	7	2	7
Middle Salmon-Chamberlain	0	44	24	20	24	20	22	22	25	19	22	22	25	19	24	20
South Fork Salmon	3	67	23	47	47	23	48	22	27	43	21	49	33	37	49	20
Upper M.F. Salmon	3	12	6	9	9	6	9	6	10	5	5	10	10	5	9	6
Upper Salmon	0	44	5	39	32	14	39	9	5	39	4	40	23	22	31	15
Totals	**10**	**217**	**92**	**135**	**155**	**77**	**156**	**78**	**104**	**124**	**82**	**146**	**129**	**101**	**148**	**81**

S = Stronghold Subpopulations; D = Depressed Subpopulations

In 50 years, under these alternatives, chinook populations are predicted to improve from 10 strong subpopulation subwatersheds up to a range of 82 (Alt. 5) to 156 (Alt. 3). Some of the largest increases would occur in the Upper Salmon, Upper and Lower Middle Forks of the Salmon River, and Middle Salmon-Chamberlain subbasins under these alternatives. Alternative 4 would have a moderate increase from 10 to 104 stronghold subwatersheds, and Alternatives 1B (92) and 5 (82) would have the smallest increase in stronghold subwatersheds.

The predicted increase in strongholds is a result of the greater restoration emphasis, adjustments to grazing and vegetation management, and protection provided by management direction for all action alternatives. As more subwatersheds support strong subpopulations, population risks should decrease. In particular, restoration should improve density dependent (e.g., sex ratios, etc.) and genetic diversity factors. Many of the remaining strongholds for chinook are clustered in a few subwatersheds in two or three subbasins and are at high risk from disturbances. Stronger populations should result in more dispersed and resilient metapopulations across each subbasin, reducing the risks from uncharacteristic disturbance events. Restoration and conservation should also increase the availability of high quality habitats, thereby decreasing the chances that a large random disturbance event, such as wildfire, would reduce the effectiveness of available habitat.

The Upper Salmon, and Upper and Lower Middle Forks of the Salmon River subbasins are predicted to increase from three stronghold populations to 59 or more strongholds for Alternatives 2, 3, 6, and 7. Alternatives 1B, 4, and 5 would increase up to 41 strongholds. If these predictions came true, adjacent subbasins such as the Pahsimeroi, Lemhi, and Middle Salmon-Panther could benefit from fish straying and re-colonizing accessible habitat. Strays entering the mainstem Pahsimeroi and Lemhi subbasins, however, would find limited access due to seasonal dewatering and areas where channels have been rerouted to facilitate water withdrawals. Currently, very few tributaries in the Pahsimeroi and Lemhi subbasins are connected to the mainstem during irrigation season (April through October) except in high water years.

Based upon the predicted viability outcomes, all alternatives appear to improve the chances of recovery over time, by decreasing depressed and increasing stronghold subpopulations. While no alternative by itself would ensure recovery or de-listing due to the multitude of cumulative influences involved, those alternatives that have the potential for a faster rate of aquatic restoration would more quickly reduce effects on spawning and rearing habitat. Aquatic restoration, coupled with other management changes, could make great strides in increasing the overall viability of subpopulations in the ESU. However, for the predicted increases to be realized, restoration must be funded and implemented with the appropriate prioritization, and improvement to the downstream survival must also occur. Additional high quality habitat alone is no guarantee of increased persistence without a comprehensive approach that addresses all mortality factors acting upon the population, including those outside the Ecogroup's jurisdiction (ICBEMP 1997a).

Effects on Snake River Fall Chinook Salmon, A Threatened Species – Issue 4

Direct and Indirect Effects on Fall Chinook

Issue 4, Indicator 1: Effects From Vegetation Treatments, Roads, and Fire Use

Suited Timberland Acres – Based on suited timberland acres assigned by MPCs, Alternative 5 would have the greatest potential (71,873 acres) for impacts from commercial timber harvest and associated road activities. Alternatives 3, 1B, and 7 would have a moderate potential, and Alternatives 2, 4, and 6 a low potential for impacts from timber harvest and associated road activities (Table SW-41). Alternative 7 would have over 6,000 less suited acres (43 percent) than the No Action Alternative (1B), with the greatest difference occurring in the Lower Salmon subbasin.

Table SW-41. Acres of Suited Timber Base within Subbasins in the Snake River Fall Chinook ESU, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon	564	0	0	0	5,965	0	564
Lower Salmon	14,321	4,040	15,650	0	65,907	3,705	7,965
Entire ESU	**14,885**	**4,040**	**15,650**	**0**	**71,873**	**3,705**	**8,529**

ERT Acres Compared to Subbasin TOCs - Most alternatives have ERT acres between 34 to 90 percent of the TOC for each subbasin in the first 20 years (Table SW-42).

Table SW-42. Percent of ERT Acres Relative to the Threshold of Concern (100) within Subbasins in the Snake River Fall Chinook ESU, by Alternative, After 20 and 50 Years

Subbasins	Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.
Hells Canyon	107	106	45	37	36	26	48	29	90	84	136	67	39	31
Lower Salmon	77	52	62	42	34	30	51	31	64	52	91	52	52	41

Only the Hells Canyon subbasin has ERT acres above 100 percent in two alternatives (Table SW-42). Many of the higher ERT percentages are due to potential management activities to reduce wildfire risks and move vegetation toward desired conditions using fire reintroduction. The modeled ERT values exceeds the threshold of concern in Hells Canyon subbasin for Alternatives 1B and 6. However, lands managed by the Ecogroup comprise only 3 percent of the subbasin. Therefore any impacts are expected to be localized and pose little risk to fall chinook.

Issue 4, Indicator 2: Effects From Livestock Grazing

Suitable Rangeland Acres – Suitable rangeland acres are slightly lower in Alternatives 3, 4, 6 and 7 in the fall chinook ESU than in the current forest plans, represented by Alternative 1B (Table SW-43). Alternatives 2 and 5 are the same as 1B, or 18 percent suitable rangeland acres across the ESU. The Lower Salmon subbasin consistently has a higher percentage of suitable acres than Hells Canyon subbasin across all alternatives. This suggests that there would be a greater potential for grazing impacts in the Lower Salmon subbasin regardless of the alternative.

Table SW-43. Percent of Suitable Rangeland within Subbasins in the Snake River Fall Chinook ESU, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon	12%	12%	4%	4%	12%	0%	2%
Lower Salmon	19%	19%	19%	19%	19%	19%	19%
Entire ESU	**18%**	**18%**	**17%**	**17%**	**18%**	**17%**	**17%**

Less Restrictive vs. More Restrictive Grazing Management - Overall, the grazing management strategies would change significantly from the current forest plans in Alternatives 3, 4, and 7, from 3 percent to 77 percent or greater with more restrictive grazing strategies (Table SW-44). The Lower Salmon subbasin, even with 19 percent in suitable rangeland acres, would pose a lower risk under these alternatives due to the more restrictive management strategies in place (Table SW-4). These more restrictive strategies, coupled with the low amount of suitable rangeland acres in the Hells Canyon subbasin, would pose a low overall risk to fall chinook salmon and its critical habitat within lands administered by the Ecogroup in the ESU. Alternatives 1B, 2, 5 and 6 would pose a higher risk in the Lower Salmon subbasin because MPCs have less restrictive (74 to 97 percent of suited acres) management strategies.

Table SW-44. Percent of Less and More Restrictive Grazing Strategies within Subbasins in the Snake River Fall Chinook ESU, by Alternative

Subbasins	Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	L	M	L	M	L	M	L	M	L	M	L	M	L	M
Hells Canyon	100	0	99	1	98	2	97	3	100	0	55	45	98	2
Lower Salmon	97	3	74	26	17	83	0	100	97	3	94	6	11	89
Entire ESU	**97**	**3**	**76**	**24**	**23**	**77**	**7**	**93**	**97**	**3**	**95**	**5**	**17**	**83**

L = Less restrictive grazing strategies; M = More restrictive grazing strategies

Issue 4, Indicator 3: Effects From Wildfire Vs. Treatments to Reduce Wildfire Hazard
Effects of Wildfire vs. Managing Wildfire Hazard in Subwatersheds with Depressed Populations – Because fall chinook do not occur on lands administered by the Ecogroup in the Lower salmon subbasin, there is no direct risk from uncharacteristic wildfire. However, four subwatersheds in the Lower Salmon subbasin are at high risk from uncharacteristic wildfires. If an uncharacteristic wildfire occurred, increased water and sediment yields may occur to fall chinook habitat downstream. In the Hell Canyon subbasin, one depressed fall chinook subpopulation (Deep Creek) is at high risk from uncharacteristic wildfires. Alternatives 2 to 5, and 7 could be the most

aggressive in reducing wildfire risk in Deep Creek, while Alternatives 1B and 6 would propose no treatments in this subwatershed. However, potential management and effects for any alternative in Deep Creek would be constrained because most of the subwatersheds are in wilderness or roadless areas (Table SW-45 and SW-46).

Table SW-45. Percent of Depressed Chinook Subwatersheds Where Risks from Uncharacteristic Wildfires Could be Reduced within Subbasins in the Snake River Fall Chinook ESU, by Alternative

Subbasin and ESU	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon	0%	100%	100%	100%	100%	0%	100%

Table SW-46. Percent of Depressed Chinook Subwatersheds Where Risks from Uncharacteristic Wildfires Would Remain High within Subbasins in the Snake River Fall Chinook ESU, by Alternative

Subbasin and ESU	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon	100%	0%	0%	0%	0%	100%	0%

Risks from uncharacteristic wildfires to depressed chinook subpopulations would remain high for whose alternatives that treat the least amount of acres and have fewer management tools available to reduce wildfires. If wildfires occurred in high risk from uncharacteristic wildfire subwatersheds, it is believed that some depressed populations could decline further depending on the severity of each fire. Risk from uncharacteristic wildfires would be remain high in select areas of Deep Creek under Alternatives 1B and 6 due to the lack of potential treatments. The risks from uncharacteristic wildfires could be less under the other alternatives depending on the level of treatment implemented.

<u>*Effects of Wildfire vs. Managing Wildfire Hazard in Subwatersheds with Strong Populations*</u> **-** There are no stronghold fall chinook subpopulations within lands administered by the Ecogroup.

Issue 4, **Indicator 4: High Priority Subwatersheds Receiving Appropriate Restoration and Conservation Emphasis –** Alternative 2 has MPCs that emphasize appropriate restoration and conservation in more high-priority subwatersheds (56 percent) identified by the WARS (Table SW-47) than other alternatives. Under this alternative, the Lower Salmon has the potential to see a relatively fast rate of aquatic restoration, given MPCs and number of ACS priority subwatersheds. However, fall chinook do not occur on lands administered by the Ecogroup in the Lower Salmon subbasin. Thus, benefits from restoration or conservation would be more indirect to habitat downstream and critical habitat in tributary streams. Benefits from restoration or conservation, however, would be more direct in the Hells Canyon subbasin.

Alternatives 1B, 3, 4, 6, and 7 have MPCs that emphasize limited aquatic restoration in the Lower Salmon subbasin. Alternative 5 has no MPCs that emphasize aquatic restoration. A few subwatersheds in the Lower Salmon subbasin, however, are ACS priority subwatersheds. It is anticipated that the ACS designation would place a greater emphasis on aquatic restoration so that current conditions would be either maintained or slowly trend toward recovery. Yet, many other subwatersheds do not fall within ACS priority subwatersheds. Localized effects to water quality, channel condition, watershed condition, and flow/hydrology pathways may continue to occur in these areas where problem sites are not addressed in the short term. This may cause effects downstream to where fall chinook and critical habitat occur.

Table SW-47. Percent of High Priority Subwatersheds Receiving Appropriate Restoration or Conservation Emphasis within Subbasins in the Snake River Fall Chinook ESU, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon	0%	0%	0%	0%	0%	0%	0%
Lower Salmon	38%	63%	38%	38%	0%	38%	38%
Entire ESU	**33%**	**56%**	**33%**	**33%**	**0%**	**33%**	**33%**

No alternatives have MPCs that emphasize the appropriate restoration or conservation recommended by WARS to depressed populations in the Hells Canyon subbasin (Table SW-48). Although more restrictive management direction would help reduce threats, aquatic restoration would not be as aggressively pursued where needed in Deep Creek under any alternative (Table SW-48). Delays in restoration may also delay habitat improvements in the short term. These delays could place an already depressed fall chinook subpopulation at greater risk. Depressed fall chinook populations only occur downstream of subwatersheds administered by the Ecogroup Forests in the Lower Salmon subbasin and would not be affected directly by aquatic restoration.

Table SW-48. Percent of Depressed Chinook Subwatersheds Receiving Appropriate Restoration or Conservation Emphasis within Subbasins in the Snake River Fall Chinook ESU, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon	0%	0%	0%	0%	0%	0%	0%
Entire ESU	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**

Issue 4, Indicator 5: Effects From Motorized Trail Use – Trails currently open to motorized use would be prohibited within proposed wildernesses under Alternatives 4 and 6. Under Alternative 4, the Lower Salmon would see the most closures where fall chinook critical habitat occurs. Under Alternative 6, no fall chinook subbasins would see trails closed. All motorized trails would remain open under remaining alternatives. The majority of motorized trails in the Lower Salmon occur in recommended wilderness. Their closure would concentrate use on remaining motorized trails in only a few areas, most of which are not in RCAs. Where use does occur, management direction for the action and no action alternatives would help to minimize most potential impacts. However, some impacts to riparian vegetation and stream banks from unauthorized ATV use may still occur. Effects to aquatic species and SWRA resources would be similar under Alternatives 1-3, 5, and 7. Trail use would not be concentrated, but so few motorized trails in this subbasin exist that impacts to riparian vegetation and streams would be minimal.

Cumulative Effects on Fall Chinook

Non-federal actions are likely to continue affecting listed species. The greatest potential for cumulative effects from non-federal activities would occur in the Lower Salmon and Hell Canyon subbasins. Each subbasin has non-federal lands that comprise 40 percent or more of the acres in the action area. As described in the Cumulative Effects Common to all Alternatives section, degradation and loss of chinook trout habitat from non-federal actions would continue. Degraded baseline conditions, and threats from hatchery fish also would continue to stress populations in most subbasins. These effects, again, would be most severe on non-federal lands.

The level of risk associated with cumulative effects was evaluated for each subbasin in the fall chinook ESU within the Ecogroup. Alternatives 1B, 5 and 6 would have a slightly higher risk of cumulative effects based on greater timber, grazing, etc. management and less aquatic restoration, than the other alternatives (Table SW-49). In particular, the Lower Salmon could see more cumulative effects under these alternatives due to MPCs emphasizing more grazing with less restrictive management direction, combined with degraded baselines. The other alternatives would have the same risk of cumulative effects.

Table SW-49. Relative Risks* from Cumulative Effects within the Ecogroup Portion of the Snake River Fall Chinook ESU, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon	10	8	8	8	8	10	8
Lower Salmon	10	10	9	9	11	10	9
Entire ESU	**10**	**9**	**9**	**9**	**10**	**10**	**9**

*****Relative risk rating based upon a maximum total of 18 possible points. Refer to Methodology section to see how ratings were assigned.

Viability Analysis for Fall Chinook Salmon

A viability analysis was not run for fall chinook because the analysis for spring/summer chinook salmon, steelhead and bull trout was thought to adequately represent potential watershed condition changes for this species. Modeled outcomes for spring/summer chinook could be used to predict similar changes for fall chinook where the two species overlap. For example, the status of spring/summer chinook subpopulations would not change under most alternatives due in large part to MPCs not emphasizing the appropriate restoration recommended by WARS. However under the action alternatives, the lower restoration emphasis would be addressed by the ACS priority designation (Deep Creek) where fall chinook occur. It is anticipated that the ACS designation would place a greater emphasis on aquatic restoration so that current conditions would be either maintained or slowly trend toward recovery.

Only Alternatives 2 and 4 would see some depressed spring/summer subpopulations trending toward stronghold subpopulations in 50 years. The fall chinook subpopulation in Deep Creek would also be expected to improve under Alternatives 2 and 4. How much fall chinook responds to watershed and habitat improvement under any alternative is dependent upon downstream influences in the Columbia River Basin.

Effects on Snake River Steelhead, A Threatened Species – Issue 4

Direct and Indirect Effects on Steelhead

Issue 4, Indicator 1: Effects From Vegetation Treatments, Roads, and Fire Use

Suited Timberland Acres – Effects to steelhead trout are the same as those described for spring/summer chinook salmon.

Table SW-50. Acres of Suited Timber Base within Subbasins in the Snake River Steelhead ESU, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon	564	0	0	0	5,965	0	564
Little Salmon River	55,551	45,737	39,749	0	106,844	34,799	49,374
Lower Middle Fork Salmon	733	0	0	0	12,359	0	0
Lower Salmon	14,321	4,040	15,650	0	65,907	3,705	7,965
Middle Salmon-Chamberlain	42,602	46,708	69,053	0	89,132	10,284	18,885
South Fork Salmon	225,154	10,939	10,415	0	393,402	2,655	20,836
Upper Middle Fork Salmon	44,360	0	0	0	79,965	0	0
Upper Salmon	113,446	1,021	1,018	0	178,545	0	1,018
Entire ESU	496,731	108,445	135,885	0	932,119	51,443	98,642

ERT Acres Compared to Subbasin TOCs **-** Effects to steelhead trout are the same as those described for spring/summer chinook salmon (Table SW-51).

Table SW-51. Percent of ERT Acres Relative to the Threshold of Concern (100) within Subbasins in the Snake River Steelhead ESU, by Alternative, After 20 and 50 Years

Subbasins	Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.
Hells Canyon	107	106	45	37	36	26	48	29	90	84	136	67	39	31
Little Salmon River	58	45	43	30	32	20	29	18	51	38	42	26	44	33
Lower M. F. Salmon	40	39	36	27	28	16	31	15	48	36	32	21	51	39
Lower Salmon	77	52	62	42	34	30	51	31	64	52	91	52	52	41
Middle Salmon-Chamberlain	61	45	33	29	24	18	32	23	57	44	82	46	46	36
South Fork Salmon	72	56	66	43	44	33	35	25	63	50	52	33	78	53
Upper M. F. Salmon	112	90	61	46	55	37	50	31	61	51	61	38	90	66
Upper Salmon	42	26	120	70	85	50	69	52	42	36	62	38	125	75

Issue 4, Indicator 2: Effects From Livestock Grazing
Suitable Rangeland Acres – Effects to steelhead trout are the same as those described for spring/summer chinook salmon.

Table SW-52. Percent of Suitable Rangeland within Subbasins in the Snake River Steelhead ESU, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon	12%	12%	4%	4%	12%	0%	2%
Little Salmon River	19%	19%	19%	19%	19%	19%	19%
Lower Middle Fork Salmon	0%	0%	0%	0%	0%	0%	0%
Lower Salmon	19%	19%	19%	19%	19%	19%	19%
Middle Salmon-Chamberlain	1%	1%	1%	1%	1%	1%	1%
South Fork Salmon	2%	2%	2%	2%	2%	2%	2%
Upper Middle Fork Salmon	1%	5%	5%	1%	5%	5%	1%
Upper Salmon	8%	8%	8%	8%	8%	8%	8%
Entire ESU	**6%**	**6%**	**5%**	**4%**	**6%**	**5%**	**4%**

Less Restrictive vs. More Restrictive Grazing Management - Effects to steelhead trout are the same as those described for spring/summer chinook salmon.

Table SW-53. Percent of Less and More Restrictive Grazing Strategies within Subbasins in the Snake River Steelhead ESU, by Alternative

Subbasins	Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	L	M	L	M	L	M	L	M	L	M	L	M	L	M
Hells Canyon	100	0	99	1	98	2	97	3	100	0	55	45	98	2
Little Salmon River	97	3	88	12	49	51	18	82	84	16	89	11	58	42
Lower M. F. Salmon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lower Salmon	97	3	74	26	17	83	0	100	97	3	94	6	11	89
Middle Salmon-Chamberlain	100	0	100	0	93	7	0	100	100	0	100	0	2	98
South Fork Salmon	79	21	40	60	1	99	0	100	85	15	62	38	8	92
Upper M. F. Salmon	88	12	18	82	0	100	0	100	100	0	53	47	0	100
Upper Salmon	78	22	10	90	1	99	16	84	100	0	42	58	1	99
Entire ESU	**85**	**15**	**47**	**53**	**17**	**83**	**12**	**88**	**93**	**7**	**66**	**34**	**23**	**77**

L = Less restrictive grazing strategies; M = More restrictive grazing strategies

Issue 4, Indicator 3: Effects From Wildfire Vs. Treatments to Reduce Wildfire Hazard
Effects of Wildfire vs. Managing Wildfire Hazard in Subwatersheds with Depressed Populations – Six of the eight subbasins where steelhead occur have subwatersheds at high risk from uncharacteristic wildfires. The Upper Salmon and Upper Middle Fork Salmon subbasins do not. In these subbasins there are 48 subwatersheds with depressed steelhead at high risk (Table SW-54). Each alternative assigns MPCs that more aggressively treat vegetation to reduce fuel loading. Alternatives 1B, 2, 3, 5, and 7 are the most aggressive, potentially treating more than 50 percent of

all subwatersheds where depressed steelhead subpopulations occur within the Ecogroup across the ESU. In some subbasins, under these alternatives, all subwatersheds with depressed populations could see treatment. Alternatives 4 and 6 would treat the least amount (4 to 13 percent) of subwatersheds with depressed chinook subpopulations.

Table SW-54. Percent of Depressed Steelhead Subwatersheds Where Risks from Uncharacteristic Wildfires Could be Reduced within Subbasins in the Snake River Steelhead ESU, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon	0%	100%	100%	100%	100%	0%	100%
Little Salmon River	25%	50%	100%	0%	100%	50%	75%
Lower Middle Fork Salmon	0%	0%	0%	0%	0%	0%	0%
Lower Salmon	60%	60%	100%	0%	100%	20%	40%
Middle Salmon-Chamberlain	50%	50%	67%	0%	67%	17%	50%
South Fork Salmon	50%	32%	32%	4%	71%	7%	43%
Entire ESU	**47%**	**40%**	**49%**	**4%**	**73%**	**13%**	**47%**

Table SW-55. Percent of Depressed Steelhead Subwatersheds Where Risks from Uncharacteristic Wildfires Would Remain High within Subbasins in the Snake River Steelhead ESU, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon	100%	0%	0%	0%	0%	100%	0%
Little Salmon River	75%	50%	0%	100%	0%	80%	60%
Lower Middle Fork Salmon	100%	100%	100%	100%	100%	100%	100%
Lower Salmon	40%	40%	0%	100%	0%	80%	60%
Middle Salmon-Chamberlain	50%	50%	33%	100%	33%	83%	50%
South Fork Salmon	50%	68%	68%	96%	29%	93%	57%
Entire ESU	**55%**	**61%**	**50%**	**98%**	**25%**	**89%**	**55%**

Risks from uncharacteristic wildfires to depressed steelhead subpopulations would remain high for whose alternatives that treat the least amount of acres and have fewer management tools available to reduce wildfires. If wildfires occurred in high risk from uncharacteristic wildfire subwatersheds, it is believed that some depressed populations could decline further depending on the severity of each fire. Risk from uncharacteristic wildfires would remain high across 89 to 98 percent of the depressed steelhead subpopulations within the Ecogroup and ESU under Alternatives 4 and 6 due to the lack of potential treatments. This would be followed by Alternatives 1B, 2, 3, and 7 with 50 to 61 percent of the depressed steelhead subpopulations still having a high risk from uncharacteristic wildfires and Alternative 5 with 25 percent still having a high risk from uncharacteristic wildfires.

Effects of Wildfire vs. Managing Wildfire Hazard in Subwatersheds with Strong Populations **-** There are four subwatersheds considered as strongholds for steelhead in the Ecogroup and ESU (Table SW-56), all in the Little Salmon River subbasin. Three of the steelhead subpopulations are at high risk from uncharacteristic wildfires. Based on MPC emphasis, treatments to reduce uncharacteristic wildfire risks in three steelhead strongholds in the Little Salmon subbasin could vary by alternative. All (100 percent) of the strongholds could be treated under Alternatives 3 and 5; one third (33 percent) could be treated under Alternatives 2 and 6; and no strongholds would be treated under Alternatives 1B, 4 and 7. Because high emphasis treatments occur in some of the last remaining strongholds, management activities may pose a greater risk to steelhead than if an uncharacteristic wildfire occurred for Alternatives 2, 3, 5, and 6. Management direction for the action alternatives would help to minimize many management effects (see Direct and Indirect Effects Common to all Alternatives). However, there would still be some risk of impacts to stronghold subwatersheds in each alternative from roads and mechanical/fire treatments.

Table SW-56. Percent of Stronghold Steelhead Subwatersheds Where Risks from Management Treatments For Uncharacteristic Wildfires Would be Higher within Subbasins in the Snake River Steelhead ESU, by Alternative

Subbasin and ESU	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Little Salmon River	0%	33%	100%	0%	100%	33%	0%

Issue 4, **Indicator 4: High Priority Subwatersheds Receiving Appropriate Restoration and Conservation Emphasis** - All ACS priority subwatersheds identified by WARS would have a high emphasis for aquatic restoration in all the action alternatives. Alternative 1B (as amended by Infish, Pacfish, and the BOs) did not identify priority areas for restoration and would not receive this added emphasis. Alternatives 2, 3, 7, and 6 have MPCs that emphasize the most appropriate restoration or conservation in 71, 70, 68, and 58 percent, respectively, of the high priority subwatersheds identified by the WARS (Table SW-57). Under these alternatives, the Upper Salmon, South Fork Salmon, Lower Middle Fork Salmon and Upper Middle Fork Salmon have the most potential for timely aquatic restoration given their MPCs and number of ACS priority subwatersheds. This restoration emphasis, coupled with more restrictive management direction, should make great strides in reducing existing impacts and improving watershed/habitat conditions. Restoration would slowly decrease the number of water quality limited streams and damaged stream segments identified in the environmental baselines. It would also indirectly benefit steelhead by helping to restore subwatersheds that influence migratory corridors.

Table SW-57. Percent of High Priority Subwatersheds Receiving Appropriate Restoration or Conservation Emphasis within Subbasins in the Snake River Steelhead ESU, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon	0%	0%	0%	0%	0%	0%	0%
Little Salmon River	42%	75%	67%	50%	17%	67%	42%
Lower Middle Fork Salmon	93%	96%	96%	93%	89%	93%	96%
Lower Salmon	38%	63%	38%	38%	0%	38%	38%
Middle Salmon-Chamberlain	56%	56%	49%	61%	49%	59%	61%
South Fork Salmon	30%	64%	66%	34%	25%	43%	67%
Upper Middle Fork Salmon	50%	83%	83%	83%	33%	83%	75%
Upper Salmon	18%	78%	85%	18%	15%	58%	73%
Entire ESU	**43%**	**71%**	**70%**	**47%**	**34%**	**58%**	**68%**

Not all subbasins under Alternatives 2, 3, 6, and 7, however, have MPCs with the same restoration emphasis as WARS. In the Lower Salmon and Little Salmon subbasins, less than half of the high priority subwatersheds would receive the appropriate restoration and conservation recommended by WARS under Alternative 7. While, for the Lower Salmon subbasin, less than half of the high priority subwatersheds would receive the appropriate restoration under Alternative 3. Many of these areas, however, fall within ACS priority subwatersheds. It is anticipated that the ACS designation would place a greater emphasis on aquatic restoration so that current conditions would be either maintained or slowly trend toward recovery. Yet, some areas that do not fall within ACS priority subwatersheds may continue to see localized effects to water quality, channel condition, watershed condition, and flow/ hydrology pathways where problem sites are not immediately addressed.

In contrast, Alternatives 4, 1B, and 5 have MPCs that emphasize the appropriate restoration and conservation in little more than a third of the high priority subwatersheds identified by WARS in the Ecogroup in the ESU. Under these alternatives the Lower Middle Fork Salmon and Middle Salmon-Chamberlain subbasins have the potential for the most aquatic restoration. Although more restrictive management direction would help reduce effects, aquatic restoration in many subbasins may not be as aggressively pursued under these alternatives. Delays in restoration may also delay habitat improvements in the short term. This could place already depressed steelhead populations at greater risk in portions of each subbasin.

<u>*Effects of Aquatic Restoration in Subwatersheds with Strong and Depressed Populations*</u> **-** Alternatives 3, 2, and 6 have MPCs that emphasize the appropriate restoration and conservation recommended by the WARS to more subwatersheds containing depressed steelhead subpopulations (Table SW-59) than other alternatives. Alternatives 2, 3, 7, and 6 have MPCs that emphasize the appropriate restoration and conservation recommended by the WARS in a relatively high percentage (71, 69, 69, and 59, respectively) of subwatersheds containing stronghold steelhead subpopulations (Table SW-58). Most subbasins in the Ecogroup area with steelhead subpopulations would see improved habitat and watershed conditions as restoration is implemented. In contrast, Alternatives 1B, 4, 5, and 7 have less potential to improve habitat and watershed conditions in a timely manner.

Table SW-58. Percent of Steelhead Strongholds Receiving Appropriate Restoration or Conservation Emphasis within Subbasins* in the Snake River Steelhead ESU, by Alternative

Subbasin and ESU	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Little Salmon River	50%	75%	100%	50%	0%	75%	50%

*The other subbasins in this ESU do not have any steelhead strongholds.

Table SW-59. Percent of Depressed Steelhead Subwatersheds Receiving Appropriate Restoration or Conservation Emphasis within Subbasins in the Snake River Steelhead ESU, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon	0%	0%	0%	0%	0%	0%	0%
Little Salmon River	33%	67%	33%	335	0%	67%	33%
Lower Middle Fork Salmon	93%	96%	96%	93%	89%	93%	96%
Lower Salmon	43%	71%	29%	43%	0%	43%	43%
Middle Salmon-Chamberlain	58%	58%	50%	63%	50%	60%	63%
South Fork Salmon	30%	64%	66%	34%	25%	43%	67%
Upper Middle Fork Salmon	42%	75%	83%	75%	25%	75%	67%
Upper Salmon	16%	78%	86%	16%	14%	57%	73%
Entire ESU	**43%**	**71%**	**69%**	**47%**	**35%**	**59%**	**69%**

Issue 4, Indicator 5: Effects from Motorized Trail Use - Trails currently open to motorized use would be prohibited within proposed wildernesses under Alternatives 4 and 6. Under Alternative 4, the South Fork Salmon, Little Salmon, Lower Salmon, and Upper Salmon would see the most closures. Under Alternative 6, the South Fork Salmon and Upper Salmon would see the most closures. All motorized trails would remain open under remaining alternatives. Trail closures in these subbasins could result in more concentrated use on remaining motorized trails. Subbasins with more motorized trails in RCA potentially could also see more impacts to steelhead and their habitat. Management direction for the action and no action alternatives would help to minimize most of these potential impacts. However, impacts to riparian vegetation and stream banks from authorized and unauthorized ATV use may still occur from increased trail use. Effects to aquatic species and SWRA resources would be similar under Alternatives 1-3, 5, and 7. Trail use would not be concentrated, but localized impacts to riparian vegetation and stream channels near crossings would be anticipated.

Cumulative Effects on Steelhead

Non-federal actions are likely to continue affecting listed species. Effects to steelhead from non-federal lands would be low overall in the Salmon River Basin when compared to other areas in the Ecogroup. Non-federal lands comprise only 10 percent of the Salmon River Basin. However, cumulative effects from non-federal lands would be high in individual subbasins such as the Lemhi, Little Salmon and Lower Salmon. As described in the Cumulative Effects Common to all Alternatives, degradation and loss of habitat from non-federal actions would continue. Degraded baseline conditions, and threats from hatchery fish also would continue to stress populations in most subbasins.

The level of risk associated with cumulative effects was evaluated for each subbasin in the Snake River steelhead ESU within the Ecogroup area. Alternatives 1B, 5, 6 would have a slightly higher risk of cumulative effects based on greater timber, grazing, etc. management and less aquatic restoration, than the other alternatives (Table SW-60). In particular, the Little Salmon and Lower Salmon could see more cumulative effects under these alternatives. Remaining alternatives have slightly lower risks of cumulative effects than Alternatives 1B, 5 and 6. However, several subbasins still have a high risk of cumulative effects, - Specifically due to more grazing with less restrictive management direction in Lower Salmon, and more grazing with less restrictive management direction and potential treatments to reduce fire risk in steelhead strongholds in the Little Salmon, combined with degraded baselines.

Table SW-60. Relative Risks* from Cumulative Effects within the Ecogroup Portion of the Snake River Steelhead ESU, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon	10	8	8	8	8	10	8
Little Salmon River	11	12	11	10	14	12	11
Lower Middle Fork Salmon	6	6	6	6	6	6	6
Lower Salmon	10	10	9	9	11	10	9
Middle Salmon-Chamberlain	7	7	7	7	7	7	7
South Fork Salmon	7	7	7	7	7	7	6
Upper Middle Fork Salmon	10	6	6	6	8	6	6
Upper Salmon	8	8	6	8	8	7	8
Entire ESU	**9**	**8**	**8**	**8**	**9**	**9**	**8**

*****Relative risk rating based upon a maximum total of 18 possible points. Refer to Methodology section to see how ratings were assigned.

Viability Analysis for Steelhead

Projected trends for steelhead over the first 15 years show that the number of stronghold subpopulations would remain unchanged. This is because it will take time for subpopulations to respond to restoration and passive/conservation measures. The number depressed subpopulations would change slightly (Table SW-61) for those alternatives that have active restoration MPCs within currently absent, but "linked" subwatersheds. It is assumed in these subwatersheds that fish habitat functioning at unacceptable risk is due to poor Geomorphic and/or Water Quality Integrity. Active restoration could begin to improve these limiting factors in 15 years so that fish could re-colonize from adjacent areas. Large numbers of fish would not be expected to re-colonize each subwatershed initially. Thus, these recolonized subwatersheds would at first be depressed, increasing the number of depressed subpopulations in the first 15 years. Restoration again would not improve enough of the overall subwatershed condition to trend existing depressed populations to strong ones in 15 years.

Table SW-61. Number of Stronghold and Depressed Steelhead Subwatersheds at 15 Years within Subbasins in the Snake River Steelhead ESU, by Alternative

Subbasin	Current		Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D
Hells Canyon	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	3
Little Salmon River	4	10	4	10	4	12	4	12	4	10	4	10	4	12	4	10
Lower M.F. Salmon	0	28	0	28	0	28	0	28	0	28	0	28	0	28	0	28
Lower Salmon	0	10	0	10	0	10	0	10	0	10	0	10	0	10	0	10
Middle Salmon-Chamberlain	0	48	0	48	0	48	0	48	0	48	0	48	0	48	0	48
South Fork Salmon	0	70	0	70	0	70	0	70	0	70	0	70	0	70	0	70
Upper M.F. Salmon	0	16	0	16	0	16	0	16	0	16	0	16	0	16	0	16
Upper Salmon	0	47	0	47	0	48	0	48	0	47	0	47	0	48	0	49
Totals	**4**	**232**	**4**	**232**	**4**	**235**	**4**	**235**	**4**	**232**	**4**	**232**	**4**	**235**	**4**	**234**

S = Stronghold Subpopulations; D = Depressed Subpopulations

Projected trends over the long-term indicate a positive trend from current conditions for stronghold subpopulations under all alternatives. These predictions are based upon populations responding favorably to active and passive restoration and conservation measures. However, these predictions do not reflect changes in migration corridor survival from downstream influences in the Columbia River Basin, non-native species, harvest trends, etc. It is assumed that the temporary and short-term effects from Ecogroup activities would not compromise the benefits of restoration and conservation due to new and existing management direction. Alternatives 3, 2, 7, and 6 show the greatest increase in the number of stronghold subpopulations due to having more MPCs that emphasize the appropriate restoration and conservation within high priority subwatersheds identified by the WARS (Table SW-62).

Table SW-62. Number of Stronghold and Depressed Steelhead Subwatersheds at 50 Years within Subbasins in the Snake River Steelhead ESU, by Alternative

Subbasin	Current		Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D
Hells Canyon	0	3	0	3	1	2	0	3	2	1	0	3	0	3	0	3
Little Salmon River	4	10	6	8	10	6	8	8	14	0	4	10	10	6	6	8
Lower M.F. Salmon	0	28	26	2	27	1	27	1	4	24	25	3	26	2	27	1
Lower Salmon	0	10	3	7	5	5	3	8	9	1	0	10	3	7	3	7
Middle Salmon-Chamberlain	0	48	25	23	25	23	22	26	10	38	22	26	26	22	27	21
South Fork Salmon	0	70	21	49	46	24	47	23	58	10	19	51	31	39	48	22
Upper M.F. Salmon	0	16	4	12	8	8	9	7	1	15	2	12	9	7	8	8
Upper Salmon	0	47	5	42	32	16	39	10	5	41	4	43	23	25	31	18
Totals	**4**	**231**	**90**	**146**	**154**	**85**	**155**	**86**	**99**	**128**	**76**	**160**	**128**	**111**	**150**	**88**

S = Stronghold Subpopulations; D = Depressed Subpopulations

In 50 years, under Alternatives 2, 3, 6, and 7, steelhead subpopulations are predicted to improve from 4 strong subpopulation subwatersheds up to a range of 128 (Alt. 6) to 155 (Alt. 3). Some of the largest increases would occur in the Upper Salmon, Upper and Lower Middle Forks of the Salmon River, and Middle Salmon-Chamberlain subbasins under these alternatives. Alternatives 1B and 4 would have moderate increase from 4 up to 99 stronghold subwatersheds, and Alternatives 5 would have the smallest increase (76) in stronghold subwatersheds.

The predicted increase in strongholds is a result of the greater restoration emphasis, adjustments to grazing and vegetation management, and protection provided by management direction for all action alternatives. As more subwatersheds support strong subpopulations, population risks should decrease. In particular, restoration should improve density dependent (e.g., sex ratios, etc.) and genetic diversity factors. Many of the remaining strongholds for steelhead are clustered in a few subwatersheds in one subbasin and are at high risk from disturbances. Stronger populations should result in more dispersed and resilient metapopulations across each subbasin, reducing the risks from uncharacteristic disturbance events. Restoration and conservation should also increase the availability of high quality habitats, thereby decreasing the chances that a large random disturbance event, such as wildfire, would reduce the effectiveness of available habitat.

The Upper Salmon, and Upper and Lower Middle Forks of the Salmon River subbasins are predicted to increase from no stronghold subpopulations subwatersheds up to a range of 58 (Alt. 6) to 75 (Alt. 3) for Alternatives 2, 3, 6, and 7. Alternatives 1B, 4, and 5 would increase up to a range of 0 (Alt. 1B and 4) to 31(Alt. 5) strongholds. If these predictions came true, adjacent subbasins such as the Pahsimeroi, Lemhi, and Middle Salmon-Panther could benefit from fish straying and re-colonizing accessible habitat. Strays entering the mainstem Pahsimeroi and Lemhi subbasins, however, would find limited access due to seasonal dewatering and areas where channels have been rerouted to facilitate water withdrawals. Currently, very few tributaries in the Pahsimeroi and Lemhi subbasins are connected to the mainstem during irrigation season (April through October) except in high water years.

Based upon the predicted viability outcomes, all alternatives appear to improve the chances of recovery over time, by decreasing depressed and increasing stronghold subpopulations. While no alternative by itself would ensure recovery or de-listing due to the multitude of cumulative influences involved, those alternatives that have the potential for a faster rate of aquatic restoration would more quickly reduce existing impacts on spawning and rearing habitat. Aquatic restoration, coupled with other management changes, could make great strides in increasing the overall viability of subpopulations in the Ecogroup. However, for the predicted increases to be realized, restoration must be funded and implemented with the appropriate prioritization, and improvement to the downstream survival must also occur. Rehabilitation of depressed populations cannot be accomplished via habitat improvements alone, but would require improvements in migration corridor survival (Marmorek et al. 1998) and efforts to address causes of mortality in other life stages (Quigley and Arbelbide 1997).

Effects on Bull Trout, A Threatened and Management Indicator Species – Issue 4

Direct and Indirect Effects on Bull Trout

Issue 4, Indicator 1: Effects From Vegetation Treatments, Roads, and Fire Use

Suited Timberland Acres – Based on suited timberland acres assigned by MPCs, Alternatives 1B, 2, 3, and 5 have the greatest potential (1,093,122 to 2,510,948 acres) for impacts from commercial timber harvest and associated road activities over the range of bull trout in the Ecogroup. Alternatives 6 and 7 would have a moderate potential, and Alternative 4 would have a low potential for impacts from timber harvest and associated road activities (Table SW-63). The Southwest Idaho and Hells Canyon Recovery Units would support more suited acres compared to other recovery units. For example, the Southwest Idaho Recovery Unit would support at least 60 percent or more of the suited acres under each alternative. In particular, the South Fork Boise River, South Fork Payette, and Weiser subbasins could see a greater risk of impacts under Alternatives 1B, 2, 3, and 5 than other alternatives that propose less suited timberland acres in this recovery unit. In the Salmon River recovery Unit, the Little Salmon and South Fork Salmon could see a greater risk of impacts. Overall, Alternative 7 would have far less suited timber base than Alternative 1B, with the greatest differences occurring in the South Fork Payette, Upper Salmon, South Fork Salmon, and Lower and Upper Middle Forks of the Salmon River subbasins.

Table SW-63. Acres of Suited Timber Base within Subbasins in Bull Trout Recovery Units, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon Recovery Unit							
Brownlee Reservoir	71,845	68,542	72,331	0	99,843	52,434	66,763
Imnaha Recovery Unit							
Hells Canyon	564	0	0	0	5,965	0	564
SW Idaho Recovery Unit							
Boise-Mores	107,748	110,498	97,382	5,903	125,555	42,142	91,355
Middle Fork Payette	85,695	76,071	69,912	0	142,349	40,328	52,532
North and Middle Fork Boise	104,294	103,624	64,427	0	188,269	65,068	77,439
North Fork Payette	106,879	115,648	89,018	0	164,301	60,882	88,205
Payette	55,062	57,584	67,463	0	80,407	45,154	53,310
South Fork Boise River	172,151	178,055	168,038	3,212	263,070	62,349	106,213
South Fork Payette	180,187	195,491	165,692	0	303,980	53,268	98,633
Weiser River	165,038	164,839	162,974	0	211,055	117,228	162,721
Entire Recovery Unit	977,054	1,001,810	884,906	9,115	1,478,986	486,419	730,408
Salmon River Recovery Unit							
Little Salmon River	55,551	45,737	39,749	0	106,844	34,799	49,374
Lower Middle Fork Salmon	733	0	0	0	12,359	0	0
Lower Salmon	14,321	4,040	15,650	0	65,907	3705	7,965
Middle Salmon-Chamberlain	42,602	46,708	69,053	0	89,132	10284	18,885
South Fork Salmon	225,154	10,939	10,415	0	393,402	2655	20,836
Upper Middle Fork Salmon	44,360	0	0	0	79,965	0	0
Upper Salmon	113,446	1,021	1,018	0	178,545	0	1,018
Entire Recovery Unit	496,167	108,445	135,885	0	926,154	51,443	98,078
All Recovery Units	**1,545,630**	**1,178,797**	**1,093,122**	**9,115**	**2,510,948**	**590,296**	**895,813**

<u>ERT Acres Compared to Subbasin TOCs</u> - Most alternatives have ERT acres between 16 to 93 percent of the TOC for each subbasin in the first 20 years (Table SW-64). The shaded boxes in the table indicate alternatives and subbasins where the TOC could be exceeded based on MPC modeling assumptions. Actual treatment acres would depend on site-specific proposals, analysis, consultation, and mitigation, which would no doubt modify the numbers presented below.

Table SW-64. Percent of ERT Acres Relative to the Threshold of Concern (100) within Subbasins in Bull Trout Recovery Units, by Alternative, After 20 and 50 Years

Subbasins	Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.
Hells Canyon Recovery Unit														
Brownlee Reservoir	44	40	27	23	16	15	24	20	32	33	30	25	39	35
Imnaha Recovery Unit														
Hells Canyon	107	106	45	37	36	26	48	29	90	84	136	67	39	31
SW Idaho Recovery Unit														
Boise-Mores	36	38	18	31	18	22	18	26	33	37	16	26	26	40
Middle Fork Payette	93	56	41	34	39	31	38	28	76	67	47	37	68	63
North and M. Fork Boise	38	37	21	28	19	23	19	24	26	31	20	24	34	36
North Fork Payette	63	57	69	47	46	35	38	26	56	45	50	33	79	56
Payette	63	58	64	43	48	38	30	22	52	48	46	34	72	58
South Fork Boise River	24	24	22	23	18	19	15	23	21	23	19	20	43	36
South Fork Payette	64	56	35	34	33	31	31	28	49	47	40	33	62	51
Weiser River	35	36	25	22	22	18	22	20	30	34	31	26	37	38
Salmon River Recovery Unit														
Little Salmon River	58	45	43	30	32	20	29	18	51	38	42	26	44	33
Lower M. F. Salmon	40	39	36	27	28	16	31	15	48	36	32	21	51	39
Lower Salmon	77	52	62	42	34	30	51	31	64	52	91	52	52	41
Middle Salmon-Chamberlain	61	45	33	29	24	18	32	23	57	44	82	46	46	36
South Fork Salmon	72	56	66	43	44	33	35	25	63	50	52	33	78	53
Upper M. F. Salmon	112	90	61	46	55	37	50	31	61	51	61	38	90	66
Upper Salmon	42	26	120	70	85	50	69	52	42	36	62	38	125	75

Only the Hells Canyon, Upper Middle Fork Salmon and Upper Salmon River subbasins have ERT acres above the 100 percent TOC in select alternatives. Many of the higher acre percentages are due to potential management activities to reduce wildfire risks and move vegetation toward desired conditions using fire reintroduction and mechanical thinning. Because the modeled ERT value exceeds the threshold of concern, the potential effects to bull trout and its habitat could be high in the short term in Upper Middle Fork Salmon in Alternative 1B and Upper Salmon in Alternatives 2 and 7. Although ERT values exceed the threshold of concern under Alternatives 1B and 6 in Hells Canyon, lands managed by the Ecogroup comprise only 3 percent of the subbasin. Therefore, any impacts are expected to be localized and pose little risk to bull trout. Remaining effects (see Effects Common to All Alternatives) to water quality, watershed condition, and flow/hydrology could occur depending on the intensity of activities proposed in each alternative. Most of these affected pathways are also currently "functioning at risk" for the Upper Middle Fork Salmon and Upper Salmon subbasins. This suggests some subwatersheds may be more sensitive to proposed management actions.

Issue 4, **Indicator 2: Effects From Livestock Grazing**

Suitable Rangeland Acres – Suitable rangeland acres are slightly less under Alternatives 2, 3, 4, 6, and 7 across the Ecogroup where bull trout occur from the current forest plans, represented by Alternative 1B (Table SW-65). Alternative 5 is the same as 1B, or 12 percent suitable rangeland acres across the Ecogroup. Suited rangeland acres are also slightly less under Alternatives 2, 3, 4, 6 and 7 in most recovery units. Suitable rangeland acres are less than 10 percent in the majority of subbasins in the Salmon River Recovery Unit. However, the Brownlee Reservoir in the Hells Canyon Recovery Unit, and most subbasins in the Southwest Idaho Recovery Unit have suited rangeland acres over 20 percent of the land administered in the Ecogroup. In particular the Brownlee Reservoir, Boise-Mores, Middle Fork Payette, North Fork and Middle Fork Boise, Payette, South Fork Boise, Weiser, Little Salmon, and Lower Salmon subbasins consistently have a higher potential for grazing impacts due to a higher amount of suitable acres (19 percent or higher). Hells Canyon would also have potential for more impacts under Alternatives 1B, 2, and 5 (12 percent).

A higher percent of acres grazed by cattle or sheep in these subbasins will require vigilant application of management direction to minimize effects. Some temporary effects will occur to riparian vegetation, water quality, and stream channels where bull trout or its proposed critical habitat is present. Project level consultation on pastures and allotments will require careful analysis and monitoring to ensure affects are mitigated to the greatest extent possible and management direction is properly implemented.

Table SW-65. Percent of Suitable Rangeland within Subbasins in Bull Trout Recovery Units, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon Recovery Unit							
Brownlee Reservoir	27%	27%	19%	19%	27%	19%	27%
Imnaha Recovery Unit							
Hells Canyon	12%	12%	4%	4%	12%	0%	2%
SW Idaho Recovery Unit							
Boise-Mores	27%	26%	26%	26%	27%	26%	26%
Middle Fork Payette	24%	20%	20%	20%	24%	20%	20%
North and Middle Fork Boise	22%	21%	21%	21%	22%	21%	21%
North Fork Payette	11%	11%	11%	11%	11%	11%	11%
Payette	32%	32%	32%	32%	32%	32%	32%
South Fork Boise River	22%	22%	22%	22%	22%	22%	22%
South Fork Payette	7%	4%	4%	4%	7%	4%	4%
Weiser River	32%	32%	32%	32%	32%	32%	32%
Entire Recovery Unit	21%	19%	19%	19%	21%	19%	19%

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Salmon River Recovery Unit							
Little Salmon River	19%	19%	19%	19%	19%	19%	19%
Lower Middle Fork Salmon	0%	0%	0%	0%	0%	0%	0%
Lower Salmon	19%	19%	19%	19%	19%	19%	19%
Middle Salmon-Chamberlain	1%	1%	1%	1%	1%	1%	1%
South Fork Salmon	2%	2%	2%	2%	2%	2%	2%
Upper Middle Fork Salmon	1%	5%	5%	1%	5%	5%	1%
Upper Salmon	8%	8%	8%	8%	8%	8%	8%
Entire Recovery Unit	4%	5%	5%	4%	5%	5%	4%
All Recovery Units	**13%**	**12%**	**12%**	**12%**	**13%**	**12%**	**12%**

Less Restrictive vs. More Restrictive Grazing Management - MPC emphasis and management direction also needs to be considered in addition to suited rangeland acres. Those alternatives and subbasins with a higher amount of suited rangeland acres and MPCs with less restrictive grazing direction have a greater potential for temporary and short-term effects to matrix pathways. The combination of moderate amounts of suited rangeland acres and high percentage of less restrictive grazing strategies in the Hell Canyon and Southwest Idaho recovery units implies there is a greater chance for temporary effects to bull trout and its proposed critical habitat. In particular, the Brownlee Reservoir, Boise-Mores, Middle Fork Payette, North Fork and Middle Fork Boise, Payette, South Fork Boise, Weiser, Little Salmon, and Lower Salmon subbasins could have more grazing impacts due to a higher percentage of the suited rangeland acres having less restrictive MPCs. Only Alternative 4 could have fewer impacts due to more restrictive MPCs.

Most matrix pathways in the above subbasin are currently "functioning at risk" (refer to Environmental Baseline in Current Conditions). This suggests that these subbasins may be more sensitive to grazing activities and effects. Alternatives that would have the most restrictive grazing strategies in these subbasins are, in descending order: 4, 3, 7, 2, 1B, 6, and 5.

Table SW-66. Percent of Less and More Restrictive Grazing strategies within Subbasins in Bull Trout Recovery Units, by Alternative

Subbasins	Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	L	M	L	M	L	M	L	M	L	M	L	M	L	M
Hells Canyon Recovery Unit														
Brownlee Reservoir	100	0	100	0	99	1	0	100	100	0	100	0	98	2
Imnaha Recovery Unit														
Hells Canyon	100	0	99	1	98	2	97	3	100	0	55	45	98	2
SW Idaho Recovery Unit														
Boise-Mores	100	0	95	5	87	13	90	10	96	4	96	4	95	5
Middle Fork Payette	100	0	94	6	94	6	51	49	100	0	100	0	100	0
North and Middle Fork Boise	83	17	82	18	68	32	13	87	93	7	88	12	78	22
North Fork Payette	79	21	78	22	48	52	8	82	100	0	78	22	52	48
Payette	100	0	100	0	100	0	51	49	100	0	100	0	100	0
South Fork Boise River	100	0	95	5	89	11	29	71	100	0	99	1	94	6
South Fork Payette	76	24	94	6	93	7	27	73	100	0	94	6	89	11
Weiser River	79	21	100	0	100	0	0	100	100	0	100	0	52	48
Entire Recovery Unit	90	10	93	7	87	13	34	66	98	2	95	5	87	13
Salmon River Recovery Unit														
Little Salmon River	97	3	88	12	49	51	18	82	84	16	89	11	58	42
Lower M. F. Salmon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lower Salmon	97	3	74	26	17	83	0	100	97	3	94	6	11	89
Middle Salmon-Chamberlain	100	0	100	0	93	7	0	100	100	0	100	0	2	98
South Fork Salmon	79	21	40	60	1	99	0	100	85	15	62	38	8	92
Upper M. F. Salmon	88	12	18	82	0	100	0	100	100	0	53	47	0	100
Upper Salmon	78	22	10	90	1	99	16	84	100	0	42	58	1	99
Entire Recovery Unit	85	15	47	53	17	83	12	88	93	7	66	34	23	77
All Recovery Units	**90**	**10**	**86**	**14**	**76**	**24**	**31**	**69**	**97**	**3**	**91**	**9**	**77**	**23**

L = Less restrictive grazing strategies; M = More restrictive grazing strategies

Overall, grazing management strategies would change significantly from the current forest plans in Alternatives 2, 3, 4, and 7, from 15 percent to 53 percent or more with more restrictive grazing strategies in the Salmon River Recovery Unit (Table SW-66). The Lower Salmon, South Fork Salmon, Upper Middle Fork Salmon, Middle Salmon-Chamberlain, and Upper Salmon subbasins would see the greatest change in MPC grazing strategies from the current forest plans, represented by Alternative 1B. The change in management strategies would help reduce effects and achieve TEPC fish and SWRA resource objectives. Risks to bull trout would be lower in the Salmon River and Imnaha-Snake recovery units because low overall acres of suited rangelands and/or the limited grazing system.

In the Southwest Idaho, Imnaha, and Hell Canyon Recovery Units, grazing management strategies would change very little (97-100 percent to 87-100 percent with a less restrictive grazing strategy) under most alternatives, except for Alternative 4 in Hells Canyon and Imnaha for Alternative 6.

Issue 4, Indicator 3: Effects From Wildfire Vs. Treatments to Reduce Wildfire Hazard
Effects of Wildfire vs. Managing Wildfire Hazard in Subwatersheds with Depressed Populations – The majority of the subwatersheds at risks from uncharacteristic wildfires occur in the South Fork Salmon, Lower Salmon, and Little Salmon River subbasins (Salmon River Recovery Unit), Brownlee Reservoir subbasin (Hell Canyon Recovery Unit) and South Fork Payette, Payette, South Fork Boise, and North Fork/Middle Fork Boise subbasins (Southwest Idaho Recovery Unit). Over the entire Ecogroup fourteen of the subbasins where bull trout occur have subwatersheds at high risk from uncharacteristic wildfires. The Upper Salmon and Upper Middle Fork Salmon subbasins do not have subwatersheds at high risk from uncharacteristic wildfires.

Each alternative assigns MPCs that more aggressively treat vegetation to reduce fuel loading. Alternatives 1B, 2, 3, 5, and 7 are the most aggressive in the Southwest Idaho Recovery Unit, potentially treating more than 69 percent of all subwatersheds where depressed bull trout populations occur within the Ecogroup. In some subbasins, under these alternatives, all subwatersheds with depressed populations could see treatment. Alternative 4 would treat the least amount (17 percent) of subwatersheds with depressed bull trout populations in this recovery unit.

Alternatives 3 and 5 in the Salmon River, Alternatives 3, 4, and 7 in the Hells Canyon, and Alternatives 2, 3, 4, 5, and 7 in the Imnaha Recovery Units are the most aggressive, potentially treating more than 53 percent of all subwatersheds where depressed bull trout populations

Table SW-67. Percent of Depressed Bull Trout Subwatersheds Where Risks From Uncharacteristic Wildfires Could Be Reduced within Subbasins in Bull Trout Recovery Units, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon Recovery Unit							
Brownlee Reservoir	20%	40%	80%	100%	20%	40%	80%
Imnaha Recovery Unit							
Hells Canyon	0%	100%	100%	100%	100%	0%	100%
SW Idaho Recovery Unit							
Boise-Mores	100%	100%	100%	100%	100%	100%	100%
Middle Fork Payette	66%	66%	100%	0%	100%	0%	100%
North and Middle Fork Boise	75%	75%	25%	50%	25%	25%	75%
North Fork Payette	NA	NA	NA	NA	NA	NA	NA
Payette	50%	50%	100%	100%	100%	50%	100%
South Fork Boise River	75%	75%	100%	63%	100%	13%	100%
South Fork Payette	43%	43%	43%	14%	86%	0%	43%
Weiser River	100%	100%	100%	100%	100%	0%	100%
Entire Recovery Unit	69%	79%	76%	52%	86%	17%	83%

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Salmon River Recovery Unit							
Little Salmon River	25%	50%	100%	0%	100%	50%	25%
Lower Middle Fork Salmon	0%	0%	0%	0%	0%	0%	0%
Lower Salmon	60%	60%	100%	0%	100%	20%	40%
Middle Salmon-Chamberlain	57%	57%	71%	0%	71%	29%	57%
South Fork Salmon	43%	29%	36%	4%	71%	7%	43%
Upper Middle Fork Salmon	NA	NA	NA	NA	NA	NA	NA
Upper Salmon	NA	NA	NA	NA	NA	NA	NA
Entire Recovery Unit	44%	38%	53%	2%	76%	16%	42%
All Recovery Units	**54%**	**50%**	**62%**	**22%**	**80%**	**16%**	**58%**

Table SW-68. Percent of Depressed Bull Trout Subwatersheds Where Risks from Uncharacteristic Wildfires Would Remain High within Subbasins in Bull Trout Recovery, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon Recovery Unit							
Brownlee Reservoir	80%	60%	20%	0%	80%	60%	20%
Imnaha Recovery Unit							
Hells Canyon	100%	0%	0%	0%	0%	100%	0%
SW Idaho Recovery Unit							
Boise-Mores	0%	0%	0%	0%	0%	0%	0%
Middle Fork Payette	33%	33%	0%	100%	0%	100%	0%
North and Middle Fork Boise	25%	25%	75%	50%	75%	75%	25%
North Fork Payette	NA	NA	NA	NA	NA	NA	NA
Payette	50%	50%	0%	0%	0%	50%	0%
South Fork Boise River	25%	25%	0%	37%	0%	87%	0%
South Fork Payette	57%	57%	57%	86%	14%	100%	57%
Weiser River	0%	0%	0%	0%	0%	100%	0%
Entire Recovery Unit	31%	31%	24%	48%	14%	83%	17%
Salmon River Recovery Unit							
Little Salmon River	75%	50%	0%	100%	0%	50%	75%
Lower Middle Fork Salmon	100%	100%	100%	100%	100%	100%	100%
Lower Salmon	40%	40%	0%	100%	0%	80%	60%
Middle Salmon-Chamberlain	43%	43%	29%	100%	29%	71%	43%
South Fork Salmon	57%	71%	64%	96%	29%	93%	57%
Upper Middle Fork Salmon	NA	NA	NA	NA	NA	NA	NA
Upper Salmon	NA	NA	NA	NA	NA	NA	NA
Entire Recovery Unit	56%	62%	47%	98%	24%	84%	58%
All Recovery Units	**46%**	**50%**	**38%**	**78%**	**20%**	**84%**	**42%**

Risks from uncharacteristic wildfires to depressed bull trout populations would remain high for those alternatives that treat the least amount of acres and have fewer management tools available to reduce wildfires. If wildfires occurred in high risk from uncharacteristic wildfire subwatersheds, it is believed that some depressed populations could decline further depending on the severity of each fire. Risk from uncharacteristic wildfires would remain high across 78 to 84 percent of the depressed bull trout populations within the Ecogroup under Alternatives 4 and 6 due to the lack of potential treatments. This would be followed by Alternatives 1B, 2, 3, and 7 with 38 to 50 percent of the depressed bull trout populations still having a high risk from uncharacteristic wildfires and Alternative 5 with 20 percent still having a high risk from uncharacteristic wildfires. The Southwest Idaho and Salmon River Recovery Units would follow a similar pattern, with depressed bull trout populations having the highest risk from uncharacteristic wildfire under Alternatives 4 and 6 and the lowest risk under Alternative 5. Alternatives 1B and 5 in the Hells Canyon and Alternatives 1B and 6 in the Imnaha Recovery Units would have higher risks to depressed bull trout because of the potential for less fuel reduction treatments.

Effects of Wildfire vs. Managing Wildfire Hazard in Subwatersheds with Strong Populations **-** There are thirty-seven subwatersheds are considered as strongholds for bull trout in the Ecogroup. Eight of these are at high risk from uncharacteristic wildfires. There are either no bull trout strongholds or no strongholds at risk from uncharacteristic wildfire in the Brownlee, Hells Canyon, Boise-Mores, Middle Fork Payette, North Fork Payette, South Fork Payette subbasins or any of the subbasins in the Salmon River Recovery Unit.

Based on MPC emphasis, treatments to reduce uncharacteristic wildfire risks in the eight bull trout strongholds could vary by alternative. All of the strongholds could be treated under Alternatives 3, 5 and 7; one third (33 percent) could be treated under Alternative 4; and no strongholds would be treated under Alternatives 1B, 2, and 6. Because high emphasis treatments occur in some of the last remaining strongholds (Payette, South Fork Boise, and North Fork/Middle Fork Boise subbasins) in Southwest Idaho recovery unit, management activities may pose a greater risk to bull trout than if an uncharacteristic wildfire occurred for Alternatives 3, 4, 5, and 6. Management direction for the action alternatives would help to minimize many management effects (see Direct and Indirect Effects Common to all Alternatives). However, there would still be some risk of impacts to stronghold subwatersheds in each alternative from roads and mechanical/fire treatments.

Table SW-69. Percent of Stronghold Bull Trout Subwatersheds Where Risks from Management Treatments for Uncharacteristic Wildfires Would Be Higher within Subbasins* within Subbasins in Bull Trout Recovery Units, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
SW Idaho Recovery Unit							
North and Middle Fork Boise	0%	0%	100%	0%	100%	0%	100%
Payette	0%	0%	100%	100%	100%	0%	100%
South Fork Boise River	0%	0%	100%	0%	100%	0%	100%
Entire Recovery Unit	**0%**	**0%**	**100%**	**33%**	**100%**	**0%**	**100%**

*The other subbasins in this ESU do not have any bull trout strongholds.

Issue 4, **Indicator 4: High Priority Subwatersheds Receiving Appropriate Restoration and Conservation Emphasis** - All ACS priority subwatersheds identified by WARS would have a high emphasis for aquatic restoration in all the action alternatives. Alternative 1B (as amended by Infish, Pacfish, and the BOs) did not identify priority areas for restoration and would not receive this added emphasis. Alternatives 3, 2, and 7 have MPCs that emphasize the most appropriate restoration and conservation in 61, 59, and 59 percent, respectively, of the high priority subwatersheds identified by the WARS (Table SW-70). Under these alternatives the North Fork and Middle Fork Boise, Upper Salmon, South Fork Salmon, Lower Middle Fork Salmon and Upper Middle Fork Salmon have the best potential to see timely aquatic restoration given their MPCs and number of ACS priority subwatersheds.

The Salmon River Recovery Unit under Alternatives 2, 3, and 7, Hell Canyon Recovery Unit under Alternatives 3 and 4, and Southwest Idaho Recovery Unit under Alternative 4 would potentially see appropriate restoration or conservation with the fastest recovery rate in high priority subwatersheds identified by the WARS. The Imnaha Recovery Unit would potentially see very little aquatic restoration under any alternative in the short term.

Forest-wide and Management Area restoration emphasis under the action alternatives, coupled with protective management direction, should make great strides in reducing existing impacts and improving watershed and habitat conditions. Effects from roads, degraded riparian, poor habitat access, and unstable stream channels should decrease as restoration is implemented. Restoration would slowly reduce the number of water quality limited streams and damaged stream segments identified in the environmental baselines.

Table SW-70. Percent of High Priority Subwatersheds Receiving Appropriate Restoration or Conservation Emphasis within Subbasins in Bull Trout Recovery Units, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon Recovery Unit							
Brownlee Reservoir	0%	0%	67%	100%	0%	0%	0%
Imnaha Recovery Unit							
Hells Canyon	0%	0%	0%	0%	0%	0%	0%
SW Idaho Recovery Unit							
Boise-Mores	50%	50%	0%	50%	50%	50%	50%
Middle Fork Payette	8%	17%	17%	17%	8%	17%	17%
North and Middle Fork Boise	60%	60%	70%	80%	40%	60%	60%
North Fork Payette	15%	15%	62%	46%	8%	15%	31%
Payette	0%	0%	0%	100%	0%	0%	0%
South Fork Boise River	0%	0%	0%	8%	0%	0%	25%
South Fork Payette	44%	44%	44%	67%	11%	44%	67%
Weiser River	17%	17%	17%	100%	0%	17%	17%
Entire Recovery Unit	23%	24%	33%	48%	12%	24%	35%
Salmon River Recovery Unit							
Little Salmon River	42%	75%	67%	50%	17%	67%	42%
Lower Middle Fork Salmon	93%	96%	96%	93%	89%	93%	96%
Lower Salmon	38%	63%	38%	38%	0%	38%	38%
Middle Salmon-Chamberlain	56%	56%	49%	61%	49%	59%	61%
South Fork Salmon	30%	64%	66%	34%	25%	43%	67%
Upper Middle Fork Salmon	50%	83%	83%	83%	33%	83%	75%
Upper Salmon	18%	78%	85%	18%	15%	58%	73%
Entire Recovery Unit	43%	71%	70%	48%	34%	59%	68%
All Recovery Units	**37%**	**59%**	**61%**	**48%**	**29%**	**50%**	**59%**

Not all subbasins under Alternatives 2, 3, and 7, however, have MPCs with the same restoration emphasis as WARS. In the Lower Salmon, Little Salmon, Middle Fork Payette, North Fork Payette, Payette, South Fork Boise, Weiser, and Hells Canyon subbasins, 42 percent or less of the high priority subwatersheds would receive the appropriate restoration and conservation recommended by WARS. Some of these areas, however, fall within ACS priority subwatersheds. It is anticipated that the ACS designation would place a greater emphasis on aquatic restoration so that current conditions would be either maintained or trend toward recovery. Yet, some areas that do not fall within ACS priority subwatersheds may continue to see localized effects to water quality, channel condition, watershed condition, and flow/hydrology pathways where problem sites are not addressed in the short term.

Alternatives 1B, 4, 5, and 6 have MPCs that emphasize the appropriate restoration and conservation in 50 percent or less of the high priority subwatersheds identified by the WARS. Under these alternatives the Lower Middle Fork Salmon, Middle Salmon-Chamberlain, Boise-Mores, North Fork and Middle Fork Boise, and South Fork Payette subbasins have the potential for the most expedient aquatic restoration. Although management direction would help reduce effects, aquatic restoration in many subbasins may not be as aggressively pursued under these alternatives. Delays in restoration may also delay habitat improvements in the short term. This could place already depressed bull trout populations at greater risk in portions of each subbasin.

Effects of Aquatic Restoration in Subwatersheds with Strong and Depressed Populations - Alternatives 2, 3, and 7 have MPCs that emphasize the appropriate restoration or conservation recommended by the WARS to more subwatersheds containing depressed bull trout populations (Tables SW-71) than other alternatives. Alternatives 7, 2, 3, 4, and 6 have MPCs that emphasize the appropriate restoration or conservation recommended by the WARS to more subwatersheds containing stronghold bull trout populations than other alternatives. There are no bull trout strongholds in the Brownlee, Hells Canyon, Middle Fork Payette, North Fork Payette, Weiser, Lower Middle Fork Salmon, Lower Salmon and Middle-Salmon Chamberlain subbasins to assess for restoration.

Table SW-71. Percent of Bull Trout Strongholds Receiving Appropriate Restoration or Conservation Emphasis within Subbasins* in Bull Trout Recovery Units, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
SW Idaho Recovery Unit							
Boise-Mores	100%	100%	0%	100%	100%	100%	100%
North and Middle Fork Boise	33%	67%	67%	67%	50%	67%	67%
Payette	0%	0%	0%	100%	0%	0%	0%
South Fork Boise River	0%	0%	0%	0%	0%	0%	25%
South Fork Payette	43%	43%	43%	57%	14%	43%	71%
Entire Recovery Unit	32%	42%	37%	53%	26%	42%	58%
Salmon River Recovery Unit							
Little Salmon River	60%	100%	100%	80%	40%	80%	60%
South Fork Salmon	0%	100%	100%	0%	100%	0%	100%
Upper Middle Fork Salmon	75%	100%	100%	100%	25%	100%	100%
Upper Salmon	60%	60%	60%	60%	60%	60%	60%
Entire Recovery Unit	56%	87%	87%	67%	50%	67%	73%
All Recovery Units	**41%**	**62%**	**59%**	**59%**	**35%**	**53%**	**65%**

*The other subbasins in this ESU do not have any bull trout strongholds.

Alternatives 2, 3, and 7 have the most potential to initiate habitat and watershed improvements in 53 percent or more of the stronghold bull trout populations (Table SW-71) and 60 percent or more of the depressed bull trout populations (Table SW-72). Most subbasins in the Ecogroup with bull trout populations would see improved habitat and watershed conditions as restoration is implemented. In contrast, Alternatives 1B and 5 have the least potential to initiate habitat and watershed improvements in subbasins with stronghold bull trout populations, and Alternatives 1B, 4, 5, and 6 have the least potential in subbasins with depressed bull trout populations.

Most restoration and conservation would take place in the Salmon River Recovery unit for depressed and stronghold bull trout populations (Tables SW-71 and SW-72). Restoration and conservation should help to reduce existing impacts and improving watershed/habitat conditions for bull trout in a portion of the Southwest Idaho recovery unit (South Fork Payette, Boise-Mores, North Fork/Middle Fork Boise).

Table SW-72. Percent of Depressed Bull Trout Subwatersheds Receiving Appropriate Restoration or Conservation Emphasis within Subbasins in Bull Trout Recovery Units, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon Recovery Unit							
Brownlee Reservoir	0%	0%	60%	100%	0%	0%	0%
Imnaha Recovery Unit							
Hells Canyon	0%	0%	0%	0%	0%	0%	0%
SW Idaho Recovery Unit							
Boise-Mores	0%	0%	0%	0%	0%	0%	0%
Middle Fork Payette	33%	33%	33%	33%	33%	33%	33%
North and Middle Fork Boise	50%	50%	75%	100%	25%	50%	50%
North Fork Payette	17%	17%	67%	67%	0%	17%	17%
Payette	0%	0%	0%	100%	0%	0%	0%
South Fork Boise River	0%	0%	0%	14%	0%	0%	14%
South Fork Payette	50%	50%	50%	100%	0%	50%	50%
Weiser River	0%	0%	0%	100%	0%	0%	0%
Entire Recovery Unit	17%	17%	31%	62%	7%	17%	21%
Salmon River Recovery Unit							
Little Salmon River	33%	67%	33%	33%	0%	67%	33%
Lower Middle Fork Salmon	93%	96%	96%	93%	89%	93%	96%
Lower Salmon	38%	63%	38%	38%	0%	38%	38%
Middle Salmon-Chamberlain	56%	56%	49%	61%	49%	59%	61%
South Fork Salmon	31%	63%	64%	36%	23%	44%	66%
Upper Middle Fork Salmon	38%	75%	75%	75%	25%	75%	63%
Upper Salmon	13%	81%	87%	13%	10%	55%	74%
Entire Recovery Unit	68%	70%	68%	48%	35%	58%	68%
All Recovery Units	**39%**	**63%**	**62%**	**50%**	**30%**	**51%**	**60%**

Effects from past management activities in other subbasins (Weiser, Middle Fork Payette, North Fork Payette, Payette, and South Fork Boise) in the Southwest Idaho recovery unit may persist in the short term because WARS recommends active restoration, but MPCs prescribe either passive restoration, conservation, or a moderate restoration priority. It is assumed that where MPCs have a low to moderate aquatic restoration emphasis, aquatic restoration would not be as aggressively pursued. This could place already depressed bull trout populations in a number of subbasins at greater risk from increased sediment, fragmented habitat, and unstable channels. The ACS designations in these subbasins, however, would emphasize aquatic restoration, allowing projects to better compete with other resources priorities. Where there is overlap with ACS priority subwatersheds, habitat conditions should either be maintained or slowly trend toward recovery.

In the Imnaha-Snake and Hell Canyon Recovery Units, most alternatives do not provide the appropriate restoration and conservation MPCs to high priority subwatersheds identified by the WARS. As described previously, it is assumed that aquatic restoration would not be as great an emphasis in these subwatersheds. This could place already depressed and fragmented bull trout populations in these two recovery units at greater risk from continued sediment, fragmented habitat, and unstable channels. Several populations in the Hells Canyon Recovery Unit (Brownlee Reservoir) also occur as isolated local populations, making them more susceptible to management activities and degraded baselines. Several ACS priority subwatersheds in these recovery units have been designated. This designation will make restoration activities a higher priority and establishes restoration objectives in these areas. Habitat conditions should either be maintained or slowly trend toward recovery. These conditions may or may not be enough to reverse the trend of depressed populations or minimize all effects.

Issue 4, Indicator 5: Effects From Motorized Trail Use - Trails currently open to motorized use would be prohibited within proposed wildernesses under Alternatives 4 and 6. Under Alternative 4, in the Salmon River Recovery Unit, the South Fork Salmon, Little Salmon, Lower Salmon, and Upper Salmon would see the most closures. Under Alternative 6, the South Fork Salmon and Upper Salmon would see the most closures. Under Alternative 4, in the Southwest Idaho Recovery Unit, the South Fork Boise, South Fork Payette, and Middle Fork Payette subbasins would see the most closures. Under Alternative 6, the South Fork and North Fork Payette subbasins would see the most closures. Only a few motorized trails would remain open in the Middle Fork and South Fork Payette subbasins. Most of these trails are outside of RCAs, so only localized effects to bull trout and their habitat would be anticipated. Motorized trails outside of recommended wilderness areas are more extensive in the South Fork Boise subbasin.

The Imnaha Recovery Unit would see minimal closures under Alternative 4 and no closures under Alternative 6. Finally, the Hells Canyon Recovery Unit would see the most closures under Alternative 4 and no closures under Alternative 6.

Trail closures could result in more concentrated use on remaining motorized trails. Subbasins with more motorized trails in RCA potentially could also see more impacts to bull trout and their habitat. Management direction for the action and no action alternatives would help to minimize most of these potential impacts. However, impacts to riparian vegetation and stream banks from authorized and unauthorized ATV use may still occur from increased trail use.

All motorized trails would remain open under remaining alternatives. Effects to aquatic species and SWRA resources would be similar under Alternatives 1-3, 5, and 7. Trail use would not be concentrated, but localized impacts to riparian vegetation and stream channels near crossings would be anticipated.

Cumulative Effects on Bull Trout

Non-Federal actions are likely to continue affecting listed species. The greatest potential for cumulative effects from non-federal activities would occur in the Imnaha-Snake River and Southwest Idaho recovery units. In these recovery units, non-federal lands comprise 40 percent or more of the acres in the action area. Subbasins with the highest potential for non-federal cumulative effects include the Payette, North Fork Payette, Weiser, and Brownlee Reservoir. As described in the effects common to all subbasins and in the subbasin analyses, degradation and loss of bull trout habitat from non-federal actions would continue. Degraded baseline conditions, and threats from brook trout hybridization and competition also would continue to stress bull trout populations in most subbasins. These effects, again, would be most severe on non-federal lands.

Effects to bull trout from non-federal lands would be lower overall in the Salmon River because non-federal lands comprise only 10 percent of the recovery unit. However, cumulative effects from non-federal lands would be high in individual subbasins such as the Lemhi, Little Salmon and Lower Salmon.

The level of risk associated with cumulative effects was evaluated for each subbasin by recovery unit within the Ecogroup. Alternatives 3, 5, and 7 would have a slightly higher risk of cumulative effects based on greater management and less aquatic restoration, than the other alternatives in the Southwest Idaho Recovery Unit (Table SW-73). In particular, the North Fork and Middle Fork Payette, Payette, and South Fork Payette subbasins could see more cumulative effects under these alternatives. In the Salmon River Recovery Unit, Alternatives 1B and 5 has a slightly higher cumulative effects risk. Specifically the Lower Salmon and Little Salmon could see higher risks due to grazing with less restrictive management direction, combined with degraded baselines.

Table SW-73. Relative Risks* from Cumulative Effects within Subbasins in Bull Trout Recovery Units, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon Recovery Unit							
Brownlee Reservoir	10	10	8	7	10	10	10
Imnaha Recovery Unit							
Hells Canyon	10	10	8	8	8	8	8
SW Idaho Recovery Unit							
Boise-Mores	10	10	11	10	10	10	10
Middle Fork Payette	11	11	11	11	11	11	11
North and Middle Fork Boise	9	9	11	7	12	9	12
North Fork Payette	10	10	9	9	10	10	10
Payette	11	11	14	12	14	11	14
South Fork Boise River	10	10	13	10	13	10	13
South Fork Payette	7	7	7	6	8	7	6
Weiser River	11	11	11	8	11	11	11
Entire Recovery Unit	10	10	11	9	11	10	11
Salmon River Recovery Unit							
Little Salmon River	10	9	8	9	11	9	10
Lower Middle Fork Salmon	6	6	6	6	6	6	6
Lower Salmon	10	10	9	9	11	10	9
Middle Salmon-Chamberlain	7	7	7	7	7	7	7
South Fork Salmon	7	7	7	7	7	7	6
Upper Middle Fork Salmon	10	6	6	6	8	6	6
Upper Salmon	8	6	8	8	8	7	6
Entire Recovery Unit	8	7	7	7	8	7	7

*****Relative risk rating based upon a maximum total of 18 possible points. Refer to Methodology section to see how ratings were assigned.

In the Hells Canyon Recovery Unit, Alternatives 1B, 2, 5, 6, and 7 could see higher cumulative effects risk due to grazing with less restrictive management direction, little to no aquatic restoration, and degraded baselines. Finally in the Imnaha Recovery Unit, Alternatives 1B and 2 could see higher cumulative effects risk due to little aquatic restoration and ERT acres above the 100 percent TOC.

Viability Analysis for Bull Trout

Projected trends for bull trout over the first 15 years show that the number of stronghold subpopulations would remain unchanged. This is because it will take time for populations to respond to restoration and passive/conservation measures. The number depressed populations would change slightly (Table SW-74) for those alternatives that have active restoration MPCs within currently absent, but “linked” subwatersheds. It is assumed in these subwatersheds that fish habitat functioning at unacceptable risk is due to poor Geomorphic and/or Water Quality Integrity. Active restoration could begin to improve these limiting factors in 15 years so that fish could re-colonize from adjacent areas. Large numbers of fish would not be expected to re-colonize each subwatershed initially. Thus, these recolonized subwatersheds would at first be depressed, increasing the number of depressed subpopulations in the first 15 years. Restoration again would not improve enough of the overall subwatershed condition to trend existing depressed populations to strong ones in 15 years.

The Salmon River Recovery Unit would see the most potential for re-colonization under Alternatives 2, 3, and 7 in the Upper Salmon subbasin. The Southwest Idaho Recovery Unit would see the most re-colonization under Alternatives 4 and 7 in the Weiser and South Fork Payette subbasins. Re-colonization would not likely occur in the Hells Canyon or Imnaha Units.

Table SW-74. Number of Stronghold and Depressed Bull Trout Subwatersheds at 15 Years within Subbasins in Bull Trout Recovery Units, by Alternative

Subbasin	Current		Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D
Hells Canyon Recovery Unit																
Brownlee Reservoir	0	6	0	6	0	6	0	6	0	10	0	6	0	6	0	6
Imnaha Recovery Unit																
Hells Canyon	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	3
SW Idaho Recovery Unit																
Boise-Mores	1	3	1	3	1	3	1	3	1	4	1	3	1	3	1	3
Middle Fork Payette	0	3	0	3	0	3	0	3	0	3	0	3	0	3	0	3
North and M. Fork Boise	6	13	6	13	6	13	6	13	6	14	6	13	6	13	6	13
North Fork Payette	0	5	0	5	0	5	0	6	0	6	0	6	0	5	0	6
Payette	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
South Fork Boise River	4	21	4	21	4	21	4	21	4	24	4	21	4	21	4	22
South Fork Payette	7	16	7	16	7	17	7	17	7	16	7	16	7	16	7	17
Weiser River	0	8	0	8	0	8	0	8	0	13	0	9	0	8	0	8
Entire Recovery Unit	19	71	19	71	19	72	19	73	19	82	19	73	19	71	19	74
Salmon River Recovery Unit																
Little Salmon River	6	10	6	10	6	12	6	12	6	10	6	10	6	12	6	10
Lower M.F. Salmon	0	28	0	28	0	28	0	28	0	28	0	28	0	28	0	28

Subbasin	Current		Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D
Lower Salmon	0	11	0	11	0	11	0	12	0	11	0	11	0	11	0	11
Middle Salmon-Chamberlain	0	49	0	49	0	49	0	49	0	49	0	49	0	49	0	49
South Fork Salmon	2	66	2	66	2	66	2	66	2	66	2	66	2	66	2	66
Upper M.F. Salmon	5	12	5	12	5	12	5	12	5	12	5	12	5	12	5	12
Upper Salmon	5	39	5	39	5	42	5	44	5	39	5	39	5	41	5	42
Entire Recovery Unit	18	215	18	215	18	220	18	223	18	215	18	215	18	219	18	218
All Recovery Units	**37**	**295**	**37**	**295**	**37**	**301**	**37**	**305**	**37**	**310**	**37**	**297**	**37**	**299**	**37**	**301**

S = Stronghold Subpopulations; D = Depressed Subpopulations

Projected trends over the long term indicate a positive trend from current conditions for stronghold populations under all alternatives. These predictions are based upon populations responding favorably to active and passive restoration and conservation measures. However, these predictions do not reflect changes in migration corridor survival from downstream influences, non-native species, harvest trends, etc. It is assumed that the temporary and short-term effects from Ecogroup activities would not compromise the benefits of restoration and conservation due to new and existing management direction. For all recovery units, Alternatives 3, 2, 7, and 4 show the greatest increase in the number of stronghold populations due to having more MPCs that emphasize the appropriate restoration and conservation within high priority subwatersheds identified by the WARS (Table SW-75).

In 50 years, under Alternatives 2, 3, 4, and 7, bull trout populations are predicted to improve from 37 strong population subwatersheds up to a range of 143 (Alt. 6) to 160 (Alt. 4). Some of the largest increases would occur in the Upper Salmon, Upper and Lower Middle Forks of the Salmon River, Middle Salmon-Chamberlain and South Fork Payette subbasins under these alternatives (Table SW-75). Alternatives 1B and 3 would have slightly smaller increases from 37 up to 137 stronghold subwatersheds, and Alternatives 5 would have the smallest increase (113) in stronghold subwatersheds. The number of depressed bull trout populations may also continue to increase as more "linked" subwatersheds are re-colonized. The re-colonization of subwatersheds will be an important indicator for this MIS species.

Table SW-75. Number of Stronghold and Depressed Bull Trout Subwatersheds at 50 Years within Subbasins in Bull Trout Recovery Units, by Alternative

Subbasin	Current		Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D
Hells Canyon Recovery Unit																
Brownlee Reservoir	0	6	0	6	0	6	0	6	4	6	0	6	0	6	0	6
Imnaha Recovery Unit																
Hells Canyon	0	3	0	3	0	3	0	3	1	2	0	3	0	3	0	3
SW Idaho Recovery Unit																
Boise-Mores	1	3	1	3	1	3	2	2	5	3	1	3	1	3	1	3
Middle Fork Payette	0	3	1	2	1	2	1	2	1	2	1	2	1	2	1	2
N. and M. Fork Boise	6	13	8	11	8	11	7	12	9	11	7	12	8	11	9	10
North Fork Payette	0	5	1	4	1	4	2	4	2	4	1	5	1	4	2	4

Payette	1	2	1	2	1	2	1	2	2	1	1	2	1	2	1	2
South Fork Boise River	4	21	4	21	6	19	6	19	11	17	4	21	4	21	6	20
South Fork Payette	7	16	12	11	14	10	15	9	15	8	11	12	14	9	15	9
Weiser River	0	8	1	7	1	7	1	7	6	7	1	8	1	7	1	7
Entire Recovery Unit	19	71	29	61	33	58	35	59	51	53	27	67	31	59	36	57
Salmon River Recovery Unit																
Little Salmon River	6	10	8	8	10	8	8	10	8	8	6	10	10	8	7	9
Lower M.F. Salmon	0	28	26	2	26	2	26	2	26	2	25	3	26	2	26	2
Lower Salmon	0	11	3	8	3	8	1	11	3	8	0	11	3	8	3	8
Middle Salmon-Chamberlain	0	49	25	24	25	24	22	27	26	23	22	27	26	23	25	24
South Fork Salmon	2	66	23	45	27	41	22	46	23	45	18	50	25	43	25	43
Upper M.F. Salmon	5	12	8	9	8	9	7	10	9	8	7	10	9	8	9	8
Upper Salmon	5	39	9	35	14	33	16	33	9	35	8	36	13	33	12	33
Entire Recovery Unit	18	215	100	132	111	126	101	139	103	129	84	148	110	126	105	128
All Recovery Units	**37**	**295**	**131**	**201**	**146**	**192**	**137**	**205**	**160**	**190**	**113**	**221**	**143**	**195**	**143**	**193**

S = Stronghold Subpopulations; D = Depressed Subpopulations

Under Alternative 7, much of the predicted increases would occur in the Salmon River Recovery Unit. In the Southwest Idaho Recovery Unit bull trout would see the most potential increase in the North Fork/Middle Fork Boise and South Fork Payette subbasins, with other subbasins showing little to no change in the number of strong populations. Adjacent subbasins to the North Fork/Middle Fork Boise and South Fork Payette subbasins would likely see limited straying and recolonization of bull trout. This is because bull trout would have to migrate through high water temperatures and degraded habitat conditions. But the most serious impediment would be from the Lucky Peak, Arrowrock, and Deadwood dams. These dams would continue to keep populations isolated reducing genetic diversity. There would be no change in bull trout status in the Imnaha-Snake or Hells Canyon recovery units under Alternative 7.

The predicted increase in strongholds is a result of the greater restoration emphasis, adjustments to grazing and vegetation management, and protection provided by management direction for all action alternatives. As more subwatersheds support strong subpopulations, population risks should decrease. In particular, restoration should improve density-dependent (e.g., sex ratios, etc.) and genetic diversity factors. Restoration and conservation should also increase the availability of high quality habitats, thereby decreasing the chances that a large random disturbance event, such as wildfire, would reduce the effectiveness of available habitat. Many of the remaining strongholds for bull trout are clustered in only a few subwatersheds in one subbasin and are at high risk from disturbances. Stronger populations should result in more dispersed and resilient metapopulations across each subbasin. Bull trout populations in larger, less isolated, and less disturbed habitats may be more likely to persist, and these habitats may prove critical in terms of providing long-term refugia and re-colonization potential (Rieman and McIntyre 1995). The change in spatial pattern and population size over time will be an important way to determine the success of restoration efforts and minimization of project effects for this MIS species.

Based upon the predicted viability outcomes, all alternatives appear to improve the chances of recovery over time, by decreasing depressed and increasing stronghold populations. For any given year, subpopulations may respond positively or negatively to environmental factors; however, the metapopulations are expected to persist and their constituent subpopulations expand in distribution through the restoration of habitat and connectivity. While no alternative by itself would ensure recovery or de-listing due to the multitude of cumulative influences involved, those alternatives that have the potential for a faster rate of aquatic restoration would more quickly reduce effects on spawning and rearing habitat. Aquatic restoration, coupled with other management changes, could make great strides in increasing the overall viability of subpopulations in the Ecogroup area. However, for the predicted increases to be realized, restoration must be funded and implemented with the appropriate prioritization, and improvement to the downstream survival must also occur. Rehabilitation of depressed populations cannot be accomplished via habitat improvements alone, but would require improvements in migration corridor survival (Marmorek et al. 1998) and efforts to address causes of mortality in other life stages (Quigley and Arbelbide 1997).

Effects on Native Westslope Cutthroat Trout, A Region 4 Sensitive Species – Issue 4

Direct and Indirect Effects on Native Westslope Cutthroat Trout

Issue 4, Indicator 1: Effects From Vegetation Treatments, Roads, and Fire Use

Suited Timberland Acres – Based on suited timberland acres assigned by MPCs, Alternatives 5 and 1B have the greatest potential (926,154 and 496,164 acres) for impacts from commercial timber harvest and associated road activities. This is followed by Alternatives 2, 3, and 7 which have a moderate potential and Alternatives 4 and 6 a low potential for timber harvest and associated road activities (Table SW-76). Alternatives that have more acres available for commercial harvest and associated road activities have a higher potential for temporary and short-term impacts to previously identified matrix pathways (water quality, habitat condition, etc.) and to westslope cutthroat. In particular, the South Fork Salmon and Upper Salmon subbasins could see a greater risk of impacts under Alternatives 1B and 5 than other alternatives that propose far less suited timberland acres. Alternative 7 would have far less suited timberland acres than Alternative 1B, No Action, with the greatest differences occurring in the Lower Salmon, Middle Salmon-Chamberlain, Upper Salmon, South Fork Salmon, and Lower and Upper Middle Forks of the Salmon River subbasins.

Table SW-76. Acres of Suited Timber Base within Subbasins that Support Native Westslope Cutthroat Trout, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Little Salmon River	55,551	45,737	39,749	0	106,844	34799	49,374
Lower Middle Fork Salmon	733	0	0	0	12,359	0	0
Lower Salmon	14,321	4,040	15,650	0	65,907	3705	7,965
Middle Salmon-Chamberlain	42,602	46,708	69,053	0	89,132	10284	18,885
South Fork Salmon	225,154	10,939	10,415	0	393,402	2655	20,836
Upper Middle Fork Salmon	44,360	0	0	0	79,965	0	0
Upper Salmon	113,446	1,021	1,018	0	178,545	0	1,018
All Subbasins	496,164	108,445	135,885	0	926,154	51,443	98,078

Westslope cutthroat occur in the Hells Canyon subbasin, but are not present within tributary streams on lands managed by the Payette National Forest. Therefore, effects from timber harvest and other resource activities will not be assessed for this subbasin.

ERT Acres Compared to Subbasin TOCs - Most alternatives have ERT acres between 24 to 91 percent of the TOC for each subbasin in the first 20 years (Table SW-77). Shaded boxes in the table indicate alternatives and subbasins where the TOC could be exceeded based on MPC modeling assumptions. Actual treatment acres would depend on site-specific proposals, analysis, consultation, and mitigation, which would no doubt modify the numbers presented below.

Table SW-77. Percent of ERT Acres Relative to the Threshold of Concern (100) within Subbasins that Support Westslope Cutthroat Trout, by Alternative, After 20 and 50 Years

Subbasins	Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.
Little Salmon River	58	45	43	30	32	20	29	18	51	38	42	26	44	33
Lower M. F. Salmon	40	39	36	27	28	16	31	15	48	36	32	21	51	39
Lower Salmon	77	52	62	42	34	30	51	31	64	52	91	52	52	41
Middle Salmon-Chamberlain	61	45	33	29	24	18	32	23	57	44	82	46	46	36
South Fork Salmon	72	56	66	43	44	33	35	25	63	50	52	33	78	53
Upper M. F. Salmon	112	90	61	46	55	37	50	31	61	51	61	38	90	66
Upper Salmon	42	26	120	70	85	50	69	52	42	36	62	38	125	75

Only the Upper Middle Fork Salmon and Upper Salmon River subbasins have ERT acres above 100 percent in select alternatives. Many of the higher TOCs are due to potential management activities to reduce wildfire risks and move vegetation toward desired conditions using fire reintroduction and mechanical thinning. Because the modeled ERT value exceeds the threshold of concern, the potential effects to westslope cutthroat and its habitat could be high in the short term in Upper Middle Fork Salmon in Alternative 1B and Upper Salmon in Alternatives 2 and 7. Remaining effects (see Effects Common to All Alternatives, General Effects) to water quality, watershed condition, and flow/hydrology could occur depending on the intensity of activities proposed in each alternative. Most of these affected pathways are also currently “functioning at risk”, for the Upper Middle Fork Salmon and Upper Salmon subbasins. This suggests some subwatersheds may be more sensitive to proposed management actions.

Issue 4, Indicator 2: Effects From Livestock Grazing

Suitable Rangeland Acres – Suitable rangeland acres are slightly less under Alternatives 2, 3, 5 and 6 in the Westslope cutthroat trout subbasins than the current forest plans, represented by Alternative 1B (Table SW-78). Alternatives 4 and 7 are the same as 1B, or 4 percent suitable rangeland acres. Suitable rangeland acres are less than 10 percent in the majority of subbasins. Only the Little and Lower Salmon subbasins consistently have a higher potential for grazing impacts due to a higher amount of suitable acres (19 percent).

Table SW-78. Percent of Suitable Rangeland within Subbasins that Support Native Westslope Cutthroat Trout, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Little Salmon River	19%	19%	19%	19%	19%	19%	19%
Lower Middle Fork Salmon	0%	0%	0%	0%	0%	0%	0%
Lower Salmon	19%	19%	19%	19%	19%	19%	19%
Middle Salmon-Chamberlain	1%	1%	1%	1%	1%	1%	1%
South Fork Salmon	2%	2%	2%	2%	2%	2%	2%
Upper Middle Fork Salmon	1%	5%	5%	1%	5%	5%	1%
Upper Salmon	8%	8%	8%	8%	8%	8%	8%
All Subbasins	**4%**	**5%**	**5%**	**4%**	**5%**	**5%**	**4%**

Less Restrictive vs. More Restrictive Grazing Management - MPC emphasis and management direction also needs to be considered in addition to suited rangeland acres. Those alternatives and subbasins with a higher amount of suited rangeland acres and MPCs with less restrictive grazing direction have a greater potential for temporary and short-term effects to matrix pathways. In the Lower Salmon subbasin, Alternatives 1B, 2, 5, and 6 could allow more potential grazing impacts because they have less restrictive grazing strategies than Alternatives 3, 4, and 7 (Table SW-79). In the Little Salmon subbasin, Alternatives 1B, 2, 5, 6, and 7 could have more impacts due to a higher percentage of less restrictive grazing strategies than Alternatives 3 and 4.

Most matrix pathways in the Little Salmon subbasin are currently "functioning at risk" (refer to Environmental Baseline in Current Conditions). This suggests that this subbasin may be more sensitive to grazing activities and effects. Alternatives that would have the most restrictive grazing strategies in this subbasin are, in descending order: 4, 3, 7, 5, 2, 6, and 1B.

Overall, grazing management strategies would change significantly from the current forest plans in Alternatives 2, 3, 4, and 7, from 15 percent to 53 percent or more with more restrictive grazing strategies (Table SW-4). The Lower Salmon, South Fork Salmon, Middle Salmon-Chamberlain, Upper Middle Fork Salmon, and Upper Salmon subbasins would see the greatest change in MPC grazing strategies from the current forest plans, represented by Alternative 1B. The change in management strategies would help reduce effects and achieve TEPC fish and SWRA resource objectives. In the Hells Canyon, Lower Middle Fork Salmon, and Middle Salmon-Chamberlain subbasins, the potential effects from grazing to westslope cutthroat trout and their habitat would be low due to the low suitable rangeland acres.

Table SW-79. Percent of Less and More Restrictive Grazing Strategies within Subbasins that Support Native Westslope Cutthroat Trout, by Alternative

Subbasins	Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	L	M	L	M	L	M	L	M	L	M	L	M	L	M
Little Salmon River	97	3	88	12	49	51	18	82	84	16	89	11	58	42
Lower M. F. Salmon	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lower Salmon	97	3	74	26	17	83	0	100	97	3	94	6	11	89
Middle Salmon-Chamberlain	100	0	100	0	93	7	0	100	100	0	100	0	2	98
South Fork Salmon	79	21	40	60	1	99	0	100	85	15	62	38	8	92
Upper M. F. Salmon	88	12	18	82	0	100	0	100	100	0	53	47	0	100
Upper Salmon	78	22	10	90	1	99	16	84	100	0	42	58	1	99
All Subbasins	**85**	**15**	**47**	**53**	**17**	**83**	**12**	**88**	**93**	**7**	**66**	**34**	**23**	**77**

L = Less restrictive grazing strategies; M = More restrictive grazing strategies

Issue 4, Indicator 3: Effects From Wildfire Vs. Treatments to Reduce Wildfire Hazard
Effects of Wildfire vs. Managing Wildfire Hazard in Subwatersheds with Depressed Populations **–** The Hells Canyon, Lower Salmon, Upper Salmon, and Upper Middle Fork Salmon subbasins do not have any subwatersheds at high risk from uncharacteristic wildfire. The remaining four subbasins do have high-risk subwatersheds, and 35 of those subwatersheds have depressed westslope cutthroat trout populations (Table SW-80).

Table SW-80. Percent of Depressed Westslope Cutthroat Subwatersheds Where Risks From Uncharacteristic Wildfires Could be Reduced within Subbasins that Support Native Westslope Cutthroat Trout, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Little Salmon River	33%	67%	100%	0%	100%	67%	0%
Lower Middle Fork Salmon	0%	0%	0%	0%	0%	0%	0%
Middle Salmon-Chamberlain	33%	33%	33%	0%	33%	67%	67%
South Fork Salmon	50%	32%	36%	4%	71%	7%	43%
All Subbasins	**46%**	**34%**	**40%**	**3%**	**69%**	**17%**	**40%**

Each alternative assigns MPCs that aggressively treat vegetation to reduce fuel loading. Alternatives 1B and 5 are the most aggressive, potentially treating more than 46 percent of all subwatersheds where depressed westslope cutthroat populations occur within the Ecogroup. In the Little Salmon River subbasin, under Alternative 5, all subwatersheds with depressed populations could see treatment. Alternatives 2, 3, and 7 potentially could treat 34 to 40 percent of the subwatersheds with depressed westslope cutthroat populations, with 100 percent potentially being treated in the Little Salmon River Subbasin under Alternative 3. Alternatives 4 and 6 would treat the least amount (5 to 13 percent) of subwatersheds with depressed westslope cutthroat populations.

Table SW-81. Percent of Depressed Westslope Cutthroat Subwatersheds Where Risks From Uncharacteristic Wildfires Would Remain High within Subbasins that Support Native Westslope Cutthroat Trout, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Little Salmon River	67%	33%	0%	100%	0%	33%	100%
Lower Middle Fork Salmon	100%	100%	100%	100%	100%	100%	100%
Middle Salmon-Chamberlain	33%	67%	67%	100%	67%	33%	33%
South Fork Salmon	50%	78%	64%	96%	29%	93%	57%
All Subbasins	**54%**	**66%**	**60%**	**97%**	**31%**	**83%**	**60%**

Risks from uncharacteristic wildfires to depressed westslope cutthroat populations would remain high for whose alternatives that treat the least amount of acres and have fewer management tools available to reduce wildfires. If wildfires occurred in high risk from uncharacteristic wildfire subwatersheds, it is believed that some depressed populations could decline further depending on the severity of each fire. Risk from uncharacteristic wildfires would be remain high across 83 to 97 percent of the depressed westslope cutthroat populations within the Ecogroup under Alternatives 4 and 6 due to the lack of potential treatments. Alternatives 1B, 2, 3, and 7 could treat from 54 to 66 percent of the subwatersheds with depressed populations having a high risk from uncharacteristic wildfires, and Alternative 5 could treat 31 percent having a high risk from uncharacteristic wildfires.

Effects of Wildfire vs. Managing Wildfire Hazard in Subwatersheds with Strong Populations **-** There are currently no stronghold subwatersheds with westslope cutthroat populations that are at high risk from uncharacteristic wildfires within the Ecogroup, so there would be no potential effects to this indicator under any alternative.

Issue 4, **Indicator 4: High Priority Subwatersheds Receiving Appropriate Restoration and Conservation Emphasis** - All ACS priority subwatersheds identified by WARS would have a high emphasis for aquatic restoration in all the action alternatives. Alternative 1B (as amended by Infish, Pacfish, and the BOs) did not identify priority areas for restoration and would not receive this added emphasis. Alternatives 2, 3, 7, and 6 have MPCs that emphasize the most appropriate restoration and conservation in 71, 70, 68, and 59 percent, respectively, of the high priority subwatersheds identified by the WARS (Table SW-82). Under these alternatives, the Upper Salmon, South Fork Salmon, Lower Middle Fork Salmon and Upper Middle Fork Salmon have the potential to see a faster rate of aquatic restoration given their MPCs and number of ACS priority subwatersheds. This restoration emphasis, coupled with more restrictive management direction, should make great strides in reducing existing impacts and improving watershed/habitat conditions. Effects from roads, degraded riparian, poor habitat access, and unstable stream channels should decrease as restoration is implemented.

Table SW-82. Percent of High Priority Subwatersheds Receiving Appropriate Restoration or Conservation Emphasis within that Support Native Westslope Cutthroat Trout, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Little Salmon River	42%	75%	67%	50%	17%	67%	42%
Lower Middle Fork Salmon	93%	96%	96%	93%	89%	93%	96%
Lower Salmon	38%	63%	38%	38%	0%	38%	38%
Middle Salmon-Chamberlain	56%	56%	49%	61%	49%	59%	61%
South Fork Salmon	30%	64%	66%	34%	25%	43%	67%
Upper Middle Fork Salmon	18%	82%	82%	82%	18%	82%	73%
Upper Salmon	18%	78%	85%	18%	15%	58%	73%
All Subbasins	**43%**	**71%**	**70%**	**48%**	**34%**	**59%**	**68%**

Not all subbasins under these alternatives, however, have MPCs with the same restoration emphasis as the WARS. In the Lower Salmon and Little Salmon subbasins, less than half of the high priority subwatersheds have the restoration and conservation prescriptions recommended by WARS under Alternative 7. While, for the Lower Salmon subbasin, less than half of the high priority subwatersheds have the restoration and conservation prescriptions recommended by WARS under Alternative 3. Many of these areas, however, fall within ACS priority subwatersheds. It is anticipated that the ACS designation would place a greater emphasis on aquatic restoration so that current conditions would be either maintained or slowly trend toward recovery. Yet, some areas that do not fall within ACS priority subwatersheds may continue to see localized effects to water quality, channel condition, watershed condition, and flow/ hydrology pathways where problem sites are not addressed in the short term.

Alternatives 1B, 4, and 5 have MPCs that emphasize the appropriate restoration and conservation in little more than a third of the high priority subwatersheds identified by WARS in the Ecogroup in the ESU. Under these alternatives, the Lower Middle Fork Salmon and Middle Salmon-Chamberlain subbasins have the most potential for the timely aquatic restoration, based on MPCs alone. Although more restrictive management direction would help reduce effects, aquatic restoration in many subbasins would not be as aggressively pursued under these alternatives. Delays in restoration may also delay habitat improvements in the short term. These delays could place already depressed westslope cutthroat populations at greater risk in portions of each subbasin.

<u>Effects of Aquatic Restoration in Subwatersheds with Strong and Depressed Populations</u> - Stronghold westslope cutthroat populations only occur in three subwatersheds; Boundary Dagger in the Upper Middle Fork Salmon subbasin, and Yellow Belly Lake Creek and Champion Creek in the Upper Salmon subbasin. These populations have the potential to receive the same aquatic restoration emphasis under all alternatives (Table SW-83).

Alternatives 2, 3, 7, and 6 have MPCs that emphasize appropriate and timely restoration and conservation recommended by the WARS in more subwatersheds containing depressed westslope cutthroat populations than other alternatives (Table SW-84). These alternatives have the potential to initiate restoration of habitat and watershed conditions in 57 percent or more of the subwatersheds with depressed westslope cutthroat populations. Most subbasins in the Ecogroup area with westslope cutthroat populations would see improved habitat and watershed conditions as restoration is implemented. In contrast, Alternatives 1B, 4, and 5 have the potential to initiate habitat and watershed improvements in only 45 percent or less of the subbasins with depressed westslope cutthroat populations.

Table SW-83. Percent of Westslope Cutthroat Strongholds Receiving Appropriate Restoration or Conservation Emphasis within Subbasins that Support Native Westslope Cutthroat Trout, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Upper Middle Fork Salmon	100%	100%	100%	100%	100%	100%	100%
Upper Salmon	50%	50%	50%	50%	50%	50%	50%
All Subbasins	**66%**	**66%**	**66%**	**66%**	**66%**	**66%**	**66%**

*The other subbasins do not have any westslope cutthroat trout strongholds.

Table SW-84. Percent of Depressed Westslope Cutthroat Subwatersheds Receiving Appropriate Restoration or Conservation Emphasis within Subbasins that Support Native Westslope Cutthroat Trout, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Little Salmon River	0%	60%	60%	0%	0%	60%	0%
Lower Middle Fork Salmon	92%	96%	96%	92%	88%	92%	96%
Lower Salmon	100%	100%	0%	100%	0%	100%	100%
Middle Salmon-Chamberlain	37%	37%	37%	37%	37%	37%	37%
South Fork Salmon	29%	65%	65%	34%	25%	43%	68%
Upper Middle Fork Salmon	42%	75%	75%	75%	17%	75%	67%
Upper Salmon	20%	80%	84%	20%	16%	60%	72%
All Subbasins	**40%**	**70%**	**69%**	**45%**	**34%**	**57%**	**68%**

Issue 4, Indicator 5: Effects From Motorized Trail Use – Trails currently open to motorized use would have that use prohibited within recommended wildernesses under Alternatives 4 and 6. Under Alternative 4, the South Fork Salmon, Little Salmon, Lower Salmon, and Upper Salmon would see the most restrictions. Under Alternative 6, the South Fork Salmon and Upper Salmon would see the most restrictions. All motorized trails would remain open under the remaining alternatives. Trail restrictions in these subbasins could result in more concentrated use on remaining motorized trails. Subbasins with more motorized trails in RCA potentially could also see more impacts to westslope cutthroat and their habitat. Management direction for the action and no action alternatives would help to minimize most of these potential impacts. However, impacts to riparian vegetation and stream banks from authorized and unauthorized ATV use may still occur from increased trail use. Effects to aquatic species and SWRA resources would be similar under Alternatives 1-3, 5, and 7. Trail use would not be concentrated, but localized impacts to riparian vegetation and stream channels near crossings would be anticipated.

Cumulative Effects on Native Westslope Cutthroat Trout

Non-federal actions are likely to continue affecting listed species. Effects to westslope cutthroat from non-federal lands would be low overall in the Salmon River Basin when compared to other areas in the Ecogroup. Non-federal lands comprise only 10 percent of the Salmon River Basin. However, cumulative effects from non-federal lands would be high in individual subbasins such as the Lemhi, Little Salmon and Lower Salmon. As described in the Cumulative Effects Common to all Alternatives, degradation and loss of habitat from non-federal actions would continue. Degraded baseline conditions, and threats from hatchery fish also would continue to stress populations in most subbasins.

The level of risk associated with cumulative effects was evaluated for each subbasin where westslope cutthroat occur within the Ecogroup. Alternatives 1B, 2, and 5 would have a slightly higher risk of cumulative effects based on greater timber, grazing, etc. management and less aquatic restoration, than the other alternatives (Table SW-85). In particular, the Little Salmon and Lower Salmon could see more cumulative effects under these alternatives. Remaining alternatives have slightly lower risk of cumulative effects than Alternatives 1B, 2, and 5. However, several subbasins still have a high risk of cumulative effects, - Specifically due to more grazing with less restrictive management direction in Lower Salmon, combined with degraded baselines. Under the Alternative 7, only the Little Salmon subbasin faces greater risk from cumulative effects due to more grazing with less restrictive management direction.

Table SW-85. Relative Risks* from Cumulative Effects within Subbasins that Support Native Westslope Cutthroat Trout in the Ecogroup, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Hells Canyon	NA	NA	NA	NA	NA	NA	NA
Little Salmon River	10	9	8	9	11	9	10
Lower Middle Fork Salmon	6	6	6	6	6	6	6
Lower Salmon	10	10	9	9	11	10	9
Middle Salmon-Chamberlain	7	7	7	7	7	7	7
South Fork Salmon	7	7	7	7	7	7	6
Upper Middle Fork Salmon	10	6	6	6	8	6	6
Upper Salmon	8	8	6	8	8	7	8
All Subbasins	**8**	**8**	**7**	**7**	**8**	**7**	**7**

***Relative risk rating based upon a maximum total of 15 possible points. Refer to Methodology section to see how ratings were assigned.

Viability Analysis for Native Westslope Cutthroat Trout

A viability analysis was not run for westslope cutthroat because the analysis for spring/summer chinook salmon, steelhead and bull trout was thought to adequately represent potential watershed condition changes for this species. Chinook, steelhead, and bull trout populations are all predicted to improve in 50 years under all alternatives because of the greater restoration emphasis and continued adjustments to grazing and recreation activities. Westslope cutthroat habitat would also be expected to improve. How much westslope cutthroat populations respond to this habitat improvement, however, is dependent upon downstream influences in each subbasin.

Effects on Native Wood River Sculpin, A Region 4 Sensitive Species – Issue 4

Direct and Indirect Effects on Wood River Sculpin

Issue 4, Indicator 1: Effects From Vegetation Treatments, Roads, and Fire Use

Suited Timberland Acres – Based on suited timberland acres assigned by MPCs, Alternatives 1B and 5 have the greatest potential (126,998 and 193,946 acres) for impacts from commercial timber harvest and associated road activities. This is followed by Alternatives 2, 3, and 7 which have a moderate potential and Alternatives 4 and 6 a low potential for timber harvest and associated road activities (Table SW-86). Alternatives that have more acres available for commercial harvest and associated road activities have a higher potential for temporary and short-term impacts to previously identified matrix pathways (water quality, habitat condition, etc.) and to Wood River sculpin. In particular, Big Wood River subbasin could see a greater risk of impacts under Alternatives 1B and 5 than other alternatives that propose far less suited timberland acres. Alternative 7 would have far less suited timber base than Alternative 1B, with the greatest differences occurring in the Big Wood River subbasin.

Table SW-86. Acres of Suited Timber Base within Subbasins that Support Wood River Sculpin, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Big Wood River	104,505	29,492	57,942	0	155,744	2,360	31,779
Camas Creek	15,086	16,607	18,203	451	24,035	3,144	4,175
Little Wood River	7,407	6,935	6,735	0	14,167	1,394	6,735
All Subbasins	**126,998**	**53,034**	**82,880**	**451**	**193,946**	**6,898**	**42,689**

ERT Acres Compared to Subbasin TOCs **-** Most alternatives have ERT acres between 6 to 66 percent of the TOC for each subbasin in the first 20 years (Table SW-87). No subbasins have ERT acres above 100 percent for any alternative.

Table SW-87. Percent of ERT Acres Relative to the Threshold of Concern (100) within Subbasins that Support Wood River Sculpin, by Alternative, After 20 and 50 Years

Subbasins	Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.
Big Wood River	9	7	55	35	38	31	16	27	20	19	24	18	66	45
Camas Creek	9	13	11	14	8	7	9	26	15	16	19	18	30	28
Little Wood River	6	7	34	32	30	30	13	27	20	21	25	21	53	44

Issue 4, **Indicator 2: Effects From Livestock Grazing**
Suitable Rangeland Acres – Suitable rangeland acres are the same for all alternatives (23 percent of all subbasins), with the exception of Alternative 6, which is only 11 percent (Table SW-88). Suitable rangeland acres consistently range from 20 to 37 percent in the majority of subbasins and thus have a higher potential for grazing impacts than the acres for the listed species analyzed above.

Table SW-88. Percent of Suitable Rangeland within Subbasins that Support Wood River Sculpin, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Big Wood River	20%	20%	20%	19%	20%	4%	20%
Camas Creek	24%	24%	24%	24%	24%	24%	24%
Little Wood River	37%	37%	37%	37%	37%	37%	37%
All Subbasins	**23%**	**23%**	**23%**	**23%**	**23%**	**11%**	**23%**

Less Restrictive vs. More Restrictive Grazing Management - Overall, the percentage of more restrictive grazing management strategies for most action alternatives would change only slightly from the current forest plans (Alt. 1B), with the exception of Alternative 4 where more restrictive strategies increase by 53 percent, and Alternative 5 where more restrictive strategies decrease by 20 percent (Table SW-89). Only Alternative 4 would have a predominance of more restrictive grazing strategies, and this would only occur in the Big Wood and Little Wood subbasins.

Most matrix pathways in the Little Wood subbasin are currently "functioning at risk" (refer to Environmental Baseline in Current Conditions). This suggests that this subbasin may be more sensitive to grazing activities and effects. Alternatives that would have the most restrictive grazing strategies in this subbasin are, in descending order: 4, 3 and 7, 2, 1B, 6, and then 5.

Table SW-89. Percent of Less and More Restrictive Grazing Strategies within Subbasins that Support Wood River Sculpin, by Alternative

Subbasins	Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	L	M	L	M	L	M	L	M	L	M	L	M	L	M
Big Wood River	90	10	76	24	76	24	34	76	100	0	35	65	80	20
Camas Creek	100	0	100	0	100	0	61	39	100	0	100	0	100	0
Little Wood River	45	55	43	57	43	57	8	92	100	0	46	54	43	57
All Subbasins	**80**	**20**	**71**	**29**	**71**	**29**	**27**	**73**	**100**	**0**	**79**	**21**	**74**	**26**

L = Less restrictive grazing strategies; M = More restrictive grazing strategies

Issue 4, **Indicator 3: Effects From Wildfire Vs. Treatments to Reduce Wildfire Hazard**
Effects of Wildfire vs. Managing Wildfire Hazard in Subwatersheds with Depressed Populations – Two of the three subbasins where Wood River sculpin occur have subwatersheds at high risk from uncharacteristic wildfires, Big Wood and Little Wood River. These subbasins have 14 subwatersheds with depressed populations at high risk (Table SW-90). Each alternative assigns

MPCs that would allow aggressive treatment to reduce fuel loading. Alternative 5 would be the most aggressive, potentially treating more than 100 percent of the subwatersheds where depressed sculpin populations occur within the Ecogroup. Alternatives 2, 3, and 7 potentially could treat 50 to 57 percent of the depressed sculpin populations within the Ecogroup. Alternatives 4 and 6 would treat the least amount (7 to 14 percent) of subwatersheds with depressed sculpin populations.

Table SW-90. Percent of Depressed Wood River Sculpin Subwatersheds Where Risks From Uncharacteristic Wildfires Could Be Reduced within Subbasins that Support Wood River Sculpin, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Big Wood River	45%	64%	73%	9%	100%	18%	73%
Little Wood River	0%	0%	0%	0%	0%	0%	0%
All Subbasins	**36%**	**50%**	**57%**	**7%**	**100%**	**14%**	**57%**

Table SW-91. Percent of Depressed Wood River Sculpin Subwatersheds Where Risks From Uncharacteristic Wildfires Would Remain High within Subbasins that Support Wood River Sculpin, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Big Wood River	55%	36%	27%	91%	0%	82%	27%
Little Wood River	100%	100%	100%	100%	0%	100%	100%
All Subbasins	**64%**	**50%**	**43%**	**93%**	**0%**	**86%**	**43%**

Risks from uncharacteristic wildfires to depressed sculpin populations would remain high for those alternatives that treat the least amount of acres and have fewer management tools available to reduce wildfires. If wildfires occurred in high-risk subwatersheds, it is believed that some depressed populations could decline further depending on the severity of each fire. Risk from uncharacteristic wildfires would remain high across 86 to 93 percent of the depressed sculpin populations within the Ecogroup under Alternatives 4 and 6 due to the lack of potential treatments. Alternatives 1B, 2, 3, and 7 could treat from 43 to 73 percent of the high-risk subwatersheds with depressed sculpin populations, and Alternative 5 could treat up to 100 percent of the high-risk subwatersheds.

Effects of Wildfire vs. Managing Wildfire Hazard in Subwatersheds with Strong Populations - There are currently no subwatersheds with strong sculpin populations within the Ecogroup, so there would be no potential effects to this indicator under any alternative.

Issue 4, Indicator 4: High Priority Subwatersheds Receiving Appropriate Restoration and Conservation Emphasis - All ACS priority subwatersheds identified by WARS would have a high emphasis for aquatic restoration in all the action alternatives. Alternative 1B (as amended by Infish, Pacfish, and the BOs) did not identify priority areas for restoration and would not receive this added emphasis. No alternative has MPCs that emphasize the appropriate restoration or conservation strategy to high priority subwatersheds identified by the WARS in subbasins that contain Wood River sculpin (Table SW-92). This is because WARs recommends active restoration in many subwatersheds, but under the action alternatives, 4.1c MPCs emphasize passive restoration in much of Camas Creek and Big Wood River subbasins. Although the 4.1c provides a level of protection through passive and conservation practices, there would be little active restoration where depressed sculpin populations occur. Alternative 1B assigns 4.2 and 6.2 MPCs that have a moderate to low priority for active restoration.

Some subwatersheds within each subbasin fall within ACS priority subwatersheds. It is anticipated that the ACS designation would place a greater emphasis on aquatic restoration so that current conditions would be either maintained or slowly trend toward recovery. However, the majority of subbasins do not fall within ACS priority subwatersheds. Although more restrictive management direction would help reduce effects, and the 4.1c MPC limits many activities, aquatic restoration would not be as aggressively pursued where needed in non-ACS priority subwatersheds. Delays in restoration may delay habitat improvements in the short term. These delays could place some depressed sculpin populations at greater risk in portions of each subbasin.

Table SW-92. Percent of High Priority Subwatersheds Receiving Appropriate Restoration or Conservation Emphasis within Subbasins that Support Wood River Sculpin, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Big Wood River	0%	0%	0%	0%	0%	0%	0%
Camas Creek	0%	0%	0%	0%	0%	0%	0%
Little Wood River	0%	0%	0%	0%	0%	0%	0%
All Subbasins	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**

Effects of Aquatic Restoration in Subwatersheds with Strong and Depressed Populations **-** There are no stronghold sculpin populations within the Ecogroup (Table SW-93). Depressed sculpin populations, however, occupy more than 50 subwatersheds for spawning and rearing. As described above, no alternative has MPCs that emphasize the appropriate restoration or conservation to high priority subwatersheds identified by the WARS in subbasins that contain Wood River sculpin.

Table SW-93. Percent of Depressed Wood River Sculpin Subwatersheds Receiving Appropriate Restoration or Conservation Emphasis within Subbasins that Support Wood River Sculpin, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Big Wood River	0%	0%	0%	0%	0%	0%	0%
Camas Creek	0%	0%	0%	0%	0%	0%	0%
Little Wood River	0%	0%	0%	0%	0%	0%	0%
All Subbasins	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**

Issue 4, Indicator 5: Effects From Motorized Trail Use – Trails currently open to motorized use would have that use prohibited within recommended wildernesses under Alternatives 4 and 6. Under Alternative 4, the Big Wood would see the most restrictions, while under Alternative 6 the Little Wood would see the most closures. All motorized trails would remain open under remaining alternatives. Trail restrictions could result in more concentrated use on remaining motorized trails in or adjacent to these subbasins. Only a few motorized trails would remain open in the Big and Little Wood subbasins. Most of these trails are outside of RCAs, so only localized effects to sculpin and their habitat would be anticipated. Motorized trails outside of recommended wilderness areas are more extensive in the adjacent South Fork Boise and Camas Creek subbasins. Management direction for the action and no action alternatives would help to minimize most of these potential impacts. However, impacts to riparian vegetation and stream banks from authorized and unauthorized ATV use may still occur from increased trail use, especially in adjacent subbasins. Effects to aquatic species and SWRA resources would be similar under Alternatives 1-3, 5, and 7. Trail use would not be concentrated, but localized impacts to riparian vegetation and stream channels near crossings would be anticipated.

Cumulative Effects on Wood River Sculpin

Non-federal actions are likely to continue affecting listed species. Effects to sculpin from non-federal lands would be moderate in the Camas (39 percent) to high Little Wood (68 percent) subbasins. As described in the Cumulative Effects Common to all Alternatives section, degradation and loss of habitat from non-federal actions would continue. Degraded baseline conditions also would continue to stress populations in most subbasins.

The level of risk associated with cumulative effects was evaluated for each subbasin where sculpin occur within the Ecogroup. Alternatives 1B, 2, 3, 5, and 7 would have a slightly higher risk of cumulative effects based on greater timber, grazing, etc. management and less aquatic restoration, than the other alternatives (Table SW-94). In particular, the Camas Creek subbasin could see more cumulative effects due to more grazing with less restrictive management direction, less potential for aquatic restoration, high amount of non-federal ownership and degraded baselines.

Table SW-94. Relative Risks* from Cumulative Effects within Subbasins that Support Wood River Sculpin in the Ecogroup, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Big Wood River	10	10	10	9	10	8	10
Camas Creek	12	12	12	12	12	12	12
Little Wood River	10	10	10	10	11	10	10
All Subbasins	**11**	**11**	**11**	**10**	**11**	**10**	**11**

*****Relative risk rating based upon a maximum total of 18 possible points. Refer to Methodology section to see how ratings were assigned.

Viability Analysis for Wood River Sculpin

Wood River sculpin was not included in the viability analysis because it is a narrow endemic species, whose distribution is largely unknown. Furthermore, this species appears to be doing well in many of the streams where it occurs (Simpson and Wallace 1982). Wood River sculpin populations would be expected to improve as a result of more restrictive management direction and aquatic restoration.

How much sculpin populations respond to restoration, however, is largely dependent on downstream influences in each subbasin. Additional high quality habitat alone is no guarantee of increased persistence without a comprehensive approach that addresses all mortality factors acting upon the population (ICBEMP 1997a).

Effects on Native Yellowstone Cutthroat Trout, A Species of Special Concern –Issue 4

Direct and Indirect Effects on Native Yellowstone Cutthroat Trout

Issue 4, Indicator 1: Effects From Vegetation Treatments, Roads, and Fire Use

Suited Timberland Acres – Based on suited timberland acres assigned by MPCs, Alternatives 1B, 2, 3, 5 and 7 have the greatest potential (45,345 and 69,915 acres) for impacts from commercial timber harvest and associated road activities. Alternatives 4 and 6 would have a lower potential for impacts from timber harvest and associated road activities (Table SW-95). Alternatives that have more acres available for commercial harvest and associated road activities have a higher potential for temporary and short-term impacts to previously identified matrix pathways (water quality, habitat condition, etc.) and to westslope cutthroat. In particular, Raft River and Goose Creek subbasins could see a greater risk of impacts under Alternatives 1B, 2, 3, 5 and 7 than other alternatives that propose far less suited timberland acres. Alternative 7 would have a slightly lower suited timber base than Alternative 1B, with the greatest differences occurring in the Raft River subbasin.

Table SW-95. Acres of Suited Timber Base within Subbasins that Support Native Yellowstone Cutthroat Trout, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Goose Creek	18,148	15,286	15,244	4,365	20,816	1,511	14,875
Upper Snake-Rock	9,329	10,521	10,446	3,442	12,842	7,608	9,433
Raft River	27,338	26,107	26,006	7,452	36,257	2,724	21,037
All Subbasins	**54,815**	**51,914**	**51,696**	**15,259**	**69,915**	**12,226**	**45,345**

ERT Acres Compared to Subbasin TOCs **-** Most alternatives have ERT acres between 3 to 78 percent of the TOC for each subbasin in the first 20 years (Table SW-96).

Table SW-96. Percent of ERT Acres Relative to the Threshold of Concern (100) within Subbasins that Support Native Yellowstone Cutthroat Trout, by Alternative, After 20 and 50 Years

Subbasins	Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.	20 yrs.	50 yrs.
Goose Creek	59	42	20	29	10	6	25	46	78	46	59	30	107	92
Upper Snake-Rock	23	22	16	11	11	6	34	49	23	15	39	19	28	49
Raft River	21	25	8	11	3	11	18	28	44	29	31	21	27	32

Only the Goose Creek subbasin has ERT acres above 100 percent under Alternative 7 (Table SW-96). Many of the higher ERT acres are due to potential management activities to reduce wildfire risks and move vegetation toward desired conditions using fire reintroduction and mechanical thinning. Because the modeled ERT value exceeds the threshold of concern, the potential effects to Yellowstone cutthroat and its habitat could be high in the short term in Goose Creek in Alternative 7. Remaining threats (see Effects Common to All Alternatives, General Effects) to water quality, watershed condition, and flow/hydrology could occur depending on the intensity of activities proposed. Most of these affected pathways are also currently "functioning at unacceptable risk". This suggests some subwatersheds in Goose Creek may be more sensitive to proposed management actions.

Issue 4, Indicator 2: Effects From Livestock Grazing

Suitable Rangeland Acres – Suitable rangeland acres are 14-15 percent lower under Alternatives 3, 4, 6, and 7 than the current forest plan, represented by Alternative 1B (Table SW-97). Alternatives 2 and 5 are the same as 1B, or 57 percent total acres for all subbasins. Individually, Goose Creek (47 to 67 percent) and Upper Snake-Rock (38 to 76 percent) subbasins would have a moderate to high amount of suitable rangeland acres, depending on the alternative, while Raft River would have 38 percent of the subbasin in suitable acres across all alternatives, and therefore a lower amount of potential impacts from grazing activities.

Table SW-97. Percent of Suitable Rangeland within Subbasins that Support Native Yellowstone Cutthroat Trout, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Goose Creek	67%	67%	47%	47%	67%	47%	47%
Upper Snake-Rock	76%	76%	44%	44%	76%	38%	44%
Raft River	38%	38%	38%	38%	38%	38%	38%
All Subbasins	**57%**	**57%**	**43%**	**43%**	**57%**	**42%**	**43%**

Less Restrictive vs. More Restrictive Grazing Management – Overall, grazing management strategies would change only slightly from the current forest plans under most alternatives, from 100 percent to 90-97 percent less restrictive strategies (Table SW-98). Only Alternative 4 would have a slightly lower percentage (46) of more restrictive grazing strategy, and this would only occur in the Raft River and Goose Creek subbasins.

Table SW-98. Percent of Less and More Restrictive Grazing strategies within Subbasins that Support Native Yellowstone Cutthroat Trout, by Alternative

Subbasins	Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	L	M	L	M	L	M	L	M	L	M	L	M	L	M
Goose Creek	100	0	94	6	93	7	40	60	100	0	93	7	88	12
Upper Snake-Rock	100	0	100	0	100	0	92	8	100	0	100	0	100	0
Raft River	100	0	100	0	100	0	49	51	100	0	96	4	78	22
All Subbasins	**100**	**0**	**97**	**3**	**98**	**2**	**54**	**46**	**100**	**0**	**97**	**3**	**90**	**10**

L = Less restrictive grazing strategies; M = More restrictive grazing strategies

Issue 4, Indicator 3: Effects From Wildfire Vs. Treatments to Reduce Wildfire Hazard
Effects of Wildfire vs. Managing Wildfire Hazard in Subwatersheds with Depressed Populations – Only Raft River of the three subbasins where native Yellowstone cutthroat trout occur has subwatersheds at high risk from uncharacteristic wildfires. In this subbasin there are seven subwatersheds with depressed populations at high risk (Table SW-99). All alternatives, with the exception of Alternative 6, have the potential to aggressively treat all subwatersheds where depressed Yellowstone cutthroat populations occur within the Ecogroup area. Alternatives 6 potentially could treat 29 percent of the depressed Yellowstone cutthroat populations within the Ecogroup area.

Table SW-99. Percent of Depressed Yellowstone Cutthroat Subwatersheds Where Risks From Uncharacteristic Wildfires Could Be Reduced within Subbasins that Support Native Yellowstone Cutthroat Trout, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Raft River	100%	100%	100%	100%	100%	29%	100%

Table SW-100. Percent of Depressed Yellowstone Cutthroat Subwatersheds Where Risks From Uncharacteristic Wildfires Would Remain High within Subbasins that Support Native Yellowstone Cutthroat Trout, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Raft River	0%	0%	0%	0%	0%	71%	0%

Risks from uncharacteristic wildfires to depressed Yellowstone cutthroat populations would remain high for whose alternatives that treat the least amount of acres and have fewer management tools available to reduce wildfires. If wildfires occurred in high risk from uncharacteristic wildfire subwatersheds, it is believed that some depressed populations could decline further depending on the severity of each fire. Risk from uncharacteristic wildfires may remain high across 71 percent of the depressed Yellowstone cutthroat populations in the Raft River within the Ecogroup under 6 due to the lack of potential treatments. All other alternatives have the potential to reduce uncharacteristic wildfire risks in remaining subwatersheds that contain depressed Yellowstone cutthroat.

Effects of Wildfire vs. Managing Wildfire Hazard in Subwatersheds with Strong Populations - There are 11 subwatersheds considered as strongholds for native Yellowstone cutthroat in the Ecogroup, all within the Raft River subbasin. One population (West Dry-Eightmile Fisher subwatershed), which is isolated, is at high risk from uncharacteristic wildfires (Raft River subbasin) (Table SW-101). Based on MPC emphasis, most alternatives could promote some type of treatment to reduce uncharacteristic wildfire risks in this one stronghold. Only Alternative 6 would not have the potential for treatments in this stronghold. Because high emphasis treatments occur in one of the last remaining strongholds, management activities may pose a greater risk to Yellowstone cutthroat than if an uncharacteristic wildfire occurred for Alternatives 1B 2, 3, 4, 5, and 7. Yet this population is also isolated, suggesting that a severe, uncharacteristic wildfire has the potential to further impact this stronghold population. Since risks of treating or not treating this subwatershed may exists, a comprehensive assessment at the subwatershed and project scale will be needed to evaluate and mitigate these risks before any projects proceed.

Table SW-101. Percent of Stronghold Yellowstone Cutthroat Subwatersheds Where Risks From Management Treatments For Uncharacteristic Wildfires Would Be Higher within Subbasins that Support Native Yellowstone Cutthroat Trout, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Raft River	100%	100%	100%	100%	100%	0%	100%

Issue 4, **Indicator 4: High Priority Subwatersheds Receiving Appropriate Restoration and Conservation Emphasis** - All ACS priority subwatersheds identified by WARS would have a high emphasis for aquatic restoration in all the action alternatives. Alternative 1B (as amended by Infish, Pacfish, and the BOs) did not identify priority areas for restoration and would not receive this added emphasis. No alternative has MPCs that emphasize the appropriate restoration in a majority of high priority subwatersheds identified by WARS in the Goose, Raft River or Upper Snake-Rock subbasins. This is because WARs recommends active restoration in many subwatersheds, but the action alternatives assign 4.2, 5.1, and 6.2 MPCs that have a moderate to low priority for active restoration. Alternative 1B assigns 4.2 and 6.2 MPCs that also have a moderate to low priority for active restoration. While, these MPCs do not preclude active restoration, they would not be a high emphasis.

When individual subbasins are considered, only Alternatives 4 and 7 have MPCs (3.2) with a higher aquatic restoration emphasis in 40 to 50 percent of the subwatersheds in the Raft River and Goose Creek subbasins, matching the WARS restoration emphasis. This higher restoration emphasis falls primarily in stronghold subwatersheds, covering only a few depressed subwatersheds in the Raft River subbasin (Table SW-102).

Table SW-102. Percent of High Priority Subwatersheds Receiving Appropriate Restoration or Conservation Emphasis within Subbasins that Support Native Yellowstone Cutthroat Trout, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Goose Creek	0%	25%	25%	50%	0%	25%	50%
Upper Snake-Rock	0%	0%	0%	0%	0%	0%	0%
Raft River	0%	0%	0%	0%	0%	0%	40%
All Subbasins	**0%**	**4%**	**4%**	**9%**	**0%**	**4%**	**17%**

Some subwatersheds have an ACS priority designation in each subbasin. However, none of the ACS priority areas fall within subwatersheds containing depressed Yellowstone cutthroat populations. Although more restrictive management direction would help reduce effects, aquatic restoration in would not be as aggressively pursued in most subwatersheds where depressed populations occur. Delays in restoration may delay habitat improvements in the short term. These delays could place some depressed or isolated Yellowstone cutthroat populations at greater risk in portions of each subbasin.

Effects of Aquatic Restoration in Subwatersheds with Strong and Depressed Populations - Alternatives 4 and 7 have MPCs that emphasize the appropriate restoration and conservation recommended by the WARS to more subwatersheds containing strong Yellowstone cutthroat populations (Tables SW-103) than other alternatives. These alternatives have the potential to improve habitat and watershed conditions in 18 to 27 percent of the strong populations. In contrast, Alternatives 1B, 2, 3, 5, and 6 have the potential to improve habitat and watershed conditions in only 9 percent or less of the subbasins with stronghold populations.

Although many of the alternatives have MPCs that do not have the same aquatic restoration emphasis as WARS, some areas of each subbasin fall within ACS priority subwatersheds. Of the 11 stronghold subwatersheds, five of these fall within ACS priority subwatersheds. It is anticipated that this ACS designation would place a greater emphasis on aquatic restoration so that current conditions would be either maintained or trend toward recovery. However, not all strongholds fall within ACS priority subwatersheds. These subwatersheds may continue to see localized effects to water quality, channel condition, watershed condition, and flow/hydrology pathways where existing problem sites are not addressed in the short term.

Table SW-103. Percent of Yellowstone Cutthroat Strongholds Receiving Appropriate Restoration or Conservation Emphasis within Subbasins that Support Native Yellowstone Cutthroat Trout, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Goose Creek	0%	25%	25%	50%	0%	25%	50%
Upper Snake-Rock	0%	0%	0%	0%	0%	0%	0%
Raft River	0%	0%	0%	0%	0%	0%	25%
All Subbasins	**0%**	**9%**	**9%**	**18%**	**0%**	**9%**	**27%**

Table SW-104. Percent of Depressed Yellowstone Cutthroat Subwatersheds Receiving Appropriate Restoration or Conservation Emphasis within Subbasins that Support Native Yellowstone Cutthroat Trout, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Goose Creek	0%	50%	50%	0%	0%	50%	50%
Upper Snake-Rock	NA	NA	NA	NA	NA	NA	NA
Raft River	0%	0%	0%	0%	0%	0%	75%
All Subbasins	**0%**	**17%**	**17%**	**0%**	**0%**	**17%**	**67%**

Issue 4, Indicator 5: Effects From Motorized Trail Use – Trails currently open to motorized use would have that use prohibited within recommended wildernesses under Alternatives 4 and 6. Under Alternative 4, the Raft River subbasin would see the most restrictions, while no motorized trails would be closed under Alternative 6. All motorized trails would remain open under remaining alternatives. Trail restrictions could result in more concentrated use on remaining motorized trails in or adjacent to these subbasins. Management direction for the action and no action alternatives would help to minimize most of these potential impacts. However, impacts to riparian vegetation and stream banks from authorized and unauthorized ATV use may still occur from increased trail use, especially in adjacent subbasins. Effects to aquatic species and SWRA resources would be similar under Alternatives 1-3, 5, and 7. Trail use would not be concentrated, but localized impacts to riparian vegetation and stream channels near crossings would be anticipated.

Cumulative Effects on Native Yellowstone Cutthroat Trout

Non-federal actions are likely to continue affecting listed species. Effects to Yellowstone cutthroat trout from non-federal lands would be high in all subbasins. As described in the Cumulative Effects Common to all Alternatives section, degradation and loss of habitat from non-federal actions would continue. Degraded baseline conditions also would continue to stress populations in most subbasins.

The level of risk associated with cumulative effects was evaluated for each subbasin where sculpin occur within the Ecogroup. Alternatives 1B, 2, 3, 5, and 7 would have a slightly higher risk of cumulative effects based on greater timber, grazing, etc. management and less aquatic restoration, than the other alternatives (Table SW-105). In particular, the Raft River subbasin could see more cumulative effects due to more grazing with less restrictive management direction, less potential for aquatic restoration, potential mechanical and prescribed fire treatments in a stronghold subwatershed, high amount of non-federal ownership and degraded baselines.

Table SW-105. Relative Risks* from Cumulative Effects within Subbasins that Support Native Yellowstone Cutthroat Trout in the Ecogroup, by Alternative

Subbasins	Alt. 1B	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6	Alt. 7
Goose Creek	11	11	11	10	11	11	12
Upper Snake-Rock	12	12	12	12	12	12	12
Raft River	15	15	15	14	15	13	15
All Subbasins	**13**	**13**	**13**	**12**	**13**	**12**	**13**

*****Relative risk rating based upon a maximum total of 18 possible points. Refer to Methodology section to see how ratings were assigned.

Viability Analysis for Native Yellowstone Cutthroat Trout

Projected trends for native Yellowstone cutthroat trout over the first 15 years show that the number of stronghold and depressed subpopulations would remain unchanged. This is because it will take time for subpopulations to respond to restoration and passive/conservation measures (Table SW-106).

Table SW-106. Number of Stronghold and Depressed Yellowstone Cutthroat Subwatersheds at 15 Years within Subbasins that Support Native Yellowstone Cutthroat Trout, by Alternative

Subbasin	Current		Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D
Goose Creek	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3
Upper Snake-Rock	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1
Raft River	4	12	4	12	4	12	4	12	4	12	4	12	4	12	4	12
Totals	**11**	**16**	**11**	**16**	**11**	**16**	**11**	**16**	**11**	**16**	**11**	**16**	**11**	**16**	**11**	**16**

S = Stronghold Subpopulations; D = Depressed Subpopulations

Projected trends over the long-term indicate a positive trend from current conditions for stronghold populations under Alternative 4. Alternatives 6 and 7 would remain at 11 stronghold populations, while Alternatives 1B, 2, 3, and 5 would show a decrease in the number of strongholds (Table SW-106). These predictions are based upon populations responding favorably where active and passive restoration measures are emphasized and negatively where restoration may not be emphasized. These predictions do not reflect changes in non-native species, harvest trends, etc. It is assumed that the temporary and short-term effects from Ecogroup activities would not compromise the benefits of restoration and conservation where applied due to new and existing management direction.

While no alternative by itself would ensure recovery due to the multitude of cumulative influences involved, those alternatives that have the potential for a faster rate of aquatic restoration would more quickly reduce effects on spawning and rearing habitat. Aquatic restoration, coupled with other management changes, could make great strides in increasing the overall viability of populations in some areas of each subbasin. However, for the predicted increases to be realized, restoration must be funded and implemented with the appropriate prioritization, and improvement to the downstream survival must also occur.

Some subbasins show decreases in the number of strongholds and increases in the number of depressed population subwatersheds under all alternatives (Table SW-107). These projected changes are due to aquatic restoration not receiving the emphasis from assigned MPCs as recommended by WARS and subwatersheds not being assigned an ACS priority. It is believed in high-risk subwatersheds (low geomorphic and water quality integrity) with a lower aquatic restoration emphasis, that existing threats (e.g. undersized culverts, poorly constructed roads) could become worse, causing impacts downstream. If problem sites were not addressed over time, then impacts associated with these sites may become worse and could cause strong populations to decline.

Most Yellowstone cutthroat trout populations are already imperiled because they are isolated from each other due to downstream impacts, most populations are small putting them at greater risk from deterministic density effects, many populations are hybridized with rainbow trout, and habitat conditions are "not functioning appropriately or are functioning at risk" across much of the subbasin. If modeled predictions came true, the loss of any stronghold populations, have implications to the overall metapopulation in each subbasin. This is because there are so few strongholds, any loss could preclude future recovery options.

Table SW-107. Number of Stronghold and Depressed Yellowstone Cutthroat Subwatersheds at 50 Years within Subbasins that Support Native Yellowstone Cutthroat Trout, by Alternative

Subbasin	Current		Alt. 1B		Alt. 2		Alt. 3		Alt. 4		Alt. 5		Alt. 6		Alt. 7	
	S	D	S	D	S	D	S	D	S	D	S	D	S	D	S	D
Goose Creek	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3
Upper Snake-Rock	3	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Raft River	4	12	4	12	4	12	4	12	6	10	4	12	5	11	5	11
Totals	**11**	**16**	**10**	**17**	**10**	**17**	**10**	**17**	**12**	**15**	**10**	**17**	**11**	**16**	**11**	**16**

S = Stronghold Subpopulations; D = Depressed Subpopulations

Cumulative Effects

Cumulative Effects Common To All Alternatives, Issues, and SWRA Resources

Non-federal actions are likely to continue affecting SWRA resources. The cumulative effects in the affected areas are difficult to analyze, considering the broad geographic landscape covered by the areas, the uncertainties associated with government and private actions, and ongoing changes to the region's economy. Whether those effects will increase or decrease in the future is a matter of speculation; however, based on the growth trends and current uses identified in this section, cumulative effects are likely to increase.

For the most part, the stream systems of the Ecogroup area originate on-Forest and eventually flow downstream onto lands owned or administered by entities other than the Forest Service. Several TMDLs and 303(d) water quality limited water bodies occur within the Ecogroup area. Many more impaired streams are located downstream from the Ecogroup. Therefore, Forest Service actions can affect to impaired streams, positively or negatively, both on and off National Forest System lands. Many fish populations, whether they move off-Forest as part of their life cycle or remain entirely within a localized area, require interconnectivity of these streams to survive as a population. For most all species, genetic interchange between subpopulations is necessary to maintain healthy fish stocks. The more wide-ranging a species or population is, the more critical interconnectivity may be in order to access important habitat components. Thus, activities off-Forest that disrupt fish migration corridors can have significant impacts to fish populations upstream.

The most complex cumulative effects relate to the restoration of anadromous fish stocks and wide-ranging resident species within the project area. The complexity of these life histories exposes them to many factors affecting their abundance and viability. Cumulative effects to anadromous and wide-ranging resident fish species include: (1) reduced streamflows from water diversions for urban, agricultural and other purposes; (2) destruction or degradation of spawning and rearing habitat from logging, grazing, mining, farming and urban development on private and other non-federal lands; (3) degraded water quality as a result of polluted runoff from urban and rural areas; (4) migration barriers that result from dams on private or other non-federal lands (not regulated by the federal government); (5) introduced diseases, resource competition and gene pool dilution as a result private-, tribal- or state-operated hatcheries; (6) commercial and tribal fisheries on chinook salmon; (7) mortality as a result of illegal harvest through incidental catch; (8) habitat degradation associated with non-federal road building and maintenance; and (9) competition, predation and hybridization problems associated with introduction of non-native fish.

The affected area for cumulative effects to Issues 1, 2, and 3 includes the land administered by the three National Forests in the Ecogroup and lands of other ownerships within the National Forest boundaries. An estimated 23 percent of subbasins where the Ecogroup manages lands are in private ownership (Table SW-108). For the affected areas under Issue 4, an estimated 41 percent of the subbasins that support Yellowstone cutthroat, 36 percent of the subbasins that support Wood River sculpin, 20 percent of the subbasins that support bull trout, and 9 percent of subbasins that support westslope cutthroat and anadromous fish occur on private lands (Table SW-108). Subbasins that have the greatest potential for effects from private land activities include the Lower Boise, Lake Walcott, Payette, N. F. Payette, Weiser, Brownlee Reservoir, Lemhi, Lower Salmon, Raft River, Goose Creek, Salmon Falls and Camas Creek. Effects in these subbasins would be greatest along river valleys and the lower portions of major tributaries.

Table SW-108. Percent Landownership in Affected Area for SWRA Resources

Resource - Issue	SW Idaho Forests	Other Federal*	Private	BLM	State	Unknown
Soil, Water, and Riparian (Issues 1 to 3)						
All Subbasins within Ecogroup	24%	11%	23%	20%	2%	20%
Aquatic Fish Species (Issue 4)						
Steelhead, Chinook, Sockeye	30%	47%	9%	13%	1%	<1%
Bull Trout	34%	28%	20%	11%	3%	4%
Westslope Cutthroat	30%	47%	9%	13%	1%	<1%
Yellowstone Cutthroat	14%	<1%	41%	30%	2%	13%
Wood River Sculpin	21%	<1%	36%	39%	4%	<1%

*Other Federal includes lands administered by the Department of Defense, Energy, and Interior, excluding BLM.

Corporate Timberlands - Private land timber harvest and related road construction activities within Idaho are regulated by the Idaho Forest Practices Act (IFPA) under the Idaho Department of Lands IDL and the Oregon Forest Practices Act (OFPA) under the Oregon Department of Forestry (ODF). Neither the IFPA nor the OFPA provide the level of protection and conservation for SWRA resources as the Forest Service and BLM provide on federally administered lands.

State Administered Lands - Lands administered by the State of Idaho comprise 2 percent of the affected areas under Issues 1, 2, and 3, and between 1 and 4 percent of the subbasins that support aquatic fish species within the affected areas under Issue 4. Subbasins that have the greatest potential for SWRA resources effects from state lands include the Boise-Mores, South Fork Boise, Payette, North Fork Payette, Weiser River, Camas Creek, and Little Wood River. State-administered logging and grazing is expected to contribute short-term negative effects to spawning, rearing, and migration habitats for aquatic species and SWRA resources. The States of Idaho and Oregon have or are in the process of developing conservation plans and revising land use regulations to address listed aquatic species. Because of these efforts, it is assumed that negative effects would diminish and aquatic habitat on state lands would remain stable or slowly improve over the long term. However, the rate and extent of improvement are expected to be much lower than that projected for federal lands.

Local Actions - Local governments will be faced with direct pressures from population growth and movement. There will be demands for intensified development in rural areas, as well as increased demands for water, municipal infrastructure, and other resources. In the past, local governments in the two states generally accommodated growth in ways that negatively affected SWRA resources. Because there is little consistency among local governments regarding the way they address land use and environmental issues, both positive and negative effects on aquatic species and SWRA resources can be expected throughout the affected area.

Other Federal Actions - There has been, and continues to be, strong direction from federal authorities to restore and maintain healthy watersheds and associated aquatic ecosystems. Many recent planning efforts have identified the need to prioritize and restore degraded watersheds and improve SWRA and related resources, including: the National Fire Plan, Healthy Forest Initiative, Final Basinwide Salmon Recovery, Draft Bull Trout Recovery Plans, State DEQ water body assessments, Clean Water Action Plan (CWAP), the Forest Service and Bureau of Land Management Protocol for Addressing Clean Water Act Section 303(d) Listed Waters, recent listings of salmon, steelhead, and bull trout and their associated Biological Opinions. These plans and policies will have a cumulative influence on the management of federal and other landownerships within and adjacent to the Ecogroup area.

Actions on adjacent National Forests (Nez Perce, Salmon Challis, etc.) and Bureau of Land Management lands are expected to continue to implement Infish and Pacfish management direction until their land management plans are revised. Standards and guidelines should provide a high level of protection to aquatic resources and minimize most effects. This is because any action that "degrades" habitat conditions would be considered inconsistent with the concept of obtaining RMOs. Actions and facilities should also not measurably slow the rate of recovery or cause permanent or long-term modifications of the physical and biological processes or conditions that determine the RMO features. If uses or facilities caused large enough effects to any physical or biological processes that influenced maintaining or obtaining RMOs, then it would be deemed inconsistent and would need to be modified. Some short-term, localized effects would still be anticipated.

Dams maintained and operated by the Bureau of Reclamation and Army Corps of Engineers, on the Snake and Columbia Rivers, continue to reduce anadromous fish numbers. Dams and associated reservoirs have reduced migration success for both downstream migrating smolt and returning adults. These dams have increased mortality to these fish through predation, disease, and mechanical injury. Dams, water diversions, channel dewatering, and stream modifications have also disrupted migration and connectivity for many resident fish species, especially fluvial and adfluvial bull trout.

Federally operated fish hatcheries have contributed to developing weaker fish populations by diluting natural genetics and encouraging competition between hatchery fish and wild fish stocks. However, some negative effects from these hatcheries are expected to decline as management practices are changed to respond to impacts on listed salmonids.

Cumulative Effects for Issue 1

Increased uncharacteristic wildfire hazard increases the risk from fires that move from other ownerships to National Forest System lands. Some vegetative conditions on adjacent ownerships, particularly private lands, are relatively hazardous. Therefore, while the hazard on other ownerships may be high, the effects of fires moving onto National Forest System lands from other ownerships can change with changes in hazard. Lower hazard allows opportunities to suppress oncoming fires and keep them small, or to reduce the effects of these fires. Conversely, higher hazard on National Forest System lands increases the risk of large, difficult to suppress wildfires that can cross over onto other ownerships. Reducing the uncharacteristic wildfire hazard on other ownerships will reduce the risk of loss of soil-hydrologic function and soil productivity to National Forest System lands.

Cumulative Effects for Issue 2

The subwatersheds considered at risk to post-wildfire floods and debris flows include subwatersheds in which other landownerships are within or downstream of lands administered by the Ecogroup Forests. In these cases, vegetative conditions and treatments to reduce hazard may be more strategically placed at a landscape scale. However, the risk to human life, property, and/or municipal watersheds located downstream also depends on the watershed conditions found upstream of those lands, including vulnerability, soil-hydrologic condition, fuel conditions, and climatic patterns. The intent of the National Fire Plan is to develop strategies and treatments that are coordinated between various landowners, including federal agencies, to address the variety of hazards and risks that occur to reduce undesirable wildfire effects on all lands. This coordination would extend the effects of treatments beyond lands administered by the Forest Service. These effects may change the post-wildfire risks to human life, property, and municipal supply watersheds on both the on-Forest and off-Forest portions of these subwatersheds. Ultimately however, protection of life, property, and/or municipal supply watersheds on other ownerships is the responsibility of those owners.

Cumulative Effects for Issue 3

Cumulative Effects on 303(d) Water Quality Limited Water Bodies - Non-federal actions are likely to continue affecting water quality within subwatersheds containing the 303(d) water quality limited water bodies. Due to a small percentage of non-federal ownership, effects to water quality from non-federal lands would be relatively low in the following subbasins: South Fork Salmon, Upper Middle Fork Salmon, South Fork Payette, Middle Fork Payette, North and Middle Fork Boise, Middle Salmon-Chamberlain, and Lower Middle Fork Salmon subbasins. All other subbasins may have relatively high cumulative effects from non-federal lands. The effects associated with the Forest management activities may assist in improving water quality and beneficial use status related to 303(d) water quality limited water bodies on both the on-Forest and off-Forest portions of these subwatersheds and subbasins.

Cumulative Effects on TMDLs - Non-federal actions are likely to continue affecting water quality within the TMDL watersheds. Effects to water quality from non-federal lands would be low overall in the South Fork Salmon and Middle Fork Payette subbasins as non-federal lands comprise only a small portion of these TMDL watersheds. However, cumulative effects from non-federal lands would be high in the TMDLs for the Lower Boise, Lake Walcott, and Upper Snake-Rock. As described in the Cumulative Effects Common to all Alternatives, implementation of the existing TMDL watershed restoration plans should greatly improve the water quality within these TMDLs. The effects associated with the Forest management activities may assist in improving water quality and beneficial use status related to TMDLs on both the on-Forest and off-Forest portions of these subwatersheds and subbasins.

Cumulative Effects for Issue 4

See the species-specific discussions for Issue 4 in the Direct and Indirect Effects section, above.