INTRODUCTION

There is a direct correlation between public needs and concerns for adequate supplies of clean water and subsequent impacts on fisheries and aquatic species. The waters of the planning area support a variety of ecosystems. In southwestern Colorado, these aquatic communities and ecosystems can be found at many different elevations and within many different habitats. In general, the most common aquatic biota within the planning area can be categorized as fishes, aquatic plants, aquatic insects, and the embryonic and larval stages of amphibians (e.g., frogs and toads) (see Wildlife section). Less obvious, and less well understood, biota include the phytoplankton and algal, zooplankton, and microbe species associated with aquatic environments (especially in lakes, reservoirs, and ponds). Undoubtedly, these organisms play important roles in ecosystem processes (including nutrient cycling and energy fluxes, as well as in the composition of aquatic food chains).
Within the planning area, most aquatic insects or macroinvertebrate communities are composed of bottom-dwelling insects that live among the boulders, cobble, and gravel in streams. They are dominated by taxonomic orders that require clean water. Macroinvertebrates such as true flies *(Diptera)*, mayflies *(Ephemeroptera)*, stoneflies *(Plecoptera)*, and caddisflies *(Tricoptera)* are abundant in many streams and rivers within the planning area. The richness, distribution, and abundance of macroinvertebrates are often indicators of the water quality conditions in their environments.

The planning area contains native and desired non-native fish species. Although non-native fish introductions have increased fish diversity, they have also resulted in negative impacts to native fish populations. Historic and current forest/rangeland management activities have impacted, and may continue to impact, the characteristics and functions of aquatic ecosystems. Accommodating increasing public needs for water while, at the same time, protecting these aquatic ecosystems will be one of the biggest challenges to public land management over the next few decades.

This chapter describes the existing conditions and trends for the native and desired non-native fish species within the planning area, as well as the anticipated environmental impacts related to implementing the alternatives (see Chapter 2).

LEGAL AND ADMINISTRATIVE FRAMEWORK

LAWS

- ***The Organic Administrative Act of 1897, as amended***: This act recognizes watersheds as systems to be managed with care, in order to sustain their hydrologic function.
- ***The Fish and Wildlife Coordination Act of 1934***: Based on this act, fish and wildlife resources receive equal consideration with other resources in water resource development programs.
- ***The Multiple-Use, Sustained-Yield Act of 1960, as amended***: This act recognizes, and clarifies, USFS authority and responsibility regarding the management of fish and wildlife.
- ***The Federal Water Pollution Control Act of 1956, as amended***: This act restores and maintains water quality, in order to meet national standards.

- ***The National Environmental Policy Act of 1970***: This act requires fish and aquatic concerns to be addressed in environmental assessments (EAs) and environmental impact statements (EISs) for all major Federal actions.
- ***The Endangered Species Act of 1973***: This act requires Federal agencies to conserve threatened and endangered species and their ecosystems.
- ***The National Forest Management Act of 1976***: This act prevents watershed conditions from being irreversibly damaged, and protects streams and wetlands from detrimental impacts. In addition, fish habitat must support a minimum number of reproductive individuals, and be well distributed, for interaction between populations on USFS lands.
- ***The Federal Land Policy and Management Act of 1976***: This act requires BLM-administered lands to be managed in a manner that protects and maintains fisheries and their habitat, along with other resources and values.

EXECUTIVE ORDERS

- ***Executive Order 11990 of 1977***: This EO requires agencies to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the beneficial values of wetlands,
- ***Executive Order 11988 of 1977***: This EO requires agencies to take actions in order to minimize flood loss, preserve and restore the natural and beneficial values served by floodplains, and analyze the potential impacts of actions on the functionality of floodplains.

REGULATIONS AND POLICES

- ***FSM 2600 and FSH 2600***: These provide direction, regulation, and policy regarding fish and wildlife management.
- ***BLM Manual 1120***: These provide policy and direction regarding fish and wildlife management on BLM-administered lands.
- ***BLM Manual 6840***: These provide BLM policy and direction concerning Sensitive Species.

DESIGN CRITERIA

Management guidelines and design criteria describe the environmental protection measures that would be applied to all of the alternatives at the project level in order to protect, enhance, and, where appropriate, improve aquatic resources. Guidelines and design criteria are presented in Part 3 of Volume 2 of the DLMP/DEIS.

AFFECTED ENVIRONMENT

EXISTING CONDITIONS AND TRENDS

Threatened and Endangered Fish Species

In relation to the planning area, four fish species, and their designated critical habitats, are federally listed (bonytail chub; humpback chub; Colorado pikeminnow; and razorback sucker) (see Table 3.4.1). The bonytail chub and Colorado pikeminnow are also listed as endangered. The humpback chub and razorback sucker are also listed as threatened by the State of Colorado.

Table 3.4.1 – Federally Listed Fish Species for SJPL

SPECIES	STATUS	POTENTIAL FOR OCCURRENCE ON BLM LANDS	POTENTIAL FOR OCCURRENCE ON USFS LANDS
Bonytail chub *(Gila elegans)*	Endangered	Yes	Yes
Colorado pikeminnow *(Ptychocheilus lucius)*	Endangered	Yes	Yes
Humpback chub *(Gila cypha)*	Endangered	Yes	Yes
Razorback sucker *(Xyrauchen texanus)*	Endangered	Yes	Yes

All four species are found downstream of the planning area, in the mainstems of the San Juan and Dolores Rivers. These species fall under the purview of Section 7 of the ESA [16 U.S.C. 1531 et seq.], which outlines the procedures for Federal interagency cooperation designed to conserve federally listed species and designated critical habitats. Section 7(a)(2) of the ESA states that any action authorized, funded, or carried out by a Federal agency would not likely jeopardize the continued existence of a listed species, or result in the destruction or adverse modification of designated critical habitat.

Within the planning area, management activities may impact these four endangered fish species, and/or their potential habitat. Activities that result in water depletions, influence stream-flow, or degrade water quality may impact these four endangered fish. Species management is guided by two USFWS Recovery Implementation Programs. One addresses the needs for the San Juan River populations the other addresses the needs for the upper Colorado River populations (including the Dolores River system). As a result, consultation with the USFWS is frequently required for many project level activities within the planning area under Section 7(c) of the ESA. A consultation is always required for projects and activities with proposed water depletions. BMPs and mitigation measures have been, and will continue to be, implemented in order to minimize impacts to the water quality of local streams and rivers, and, subsequently, to downstream endangered fish species.

USFS and BLM Sensitive Fish Species

In relation to the planning area, four native fish species are listed as both USFS and BLM Sensitive Species: roundtail chub, flannelmouth sucker, Colorado River cutthroat trout, and bluehead sucker (see Table 3.4.2). All four species are also identified as species of special concern by the State of Colorado.

Generally, the roundtail chub, flannelmouth sucker, and bluehead sucker are found in main-stem rivers at lower elevations within the planning area (including the Dolores, Mancos, La Plata, Animas, Florida, Los Pinos, Piedra, San Juan, and Navajo Rivers). The Colorado River cutthroat trout populations, on the other hand, are found mostly in headwater streams and lakes that are tributary to the Dolores and San Juan River systems (see Table 3.4.3). The Hermosa Creek watershed is especially important for the conservation and recovery of this species in southwestern Colorado.

Table 3.4.2 – USFS and BLM Sensitive Fish Species

SPECIES	BLM SENSITIVE SPECIES	USFS SENSITIVE SPECIES	GLOBAL RANKING*	NATIONAL RANKING*
Roundtail Chub *(Gila robusta)*	Yes	Yes	G3	N3
Flannelmouth sucker *(Catostomus latipinnis)*	Yes	Yes	G3G4	N3N4
Colorado River cutthroat trout *(Onchorynchus clarki pleuriticus)*	Yes	Yes	G4T3	N2N3
Bluehead sucker *(Catostomus discobolus)*	Yes	Yes	G4	N4

*Ranking and status categories through the NatureServe Global Conservation Status Rank Guidance (2006). Rankings are as follows: 1 = critically imperiled, 2 = imperiled, 3 = vulnerable to extirpation, 4 = apparently secure, 5 = demonstrably widespread, abundant, and secure (Gerhardt, pers comm. 2006). For more detailed information concerning the historic range, habitat needs, and current distribution of these four species, consult the Biological Evaluation in the planning files for this DLMP/DEIS (see Appendix T).

Table 3.4.3 – Streams in Southwestern Colorado with Colorado River Cutthroat Trout Conservation Populations

SAN JUAN RIVER SYSTEM	DOLORES RIVER SYSTEM
Augustora Creek	Deep Creek
Beaver Creek	Elk Creek
Big Bend Creek	Rio Lado Creek
Clear Creek	Little Taylor Creek
Headache Creek	
East Fork Hermosa Creek	
Himes Creek	
Upper Navajo Creek	
East Fork Piedra River	
Shaw Creek	
Terminal Reservoir	
West Virginia Gulch Creek	

The USFS and BLM Sensitive Species are species for which some management actions and direction are necessary in order to prevent listing of these species under the ESA. Management direction is also necessary so that land management activities do not contribute to a loss of species viability. Although none of the above four native fish species is a candidate species under ESA, the decline of Colorado River cutthroat trout has been so severe that this subspecies of cutthroat has recently been petitioned for Federal listing. The USFWS, however, decided against listing because no evidence of major declines in the overall distribution or abundance over the last several decades was found. The Colorado River cutthroat trout is also listed as a USFS Management Indicator Species (MIS).

The populations of the roundtail chub, flannelmouth sucker, Colorado River cutthroat trout, and bluehead sucker are all in decline (Young 1995; Wheeler 1997; Bezzerides and Bestgen 2002; Weitzel 2002). The reasons for this decline are primarily due to the alteration of stream-flow regimes in main-stem rivers and tributary streams resulting from water developments, water diversions, on-going drought impacts, changes in water temperature regimes, interactions with non-native species, and degradation of habitat (see Environmental Consequences). Of the three downriver species, the flannelmouth sucker appears to be more at risk to impacts than are the roundtail chub or the bluehead sucker. This is due to current water developments, water diversions, and/or drought-related impacts (Gerhardt, pers comm. 2006).

USFS Management Indicator Species/Common Cold-Water Fish

In relation to the planning area, 4 common, cold-water trout species are widely distributed and abundant in most rivers and perennial streams, as well as in many of the larger and deeper reservoirs. They are considered as USFS Management Indicator Species (MIS) (see Table 3.4.4). These species are brook trout *(Salvelinus fontinalis)*, brown trout *(Salmo trutta),* cutthroat trout *(Oncorhynchus clarki spp.),* and rainbow trout *(Oncorhynchus mykiss)*. Only the Colorado River cutthroat trout subspecies is a native. The other trout species are non-native. MIS are monitored during the implementation of the selected alternative in order to assess the impacts of management activities on their habitat or population levels. Although the Colorado River cutthroat trout is a USFS and BLM Sensitive Species, it is also listed as a MIS. The brook, brown, cutthroat, and rainbow trout are listed as MIS due to their recreational and economic value.

Table 3.4.4 – USFS Management Indicator Species (MIS)

MANAGEMENT INDICATOR SPECIES	PLAN ISSUES FOR SELECTION
FISH	
Trout species (Colorado River cutthroat, cutthroat sps., brook, brown, and rainbow) *(Oncorhynchus clarki pleuriticus)* *(Oncorhynchus clarki sp.)* *(Salvelinus fontinalis)* *(Salmo trutta)* *(Oncorhynchus mykiss)*	Impacts to water quantity due to water depletions associated with reservoirs, diversions, and oil and gas development. Impacts to water quality due to soil erosion and sedimentation associated with ground-disturbing activities (including fuels treatments, oil and gas development, timber harvesting, livestock grazing, road construction, and recreation).

Generally, brook and brown trout have self-sustaining populations throughout the planning area. Population levels for cutthroat and rainbow trout are more likely influenced by current stocking efforts by the Colorado Division of Wildlife (CDOW). All 4 trout species are managed as game and sport fish, and may be harvested (subject to State fishing regulations).

Impacts to these 4 cold-water trout species related to land management activities have resulted primarily from water quantity and water quality influences. Lack of, or decreased, stream-flow has resulted in the greatest impacts to these species, coupled with stream temperature increases. Over the history of the planning area, hundreds of water diversions and ditches have been constructed, especially in the most downstream sections of rivers and streams near agricultural lands, towns, cities, and residential developments. Water storage projects, trans-basin diversions, and numerous water wells are also located on SJPLC-administered lands. With persistent drought conditions, and increased population growth in southwestern Colorado, new private water rights filings within the planning area will continue. Decreased stream-flows can impact aquatic habitat and trout populations by reducing, or eliminating, the quantity and quality of suitable habitat, altering water temperature regimes (e.g., increasing stream temperatures), and, subsequently, by reducing dissolved oxygen levels (Meehan et al. 1977; Marcus et al. 1990). These impacts could be more pronounced during periods of natural cyclic flow reductions (during fall and winter) or during summer months in a drought.

For some rivers or streams, minimum in-stream flow water rights have been acquired by the Colorado Water Conservation Board (CWCB) in order to protect these fisheries from being impacted by some existing, and all new, water users. However, most existing consumptive uses (e.g., irrigation) on these rivers and streams have priority over the non-consumptive CWCB in-stream flow rights. On fully appropriated rivers or streams, and during high-use periods, all surface flows may be diverted, leaving sections of stream dewatered. For some of these impacted areas, a small amount of aquatic habitat may be maintained by ground-water in-flow and return-flow from diversions. A loss in stream-flow will also reduce a stream's ability to convey sediment downstream and result in deposition, which may, in turn, impact the numbers and diversity of benthic macroinvertebrates, and, ultimately, aquatic habitat.

Water quality has had the next greatest influence (impact) on these 4 trout species. Throughout the planning area, sediment is the greatest concern. Beyond natural sources, human-caused sediment loading in streams may result from existing or recently constructed roads, gas well pads, timber harvesting, historic placer and hydraulic mining, grazing, off-road vehicle use, and other land disturbing actions. Locally, some rangelands in the western portions of the planning area have large areas of exposed marine shale. Marine shales are typically highly erosive and can increase salinity in streams. The BLM, the USFS, and the Colorado River Salinity Control Forum have spent substantial resources in order to minimize salt delivery to the Colorado River. However, where sediment production is extremely high, salt concentrations in streams and rivers can be at toxic levels for fish survival. Fine sediment deposition in streams and rivers can also reduce intergravel dissolved oxygen and increase stream temperatures, which can, in turn, impact fish habitat (Meehan 1991). In other areas (the Silverton area/upper Animas River basin; and the Rico, Mancos, and La Plata City areas), acid drainage and heavy metal loading from hard-rock mining activities, as well as form natural sources, into nearby rivers and streams limit fish and aquatic populations, and, depending upon the species, may be toxic (Simon et al. 2000). Atmospheric deposition of metals, oxides of sulfur, and nitrogen from coal-fired power plants in New Mexico and Arizona are known to impact the water quality of many fish-bearing waterbodies (see Air Quality).

Where fishery surveys and inventories have been conducted within the planning area, the current trends for the habitat and population levels for the brook, brown, cutthroat, and rainbow trout are all decreasing. Much of this monitoring information has been collected in drainages subject to water depletions (including streams with water developments or water diversions, and/or streams that area strongly influenced by drought-related impacts over the last 8 to 10 years). The combined stress of reduced stream-flows, higher water temperatures, poorer water quality, and resulting marginal habitat conditions, have decreased population levels of these species from historic levels. With the drought continuing in southwestern Colorado, fishery habitat is predicted to decrease into the future. However, trout populations may remain stable into the future, due to artificial stocking efforts for some species (including the rainbow and cutthroat trout). All 4 species will continue to be harvested in accordance with State fishing regulations.

In spite of the trends, land management activities within the planning area may result in small localized impacts to habitat quality or to population levels of these 4 trout species. Generally, the habitat and population of these 4 trout species would be maintained and protected (USFWS 2002; CDOW 2002; CNHP 2002; USFS 2005a). This would be due to their widespread distribution and abundance, to continued artificial stocking efforts by CDOW for some species, to State-regulated fishing pressure, to the utilization of BMPs designed to minimize impacts on water quality, and to the implementation of mitigation measures designed to reduce impacts on fish populations and habitat. However, any activities that result in water depletions, influence stream-flow, or increase water temperatures may result in greater impacts to these 4 cold-water trout species.

Common Warm-Water Fish

Southwestern Colorado contains several warm-water fish species that are found primarily in the larger reservoirs (including within the planning area). These warm-water species include northern pike, walleye, small mouth bass, large mouth bass, crappie, perch, bluegill, catfish, speckled dace, and molted sculpin. Except for the native speckled dace and molted sculpin, all other warm-water fishes are non-native. All of these fish are primarily found in McPhee, Narraguinnep, Groundhog Summit, Jackson Gulch, Lemon, Vallecito, Navajo, and Williams Creek Reservoirs. These warm-water species are fished for sport and recreation, and are subject to State fishing regulations.

Currently, the populations for these warm-water fish are stable. This is due to self-reproducing populations and/or to artificial stocking by the CDOW. Mercury contamination has occurred in fish from McPhee, Narraguinnep, Navajo, and Vallecito Reservoirs, especially in the larger, non-native predators (northern pike and walleye). The contamination seems to be more of a public health hazard, rather than a fish injury concern. All species will continue to be game fish and harvested in accordance with State fishing regulations.

Future management activities within the planning area will likely not impact or change these warm-water fish. The mercury-contaminated fish issue is speculated to be linked to air pollution from the Four Corners coal-fired power plants in New Mexico and Arizona; however, this has not yet been formally determined (see Air Quality).

DIRECT AND INDIRECT IMPACTS

Almost all of the multiple-use activities conducted within the planning area, and described in this analysis, have the potential to impact aquatic ecosystems. Based on the assessment of current aquatic conditions, it appears that the greatest risks to fish and aquatic species are from management activities that directly impact to streams, riparian areas and wetlands ecosystems, and/or aquatic community composition. These activities include water-use and development projects, grazing, road construction and road management, oil and gas development, hard-rock mining, mining reclamation, timber harvesting, mechanical fuels reduction projects, rangeland treatments, wildfire, prescribed burns, wildland fire use, utility corridor projects, ski area modifications and expansion, and off-road vehicle use.

The uplands of watersheds appear to be more resilient; therefore, management activities that directly impact the uplands tend to pose a smaller risk to fisheries and aquatic species (except in erosive watersheds). Generally, resilient uplands are further away from stream channels and riparian areas, and/or have the ability for vegetation and ground debris to filter out erosion from reaching stream channels, and/or headwater streams to store sediment.

Environmental consequences related to multiple-use activities are generally expected to be proportional to the magnitude and extent of activities that occur in erosive or sensitive watersheds. Streams in other watersheds may be more resilient to anthropogenic influences due to their geology, soils, vegetation cover, or relative intactness of riparian areas and wetlands ecosystems. Potential impacts would be minimized through the application of design criteria and guidelines described in the DLMP/DEIS.

Surface water, ground water, floodplains, riparian areas and wetlands ecosystems, and habitat for fish and other aquatic species are all closely related. BLM and USFS manuals and handbooks, including the USFS Watershed Conservation Practices Handbook (USFS 2006) and the BLM's Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development -The Gold Book (USDA and USDI 2006), prescribe extensive measures designed to protect soil, riparian, and aquatic resources. When applicable, mitigation measures would be implemented and would be effective in reducing impacts. Adverse impacts to the aforementioned resources from management activities are expected to be minor. However, as the intensities, and the extent, of activities increase, there may be an increased risk that conservation practices would not be as cumulatively effective over time. Therefore, it is reasonable to presume that alternatives prescribing greater levels of multiple-use activities (Alternatives A and D) than the other Alternatives (B and C) may pose greater risks to fisheries and aquatic ecosystems and may require additional, appropriate project design and mitigation approaches.

For each of the management activities described below, the environmental consequences for fisheries and aquatic species are compared by alternative.

Impacts Related to Water Use and Development Projects

The impacts related to water use and development projects (including diversion ditches, storage reservoirs, pipelines, and wells) on water quantity, timing, water quality, fisheries, and aquatic species are described in the Water Resources section of this Chapter. The primary impact to fisheries and aquatic species would be from reduced or eliminated stream-flows, and reduced or eliminated fishery habitat that is unavailable for use. Additional impacts on fisheries and aquatic species may include increased stream temperatures and reduced dissolved oxygen levels. These impacts may be more pronounced during periods of natural cyclic flow reductions (during fall and winter) or during summer months in a drought. Winter base flows would also be reduced when ski area snowmaking operations drain water from streams and/or from water wells that are likely connected by ground water to streams. This may limit habitat, and populations, of fish and other aquatic species, which may, in turn, disrupt the life cycles of such species.

Threatened or Endangered Species - Under all of the alternatives, the impacts related to water use and development projects would be moderately adverse to the bonytail chub, Colorado pikeminnow, humpback chub, and razorback sucker found in the San Juan and Dolores Rivers downstream of the planning area. The impacts would be mainly due to water depletion and reduced stream-flows (i.e., reduced or eliminated fishery habitat, increased stream temperatures, and reduced dissolved oxygen levels).

Sensitive Species - Under all of the alternatives, water use and development projects would result in moderate adverse impacts to the roundtail chub, flannelmouth sucker, and bluehead sucker found immediately downstream in the Dolores, Mancos, La Plata, Animas, Florida, Los Pinos, Piedra, San Juan, and Navajo Rivers at the lower elevations of the planning area. The impacts of reduced or eliminated fishery habitat would result from water depletions and reduced stream-flows. Under all of the alternatives, depending upon the location of the water use and development project, the impacts on the Colorado River cutthroat trout could vary from no impact to a moderate adverse impact immediately downstream. The impacts would be mainly due to water depletions, reduced stream-flows, and to the subsequent impacts on fishery habitat available for use.

MIS/Common Cold-Water Fish - Under all of the alternatives, the impacts from water use and development projects on brook, brown, cutthroat, and rainbow trout may be adverse immediately downstream from these projects. Due to the widespread distribution and abundance of these trout, their viability may not be threatened. The impacts resulting from some projects may be substantial to fisheries and aquatic ecosystems; however, the impacts are not expected to vary between the alternatives. This is because the demand for water use authorizations is driven by project proponents, rather than by SJPLC-administered programs or budgets.

DLMP/DEIS Alternatives: The impacts related to water use and development projects on fisheries are not expected to vary between the alternatives. This is because the demand for water use authorizations is driven by project proponents, rather than by SJPLC-administered programs or budgets. The impacts on threatened or endangered species, or warm-water Sensitive Species would be moderately adverse downstream of water use and development projects (due to water depletion and reduced stream-flows). The impacts to Colorado River cutthroat trout would vary from no impact to moderately adverse impacts, depending upon the location of the water use and development project. For common, coldwater trout, the impacts would be localized and adverse immediately downstream from these projects (due to reduced or eliminated stream-flows and/or fishery habitat).

Impacts Related to Livestock Grazing and Big Game Use

The impacts related to livestock grazing and big game use on water quantity, water quality, fisheries, and aquatic species are discussed in the Water Resources section of this Chapter. The primary impact to fisheries and aquatic species would be mainly due to degraded habitat resulting from erosion and sedimentation and increased stream temperatures.

Threatened or Endangered Species - Under all of the alternatives, the impacts related to livestock grazing and big game use on the bonytail chub, Colorado pikeminnow, humpback chub, and razorback sucker would generally be minor. The impacts of sedimentation and increased stream temperatures from livestock grazing and big game use would minimally impact fish habitat for these off-SJPL species. This may even be true under Alternative D (which may result in the greatest impacts).

Sensitive Species - Under all of the alternatives, the impacts related to livestock grazing and big game use may adversely affect specific individuals of the species. Overall, however, they would be minor for the populations of the roundtail chub, flannelmouth sucker, bluehead sucker, and Colorado River cutthroat trout. Due to the delay in influencing existing conditions, Alternative C (with its proposed reductions in suitable and available livestock grazing acres) may reduce grazing impacts on fisheries in the long term, but not, however, in the short term. Under Alternative D (with its proposed increases in suitable and available livestock grazing acres) grazing may increase impacts to these fisheries in the long-term, but not, however, in the short-term. There will be localized improvements in grazing management. In addition, rangeland health improvement projects would be implemented. However, the impacts of sediment and increased water temperatures on fishery habitat quality will continue.

MIS/Common Cold-Water Fish - The potential impacts on brook, brown, cutthroat, and rainbow trout related to livestock grazing would be nearly equal under Alternatives A and B. Within the planning area, the overall impacts would vary from minor to moderate. The primary impact to fisheries related to grazing would be mainly due to degraded habitat (resulting from erosion, sedimentation, and increased stream temperatures). With reductions in suitable and available livestock grazing acres (e.g., closing some active sheep allotments), the impacts of livestock grazing on fisheries under Alternative C would be less in the long term, but would remain similar to Alternatives A and B in the short term. With increases in suitable and available livestock grazing acres (e.g., stocking vacant sheep allotments), Alternative D would increase adverse impacts to these trout species in the long term, but continue impacts similar to Alternatives A and B in the short term. Due to their widespread distribution and abundance, the viability of these fish populations would not be threatened under any of the alternatives. Protection and improvement of riparian areas and wetlands ecosystems would continue to receive emphasis under all of the alternatives.

DLMP/DEIS Alternatives: Overall, the long-term impacts related to livestock grazing and big game use on fisheries and aquatic habitat would be minor. By alternative, the greatest impacts would be under Alternative D, followed by Alternatives A and B with similar impacts and then by Alternative C. These impacts vary by alternative. This would be due to the variations in amounts of suitable and available livestock grazing acreages proposed under each alternative, and to the corresponding impacts on fish habitat from sediment and increased stream temperatures).

Impacts Related to Road Management and Construction

The impacts related to roads and trails on stream-flow and sediment production are described in the Water Resources section in this Chapter. With regard to fisheries and aquatic species, heavy sediment loads can reduce pool depths, bury stream substrates and spawning gravels, adhere to aquatic insects and the gills of fish, alter channel form and function, and result in other forms of habitat degradation. Improperly placed, shaped, and sized culverts can act as fish barriers on key streams or exacerbate erosion and, in turn, result in head-cutting. For any given watershed, the overall risks of impacts to aquatic ecosystems due to roads tend to increase with new road construction or reconstruction. Conversely, risks of impacts to aquatic and riparian ecosystems tend to decrease with road obliterations. Road maintenance may result in short-term increases in soil erosion; however, routine road maintenance provides opportunities to stabilize road features and improve road drainage. The location of roads is also an important consideration when minimizing erosion and sedimentation of streams. Roads constructed adjacent to stream channels can potentially restrict channel meander or increase stream slope, causing the stream to downcut and erode. Roads adjacent to streams can directly increase sedimentation. The relative impacts of roads on aquatic resources are based on the net change between new construction/ reconstruction, and road obliteration proposed under each alternative.

Threatened or Endangered Species - Under all of the alternatives, the impacts related to roads on the bonytail chub, Colorado pikeminnow, humpback chub, and razorback sucker found in the San Juan River downstream of the planning area would generally be minor. Under all of the alternatives, due to concerns over new oil and gas leases, as well as over other activities that require road construction in areas with salinity issues, high road densities, or sensitivity to disturbance, projects in the Dolores River watershed may moderately adversely impact these 4 endangered species. However, the impacts related to roads from oil and gas development, timber sales, or other vegetation treatment are speculative. More precise impacts cannot be determined until the location, timing, size, and exact design of the projects are known.

Sensitive Species - Generally, the impacts related to roads may adversely impact specific individuals of the species. Overall, however, these impacts would be minor under all of the alternatives for the populations of the 3 warm-water species found in the La Plata, Animas, Florida, Los Pinos, Piedra, San Juan, and Navajo Rivers (roundtail chub, flannelmouth sucker, and bluehead sucker) at the lower elevations of the planning area. Specific projects with new road construction in the Dolores or Mancos River drainages may result in moderate adverse impacts to the roundtail chub and bluehead sucker. However, under all of the alternatives, the impacts related to road construction in the Dolores or Mancos River drainages on the flannelmouth sucker would likely be more adverse (due to its more tenuous situation) than for the roundtail chub or bluehead sucker. The exact details for these projects are presently unknown; therefore, the impacts are speculative. Under all of the alternatives, due to the locations of streams with conservation populations, roads may adversely impact individuals. These impacts, however, would be minor for the population of the Colorado River cutthroat trout.

MIS/Common Cold-Water Fish - Under all of the alternatives, the potential impacts on brook, brown, cutthroat, and rainbow trout related to from roads may be similar. The overall impacts would vary from minor to moderate. Alternatives A and D would propose slightly more miles of construction and reconstruction than would Alternatives B and C; therefore, they would result in slightly more potential impacts to fishery habitat quality (due to sediment production). Under all of the alternatives, due to their widespread distribution and abundance, the viability of these fish populations would not be threatened. The potential impacts to fisheries and aquatic species related to trails would be negligible, relative to the potential impacts related to roads.

DLMP/DEIS Alternatives: Overall, the impacts related to roads on fisheries would vary from minor to moderate, depending upon the location of the project. Alternatives A and D have the greatest potential for impacts to fisheries and aquatic species (due to the similarity in proposed miles of road construction and reconstruction). Alternatives B and C would have the least potential for impacts (because they would propose slightly fewer miles of road construction and reconstruction). With regard to threatened, endangered, or sensitive species, the impacts in the La Plata, Animas, Florida, Los Pinos, Piedra, San Juan, and Navajo River systems would be minor. The impacts in the Dolores or Mancos River systems may be more adverse. This would be due to the greater number of areas in the Dolores and Mancos River watersheds with salinity issues, as well as to high road densities and/or species sensitivity to disturbance). The impacts on fish related to roads would be mainly due to sediment degradation of fish habitat.

Impacts Related to Oil and Gas Leasing and Development, Mining, and Mining Reclamation

The impacts related to oil and gas leasing and development, mining, and mining reclamation on water quantity and water quality are discussed in the Water Resources section in this Chapter. There is some indication that oil and gas resource potential may result in leasing and exploration east of Pagosa Springs (in the San Juan Sag area), and on the national forest portion of the Paradox Basin (in the Glade area). Exploration could include two wildcat wells per year in the San Juan Sag area, and up to nine wildcat wells per year in the national forest portion of the Paradox Basin (see 3.15 Fluid Minerals). Approximately 45 acres per year may be disturbed from well pads and roads for these areas, combined. If paying quantities of gas are discovered the San Juan Sag and the national forest portion of the Paradox Basin, as many as 140 production wells are projected. The impacts to fisheries and aquatic species from oil and gas leasing and development would be mainly related to reduced stream-flows over time (due to the dewatering of gas-producing rock formations). This would, subsequently, reduce fishery habitat available for use, increase sediment production, and result in degraded fishery habitat (as well as in the potential for contamination from petroleum products, drilling mud, and other contaminants).

Within the planning area, mining activities may include recreational gold panning and suction dredging, gravel mining operations, hard-rock mining, and uranium and vanadium mining. The impacts to fisheries and aquatic species related to mining or mining reclamation would be mainly due to erosion and sediment impacts (i.e., degraded fishery habitat), saline run-off, heavy metal loading of streams (i.e., toxic levels for aquatic species), and/or altered stream channels and associated fishery habitat.

Threatened or Endangered Species - Generally, the impacts related to oil and gas leasing and development are similar under all of the alternatives, and may result in moderate adverse impacts to the bonytail chub, Colorado pikeminnow, humpback chub, and razorback sucker found in the San Juan and Dolores rivers downstream of the planning area. The impacts would be mainly due to water depletion and reduced stream-flows over time (from the dewatering of gas seams), and reduced fishery habitat available for use. There would be concerns related to new oil and gas development in the Dolores River watershed in relation to salinity issues, high road densities, or sensitivity to disturbance (i.e., degraded fishery habitat). However, the impacts related to oil and gas development are speculative. More precise impacts cannot be determined until the location, timing, size, and exact design of the projects are known. If new leases were not made available, there would be no impacts on these endangered fish species because no new impacts would occur from oil and gas development.

Generally, the impacts related to mining and mining reclamation would be similar under all of the alternatives; and would be minor on the bonytail chub, Colorado pikeminnow, humpback chub, and razorback sucker found in the San Juan River downstream of the planning area. Under all of the alternatives, due to concerns with salinity issues, high road densities, or sensitivity to disturbance, projects in the Dolores River watershed would have the potential to result in moderate adverse impacts to these four endangered species. However, the impacts related to mining are speculative. More precise impacts cannot be determined until the location, timing, size, and exact design of the projects are known.

Sensitive Species - Generally, the impacts related to oil and gas leasing and development would be similar under all of the alternatives; and, could result in moderate adverse impacts to the roundtail chub, flannelmouth sucker, and bluehead sucker found in the Dolores, Mancos, La Plata, Animas, Florida, Los Pinos, Piedra, San Juan, and Navajo Rivers at the lower elevations of the planning area. The impacts would be mainly due to water depletion and reduced stream-flows (from the dewatering of gas seams), and the subsequent reduction in fishery habitat available for use. There would be concern regarding new oil and gas development in the Dolores and Mancos River watersheds in relation to salinity issues, high road densities, or sensitive to disturbance (i.e., degraded fishery habitat). The impacts related to oil and gas development are speculative. More precise impacts cannot be determined until the location, timing, size, and exact design of the projects are known. If new leases were not made available, there would be no impacts on these warm-water sensitive fish species because no new impacts would occur from oil and gas development. Under all of the alternatives, given the locations of the conservation populations and the lease parcels, the impacts on Colorado River cutthroat trout may be negligible. However, if oil and gas development occurs in the vicinity of streams or potential habitat occupied by Colorado River cutthroat, then the impacts, over time, could be moderately adverse immediately downstream over time. The impacts would be mainly due to water depletions, as well as to the subsequent impacts resulting from reduced stream-flows. In addition to leasing stipulations for watershed, soil, steep slopes, riparian areas, wetland, and floodplain concerns, an oil and gas development stipulation would be applied in order to protect Colorado River cutthroat trout and minimize impacts. Like other sensitive species, if no new leases were made available, there would be no impacts on the Colorado River cutthroat trout because no new impacts would occur from oil and gas development.

Generally, the impacts related to mining and mining reclamation would be similar under all of the alternatives; and may adversely impact specific individuals of the species. They may, however, generally be minor for the populations of the roundtail chub, flannelmouth sucker, and bluehead sucker found in the La Plata, Animas, Florida, Los Pinos, Piedra, San Juan, and Navajo Rivers at the lower elevations of the planning area. Under all of the alternatives, specific mining projects in the Dolores or Mancos River drainages with salinity issues, high road densities, or sensitivity to disturbance would likely result in minor adverse impacts to the roundtail chub and bluehead sucker. However, the impacts related to mining in the Dolores or Mancos River drainages on the flannelmouth sucker may be moderately adverse (due to its more tenuous situation). The exact details for these projects are presently unknown; therefore, the impacts continue to be speculative. Depending upon the location of the action, the impacts related to mining or mining reclamation, which may be nearly identical under all of the alternatives, on Colorado River cutthroat trout may vary from no impact to adverse impacts to specific individuals. Overall, however, they would be minor for planning area populations.

MIS/Common Cold-Water Fish - For both future lease areas (the San Juan Sag area and the USFS portion of Paradox Basin), Alternative A would result in the greatest risk of adverse impacts related to oil and gas exploration and development on brook, brown, cutthroat, and rainbow trout. This is because Alternative A would contain the most acreage under standard lease terms. However, adequate protection of fishery habitat quality would still be required. Generally, under all of the alternatives, the impacts related to oil and gas exploration and development could vary from minor to moderate. The impacts would be mainly due to water depletions, reduced stream-flows (i.e., reduced fishery habitat available for use), and sediment production (i.e., degraded fishery habitat). The greatest impacts to these coldwater trout would occur immediately downstream from these projects. Under all of the alternatives, due to their widespread distribution and abundance, the viability of these trout would not be threatened. If new leases were not made available, there would be no impacts on these common coldwater trout species because no new impacts would occur from oil and gas development.

The impacts related to mining or mining reclamation on brook, brown, cutthroat, and rainbow trout are assumed to be proportional to the amount of land available for locatable minerals. Under all of the alternatives, potential adverse impacts to these trout and associated aquatic species are expected to be minor and relatively localized. Under all of the alternatives, the potential for mineral exploration and development (for uranium in particular) would be similar; therefore, all of the alternatives could result in similar adverse impacts to aquatic ecosystems. Mining reclamation could benefit some trout habitat and populations (by reducing the amount of heavy metal loading into stream systems).

DLMP/DEIS Alternatives: The impacts related to oil and gas leasing and development on fisheries are not expected to vary between alternatives. This is because the number of gas wells and other infrastructure and acres of disturbance are nearly identical under all of the alternatives. The impacts on threatened and endangered species, or warm-water Sensitive Species may be moderately adverse downstream of development. This would be mainly due to water depletion, reduced stream-flows, and reduced fishery habitat. There would be concerns in the Dolores and Mancos River watersheds with salinity issues, high road densities, and sensitivity to disturbance. The impacts on Colorado River cutthroat trout would vary from negligible to moderately adverse, depending upon the location of the oil and gas development. With regard to common cold-water trout (MIS species), the impacts would be minor to moderate (due to water depletions, reduced stream-flows, and sediment impacts on habitat). The greatest impacts would occur immediately downstream from these projects. The no lease alternative would essentially result in no change from existing conditions related to current oil and gas development activities, and there would be no impacts on threatened, endangered, sensitive, or management indicator fish species because no new impacts would occur from oil and gas development.

The impacts related to mining and mine reclamation are not expected to vary between the alternatives. This is because the acres of disturbance would be the same under all of the alternatives. Overall, the impacts to fisheries would vary from no impact to moderately adverse impacts (depending upon the location of the mining or mine reclamation project). With regard to threatened, endangered, and Sensitive Species, the impacts in the La Plata, Animas, Florida, Los Pinos, Piedra, San Juan, and Navajo River drainages may be minor. The impacts in the Dolores or Mancos River systems may be more adverse (due to the greater number of areas with salinity issues, high road densities, and sensitivity to disturbance). With regard to the common cold-water trout, the impacts would be minor, with localized adverse impacts. The impacts related to mining and mine reclamation would be mainly due to sediment impacts on habitat, saline run-off or heavy metal loading of streams, or altered fishery habitat.

Impacts Related to Vegetation Management

As described in the Water Resources section in this Chapter, the greatest impacts related to timber sales on fisheries may be from road construction or reconstruction, as well as from the subsequent sedimentation and degraded fishery habitat. The impacts from mechanical fuels reductions, rangeland treatments, and wildfire and additional timber sales on the magnitude, timing, and duration of stream-flow, and on water quality, are described in the Water Resources section. Where mechanical fuels treatments use hydro-mowers and roller choppers, mulch would also be generated on the soil surface, which would reduce overland flow and erosion. Other vegetation management (including utility corridors and ski area modifications and expansions) may result in similar impacts as those presented in the Water Resources section.

Other vegetation treatments (including prescribed burns and wildland fire use) may result in considerably less severe impacts compared to wildfire. Under these treatments the location and severity of the fire are controlled to a greater extent; therefore, more ground cover would remain and the erosion potential would be reduced. Sediment trapping buffers would generally remain around stream channels in order to reduce the amount of sediment delivered to the stream. Rarely do entire watersheds burn as a result of prescribed burns or WFU. These treatments are beneficial because they can reduce the impacts of changes in water yield and peak flows due to conditions such as drought. Furthermore, the careful and judicious use of prescribed burns may help to reduce the risk of uncontrolled wildfires -- wildfires that would otherwise burn through, and severely damage, watersheds and riparian areas, increase erosion and sedimentation, and degrade large segments of fishery habitat.

Beyond the effects of sediment from vegetation management, fisheries and aquatic species can be impacted by a reduction of streamside vegetation. A reduction in streamside vegetation can increase average annual and average daily stream temperatures by reducing shade and decreasing the recruitment of large woody debris in streams. Overhanging vegetation provides cover for fish and helps cool stream temperatures. Large woody debris recruitment is important because it dissipates erosive stream energy, regulates sediment movement downstream, provides nutrients, and creates pools important to aquatic species.

Threatened or Endangered Species - Generally, in terms of impacts related to vegetation management, impacts under all of the alternatives would be similar. This is because all of the alternatives would be similar (only 1,800 acres separate Alternative D, which would propose the greatest levels of vegetative treatment, and Alternative C, which would propose the least amount of harvesting). Vegetation management would result in minor adverse impacts to the bonytail chub, Colorado pikeminnow, humpback chub, and razorback sucker in the lower San Juan and Dolores Rivers. The impacts would be mainly due to upstream sediment and stream temperature impacts on downstream fishery habitat.

Sensitive Species - Under all alternatives, the impacts related to vegetation management may adversely impact specific individuals of the species. However, they would be minor for the population of the roundtail chub, flannelmouth sucker, bluehead sucker, or Colorado River cutthroat trout. This is because all of the alternatives would be similar (only 1,800 acres separate Alternative D, which proposes the greatest levels of vegetative treatment, and Alternative C, which proposes the least amount of harvesting). The impacts are driven by sediment and stream temperature influences on fishery habitat quality.

MIS/Common Cold-Water Fish - Under all of the alternatives, aquatic ecosystems would be protected. However, the residual risk of adverse consequences to these trout species would increase with higher harvesting and treatment levels. The potential for impacts to brook, brown, cutthroat, and rainbow trout would be proportional to the harvesting or treatment acres per year. Alternative D proposes more treatment acres than would any of the other alternatives; therefore, it would result in the highest risk of potential adverse impacts to aquatic species related to vegetation management. Under all of the alternatives, the impacts related to vegetation management on these trout species would vary from minor to moderate. Risk and consequence would depend upon a variety of factors, including the type of harvesting or treatment, as well as on the location of such treatments relative to stream system. Due to their widespread distribution and abundance, the viability of these fish populations would not be threatened under any of the alternatives.

DLMP/DEIS Alternatives: Overall, the impacts related to vegetation management of fisheries would be minor, with some localized impacts. Alternative D would result in a greater potential for impacts to fisheries and aquatic habitat because it proposes the largest amount of vegetation treatment acres than would any of the other alternatives. The impacts to fisheries would be mainly due to sediment and stream temperature influences.

Impacts Related to Fishery, Watershed, and Riparian Area Improvement Projects

The impacts related to fishery, watershed, and riparian area improvement projects on watershed health, stream channel function, and water quality are summarized in the Water Resources section in this Chapter. These improvement projects can result in positive outcomes for both fisheries and recreational anglers. Over the last 20 years, a variety of fish habitat improvement projects (including stream-bank stabilizations, pool forming structure placements, spawning habitat enhancement, fish barriers, and culvert replacements) have been implemented throughout the planning area. In addition, the SJPLC has assisted the CDOW in conserving and reintroducing genetically pure, wild populations of Colorado River cutthroat trout in selected streams (especially in the Hermosa Creek watershed). On occasion, and after project-level analysis and public involvement, some desired non-native fish populations have been (and are being) removed in order to favor the establishment of native fish populations (including the Colorado River cutthroat trout). In these instances, the SJPLC and the CDOW would continue to work together in order to achieve all environmental objectives.
Threatened or Endangered Species - Under all of the alternatives, improvement projects would result in no impacts to the 4 endangered trout species downstream of the planning area. This is because there would be no water depletion and no suitable habitat directly impacted.

Sensitive Species - Similar to threatened or endangered species, and in relation to all of the alternatives, improvement projects would result in no impacts to the 3 warm-water species (roundtail chub, flannelmouth sucker, and bluehead sucker) found in the Dolores, Mancos, La Plata, Animas, Florida, Los Pinos, Piedra, San Juan, and Navajo Rivers. These species would have no directly affected suitable habitat, nor would there be any water depletions. Under all of the alternatives, due to the locations of specific streams with conservation populations, and to reintroduction efforts, these improvement projects would result in no impacts, or result in beneficial impacts, to Colorado River cutthroat trout.

MIS/Common Coldwater Fish - All of the alternatives would propose annual fishery, watershed, and riparian improvement projects (including fish habitat improvement, erosion control, stream restoration, riparian/lake/fen treatments, or road decommissioning). Alternative C proposes the greatest number of total treatments per year; therefore, it would result in the greatest overall benefit to brook, brown, cutthroat, and rainbow trout. Occasionally, where a reintroduction project for a Sensitive Species occurs, these common coldwater trout species may be removed from certain drainages. Under all of the alternatives, due to their widespread distribution and abundance, the viability of these fish populations would not be threatened.

DLMP/ DEIS Alternatives: Under all of the alternatives, with regard to threatened and endangered species, or to warm-water Sensitive Species, improvement projects would result in no impacts. This is because there would be no water depletion and no suitable habitat would be directly impacted. With regard to Colorado River cutthroat trout and MIS/common cold-water trout, Alternative C would result in the greatest benefits related to improvement projects, followed by Alternatives D, B, and A (due to the amount of stream miles or acres impacted or structures proposed).

CUMULATIVE IMPACTS

Actions taken to implement any of the alternatives, along with past, present, and foreseeable future activities undertaken within the planning area (or other nearby jurisdictions, including local, State, Native American tribal, and other Federal; as well as private) could result cumulative impacts. The cumulative impacts analysis covers the implementation time-frame of the approved LMP (10 to 15 years) and includes lands (within or downstream of the planning area) contained in all 5th level, hydrologic unit code boundaries. (An example would be watersheds roughly the size of Hermosa Creek or Piedra River watersheds.) A synopsis of key cumulative impacts on water quantity, water quality, and water-dependent ecosystems is provided in the Water Resources section of this Chapter, and is not repeated here.

Threatened or Endangered Species

As a result of past local and regional cumulative impacts, the bonytail chub, Colorado pikeminnow, humpback chub, and razorback sucker found in the San Juan and Dolores Rivers downstream of the planning area are federally listed as endangered species. Under all of the alternatives, the primary adverse cumulative impacts on these species would occur as the result of activities that lead to further water depletions and reduced stream-flows, as well as to subsequent reduced or eliminated fishery habitat, increased stream temperatures, and reduced dissolved oxygen levels. These activities would be mainly related to water use and development projects, or to oil and gas development from current and projected new leases on or off the planning area. Due to heightened concerns about sediment and salinity inputs and subsequent downstream impacts to fishery habitat quality, ground-disturbing activities (including new road construction and mining) in the Dolores River watershed may also adversely impact these endangered species. Since the exact details for these projects and activities are presently unknown, the impacts continue to be speculative. Consultation with the USFWS is frequently required for many project-level activities within the planning area, and would always be required for projects and activities with proposed water depletions.

Sensitive Species

As the result of past local and regional cumulative impacts, the roundtail chub, flannelmouth sucker, and bluehead sucker are USFS and BLM Sensitive Species. Under all of the alternatives, the primary adverse cumulative impacts on the 3 warm-water species (roundtail chub, flannelmouth sucker, and bluehead sucker) found in the Dolores, Mancos, La Plata, Animas, Florida, Los Pinos, Piedra, San Juan, and Navajo Rivers may occur as the result of activities that lead to additional water depletions and reduced stream-flows (i.e., reduced or eliminated fishery habitat that is available for use). These activities would be mainly related to water use and development projects, or to oil and gas development from current and projected new leases on or off the planning area. Due to heightened concerns about sediment and salinity inputs and downstream impacts on fishery habitat quality, ground-disturbing activities (including new road construction and mining) in the Dolores or Mancos River watersheds may also adversely impact the flannelmouth sucker. The flannelmouth sucker appears to be more at risk than the roundtail chub or bluehead sucker under all of the alternatives; therefore, activities on or off the planning area could contribute to adverse impacts. However, since the exact details for these projects and activities in the Dolores or Mancos River watersheds are presently unknown, the impacts continue to be speculative.

As the result of past local and regional cumulative impacts, the Colorado River cutthroat trout is a USFS and BLM Sensitive Species. Like the other sensitive species, the primary adverse cumulative impacts, under all of the alternatives, would occur as a result of activities that lead to further water depletions and reduced stream-flows (i.e., reduced or eliminated fishery habitat for use). Depending upon the location of ground-disturbing activities, the cumulative impacts of sedimentation may range from minor to moderately adverse for certain stretches of stream habitat and individual fish. In order to help avoid Federal listing, the SJPLC will focus the majority of its fishery habitat improvement efforts toward the recovery of the Colorado River cutthroat trout.

Management Indicator Species/Common Coldwater Fish

The cumulative impacts related to land management activities resulting in water depletions, stream-flow reductions, fishery habitat elimination, water temperature increases, sedimentation additions, or fishery habitat degradation in relation to brook, brown, cutthroat, and rainbow trout would be confined to specific stretches of stream habitat and/or localized populations. Due to their widespread distribution and abundance, their viability would not be threatened under any of the alternatives. Therefore, no alternative is expected to result in substantial cumulative impacts to any common cold-water trout species.