

The following section supplements the analysis found in Chapter Three, [Section 3.4 - Aquatic Ecosystems and Fish Species](#) of the Draft EIS on page 3.59, “Impacts Related to Oil and Gas Leasing.”

DIRECT AND INDIRECT IMPACTS

As described in the Draft EIS, the potential impacts to aquatic ecosystems and fish species from oil and gas leasing and development include the effects from water depletion and some reduced stream flows, erosion and sediment deposition, salinity and water contamination. The major river basins primarily affected by the projected development of the GSGP are the Dolores and San Juan River Basin. Impacts to Threatened or Endangered Species and Sensitive Species (TES), and Management Indicator Species (MIS)/common cold water fish within these basins are described below.

Developing the GSGP could increase the magnitude of impacts and concerns for fisheries. Substantial quantities of water are projected to be used in the drilling, fracturing, and completion process for GSGP development (see Table S-3.4.1). GSGP gas wells in the Paradox Basin would use, approximately 7.9 to 13.1 acre-feet per well of water in the well drilling and completion process. This level of water consumptions is 6 to 11 times the amount of water used to drill and complete a conventional gas well, and 11 to 18 times the amount of water used to drill and complete a coalbed methane gas well. It is assumed that all water associated with GSGP gas development and production would have to be purchased and trucked into the project area, as the water would not be obtained from water sources on public land. The sources of this private water are unknown, but would occur within the San Juan River Basin and Dolores River Basin. Since this water is connected to a Federal action, it is considered a depletion from a major river basin, and would require preparation of a biological assessment and coordination and consultation with the U.S. Fish and Wildlife Service (USFWS) for threatened and endangered species (T&E), under Section 7 of the Endangered Species Act (see Table S-3.4.2).

Water can also be depleted during gas field production. For the GSGP, small quantities of water are produced or pumped from the gas producing formation(s) in order to release the pressure on the gas tied-up in the seam and allow it to flow. In some cases as wells are drilled and the formation(s) fractured, groundwater may be connected to surface water streams. With the large number of gas wells proposed in the GSGP (see Table S-3.4.2), the amount of produced water removed may reduce some stream-flows in stream systems with warm-water sensitive fisheries or tributary to downstream TES fishery streams. Because of difficulties in quantifying effects on stream-flow, water depleted due to gas field production was not estimated.

Decreased stream-flows may impact aquatic habitat and fish populations by reducing, or eliminating both the extent and quality of suitable habitat by increasing stream temperatures, and subsequently, by reducing dissolved oxygen levels. Such impacts may be more pronounced during periods of natural cyclic flow reductions during fall and winter or during summer months during periods of drought. A loss of stream-flow can also reduce a stream’s ability to transport sediment downstream and result in increase deposition which, in turn, can impact the numbers and diversity of benthic macro invertebrates and ultimately, aquatic habitat.

Table S-3.4.1 - Projected Water Used in Well Drilling, Fracturing, and Completion (Acre-Feet) for the GSGP over a period of 15 Years for USFS lands, BLM lands and Non-Federal Leases under Alternative A

	Unleased Lands	Leased Lands	Non-Federal Leases	Total
GSGP Only	5,450	3,022	6,501	14,973

Table S-3.4.2 – Projected Number of Gas Wells and Water Used in Well Drilling, Fracturing, and Completion (Acre-Feet) for the GSGP over a period of 15 years by Major River Basin for USFS lands and BLM lands under Alternative A

	Unleased Lands	Unleased Lands	Leased Lands	Leased Lands
	Dolores River Basin	San Juan River Basin	Dolores River Basin	San Juan River Basin
USFS				
Number of Wells	432 Wells	23 Wells	110 Wells	--
Water Depletion (Acre-Feet)	3,709 A-F	193 A-F	946 A-F	--
BLM				
Number of Wells	143 Wells	37 Wells	218 Wells	24 Wells
Water Depletion (Acre-Feet)	1,228 A-F	320 A-F	1,875 A-F	201 A-F

Clearing of drill pads and roads and their continued use can expose soil to both wind and water erosion. Given the number of well pads and roads projected in the GSGP, consequential sedimentation of streams and still water bodies could have the potential to impact fishery and aquatic resources (see Table S-3.4.3). These impacts may be more pronounced in the GSGP because of the number of sensitive watersheds with sediment and salinity concerns that may be upstream of warm-water sensitive fisheries or T&E (see Table S-3.3.2 and Table S-3.3.4 in the Water Section). Eroded material may be delivered to streams as fine sediment and deposited in channels or transported downstream. The actual amount of sediment from these land disturbing activities that reaches stream channels or still water bodies would be a result of numerous factors including the location of roads, number of road/stream crossings, slope steepness and length, amount of exposed soil, type of vegetation in the area, frequency and intensity of rainfall, soil type and the implementation and effectiveness of BMPs. Sediment loads, above background levels, 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 in roads can also act as fish barriers on key streams or exacerbate erosion and cause head-cutting. Elevated salinity levels, over extended periods of time, may become toxic for aquatic ecosystems and fish species.

Table S-3.4.3 - Projected Surface Disturbance (in acres) for Gas Well Development in the GSGP Over a period of 15 Years for USFS lands, BLM lands and Non-Federal Leases under Alternative A

	Unleased Lands	Leased Lands	Non-Federal Leases	Total
GSGP Only	2,059	1,166	3,030	6,255

Measures have been developed to address potential aquatic impacts from surface disturbance. Where gas facilities are developed within the GSGP, soil erosion and sediment deposition, and corresponding potential to impact aquatic and riparian habitat would be limited by implementing lease stipulations that require avoidance of sensitive, erosion prone areas and riparian areas, and secondly by the application of BMPs that include, for example: graveling road surfaces to avoid dust and loss of soil to wind erosion; re-vegetating or covering any soil stockpiles that would remain for extended periods to avoid significant wind and water erosion; installing slope breaks and silt fences on slopes to slow and filter storm water runoff that might carry exposed soils to surface water drainages; timely reclamation of disturbed areas to minimize erosion after construction of facilities; and avoiding locations having highly erosive soils where possible. Non-productive wells would also be immediately reclaimed.

Another potential impact to fisheries from the projected gas development and production would be the potential for various chemical leaks and spills. This impact has been addressed previously in Section 3.3 - Water of this Supplement.

In regard to air quality (as described Section 3.1 of this document), the effects on aquatic ecosystems and fish species would be negligible over the life of the plan. The air analysis was focused on the entire unit, not just the GSGP. It is a modeling effort with many assumptions, including the GSGP, as depicted in the RFD. The potential impacts of nitrogen loading or sulfur dioxide deposition to lakes, streams, and the aquatic ecosystems and fish species would be a very slow and prolonged process. It would probably be difficult to detect any measureable effects on aquatic ecosystems beyond the life of the plan.

Alternative Comparison: GSGP development impacts to fisheries vary as a function of the stipulations applied and to the amount of gas development projected under each alternative. Alternatives A, B, C, and D are generally similar in terms of the amount of development projected due to the management area emphases applied to prospective development areas. The lease stipulations that mitigate impacts to aquatic ecosystems and fish species are the same in Alternatives B, C, and D. The stipulations under Alternative A are not as protective. Quantitatively and qualitatively, Alternative A could result in the most impacts to aquatic habitat followed in order by Alternatives D, B and C. Note that due to the narrow geographic scope of this Supplement (GSGP area only), this analysis is based on a subset of the complete, reasonable range of management alternatives developed for the entire planning area as presented jointly in this Supplement and the Draft LMP/EIS; therefore, the range of proposed management presented in this Supplement does not represent the full range of alternatives or impacts.

Under the No Lease Alternative, potential impacts to endangered, sensitive, and MIS fish species could result from developing existing leases only, which is approximately 635 gas wells less and 406 well pads fewer than Alternative A, and generally the other alternatives, and therefore would have the least impact to aquatic ecosystems and fish species.

Threatened or Endangered Species: 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. The impacts from gas leasing and development in the GSGP are similar for all alternatives. The impacts to these endangered fish species may be minor to moderately adverse downstream of development due mainly to water depletions from gas development and production, some reduced stream-flows, and some reduced fishery habitat. Despite large quantities of water used in the drilling, fracturing, and completing of gas wells in the GSGP, much of this private water may be already considered as losses to these major river basins through high evaporative losses during irrigation and other consumptive uses. There would be concerns in the sensitive HUC 6 Watersheds (see Table S-3.3.2 and Table S-3.3.4 in the Water Section of this document) with salinity issues, high road densities, and sensitivity to disturbance, resulting in higher salt concentrations in streams and increased sediment impacts. We will

coordinate with the USFWS and rely on their recovery programs in these major river basins for guidance with proactive management to minimize effects.

Sensitive Species: The sensitive fish species that would be potentially impacted by development of the GSGP include the roundtail chub, flannelmouth sucker, and bluehead sucker found in the major rivers and streams at the lower elevations of the planning area. The impacts from GSGP leasing and development would be similar under all alternatives and could result in minor to moderately adverse impacts, depending on the location of the specific downstream populations. Impacts would be as described for T&E and the impact mitigation approaches contained in leasing stipulations, standards and guidelines, and BMPs would be implemented. We would work cooperatively with the Colorado Division of Wildlife (CDOW) to develop proactive management programs to minimize adverse effects to these warm-water sensitive fish species.

MIS/Common Cold-Water Fish: Generally, the impacts could vary from minor to moderate, depending on the well pad and road location, for brook, brown, cutthroat, and rainbow trout. The greatest potential for impacts to coldwater trout would occur immediately downstream from areas of gas development. The impacts would be primarily due to water depletions, some reduced stream-flows and commensurate reduced fishery habitat available for use, sediment production, and salinity concerns. Alternative A would present the greatest risk to brook, brown, cutthroat, and rainbow trout because it has the least restrictive stipulations relative to the other alternatives. Alternatives B, C, and D would have more protective lease stipulations than Alternative A as described above, and commensurately less potential to impact fisheries. Under all of the alternatives, the viability of common coldwater fish would not be threatened due to their widespread distribution and abundance.

CUMULATIVE IMPACTS

In addition to two tables (S-3.3.2 and S-3.3.4) in the Water Section of this Supplement, the three tables above in the Aquatics Section are based on the development scenario in the 2009 Addendum to the RFD and the projections for gas development for Alternative A, and quantify the factors that would lead to cumulative effects to fisheries and aquatic resources in the GSGP. Table S-3.4.1 displays the projected acre-feet of water that would be used over 15 years for both future and existing leases on both USFS and BLM public lands, and on non-Federal leases. Table S-3.4.2 displays the projected number of gas wells and acre-feet of water that would be used over 15 years by major river basin for both future and existing leases on both USFS and BLM public lands. Table S-3.4.3 describes the surface disturbance (in acres) on both future and existing leases on USFS and BLM public lands, and on non-Federal leases. While these numbers are based on Alternative A, they would only be slightly less for Alternatives B through D; and approximately three-quarters (3/4) less for the No Lease Alternative.

Threatened or Endangered Species and Sensitive Species: 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 due to past local and regional water development activities and their cumulative impacts. Under the alternatives, adverse cumulative impacts on these species would occur primarily as the result of activities, including gas development and production that lead to further water depletions and some reduced stream-flows, as well as to subsequent reduced or eliminated fishery habitat, increased stream temperatures, and reduced dissolved oxygen levels. Private mineral estate development may add an additional 750 wells to those projected for development on federal mineral estate for the GSGP.

Due to the heightened potential for sedimentation and salinity resulting in downstream impacts to fishery habitat quality, ground-disturbing activities, including new well pad and road construction for gas development in the sensitive HUC 6 Watersheds (see Table S-3.3.2 and Table S-3.3.4 in the Water Section of this document), may also adversely impact endangered fish species. Since specific details for these projects and activities are presently unknown, the impacts continue to be speculative. Preparation of a biological assessment and coordination and 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 potential water depletions, prior to agency decision-making. Stipulations and BMPs for oil and gas development should reduce the potential for measurable sedimentation. Cumulative impacts to warm-water sensitive fish species (roundtail chub, flannelmouth sucker, and bluehead sucker) at the lower reaches of the planning area would be generally as described for threatened or endangered fish species.

MIS/Common Cold-Water Fish: The cumulative impacts related to land management activities resulting in water depletions, some stream-flow reductions, fishery habitat elimination, water temperature increases, sedimentation and salinity 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, these species 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.