BIOLOGICAL EVALUATION FOR SAN JUAN NATIONAL FOREST AQUATIC SENSITIVE SPECIES AND MANAGEMENT INDICATOR SPECIES

Weminuche Landscape Grazing Analysis,

San Juan National Forest, Columbine Ranger District

Hinsdale, La Plata and San Juan Counties, Colorado

Introduction and Summary of Findings:

The purpose of this Biological Evaluation (BE) is to evaluate the effects of potential changes to domestic livestock grazing operations in the Weminuche Landscape on aquatic Sensitive Species and Management Indicator Species (MIS) located on the San Juan National Forest (SJNF). Upon completion of the analysis provided in this review, I have determined that the proposed project will not alter current population trends or habitat trends on a Forest wide scale for MIS fish species. Sheep grazing associated with this project may impact individual Colorado River Cutthroat Trout (Sensitive Species) but is not likely to result in a loss of viability in the planning area, cause a trend toward federal listing, or loss of species viability rangewide. Cattle grazing associated with this project will have no impact to Colorado River Cutthroat Trout populations within the analysis area. This project has no impacts to other sensitive fish species.

Project Information:

Location:

The Weminuche Landscape is located Hinsdale, La Plata and San Juan Counties, Colorado. The area is located northeast of Durango in Townships 36-40 North, Ranges 4-9 West, N.M.P.M., and is within the Columbine Ranger District of the San Juan National Forest (see Figure 1, below). Most of the Weminuche Landscape analysis area is within the congressionally designated Weminuche Wilderness, the largest single wilderness area in the state of Colorado.

The Weminuche Landscape includes about 166,627 acres, of which about 162,599 acres (98%) is National Forest System (NFS) land. The remaining 4,028 acres are split out between Durango Reservoir Grant lands (City Reservoir) at 2,962 acres, and private lands at 1,066 acres. On National Forest System lands, 85% of the analysis area is in the Weminuche Wilderness.

Within the Weminuche Landscape, domestic sheep grazing is currently permitted on about 57,983 acres (36%) of National Forest System lands in 6 active allotments (Burnt Timber, Canyon Creek, East Silver Mesa, Spring Gulch, Tank Creek, and Virginia Gulch), and 7 vacant allotments (Cave Basin, Fall Creek, Flint Creek, Johnson Creek, Leviathan, Pine River, and Rock Creek).

The majority of the Weminuche Landscape analysis area is located west and south of the Continental Divide, in extremely rugged and colorful volcanic mountains, with elevations ranging from about 7,200 feet to 14,100 feet. The Florida and Pine Rivers as well as Vallecito Creek have their headwaters in the analysis area. The analysis area is principally alpine tundra, mountain grassland, and spruce-fir forest. There are smaller areas of aspen, mixed conifer, ponderosa pine, and mountain shrub communities. Cirques and talus slopes, along with numerous streams, fens, and lakes add diversity to the rugged landscape.

Various sections of roads and trails may be used for trailing livestock. Some of these trailing routes are outside the Weminuche Landscape but they have been included in this analysis because they are integral to the function and effective management of the Landscape's allotments.

The trailing routes include the following:

> U.S. Hwy 160, County Roads 151, 172, 240, 243, 318, 319, 421, 501, 502, 521, 523, 527, Forest Roads #076 (Red Rim #2), #081 (Lime Mesa), #595 (Red Rim), #597 (Endlich Mesa), #602 (Pine River), #682 (Missionary Ridge), #724 (Middle Mountain), #775 (Saul's Creek), and sections of the Pine River Trail #523, Vallecito Creek Trail #529, Cave Basin Trail #530, Young's Canyon Trail #546, and Lime Mesa Trail #676. This analysis also includes a pre-existing right of way across MacDonald Becket Family Trust properties, and their successors, for access to the Canyon Creek allotment and cattle allotments in an adjacent Landscape (Missionary).

Purpose and Need:

The purpose of this action is to administer term livestock grazing on all or portions of the Weminuche Landscape in such a manner that will meet or move existing resource conditions toward desired conditions, and be consistent with the Forest Plan direction, standards and guidelines. The site-specific need for those areas where desired conditions are currently being met is to maintain or improve current conditions. The site-specific need for change for those areas which are *not* meeting or moving toward desired conditions is to bring existing conditions up to, or moving towards the desired conditions in a timely manner.

Proposed Action:

The proposed action is to authorize domestic sheep or cattle grazing on all or portions of Federal lands in the Weminuche Landscape through an adaptive management process (see Alternative 4 below) that will meet or move resource conditions toward desired conditions and be consistent with Forest Plan standards and guidelines. The proposed action will not authorize nor analyze grazing on non-federal lands which are intermixed with USFS lands across the Weminuche Landscape.

Four alternatives are being evaluated by the Environmental Impact Statement (EIS) which are summarized below. A more detailed description of the four alternatives, desired resource conditions, design criteria of both a specific and general nature can be found in the EIS. Additional boundary adjustments and other administrative changes associated with this project can be found in the EIS.

Alternative 1 – No Grazing whereby domestic livestock grazing would not be reauthorized on these allotments.
Alternative 2 – Current Management involving traditional livestock management using a predefined number of livestock (domestic sheep only) and specific grazing dates and allotment configurations.
Alternative 3 – Adaptive Management with Forage Reserves. Continue to permit domestic livestock grazing on NFS lands by incorporating a variety of Adaptive Management strategies. Adaptive Management strategies are "tools" or management actions designed to maintain suitable resource conditions, or move unacceptable resource conditions towards desired conditions. Adaptive Management is designed to be flexible in regards to livestock numbers,

type of livestock and season dates. Alternative 3 would reissue six term sheep grazing permits on the following currently active allotments: Burnt Timber, Canyon Creek, Endlich Mesa, Spring Gulch, Tank Creek, and Virginia Gulch. Three Allotments (Johnson, Leviathan, and Rock) would be open for sheep grazing as Forage Reserves, and part of the Cave Basin Allotment would be open for cattle grazing as a Forage Reserve.

Alternative 4 – Proposed Action – Adaptive Management/Closing Vacant Allotments. The proposed action is to continue to permit livestock grazing by incorporating adaptive management strategies on six active allotments: Burnt Timber, Canyon Creek, Endlich Mesa, Spring Gulch, Tank Creek and Virginia Gulch. Alternative 4 proposes to authorize sheep grazing in all six active allotments (Figure 2) and authorize cattle grazing in all or portions of four currently active domestic sheep allotments: Burnt Timber (all of the allotment), Endlich Mesa (southern third of the allotment), Spring Gulch (all of the allotment), and Tank Creek (southern half of the allotment) (Figure 3).

Boundary adjustments would be made to eliminate mapped overlap between domestic sheep and bighorn sheep ranges, more accurately reflect natural boundaries, and better reflect actual domestic sheep usage on the ground. As part of the boundary adjustments, the western most parts of Tank Creek and Canyon Creek would be closed to grazing except for livestock trailing to reach the allotments.

Cave Basin, Flint Creek, Johnson Creek, Leviathan, Pine River, Rock Creek, and most of Fall Creek Allotments would be closed to all livestock grazing.

Alternative 4 would also include monitoring and a variety of "tools", or adaptive management actions, to meet or move towards desired resource conditions. Adaptive Management is designed to be flexible in regards to livestock numbers, season dates, and class of livestock. Also included in Alternative 4 are specific actions included in Site-Specific Design Criteria, and other general Design Criteria as described in *Chapter 2* of the associated EIS.

Field Reconnaissance:

Hydrologic, stream geomorphology, and riparian condition data have been collected by the USFS in support of this project. These data can be obtained by request to the Columbine Ranger District office in Bayfield, CO.

Fish population surveys have been conducted within the project area by the Colorado Parks and Wildlife and the USFS. The results of these surveys are also available by request to the Columbine Ranger District office in Bayfield, CO.

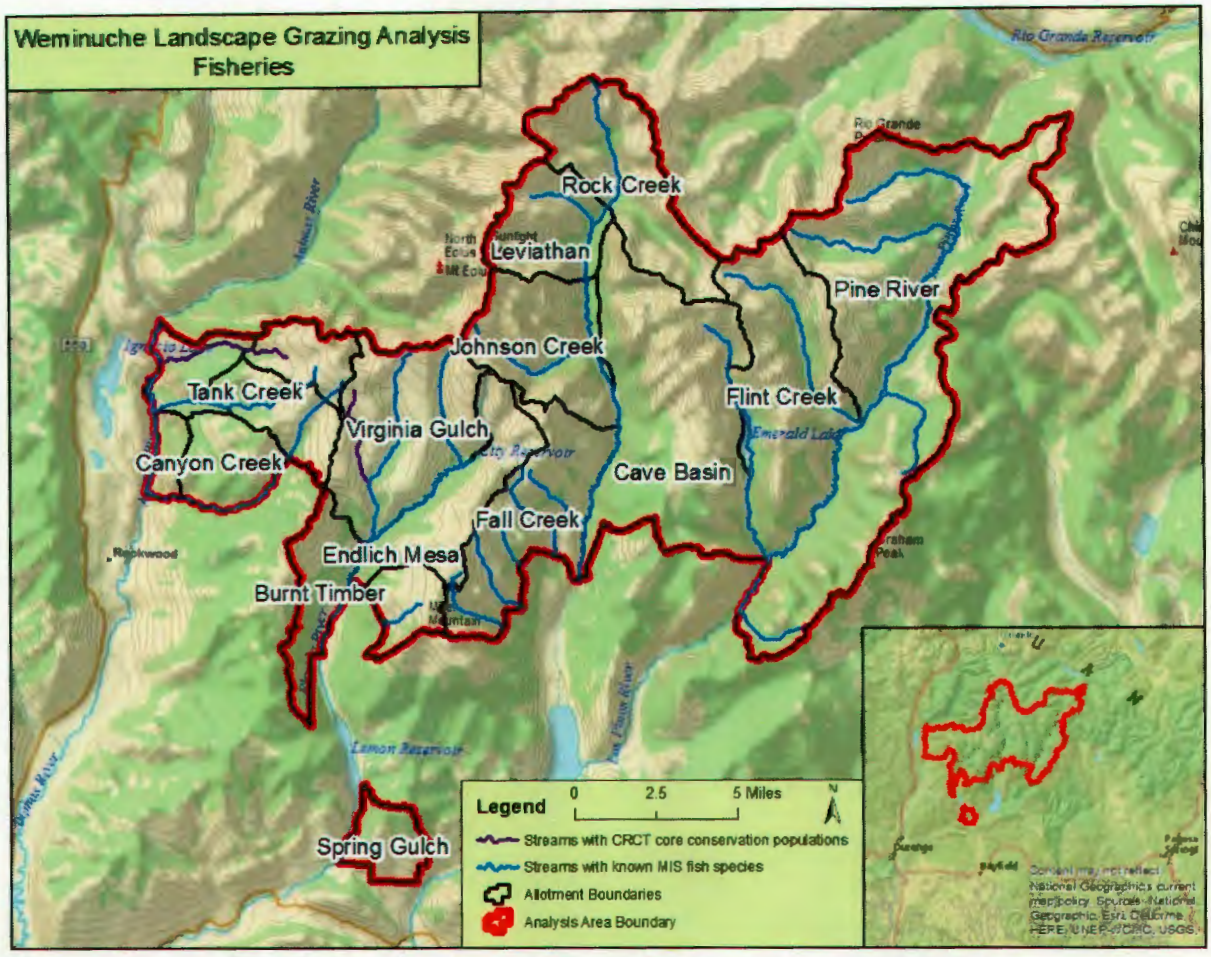

Figure 1. Known fish resources within the analysis area boundary of the Weminuche Landscape Grazing Analysis.

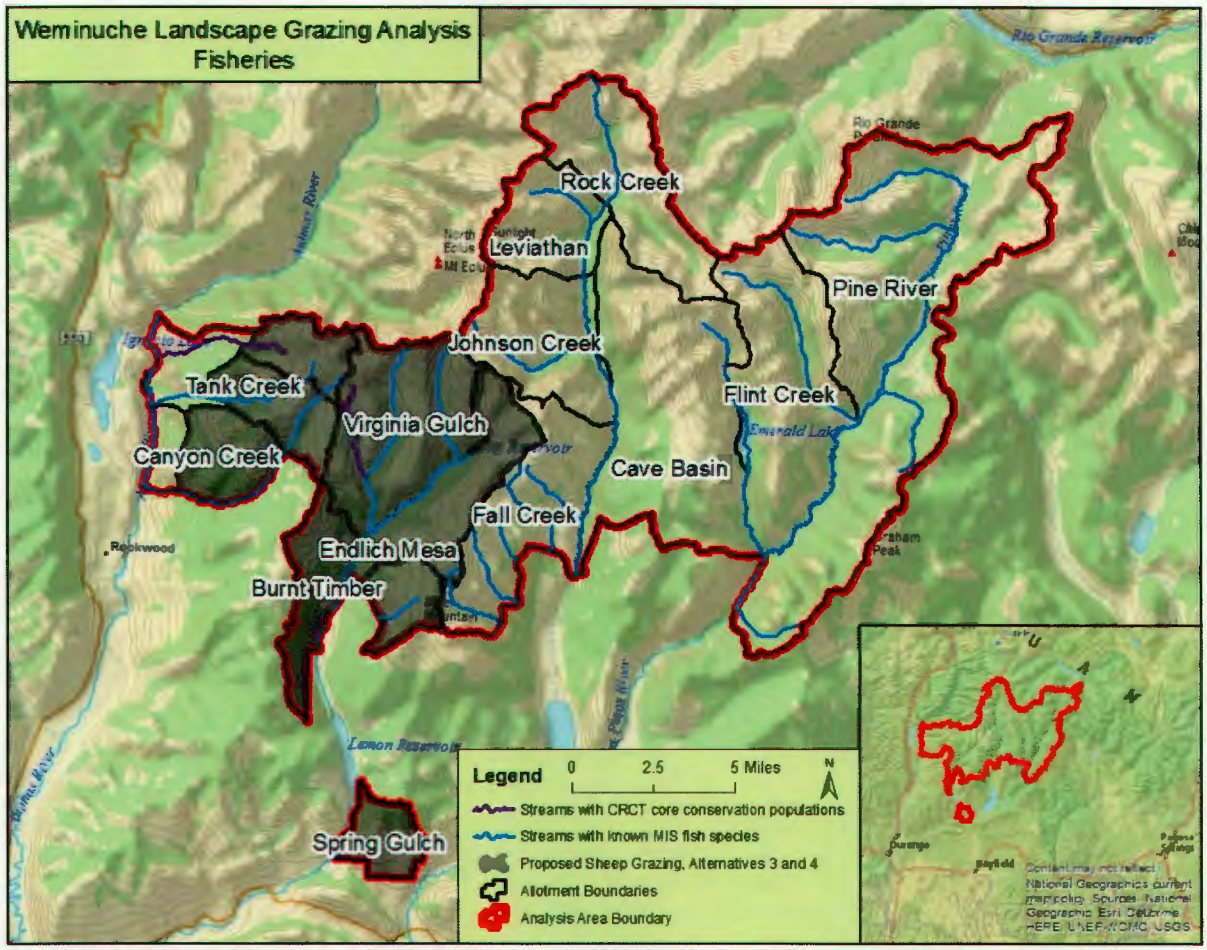

Figure 2. Proposed sheep grazing in Alternatives 3 and 4 and known fish resources within the analysis area boundary of the Weminuche Landscape Grazing Analysis.

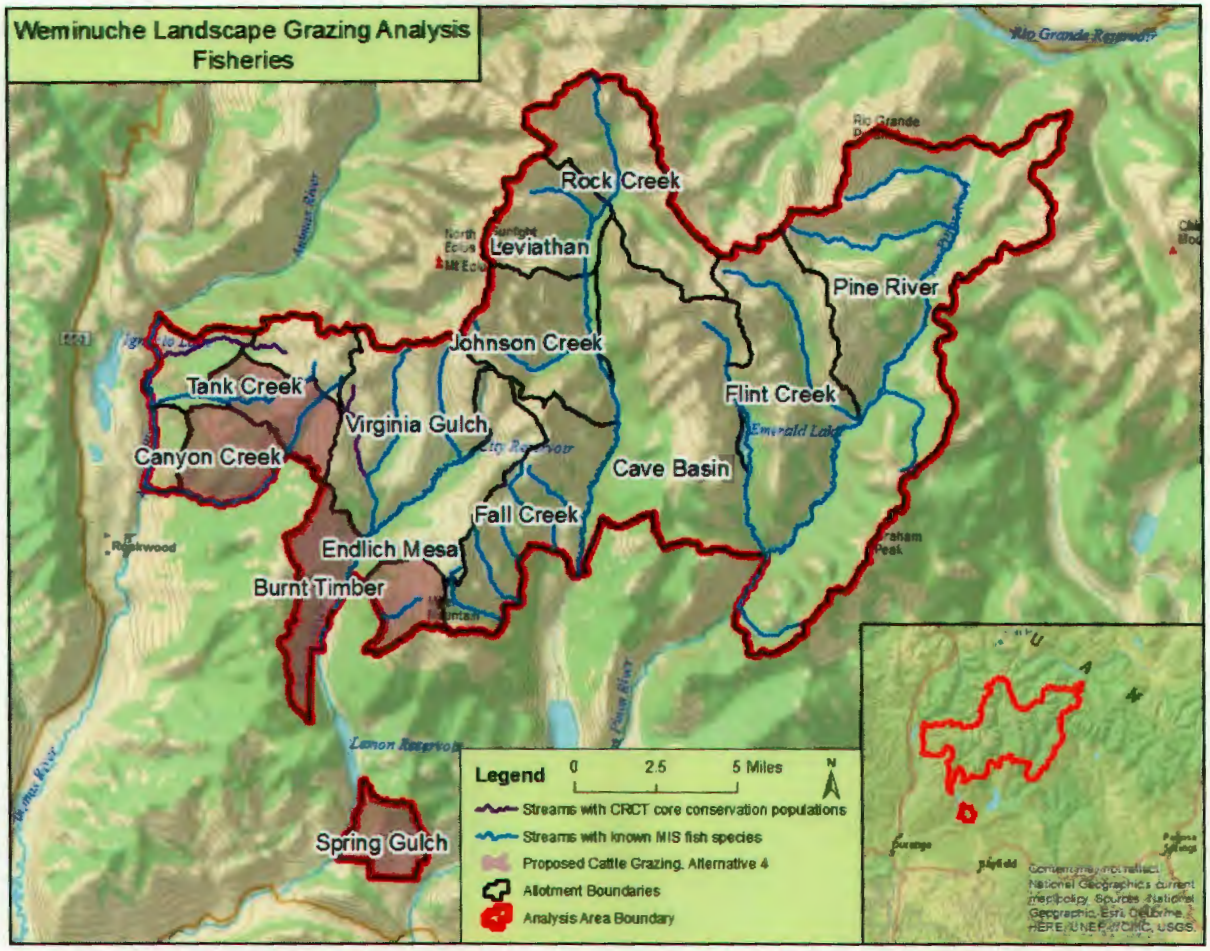

Figure 3. Proposed cattle grazing in Alternative 4 and known fish resources within the analysis area boundary of the Weminuche Landscape Grazing Analysis.

Background:

Threatened and Endangered Species:

In 2014, a Biological Assessment (BA) was prepared to assess the effects of the proposed project on Colorado Pikeminnow (Ptychocheilus lucius), Razorback Sucker (Xyrauchen texanus), Bonytail (Gila elegans) and Humpback Chub (Gila cypha) (Schultz, Kampf and Gerhardt 2014). Federally listed species addressed in the BA are from the most recent list received from the USFWS (USDI Fish and Wildlife Service 2011). There are no species proposed for listing under ESA, nor is there any designated critical habitat for any listed species in the project area. The process used to evaluate the potential effects the proposed action could have on threatened, endangered, or proposed species is described in the U.S. Fish and Wildlife Service's endangered species consultation handbook (USDI Fish and Wildlife Service 1998).

Activities that result in water depletions on the Forest lands can have an adverse effect on the **Colorado Pikeminnow** and **Razorback Sucker**, which reside in rivers downstream from the analysis area. Known water depleting activities which include the construction and maintenance

of stock ponds associated with the Weminuche Landscape Grazing Analysis were assessed in the Biological Assessment for Federally Listed Terrestrial and Aquatic Species for the Weminuche Landscape Grazing Analysis and are not considered in this report (Schultz, Kampf and Gerhardt 2014).

No water developments are proposed for sheep grazing in the Analysis Area. In the event cattle grazing is authorized in the Spring Gulch Allotment, Burnt Timber Allotment, Canyon Creek Allotment, and portions of the East Silver Mesa and Tank Creek Allotments identified as suitable cattle grazing in Figure 3 additional water developments may be needed in the future. Water depletions associated with these water developments will be assessed as necessary when defined as they are not part of this action.

Greenback Cutthroat Trout are not located within the analysis area and will not be impacted by the project and therefore the proposed project would have **"no effect"** to this species.

Sensitive Species:

U.S. Forest Service identifies Sensitive Species for each Forest within the Rocky Mountain Region to ensure these species receive added consideration and avoid future declines in abundance and distribution and avoid Federal listing as threatened or endangered (Forest Service Manual 2600, Chapter 2670, Rocky Mountain Region; Supplement No. 2600-2011). Eight criteria were considered and evaluated to determine whether species merited Sensitive status in the Region (R2 Supplement 2600-2011-1, 2672.11 Exhibit 01). These criteria included 1) geographic distribution within the Region, 2) geographic distribution outside the Region, 3) capability of the species to disperse, 4) abundance of the species in the Region, 5) population trend in the Region, 6) habitat trend in the Region, 7) vulnerability of habitats in the Region, and 8) life history and demographic characteristics of the species. Application of these criteria resulted in the Regional Foresters list of Sensitive Species in the U.S. Forest Service Rocky Mountain Region, effective August, 2013.

For the SJNF, four fish species are designated as sensitive: Colorado River Cutthroat Trout (CRCT), Flannelmouth Sucker, Bluehead Sucker and Roundtail Chub. Of these four species, only CRCT is known to occur within the project area and has the potential to be impacted by this project. The Bluehead Sucker, Flannelmouth Sucker, and Roundtail Chub are not located in the project area and will not be affected by the proposed action and they are not included in any further analysis. Information on the habitat requirements, status, distribution, abundance and key habitat components of all Sensitive Species is on file at the Columbine Ranger District office in Bayfield, Colorado.

Colorado River Cutthroat Trout

Populations of pure CRCT are rare in occurrence with only 14 known populations occurring on San Juan National Forest System lands. Pure CRCT are managed with special regulations that require using specific tackle and immediate release of caught fish, subject to State fishing regulations. There are concerns about population viability for extant CRCT populations, primarily due to small population numbers and limited distribution. Native trout reintroduction

projects in recent years have increased the available habitat for CRCT with the intent of supporting population viability within San Juan National Forest Lands.

The diversity of CRCT life histories is reduced from historic levels (Young 2008). Migratory life histories were once common but have largely been eliminated due to the competition of non-native trout species located downstream of persisting CRCT populations.

Spawning by this subspecies begins after flows have peaked in spring or early summer and ends before runoff subsides. Water temperature may be a cue for spawning. Colorado River Cutthroat Trout typically spawn in gravel substrate, mean particle size from 3.7 to 30 mm. The best survival rates are found in substrates with mean particle sizes from 13.8 to 15.9 mm or larger. Redds tend to be located where velocity, depth, and bottom configuration induce water flow through the stream substrate. Redds are generally located where the water is between 11 and 18 cm deep and nose velocity is 15 to 35 cm per second. Fry (young-of-year) feed principally on aquatic and terrestrial macroinvertebrates. In addition to macroinvertebrates, adult Cutthroat Trout also prey on other fish species, including other species of trout (Young 2008).

Emergence generally occurs in late summer depending on elevation and annual climatic variation. Fry summer microhabitats are usually deeper than 3 cm and water velocity is slower than 6 cm per second. Woody debris, boulders, and rootwads shelter these sites from higher flows (Young 2008).

Declines in native Cutthroat Trout populations are attributed to a number of factors, including overharvest, habitat degradation, habitat fragmentation, and especially the introduction of non-native fishes. Brook and Brown trout introductions into Cutthroat waters almost always lead to the replacement of Cutthroat Trout due to increased competition for available resources. The Cutthroat will readily hybridize with the Rainbow Trout and among the other various subspecies of Cutthroat. The result is hybrid populations of fish lacking the genetic integrity of the native forms (Young 2008).

Current Status:

Genetically pure CRCT are known to occupy 14 streams on the SJNF. Core Conservation populations of CRCT are located in two stream reaches in the analysis area, Grasshopper Creek located in the Tank Creek Allotment and West Virginia Gulch located in the Virginia Allotment. These populations are known to be Colorado River lineage CRCT and are not designated as threatened under the Endangered Species Act. A core conservation population is a conservation population that is greater than 99% genetically pure, phenotypically true, and representative of the historic genome of the native Cutthroat Trout (Hirsch et. al. 2013).

Direct and Indirect Effects:

Neither the watershed for Grasshopper Creek nor the watershed for West Virginia Creek will be authorized for cattle grazing as part of Alternative 4, the Proposed Action (Figure 3). Cattle grazing within the analysis area will have **"No Impact"** to the two CRCT populations.

Improper sheep grazing management can potentially degrade riparian and aquatic habitats in a variety of direct and indirect manners (Platts 1981, 1991). Direct effects from permitted livestock grazing to fish include directly stepping on individual fish and trampling redds. Indirect effects may include a change in riparian canopy (through livestock grazing and trampling) that could reduce shade and escape cover, reduced terrestrial invertebrate food sources, stream bank degradation, and increased sedimentation or stream widening. Additionally, livestock grazing may affect a number of other water quality parameters (See Watershed Section 3.2).

Alternative 1 would not reauthorize sheep grazing in these allotments while alternatives 2, 3, and 4 include authorization of sheep grazing in both the Tank Creek and Virginia allotments. Alternative 2 maintains current management and stock numbers in both allotments while alternatives 3 and 4 include adaptive management design criteria to reduce impacts to stream banks and water quality. Under current management, Alternative 2, the stream and riparian areas within the project area are generally in good to excellent condition as assessed by baseline Watershed monitoring (See Watershed Section 3.2) and any aquatic habitat problems within the analysis area tend to be site specific. Water quality has not been noted as a problem in any of the watersheds within the analysis area (See Watershed Section 3.2). Impacts to stream systems that represent the primary concern to CRCT core conservation populations in the Tank Creek and Virginia Allotments are associated with trailing locations that cross stream courses and livestock use in and near the stream. These impacts appear to be minimal as they are isolated and small in the analysis area under current management and would be expected to be lessened with the implementation of adaptive management under alternatives 3 and 4 by manipulation livestock numbers to achieve Desired Conditions if deemed necessary.

Alternative 1 (no grazing) would prevent direct effects associated with livestock trampling of CRCT individuals or their redds, as well as indirect effects associated with livestock grazing. Under alternatives 2, 3, and 4, sheep trailing across streams and livestock watering would continue to occur, therefore the potential for livestock to trample individual CRCT or their redds would remain a concern. It is expected that the overall influence to CRCT populations would be minimal due to the large number of redds during spawning season and sufficient numbers of individuals in the populations to ensure the persistence of both of the core conservation populations under alternatives 2, 3 and 4. Recent fish population monitoring in CRCT streams indicate that CRCT populations are viable under current management. Adaptive management strategies and design criteria (Table 1 and Table 2 respectively) that require herding sheep away from watercourses along with varying livestock numbers based on resource conditions would likely reduce but not eliminate the potential direct and indirect effects to CRCT under alternatives 3 and 4.

Implementation of Forest Plan Standards and Guidelines, adaptive management techniques as described in the EIS and project specific design criteria should effectively minimize impacts to watershed resources (See Watershed Section 3.2) and as a result should alleviate both direct and indirect effects to CRCT populations within the analysis area.

Cumulative Effects:

Anthropogenic factors such as fish stocking, water development, recreational use, mining activities, timber harvest, grazing, road and trail construction, and outfitter use likely have changed the fish population dynamics in the past within the analysis area. Additionally, natural disturbances such as wildfire, insect and disease outbreaks, landslides, floods, droughts, and climate change have and will continue to influence fish populations in the analysis area.

The primary influence to CRCT populations is the introduction of non-native fish species. Past fish stocking in the analysis area has reduced the size, connectivity, and in most cases the genetic purity and presence of CRCT populations (Young 2008). Non-native fish introductions represent the primary driver for the reduction of CRCT population size and genetic integrity in the analysis area. Efforts have been underway to re-establish CRCT in some stream reaches in the analysis area which typically consists of stocking barren waters with genetically pure CRCT; such is the case with Grasshopper Creek. It is unlikely that CRCT populations will naturally expand within the analysis area without the implementation of projects specifically designed to increase CRCT populations or numbers of individuals.

High recreational use occurs and may increase in the future within the analysis area. Fishing regulations designed to protect core conservation populations of CRCT should serve to protect these populations regardless of increased recreational use over time. Increased fishing pressure and the resulting increased stream access at trail locations may increase isolated sedimentation in the stream and reduction of streamside vegetation. These impacts are expected to be minimal to CRCT populations.

Other anthropogenic influences will likely be minimal on CRCT populations in the future due to the implementation of Forest Plan standards and guidelines and special management for core conservation populations of CRCT. Additionally, impacts would likely be minimized since the designation of the Weminuche Wilderness (Virginia Allotment) and the Colorado Roadless Rule (portions of Tank Creek Allotment) due to the lack of motorized travel and limited future development. Discussions with resource Program Leaders indicate that there are no additional projects planned in the Analysis Area that would add to the cumulative effects.

Climate change has the potential to reduce the available habitat for CRCT by increasing stream temperatures or increasing the likelihood of other disturbances such as flooding or wildfire over time within the analysis area. Increased stream temperatures may limit CRCT to shorter stream reaches at higher elevations as the lower reaches become uninhabitable by CRCT. Other disturbances such as insect outbreaks or wildfire may impact populations as they occur. The potential for these and other natural disturbances to influence CRCT populations is unknown.

Determination:

Alternative 1. Alternative 1 will have **"No Impact"** to CRCT core conservation populations.

Sheep grazing associated with alternatives 2, 3, and 4 **"May Impact Individuals, but is not likely to cause a trend towards Federal listing or result in loss of viability in the planning area"** to CRCT core conservation populations.

Cattle grazing associated with alternatives 2, 3, and 4 will have **"No Impact"** to CRCT core conservation populations within the analysis area.

Management Indicator Species:

The Land and Resource Management Plan (LRMP) for the SJNF identifies species that are to be used to assess long-term population trends and evaluate continued population viability. These species are designated as Management Indicator Species (MIS). The aquatic MIS known to occur within the project area are the Brook Trout, Brown Trout, Rainbow Trout, and Cutthroat Trout and will be analyzed collectively in this report.

Brook Trout

The Brook Trout is native to the eastern North America. It was introduced into most major drainages of Colorado during the late 1800s. The Brook Trout now occurs widely throughout much of the United States and Canada and is common within cold-water habitats in Colorado. The species is managed as a game fish and may be harvested subject to State fishing regulations. The Brook Trout's selection as a Management Indicator Species for the SJNF was because of its importance as a game species, and to some degree its potential to respond to management actions.

Brook Trout inhabit cold-water streams and lakes throughout the Rocky Mountain West. They tend to thrive in cold-water habitats of small, headwater streams. The Brook Trout has a penchant for upstream movement which can result in overpopulating headwater reaches. The result is often high densities of fish competing for limited resources, which then results in slow growth rates and stunted populations (Baxter and Simon, 1970).

Optimal water temperature for growth and survival is 10 to 14 °C, which is lower than the other three MIS trout species. Upper incipient lethal temperature ranges between 25.8 and 29.8 °C (Lee and Rinne, 1980; Brett 1952). The Brook Trout matures at an early age with some males reaching sexual maturity within the first year (McFadden, 1961). Spawning occurs during fall. As with other trout species, the Brook Trout requires cool running water and clean spawning gravels to successfully reproduce. Fry occupy quiet waters and feed principally on aquatic and terrestrial macroinvertebrates. Adult Brook Trout also prey on other fish species, including other species of trout. They can be considered the top predator in many aquatic ecosystems. The Brook Trout is known to compete effectively with other species for food and living space. They often out-compete native trout species to the point of exclusion (Beckman 1952, Behnke 2002).

Brown Trout

The Brown Trout is native to Europe and western Asia. It was introduced into most major drainages of Colorado during the late 1800s (Behnke 2002). The Brown Trout now occurs

widely throughout much of the United States and Canada (Beckman 1952) and is common within cold-water habitats in Colorado. The species is managed as a game fish and may be harvested subject to State fishing regulations. The Brown Trout's selection as a Management Indicator Species for the SJNF was because of its importance as a game species, and to some degree its potential to respond to management actions.

Brown Trout inhabit cold-water streams and lakes. In streams, they prefer deeper, lower-velocity waters with adequate cover in the form of submerged rocks, undercut banks, and overhanging vegetation. Optimal water temperature for growth and survival is 12 to 19 °C. Upper incipient lethal temperature ranges between 22 and 28 °C (Behnke 2002; Alabaster and Lloyd 1980). The species becomes sexually mature during its second to fifth year (Beckman 1952). Spawning occurs during late fall and early winter when water temperatures approach 7 °C. As with other trout species, the Brown Trout requires cool running water and clean spawning gravels to successfully reproduce. Females produce about 10,000 eggs per spawning event.

Fry occupy quiet waters and feed principally on aquatic and terrestrial macroinvertebrates. Adult Brown Trout also prey on other fish species, including other species of trout. They can be considered the top predator in many aquatic ecosystems. The Brown Trout is known to compete effectively with other species for food and living space. They often out-compete native trout species to the point of exclusion (Beckman 1952, Behnke 2002).

Rainbow Trout

The Rainbow Trout is native to the Pacific coast of North America, from Alaska to northern Mexico. It was introduced throughout many western states in the early 1800's. It is common within cold-water habitat of the Rocky Mountain west and is well distributed across the SJNF. The species is managed as a game fish and may be harvested subject to State fishing regulations. The Rainbow Trout's selection as a Management Indicator Species for the SJNF was because of its importance as a game species, and to some degree its potential to respond to management actions. Although some streams have self-sustaining populations, Rainbow Trout population levels are more likely influenced by current stocking efforts by CPW on the San Juan National Forest (USDA Forest Service, 2013).

As with other trout species, the Rainbow Trout requires cool running water and clean spawning gravels to successfully reproduce. Upper incipient lethal temperature ranges between 25.0 and 29.4 °C (Lee and Rinne, 1980). Spawning occurs primarily in May but can occur anytime between January and June, depending on water temperature. Spawning is initiated when daily water temperature exceeds 6-7 °C. Fry occupy quiet waters and feed principally on aquatic and terrestrial macroinvertebrates. Adult Rainbow Trout also prey on other fish species, including other species of trout. They can be considered the top predator in many aquatic ecosystems.

Cutthroat Trout

There are multiple subspecies of Cutthroat Trout that occupy streams on the SJNF. When considered collectively, "Cutthroats" are common and are well distributed across the SJNF. Cutthroats are managed as a game fish and most populations may be harvested, subject to State

fishing regulations. The Cutthroat Trout's selection as a Management Indicator Species for the SJNF was because of its importance as a game species, and to some degree its potential to respond to management actions.

As with other trout species, the Cutthroat Trout requires cool running water and clean spawning gravels to successfully reproduce. Spawning occurs during the spring, usually as springtime high flow start to decline (Young, 2008). Fry occupy quiet waters (velocities less than 6 cm/s) and feed principally on aquatic and terrestrial macroinvertebrates. In addition to macroinvertebrates, adult Cutthroat Trout also prey on other fish species, including other species of trout (Young 2008).

Project Effects:

Known MIS fish populations located within the analysis area are displayed in Figure 1, however there is the potential that some MIS fish are located in tributary streams or other streams and lakes within the analysis area. It is assumed that MIS fish species inhabit the entire length of perennial streams in which fish occur for the purposes of this analysis. Comprehensive fish population records within the analysis area are not maintained by the SJNF.

Improper grazing management can potentially degrade riparian and aquatic habitats in a variety of direct and indirect manners as outlined by Platts (1981; 1991). Direct effects from permitted livestock grazing to fish include directly stepping on individual fish and trampling trout redds. Indirect effects include changes in riparian canopy (through livestock grazing and trampling) that could reduce shade and escape cover or reduce terrestrial invertebrate food sources, stream bank degradation resulting in loss of spawning or pool habitat due to increased sedimentation or stream widening. Additionally, livestock grazing may affect a number of other water quality parameters (See Watershed Section 3.2).

Alternative 4, the Proposed Action, could authorize cattle grazing in all or portion of the allotments as described above. Generally, grazing cattle poses the potential for more impacts to stream systems and riparian vegetation than sheep grazing and as a result more impacts to fish populations. It is anticipated that the impacts to fish populations would be greater from cattle grazing than with sheep grazing due to the tendency of cattle to congregate in riparian areas, but the direct and indirect effects would be the same. In particular, the headwaters of Tank Creek, Canyon Creek, and McClure Canyon as well as a portion of the Florida River could be influenced by cattle grazing. While project specific design criteria may alleviate some of the impacts over time, the monitoring period is such that in the interim between when cattle are grazed and the potential direct and indirect effects are noted in the requiring monitoring some MIS fish population may be influenced by grazing activities. Cattle grazing in the watersheds where MIS fish species are located **may temporarily displace or alter how individuals use affected habitats through habitat alteration and/or disturbance, but these effects will not alter current population trends or habitat trends for MIS fish species at the project or Forest-wide scales.**

Implementation of Forest Plan Standards and Guidelines, adaptive management techniques as described in the EIS, and project specific design criteria should effectively minimize impacts to

watershed resources (See Watershed Section 3.2) and as a result should alleviate impacts to MIS populations within the analysis area and those encountered on trailing routes to the allotments. Therefore, **none of the alternatives would alter current population trends or habitat trends for MIS fish species on a Forest wide scale.**

Cumulative Effects:

Anthropogenic factors such as fish stocking, water development, recreational use, mining activities, timber harvest, grazing, road and trail construction, and outfitter use likely have changed the fish population dynamics in the past within the analysis area. Additionally, natural disturbances such as wildfire, insect and disease outbreaks, landslides, floods, droughts, and climate change have and will continue to influence fish populations in the analysis area.

High recreational use occurs and may increase in the future within the analysis area. Fishing regulations designed to protect MIS fish species should serve to protect these populations regardless of increased recreational use over time. Increased fishing pressure and the resulting increased stream access at trail locations may increase isolated sedimentation in the stream and reduction of streamside vegetation. These impacts are expected to be minimal to MIS fish populations.

Other anthropogenic influences will likely be minimal on MIS fish populations in the future due to the implementation of Forest Plan standards and guidelines. Additionally, impacts would likely be minimized since the designation of the Weminuche Wilderness and the Colorado Roadless Rule. Discussions with resource Program Leaders indicate that there are no additional projects planned in the Analysis Area that would add to the cumulative effects.

Climate change has the potential to reduce the available habitat for MIS fish by increasing stream temperatures or increasing the likelihood of other disturbances such as flooding or wildfire over time within the analysis area. Increased stream temperatures may limit MIS fish populations to shorter stream reaches in the future. Other disturbances such as insect outbreaks or wildfire may impact populations as they occur. The potential for these and other natural disturbances to influence MIS fish populations is unknown.

Comparison of Alternatives for all fish species within the Analysis Area:

Alternative 1

Under this alternative, all of the allotments and associated trailing routes would be closed to livestock grazing and the trailing routes would not be used. All of the direct and indirect effects associated with livestock grazing would be eliminated.

Alternative 2

Under this alternative, current livestock stocking rates, season dates, and pasture rotation would continue in all allotments and trailing routes would continue to be used as in the past. None of the allotments within the analysis area would be closed and could be available for livestock

grazing in the future. Adaptive management techniques would not be used resulting in direct and indirect effects to continue as they have in recent years. Site specific environmental effects would likely not improve over time. Although this alternative would likely not lead to population declines for FS Sensitive Species or MIS species, there may be more impacts to individual fish within the analysis area when compared to the other alternatives.

Alternative 3

Under this alternative, adaptive management strategies would be used to maintain and/or move towards desired resource conditions within the analysis area. Grazing permits would be re-issued on the 6 currently active allotments and the remaining allotments would be used as forage reserves, or closed entirely. Portions of some of the forage reserve allotments would also be closed. The forage reserve allotments would minimize direct and indirect effects of livestock grazing by only allowing grazing up to three out of ten years when compared to permitting these allotments by using historical stocking rates. Direct and indirect effects would be eliminated in the closed allotments and in the portions of the forage reserve allotments that will be closed. Boundary adjustments to the Tank Creek Allotment and the Canyon Creek Allotment, as described in the EIS, would alleviate some of the direct and indirect effects associated with livestock grazing by reducing the available acreage of these allotments; however the effects would be minimal. Cattle grazing in the Canyon Creek Allotment may increase stress on the riparian areas when compared to sheep grazing (See Watershed Section 3.2). The change to cattle grazing should not alter current population trends or habitat trends for MIS species on a Forest wide scale. Design criteria of both a site specific and general nature would be implemented to minimize impacts to watershed and fishery resources in all active allotments. A monitoring plan would be implemented in support of the adaptive management strategy and should also minimize negative effects to resources. For these reasons, this alternative should reduce direct and indirect effects to fish more than Alternative 2.

Alternative 4

Under this alternative, adaptive management strategies relevant to Watershed and Fisheries resources (Table 1) would be used to maintain and/or move towards desired resource conditions within the analysis area. Grazing permits would be re-issued as in Alternative 3 in regards to sheep grazing with the same effects, but the currently vacant allotments would be closed, entirely eliminating the effects of livestock grazing in these allotments. The boundary adjustments would be the same as Alternative 3 and would have the same effect. Design criteria would be implemented as in Alternative 3 for the active allotments, but would not be implemented in the closed allotments. Monitoring would be the same as Alternative 3 in the active allotments, but limited in the closed allotments. Cattle grazing in the Canyon Creek Allotment will have the same effects as in Alternative 3. But additional impacts associated with cattle grazing may occur in the future in the other allotments where cattle grazing may be authorized. In the event that cattle grazing were authorized as described in Alternative 4, the effects of livestock grazing to CRCT would be eliminated.

Table 1. Potential Adaptive Options (all classes of livestock)

Possible Structural Actions:
Construct fence to create riparian unit – allow livestock grazing under riparian livestock grazing guidelines
Construct fence to exclude livestock from areas of concern (riparian, streams, springs, wetlands, mesic meadows, etc.)
Construct temporary electric fence to control livestock distribution patterns
Construct permanent fence to control livestock distribution patterns
Control livestock distribution patterns using water (turn water on or off at developed water sites)
Construct livestock water development (pipeline, tanks, windmill, sediment traps, well, stock dam, submersible pumps, solar)
Construct water gaps to control livestock access to riparian areas
Construct armored stream crossings
Remove existing water development (pipeline, tanks, windmill, well, stock dam)
Remove existing fence line (electric, standard, permanent or temporary)
Possible Management Actions:
Adjust livestock grazing system (i.e. – rest rotation, deferred rotation, rest, high intensity/short duration, etc.)
Adjust use of salt or supplement to draw livestock toward or away from specific areas
Incorporate a range rider to control livestock distribution (herding)
Incorporate use of herding dogs to control livestock distribution
Adjust season of use
Adjust animal numbers
Adjust number of days of livestock utilization
Rest from livestock grazing for one or more seasons
Do not allow livestock grazing
Adjust/combine allotment boundaries and/or trailing routes
Change pasture design
Implement multiple unit rotation with permittees' private land
Do not re-issue permit when it is waived back to the FS

Table 2. Design Criteria specific to Fisheries and Watershed

Livestock grazing will be managed in riparian areas and willow carrs (a wetland willow thicket) to maintain or achieve mid-seral or higher condition to provide cover and forage for prey species within Canada lynx habitat (from Ruediger *et al.* 2000). *(Alternatives 2, 3, and 4)*
Permittees will spend as much time as needed to move livestock away from areas of concern (meadows, riparian areas, key areas, and so forth) and into areas of normally light use, provided that such herding does not result in increased potential for contact. This benefits permittees since it allows livestock to make use of forage that otherwise will not be grazed before allowable use standards are met in the key areas and the livestock are required to be removed from a pasture. *(Alternatives 2, 3 and 4)*
Sheep should be bedded at least 300 feet from all water sources, including lakes, ponds, tarns, springs and seeps, system trails, campgrounds, picnic grounds, and the remains of historic structures. There may some exceptions due to topography on the allotment but these will be approved in advance by the Forest Officer. *(Alternatives 3 and 4)*
Livestock will not be close-herded to and from water. Livestock will be moved away from water sources after animals have finished drinking. (Alternatives 3 and 4)

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