USDA United States Department of Agriculture | Forest Service | San Juan National Forest

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File Code: 2500
Date: November 30, 2017

Linda Bassi
Section Chief
Colorado Water Conservation Board
1313 Sherman Street, Room 721
Denver, CO 80203

Dear Ms. Bassi:

The U.S.D.A. Forest Service ("Forest Service") is writing this letter to formally communicate its recommendation for an instream flow water right on Himes Creek pursuant to the rules of the Colorado Instream Flow and Natural Lake Level Program. The stream is located in Colorado Water Division 7.

Natural Environment: The natural environment of Himes Creek consists of a Core Conservation population of pure-strain Colorado River cutthroat trout as defined in the Conservation Agreement and Strategy for Colorado River Cutthroat Trout in the States of Colorado, Utah, and Wyoming[1]. The native fish in Himes Creek have not hybridized with rainbow trout. The recommended reach is important to the San Juan National Forest and the State of Colorado because it contains a fish population that shares a number of genetic markers with the San Juan lineage Colorado River cutthroat trout, a subspecies of Colorado River cutthroat trout that was thought to be extinct[2].

In the Upper San Juan River Basin there are hundreds of fish-bearing streams, yet Himes Creek is one of only five streams known to contain fish with the same genetic markers as museum specimens of San Juan lineage Colorado River cutthroat trout. In one of the five streams, only one fish was found. Since Himes Creek is very isolated and in near-pristine condition, it is important refugia habitat for this rare fish species. The natural environment also consists of water dependent wildlife habitat, aquatic macroinvertebrates, and healthy riparian vegetation.

Location and Land Status: Himes Creek is a small tributary to the West Fork San Juan River located about 11.5 miles northeast of Pagosa Springs, Colorado. The recommended reach is approximately 2 miles in length and is entirely located on lands managed by the San Juan National Forest.
Segment: The recommended reach begins at the headwaters and extends to immediately above the point of diversion of the Himes Ditch. The entire proposed reach is located on public lands above all headgates and known water diversions.

[1] CRCT Task Force. 2001. Conservation agreement and strategy for Colorado River cutthroat trout (Oncorhynchus clarkii pleuriticus) in the States of Colorado, Utah, and Wyoming. Colorado Division of Wildlife, Fort Collins. 87p.
[2] Metcalf et al., 2012. Historical stocking data and 19th century DNA reveal human-induced changes to native diversity and distribution of cutthroat trout. Molecular Ecology (2012) 21, 5194-5207.

Upper Terminus Headwaters in the vicinity of:
Latitude: N37° 25' 47.67" Longitude: W106° 56' 29.86"
Lower Terminus at Himes Ditch Headgate:
Latitude: N37° 25' 28.42" Longitude: W106° 54' 31.87"

Biological Summary:
Stream Habitat Himes Creek is a cold-water, high gradient step-pool mountain stream. The watershed is largely unmanaged, undeveloped, and stream condition is excellent. The recommended reach is a predominately confined channel with large-sized cobble and boulder substrate (50^{th} percentile bed material is 86.3 mm). Aquatic habitat is dominated by cascades and pools and negligible riffle habitat is present. The predominant pool habitat in the segment consists of pools that are very small; the typical Himes Creek pool is only approximately 2 feet wide and 3.5 feet long. Average pool depth is only 0.4 feet, and the maximum residual depth of the pools is approximately 0.8 feet. The riparian corridor has variable width and has many different plant species throughout the reach. The riparian overstory is mixed conifer forest and the primary understory brush species are Rocky Mountain maple, red-osier dogwood, and alder.

Critical Habitat The importance of pool habitat for Colorado River cutthroat trout in small to medium sized mountain streams has long been recognized[3]. For Himes Creek, pools are the critical habitat feature for overwintering fish. High quality residual pools are also very important for refuge habitat during drought and during the low flows that occur in late summer, fall, and early winter.

The Himes Creek watershed is located on lands managed by the Forest Service and is by and large free of management activities such as roads and vegetation manipulation. The local geology and soils are a non-anthropogenic source of sediment for the channel. The upper Himes watershed is situated in volcanic geology comprised of ash flows, tuff, and andesite. The lower watershed is within Quaternary landslide deposits and modern alluvium[4]. All of these geologic formations are potential sources of sediment which could fill pools in Himes Creek. In fact, surveys conducted by the Forest Service and Colorado Parks and Wildlife ("CPW") in 2016 and 2017 found that eroding upland side-slopes and adjacent eroding stream banks are a ready source of fine sediment into Himes Creek in several places. Typical stream channel geomorphic processes, including minor channel adjustments and flood events can also be sources of finer sediment.

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[3] Young, Michael K., 2008. Colorado River Cutthroat Trout (Oncorhynchus clarkii pleuriticus) A technical Conservation Assessment. United States Department of Agriculture, Forest Service, Rocky Mountain Research Station, General Technical Report RMRS-GTR-207-WWW, 122 pp.
[4] Twedo, Ogden, 1979. Geologic Map of Colorado. U.S, Geological Survey, Federal Center, Denver, Colorado.

Since pool habitat is critical to the survival of this fish population, sedimentation of pools can be a significant limiting factor on the survival of the fish population. To maintain the step-pool channel morphology and pool dimensions necessary to support critical fish habitat, it is the opinion of the Forest Service that flows greater than typical R2Cross minimum flows are necessary. Peak flows generate the turbulence and shearing necessary to control step-pool channel topography by moving sediment[5]. For Himes Creek, peak flows are associated with snowmelt runoff typically occurring March through July, and from large rainstorm events which typically occur July through October.

Fish Surveys Fish surveys were conducted by the Colorado Division of Wildlife ("CDOW") and/or the Forest Service in 1994, 1998, 2007, 2013, 2016, and 2017. The standard taxonomic analysis indicated genetically pure Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*). A small population of brook trout (*Salvelinus fontinalis*) also exists, but efforts to remove the species are ongoing due to concerns about habitat competition with the native cutthroat trout. In the late 1980's, CDOW and downstream landowner cooperatively constructed a fish barrier on private land to help isolate the Himes Creek fish population.

Since 1994, CDOW and Forest Service personnel have been monitoring this fish population. In 2002, stream flows in the San Juan River basin near Pagosa Springs, Colorado reached record low levels at numerous locations. CDOW and USFS fish biologists feared that the Himes Creek cutthroats might have been lost due to low stream flows and high water temperatures. In 2003, biologists conducted an assessment of the fishery and found that a number of individual fish survived the drought. A comprehensive population survey of the fishery was not conducted at the time so as not to exert any undue stress on the remaining fish. The 2012 drought was not as severe and Himes Creek was rigorously sampled in 2013. Figure 1 illustrates the status of the Himes Creek cutthroat trout population over time. Despite the two droughts, the Himes Creek fish population persists ranging from an estimated 116 fish/mile sampled in 1998 to 264 fish/mile in 2013. The survey data also shows that since 2013, the population appears to be stable and contains several age classes of fish: this indicates that natural reproduction is occurring. As a part of this on-going monitoring effort, some fish tissue samples were collected from trout in Himes Creek in 2016.

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[5] Wohl, Ellen and Douglas Thompson, 2000. Velocity Characteristics along a Small Step-Pool Channel. Earth Surf. Landforms **25**, 353-367; Comiti, Francesco, A. Andreoli, M. Lenzi, 2005. Morphological Effects of Local Scouring in Step-Pool Streams. Earth Surf. Processes and Landforms **30**, 1567-1581.

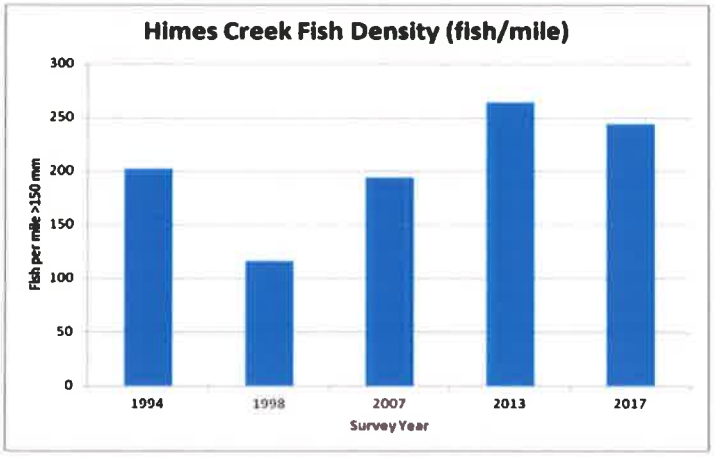

Figure 1. Estimated adult Cutthroat Trout density in Himes Creek, Mineral County, Colorado.

DNA Analysis Over the last decade or so, advanced DNA characterization technologies have provided fish biologists and managers additional information about cutthroat trout taxonomy. These scientific advancements have added both complexity and in some cases, clarity, to the job of managing and conserving these rare native fish. At this point in time, there are six known subspecies of Colorado River cutthroat trout in Colorado (two of which were thought to be extinct, including the San Juan River lineage). Though there are visual characteristics that distinguish these lineages, it is more efficient to categorize them based on the DNA profiles of individual fish and their similarity to historic samples and museum specimens. Mitochondrial DNA is passed from mother to daughter virtually unchanged, thus analysis of mitochondrial DNA is used to evaluate familial relationships, ancestry, and lineage.

Tissue samples collected from the Himes Creek fish population in 2016 were analyzed by comparing the mitochondrial DNA (genetic markers) to museum specimens collected in the 1880s from the San Juan River near Pagosa Springs. These museum specimens were the San Juan lineage cutthroat which were believed extinct. Interestingly, the Himes Creek fish shared the same mitochondrial haplotype (genetic markers) as the museum specimens, indicating the Himes Creek fish shared a close ancestry with museum specimens. No other museum specimens of San Juan lineage fish are known to exist.

At this point, the genetic analysis, which is the best available science, show a shared lineage between the Himes Creek cutthroat trout and the San Juan native, indicating that the Himes Creek population is likely a relict population of San Juan native. Due to the age of the existing museum specimens, the ability to complete a comprehensive DNA profile for those fish has not been possible. Genetic testing of fish populations in four other streams in the San Juan River basin also found genetic markers present in these fish that are consistent with markers present in the museum specimens of San Juan lineage Colorado River cutthroat trout.

Species Management and Threats The Colorado Division of Wildlife (now Colorado Parks and Wildlife or CPW) and federal land management agencies (Forest Service and BLM) as well as other state fish and wildlife management agencies in the intermountain west have been actively managing and conserving cutthroat trout populations for several decades. Cutthroat trout sub-species range from New Mexico north to Alaska and fall in various management categories ranging from "species of greatest conservation need" to "threatened or endangered" status under the Endangered Species Act. Colorado River cutthroat trout are not listed under the Endangered Species Act. They are designated by the Forest Service and State of Colorado as a Sensitive Species. Forest Service Manual (FSM) 2670.5 defines sensitive species as "those plants and animals identified by a Regional Forester for which population viability is a concern as evidenced by: a) Significant current or predicted downward trends in population numbers or density, b) Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution." Further, FSM 2672.1 directs "Sensitive species of native plant and animal species must receive special management emphasis to ensure their viability and to preclude trends toward endangerment that would result in the need for Federal listing."

A 1998 CDOW habitat survey noted that Himes Creek is a very small, isolated stream, and stated specific concerns for the resident native Colorado River cutthroat trout "Long-term, this small, isolated population is vulnerable and could be lost if measures are not taken to preserve this genetic strain". The Himes Creek population of fish is at a higher risk of extirpation because Himes Creek is isolated and has no connectivity to any other source populations of potential San Juan lineage cutthroat trout. The stream characteristics (limited reach length, small pool size, etc.) also make it vulnerable to disturbance such as fire or drought. Should the fish population decline significantly or be extirpated due to some type of disturbance or prolonged drought conditions, the Forest Service would no longer have a viable population in Himes Creek. This is significant because of the extremely limited distribution of the San Juan lineage fish and lack of connectivity to other streams from which re-colonization might occur.

The Himes Creek fish are unique and are therefore very valuable in terms of what they represent for the genetic biodiversity of native cutthroat trout in the Rocky Mountain west. Protection of the Himes Creek population is therefore a top priority for the State of Colorado (CPW) and the Forest Service. Protective land management combined with securing all the available water through a CWCB instream flow water right are two immediate steps that should be taken to help ensure that this population can persist into the future.

R2Cross Analysis: R2Cross is one of the standard methods used to quantify minimum flows necessary to preserve the natural environment to a reasonable degree. R2Cross was not an appropriate method to quantify minimum flows in Himes Creek for several reasons. First, Forest Service stream surveys conducted in 2016 document that low gradient riffles are negligible in Himes Creek. R2Cross data is collected in riffle habitat and Himes Creek does not have sufficient riffles to make appropriate measurements. In addition, the R2Cross method assumes that riffles are the most critical or limiting habitat within a reach. In Himes Creek, this is not the case because it is a high gradient step-pool system and pools are the most critical habitat to protect.

Photos 1 and 2. Himes Creek typical step-pool habitat. Photo courtesy of CWCB.

The critical habitat feature in Himes Creek are pools that the fish need for overwintering habitat and to survive the low flow conditions present in the late summer, fall, early winter, and during drought. Critical pool habitat is already limited in Himes Creek because the reach length is only 2 miles and, as stated above, the pools are small. The importance of pool habitat has been observed in Himes Creek by Mike Japhet, CDOW Aquatic Biologist, and the Forest Service while performing stream reconnaissance during drought conditions. The biologists found that water deep enough to hold fish was available almost exclusively in the pool habitat (Dave Gerhardt, retired Forest Service Fisheries Biologist, personal communication). A primary assumption for the R2Cross model is that low gradient riffles are the limiting and critical habitat feature for fish in most streams. This is not the case for Himes Creek. We make this conclusion because low gradient riffles are rare or absent in Himes Creek and the fish must hold in pools during the most stressful conditions of the year. This rare native San Juan genetic lineage of Colorado River cutthroat has been able to persist thousands of years in Himes Creek, perhaps since at the last glacial period in the San Juan Mountains. It is the existence of pool habitat and natural fluvial geomorphic processes that have provided and maintained the pool habitat over time that has allowed these fish to persist and survive.

Photo 3. Native cutthroat trout from Himes Creek, 2016 Forest Service fish survey.

The species likely survived the 2002 and 2012 droughts due in part to the natural hydrograph, unaffected by anthropogenic changes that supported natural fluvial geomorphic processes such as pool scouring, which in turn provided sufficient pool depth and refugia for the fish. However, it is important to note that the entire natural hydrograph is important to support all life stages of this rare and unique species as the reduction of flows at other periods of time could also be limiting and jeopardize their survival. The following table summarizes the various flow periods and their importance to this unique fishery.

Flow Period	Ecological / Fishery Function
Base Flows (typically check August to March)	Support macro-invertebrate life cycles, maintenance of temperature regime, juvenile rearing habitat, overwintering adult and juvenile habitat, prevention of pools from freezing.
Snow Melt Runoff Flows (typically March through July)	Recharge of aquifer for support of riparian vegetation; cutthroat spawning; removal of fine sediment, maintenance of pool depth and volume, and deposition and maintenance of spawning gravels.
Short Duration Peak Flows (Storm-driven events typically July through October)	Entrainment of large woody debris, scouring and formation of new pools, maintenance of riparian corridor and floodplain areas.

Forest Service Instream Flow Recommendation:
Based upon currently available data and information, the Forest Service has determined that all the unappropriated flow in Himes Creek is the minimum amount needed for fish population survival and to preserve the natural environment (described above) to a reasonable degree in the subject reach of Himes Creek.

The value of this fish population in terms of genetic biodiversity cannot be understated. There are only five known populations of fish with genetic markers that indicate a lineage to the San Juan River cutthroat trout, once thought to be extinct. None of these five populations have connectivity with the other populations, making recolonization impossible should one of these populations be lost due to disturbance or environmental factors. Any withdrawal of water from Himes Creek may affect the viability of this species by reducing flow, reducing the extent and depth of pools, impacting riparian habitat, and negatively affecting the macroinvertebrate food source this species relies upon. Management actions that affect the viability of a Forest Service sensitive species is precluded by the laws, regulations, and policy that direct the Forest Service. An instream flow water right for all the unappropriated flow in Himes Creek would assist the USFS in this management responsibility and protect this critical fish population.

Water Availability: All water rights on Himes Creek are located downstream of the recommended reach. There are no water rights on Himes Creek within or upstream of the recommended reach. The Himes Ditch is located on Forest Service lands but is below the recommended reach.

Himes Creek is a very small stream with no gage record. Available water can be estimated by extrapolating the records from nearby similar stream gages and from the USGS StreamStats model. StreamStats estimates the mean monthly flows during base flow periods could be 1 cfs or less. The mean monthly flows during runoff periods are up to 11 cfs. It should be noted that all the unappropriated flow in the Himes Creek watershed represents modest flows at most times.

Relationship to Land Management Plans: Forest Service watershed and aquatic habitat conservation is based on several key federal laws that set a consistent land-and-water stewardship vision (see Appendix). These Laws direct Forest Service actions to protect watersheds and aquatic habitat through sound management. In addition, the San Juan Forest Plan calls for Himes Creek to be managed to provide ecological conditions sufficient to support native fish species and other aquatic biota in the long-term. Specifically, the Forest Service Land Management Plan strategy for Colorado River cutthroat trout is to 1) stabilize and maintain existing populations, and 2) expand the distribution and overall abundance of this species to a point where long-term viability is no longer a concern. It also directs that the management of riparian areas restore the composition, structure, and function of these ecosystems. In addition, aquatic habitat should support well-distributed populations of vertebrate and invertebrate species.

Establishing an instream flow water right for all the unappropriated flow on Himes Creek pursuant to the Colorado Instream Flow and Natural Lake Level Program would assist in meeting the Forest Service management obligations and Forest Plan direction summarized above. Thank you for considering the Forest Service recommendation for Himes Creek, a stream with many important resource values including a rare native fish species, water dependent wildlife habitat, aquatic macroinvertebrates, and healthy riparian vegetation.

If you have any questions regarding our instream flow recommendation, please feel free to contact me or Forest Hydrologist Kelly Palmer at (970) 385-1232 or via email at kapalmer@fs.fed.us.

Sincerely,

Kara L Chadwick

KARA L. CHADWICK
Forest Supervisor

Appendix

LAWS, REGULATION, AND POLICY GUIDING U.S. FOREST SERVICE AQUATIC RESOURCE MANAGEMENT

Forest Service watershed and aquatic habitat conservation is based on several key federal laws (listed below in chronological order) that set a consistent land-and-water stewardship vision. These laws direct Forest Service actions to protect watersheds and aquatic habitat through sound management. Brief summaries of these laws and their direction for management related to watersheds and aquatic habitat are included below. Federal regulations contain the current interpretations and direction specific to these laws.

1. **Organic Administration Act of 1897 (16 U.S.C. 475).** This law defines original National Forest purposes to improve and protect the forest, secure favorable conditions of water flows, and furnish a continuous supply of timber. Years of concern about watershed damage led to creation of the National Forest System. Watersheds must be cared for to sustain their hydrologic function as "sponge-and-filter" systems that absorb and store water and naturally regulate runoff. The goals are good vegetation and ground cover, streams in dynamic equilibrium with their channels and flood plains, and natural conveyance of water and sediment.

2. **Multiple Use-Sustained Yield Act of 1960 (16 U.S.C. 528).** This law expands National Forest purposes to include watershed, wildlife and fish, outdoor recreation, range, and timber and to sustain native ecosystems. Renewable surface resources are to be managed for multiple use and sustained yield of the several products and services that they provide. The principles of multiple use and sustained yield include the provision that the productivity of the land shall not be impaired.

3. **Endangered Species Act of 1973 (16 U.S.C. 1531-1536, 1538-1540).** This law conserves endangered and threatened species of wildlife, fish, and plants and the ecosystems on which they depend. Federal agencies must conserve endangered and threatened species and cooperate with State and local agencies to resolve resource issues (Section 2). Each Federal agency shall, with the consultation and help of the Secretary of Interior, ensure that any action authorized, funded, or done by the agency is unlikely to jeopardize the continued existence of any endangered or threatened species or result in adverse modification of their critical habitat (Section 7).

4. **National Forest Management Act of 1976 (16 U.S.C. 1600-1602, 1604, 1606, 1608-1614).** The Forest Service must be a leader in conserving natural resources (Section 2). Programs must protect and, where appropriate, improve the quality of soil and water (Section 5). The overall goal of managing the National Forest System is to sustain the multiple uses of its renewable resources in perpetuity while maintaining the long-term productivity of the land. Maintaining or restoring the health of the land enables the National Forest System to provide a sustainable flow of uses, benefits, products, services and visitor opportunities (36 CFR 219.1 (2005)). The overall goal of the ecological element of sustainability is to provide a framework to

contribute to sustaining native ecological systems by providing ecological conditions to support a diversity of native plant and animal species (36 CFR 219.10 (2005)).

Ecological conditions are the components of the biological and physical environment that can affect diversity of plant and animal communities and the productive capacity of ecological systems. These components could include the abundance and distribution of aquatic and terrestrial habitats, roads and other structural developments, human uses, and invasive, exotic species (36 CFR 219.16 (2005)).

5. **Federal Land Policy and Management Act of 1976 (43 U.S.C. 1752).** Rights-of-way for water diversion, storage, and/or distribution systems, and other uses must include terms and conditions to protect the environment and otherwise comply with the requirements of Section 505, including section (a) (ii): "minimize damage to scenic and esthetic values and fish and wildlife habitat and otherwise protect the environment".

6. **Clean Water Act of 1977 (33 U.S.C. 1251, 1254, 1323, 1324, 1329, 1342, 1344).** This series of laws was written to restore and maintain the chemical, physical, and biological integrity of the Nation's waters (Section 101). Congress sought to sustain the integrity of water quality and aquatic habitat so that waters of the United States will support diverse, productive, stable aquatic ecosystems with a balanced range of aquatic habitats. All issues are framed by the intent of Congress to improve and preserve the quality of the Nation's waters (540 F2.d 1023; 543 F2.d 1198; 612 F2.d 1231; 97 S.Ct 1340; 97 S.Ct 1672).

Waters of the United States include perennial and intermittent streams, lakes, wetlands, and their tributaries. Aquatic ecosystems are waters of the United States that serve as habitat for interrelated and interacting communities and populations of plants and animals (40 CFR 230.3). Impacts to flow patterns, temperature, dissolved oxygen, sediment, and pollutant levels must be controlled (33 U.S.C. 1311 and 1314; 843 F2.d 1194; 753 F2.d 759). Physical features needed to support existing uses for anti-degradation include substrate, cover, flow, depth, pools, and riffles (40 CFR 131.10, 230.10, and 230.11).

7. **Forest Plans.** The purpose of the San Juan National Forest Land and Resource Management Plan (Forest Plan) is to provide strategic guidance for future management of all National Forest System lands managed by the San Juan National Forest. It provides a framework for informed decision making, while guiding resource management programs, practices, uses, and projects.

To ensure the long-term sustainability of ecosystems, humans must manage within the physical and biological capabilities of the land, maintain all of the ecological components and processes, and not irreversibly alter ecosystem integrity and resilience. The concept of sustainability is a fundamental component of the Forest Plan and is guided by the Multiple-Use Sustained-Yield Act (MUSY) and the Federal Land Policy and Management Act (FLPMA). Ecological sustainability is intended to provide the ecological conditions that maintain or restore the diversity of native ecosystems and natural disturbance processes. This in turn will maintain suitable habitats for a wide range of plant and animal species and provide for the diversity and viability of plant and animal species, populations and communities.

For lands managed by the USFS, the Planning Rule in 36 CFR 219.19 specifically requires that "[f]ish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area," and "[f]or planning purposes, a viable population shall be regarded as one which has the estimated numbers and distribution of reproductive individuals to insure [sic] its continued existence is well distributed in the planning area." Regulation 36 CFR 219.26 requires that "[f]orest planning shall provide for diversity of plant and animal communities and tree species consistent with the overall multiple-use objectives of the planning area. Such diversity shall be considered throughout the planning process." In addition, the FLPMA specifies that special uses granted by the Secretary of Agriculture are subject to terms and conditions that "minimize damage to fish and wildlife habitat and otherwise protect the environment." Agency actions should avoid or minimize impacts to species whose viability has been identified as a concern. USFS actions must not result in loss of population viability or create significant trends toward federal listing (FSM 2670.32).

For riparian area and wetland ecosystems, aquatic ecosystems, and terrestrial ecosystems, specific management direction has been developed that is intended to address the legal, regulatory, and policy requirements for species diversity and population viability. The process applied was to identify a range of key ecosystem elements, determine the importance of those elements to maintaining species diversity and population viability (e.g. limiting factors), define desired future conditions and land management objectives for those elements, and ensure that appropriate management standards and guidelines are in place that address the ecological needs of species and populations. In general, management standards have been developed for those elements determined to have an overriding influence on species diversity or long-term population viability, while other elements that have less influence are typically addressed through the application of guidelines.