November 1, 2016

Bureau of Land Management
Colorado State Office
2815 Youngfield St.
Lakewood, CO 80215

Uncompahgre Field Office
2465 South Townsend Ave.
Montrose, CO 81401

Submitted electronically to uformp@blm.gov

Cc:
Ruth Welch, Colorado State Director, Bureau of Land Management, rwelch@blm.gov
Joe Meyer, District Manager, Southwest District of Colorado, BLM, jmeyer@blm.gov
Teresa Pfifer, Field Manager, Uncompahgre Field Office, BLM, tpfifer@blm.gov

Neil Kornze, Director, BLM, director@blm.gov
Secretary Sally Jewell, Department of Interior

RE: Draft Uncompahgre Field Office Resource Management Plan Public Comments

Dear Ms. Pfifer, Mr. Meyer, and Ms. Welch:

Please accept these comments on the draft Uncompahgre Field Office Resource Management Plan on behalf of the staff, board, and members of the Western Slope Conservation Center (WSCC). The WSCC is a grassroots non-profit with 450 members who live in the North Fork Valley and Western Slope of Colorado. The WSCC has a 40-year legacy of conservation environmental resources in the North Fork Valley, and we are dedicated to the mission of building an active and aware community to protect and enhance the lands, air, water and wildlife of the Lower Gunnison Watershed.

The WSCC understands the magnitude of the challenge that the BLM faces in producing a new Resource Management Plan (RMP) for the Uncompahgre planning area, and we appreciate the significant amount of time and energy that has gone into the current draft plan. The WSCC also recognizes the significance of this RMP in determining the future of the BLM lands that surround our homes, farms, businesses, and recreational areas for the next 20-30 years. Consequently, we have engaged our members in a thorough analysis of the draft plan and ask that the BLM incorporate the following additional information and comments into the final plan.

The WSCC has determined that the Preferred Alternative will not provide adequate management protections for the water, air, viewshed, wildlife, recreational opportunities, foodshed, or economies of the North Fork Valley and Western Slope. We would like to thank the BLM for including the North Fork Alternative within the draft plan as Alternative B1, which provides a minimum degree of protection for these resources identified by our community members. For all other management actions not associated with oil and gas leasing in the North Fork planning area, Alternative B provides a minimum degree of protection for the resources identified above.

Our following comments are organized into three main sections: I) Detailed information and support for Alternative B1, the only alternative in the plan that adequately protects the communities in the North Fork Valley from unreasonable impacts from oil and gas leasing and corresponding development activities; II) Specific concerns regarding water resources in the planning area, especially as related to actions included in the Preferred Alternative; and III) Additional specific concerns and support for management prescriptions in the draft RMP.

Sincerely,

Alex Johnson
Executive Director
Western Slope Conservation Center
director@theconservationcenter.org
970-527-5307x201

Comment Contents

I) The North Fork Alternative (B1) and Oil and Gas Leasing in the North Fork Valley

Regarding oil and gas leasing and development, we support the incorporation into the final RMP of Alternative B1 (North Fork Alternative) as the only proposed management prescriptions and designations that provide the protection warranted for the North Fork area; with all additional general provisions beyond oil and gas leasing of Alternative B, or as otherwise indicated throughout these comments.

Alternative B1 is derived from a detailed document submitted by stakeholders, organizations and individuals from the North Fork Valley to the Uncompahgre Field Office of BLM in December 2013. *The North Fork Alternative Plan: A Proposal to the BLM for Managing Oil and Gas Development in the North Fork Valley* was developed over an 18-month period by a group of stakeholders and supported by local governments. It seeks to manage oil and gas leasing and development on the North Fork Valley's public lands and minerals in balance with the unique and highly cherished resources that those lands contain, surround and impact directly, indirectly, and cumulatively.[1]

The North Fork Alternative Plan (NFAP) is included in the draft RMP/EIS as Alternative B1:

> Alternative B.1 is a partial alternative specific to oil and gas leasing and development in the North Fork and Smith Fork drainages of the Gunnison River (referred to as North Fork), primarily in portions of Delta and Gunnison Counties. Alternative B.1 is a resource-based set of recommendations provided by a community group. [DEIS at 2-7]

Alternative B1 reinforces broader community-wide efforts to establish a more resilient, place-based economy in Delta County. In 2015 Better City was retained through a federal grant to help strategize ways to strengthen the local economy. That report reinforces what the stakeholders who crafted the NFAP have long maintained. Economic resiliency and growth in the North Fork Valley depends on safeguarding the area's natural resources not exploiting them.

> Delta County is home to a number of unique resources, attributes, organizations, and conditions that help differentiate it from other communities. The County is home to natural attractions including two rivers, the Grand Mesa National Forest, and two National Conservation Areas. The County enjoys a more temperate climate than the majority of the state, has a large amount of farmland, and has access to water resources and clean air. ... Although its coal deposits remain a vital asset for the community, they are not a source of future growth. [2]

The NFAP, incorporated as Alternative B1, set out to protect six key sets of resources that are dependent on, tied to, and impacted by activity on the area's BLM-administered lands. These include: the existing economy, towns and community areas, water source areas and delivery systems, river corridors and riparian areas, important wildlife habitat and migration routes, and sensitive landscapes and soils. In addition, the NFAP sought protective management to safeguard outstanding recreational opportunities at Jumbo Mountain and the overall highly scenic visual character of the valley and its surrounding mesas.

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[1] "North Fork Submits Community-based Management Plan to the BLM," News release, December 4, 2013. Online at www.citizensforahealthycommunity.org/wp-content/uploads/2013/12/North-Fork-Community-submit-Alternative-Plan.pdf

[2] Economic Development Strategic Plan Executive Summary Delta County, CO prepared by Better City, 2015. Available online at www.deltacountyed.org/resources/Documents/EDA%20Study%20Summary%202016.pdf

These characteristics of the valley, its high quality scenery features, good water and abundant wildlife, and outstanding recreational opportunities are the backbone of the area's growing, emerging, and future economy.

Our comments are overall supportive of Alternative B1 in the draft RMP/EIS, however they recommend some changes and additions, as well as raise some concerns and weaknesses in the draft RMP/EIS and the analysis. Our comments regarding Alternative B1 will first consider four major areas of emphasis that should guide management objectives and that must be part of any acceptable resource plan.

It is our belief that the agency-identified Preferred Alternative (Alternative D) is especially unacceptable for the North Fork Valley regarding oil and gas leasing; and that other deficiencies in the draft RMP/EIS could leave the overall decision open to challenge, especially under a management regime like that proposed under Alternative D. Thus we urge that the agency not only adopt the provisions in Alternative B1 for the North Fork, but begin to apply this level of protection to additional public lands under its purview. We will outline specific deficiencies identified in Alternative D in section III and the conclusion of these comments.

A. Purpose and Need: North Fork Alternative Plan

The North Fork Alternative Plan (NFAP) was crafted by North Fork Valley stakeholders, organizations and individuals that wanted to ensure any potential future oil and gas leasing and development would not jeopardize the many important values, resources and features of the area's public lands—which in many cases form the basis of the local economy, convey and/or are source areas for water supplies, represent critical wildlife lands, and provide outstanding recreational opportunities for residents and visitors alike.

The NFAP identified critical resources and shared values, and researched appropriate leasing and oil and stipulations, best management practices, and public land designations. It was derived as a resource-based approach to oil and gas leasing and development to achieve the necessary level of management to protect cherished features, public land resources, wildlife and economic well-being of the valley.

Development of the NFAP started with a careful review of the thousands of comments submitted to the BLM in response to the withdrawn lease sales (Dec. 2011, Nov. 2012), and through conversations with valley residents and stakeholders. The NFAP was incorporated into the draft RMP/EIS as Alternative B1, as noted in the DEIS Executive Summary:

> The North Fork Alternative Plan would close certain areas to oil and gas leasing and would also impose development setbacks with strict surface use restrictions, including no surface occupancy (NSO), controlled surface use (CSU), and timing limitations (TLs), in places where leasing may be allowed. Management actions and allowable uses under Alternative B that are not superseded by those in Alternative B.1 would also apply to the North Fork area. [DEIS, ES-8]

Since the NFAP in its entirety has been submitted and accepted by the BLM UFO, and has formed the basis of the draft RMP/EIS sub-alternative B1, these comments incorporate that submitted information herein by reference, and refer—unless otherwise noted—to the agency's presentation of the information in the draft RMP/EIS.

In both cases—as a stakeholder proposal and as the sub-alternative B1 in the draft RMP/EIS — NFAP/B1 sets out to protect the important character, resources, and features that make the North Fork Valley both beloved and unique. For the purpose of these comments, those can be described as 1) Character of place, 2) Water supply, 3) Wildlife habitat and migration routes, 4) Recreational opportunities and access.

1. Character of place.

The North Fork Valley is a nationally unique landscape: geographically, geologically, ecologically, economically, and socially. As the Better City report notes, the area is 44th in the United States as a hub of organic agriculture, is one of only two federally recognized wine regions in the state, and is Colorado's only multi-jurisdictional and rural Creative District. The Valley is known for its dark skies, rural charm, bucolic beauty, and stunning views. Thomas Huber, a Colorado geographer and author describes the area in An American Provence, a book linking the North Fork with France's Coulon River valley, according to a January 2012 article in the *Grand Junction Daily Sentinel*:

> The landscapes of the two valleys have one critical thing in common, the reason they are near-clones of each other in the broader dimension: they are both human-scale places," he writes. "The towns and villages are all easily walkable, the fields are small and individually tended, the trails are suitable for walking and biking, the food comes from local farmers as much as possible, and the wine is a personal statement from the vintner, not a corporate artifact.

This economy-of-place, coupled with more standard regional tourist attractions—popular mule deer and elk hunting seasons, U-pick orchards, whitewater rafting, mountain biking, horse packing, and backpacking—is a driving force in the North Fork, a trend noted in a 2007 Colorado State University study and report.[3]

> Colorado's abundant wildlife, vineyards and vast agricultural landscapes help draw thousands of visitors to the state and are ripe in potential to anchor emerging agritourism markets, according to a recent Colorado State University study.

The North Fork's scenic features, rural communities, and bucolic charm are critical components of the area's existing and emerging economy that must be safeguarded under any management regime. Furthermore, the character of place includes its sense of health and well-being, clean living, fresh water, healthy land. The North Fork strives to be a place that welcomes families at all stages and ages.

Public health considerations, the known impacts to air quality, water quality, and other health factors that oil and gas development can contribute to are not to be understated. [4] Both in terms of real and meaningful threat, and also in terms of intense public concern that the agency is obligated to consider in weighing the significance of its actions and the effectiveness of its management.

2. Water supply.

Colorado agriculture depends on irrigation, along with area residents. The North Fork is well-situated even as climate change threatens increased scarcity, being primarily gravity fed and located just below the source areas on the Grand Mesa and West Elk Mountains.

The water quality of the North Fork remains good, and industrial pollutants remain low. The primary water quality issues for irrigators are related to salinity and selenium loads, which increase as the river

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[3] CSU: "Colorado's Agritourism Market Climbing, Says New CSU Report," August 14, 2007.

[4] Intermountain Oil and Gas BMP Project: Public Health. Online at www.oilandgasbmps.org/resources/public_health.php. See the Grand Junction Daily Sentinel, "Ursa holds off on plan to drill close to school," October 6, 2016.

and ditches flow down valley, and is exacerbated by development on the highly erodible Mancos soils that comprise much of the region. Irrigation in the valley relies on an interconnected series of canals, ditches and water impoundments. Surface contamination and spills, which occur regularly in Colorado oil and gas fields, could spread rapidly through the irrigation systems that water the valley, and in turn provide fresh food locally, regionally, and nationally.[5] With such a short pathway from water source to table, oil and gas contaminants from a surface spill in the North Fork Valley could enter the irrigation water supply, irrigate plants that are then harvested, and be served to customers locally at one of our farm-to-table restaurants before the oil and gas company is even mandated to report the spill.

In addition, impacts in source areas carry real risk of groundwater harm. Recharge areas for aquifers are both broad and shallow, as noted in a comment from one local domestic water company.

> These springs are primarily fed by subsurface collection of precipitation percolating through talus and glacial deposits into a larger sub-surface groundwater storage in the till deposits. These springs are dependent entirely upon precipitation and surface runoff for their supply and recharge of the underground well system (Wright Engineering Study of 1977, extracting data from U.S. Geological Survey's Professional Paper No. 617 entitled "Quaternary Geology of the Grand and Battlement Mesas Area, Colorado") and do so from an area of greater than 1 sq. mi.[6]

Finally, the North Fork and Smith Fork Rivers sit in the Gunnison Basin, a major headwater for the Colorado River System. The Gunnison Basin is identified as a "water bank" to ensure adequate flows remain in the Colorado River to meet Colorado River Compact requirements. Adequate flows in the Gunnison are also needed to maintain water quality considerations due to selenium and salinity loads, and to avoid irrigators being forced to cut back on water use under the Endangered Species Act.[7] Any water quality impacts that occur within the North Fork and Smith Fork Rivers could produce corresponding impacts to the full downstream Colorado River System.

3. Wildlife habitat and migration routes.

Situated between the West Elk Mountains and Wilderness Area, Grand and Black Mesas, and encompassing two significant river riparian areas, the North Fork (and contiguous Smith Fork) Valley is a wildlife haven. The West Elk Mountains and the flanks that lie on BLM lands are known as concertation areas for black bears, especially in the crucial late summer and early fall period when this species is preparing for winter hibernation.[8] BLM lands in the area are critical winter range for both deer and elk. Public lands in and surrounding the North Fork are home to threatened, endangered and sensitive species including the Gunnison Sage Grouse, and important hunting and migration routes for others including the Canada lynx. Yellow-billed cuckoos nest in the riparian vegetation along the North Fork River and tributaries. Raptors frequent the area, including wintering bald eagles and peregrine falcons.

Streams and rivers that begin on the Grand Mesa and West Elks contain important trout fisheries, and the Gunnison River just below the confluence with the North Fork is a Colorado Gold Medal trout stream.

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[5] "Oil and gas companies in Colorado reported 615 spills in 2015," Denver Post March 17, 2016. Online at www.denverpost.com/2016/03/17/oil-and-gas-companies-in-colorado-reported-615-spills-in-2015/

[6] Pitkin Mesa Pipeline Company draft RMP/EIS comments.

[7] "Program Overview," Gunnison Basin Selenium Task Force. Online at www.usbr.gov/uc/wcao/progact/smp/overview.html

[8] Oil and Gas Leasing and Development Final EIS, Grand Mesa Uncompahgre Gunnison National Forest 1993.

The Gunnison River is also home to three species of endangered fish that are known to be impacted by activity on the selenium rich soils of the valley.[9]

Wildlife have been utilizing the valley for millennia, and the ethical importance of protecting wildlife habitat, managed jointly with the state as a "public trust," is paramount.[10] Colorado Parks and Wildlife, in previous comments on the recently deferred lease sales in the North Fork Valley, emphasized the importance not only of protecting the critical winter habitat that covers nearly all of the valley, but of the important migration routes that connect the winter range with uplands and calving areas.

4. Recreational opportunities and access.

The North Fork is a public lands paradise, nestled among national forest, park, and conservation lands managed by the Forest Service, National Park Service, BLM, and the State of Colorado.[11] Hunting is a mainstay that brings large revenue for western Colorado coffers. The economic contributions made by maintaining healthy and abundant fish and wildlife populations are substantial. The CPW comments emphasized the economic importance of protecting this habitat for the hunting opportunities provided.

> ...benefits from hunting and fishing recreational activities are a sustainable annual source of economic benefit for Delta and Gunnison counties only if wildlife populations, and particularly big game populations, are maintained and quality hunting opportunities continue to exist.[12]

Hunting and fishing are multimillion dollar industries in the region, estimated at over $80 million annually (in 2007) for the two counties.[13] River sports, hiking, camping, mountain biking, climbing and trail running are other highly popular public lands pursuits in which the North Fork excels.

And then there are the "windshield tourists" and those that bask in the beauty of the surrounding landscape while enjoying a visit requiring less physical exertion. The communities and farms of the valley are stitched together by the world-famous West Elk Loop Scenic Byway. Area features that must be protected to safeguard recreation and tourism opportunities include the overall rural and scenic character of the place—which draws in an ever-increasing number of tourists and residents, benefits the wineries and farm stands, fuels the creative muses of the area's growing number of artists, performers and authors.

Finally, the final RMP must start to actively manage recreation on BLM lands, through designation of recreation management areas. Jumbo Mountain is the obvious example that deserves designation as a Special Recreation Management Area (SRMA). Management should prioritize dispersed, trail-based activity, day-use opportunities, outdoor education, and maintaining the area's natural appearance. Jumbo Mountain sits prominently within the valley, and the visual resources of the BLM parcels on Jumbo are significant to the quality of life in the entire valley.

Jumbo Mountain is not the only area on North Fork BLM lands likely to need special attention to better direct recreation activity, especially during the life of the RMP. BLM should anticipate this eventuality, and consider Extensive Recreation Management Areas (ERMAs) for places such as Elephant Hill, Lone Cabin, McDonald Mesa/Creek, and C Hill—all of which are seeing increasing, but undirected use.

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[9] "Aspinall Unit Operations Biological Assessment," US Bureau of Reclamation https://www.usbr.gov/uc/envdocs/ba/AspinallUnitOps/ch4.pdf
[10] DEIS at Volume II 4-127.
[11] DeltaCountyColorado.com – Public Lands: Diverse Destinations at www.deltacountycolorado.com/public_lands/
[12] Colorado Park and Wildlife comments on March 2012 oil and gas lease sale, February 3 2012.
[13] Ibid.

> Current BLM guidance defines ERMAs as administrative units that require specific management consideration in order to address recreation use, demand or recreation and visitor service program investments. ERMAs are managed to support and sustain the principal recreation activities and the associated qualities and conditions of the ERMA.

Public lands recreation is a multi-billion-dollar industry on Colorado's public lands, and forms not only the basis for tourism based economies across the state, but also as a draw for new residents, new business, and new economic opportunity.[14]

B. Sub-alternative B1: North Fork Alternative

1. Alternative B1 is the best alternative proposed in the RMP, which the BLM should adopt for the North Fork Valley

We support the protections outlined in Alternative B1 as those that provide the strongest protection (of any alternative in the draft RMP/EIS) for the important features of the North Fork Valley that are interwoven with management on the adjacent and proximate public lands.[15] Only B1 provides the level and type of protections that the resources and public land values of the North Fork warrant.

> The North Fork Alternative Plan would close certain areas to oil and gas leasing and would also impose development setbacks with strict surface use restrictions, including no surface occupancy (NSO), controlled surface use (CSU), and timing limitations (TLs), in places where leasing may be allowed. Management actions and allowable uses under Alternative B that are not superseded by those in Alternative B.1 would also apply to the North Fork area (DEIS I 2-7).

B1 would place 75% of the North Fork area into a No Leasing category, impose strict nonwaivable, nonmodifiable No Surface Occupancy stipulations on an additional 20% of the area, and manage the remaining 5% of the BLM lands/minerals under Controlled Surface Use stipulations.

> In the North Fork area, 104,750 acres (75 percent of the North Fork area) would be unavailable for leasing, compared to 10,610 acres in Alternative B, and 27,280 acres (20 percent of the North Fork area) would have an NSO stipulation... (DEIS II 4-276).

The NFAP considers oil and gas leasing and development for BLM lands and BLM-administered minerals under private/nonfederal lands ("split estate"); and it imposes protective measures for six key resources, plus management designations for recreation areas and visual resource protection.[16]

For features vital to the area's character of place, B1 includes the strongest protections. This includes leasing and development setbacks for certain visual and scenic resources, leasing and development setbacks from towns and community facilities, and leasing and development setbacks and other protection for sensitive soils and delicate landscapes. B1 provides the strongest protection for the North Fork's water supply, with setbacks from water source areas and systems, irrigation facilities, and waterbodies; and

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[14] Ray Rasker, Patricia H. Gude, and Mark Delorey, "The Effect of Protected Federal Lands on Economic Prosperity in the Non-metropolitan West," Headwaters Economics, 2013. Online at http://headwaterseconomics.org/wphw/wp-content/uploads/ProtectedPublicLands_Manuscript_2012.pdf

[15] See DEIS Volume I, Chapter 2: "Description of Alternatives," Table 2-2 beginning at DEIS 2-22.

[16] "Executive Summary," North Fork Alternative Plan. Citizens for a Healthy Community, et al. December 2013.

prohibitions on leasing on the areas with highest potential for selenium loading. These measures will help to ensure that the area's nationally significant water supplies are protected.

B1 prohibits development within critical fish and wildlife habitat, and includes leasing and development setbacks from rivers—all measures that serve to provide strong protections to the important fish and wildlife species of the valley, including threatened, endangered, and sensitive species.

B1 would designate 5,020 acres at Jumbo Mountain area as a Special Recreation Management Area (SRMA), and provides the strongest level of protection for the highly scenic features of the valley, including a Visual Resource Management (VRM) II classification ensuring the scenic and rugged features of Jumbo Mountain are not degraded. B1 includes leasing and development setbacks from rivers and riparian areas. These protective measures, together with protection for wildlife habitat, ensure that the valley's recreational assets will not be diminished by ill-conceived oil and gas development.

2. Alternative B1 includes reasonable but strong stipulations to protect resources in the North Fork.

Given the unique quality of the resources at stake, directly, indirectly and cumulatively from the agency's land use decisions, and the management outlined for oil and gas leasing and development under all four alternatives and sub-alternative B1, only B1 provides the level of protection warranted.

Only Alternative B1 closes to all oil and gas leasing the areas with the most severe selenium loading problems, area within a half mile of rivers and riparian corridors, water bodies and waterways, areas around communities and community facilities, and for protection of the valley's exceptional scenic qualities. And only Alternative B1 includes protective surface development prohibitions that are not waivable or modifiable, for features and resources such as agricultural operations, moderate and high geologic hazards, critical wildlife habitat, unstable geology, irrigation facilities, and recreational lands.

> [B1] would be the most restrictive to oil and gas exploration and development activities because a larger percentage of the planning area would be unavailable for leasing, and areas open to leasing would have major restrictions. ...[Under] Alternative B.1, approximately 280,840 acres would be unavailable for oil and gas leasing, exploration, development, or production, 6 times the acreage under Alternative A. In the North Fork area, 104,750 acres would be closed to leasing, 94,140 acres more than in Alternative B. Approximately 635,190 acres would be open to leasing, 27 percent less than under Alternative A. (DEIS II 4-276)

Even in comparison to Alternative B, which is the most conservation-oriented full alternative in the draft RMP/EIS, none come close to the protection offered in B1. Alternative B1 provides a baseline of management to safeguard the valley's character of place, water supply, wildlife habitat, and recreation.

a. Character of place.

The overall character of place in the North Fork Valley, its high quality scenic features, its rural charm, its backdrop of undeveloped public lands, mesas melting into mountains, is of utmost importance to the area residents, businesses, and economic future. Character of place relies on healthy communities and vibrant economies, and the rural, farm-based settlement of the valley. We support the B1 stipulations NL-13 Coal

leases; [17] NSO-68 Community facilities; and NSO-3 Agricultural operations. These provide reasonable and prudent leasing and development restrictions and stipulations to protect current and emerging economic activity, and to provide setbacks from communities and community facilities.

The quality 'character of place,' is difficult to under-emphasize as a critical component to what is special about, and must be preserved of, the North Fork Valley. Specifically, given the high importance of protecting the area's visual features and sensitive landscapes we support the VRM classifications in Alternative B1, and the protection of landscape and visual characteristics through the following stipulations: NL-11 Prominent landmarks; NL-3 Major river corridors; NSO-52 Travel & Scenic Corridors; NSO-7 Major river corridors; NSO-5 High geologic hazards; CSU-47 Vistas; CSU-7 Moderate geologic hazards.[18]

b. Water supply.

Protection of the valley's water supply relies on preventing pollution, protecting source water areas, protecting water bodies and riparian areas, and protecting water systems and conveyances. For agricultural operators, water quantity and quality are both of utmost importance. Organic agriculture, specialty crops and high quality hay all depend on abundant water, free from contamination.

The combination of individual wells, several private and public water companies, and with source water areas ringing the valley—safeguarding water quality is a top concern. Drilling is known to contaminate water supplies, both above and below ground, and to harm water bodies, rivers and source areas.[19] That is a risk too great for many operators in the valley, home to Colorado's highest concentration of organic farms, an agritourism haven, and major headwaters to the Colorado River system.

We support the following stipulations to protect water supply. In cases where other alternatives in the draft RMP/EIS provide more protection than B1 for water supply resources, and where those stipulations overlap with B1, we recommend that the more protective stipulations apply. Here we recommend both the NL- 6 stipulation (from Alternative B) and NL- 7 stipulation (B1) be included in the final RMP. To adequately protect the water supply, we favor—at a minimum—the following stipulations for oil and gas leasing and development in the valley: NL-1 Selenium soils; NL-3 Major river corridors; NL-4 Water bodies; NL-6 Public water supplies (*Alt. B); NL-7 Public water supplies; NL-9 Domestic wells and water systems; NSO-15 Domestic wells and water systems; NSO-55 Bureau of Reclamation dams & facilities (*Alts. B, C, D); NSO-16 Water conveyance systems; NSO-12 Public water systems; NSO-2 Selenium soils; NSO-7 Major river corridors.

c. Wildlife habitat and migration routes.

The BLM lands in and around the valley provide for an abundance and diversity of wildlife, from moose, bear and lynx in the upper reaches, to Gunnison sage grouse, Yellow-bill Cuckoo, fox and coyote in the bottomlands—which are critical winter range for herds of elk and deer. Waterbodies and riparian areas

[17] Re: Agency comment at DEIS Volume II 4-276: We think that the NL-Coal lease areas can be made available for Coal Mine Methane capture by classifying them as 'Leasable' and stipulating that is only in conjunction with an approved coal mine methane capture/utilization facility. This would also have a climate benefit.

[18] NL is No Leasing, under Alternative B1 these lands and minerals would not be available for future oil and gas leasing. If currently leased lands expire without activity, they would become subject to the revised RMP and its leasing guidance. NSO is No Surface Occupancy, which under Alternative B1 cannot be waived, modified or excepted.

[19] "Stanford scientist weighs the risk of groundwater contamination from oil and gas wells," Stanford News: February 8, 2016. Article online at http://news.stanford.edu/2016/02/18/aaas-jackson-water-021816/

provide important habitat and travel routes for a variety of species. Upland migration routes and connectivity are critical elements to maintaining healthy populations, from endangered and sensitive species to big game. Specific habitat areas—nesting sites, leks, floodplains and fish habitat, migration routes, and winter range are all important and valued features that deserve the strongest protections.

In cases where species or habitat management plans, other considerations, or other alternatives in the draft RMP/EIS propose stronger protections for resources than in Alternative B1, we prefer the stronger stipulation; for instance, with Gunnison sage grouse habitat: we recommend that the No Leasing stipulation from Alternative B also be carried forward and applied where applicable. We support the following stipulations as providing a minimum level of protection for wildlife habitat: NL-4 Waterbodies; NL-3 Major river corridors; NL- NSO-35 Raptor sites; NL-10 Gunnison sage grouse (*Alt. B); NSO-33 Gunnison sage grouse; NSO-27 Leopard frog; NSO-25 CRCT habitat; NSO-21 Deer & elk habitat; NSO-30 Yellow billed cuckoo (*Alt. B); NSO-39 Mexican spotted owl (*Alt. B); NSO-20 Ecological Emphasis Area (*Alt. B); NSO-8 Floodplains; NSO-7 Major river corridors.

d. Recreational access and opportunities

Recreational opportunities surround the North Fork's homes, farms and communities – from those provided by the public lands directly, to the indirect benefit the scenic nature of the area provides for tourists and visitors. The rivers, nearby trailheads, unique public lands features, mountain biking and hiking opportunities, together with the scenic landscape wound together with farm roads, wineries, and rolling hayfields. The following stipulations provide protection for recreational areas and amenities, and should be carried forward to the final RMP: NL-5 Water ways; NL-3 Major river corridors; NL-14 Recreation Park (*Alt. B); NL-15 Recreation SRMA (*Alt. B); NSO-7 Major river corridors; NSO-57 Recreation-Jumbo Mountain SRMA (with VRM Call II). At Jumbo Mountain, Alternative B1 closes the SRMA to competitive events, which seems like a premature determination. Instead the final RMP should consider the possibility for limited competitive events in the SRMA through the stakeholder/planning process. See below (WSCC RMP Comments III.E) for additional comments on recreation management not specific to the North Fork Alternative.

3. Only B1 provides management that North Fork's unique character, culture, and resources requires

In considering important features of the North Fork, only B1 provides the level of management needed.

a. Alternative B1 protects what matters, even where Alternative B mostly fails

B1 best protects the North Fork even when contrasted with the conservation-oriented Alternative B.

i. Character of place: visual resources, healthy communities, farms, landscapes, river corridors

The scenic qualities of the valley are a driving force for business, for increasing property values, a force behind the burgeoning creative economy, a central ingredient to the marketing of bed and breakfasts, wineries, retreat centers, guest ranches and numerous other ventures. Visual scarring raises a point in general, that much of the opposition to oil and gas development is a response to industrial impacts that are

incompatible with this growing economy. Alternative B1 goes furthest to address this general concern, closing most BLM lands in the North Fork to oil and gas leasing altogether.[20]

And in considering North Fork visual resource management (VRM) classifications specifically, under Alternative B1 over 82,218 acres are classified as either the VRM I or II, the most protective. Under Alternative B only 15,824 acres in the North Fork fall into VRM I or II.[21] And B1 not only protects more acres than alternative B, but it also applies stronger stipulations to do so.

> Depending on the location, VRM Class II under Alternative B.1 would be closed to leasing, have an NSO stipulation, or have a CSU stipulation, compared to Alternative B where VRM Class II would have a CSU stipulation. (DEIS II 4-208)

Other community issues include loss of dark sky, increased traffic, noxious odors, declining property values, and harm to reputation. Public health impacts are also a top concern. Community and residential setbacks attempt to lessen these threats. B1 includes NSO setbacks from community facilities, including schools, recreation facilities, and parks (NSO-68).[22] B1 reduces these threats, from poor air quality.

> Alternative B.I emission estimates result in the lowest total air pollutant emissions in future planning years and decreases in emissions of some pollutants over the base year. ...Alternative B.1 would likely result in the least adverse impacts on air quality. (DEIS II 4-21)

The BLM analysis anticipates "increased benefit to non-extractive uses in [the North Fork]" under Alternative B1 (DEIS II 4-473). This is, of course, exactly what economic experts recommend for the North Fork, including the Better City report.[23]

> Efforts to identify opportunities in other industries that provide a diverse employment base could help mitigate the boom bust cycle associated with extractive industries.

The Better City report goes on to highlight the area's agricultural industry and heritage as a strong sector upon which to build for a more diverse economy. [24]

> Based on its rich agriculture base, Delta County is well positioned to leverage the existing boom in organic food markets.

Impacts from oil and gas development on agriculture and ranching operations would less under B1 which includes specific protections and a 0.25-mile No Surface Occupancy setback from "prime and unique farmlands, livestock operations, organic farm, conventional farm, ranch, orchard, and the West Elks American Viticultural area, thereby protecting these" (DEIS II at 4-69). Importantly B1 is also the most protective of the valley's water supply including irrigation facilities.

ii. Water supply: river system, waterbodies, private wells, water systems, public water source areas, irrigation facilities

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[20] DEIS II 4-91

[21] Acreages developed from analysis of GIS data downloaded from BLM.

[22] If stipulation NSO-67 (Alt. B) for "high occupancy buildings," provides protections beyond B1; then we recommend it be carried forward as well.

[23] "New Study Repeats Changing of Delta County Economic Basics," Merchant Herald, 11/12/15. Article online at www.merchantherald.com/new-study-repeats-changing-of-delta-county-economic-basics-new-study-repeats-changing-of-delta-county-economic-basics/

[24] "Better City presents economic development visions for Delta, Gunnison Counties," Region 10 Website, article at www.region10.net/better-city-presents-economic-development-visions-for-delta-gunnison-counties/

The rivers in the area provide broad benefit, including to the valley's character, water supply, wildlife habitat, and recreational opportunities. Alternative B1 is the most protective of the river corridors.

> In addition to these Alternative B restrictions, Alternative B.1 would also apply NL areas within 0.5-mile of the North Fork of the Gunnison and Smith Fork of the Gunnison Rivers, lakes, ponds, naturally occurring wetlands and impounding reservoirs, streams, watercourses, and waterways; and would apply NSO within 0.5 to 1.0 mile of the North Fork of the Gunnison and Smith Fork of the Gunnison Rivers, and within the 100-year floodplain of any stream or river system. These NL areas (96,910 acres) and NSO restrictions (9,680 acres) would further protect riparian and wetland vegetation in the North Fork area. (DEIS II 4-117)

B1 is also more protective generally of other water supply resources, as noted at DEIS II 4.90:

> Unlike Alternative B, Alternative B.1 also includes an NSO stipulation within 1,320 feet of any dam, ditch, irrigation intake, canal, or other water conveyance. ...Alternative B.1 offers the most protection of private water supplies and would only apply to the North Fork area.

While B1 is overall more protective of water resources: from river systems, water bodies and irrigation facilities to water wells and systems; in two cases regarding public water supplies, the stipulations in Alternative B area stronger.[25] We have recommended (in WSCC Comments Table 1 and the discussion above) that the stronger (Alternative B) stipulation be included in the final RMP regarding public water supplies.

The river systems, riparian corridors, and other water resources are important not only to the character of place and the water supply, but also for all life in the valley. River systems are a critical component of the West's habitat. In the winter deer and elk concentrate in the river bottom, and the riparian corridors provide year-round habitat for birds, reptiles and mammals, and migration routes for larger species.

[25] DEIS II 4-90: Under Alternative B.1, a buffer of 1,320 feet from public water supplies would be closed to oil and gas leasing and geophysical exploration, half the distance as under Alternative B. As such, Alternative B provides greater protection than Alternative B.1 for public water supplies from a classified surface water-supply stream segment. Beyond 1,320 feet and up to 2,640 feet, such water supplies would be subject to NSO stipulations. This would offer more protection than Alternative A but less than Alternative B.

Table 1: Recommended oil and gas stipulations

*Several stipulations are recommended from other alternatives in the draft RMP/EIS, as noted.

Alt. B1+ Stipulations*	No Leasing	No Surface Occupancy	Controlled Surface Use
Character of place			
Visual resources, local economies, farms & communities, sensitive landscapes, river corridors	NL-11 Prominent landmarks; NL-13 Coal leases; NL-3 Major river corridors.	NSO-52 Travel & Scenic Corridors; NSO-5 High geologic hazards; NSO-67* High occupancy buildings (Alts. B, D); NSO-68 Community facilities; NSO-3 Agricultural operations; NSO-7 Major river corridors.	CSU-7 Moderate geologic hazards; CSU-47 Vistas.
Water supply			
Waterbodies, private wells, water systems, public water source areas, irrigation facilities, river system	NL-1 Selenium soils; NL-4 Water bodies; NL-6* Public water supplies (Alt. B); NL-7 Public water supplies; NL-9 Domestic wells and water systems; NL-5 Water ways; NL-3 Major river corridors.	NSO-2 Selenium soils; NSO-15 Domestic wells and water systems; NSO-16 Water conveyance systems; NSO-12 Public water systems; NSO-55* BuRec dams & facilities (Alts. B,C,D).	
Wildlife habitat and migration			
Wildlife and species habitat, floodplains, riparian areas	NL-4 Water bodies; NL-5 Water ways; NL-10* Gunnison sage grouse (Alt. B).	NSO-35 Raptor sites; NSO-33 Gunnison sage grouse; NSO-27 Leopard frog; NSO-25 CRCT habitat; NSO-30* Yellow billed cuckoo (Alt. B); NSO-39* Mexican spotted owl (Alt. B); NSO-21 Deer & elk habitat; NSO-17* Rare plant communities (Alt. B); NSO-20* Ecological Emphasis Area (Alt. B); NSO-8 Floodplains.	

Recreational areas and access			
Jumbo Mountain SRMA, river access, hunting opportunities, visual resource protection	NL-11 Prominent landmarks; NL-14* Parks (Alt. B); NL-3 Major river corridors.	NSO-57 Recreation-Jumbo Mountain SRMA (VRM II); NSO-52 Travel & Scenic Corridors; NSO-25 CRCT habitat; NSO-21 Deer & elk habitat; NSO-7 Major river corridors.	CSU-47 Vistas.

Table 1 provides a summary of recommended oil and gas stipulations for the North Fork area. Most are those proposed are from Alternative B1, although some other stipulations from among the other alternatives are also recommended, as noted in the table above and in the narrative.

iii. Wildlife habitat and migration: wildlife and species habitat, floodplains riparian areas

Protecting the abundant wildlife populations is a top priority and main component of the North Fork Alternative Plan.

B1 would be the most protective of wildlife habitat in the North Fork.[26] The DEIS notes:

> Under Alternative B.1, an NSO would be applicable within 0.25mile of any active or historic bald eagle or golden eagle nest site, and within 0.50-mile of any active or historic peregrine falcon nest site. This would further protect these species within the North Fork area. Alternative B.1 also includes an NSO on mule deer and elk crucial winter range, including severe winter range and winter concentration areas, and in elk reproduction areas, as well as in big game migration corridors, which would further protect big game within the North Fork area. (DEIS II 4-136)

B1 best protects riparian corridors, which are critical components in the habitat systems in the valley.

> These actions would reduce the potential for impacts on vegetation in the North Fork area more than Alternative B. (DEIS II 4-116)

The stronger management in B1 include more protection for the valley's special status species.

> These actions would reduce the potential for impacts on special status species in the North Fork area more than Alternative B. (DEIS II 4-155)

Overall protections in B1 are the strongest proposed, and this includes for fish as well as wildlife habitat.

> Alternative B.1 provides more enhanced protection of aquatic and riparian species and their habitats than Alternative B. (DEIS II 4-154)

B1 provides the strongest level of protections proposed for the native Colorado River cutthroat trout.

[26] DEIS Volume II 4-134

> In addition, Alternative B.1 would apply NSO within 0.50-mile of stream segments that have existing and potential habitat for native cutthroat trout, further protecting this species in the North Fork area. (DEIS II 4-155)

And it is not only the direct management prescriptions that benefit wildlife. A number of the prescriptions in Alternative B1 overlap to provide the strongest proposed levels of habitat protection.

> [VRM] Classes I and II, which preserve or retain the existing character of the landscape, would restrict surface-disturbing activities, reduce direct impacts on fish and wildlife, and retain habitats. (DEIS II 4-131)

In a few cases, Alternative B identifies stipulations for species that are not included in B1. In these cases, we recommend those stipulations be included in the final RMP (as indicated above and in Table 1). However, in addition to best protecting important features to the humans that occupy the North Fork—in nearly every case B1 provides the best protections for furred, finned and feathered residents as well.

iv. Recreation areas and access: river access, hunting opportunities, visual resource protection, Jumbo Mountain SRMA

Alternative B1 best preserves the valleys river corridors and riparian areas, which is important to protecting the valley, its water supply, and its wildlife, and for the recreational opportunities provided. Alternative B1 provides the strongest protections overall for recreational access, resources, and opportunities in the North Fork, and for the features in the valley that help drive tourism.

Oil and gas development poses a direct threat to the scenic features of the valley, as the DEIS notes:

> Development could also add to the changes in the scenic values and other non-market commodities. (DEIS II 4-479)

Thus the stronger visual resource protections under B1 is a plus for tourism and recreation in the valley.

> [Fewer] acres available to fluid minerals leasing would result in fewer areas impacted from construction and operation. Applying NSO stipulations on 325,940 acres of BLM-administered lands would preserve the natural character of the landscape and would maintain existing recreation opportunities. (DEIS II 4-301)

The DEIS notes that recreation and tourism related activity is likely to increase across the resource area.

> Recreation is expected to increase as the Colorado population and the desire to live near or recreate on BLM-administered lands increase. This follows the trend of recent years seen across the state. (DEIS II 4-479)

The Jumbo Mountain area is important to the Town of Paonia and to many who recreate and live in the valley. Mountain bike groups, the Chamber of Commerce, area merchants, and the Town of Paonia all support inclusion of Jumbo Mountain as a SRMA, with B1 acreage and stipulations. Under B1 the entire Jumbo SRMA would have NSO stipulations, rather than only a slice as under Alternative B (DEIS II 4-306).

Given the likelihood that use at Jumbo will increase, and that the Town of Paonia and other local stakeholders are likely to incorporate the area into marketing and planning, keeping incompatible activity out of this close-in and primarily non-motorized recreational area only makes sense. However, and although the draft RMP/EIS notes that public use is likely to increase, under all alternatives except B1 the agency leaves most of the area open to oil and gas leasing and development.

Tourism is booming in the North Fork, and the current (Summer 2016) season is reportedly the busiest ever according to numerous area merchants. This trend is consistent with reports from across the state. B1 specifically protects scenic vistas and travel corridors (DEIS II 4-208).

> Other potential growth areas include recreation and information industries. Identifying avenues to support the development of these industries could provide additional diversification to the local economy.

These stronger protections benefit recreation directly, and also indirectly in many cases, for example through strong fish and habitat protections under B1 that enhance hunting and fishing opportunities.

In addition to stipulations included in B1 to protect recreational lands, access, and opportunities, we also recommend the NL-14 from Alternative B be carried forward to the final RMP, to protect public lands administered by the National Park Service. Regarding competitive events in the Jumbo Mountain SRMA, we propose the decision to allow some of these events be deferred until the SRMA planning process. And although not part of the North Fork Alternative Plan, and not identified in earlier scoping, new information that BLM should consider includes potential future Extensive Recreation Management Areas (ERMAs) for places such as Elephant Hill, Lone Cabin, McDonald Mesa/Creek, and C Hill—all of which are seeing increasing, but undirected use. The decision record should note this eventuality.

II) Specific concerns for water resources in the planning area, particularly as related to the Preferred Alternative

For the last 40 years, the Western Slope Conservation Center has advocated for our public lands as well as stewarded our water resources within the North Fork Valley and Lower Gunnison watershed. Consequently, we would be remiss not to include a detailed description of our water resource concerns beyond the geographic scope of the North Fork Alternative, B1, as well as our water resource concerns unrelated to oil and gas within the greater Lower Gunnison watershed.

We have focused these comments primarily on the failures of the draft RMP and Preferred Alternative, Alternative D, to adequately protect surface and groundwater quality, stream and water body health, and threatened and endangered aquatic and riparian species from surface activities including oil and gas development, road building, and naturally occurring salinity and selenium within the watershed.

The draft RMP (DEIS 4.3.3) provides only a general outline for impacts to water resources within the planning area. There is no discussion of impacts or mitigations to water resources due to specific management actions in particular locations. The final RMP must include a detailed discussion and analysis of water resource impacts with a much higher degree of specificity to location, scale, and scope of impacts.

The final RMP must also include all best available data regarding impacts of oil and gas development on water quality as well as water resources within the planning area, which includes a number of studies and reports references in these comments as well as other concerned parties. Part of this data includes a newly released Western Slope Conservation Center report on the Water Quality of the North Fork Watershed based on water quality monitoring conducted monthly between April 2001 and April 2014. (WSCC Comments, Appendix II) All of the following comments should be read in reference to this newly released report.

A. Fluid Minerals

It is clear that the final RMP's treatment of fluid mineral leasing and development will determine the water quality and watershed health of the Lower Gunnison watershed for decades to come.

1. Surface Occupancy, No Surface Occupancy, and No Leasing stipulations

Surface occupancy can produce highly consequential impacts to water resources, particularly with regards to the application, handling, and transport of liquids and chemicals associated with oil and gas activities. Surface occupancy can result in the following:

- Increased risk for surface and groundwater contamination as "current scientific consensus is that accidents and malfunctions, such as well blowouts, leaking casings, and spills of drilling fluids or wastewater, are more likely to contaminate surface and groundwater supplies than the process of high-volume hydraulic fracturing itself"[27]

[27] Adgate, John L., Bernard D. Goldstein, and Lisa M. Mckenzie. "Potential Public Health Hazards, Exposures and Health Effects from Unconventional Natural Gas Development." *Environmental Science & Technology Environ. Sci. Technol.* 48.15 (2014): 8307-320. Web. 19 Oct. 2016.

- The development and maintenance of new roads and/or increased traffic on existing roads, and the corresponding negative impacts to surface and groundwater contamination.
- Increased air and water pollution due to "(1) direct and fugitive emissions of methane and non-methane hydrocarbons from the well and associated infrastructure (e.g., production tanks, valves, pipelines, and collection and processing facilities); (2) diesel engines that power equipment, trucks, and generators; (3) drilling muds, fracturing fluids, and flowback water; and (4) deliberate venting and flaring of gas and related petroleum products"[28]
- Negative impacts on federally protected fish habitats and the native cutthroat trout and other species of concern.

The Preferred Alternative does not include adequate limitations to surface occupancy through the No Surface Occupancy and No Leasing management prescriptions. NSO and No Leasing buffer zones for domestic and irrigation water sources, stream bodies, and other sensitive ecological and agricultural resources as identified in Alternative B and B1 are supported by all referenced documentation in the NFAP as previously submitted to the BLM, as well as in these comments. These prescriptions are absolutely necessary to provide a minimum degree of protection for the water resources within the North Fork and Lower Gunnison watersheds, and similar buffers and protections should be extended to the full planning area.

2. Controlled Surface Use Stipulations in Preferred Alternative not adequate for protection of water resources in the North Fork Valley

It is clear that the Preferred Alternative attempts to address many of the impacts of oil and gas leasing and development on water resources in the planning area through the use of non-binding, waivable controlled surface use (CSU) stipulations. Nearly across the board, these CSUs do not provide adequate protections for water resources compared to the management prescriptions in Alternatives B1 and B. (See Table 2 in Appendix)

There is a 73%-96% difference in No Leasing prescription acreage between Alternatives B and D, with Alternative D drastically limiting the use of No Leasing, and therefore minimizing protections for water resources. Alternative D does not include B1 protections within .50 mile of Paonia, Hotchkiss, and Crawford. Alternative D also fails to include 76%-86% of acreage closure/withdrawal from locatable mineral entry as compared to Alternatives B (DEIA VI, Table 2-2: action 333,334,336, 348,352)(DEIS Vol II 4-92,4-99, 4-98)

3. Best Management Practices for Fluid Mineral Management

The Best Management Practices outlined in the draft RMP are inadequate for providing minimum degrees of protection for water resources within the planning area.

a. Final plan should exclude oil and gas activities on slopes steeper than 30%

Best Management Practices as outlined in the agency preferred alternative do not sufficiently protect slopes steeper than 30%, listing them as avoidance areas rather than exclusion areas (table 2-2, actions 39 and 40). Furthermore, a stipulation is made in Alternative D for slopes between 30-39% to allow occupancy and use along with special designs, construction, and implementation measures (including the possibility of an operator submitted engineering report) to maintain soil stability. Based on decades of local knowledge, along with a long record of local surface instability within the region, we recommend that the agency adopts surface use stipulations included in alternatives B and B1 for slopes over 30%

[28] (8310 Adgate et al)

rather than the stipulations outlined in action 40, alternative D. Unstable geology in the North Fork of the Gunnison watershed lead to broad destabilization resulting in high sediment loads within waterways as well as landslides.[29]

b. Abandoned and non-viable wells

The BLM's Preferred Alternative does not address best management practices or standard operating procedures for the processes involved with plugging and abandoning wells that are no longer viable. The final RMP must include mitigation and protection from impacts to water resources from abandoned, plugged, and non-viable wells.

4. Not enough data exists to make decisions about processing produced water.

Throughout the BLM's draft RMP, actions in the Preferred Alternative lack informed data to make informed decisions. This is particularly evident with regard to the best management plans (and lack thereof) for produced water associated with hydraulic fracturing for oil and gas development. The relationship between the injection of produced water and its impacts to the environment is still too new and too dynamic for the best available science to make prudent decisions that will protect our natural resources for future generations. From the initial diversion from the natural water system to disposal and processing post processing, produced water has the potential to negatively impact natural resources such as surface and groundwater, riparian and stream health, and geologic functions. For example, some have alleged that the storage of produced water in Oklahoma has caused an increase in the quantity and intensity of earthquakes in the area.[30] However, in the past year, the number of earthquakes has decreased since their peak.[31] Because of the consumptive nature of this water use and the potentially toxic chemicals and components that are present in produced water, this is highly concerning for what it indicates about possible impacts to the North Fork Valley of future oil and gas drilling. The potential impacts that produced water could incur on the environment and communities are too great, and too little data exists to make scientifically sound decisions that allow for safe development of oil and gas while protecting the communities that will be impacted by the BLM's final RMP.

5. The RMP does not address concerns to groundwater health, potential seismic activity, and surface water impacts associated with produced water

Not only does too little data exist to make informed decisions, but no action in the RMP addresses the potential environmental impacts of any part of the process that involves produced water. It is highly concerning that the preferred alternative opens 865,970 acres to oil and gas development but does not address the impacts and corresponding best management practices associated with management of produced water.

The local impacts of withdrawing significant quantities of water for hydraulic fracturing on stream and riparian health, local industry other than oil and gas development, and community health have also not been addressed by the draft RMP. A conservative estimate of water needed for hydraulic fracturing is 500,000 gallons per well.[32] While this totals into a relatively small percentage compared to total water use compared to agricultural and municipal water use statewide and nationally, the amount of water required

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[29] Regmi, N.R., Giardino, J.R. & Vitek, J.D. Landslides (2014) 11: 589. doi:10.1007/s10346-013-0412-6

[30] Ellsworth, W. L. "Injection-Induced Earthquakes." *Science* 341.6142 (2013): 1225942. Web. 19 Oct. 2016.

[31] Regan, Michael D. "Why Is Oklahoma Seeing Fewer Earthquakes? Scientists Point to New Oil & Gas Rules." *PBS*. PBS, 28 Aug. 2016. Web. 19 Oct. 2016.

[32] Jackson, Robert B., Avner Vengosh, J. William Carey, Richard J. Davies, Thomas H. Darrah, Francis O'sullivan, and Gabrielle Pétron. "The Environmental Costs and Benefits of Fracking." *Annual Review of Environment and Resources Annu. Rev. Environ. Resour.* 39.1 (2014): 327-62. Web. 19 Oct. 2016.

locally can be comparatively significant within the immediate water system's supply and use. This dynamic can have serious repercussions on local river health, especially when the North Fork of the Gunnison River already experience flows of under 20 cubic feet per second (cfs) during summer months. For example, in the Marcellus Shale of Pennsylvania, the early shale gas boom led to water withdrawal problems that had to be rectified by the state due to withdrawing too much water.[33]

The final RMP must include adequate best management practices to mitigate impacts of storing, transporting, or disposing produced water.

On-site storage of produced water (and flowback water) typically occurs in surface pits or sealed tanks prior to reuse and/or disposal.[34] While current evidence "suggests that wastewater is more effectively treated onsite because effluents discharged to publicly owned treatment plants may not be able to be sufficiently treated by such treatment plants for this waste stream," the proposed RMP lacks any actions to address protocol for this potentially toxic fluid.[35]

Should 100 percent of the produced water and condensate from oil and gas development be transported by truck, the transport will exhibit significant risks to the environmental and population. On-site release incidents from leaks, faulty equipment, and inadvertent human error can have significant and permanent impacts.

The transport of produced water and condensates will also produce negative impacts such as: increased local traffic along small, rural highways; increased emissions from heavy truck travel (thus contributing to greenhouse gases that exacerbate climate change); poor air quality due to increased particulate in the air due to dirt-road travel; and the negative impacts to the North Fork Valley and Western Slope way of life.

These persistent impacts would have little consequence compared to the high-impact potential of an accident of a vehicle that is transporting produced water and condensate. Any release that might occur along local highways and roads would contaminate local rivers and streams, negatively impacting water quality in a water system that is part of the Colorado River's headwaters. Additionally, we are concerned that the transport of produced water from the Uncompahgre region to be injected at another site would induce undue negative impacts on other communities and environments.

Should less than 100 percent of the produced water and condensate from oil and gas development not be transported by truck, the remaining produced water and condensate would likely be injected into earth or recycled.

The final RMP must address best management practices for these activities, and include management actions that mitigate possible impacts on other resources as detailed in these comments.

B. Concerns regarding impacts to Soils and Water Resources

The Preferred Alternative in the draft RMP does not provide adequate safeguards for sensitive soil and water resources within the planning area.

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[33] (Jackson et al 335).
[34] (8313, Adgate et al).
[35] (8313, Adgate et al).

1. Water Quality Impacts to Domestic and Agricultural Water Use

Residents within the North Fork Valley and Uncompahgre planning area are fully dependent on the quality of their domestic and agricultural water supply for their health, happiness, and livelihoods. The Preferred Alternative in the draft RMP does not provide adequate protections for these essential water resources.

a. RMP does not adequately describe protections for groundwater

Domestic groundwater sources vary greatly throughout the planning area. The protections outlined in the agency's preferred alternative are not sufficient for protecting groundwater aquifers. Objective 54 in Table 2-2, states "Protect groundwater resources and recharge areas to maintain functioning condition of all parameters within the hydrologic cycle, including groundwater quantity and quality." However, the agency's actions do not meet this proposed objective.

Action 55 allows an unlimited surface occupancy distance (no prohibition or setbacks) and only vaguely describes the required mechanisms for sealing the interface of casing and substrate. The interconnected nature of groundwater aquifers (some of them quite shallow), and the potential loss of drilling fluid into aquifers during exploration poses too high a risk for permanent contamination. It is recommended that the BLM adopt the protections outlined in Alternative B and B1 to meet the objective outlined in line 54.

Fluid mineral exploration and development often produces significant amounts of saltwater/ produced water containing oil, sand, polymers, chemicals, and dissolved solids. As this water is no longer usable, it is recycled or disposed of in underground reservoirs, which produces significant surface disturbance in addition to the surface disturbance of the oil and gas producing wells. If these disposal wells are permitted by the BLM, they should be subject to at least the same surface restrictions as oil/gas wells. The draft RMP does not address regulatory specifics associated with fluid mineral exploration and development.

b. Water Rights

While the BLM supports existing water rights through quantitative protections, it does not protect the quality of the water associated with those rights. Current uses of the water rights depend on a historical standard of water quality.

The WSCC supports Objective 51 and the agency preferred alternatives 52 and 53 to provide sufficient water quantity on BLM lands for multiple use management and functioning, healthy riparian and aquatic ecosystems. Healthy instream flows are vital for fisheries, wetlands, and riparian areas. Action 52 will help keep those ecosystems that depend on instream flows viable and healthy. Additionally, maintaining historical water quality standards is critical for human and economic health.

The Preferred Alternative, however, would allow oil and gas development (fluid mineral exploration and development, non-fluid mineral exploration and development, construction and maintenance of roads, and other surface disturbing activities including recreation) which would negatively impact the *quality* of the water within the watershed, through the inadvertent release of potentially and proven toxic chemicals, increased particulate matter in air and watersheds due to increased surface activity, etc. Historical water use, primarily associated with farming, depends on the continuation of the high standards of water quality that have persisted in the area for generations.

The final RMP must include specific stipulations, actions, and best management practices for maintaining the historical water quality standards and mitigating potential negative impacts to water quality. This

should include publicly available monitoring for conductivity, total and dissolved metals including selenium, nutrients, and field parameters to evaluate conditions. The final RMP must also include enforceable action plans should water quality conditions exceed state and national water quality standards or shift substantially from historical records. The Western Slope Conservation Center has gathered water quality on the North Fork of the Gunnison River for 15 years and has used this data to establish a water quality baseline (WSCC, See Appendix). Management thresholds should be based on the site specific water quality classifications determined by the state of Colorado.[36]

c. Final plan must include adequate buffers for domestic and irrigation water sources

The North Fork Valley and Colorado's Western Slope have been defined for over one hundred years by their idyllic, agricultural landscapes. In a water scarce landscape, the hard work of farming families over the course of generations to channel and beneficially use the water that is available is nothing less than extraordinary. Some of the ditches that provide these farms were built by hand with mule teams. Now, those ditches provide water for people who are keeping the agricultural tradition of the region alive. The agricultural products and value-added goods are sold nationally, statewide, and locally. Neighboring resort communities like Aspen, Telluride, and Crested Butte particularly benefit from the North Fork Valley's agricultural production because they attract tourists who are interested in human powered lifestyles like hiking and skiing that heavily emphasize the consumption of local foods. Locally, it is universally known that Paonia peaches are the best in the country.

The value of agriculture is "often understated because some of its most valuable attributes are intrinsic and qualitative. It is valuable because it is an iconic part of the culture and heritage, its expansive landscape provides value to residents and visitors, it has a strong and complementary relationship to visitor enjoyment, return flows from irrigation sustain late season stream flows for fisheries and recreation and replenish underground aquifers needed for some rural residential real estate."[37]

The final plan must include adequate buffers for irrigation and domestic water sources in order to protect the livelihoods, foodshed, and residents of the North Fork Valley. Fruit, hay, corn, vegetables, and more depend on clean water that is free of highly toxic chemicals, components, and condensates. In the North Fork Valley, many people raise their crops organically, but even if someone uses agricultural aids to maximize their production, those crops will still be negatively impacted by poor water quality. While the North Fork's quintessential way of life is shaped by fields and orchards, many local residents also nurture gardens that help feed their families throughout the year. Those gardens depend on clean domestic and municipal water, as do the people who tend them.

The preferred Alternative does not give this legacy of agriculture the protections that the farmers deserve. The BLM's preferred alternative in Table 2-2, does not stipulate surface occupancy protections with regards to agricultural water conveyance systems. Ditches that were dug by hand and fields and orchards that have been tended by generations will not be protected from the potential inadvertent accidents and releases associated with surface occupancy.

In addition to failing to protect local farms, the BLM's proposed RMP does not provide adequate protection for domestic water supplies and does not fulfill the BLM's objective to "manage lands within

[36] https://www.colorado.gov/pacific/sites/default/files/42_2014%2807%29withmaps.pdf
[37] Coley/Forrest, Inc. "Water and Its Relationship to the Economies of Headwater Counties." *Http://nwccog.org/wp-content/uploads/2015/03/QQStudy_Report_Jan-2012.pdf*. The Northwest Colorado Council of Governments Foundation, Inc, Dec. 2011. Web. 19 Oct. 2016. 10.

municipal watersheds and public water supply areas to provide clean drinking water to local communities."

Some of the proposed actions include the following:

- Applying inadequate restrictions and closures on lands to activities such as fluid mineral leasing and geophysical exploration, mineral materials disposal, etc. (Action 50).
- Manage land within 1,000 feet of a surface water supply-stream as a right of way avoidance area.
- Allow well bores to be drilled within 1,000 feet of a domestic water well (Action 55).
- Allow fluid mineral drilling leasing and geophysical exploration on 36,810 acres more than Alternative B by only prohibiting leasing and exploration on land that is within 1,000 feet of public water supply water (Action 334).
- Allowing surface occupancy on 214,790 acres more than Alternative B by stipulating only minimal protections for rivers and streams (Action 336)
- Allowing controlled surface occupancy on 333,330 acres by stipulating only minimal protections for rivers and streams (Action 337)

None of these actions give public water supplies the protection they deserve because of the highly consequential impacts of development. Currently, no comprehensive, population-based study of the public health effects of unconventional natural gas operations exists.[38] As such, the proposed alternative's actions that impact public water supplies and subsequently public health are a highly inappropriate and arbitrary attempt at minimizing the impacts from surface occupancy, leasing, and exploration associated with oil and gas development in addition to other minerals.

Furthermore, the protection amount of 1,000 feet is applied widely throughout the draft RMP, under the agency preferred alternative D, as a buffer to streams, wetlands, domestic water sources (including wells and springs), as well as irrigation ditches and other water conveyance systems. Clarification supported by the best available science is needed to clarify the otherwise arbitrary distances proposed in the preferred Alternative. In its absence, it is recommended that the BLM adopt the protections described in alternative B and B.1 for buffer zones as they are more specific to the needs of each particular use.

For all actions that address public water supply, it is recommended that the BLM adopt Alternatives B and B1 in order to meet the RMP's objectives related to water supply.

2. Salinity and selenium

The watersheds within the UFO have been the subject of much attention because of the high levels of salinity and selenium that have negative downstream impacts when they are released into rivers and streams. Indeed, "[t]he Lower Gunnison Basin represents the largest contribution of salinity to the Colorado River system, with a total annual loading of 1,440,000 tons."[39] "The Mancos Shale is a major source of dissolved solids and selenium in the study area. The Mancos Shale is the lateral equivalent to the Niobrara Shale, Cody Shale, and Pierre Shale in Colorado, Montana, Nebraska, South Dakota, and Wyoming (Tweto, 1979; Green, 1992; Wright and Butler, 1993)".[40]

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[38] (Adgate et al).
[39] URS, and US Department of the Interior / Bureau of Reclamation. *Final Findings and Strategies: Comprehensive Planning Studies for Salinity Control Measures in the Upper Colorado River Basin.* Rep. N.p.: n.p., 2013. Print.
[40] Thomas, Judith C., Jennifer L. Moore, Keelin R. Schaffrath, Jean A. Dupree, Cory A. Williams, and Kenneth J. Leib. "Characterization and Data-Gap Analysis of Surface-Water Quality in the Piceance Study Area, Western Colorado, 1959–2009." *Scientific Investigations Report 2013–5015* (2013): Iii-300. Web. 19 Oct. 2016, 4.

Salinity control efforts in the Gunnison River Basin dates back to the 1970s with the creation of the Colorado River Basin Salinity Control Forum. "The Bureau of Reclamation (2011a) estimated that 47 percent of the salinity load in the entire Colorado River Basin is derived from natural sources, including geological formations, saline springs, and surface runoff; 37 percent results from irrigation; and the remaining 16 percent results from reservoir-storage effects and municipal and industrial activities".[41] In response, the "Natural Resources Conservation Service and US Bureau of Reclamation have been replacing irrigation ditches with buried pipe to conserve water and reduce salinity and selenium within the Colorado River system" (RMP Volume II, 4-17). The effect of these efforts has resulted in the reduction of "227,100 tons per year by both on-farm and off- farm measures through combined efforts from Reclamation, USDA/NRCS, and the BLM."[42]

The Western Slope Conservation Center is concerned that the agency preferred alternative in the proposed RMP will exacerbate the concentrations of salinity and selenium in the Lower Gunnison River and Colorado River Basins through run-off and erosion due to the deterioration of aging, existing agricultural infrastructure and surface disturbing activities (such as fluid mineral exploration and development, off-trail recreation, and road and infrastructure construction and maintenance) coupled with wind and water erosion, the effects of drought, and the unpredictability and extreme weather events and trends associated with global climate change. Additionally, as stated in the proposed RMP (Volume I, 3-32): "Management actions in the planning area that could result in accelerated selenium yields from deep water percolation include ROWs involving open water sources (such as irrigation ditches and canals), and land sales or exchanges that involve lands dominated by Mancos Shale."

Already, millions of dollars have been invested in the watershed to minimize salinity and selenium leaching. The Western Slope Conservation Center is concerned that the preferred alternative will negate that investment of time and money and will increase salinity and selenium loading in the Lower Gunnison River. This will result in a failure to protect domestic and agricultural water within the UFO and downstream in the Colorado River Basin. It is recommended that the BLM adopt Alternative B in order to meet Objective 30 in Table 2-2 to "manage the activities to minimize the yield of sediment, salt, and selenium contributions from BLM administered lands to water resources."

As referenced in Vol. II, page 4-84, motorized travel has detrimental effects on erosion, soil health, water quality, and watershed health. It is suggested that to minimize the detrimental effects of motorized travel on saline/selenium soils and to minimize saline/ selenium loading in this watershed and the greater Colorado River watershed, that soils with high concentrations for saline/selenium be managed as ROW exclusion areas. Table 2-2, Action 33 outlines management of saline/selenium soils with relation to ROW travel. It is recommended that the BLM adopt the actions outlined in alternative B rather than the preferred alternative D which is "no action".

Table 2-2, Action 31: The agency preferred alternative D supports activities to minimize the yield of sediment, salt, and selenium contributions from BLM administered lands to water resources as outlined in Objective 30.

3. Stream and water body health

Streams, wetlands, and riparian corridors are of critical importance to watershed health. While riparian areas only account for one percent of land cover, they "are among the most productive and valuable

[41] Thomas, Judith C., Jennifer L. Moore, Keelin R. Schaffrath, Jean A. Dupree, Cory A. Williams, and Kenneth J. Leib. "Characterization and Data-Gap Analysis of Surface-Water Quality in the Piceance Study Area, Western Colorado, 1959–2009." *Scientific Investigations Report 2013–5015* (2013): Iii-300. Web. 19 Oct. 2016. 12.
[42] (URS, 1-5).

natural resources," and in western desert areas, "riparian areas are the major providers of habitat for endangered and threatened species."[43] These sensitive areas are critical for the services they provide. These services include, but are not limited to: helping control nonpoint source pollution; supplying food, cover, and water a large diversity of animals including threatened and endangered species; providing migration routes and stopping points during migration; streambank stabilization and floodwater mitigation.[44]

a. RMP does not adequately protect sensitive areas

Proposed management actions in the preferred alternative of the draft RMP fail to protect sensitive areas such as streams, wetlands, and riparian corridors, and as such, the proposed actions fail to protect the species, livelihoods, and economies dependent on the health of that habitat. What follows includes a list of concerns and recommendations related to particular actions of the preferred alternative. Unless otherwise stated, the Western Slope Conservation Center recommends the adoption of alternatives B and B1 as a minimum compromise to protect and preserve these sensitive and valuable areas and the species that are dependent on them.

- **Table 2-2, Action 44** fails to protect the Gunnison, North Fork Gunnison, Smith Fork, San Miguel, Uncompahgre, and Dolores Rivers from oil and gas leasing, geophysical exploration, surface occupancy, and its subsequent impacts. These rivers provide invaluable economic, environmental, and public health resources, and the proposed action has the potential to negatively impact all of these resources indefinitely. Only Alternatives B and B.1 adequately provide protections for these riverine resources while still allowing for surface occupancy, exploration, and development in more appropriate areas.
- **Table 2-2, Actions 63 & 64** outline methods and actions for maximizing native vegetation throughout BLM lands. The maximization of native vegetation is essential for the health of riparian areas, wetlands, and other sensitive habitats. The BLM has taken great effort to promote the success of native vegetation in this section. The agency preferred alternative D is a reasonable option, but when allowing for the use of non-native revegetation, the agency should add the words "as a last and final option" or "when all other native re-vegetation options have been exhausted."
- **Table 2-2, Action 75** fails to protect valuable riparian and wetland areas by managing a 325-foot buffer zone as a right of way avoidance area. Avoidance areas do not guarantee that these valuable habitat resources will receive the levels of protection that they deserve.
- **Table 2-2, Action 76** does not provide an adequate buffer to protect the valuable riparian habitat within the UFO. It is recommended that the BLM modify their preferred Alternative D to include a 500-foot buffer (rather than the 100ft buffer currently drafted), in addition to requiring stipulations for commercial special recreation permits.
- **Table 2-2, Action 79** does not ensure that wetlands and riparian areas impacted by historic land use and flow regime modification will be enhanced and restored. It is suggested that the words "Pursue opportunities to" are removed from Alternative D to ensure that wetlands and riparian areas impacted by historic land use and flow regime modification are enhanced and restored.
- **Table 2-2, Action 81** fails to protect the ecological values, water quality, aquatic value, recreational attractions, water storage, and flood control services provided by lakes, ponds, naturally occurring wetlands and impounding reservoirs from the impacts of surface occupancy and use. The proposed action of the preferred alternative does not give ample protections to these

[43] "Natural Resources Conservation Service." *Riparian Areas Environmental Uniqueness, Functions, and Values*. NRCS, 1996. Web. 19 Oct. 2016.
[44] (NRCS).

water bodies, subsequently endangering the viability of the species, farms and irrigated acreage, public health, and environmental health dependent on them. Only alternatives B and B.1 offer a minimum level of protection for these invaluable resources.

- **Table 2-2, Action 88** fails to manage lands under Integrated Weed Management strategies to support BLM Colorado Public Land Health Standards. Invasive species negatively impact riparian and wetland health. Suppressing and eradicating noxious and invasive species is essential for the health of these habitats.
- **Table 2-2, Actions 99, 139, and 147** endanger the health of fisheries by failing to protect aquatic habitat to the most prudent extent necessary to ensure a viable and healthy fish habitat into the future. The pursuit of "opportunities to enhance, protect, or restore native aquatic species habitats" (Action 99) does not guarantee that such goals will be met. Additionally, the preferred alternative fails to recognize priority habitats for special status fish and aquatic wildlife which include perennial water sources, riparian areas, intermittent streams and ponds, and ephemeral/seasonal waters. These failures have the potential to place undue stress on these species and threaten the community health of these organisms (Action 133). Threatened and endangered species are particularly under threat because the habitat they occupy will be managed under the proposed preferred alternative as right of way avoidance, rather than exclusion areas (Action 139). Finally, the proposed alternative fails to provide adequate protection for the Native Cutthroat Trout (Action 147). This federally listed fish species requires the maintenance of its habitat integrity and the promotion of their recovery, and the buffer zones and other restrictions threaten that integrity and recovery.

b. RMP does not put in place adequate monitoring metrics including macro-invertebrates

The preferred alternative proposes actions that have the potential to negatively impact stream health and water quality. However, the RMP does not put into place adequate monitoring metrics for parameters for evaluating stream health and water quality, nor does it establish best management practices for entities that might engage in resource development on the landscapes addressed by the RMP. This is unacceptable because it fails to provide metrics to evaluate the impacts of activity on the landscape. In order to understand the impacts of activity, it is recommended that a baseline for parameters including but not limited to conductivity, dissolved metals, and macroinvertebrates be established where surface activity occurs and monitoring continues during and after such activity.

c. Stream health standards in RMP do not equate to healthy ecosystems, but instead are inadequate minimum-level protections

Stream health is a vital component for functioning land and water-based ecosystems. Should the quality of rivers, streams, and their riparian and wetland areas falter, the entire system and the economies dependent on it will falter as well. Because the health of streams and sensitive areas such as riparian and wetland areas play an important role in not just a functioning ecosystem but also a functioning economy, it is critical to afford them maximum protections. However, the stream health standards in the RMP outline measures that do not meet even minimum needs for protection.

The preferred alternative, as stated in Table 2-2, Action 43, will promote the delisting of state impaired water bodies for 303[d]-listed water bodies only, and that it will "develop a water and aquatic monitoring plan, if necessary, to determine areas where adaptive management is needed." Alternative B will promote the delisting of state impaired 303[d]-listed and Monitoring and Evaluation list water bodies. It is recommended that the final RMP include water bodies which are on the Monitoring and Evaluation List in order to address issues on less impaired streams before they become more impaired and more

expensive to improve. The final RMP must also define what requirements necessitate adaptive management plans and the process required to develop a water and aquatic monitoring plan. The final RMP should include all other available water quality data and reports for the planning area, including the Western Slope Conservation Center's newly released "VOLUNTEER WATER QUALITY MONITORING NETWORK, April 2001 – April 2014 Data Report." (WSCC Comments, Appendix II)

Though the draft RMP makes an effort at protecting sensitive areas (DEIS Table 2-2, Actions 23-24), there are many objectives and actions that need to be modified to better reach the goals outlined for land health (Table 2-2, Goal 22). The preferred alternative, Objective 24 partitions some of BLM lands (those specially designated as sensitive areas) to be managed and protected to "fully meet Colorado Public Land Health Standards", but leaves the remaining lands to be managed "with problems" as long as they are trending in the general direction of meeting Colorado Public Land Health Standards. We ask that the BLM manage all lands to fully meet Colorado Public Land Health Standards, thereby closing loopholes that could allow ambiguous protections for sensitive areas left undesignated.

d. RMP standards and Best Management Practices do not adequately protect water bodies

The WSCC is extremely concerned that the standards and Best Management Practices outlined in the RMP are inadequate to meet the goals and objectives listed for Water Resources (Table 2-2, Action 29). Table 2-2, Action 32 describes methods to protect water bodies in areas with high levels of salt and selenium. While Alternatives B and B1 mandate inventory assessments for activities completed within these hazardous areas (and also outlines specific geographic hazards), the agency preferred alternative leaves site assessments/evaluation as an option to be completed or ignored "when feasible." The preferred alternative here falls far short of outlining the protections necessary to meet aforementioned goals.

In regard to riparian areas, the preferred alternative states: "Manage naturally occurring riparian and wetland areas to maintain or improve hydrologic and riparian vegetation conditions and to improve or exceed proper functioning conditions" (Table 2-2, Objective 74). However, the supporting agency preferred actions fail to adequately meet that objective. It is our concern that by managing buffer zones as "avoidance areas" rather than "exclusion areas" (Action 75) these sensitive areas are open to all manner of disturbance which would result in irreversible ecological damage.

The WSCC is also concerned that the preferred alternative actions outlined to meet Objective 74 are too ambiguous in their management of sensitive areas such as water bodies. For example, Action 79, alternative B mandates that the agency "create, enhance, and restore wetland and riparian areas impacted by historic land use and flow regime modification" however, the agency preferred alternative dictates the action to only "pursue" such measures and in effect gives this action very little in the way of requirements to complete restoration measures. It is of great concern to the WSCC that these types of vague measures as outlined in the agency's preferred alternative will result in vague management and therefore negatively impact sensitive ecological areas.

The WSCC also recommends that the BLM adopt the measures described in alternatives B and B1 for allowable use and surface occupancy (Table 2-2, Action 81). While the preferred alternative describes stipulations that would allow for various types of use and occupancy (including oil and gas leasing), the stipulations described are inadequate for the protection of these water bodies. For example, the preferred alternative prohibits use and occupancy within 325'-500' of the water bodies listed and briefly describes how to determine the mapped extent of such water bodies according to observed vegetation. However, such boundaries such as riparian and wetland margins can be difficult to determine and are not necessarily dictated by the vegetation observed in the field. Hydrologic conditions must be taken into account as well as the connectivity of source water for such impounded ponds, perennial, intermittent /ephemeral streams,

wetland, fens, springs, seeps, and riparian areas. At times, the source water for such sensitive ecological areas is not easily observable and can originate from a myriad of locations, many of them much further than the 500' buffer. We highly recommend that the BLM adopt the measures described in Alternatives B and B1 for allowable use and surface occupancy when it comes to these important water bodies.

e. BLM has not completed research or accrued necessary information to make an informed or accurate management plan for water bodies

The Western Slope Conservation Center is disappointed with the extent to which the draft RMP addresses the cumulative impacts of the preferred alternative's proposed actions to water resources. As it stands, the actions included in the preferred alternative are deficient in addressing water resource concerns. The lack of baseline monitoring and evaluation current conditions will make it impossible to understand and address changes in water quality and stream health which in turn will impact public health and the economy.

While Alternative B and B1 do provide more support for water resources, they too fail to address the impacts of the potential consumptive water use of fluid minerals development on watershed, stream, riparian, and wetland health.

The final RMP must include additional baseline data (see Appendix II) and a more thorough analysis of cumulative impacts to water bodies, including from all consumptive water uses.

f. Ecological Impacts from motorized use

The WSCC is concerned about the impacts from motorized use particularly near sensitive areas such as intermittent streams, wetlands, fens, seeps, springs, water bodies, and other ACEC's.

The draft RMP describes (in acres) the amount of area impacted by motorized use according to each alternative (Volume II, Tables 4-21, 4-22, 4-23). In all tables, the agency preferred alternative D opens more land to motorized use than any of the other alternatives, barring Alternative C. Table 4-22 shows the amount of lands closed to motorized use for slopes greater than 30%. The preferred alternative closes only 40 acres of this highly erodible topography (compared with the alternative B, 2,440acres). Alternative C, in this case, opens all lands over 30% slope for motorized use. The agency's preferred alternative D and alternative C are unacceptable options for sensitive areas and will lead to harmful ecological impacts for streams and waterbodies throughout the UFO.

4. Drought Management

Under severe drought conditions (D2), Appendix I (DEIS) of the draft RMP states that drought letters would be sent to grazing permittees and other land users. Please provide information in Appendix I on what these letters would say, and what follow up in management would occur with these letters, including actions by the land users, if required.

Similarly, Appendix I (DEIS) states that under severe drought conditions (D2), the BLM will "prepare local seasonal precipitation graphs." Please explain how "local" are these graphs, how many of these are prepared within the planning area, how the data are collected that are used in these graphs, and what is done with the graphs after they are prepared.

Also, Appendix I (DEIS) states that under extreme drought conditions (D3), OHV Open Areas and designated routes would be temporarily closed. Please explain what conditions would allow these areas to be re-opened, and what a reasonable timeline for that reopening would look like.

C. Right Of Way (ROW) Concerns - The draft RMP does not adequately protect surface water quality from development impacts including increased sedimentation, pollutants, etc.

The WSCC is concerned that the preferred alternative does not protect surface water quality from surface activities as determined by Right of Way. ROW buffers outlined under the agency's preferred alternative D fall far short of the protections needed to meet goals and objectives for surface water quality throughout the draft RMP. The WSCC recommends that the BLM adopt the guidelines expressed in alternative B and B1 for ROW buffers. The following actions are examples of inadequate protections as outlined in the agency preferred alternative D and recommendations for modification.

- (Table 2-2, Action 45) Alternative B designates a ROW avoidance area within 0.25 miles along major river corridors. However, the agency preferred alternative D is "no action". Though ROW exclusion of major river corridors is infeasible, it is recommended that the BLM adopt ROW avoidance areas outlined in Alternative B to meet the agency objectives.

- (Table 2-2, Action 46) The agency preferred alternative would manage a 325-foot buffer along perennial streams as ROW avoidance areas as the preferred alternative. Alternative B would manage a 325-foot buffer along perennial streams as ROW exclusion areas. The WSCC is concerned that perennial streams will be impacted by the construction and use of roads, pipelines, etc. While these areas would be operated with stipulation, by managing the areas as avoidance areas some perennial streams would ultimately be adversely impacted by the construction and development of roads, pipelines, and utility lines, etc. It is recommended that these impacts be avoided by managing the area according to Alternative B as an exclusion area. *(Vol. I, Table 2-2: Action 45, 46, 49, 493, 494); (Vol. II: 4-90, 4-93, 4-97, 4-99, 4-100)*

- (Table 2-2, Action 75-84) The ROW protections in the agency's preferred alternative D for Riparian and Wetland areas as described in Table 2-2, are not adequate to meet the corresponding Objective 74. For example: In addition to the action proposed in alternative D, there needs to be a ROW "exclusion" in the naturally occurring riparian and wetland areas, seeps, and springs instead of an ROW "avoidance" buffer.

- (Table 2-2, Action 49) Alternative D manages lands within 1,000 feet of a surface water supply-stream segment as ROW avoidance areas. Alternative B manages lands within 2,640 (.5 mile) of a supply stream segment as ROW exclusion areas. As listed above in section II.3, until clarification supported by the best available science is given for the otherwise arbitrary buffer distance of "1,000ft," the WSCC recommends that the BLM adopt the ROW buffers outlined in alternatives B and B.1 as they are specific to the needs of each particular use

- (Table 2-2, Action 26) The overall goal for land health as stated in Table 2-2 is to "Manage soils, riparian- wetland areas, native plant and animal communities, special status species, and water quality to meet land health standards". However, the corresponding actions do not support the objectives outlined to meet that goal. For example: It is stated in Action 26 "Limit, modify, or manage the cause..." It is suggested that the BLM should add "Close" to these management actions in Alternative D in order to fully meet the goal for land health as described in Table 2-2.

D. Special Status Species, Wildlife & Vegetation (Aquatic and Riparian)

The draft RMP does not adequately protect fish from adverse surface activity. The WSCC is concerned the BLM has not taken sufficient measures within the draft RMP to protect and support and growth of fisheries within the UFO. Inadequate buffers zones described in the agency's preferred alternative D for

ROW, surface use, and travel management are pervasive throughout the draft RMP. It is imperative that the BLM protect special status fish and aquatic wildlife by recognizing that perennial water sources, riparian areas, intermittent streams and ponds, and ephemeral/seasonal waters as priority habitats (Action 133, Alt. B).

Furthermore, it is vitally important that the BLM protect federally listed fish species, maintain the integrity of habitat for federally listed species, and promote their recovery by prohibiting surface occupancy and restricting all ground disturbances within one mile of federally listed fish occupied habitat as described in Action 147, Alt. B; Appendix B, B-24.

The WSCC has found that throughout the draft RMP there are multiple areas where the agency preferred alternative leaves far too much uncertainty in its prescribed actions. For example, in Table 2-2, action 99, the preferred alternative dictates that the action "pursue opportunities to enhance, protect or restore native aquatic species habitat". The word "Pursue" allows for incompletion of the presented objective of the action. However, Alternative B dictates precise actions to enhance protect and restore native aquatic species habitat' The WSCC recommends the BLM adopt actions described in alternative B to protect habitat for fisheries and aquatic animals by enhancing, protecting, and restoring at least 5 miles of aquatic habitat by doing things like modifying or removing fish migration barriers and improving stream vegetation and structure to benefit non-game native species (Action 99, Alt. B) and thereby achieve the intended objective.

E. Best Management Practices and Standard Operating Procedures not adequate for protecting Water Resources

In the draft RMP's discussion of Best Management Practices and Standard Operating Procedures, it does not provide adequate information regarding these practices and procedures in order to assess mitigation of impacts to water resources within the planning area.

1. Road construction and management

Please address the management of the construction of permanent and semi-permanent roads as related to Forestry and Woodland Products. It is noted that in Table 2-2, Action 270, that there doesn't seem to be any action under Forestry and Woodland Products that addresses the construction of permanent or semi-permanent roads, and the corresponding impacts to surface water and stream bodies. (DEIS 2.4.91 and 2.4.97)

Also, the draft RMP does not sufficiently explain how the BLM will prevent "using roads during wet periods if use will damage the road drainage features?" (DEIS G-10). WSCC members have observed that historically the BLM continually fails to close roads during wet periods, and BLM roads are substantially damaged by heavy rutting caused by use during said wet periods.

2. Water – Oil and Gas

In Appendix G, the WSCC suggests that the word "should" be replaced by "is required to" or "will" to make it clear that the BMPs and SOPs listed in this section are required by BLM rather than suggested (DEIS G-10).

3. Vegetation – Riparian

Please describe the methods to be used by BLM or land users to minimize livestock grazing and trailing impacts in riparian areas (DEIS G-13).

4. Forestry – Best Management Practices

It is suggested that the bullet that states "perform construction, installation, and removal work during low-water flow if circumstances allow" be changed to state that all instream and near-stream work be performed during low water flows. (DEIS G-28)

5. Reducing Fluid Mineral Development Footprint

It is stated that drilling will be done with closed loop systems as much as possible within municipal watersheds, and that the operator will develop and implement a Watershed Protection Plan in municipal watersheds. Within the UFO area, there are numerous private water companies whose watersheds also need protection to ensure that their drinking water supplies are not impaired and human health is not adversely affected. It is suggested that the bullets on page G-34 that refer to municipal watersheds be changed to say "in watersheds used to supply water to public or private domestic water systems…" (DEIS G-34)

III) Additional specific concerns regarding the Preferred Alternative and support for protective management prescriptions in the draft Resource Management Plan

In addition to the concerns and recommendations already outlined in these comments regarding the North Fork Alternative, B1, and water resources in the planning area, the WSCC would like to address concerns related to other resources not otherwise mentioned, and provide support for corresponding prescription recommendations.

A. Socio-economics

We have clearly state in Part I of these comments why the North Fork Alternative, B1, is the only alternative in the draft RMP that would adequately protect against the negative socio-economic impacts of oil and gas activities within the North Fork planning area.

This support notwithstanding, we strongly urge the BLM to include in the final RMP more robust analysis on socio-economic impacts from oil and gas development within the full Uncompahgre planning area. The U.S. Bureau of Land Management should ensure that management of public lands do not harm, but rather enhance, the economic opportunities that exist within the Uncompahgre planning area by working to maintain the area's current character, visual and scenic resources, clean air and water, non-industrialized public lands and recreational trails and access.

1. Economic sectors to be included in full socio-economic analysis.

The final RMP should provide protections that enhance the following inputs into the economies of the Uncompahgre planning area:

Trails-based and River Recreation
Colorado is emerging as a leader in the recreation economy, and both nonmotorized (i.e. hiking, trail running, mountain biking, etc.) and motorized (snowmobiling, OHV, etc.) trail-based recreation on Colorado's public lands contribute millions of dollars into local economies. River recreation is a growing opportunity in the North Fork, one being increasingly prioritized by area communities and stakeholders. The North Fork Alternative provides protection from oil and gas development for streams and river corridors, trailhead areas, the flanks of the West Elk Mountains, and the Jumbo Mountain area.[45]

Hunting and Angling
Public lands access for hunting, camping, fishing and travel, as well as plentiful and healthy habitat are critical components that help sustain the multi-million-dollar hunting industry in the area. The North Fork Alternative would prohibit any surface occupancy in critical wildlife habitat, and includes both No Leasing and No Surface Occupancy setbacks from streams, riparian areas, and water bodies.[46]

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[45] "Colorado emerging as a national leader in developing a recreational-based economy," Denver Post June 5, 2016
"The Economic Value of Quiet Recreation on BLM Lands: Colorado," Pew Charitable Trust fact sheet, www.pewtrusts.org/~/media/assets/2016/03/wli_co_quietrec_final.pdf?la=en.

[46] "Big game hunting pours massive money into state, regional economy," Glenwood Springs Post Independent, October 25, 2015
www.postindependent.com/news/local/big-game-hunting-pours-massive-money-into-state-regional-economy/. "Colorado Parks & Wildlife 2016 Fact Sheet," at http://cpw.state.co.us/Documents/About/Reports/StatewideFactSheet.pdf

North Fork Valley Festivals and Events
Festivals and events, including agritourism-related activities like the *West Elk Wine Trail*, farm-to-field dining, car, bike and motorcycle rallies, races, and groups rides, community festivals (like Cherry Days, the Harvest Festival, Pioneer Days, Sheep Camp Stock Dog Trials in Hotchkiss) rely in part on the characteristics provided by the small town atmosphere and undeveloped public lands in and around our valley. The North Fork Alternative prohibits leasing and development on the edges of towns and away from farms and residences, schools, parks, and community facilities.[47]

Windshield Tourism
The North Fork Valley sits at the very heart of the West Elk Loop Scenic Byway, world renowned for its scenery and rural character, called "the closest you can come to a wilderness experience in a passenger car." Oil and gas development could jeopardize the scenic qualities of the area. The North Fork Alternative includes the strongest protections for the Valley's scenic features.[48]

Agritourism
Agritourism relies on a character inherent in the place, the North Fork Valley in this case, which is home to the West Elk Wine region and has been called America's Provenance, Colorado's Farm-to-Table Capital, and other laudatory titles. That character would be jeopardized by industrialization that accompanies oil and gas development. Alternative B1 requires development setbacks from agricultural lands, prevents damage to visual qualities, and best preserves the current rural character of the valley.[49]

Farming, Ranching and Food-based Enterprise
Agriculture remains the dominant force in the valley, known for its concentration of organic and sustainable farms, orchards, and ranches. The brand that food-based enterprise already in the North Fork Valley relies on is its reputation for high quality, organic or natural products. This North Fork brand has been acknowledged widely throughout the state and region, including in a recent federally funded economic study for Delta County completed by Better Cities. [50] Impacts to agriculture from the management of nearby and adjacent public lands, which include water conveyances for, lie upslope, and otherwise directly impact farms and private lands from oil and gas development poses a legitimate concern and potential, if uncertain, threat.

Creative Industries
The North Fork Valley is an emerging hotspot for the creative industries—from musicians and poets, founders, sculptures and glassblowers, to authors, playwrights, photographers and painters—and is Colorado's only rural state-designated Creative District. The agricultural roots and bucolic character of

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[47] "Annual Festivals & Events," North Fork Visitors Guide, at www.northforkvisitorguide.com/annual-festivals--events.html. Behind the Vines: Stone Cottage Cellars, 5280 Magazine, June 30 2016 at www.5280.com/digital/2016/06/behind-vines-stone-cottage-cellars

[48] "Scenic Byways of Colorado: West Elk Scenic and Historic Byway," GrandCircle.org at http://www.grandcircle.org/scenic-byways/scenic-byways-of-colorado/324-west-elk-scenic-and-historic-byway

[49] "Agritourism in the North Fork Valley Is Blooming," Slow Food Western Slope, July 18 2014 at http://slowfoodwesternslope.org/agritourism-in-the-north-fork-valley-is-blooming/. "Agritourism," Delta County Tourism Cabinet, at http://www.deltacountycolorado.com/about/agritourism.aspx

[50] "Shale Development and Agriculture, Agricultural and Applied Economics Association," 2014 at http://www.choicesmagazine.org/choices-magazine/theme-articles/is-the-natural-gas-revolution-all-its-fracked-up-to-be-for-local-economies/shale-development-and-agriculture. "Economic opportunities lie in ag, tourism and manufacturing," Delta County Independent, August 25, 2015.

the valley are primary components of what makes the North Fork a uniquely inspirational base for a growing creative community.[51]

Footloose Economy
Economic activity that follows quality-of-life cannot not be understated in quantifying value of nearby public lands. This is especially true for the North Fork, due to the outstanding opportunities to access top quality public lands and the spectacular backdrop these lands provide our community, paired with the other initiatives happening in the valley. This includes current efforts to bring a food enterprise hub, new educational facilities, and gigabyte speed broadband. Combined these efforts at economic development can continue to attract consultants, start-up entrepreneurs, educators and students, creative industries such as photography, art, design, and music, tele-commuters, and many other of the self-employed—all drawn to the area's high quality of life, rural and healthy environment, and adjacent non-industrialized public lands. The North Fork Alternative goes furthest in protecting and maintaining these features.[52]

Real Estate
Real estate sales in the North Fork Valley continue to be driven be those seeking a rural, non-industrial, and agricultural lifestyle. "The argument repeated many times was that gas development on public lands this close to organic farms and wineries who are marketing the healthy setting and perceived purity of their production as well as the product itself, is incompatible and would result in the federal government willfully vandalizing a local economy. A group of area realtors filed a joint protest that echoed this thought." [53]

2. The RMP does not adequately take into account economic trends such as the decline of local coal production

The BLM has not completed the necessary research needed to develop an accurate economic impact study. It is recommended the BLM reconsider their assumption for mineral development with regards to coal extraction. Specifically, in the Somerset coal field in order to take into account market forces that have caused coal mines to close. This will change the results of the economic impact study in regards to anticipated economies and population growth in the next 20 years. (Vol II, paragraph 2, 4-458, Paragraph 2, 4-457)

B. Air Quality

1. Cumulative Air Quality Impacts
Impacts to air quality begin when the first exploratory well is drilled—according to some recent studies, including research by Paonia-based The Endocrine Disruptor Exchange, according to an article in the *Glenwood Springs Post-Independent* ("Study calls for scrutiny of air emissions at gas well sites" November 20, 2012).

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[51]"Supporting the Creative Industries of Colorado's North Fork Valley," North Fork Valley Creative Coalition at http://northforkcreative.org/

[52] "Understanding the Recreation Economy on Nearby Public Lands," Headwaters Economic white paper, November 2014 at http://headwaterseconomics.org/public-lands/insights-understanding-the-recreation-economy/. "Colorado: Assessing the Economic Value of Public Lands," OurPubliclnds.org at www.ourpubliclands.org/public-lands-report-co. "Western Public Lands," Wilburforce Foundation, September 2014 at www.wilburforce.org/files/western-lands-messaging-report/at_download/file

[53] "BLM Deadline Passes – The Valley Waits to See Results of Protests," Merchant Herald, December 2012 at www.merchantherald.com/blm-deadline-passes-the-valley-waits-to-see-results-of-protests/

These effects continue and build cumulatively in regards to other oil and gas activity in the region. Communities in the West that are near BLM lands subject to oil and gas development are seeing significant problems with winter smog, believed to be—in large part—caused by federal leasing of these lands for oil and gas. But the draft RMP does incorporate adequate data collected from relevant state and federal agencies, including the Colorado Oil and Gas Conservation Commission (COGCC) before determining final management actions.

The lack of cumulative air analysis was at the heart of a recent decision by the BLM-Uncompahgre Office to complete an EIS for the Bull Mountain Master Development Plan,[54] located within the upper North Fork Watershed. The air quality analysis in the Bull Mountain MDP FEIS has not yet been incorporated into the draft RMP's discussion of environmental consequences of the alternatives nor the cumulative impacts of regional oil and gas activity on air quality.

BLM has lost in court on several notable occasions of late on very similar issues: its failure to consider the impacts on air quality of leasing lands for oil and gas development given the other activity it is permitting in the region. Notably, a federal judge sent the Roan Plateau RMP amendment back to the BLM due to these concerns (and due to the failure of the agency to adequately consider an alternative management plan put forward by local stakeholders).

The clean and usually clear air of the North Fork Valley is a high quality community and shared resource. The BLM in Colorado has already been brought to task on its failure to properly consider the cumulative impacts of its own actions on the region's air quality, particularly in regards to oil and gas leasing. This has happened elsewhere as well, like at Otero Mesa in New Mexico. The final RMP revision that properly considers this activity in relation to the area's air quality.

The draft RMP states explicitly that oil and gas development are a major contributor to total pollutant emissions:

> Emissions from oil and gas (fluid minerals) development are a major contributor to total estimated emissions under all alternatives. For the Uncompahgre planning area, this category includes conventional oil and gas and coalbed natural gas development. Activities quantified in this category include well drilling and completion, road and well pad construction, flaring and venting, compressor operations, dehydrator and separator operations, tank venting and load out, wellhead fugitives, pneumatic device operations, and vehicle traffic. The quantities of emissions estimated from these activities are based on reasonably foreseeable estimates of development rates, well counts, production rates, and existing technologies. (DEIS 4-25)

It also states that Alternative B1 would produce the lowest level of emissions, followed by Alternative B. The draft RMP simultaneously states plainly that emissions from all four alternatives included in the draft RMP could produce a number of negative impacts to local air quality and corresponding public health:

> estimated emissions from oil and gas development would increase for all pollutants over the base year due to increased development. The emissions of carbon monoxide, nitrogen oxide, sulfur dioxide, volatile organic compounds, and particulate matter could impact air quality and air quality-related values. Nitrogen oxide and volatile organic compound emissions could contribute to regional ozone formation. The CARMMS analysis presented below estimates these emissions

[54] BLM Bull Mountain MDP FEIS 2016. 4.2.1
http://www.blm.gov/co/st/en/BLM_Information/nepa/ufo/Bull_Mountain_EIS.html

> sources' impacts on air quality (including potential ozone formation) and air quality-related values (visibility and atmospheric deposition) in planning Year 10.
>
> Hazardous air pollutants emissions could increase the risk of localized human health impacts. (DEIS 4-37)

The unknown risks to local human health impacts of air pollutant emissions is unacceptable, and the BLM must include in the final plan adequate management of oil and gas leasing, including significant no leasing and no surface occupancy stipulations to safeguard the health of community members and residents who live within the Uncompahgre planning area.

2. Methane Capture in the North Fork Valley

The Western Slope Conservation Center believes the final RMP must take into account possible changes related to the Coal Leasing PEIS that the Department of the Interior is currently undertaking. The DOI will be mitigating the challenges our communities face in weathering the boom-bust cycles of mining which will require the highest degree of reclamation standards, full bonding (not self-bonding) for future reclamation activities, thorough analysis of all impacts to air, water and wildlife prior to issuing new leases, and assurance of a fair return from coal leasing.

One additional step that the BLM and DOI can take over the coming years is to incentivize and expedite the capture of coal mine methane, which the North Fork produces in excess. The OxBow mine coal methane recapture demonstration project is the ideal example.[55] It repurposes coal mine methane (CMM) gas, an unseen, toxic greenhouse gas, between 20-25 times more potent than carbon dioxide, into 3-megawatts of electricity for Aspen Ski Corporation. The project is at the now-closed OxBow Elk Creek mine in Somerset. It was collaboration between the Western Slope Conservation Center, a 501c3 non-profit organization headquartered in Paonia, Colorado, OxBow Delta Montrose Electric (DMEA), Holy Cross Electric, Aspen Ski Company, and mine that purchases the electricity, the BLM and others. It is expected to eliminate approximately 96,000 tons of CO_2 a year, with a projected life of at least 15 years.[56]

On June 18, 2016, the Federal Energy Regulatory Commission ruled in favor of DMEA, the local rural electric COOP. It struck down a "lost revenue recovery fee" imposed by Tri-State Generation & Transmission Association (Tri-State) reaffirming that DMEA couldn't be financially disadvantaged for following the law and purchasing local, renewable power.[57] This opens the door for DMEA to purchase locally recaptured CMM. This would meet member demands for clean energy, hedge against fossil-fuel price increases, promote economic development, and save money.

In many ways, the North Fork is a best-case scenario for coal mining communities. North Fork mines produce some of the cleanest burning coal in the country. Our communities have benefited from this wealth over many decades without sacrificing the other riches that our local land, water, and air provide. That, coupled with the methane recapture project and the methane off-gassing from our closed and operational mines, puts us in an excellent position for the federal government to leverage us as a methane recapture research and training site. It could create training and jobs for some displaced miners while diversifying our local economy and energy generation.

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[55] Aspen Times. "Coal Mine Is Key to Utility's 'Green' Goals." April 5, 2012. Retrieved June 25, 2016.
[56] Ray, Kecia. The Invisible Plume/ Why coal mine methane is worth looking at. Colorado Independent. May 2, 2016. Retrieved Jul 10, 2016.
[57] Federal Energy Regulatory Commission Summary, June 16, 2016 Meeting

The North Fork also possesses a wealth of other renewable energy sources like micro-hydro, solar and biomass. Public lands that once extracted coal could become solar farms, as the infrastructure to transport this source of energy already exists at those sites. We would welcome an opportunity to pilot some innovative ways to leverage those sources of energy for our homes, farms, businesses, government and community centers. This could similarly diversity our economy, create new jobs and realize the mass potential for renewable energies.

The final RMP must include adequate analysis of the air quality, climate change, and social costs of coal mine methane venting. These impacts are local, regional, and national. As our above comments attest, the North Fork Valley is primed to benefit massively from improved methane capture administrative policy.

The final RMP should also include stipulations that allow for coal mine methane drilling while excluding other forms of fluid mineral leasing and withdrawal associated with oil and gas development. However, the Western Slope Conservation Center believes coal *bed* methane leasing and extraction, which would occur above coal seams that have not yet been mined, should be subject to all the same standards and stipulations of other fluid mineral leasing and development.

C. Wildlife

1. Imperiled Species

Oil and gas exploration and development authorized through the Preferred Alternative in the draft RMP is likely to have negative impacts on several special status species. Federally listed threatened, endangered or candidate species that could occur or have potential habitat in the vicinity of lands open to leasing include Canada lynx, Gunnison Sage-grouse, greenback cutthroat trout and Colorado hookless cactus. Other special status species that could be impacted by the lease sale include white-tailed prairie dogs, clay-loving wild buckwheat, roundtail chub and Debeque milkvetch. BLM has not taken the requisite hard look at the impacts of unconventional oil and gas development on wildlife, including threatened and endangered species, and other sensitive species. BLM's existing analysis in the draft RMP does not fulfill the requirements of NEPA to assess the impacts of oil and gas leasing on these species. Nor do the CSU's as included in the Preferred Alternative adequately protect the following species from adverse impacts from surface activities, and primarily those surface activities related to leasing of oil and gas.

1. Canada Lynx

The Canada lynx *(Lynx canadensis)* is a Federally Listed Threatened species and Colorado Parks and Wildlife (CPW) Endangered Species. The BLM has previously identified Lynx potential habitat, which also contains lynx winter habitat. Lynx Analysis Units (LAUs) have also been identified. In spite of the potential for negative impacts on lynx that could result from leasing within the planning area, BLM failed to prepare sufficient NEPA analysis of the impacts on lynx from leasing, failed to include No Surface Occupancy or No Leasing stipulations to protect lynx habitat.

During scoping for recent lease sales located within the North Fork Valley, comments were submitted by the U.S. Fish and Wildlife Service (FWS) expressing concern with the lease sale's potential impacts to lynx. The FWS determined that several lease parcels abutted primary and secondary suitable habitat for lynx. The Service stated that "[t]o date, *BLM has not updated their mapping or assessment of habitat suitability for Canada lynx. Therefore, these parcels, and others, should be evaluated for suitability for Canada lynx prior to leasing*." BLM has not undertaken the requisite evaluation of the lands included for leasing in the Preferred Alternative, and must provide No Surface Occupancy and No Leasing stipulations until it can determine that leasing and development will not jeopardize the species.

In 2000, when FWS concluded that listing the lynx as a threatened species under the ESA was warranted, it identified inadequate regulatory mechanisms in existing RMPs as a primary factor contributing to the lynx's decline. *Recognizing this, the UFO's draft Preferred Alternative of the RMP revision proposes new stipulations for Canada lynx habitat that are not included in the 1989 RMP*. Alternative B, however, provides the most protective stipulations, and should be included in the final RMP.

In this case, leasing without non-waivable NSO stipulations could result in jeopardy to lynx. Thus any future proposed leasing would require consultation with the FWS. Leasing any parcels in lynx habitat would violate the ESA, and these lands should be protected with No Surface Occupancy or No Leasing for the BLM to meet its obligations under the ESA.

2. Gunnison Sage-grouse

We support protective non-waivable NSO and No Leasing stipulations for all seasonal Gunnison sage-grouse habitat, as included in Alternative B.

Recent research indicates that all Gunnison Sage-grouse populations must be increased in size in order to avoid inbreeding depression and/or maintain adaptive potential and avoid increased extinction risk. It is now widely agreed that it will be necessary to maintain large expanses of suitable sagebrush habitat across the landscape to conserve populations. As such, BLM must consider what impacts leasing and development on suitable, former Gunnison Sage-grouse habitat would have on ongoing efforts to save this species from the brink of extinction. The Gunnison Sage-grouse Rangewide Conservation Plan states that "the issues of primary focus for [the Crawford] population are habitat enhancement and restoration, expansion of occupied habitat, and protection of habitat from permanent loss, especially in potential areas of expansion," and that "*expansion of the area occupied by sage-grouse is necessary in this population in order to meet population goals*."

All parcels with Historic or Potential Gunnison Sage-grouse habitat should be protected with non-waivable NSO or No Leasing stipulations in the final RMP.

4. Colorado Hookless Cactus

The draft RMP includes extensive description of documented existence of Colorado hookless cactus, a federally-listed threatened species, within the planning area, including in areas that would remain open to oil and gas leasing under the draft Preferred Alternative. The draft RMP also indicates that some individuals are being impacted by OHC use in the North Delta area (DEIS 3-115). For this reason, the BLM must include the Adobe Badlands LWC, Adobe Ecological Emphasis Area, and the Salt Desert Shrub Ecosystem ACEC in the final RMP.

5. White-tailed Prairie Dog

Active White-tailed Prairie Dog colonies occur within lands open to oil and gas leasing in the Preferred Alternative. The White-tailed Prairie Dog is a USFS Sensitive Species and Colorado BLM Sensitive Species. We support non-waivable stipulations, including NSO-41,
that includes No Surface Occupancy and No Leasing within close proximity to active prairie dog colonies.

6. Clay-loving Wild Buckwheat

The draft RMP states that clay-loving wild buckwheat is found within the planning area, and we support the proposed Action 20. in Alternative B:

> Seven ACECs (92,900 acres) would be designated to protect special status and rare plants (Colorado hookless cactus, clay-loving wild buckwheat, Adobe Hills beardtongue, Colorado

desert parsley, good-neighbor bladderpod, kachina daisy, Naturita milkvetch, Paradox Valley lupine, Paradox breadroot, and Grand Junction milkvetch), the most of any alternative. OHVs would be limited to designated trails on portions of the Kinikin Hills SRMA, where there are clay-loving wild buckwheat populations.

Any lesser protection would be inadequate to protect clay-loving wild buckwheat and other special status species within the planning area.

8. Debeque Milkvetch

The UFO planning area contains populations of Debeque Milkvetch, a Colorado BLM Sensitive plant. In spite of this recognition, the draft RMP does not analyze or recommend any substantive protections for the species. BLM should survey the planning area for Debeque milkvetch to determine whether the species is present, with corresponding stipulations added for protections.

B. Areas of High Conservation Value

Oil and gas exploration and development related to oil and gas leasing allowed in the Preferred Alternative is likely to have significant negative impacts on numerous areas of high conservation value, including elk winter range, mule deer winter range, and the Roeber and McCluskey State Wildlife Areas.

1. Big Game Winter Range

The final RMP must take into account significant new research demonstrating the effects of natural gas development on wildlife. See comments on Ecological Emphasis Areas. We commend the BLM for designating Ecological Emphasis Areas and encourage their inclusion in the final plan.

Critical big game winter range is dispersed across much of the land open to oil and gas leasing in the North Fork in the Preferred Alternative. The North Fork's deer and elk populations are vital for the local economy, and a key component of the landscape's ecosystem health.

We ask that the final RMP include additional analysis regarding the impacts on terrestrial wildlife habitat from oil and gas development specifically. Development across BLM lands in the North Fork particularly would result in additional roads, pipelines, habitat loss, fences and increased human disturbance on winter ranges used by thousands of elk and mule deer. BLM must determine how, when and to what degree elk and mule deer populations would be impacted. Reduction in effective winter range size caused by extensive oil and gas development in the North Fork cold increase deer density on remaining winter ranges, reducing forage quality, fawn survival and overwinter carrying capacity. Given the quality of big game habitat within the proposed lease parcels and the social and economic importance of hunting to the North Fork communities, it would be a travesty to rely on inadequate analysis.

3. Roeber and McCluskey State Wildlife Area

The leasing of lands adjacent to McCluskey and Roeber State Wildlife Areas is inappropriate. McCluskey SWA is popular for hunting deer, elk, dusky grouse and rabbit. Roeber SWA is a popular location for hunting deer, elk and rabbit, and for fishing in the cold water lake. State wildlife areas are paid for by revenue from sportsmen and under state law, Colorado Parks and Wildlife (CPW) is required to manage the areas for the benefit of wildlife. However, activities that conflict with the primary mission of providing wildlife recreation on State Wildlife Areas are discouraged. Oil and gas development adjacent to these protected areas could have negative impacts on the wildlife and recreational opportunities for which the lands have been set aside.

D. Lands with Wilderness Characteristics

We appreciate that BLM has inventoried lands with wilderness characteristics in the planning area and that the Draft RMP considers multiple alternatives to protectively manage those lands. Specifically, we are particularly concerned with the Adobe Badlands WSA Adjacent and Camel Backs WSA Adjacent units, both of which have been partially included within Alternative B to be Lands Managed to Protect Wilderness Characteristics (LWCs). We strongly support all acres of these units to be included as LWCs within the final plan.

We recognize that the Uncompahgre Field Office has been a leader in Colorado in regards to complying with the updated inventory requirements, as the field office publicly posted inventory information in a timely fashion when the new policy was released and refined that information in 2015 to better align with BLM Manual 6310. We value the UFO's commitment to addressing this resource through the RMP revision. However, BLM should make some adjustments in the draft RMP to better comply with agency policy, and the agency's obligations under FLPMA and NEPA, to achieve a more balanced land use plan that embodies multiple use and sustained yield.

FLPMA requires BLM to inventory and consider lands with wilderness characteristics during the land use planning process. 43 U.S.C. § 1711(a); s*ee also Ore. Natural Desert Ass'n v. BLM*, 625 F.3d 1092, 1122 (9th Cir. 2008) (holding that "wilderness characteristics are among the values the FLPMA specifically assigns to the BLM to manage in land use plans).[58] IM 2011-154 and Manuals 6310 and 6320 contain mandatory guidance on implementing that requirement. The IM directs BLM to "conduct and maintain inventories regarding the presence or absence of wilderness characteristics, and to consider identified lands with wilderness characteristics in land use plans and when analyzing projects under [NEPA]." This includes the "necessary forms for each area" including photo logs, route analysis forms and inventory area evaluations (Manual 6310, Appendices A-D). Manual 6310 reiterates that, "[r]egardless of past inventory, the BLM must maintain and update as necessary, its inventory of wilderness resources on public lands." Manual 6320 requires BLM to consider lands with wilderness characteristics in land use planning, both in evaluating the impacts of management alternatives on lands with wilderness characteristics and in evaluating alternatives that would protect those values. Wilderness inventories are to be done on a *continuing* basis and relevant citizen-submitted data is to be evaluated. BLM Manual 6310 at .04(C)(1).

1. Inventory

There are a few specific instances in which BLM's LWC inventory is inconsistent with current agency policy. Below are comments addressing where and how BLM's inventory fails to follow the guidance for conducting lands with wilderness characteristics inventories detailed in BLM Manual 6310.

<u>Adobe Badlands WSA Adjacent</u>

[58] In an April 2003 settlement agreement (Utah Settlement) between Secretary of the Interior Norton and the State of Utah, the BLM abdicated its authority to designate any additional WSAs, and we maintain that this agreement is invalid and will ultimately be overturned. In addition, the Utah Settlement is based on an interpretation of FLPMA §§ 201, 202, and 603 that is contrary to FLPMA's plain language. Section 603 did not supersede or limit BLM's authority under § 201 to undertake wilderness inventories, but rather relies explicitly on BLM having exactly that authority under § 201. Nor did § 603 in any way limit BLM's discretion under § 202 to manage its lands as it sees fit, including managing areas as § 202 WSAs in accordance with BLM Manual 6330. This administration has the authority to create new WSAs under § 202 and BLM should be considering this within its range of reasonable alternatives that are deserving of consideration in this NEPA process.

BLM's inventory for the Adobe Badlands LWC unit is 6,200 acres, while partner assessments, submitted in their comments on this draft RMP show the unit to be about 8,200 acres. The major difference is in the far southwest portion of the unit, where BLM drew boundary lines to cut out two portions of the unit (downslope towards the power lines) based on the argument those areas do not have either outstanding opportunities for solitude or primitive recreation. However, these areas are contiguous with the Adobe Badlands WSA, and therefore inherit the outstanding opportunities already identified in the WSA. BLM Manual 6310 provides that if a polygon of land is contiguous with lands currently managed to protect their wilderness character (e.g. WSA) and that contiguous land meets the naturalness criterion, then that naturally appearing contiguous land meets the criteria for LWC because it inherits the outstanding opportunities already identified in the adjacent WSA. BLM Manual 6310 is clear that not every acre needs to have outstanding opportunities, including when the area is contiguous with a WSA: "The area does not have to possess outstanding opportunities for both elements, nor does it need to have outstanding opportunities on every acre, even when an area is contiguous to lands with identified wilderness characteristics." BLM Manual 6310 at .06(C)(2)(c). BLM finds in its inventory report for the Adobe Badlands LWC unit that the eliminated areas are both contiguous with the WSA and natural; therefore, they should qualify as LWC. Furthermore, BLM should not cut out areas that don't have outstanding opportunities; cut outs should be for impacts related to naturalness only according to BLM Manual 6310.

Camel Back WSA Adjacent

BLM's Camel Back LWC unit only includes lands from the canyon rims down, eliminating obviously qualifying lands on the mesa tops, which may total 1,000-2,000 additional acres. BLM's report for this unit states that BLM removed 1,750 acres on Monitor Mesa for further consideration as lands with wilderness characteristics because of "substantial evidence of human modification" on "most" of Monitor Mesa, including "constructed and maintained routes that run the length of the mesa top" and mechanical vegetative treatments…that are obvious to the casual observer.

However, while two constructed and maintained routes do traverse the length of the mesa top, these routes are easily cherry-stemmed from the larger unit; stating that these routes contribute to "substantial evidence of human modification" across "most of Monitor Mesa" is entirely misleading. These two routes only make up a small portion of the mesa top, and because of significant vegetative screening along there length, they have little impact on the naturalness of the area as a whole.

Further, BLM's claims that "most of" Monitor Mesa "shows substantial evidence of human modification" and that old vegetative treatment areas are "obvious to a casual observer" is factually incorrect. Such statements are an indication that BLM inventoried this area using aerial imagery, rather than on-the-ground investigation.

Summary of Comments: BLM should refine the LWC inventory to address the inconsistencies with BLM Manual 6310 identified above, and should include LWC management status for all acreage of Adobe Badlands WSA Adjacent and Camel Back WSA Adjacent units

2. Environmental Consequences Analysis

Manual 6320 provides that BLM must "consider the benefits that may accrue to other resource values and uses as a result of protecting wilderness characteristics." BLM Manual 6320.06(A)(1)(b). Those benefits should be analyzed in the RMP, particularly in the environmental effects analysis. They include the following:

(a) Scenic values – FLPMA specifically identifies "scenic values" as a resource of BLM lands for purposes of inventory and management (43 U.S.C. § 1711(a)), and the unspoiled landscapes of lands with wilderness characteristics generally provide spectacular viewing experiences. The scenic values of these lands will be severely compromised if destructive activities or other visual impairments are permitted.

(b) Recreation – FLPMA also identifies "outdoor recreation" as a valuable resource to be inventoried and managed by BLM. 43 U.S.C. § 1711(a). Lands with wilderness characteristics provide opportunities for primitive recreation, such as hiking, camping, hunting and wildlife viewing. Most, if not all, primitive recreation experiences will be foreclosed or severely impacted if the naturalness and quiet of these lands are not preserved.

(c) Wildlife habitat, connectivity and riparian areas – FLPMA acknowledges the value of wildlife habitat found in public lands and recognizes habitat as an important use. 43 U.S.C. § 1702(c). Due to their unspoiled state, lands with wilderness characteristics provide valuable habitat for wildlife, thereby supporting additional resources and uses of the public lands. As part of their habitat, many species are also dependent on riparian and other wetland habitats, especially during either seasonal migrations or seasons and years when surrounding habitats are dry and unproductive. Wilderness-quality lands support biodiversity, watershed protection and overall healthy ecosystems. In addition, they provide connectivity that facilitates wildlife migration, seasonal movements and dispersal of young. The low route density, absence of development activities and corresponding absence of motorized vehicles, which are integral to wilderness character, also ensure the clean air, clean water and lack of disturbance necessary for productive wildlife habitat, large scale connectivity and riparian areas (which support both wildlife habitat and human uses of water).

(d) Cultural resources – FLPMA also recognizes the importance of "historical values" as part of the resources of the public lands to be protected. 43 U.S.C. § 1702(c). The lack of intensive human access and activity on lands with wilderness characteristics helps to protect these resources. Managing lands to protect wilderness qualities will also help protect cultural and archaeological sites.

(e) Quality of life – The wildlands located within the planning area help to define the character of this area and are an important component of the quality of life for local residents and future generations, providing wilderness values in proximity to the population centers spread across the planning area. Their protection enables the customs and culture of this community to continue.

(f) Balanced use – The vast majority of BLM lands are open to motorized use and development. FLPMA recognizes that "multiple use" of the public lands requires "a combination of balanced and diverse resource uses" that includes recreation, watershed, wildlife, fish, and natural scenic and historical values. 43 U.S.C. § 1702(c). FLPMA also requires BLM to prepare land use plans that may limit certain uses in some areas. 43 U.S.C. § 1712. Many other multiple uses of public lands are compatible with protection of wilderness characteristics – in fact, many are enhanced if not dependent on protection of wilderness qualities (such as primitive recreation and wildlife habitat). Protection of wilderness characteristics will benefit many of the other multiple uses and values of BLM lands such as air and water quality, night skies, soundscapes, and viewsheds, while other more exclusionary uses (such as off-road vehicle use and timber harvesting) will still have adequate opportunities on other BLM lands.

(g) Economic benefits – The recreation opportunities provided by wilderness quality lands also yield direct economic benefits to local communities. According to the U.S. Fish & Wildlife Service, in 2011

state residents and non-residents spent $3 billion on wildlife recreation in Colorado.[59] In addition, local communities that protect wildlands reap measurable benefits in terms of employment and personal income. Sonoran Institute 2004. Other "non-market" economic values arise from the ability of wildlands to contribute to recreation and recreation-related jobs, scientific research, scenic viewsheds, biodiversity conservation, and watershed protection. Morton 1999; Loomis 2000. All of these economic benefits are dependent upon adequate protection of the wilderness characteristics of the lands.

We appreciate that the Draft RMP acknowledges in many instances that protecting lands with wilderness characteristics will also protect other resources such as soil, water, vegetation, fish and wildlife, and wild and scenic river ORVs. *See, e.g.*, Uncompahgre Draft RMP at 4-68, 4-91, 4-115, 4-151, 4-414. However, those analyses do not appear to inform the decisions made in the Draft RMP, particularly the preferred alternative, because BLM would only manage 18,320 acres of lands with wilderness characteristics in the preferred alternative – less than 3% of the public land in the planning area. This preferred plan does not reflect BLM's findings that many public lands resources would benefit from managing lands to protect wilderness characteristics.

Additionally, the Draft RMP does not adequately analyze or acknowledge the economic benefits of protecting lands with wilderness characteristics. We appreciate that BLM discusses nonmarket values, including the fact that setting land aside for protection can maintain and enhance nonmarket values associated with natural amenities. Uncompahgre Draft RMP at 4-460. However, the Draft RMP fails to meaningfully analyze nonmarket values, stating: "Nonmarket values are difficult to quantify, and insufficient data exists in order to assess the impacts of management actions." *Ibid*. The brief and qualitative treatment of nonmarket values in the Draft RMP is not adequate to inform management decisions in the RMP, and does not conform to agency guidance. BLM should complete more robust analysis of nonmarket values, including specifically lands managed to protect wilderness characteristics.

BLM has current guidance on estimating nonmarket environmental values and analyzing those values in land use planning.[60] IM 2013-131 directs BLM to "utilize estimates of nonmarket environmental values in NEPA analysis supporting planning and other decision-making." Nonmarket values are described as values that "reflect the benefits individuals attribute to experiences of the environment, uses of natural resources, or the existence of particular ecological conditions that do not involve market transactions and therefore lack prices," such as "the perceived benefit of hiking in wilderness."

BLM's guidance directs the agency to analyze nonmarket values for each alternative and adopt management decisions that are informed by that analysis:

> In framing information for management decisions, focus on the *difference in changes to nonmarket values* between action alternatives. Such information can highlight tradeoffs. For example, an alternative designating an additional thirty miles of trails for off-highway vehicles may *increase* the visitor days of use – therefore the total nonmarket benefits – from motorized recreation, but may *decrease* the benefits of subsistence hunting and watershed protection in this area. The *difference* between the changes to nonmarket values between this alternative and an alternative that, for example, only designates an additional ten miles of trails, can inform the choice among action alternatives. IM 2013-131, Attachment 1-5.

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[59] USFWS 2011, National Survey of Hunting, Fishing and Wildlife-associated Recreation, available at http://www.census.gov/prod/2013pubs/fhw11-co.pdf

[60] IM 2013-131, available at: http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_instruction/2013/IM_2013-131__Ch1.print.html.

The guidance also directs that quantitative analysis of nonmarket values is strongly encouraged when "the alternatives to be considered present a strong contrast between extractive and non-extractive uses of land and resources. For example, an RMP may include alternative resource allocations that vary between managing land primarily for oil and gas development or managing it for habitat conservation and recreation." IM 2013-131, Attachment 1-7. Because the Uncompahgre RMP is evaluating a range of alternatives that has a development-focused alternative at one end of the spectrum and a conservation-focused alternative at the other, this criterion applies to the RMP and BLM should conduct quantitative analysis of nonmarket values.

Summary of Comments: BLM should adopt a final plan that actually reflects BLM's findings that many public lands resources would benefit from managing lands to protect wilderness characteristics. BLM should complete more robust analysis of nonmarket values, including specifically lands managed to protect wilderness characteristics. BLM should analyze the economic benefits of protecting lands with wilderness characteristics for each alternative and utilize that analysis to inform the management decisions ultimately adopted in the RMP.

3. Management

i. An accurate and comprehensive inventory of lands with wilderness characteristics is necessary to inform management alternatives, impact analysis and decision-making.

Evaluating management alternatives for lands with wilderness characteristics requires an accurate inventory to serve as baseline information. FLPMA requires BLM to inventory the resources of the public lands in order to development management plans. 43 U.S.C. § 1711(a). The National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 *et seq*., requires agencies to "describe the environment of the areas to be affected or created by the alternatives under consideration." *See* 40 C.F.R. § 1502.15. Establishment of baseline conditions is a requirement of NEPA. In *Half Moon Bay Fisherman's Marketing Ass'n v. Carlucci*, 857 F.2d 505, 510 (9th Cir. 1988), the Ninth Circuit states that "without establishing . . . baseline conditions . . . there is simply no way to determine what effect [an action] will have on the environment, and consequently, no way to comply with NEPA." The court further held that "[t]he concept of a baseline against which to compare predictions of the effects of the proposed action and reasonable alternatives is critical to the NEPA process."

The U.S. Court of Appeals for the Ninth Circuit has held: "wilderness characteristics are among the 'resource and other values' of the public lands to be inventoried under § 1711. BLM's land use plans, which provide for the management of these resources and values, are to 'rely, to the extent it is available, on the inventory of the public lands, their resources, and other values.' 43 U.S.C. § 1712(c)(4)." *Ore. Natural Desert Ass'n v. Bureau of Land Management*, 531 F.3d at 1119. Therefore, BLM is required to consider "whether, and to what extent, wilderness values are now present in the planning area outside of existing WSAs and, if so, how the Plan should treat land with such values." *Id*. at 1143.

Conducting an accurate and comprehensive inventory as directed by Manual 6310 is BLM's current policy for establishing the baseline conditions required by NEPA. While we appreciate that the Uncompahgre Field Office has completed lands with wilderness characteristics inventory under BLM Manual 6310, BLM must correct the remaining inconsistencies with the Manual in order to have an inventory that is sufficient to inform land use planning.

Summary of Comments: In order to establish a true set of baseline conditions as required under NEPA, BLM must refine its lands with wilderness characteristics to fully comply with BLM Manual 6310 in order to adequately evaluate management alternatives and environmental consequences in the Uncompahgre RMP.

ii. BLM should manage additional lands to protect their wilderness characteristics in the final RMP in order to meet its statutory and regulatory obligations.

Although the BLM identified 42,150 acres of lands with wilderness characteristics, the preferred alternative would only manage 18,320 acres to protect those values. This is less than half of the inventoried wilderness resource and less than 3% of the public land in the planning area. This approach does not evidence a meaningful consideration of the value of this important resource in the planning area or balanced land management.

FLPMA directs BLM to inventory for the many values of the public lands and consider ways to protect them in the RMP (i.e., not all uses are appropriate in all places). 43 U.S.C. §§ 1711, 1712. FLPMA further requires that: "In managing the public lands the [Secretary of Interior] shall, by regulation or otherwise, **take any action necessary to prevent unnecessary or undue degradation** of the lands." 43 U.S.C. §1732(b) (emphasis added). BLM's duty to prevent unnecessary or undue degradation under FLPMA is mandatory, and BLM must, at a minimum, demonstrate compliance with this standard. *See, Sierra Club v. Hodel*, 848 F.2d 1068, 1075 (10th Cir. 1988). As the court found in *Mineral Policy Center v. Norton*, "in enacting FLPMA, Congress's intent was clear: **Interior is to prevent, not only unnecessary degradation, but also degradation that, while necessary to mining, is undue or excessive**." 292 F.Supp.2d 30 (D.D.C. 2003) (emphasis added). Further: "FLPMA, by its plain terms, vests the Secretary of the Interior with the authority—and indeed the obligation—to disapprove of an otherwise permissible mining operation because the operation though necessary for mining, would unduly harm or degrade the public land." *Id.* at 20.

Protecting all of the inventoried lands with wilderness characteristics in the Uncompahgre Field Office is arguably appropriate to prevent unnecessary and/or undue degradation to wilderness resources on the public lands. BLM has not shown that such a decision is infeasible. Accordingly, BLM is under a statutory obligation to demonstrate compliance with FLPMA's requirement to not cause undue or unnecessary degradation to important resources. *See e.g., Kendall's Concerned Area Residents*, 129 IBLA 130, 138 (1994). In fact, declining to manage the reasonable amount of land BLM has found to possess wilderness characteristics could be a choice **not** to avoid unnecessary or undue degradation. BLM should discuss a variety of options to protect this important resource, including through explicitly managing to protect wilderness characteristics.

BLM also is not in compliance with its regulations regarding off-road vehicles in the management alternatives under consideration in the Draft RMP. While Alternative B would close lands managed to protect wilderness characteristics to off-road vehicle use, the preferred alternative would limit motorized travel to designated routes. Uncompahgre Draft RMP at 2-149. In allowing ORV use to be designated as limited in lands with wilderness characteristics, the Draft RMP is in direct violation of Executive Orders and agency regulations implementing these Orders. Executive Orders (EO No. 11644 (1972)) as amended by Executive Order No. 11989 (1977)) and the BLM's regulations (43 C.F.R. § 8342.1) require BLM to ensure that areas and trails for off-road vehicle use are located:

- to minimize damage to soil, watershed, vegetation, air, or other resources of the public lands, and to prevent impairment of wilderness suitability; to minimize harassment of wildlife or significant

disruption of wildlife habitats, and especially for protection of endangered or threatened species and their habitats;
- to minimize conflicts between off-road vehicle use and other existing or proposed recreational uses of the same or neighboring public lands; and
- outside officially designated wilderness areas or primitive areas and in natural areas only if the agency determines that off-road vehicle use will not adversely affect their natural, aesthetic, scenic, or other values for which such areas are established.

These Executive Orders put the burden of proof on the BLM to make sure that sensitive and protected conservation lands are not harmed by ORV use. Given the small amount of public land managed to protect wilderness characteristics, and the high likelihood of off-road vehicle use causing conflict with quiet recreation experiences and other public lands resources that benefit from protected lands with wilderness characteristics, these areas should be closed to ORV use.

Furthermore, BLM should maximize protection of wilderness characteristics through layering management, as contemplated in several areas in the Draft RMP. Layering management that protects a variety of resources is an important tool that BLM consistently uses. Protection of wilderness characteristics can be effective as a standalone management approach but is also effective along with designation of ACECs and other conservation-oriented designations, as well as portions of special and extensive recreation management areas.

In the RMP for the Monticello Field Office, BLM responded to resistance to layering designations in the following appropriate way:

> "Layering" is planning. Under FLPMA's multiple use mandate, BLM manages many different resource values and uses on public lands. Through land use planning BLM sets goals and objectives for each of those values and uses, and prescribes actions to accomplish those objectives. Under the multiple use concept, BLM doesn't necessarily manage every value and use on every acre, but routinely manages many different values and uses on the same areas of public lands. The process of applying many individual program goals, objectives, and actions to the same area of public lands may be perceived as "layering". BLM strives to ensure that the goals and objectives of each program (representing resource values and uses) are consistent and compatible for a particular land area. Inconsistent goals and objectives can lead to resource conflicts, failure to achieve the desired outcomes of a land use plan, and litigation. Whether or not a particular form of management is restrictive depends upon a personal interest or desire to see that public lands are managed in a particular manner. All uses and values cannot be provided for on every acre. That is why land use plans are developed through a public and interdisciplinary process. The interdisciplinary process helps ensure that all resource values and uses can be considered together to determine what mix of values and uses is responsive to the issues identified for resolution in the land use plan. Layering of program decisions is not optional for BLM, but is required by the FLPMA and National BLM planning and program specific regulations.

Monticello Proposed RMP, Response to Comments, at 7-48. This rationale is equally applicable to the many opportunities to layer management of LWC with management of other values and uses in this plan.

Summary of Comments: BLM should better balance the multiple uses of public lands and prevent unnecessary or undue degradation by managing significantly more lands for protection of wilderness characteristics, including closing those areas to motorized use and layering them with other special management areas.

iii. Management prescriptions must be robust to adequately protect wilderness resources identified for protection in the RMP and BLM should consider a variety of management regimes for lands identified as possessing wilderness characteristics.

BLM must adopt meaningful protections for wilderness resources as part of its multiple use mission. Manual 6320 directs that "an alternative that protects lands with wilderness characteristics must contain management actions to achieve protection." Manual 6320 at .06(A)(2)(d). The manual provides examples of land use plan decisions that could protect wilderness characteristics, including: recommend withdrawal from mineral entry; close to leasing or NSO with no exceptions, waivers or modifications; right-of-way exclusion; close to construction of new roads; close or limit motorized and/or mechanized use; designate as VRM I or II; among others. We appreciate that the Uncompahgre Draft RMP evaluates management decisions for lands with wilderness characteristics consistent with BLM Manual 6320.

BLM also has wide discretion regarding how it manages lands with wilderness characteristics outside of lands prioritized for protection of wilderness characteristics over other multiple uses. While certain lands with wilderness characteristics units undoubtedly deserve the highest levels of protection to ensure that their outstanding wilderness, wildlife, cultural, scenic, and/or recreation values are protected, other lands with wilderness characteristics units may overlap with different types of multiple uses that suggest BLM should consider a wider range of uses for those lands. In this case the Draft RMP simply selects all identified lands with wilderness characteristics and gives them identical management prescriptions (Alternative B), or selects a sub-set of those units for protection and gives that smaller set an identical set of management prescriptions (Alternative D).

Analyzing alternatives that would "avoid or minimize" adverse environmental effects is a requirement of NEPA, and current guidance outlined in Manual 6320 states that land use planning efforts should consider several outcomes for lands with wilderness characteristics. BLM should not simply analyze alternatives that would protect or leave unprotected lands with wilderness characteristics, but can also consider additional management options for these lands, where other multiple uses are emphasized "while applying management restrictions (conditions of use, mitigation measures) to reduce impacts to wilderness characteristics." Manual 6320 at .06(A). In fact, even for areas where BLM specifically decides to not protection wilderness characteristics, BLM is still required to "consider measures to minimize impacts on those characteristics." Manual 6320 at .06(A)(2)(d).

The only goal for lands with wilderness characteristics in the Draft RMP is to: "Manage lands with wilderness characteristics that are identified for protection to maintain those characteristics." Uncompahgre Draft RMP at 2-148. Where lands with wilderness characteristics are not explicitly managed for protection in the draft alternatives, no description of management goals or objectives is provided that describes how impacts to any of the other identified lands with wilderness characteristics areas might be minimized "to reduce impacts to wilderness characteristics" as outlined in Manual 6320. For example, the Rio Puerco (NM) Draft RMP developed three approaches for managing lands with wilderness characteristics: Protect Wilderness Characteristics, Minimize Impacts to Wilderness Characteristics, and Not Managed to Protect Wilderness Characteristics (Rio Puerco Draft RMP, p. 2-38—40; excerpt included as Attachment 1). All three categories, **including lands not managed to protect wilderness characteristics**, have management prescriptions in place to minimize impacts to wilderness characteristics.

For the Uncompahgre RMP, we recommend BLM manage lands with wilderness characteristics in two categories: high quality LWC meriting the strongest levels of protection; and additional LWC managed to

protect wilderness characteristics while providing for other multiple uses. Because all of the inventoried lands with wilderness characteristics in the Uncompahgre Field Office comprise just 6% of the public land in the planning area, it is perfectly reasonable to manage all LWC to protect wilderness resources in some form. Both categories should include management direction to consider impacts to wilderness characteristics in implementation-level decisions and avoid, minimize or mitigate those impacts to the extent possible.

For example, the Rio Puerco (NM) Draft RMP developed three approaches for managing lands with wilderness characteristics: Protect Wilderness Characteristics, Minimize Impacts to Wilderness Characteristics, and Not Managed to Protect Wilderness Characteristics. Rio Puerco Draft RMP, p. 2-38—40; excerpt included as Attachment A.1. All three categories, **including lands not managed to protect wilderness characteristics**, have management prescriptions in place to minimize impacts to wilderness characteristics. Similarly, the White River (CO) Proposed RMPA grouped inventoried LWC into 3 management tiers ranging from most restrictive management to least. Even the least restrictive tier allows for applying management decisions to avoid and minimize impacts to wilderness characteristics. White River Proposed RMPA at Table 2-22; excerpt included as Attachment A.2.

4. High quality LWC meriting the strongest levels of protection

Management prescriptions for Camel Back WSA-adjacent should include:

- VRM I
- Closed to oil and gas leasing
- Closed to renewable energy development
- Closed to new rights-of-way (ROW exclusion)
- Closed to motorized and mechanized use
- Construction of new permanent and temporary roads is prohibited
- Close to mineral material disposal and non-energy solid leasable mineral exploration and development
- Recommend withdrawal from locatable mineral entry
- Closed to commercial timber harvest
- Vegetation treatments must utilize the minimum tool necessary
- Seek opportunities to acquire and incorporate non-federal inholdings
- Retain lands in federal ownership
- Close area to military training activities, including landings associated with High Altitude Mountain Environment Training.

This area is proposed for management to protect its wilderness characteristics in the Draft RMP preferred alternative.

(1) Additional LWC managed to protect wilderness characteristics while providing for other multiple uses

Management prescriptions for Adobe Badlands WSA Adjacent should include:

- VRM II

- NSO stipulation for fluid minerals without exception, modification, or waiver.[61]
- Closed to renewable energy development
- Closed to new rights-of-way (ROW exclusion) outside of designated utility corridors
- Motorized and mechanized use limited to designated routes
- Construction of new permanent and temporary roads is prohibited
- Close to mineral material disposal and non-energy solid leasable mineral exploration and development
- Recommend withdrawal from locatable mineral entry
- Closed to commercial timber harvest
- Vegetation treatments must not have long-term impacts on wilderness characteristics
- Seek opportunities to acquire and incorporate non-federal inholdings
- Retain lands in federal ownership

This area is evaluated for management to protect its wilderness characteristics in Alternative B of the Draft RMP preferred alternative. Our rationale for managing it in a second category of LWC management in the proposed plan is as follows:

Adobes LWC

The Adobe Badlands WSA-adjacent unit contains oil and gas leases that are part of the Whitewater Unit. However, the Master Development Plan for the Whitewater Unit that is currently under evaluation only proposes development in the northern portion of the unit and explicitly states that "development in the southern portion of the Whitewater Unit is not reasonably foreseeable." (Fram Whitewater Unit MDP EA at 1.1). Therefore, BLM should not preclude protection of highly valuable wilderness characteristics of the Adobe Badlands WSA-adjacent unit based on the existing Whitewater Unit leases.

The Adobe Badlands WSA adjacent unit also provides a critical resource as a place for quiet and unconfined recreation close to the city of Delta. Although close to a population center, once one hikes into the unit away from the boundary roads and past the WSA, the area clearly still has wilderness characteristics in terms of solitude, naturalness and unconfined recreation.

Solitude: After hosting multiple hikes into the area over a three-year period, we only once saw other people in the area and they were on the boundaries of the WSA, not in the LWC unit boundaries. The further in you hike; the eroded hills and gullies of the Mancos shale hide the signs of human proximity and can give a person the feeling of hiking in a desert far from other people. Once you are in the higher topography with pinon and juniper, the vegetative screening provides additional privacy. This area provides the public a rare opportunity to find solitude without having to travel far distances from home.

Unconfined recreation: The unit also allows people a large area to explore through primitive and unconfined recreation. Again, if one stays close to the boundary roads, the character of the area is very different from when you hike further in. Apart from the boundary roads, there are not recreational developments or established/maintained trails. One can find opportunities for both easy and challenging hiking. People are able to explore freely through the gullies and climb the mesas of their own accord.

Naturalness: Again, on the boundaries of the greater Adobes area and in proximity to the private inholdings, there are obvious signs of human disturbance and encroachment of motorized recreation. However, the further one explores the area and heads north, the more natural it becomes as you travel

[61] By way of example, the White River RMPA would apply an NSO stipulation without exception, modification or waiver for Tier 1 LWC in the proposed plan. White River Proposed RMPA at A-42.

towards the Grand Mesa FS boundary. The proposed LWC boundaries encompass the core of this natural area.

In summary, the BLM should manage this area to protect and maintain these rare characteristics in a place where they provide valued opportunities for people to find solitude and naturalness literally in their backyard. The need for added protection is only heightened because of its proximity to a population center, not lessened, and we encourage the BLM to protect this unit to the highest degree possible through a LWC designation in the final RMP. The surrounding adobe areas that do not meet LWC qualifications should then be protected as ACECS and EEA, as described later.

Summary of Comments: BLM must adopt robust management prescriptions for lands managed to protect wilderness characteristics to ensure wilderness resources are adequately protected. BLM should consider a variety of management regimes for lands identified as possessing wilderness characteristics to allow for management of other multiple uses in conjunction with maintaining wilderness characteristics.

E. Recreation

1. Specific RMA Recommendations for the North Fork and Lower Gunnison Watersheds

The final RMP must actively manage recreation on BLM lands within the North Fork and Lower Gunnison Watersheds through designation of recreation management areas (RMAs) and other recreation management stipulations.

We support following stipulations in the draft RMP which provide for improved recreation management and should be carried forward to the final RMP: NL-5 Water ways; NL-3 Major river corridors; NL-14 Recreation Park (*Alt. B); NL-15 Recreation SRMA (*Alt. B); NSO-7 Major river corridors; NSO-57 Recreation-Jumbo Mountain SRMA (with VRM Call II).

Other areas within the North Fork watershed also need recreation management designation to adequately manage the current and highly likely increased future recreation use on these lands within the lifetime of the RMP. BLM should anticipate this eventuality, and consider Extensive Recreation Management Areas (ERMAs) and other recreation stipulations for places such as Elephant Hill, and Youngs Peak—all of which are seeing increasing, but unmanaged use.

Current BLM guidance defines ERMAs as administrative units that require specific management consideration in order to address recreation use, demand or recreation and visitor service program investments. ERMAs are managed to support and sustain the principal recreation activities and the associated qualities and conditions of the ERMA.

a. Jumbo Mountain

All 5,020 acres of the Jumbo Mountain unit deserves management as a Special Recreation Management Area (SRMA) in the final RMP. Management should prioritize dispersed, trail-based activity, day-use opportunities, outdoor education, and maintaining the area's natural appearance. Documented activities include mountain biking, horseback riding, trail running, birding, hiking, hunting, and infrequent OHV use. Jumbo Mountain sits prominently within the valley, and the visual resources of the BLM parcels on Jumbo are significant to the quality of life in the entire valley. We also support all VRM stipulations and protective management prescriptions as well.

The final RMP should include the entire Jumbo Mountain unit as a SRMA, RMZ-1 and RMZ-2 as included in Alt B (DEIS J-4). Our members attest to increasing use of the Jumbo Mountain area, despite a lack of management and oversight. We believe the trend of use will continue to increase, and that the full area will be used heavily for recreation over the lifetime of the plan. RMZ-2, as defined in Alt B, allows for trail connectivity with other current and future recreation areas. We also strongly support stipulations that would limit all oil and gas leasing and surface activities in this area, including those in the draft plan (DEIS NSO-56, NSO-57), as these activities would not be compatible for the recreation experience, and would diminish the many other resources already identified in this area.

Support has been building for Jumbo Mountain to become an SRMA, with the Paonia Town Council, local trail advocacy and mountain bike clubs, and local businesses and chambers fully supporting the Jumbo Mountain SRMA as outlined in alternative B with all 5,020 acres included in the SRMA status. The full acreage deserves SRMA status since local trends of use indicate that recreation users will continue to expand into adjacent BLM lands due to the high quality of the recreational resources. Additionally, the full SRMA status will allow for the current Jumbo Mountain trail network to be connected to other existing and future recreational trails within the lifetime of this RMP.

ERMA status for Jumbo, as proposed for 5,020 acres in Alternative C, is inadequate to protect the visual resources of this unit, as well as mitigate future conflicts of multiple uses on this unit. Members of the public frequently take part in a number of different recreational activities, including hiking, biking, and running, almost exclusively non-motorized, on these acres, and these activities must be managed for the quality of the experience for all users.

The North Fork watershed currently suffers from a dearth of officially acknowledged and managed biking areas, despite numerous landscapes with superb terrain for mountain biking.[62] The trails on Jumbo have been built outside of established protocols and as such cannot be utilized for the gain of the community as trail systems like 18 Rd in Fruita.[63] The trails and conditions on the Jumbo Mountain unit surpass those at 18 Rd, but without management and acknowledgment from the BLM with SRMA status, the full potential of the recreational resource on the Jumbo trails cannot be realized.

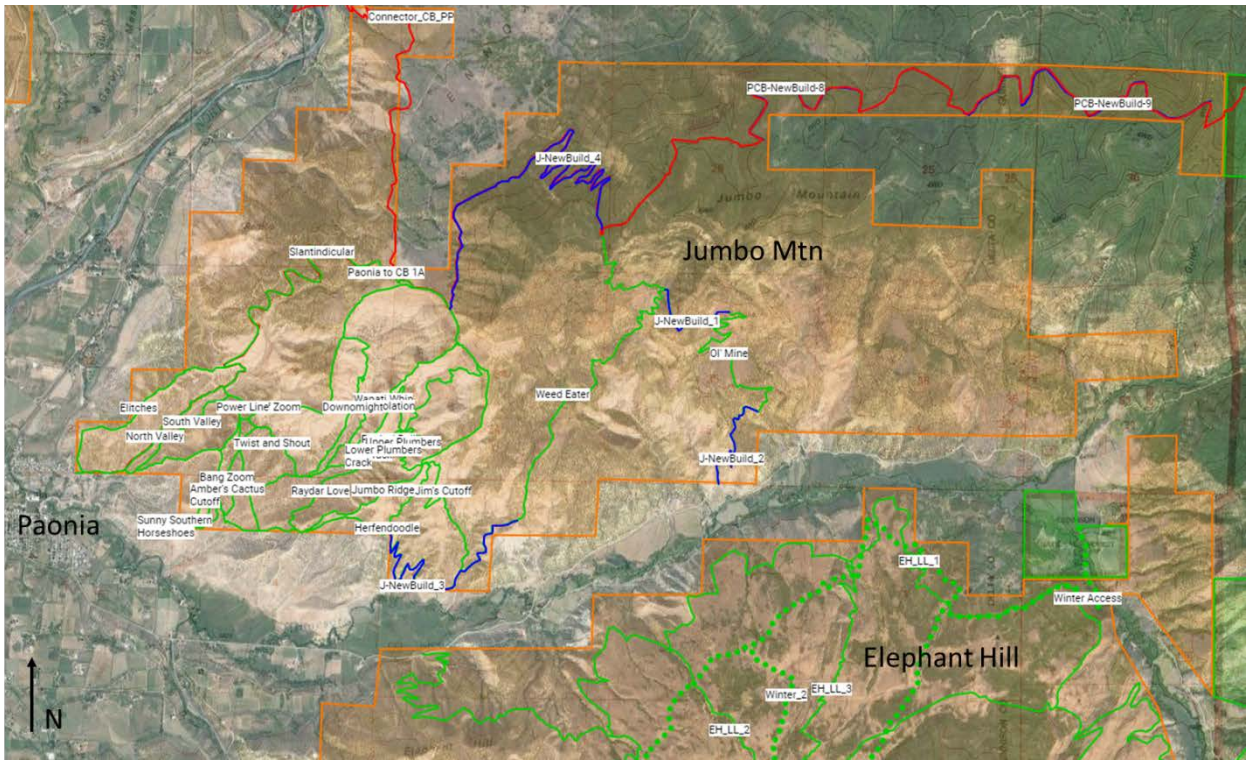
In addition to the economic and conflict mitigation gains that could come about from designating Jumbo Mountain as an SRMA, the acknowledgement of trails on Jumbo will allow trail building expertise, environmental considerations, signage, and enforcement to come together to produce a more sustainable trail network.

Lastly the location of the Jumbo trails is quite unique in that the trails are located very close to the town of Paonia and thus the type of impacts on the land seen at locations like 18 Rd. can be shifted to the urbanized areas of Paonia, reducing the impact to natural landscapes.

Please see the Figure 2a for mapped current and proposed trails within the Jumbo Mountain area.

Figure 2a. Map of existing and proposed recreation routes on Jumbo Mountain.

[62] See https://www.Mountainbproject.com/
[63] http://www.gjsentinel.com/sports/articles/a-good-change



All routes shown in green and red are existing routes (except for the red route leading north from slantindicular). All segments in blue are proposed connector routes.

The draft RMP includes closure of the SRMA to competitive events (DEIS Appendix J-28, SRPs), which seems like a premature determination. Instead the final RMP should consider the possibility for limited competitive events in the SRMA identified through the stakeholder/planning process. It is important to the economy of Paonia to be able to hold several non-motorized competitions on the Jumbo trails every year as these events can be major economic drivers for the community.

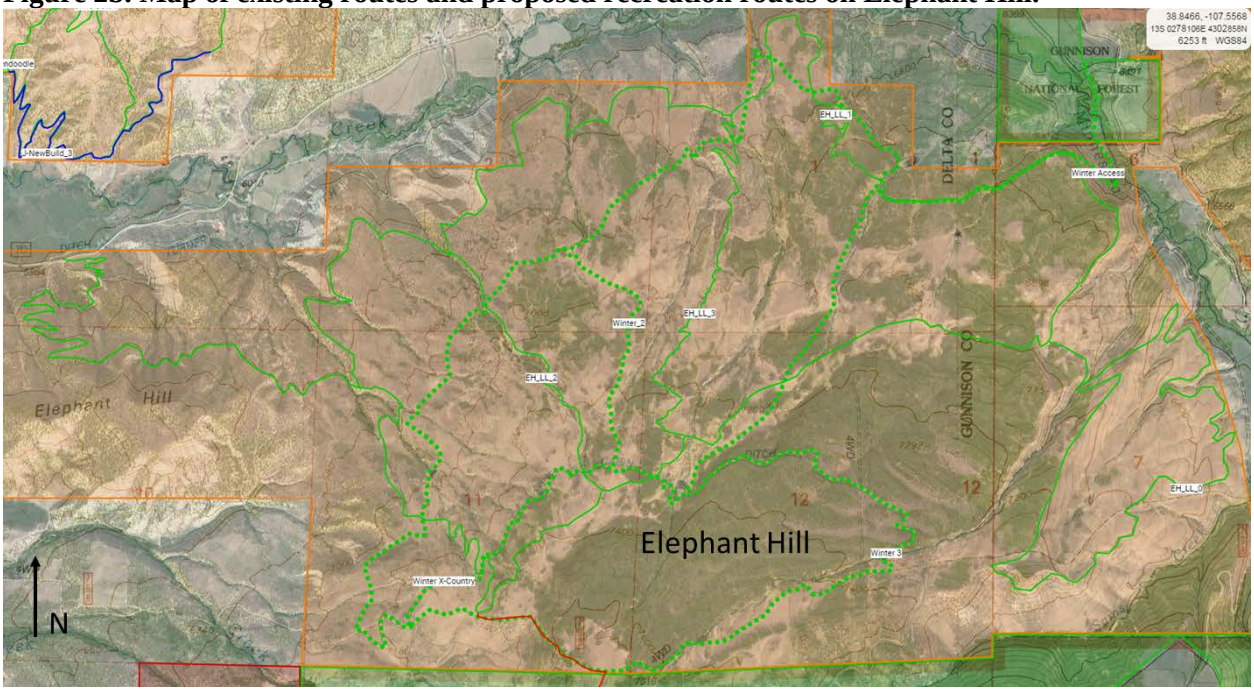
We also support the Ecological Emphasis Area designation for Jumbo Mountain/McDonald Creek, which we believe do not conflict with SRMA and successful recreation management of these areas. Please see our comments below (WSCC RMP Comments Part III.G).

b. Elephant Hill

We support SRMA or ERMA designation along with other recreation stipulations for proactive management of the BLM acreage surrounding Elephant Hill, located directly south of Jumbo Mountain. These lands have been identified as a prime recreational resource for mountain biking, hiking, and other day-use activities. There is currently some local recreational use of these lands, but summer and winter recreational use is likely to significantly increase over the lifetime of this RMP. SRMA or ERMA designation would provide resources and management for these lands to maintain and develop access, trails, and management plans that mitigate conflict between multiple users.

Please see Figure 2b for mapped current and proposed trails on Elephant Hill.

Figure 2b. Map of existing routes and proposed recreation routes on Elephant Hill.



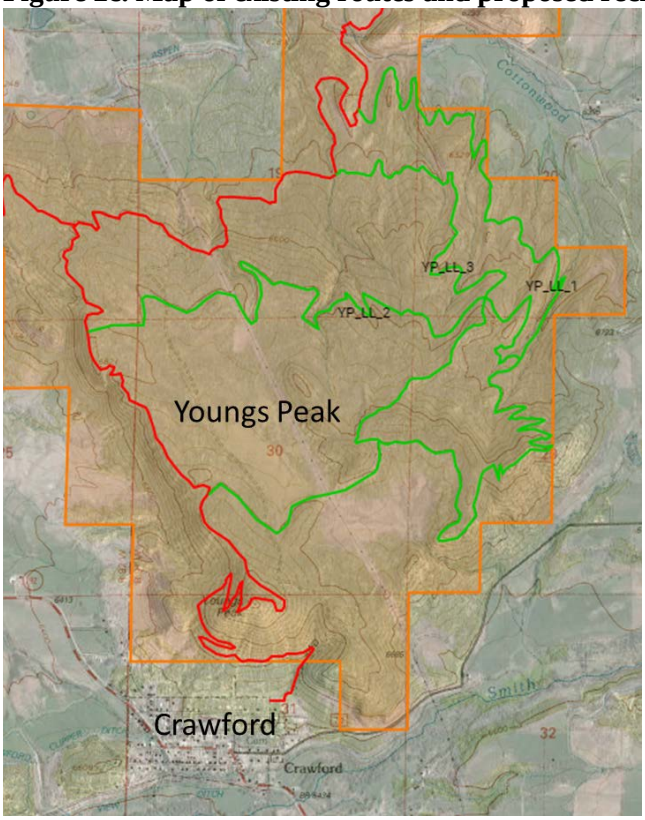
All solid green routes are proposed routes for recreation travel. Dotted green routes represent recreation winter routes located on preexisting roads.

c. Youngs Peak

We support SRMA or ERMA designation along with other recreation stipulations for proactive management of the BLM acreage surrounding Youngs Peak, located directly north of the town of Crawford. These lands have been identified as a prime recreational resource for mountain biking, hiking, and other day-use activities. There is currently some local recreational use of these lands, but summer recreational use is likely to increase over the lifetime of this RMP. SRMA or ERMA designation would provide adequate resources and management for these lands to maintain and develop access, trails, and management plans that mitigate conflict between multiple users.

Please see Figure 2c for mapped current and proposed trails on Youngs Peak.

Figure 2c. Map of existing routes and proposed recreation routes on Youngs Peak



All routes shown in red or green are proposed routes. Some primitive trails exist in the western area of Young's peak.

d. North Delta SRMA - WSCC supports the designation of the North Delta SRMA as well as the inclusion of mountain biking in the North Delta SRMA RMZ-1 and RMZ-2 for the development of non-motorized singletrack trails. Cyclists are not currently considered in the SRMA plan for North Delta.

e. Hotchkiss High School Area – WSCC supports ERMA designation for BLM lands in the immediate vicinity of Hotchkiss High School, which is a prime location for a trail network that would provide easy access to youth and families in the Hotchkiss area. There would be strong support for this recreation area due to an outdoor education coalition called the Nature Connection. The Nature Connection plans to give kids and families easy access to mountain bike equipment, for short-term use, to gain experience in a sport that promotes good health, and opportunities of adventure. By developing a fun and exciting trail network on public lands in this area, residents of Delta County will have turnkey access to a healthy sport that allows them access to the natural environment, opportunities to improve outdoor knowledge and self-confidence, improve outdoor recreation skills, and gain more understanding of our community's dependence and impact on public lands.

f. Roubideau SRMA

We support designation, as proposed in Alternative B and the Preferred Alternative, of all 25,350 acres of Roubideau as a SRMA. This designation, however, should not supersede protections for wildlife management. We:

- Support motorized being limited to RMZ 4 and to designated trails within that Zone. Understand desire to leave routes in RMZ 3 open for hunting purposes however recommend that it include seasonal closures for off-season use.
- Support RMZ 1 and RMZ2 being closed to motorized and mechanized uses to prioritize hiking, back pacing and horseback riding in LWC areas.
- Support Alt B closing RMZ 1 to all fluid and recommending locatable mineral withdraw- as it is within the WSA. No leasing should be applied to RMZ 2 and 3 as we as it overlaps with the LWC proposal and we recommend that all "Tier 1" LWC units should be closed to leasing.

Similarly, the area is also identified as and ACEC and EEA. In order to manage for these areas to protect the identified vulnerable resources (riparian forest and montane ecosystems with identified BLM and CNHP sensitive species), should carry Alt B management prescription of NO LEASING for all parts of the SRMA that overlap with the Roubideau ACEC as identified in Alternative B1.

Similar logic applies to the over lapping EEA designation for the Roubideau area. As mentioned in our broader comments, EEAs should require stronger management requirements for leasing. The BLM identifies sensitive species such as the Grand Junction milkvetch, desert bighorn sheep and northern leopard frog in the area and should manage the area to protect these natural values that make it a unique and special place for people to visit and have a pleasant recreation experience.

In summary, the Roubideau area has many high valued resources that qualify it for LWC, ACEC, EEA and SRMA management. In order to fully protect all the canyons, mesa tops and connecting areas- and manage for future recreational use- a layered management decision utilizing all of these designations is warranted.

As the Roubideau area is identified as a high value are for habitat, wilderness and recreation values, we recommend that it be closed to oil and gas leasing in accordance to our larger comments on oil and gas leasing throughout the field office. The area is clearly valued for other resources other than oil and gas development and should be managed to highlight and protect these values over oil and gas minerals that have low development potential in this area.

2. Planning for Recreation and Visitor Services

In the Draft RMP, we note that there is an apparent lack of background data conducted or provided by BLM to inform the recreation analysis and alternatives development. As indicated in BLM Manual 8320, planning, management and monitoring of recreation and visitor services is an iterative process. Monitoring methods such as social surveys and visitation rates are essential for assessing the effectiveness of recreation planning and implementation actions. Under all planning phases of the RMP, BLM should collect data that is sufficient to address the nature and complexity of existing and potential issues. BLM Manual 8320 at .06(B)(1)(b).

In general, we support the extensive and special Recreation Management Areas that are evaluated in the range of alternatives targeting primitive and non-motorized recreation opportunities. We recommend the Uncompahgre Field Office build on these opportunities for quiet recreation such as hiking, wildlife viewing, back country hunting and horseback riding in the final RMP, which are popular activities for public lands visitors in the planning area. The draft RMP states that the primary recreation activities in the planning area are hunting, fishing, whitewater rafting, OHV use, canoeing, kayaking, camping, hiking, backpacking, mountain biking, horseback riding, rock climbing, photography, and scenery and wildlife viewing. Uncompahgre Draft RMP at 3-130. However, the draft RMP fails to provide sound data on the

relative prevalence of these uses, stating: "Most public land use and activity participation estimates depend on a mix of computerized trail counter data, field observations, and professional judgment of the recreation staff and hence are not scientifically based." *Id.* at 3-132. This is not sufficient to analyze recreation trends and make long range management decisions that reflect accurate data.

Public lands surveys in nearby areas have found that non-motorized recreation activities are dominant among public lands visitors. For example, a 2006-2007 visitor field survey and focus group study of BLM lands coordinated by the Colorado River Valley Field Office and Arizona State University found that hiking is the most popular activity, at 33%, followed by mountain biking, at 26%. Colorado River Valley Draft RMP at 3-151. The Moab Field Office completed a National Visitor Use Monitoring Program (NVUM)[64] as a pilot project for visitor use monitoring on BLM lands, which showed that motorized use is a small portion of recreation activity on public lands in the Moab Field Office. The NVUM states: "In terms of total participation, the top five recreation activities of the visits to the Moab Field Office were viewing natural features, hiking/walking/trail running, relaxing (hanging out, escaping heat and noise), viewing wildlife and driving for pleasure (Table 16)."

We would expect similar results in the Uncompahgre Field Office, which would support the designation of expansive Recreation Management Areas for quiet recreation as contemplated in the range of alternatives. Guidance issued in 2010 indicates that Recreation Management Area designations should reflect recreation demand and issues (IM 2011-004). BLM must include recreation data and foreseeable impacts in the baseline assessment in order to provide reasonable explanation and analysis of SRMA and ERMA designations in the range of alternatives. Moreover, environmental consequences described in Chapter 4 should more closely align to the expected increases in recreation demand (particularly of OHV use) described in Chapter 3, and account for the differences in recreation management area designations put forth in the range of alternatives.

Summary of Comments: In creating management objectives and allowable uses for recreation management areas, BLM should utilize and include monitoring data and trends by user type in the RMP. Recreation Management Area designations should reflect recreation demand. We also point out that managing lands for wilderness characteristics is another way for BLM to provide opportunities for quiet recreation in natural and scenic areas within the Uncompahgre Field Office. We therefore recommend the RMP protect expansive areas as lands with wilderness characteristics to provide desirable recreation experiences for hikers, back country hunters, and other non-motorized public land users.

3. Designating Recreation Management Areas for Non-Motorized Recreation

In 2010, BLM issued new guidance (IM 2011-004) for recreation and visitor services planning in the land use planning process. This guidance was incorporated into BLM Manual 8320 in 2011 as well as BLM's updated recreation planning handbook (H-8320-1) in 2014. The guidance changes recreation management to a three-category system wherein lands in the planning area can be designated as special recreation management areas (SRMAs), managed as extensive recreation management areas (ERMAs), or classified as public lands not designated as recreation management areas.

Management focus for SRMAs is to "protect and enhance a targeted set of activities, experiences, benefits, and desired recreation setting characteristics," whereas ERMAs are managed to "support and sustain the principal recreation activities and the associated qualities and conditions of the ERMA." In SRMAs, recreation is to be the dominant use, and in ERMAs management is "commensurate with the management of other resources and resource uses." Whereas SRMAs are intended for more intensive

[64] http://www.blm.gov/wo/st/en/prog/Recreation/national_recreation/visitor_use_surveys.html

management, ERMAs may be appropriate to designate for quiet-use, backcountry experiences and layer with other special designations that are compatible with quiet recreation, such as ACECs and lands with wilderness characteristics. Both SRMAs and ERMAs provide mechanisms for the BLM to actively manage different types of recreation to the benefit of users while protecting the other resources of the public lands.

We support efforts made by the BLM to include management for quiet-use and non-motorized recreation in many Recreation Management Areas (RMAs) evaluated in the Draft RMP. Developing and differentiating recreation areas for various user groups are important to protect multiple recreation resources and avoid conflict, consistent with the agency's regulations. BLM's regulations relating to management of off-road vehicles acknowledge the need to address the manner in which motorized recreation can prohibit other experiences, requiring that both areas and routes for off-road vehicles be located to "minimize conflicts between off-road vehicle use and other existing or proposed recreational uses of the same or neighboring public lands, and to ensure the compatibility of such uses with existing conditions in populated areas, taking into account noise and other factors." 43 C.F.R. § 8342.1.

BLM's ORV regulations also provide for protection of other values that are critical parts of not only a healthy ecosystem on BLM lands, but also of enjoying quiet recreation activities, such as hunting, photography and bird-watching, requiring that management minimize "damage to soil, watershed, vegetation, air, or other resources of the public lands" and "harassment of wildlife or disruption of habitat; and to prevent impairment of wilderness suitability or adverse effects on natural areas." *Ibid*.

The Draft RMP considers a comprehensive approach to managing recreation through a framework of SRMA and ERMA designations in each alternative. We support BLM's approach, which offers alternatives for multiple RMA designations and associated management prescriptions for important recreation areas. Uncompahgre RMP at Appendix J. This is consistent with agency policy and offers the public an opportunity to consider alternative management regimes for recreation areas, opportunities and experiences they are interested in accessing during the life of the RMP.

While we support the RMA framework provided in the draft RMP, we have gotten feedback from our members and the public that the mosaic of potential RMAs is highly complex, especially in the context of other designations and allocations under consideration in the RMP, and is therefore difficult for the public to understand. We do not believe BLM needs to simplify its approach, but instead encourage the agency to conduct additional public education and outreach on this important and complex issue. For example, BLM could conduct public workshops in the near future where the public can review spatial data for RMA and other designations/allocations and ask questions of resource specialists. BLM could accept additional public input on RMAs specifically through these workshops. This would not needlessly or extensively delay the RMP, but could greatly assist BLM in developing a proposed RMP with the best information submitted by the public on recreation resources, ultimately leading to a better RMP that serves the public and local communities and is implemented successfully.

Summary of Comments: BLM should move forward with designating Recreation Management Areas for quiet, non-motorized recreation, which is an appropriate way to implement the minimization criteria and provide opportunities for multiple recreation uses. BLM should consider public workshops to further educate the public on recreation management alternatives and collect better information and comments from the public on recreation management.

4. Special Recreation Permits

The BLM authorizes special recreation permits (SRPs) for specified recreation uses. Accordingly, the Draft RMP offers guidance and limitations for the issuance of SRPs. *See, e.g.*, Uncompahgre Draft RMP at 2-220—221; G-30. We are concerned, however, with the general lack of specificity provided by the Draft RMP on guiding the authorization of special recreation permits.

The BLM Handbook on Recreation Permit Administration states that field offices can and should develop guidelines for issuing SRPs, including thresholds for when permits are required for organized groups and events for specific types of recreation activities, land areas, or resource settings. BLM Handbook 2930-1 at 13. Analysis of the impacts of permits on a cumulative basis is best accomplished in the RMP. The Uncompahgre RMP should include a clear decision making framework for reviewing SRP applications. The Price (Utah) and Grand Junction (Colorado) RMPs offer exemplary guidance for this process. The standards set out in these RMPs are very specific so that BLM can easily determine whether and where to issue an SRP, and can better estimate cumulative impacts from such permits.

Summary of Comments: In the Uncompahgre RMP, BLM should provide specific criteria for evaluating special recreation permits to guide agency staff on processing applications.

5. Game Retrieval

We support the prohibition on cross-country motorized/mechanized travel for big game retrieval (with very narrowly limited exceptions). Uncompahgre Draft RMP at 2-307. This management action is necessary to prevent unnecessary resource damage as well as to address safety and private property concerns. A key component of the RMP and future travel planning is to create a travel network that protects resources and is enforceable. This restriction should be carried forth in the final RMP.

Summary of Comments: BLM should prohibit cross-country motorized/mechanized travel for game retrieval as proposed in the draft RMP preferred alternative.

6. Natural Soundscapes

Natural soundscapes are a public lands resource that deserves careful consideration when planning for recreation. Like viewsheds and air quality, sound is one of the resources on the public lands that is affected by agency-authorized uses and can impact other resources as well, such as recreation and wildlife. BLM has a statutory obligation to manage the public lands "in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition." 43 U.S.C. § 1701(8). To fulfill this mandate, it is important for BLM to consider natural soundscapes in order to give meaningful effect to this provision, especially on those lands which are to be managed in their "natural condition," including Wilderness Study Areas and lands with wilderness characteristics.

For recreation in particular, BLM's obligation to preserve natural soundscapes is further described in Executive Order 11644 (1972), as amended by Exec. Order 11989 (1977), which directs the BLM to locate areas and trails so as to: "Minimize conflicts between off-road vehicle use and other existing or proposed recreation uses of the same or neighboring public lands, and to ensure the compatibility of such uses with existing conditions in populated areas, taking into account noise and other factors."

We recommend the agencies incorporate soundscapes in the designation and management of backcountry recreation areas, as preserving the natural soundscape is an essential component of protecting and enhancing the backcountry experience.

BLM should furthermore utilize acoustic modeling to analyze and preserve natural soundscapes, especially in special management areas managed for quiet use recreation. The Wilderness Society has developed a GIS-based model based on The System for the Prediction of Acoustic Detectability (SPreAD; Harrison et al. 1980), which is a tool that was developed nearly 30 years ago by FS and EPA to predict the acoustic impacts of recreational activity in wildland settings. SPreAD was originally developed as a system of worksheets and tables, where the user could enter information about the sound source and environment and manually calculate noise propagation from a single point source to a single point receiver. We have adapted the SPreAD model to ArcGIS, automating the hand calculation method to predict the propagation of noise for all directions throughout the area of interest.

SPreAD-GIS can be used to 1) determine the areas within a planning unit where the natural soundscape is predominant and protect that setting through recreation planning; and 2) model sound propagation from uses such as motorized vehicles in a proposed quiet-use recreation area to determine what planning decisions, such as route closures, could restore and enhance the natural soundscape. In this way, the agencies could ensure that travel and recreation planning decisions provide opportunities for experiencing naturalness and solitude. There are other models and methodologies available, but we highlight SPreAD-GIS because it is available by request from TWS.[65]

One possible method for BLM to manage sound resources on the federal lands would be to model the approach BLM uses to manage visual resources, with a classification gradient ranging from most protective of natural soundscapes to allowing significant impacts to the soundscape.[66] This would provide for areas where maintaining the natural soundscape is prioritized to benefit recreation, wildlife, wilderness and other natural values on the public lands. It would also assist the agency with managing activities that impact sound resources by clearly defining where and how those impacts may occur. The classification system should primarily be based on desired and achieved experiences of public lands visitors.

The following classes provide an example of possible BLM guidance for inventorying and managing sound resources in landscape-level planning:

- *Class I Objective*: The objective of this class is to preserve the natural soundscape. This class would be appropriate for lands managed to preserve wilderness characteristics, promote primitive recreation experiences, and protect wildlife habitat and ecological systems. The level of change to the characteristic soundscape should be very low and must not attract attention.

- *Class II Objective*: The objective of this class is to retain the natural soundscape such that noticeable impacts are infrequent and isolated instances. The level of change to the natural soundscape should be low. Management activities may be *heard on occasion*, such as a passing motorized vehicle, but should not detract from the experience of the natural landscape.

[65] The tool is free, but installation of SPreAD-GIS requires an ArcInfo-level licensed copy of ArcGIS 9.3 or higher with the Spatial Analyst extension.
[66] See information on BLM's Visual Resource Management system at http://www.blm.gov/wo/st/en/prog/Recreation/recreation_national/RMS/2.html.

- *Class III Objective*: The objective of this class is to partially retain the natural soundscape where practicable. Management activities may attract attention but should not dominate the auditory experience of the casual observer. This class would be appropriate for front country recreation areas or other areas where natural soundscapes are not critical to the experience being sought out by visitors.

- *Class IV Objective*: The objective of this class is to provide for management activities which require significant impacts to the natural soundscape, including highly impactful events or impacts sustained over the long term. These management activities may dominate the sound of the landscape and may be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating basic elements.

These potential management objectives for sound resource classes are similar to the BLM Manual for Visual Resource Classes (BLM Manual 8400). Likewise, planning areas could be delineated into sound quality rating units for management purposes. Considerations on rating sound resources, such as landform, vegetation, and scarcity, are among the factors that could logically be incorporated into baseline data and management objectives for auditory resources. Acoustic modeling would be an important component of assessing sound quality rating units.

By going beyond a simple dichotomy of quiet-zones and zones with noise, BLM can position itself in a way that adequately addresses the adverse effects of noise on public land resources, resource-uses, and existing land designations. Soundscape classes give land managers both the authority and the flexibility to make management decisions that enhance landscape-level planning. Recognizing that lands have different soundscapes, and visitor expectations and experiences vary within a planning area, soundscape classes provide a way to determine appropriate levels of management.

Summary of Comments: BLM should acknowledge the sound resource on the public lands and address the soundscape as a separate resource which must be analyzed; complete sound modeling to the extent practicable to assess noise impacts of management alternatives on recreation and wildlife; adopt management decisions based on sound modeling data or other information generated from soundscape analysis that minimize or mitigate noise impacts on recreation and wildlife; and identify areas of the public lands where protection of the natural soundscape is prioritized.

F. Travel Management

1. Area allocations for off-road vehicles

i. Providing and protecting quiet recreation opportunities

The Draft RMP defers comprehensive travel planning, but evaluates a range of alternatives for vehicle use designations (open, limited, closed). BLM's preferred alternative would only close 58,560 acres to motorized use, representing less than 9% of the planning area. Uncompahgre Draft RMP at 2-301. This includes statutorily closed areas (such as Wilderness Study Areas), meaning BLM is hardly exercising any discretion to close areas to motorized use so they may be allocated for other multiple uses such as quiet recreation, wildlife habitat or cultural resource protection. Even Alternative B would only close 17% of the planning area to motorized vehicle use. *Ibid.* This does not represent balanced management, and is inconsistent with current BLM travel planning guidance. It is also inconsistent with the agency's obligations to comply with the minimization criteria, as detailed below.

Travel and transportation considerations play an important role in the experience of the recreation user and the management provided by BLM. The area designations that the RMP will put in place will be key determinants of recreation setting characteristics as well as fundamental tools for providing specific recreation experiences.

As such, BLM should implement OHV area designations that protect recreation opportunities for quiet and non-motorized recreation users throughout the planning area. The public land in the UFO has ample opportunity for recreation activities such as hiking, camping, and mountain biking. In this regard, the agency's 2011 Travel and Transportation Management (TTM) Manual generally recognizes that:

> The recreation program has a specific need to recognize and manage motorized recreational use of off-highway vehicles (OHVs) and non-motorized travel, such as foot, equestrian, and non-motorized mechanical travel. **The planning process should consider and address the full range of various modes of travel on public lands, not only motorized access needs**.

BLM Manual 1626 at .06(A)(1) (emphasis added).

BLM must adequately address the needs of non-motorized and quiet users in addition to motorized use. Ensuring opportunities for a full range of non-motorized travel is crucial for creating a *comprehensive* transportation and travel plan. In places managed primarily for non-motorized recreation, travel allocations and designations should reflect this desired recreation character setting. This should include restrictions and closures in areas that provide opportunities for non-motorized recreation such as lands with wilderness characteristics, areas of critical environmental concern, and other special designations.

ii. Applying the minimization criteria to area allocations

In response to the growing use of off-road vehicles (ORVs) and corresponding environmental damage, Presidents Nixon and Carter issued Executive Orders 11644 and 11989 in 1972 and 1977, respectively, requiring federal land management agencies to plan for ORV use based on protecting resources and other recreational uses.[67] When designating areas or trails available for ORV use, agencies must locate them to:

> (1) minimize damage to soil, watershed, vegetation, or other resources of the public lands;
> (2) minimize harassment of wildlife or significant disruption of wildlife habitats; and
> (3) minimize conflicts between off-road vehicle use and other existing or proposed recreational uses of the same or neighboring public lands.[68]

BLM codified these "minimization criteria" in its OHV regulations at 43 C.F.R. § 8342.1, which provide:

> The authorized officer shall designate all public lands as either open, limited, or closed to off-road vehicles. All designations shall be based on the protection of the resources of the public lands, the promotion of the safety of all the users of the public lands, and the minimization of conflicts among various uses of the public lands; and in accordance with the following criteria:

[67] Exec. Order No. 11644, 37 Fed. Reg. 2877 (Feb. 9, 1972); Exec. Order No. 11989, 42 Fed. Reg. 26,959 (May 24, 1977).
[68] Exec. Order No. 11644, § 3(a).

(a) Areas and trails shall be located to minimize damage to soil, watershed, vegetation, air, or other resources of the public lands, and to prevent impairment of wilderness suitability.
(b) Areas and trails shall be located to minimize harassment of wildlife or significant disruption of wildlife habitats. Special attention will be given to protect endangered or threatened species and their habitats.
(c) Areas and trails shall be located to minimize conflicts between off-road vehicle use and other existing or proposed recreational uses of the same or neighboring public lands, and to ensure the compatibility of such uses with existing conditions in populated areas, taking into account noise and other factors.
(d) Areas and trails shall not be located in officially designated wilderness areas or primitive areas. Areas and trails shall be located in natural areas only if the authorized officer determines that off-road vehicle use in such locations will not adversely affect their natural, esthetic, scenic, or other values for which such areas are established.

Despite its long-standing legal obligation, BLM has struggled to properly apply and implement the minimization criteria in its travel management decisions. Federal courts have repeatedly sent BLM, Forest Service, and National Park Service travel management plans back to the agencies for failure to satisfy their obligation to minimize resource damage and conflicts between recreational uses.[69] Collectively, these cases confirm the agencies' *substantive* obligation to meaningfully apply and implement – not just identify or consider – the minimization criteria when designating each area or trail, and show in the administrative record how they did so.[70] As a recent circuit court of appeals decision confirmed, agencies must "document how [they] applied [relevant] data on an area-by-area [or route-by-route] basis with the objective of minimizing impacts."[71] BLM's Travel and Transportation Manual confirms that BLM must pay particular attention to thoroughly documenting its application of the minimization criteria in making both OHV area designations (Manual 1626.06(A)) and route designations (Manual 1626.06(B)).

As Executive Order 11644, 43 C.F.R. § 8342.1, and Manual 1626 make clear, the substantive duty to minimize impacts applies equally to OHV area allocations made in resource management plans. With RMP area allocations setting the framework for where route designations will occur and providing the best opportunity to analyze OHV impacts across the broader landscape, it is critical that the Uncompahgre RMP apply and implement the minimization criteria when making area designations. To satisfy its *substantive* duty to minimize impacts, BLM must apply a transparent and common-sense methodology

[69] *See WildEarth Guardians v. U.S. Forest Service*, 790 F.3d 920, 929-32 (9th Cir. 2015) (Forest Service failed to "apply the minimization criteria to *each area* it designated for snowmobile use" and to provide the "granular analysis [necessary] to fulfill the objectives of Executive Order 11644"); *Friends of the Clearwater v. U.S. Forest Service*, No. 3:13-CV-00515-EJL, 2015 U.S. Dist. LEXIS 30671, at *37-52 (D. Idaho Mar. 11, 2015) (Forest Service's conclusory statements failed to show how it selected motorized routes with the objective of minimizing their impacts); *SUWA v. Burke* (*SUWA*), 981 F. Supp. 2d 1099, 1104-06 (D. Utah 2013) (BLM acknowledgment of minimization criteria insufficient where record showed no analysis of specific impacts of designated OHV routes); *The Wilderness Society v. U.S. Forest Service*, No. CV08-363-E-EJL, 2013 U.S. Dist. LEXIS 153036, at *22-32 (D. Idaho Oct. 22, 2013) (remanding travel plan where Forest Service relied on unsupported conclusion that route closures and elimination of cross-country travel minimized impacts); *Defenders of Wildlife v. Salazar*, 877 F. Supp. 2d 1271, 1304 (M.D. Fla. 2012) (record failed to demonstrate how Park Service decision to reopen trails was made with the objective of minimizing impacts); *Central Sierra Environmental Resource Center v. U.S. Forest Service*, 916 F. Supp. 2d 1078, 1094-98 (E.D. Cal. 2012) (Forest Service failed to show that it actually aimed to minimize environmental damage when designating motorized routes); *Idaho Conservation League v. Guzman*, 766 F. Supp. 2d 1056, 1071-74 (D. Idaho 2011) (record did not reflect whether or how the Forest Service applied the minimization criteria); *Center for Biological Diversity v. BLM*, 746 F. Supp. 2d 1055, 1071-81 (N.D. Cal. 2009) (record provided no indication that BLM considered or applied minimization criteria).
[70] *See, e.g.*, *CBD v. BLM*, 746 F. Supp. 2d at 1080-81 ("the BLM is required to place routes specifically to minimize" impacts); *Idaho Conservation League*, 766 F. Supp. 2d at 1072-73 (consideration of the minimization criteria insufficient where agency failed to demonstrate that the criteria "were then implemented into the decision process").
[71] *WildEarth Guardians*, 790 F.3d at 931.

for meaningful application of the minimization criteria to *each* area being considered for designation. That methodology must include several key elements:

First, proper application of the minimization criteria is not solely an office exercise. As the courts have repeatedly made clear, use of cryptic spreadsheets or matrices that favor OHV use and do not facilitate implementation of the substantive duty to minimize impacts is inadequate.[72] Rather, BLM must get out on the ground, gather site- and resource-specific information, ground-truth desk-top analyses, and then utilize that data to actually apply the criteria to minimize resource damage and use conflicts associated with each designated area and route. This necessarily will require the agency to incorporate monitoring data and other information identifying resource or recreational use conflicts compiled by the agency or submitted by the public.[73] That information must be applied in what courts have described as a "granular analysis [necessary] to fulfill the objectives of Executive Order 11644."[74]

Second, application of the minimization criteria should be informed by the best available scientific information and associated strategies and methodologies for minimizing impacts to particular resources.[75] In 2012, the Journal of Conservation Planning published a literature review and best management practices (BMPs) for ORVs on national forest lands.[76] The BMPs provide guidelines, based on peer-reviewed science, for ORV designation decisions, implementation actions, and monitoring activities that are intended to minimize impacts to soils, water quality, vegetation, and wildlife, and conflicts with other recreational uses. Although they were formulated for national forest lands, most of the BMPs are applicable to OHV designation decisions on BLM lands as well. Travel management planning processes should reference and incorporate these BMPs.[77]

Third, proper application of the minimization criteria must address both site-specific and larger-scale impacts.[78] For example, agencies must assess and minimize landscape-scale impacts such as habitat fragmentation, cumulative noise and air and water quality impacts, and degradation of wilderness characteristics and associated opportunities for primitive forms of recreation. The agency also must assess and minimize site-specific impacts to soils, vegetation, water, and other public lands resources, sensitive wildlife habitat, and important areas for non-motorized recreation.

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[72] *See, e.g.*, *Idaho Conservation League*, 766 F. Supp. 2d at 1071-74 (agency may not rely on "Route Designation Matrices" that fail to show if or how the agency selected routes with the objective of minimizing their impacts); *SUWA*, 981 F. Supp. 2d at 1105 ("cryptic spreadsheet for each route segment provides inadequate information . . . for someone other than the BLM to know why or how the routes were chosen").

[73] *See* 43 C.F.R. § 8342.2(a) (public participation required in travel management decision-making); *Idaho Conservation League*, 766 F. Supp. 2d at 1074-77 (invalidating travel management plan that failed to utilize monitoring and other site-specific data submitted by the public showing resource damage).

[74] *WildEarth Guardians*, 790 F.3d at 931.

[75] *See Friends of the Clearwater*, 2015 U.S. Dist. LEXIS 30671, at *24-30, 40-52 (invalidating route designations that failed to consider best available science on impacts of motorized routes on elk habitat effectiveness or to select routes with the objective of minimizing impacts to that habitat and other forest resources).

[76] T. Adam Switalski and Allison Jones, *Off-road vehicle best management practices for forestlands: A review of scientific literature and guidance for managers*, 8 Journal of Conservation Planning 12-24 (2012), *available at* http://www.journalconsplanning.org/2012/JCP_v8_2_Switalski.pdf and attached. Development of a BLM-specific literature review and set of BMPs is in progress.

[77] The Bitterroot National Forest recently referenced and applied BMPs from Switalski and Jones in its Decision Notice/Finding of No Significant Impact for a project involving the designation of ORV trails. *See* Bitterroot National Forest, Darby Lumber Lands Phase I – Decision Notice and Finding of No Significant Impact, pp. 13-14, *available at* http://a123.g.akamai.net/7/123/11558/abc123/forestservic.download.akamai.com/11558/www/nepa/80742_FSPLT3_2541294.pdf.

[78] *See, e.g.*, *Idaho Conservation League*, 766 F. Supp. 2d at 1066-68, 1074-77 (invaliding travel plan that failed to consider aggregate impacts of short motorized routes on wilderness values or site-specific erosion and other impacts of particular routes).

Fourth, application of the minimization criteria must take into account available resources for monitoring and enforcement of the designated system.[79] BLM is obligated under Executive Orders 11644 and 11989 and its travel management regulations to monitor the effects of OHV use on designated areas and routes and make adjustments to the designated system as necessary.[80] To ease enforcement obligations and ensure user compliance in the first place, OHV area designations and identification of Travel Management Areas should establish clear boundaries and simple, consistent restrictions designed to minimize resource damage and user conflicts.

Finally, attempts to *mitigate* impacts associated with an existing OHV system are insufficient to fully satisfy the duty to *minimize* impacts, as specified in the executive orders. The language of the executive orders makes this clear: "[a]reas and trails shall be *located* to minimize" impacts and conflicts.[81] 43 C.F.R. § 8342.1 mirrors that language. Thus, application of the minimization criteria should be approached in two steps: first, the agency locates areas and routes to minimize impacts, and second, the agency establishes site-specific management actions to further reduce impacts. The best available science confirms this tiered approach.[82] As described above, this approach is consistent with DOI's Landscape Mitigation Policy that prioritizes project design and siting to avoid adverse impacts in the first instance, followed by other minimization and mitigation measures.

iii. ORV "open" areas

We support that BLM would not allow any "open" areas for cross-country ORV use in the preferred alternative, and BLM should carry that decision through to the final RMP. Uncompahgre Draft RMP at 2-301. Nationally, BLM has for many years been moving away from allowing cross-country motorized use on a large scale or designating large ORV play areas. This type of motorized use is difficult for BLM field offices to properly manage; it damages natural, cultural and other resources; and it leads to conflict with other users of the public lands. BLM's regulations relating to management of off-road vehicles acknowledge the need to address the manner in which motorized recreation can prohibit other experiences, requiring that both areas and routes for off-road vehicles be located to "minimize conflicts between off-road vehicle use and other existing or proposed recreational uses of the same or neighboring public lands, and to ensure the compatibility of such uses with existing conditions in populated areas, taking into account noise and other factors." 43 C.F.R. § 8342.1.

Summary of Comments: BLM should close more of the planning area to motorized use to protect natural resources and quiet recreation opportunities and create more balanced management among the multiple uses and recreation visitors in the Uncompahgre Field Office. BLM must apply the executive order minimization criteria to demonstrate how each OHV area has been located to *minimize* resource damage and conflicts with other recreational uses. This will require a granular analysis of the impacts of OHV use in each area that addresses both site-specific and landscape-scale impacts, incorporates the best available scientific information and best management practices for minimizing impacts to particular resources, utilizes site- and resource-specific data, and accounts for available monitoring and enforcement

[79] *See Sierra Club v. U.S. Forest Serv.*, 857 F. Supp. 2d 1167, 1176-78 (D. Utah 2012) (NEPA requires agency to take a hard look at the impacts of illegal motorized use on forest resources and the likelihood of illegal use continuing under each alternative).
[80] Exec. Order No. 11644, § 8(a); 43 C.F.R. § 8342.3.
[81] Exec. Order 11644, § 3(a); *see also Center for Biological Diversity*, 746 F. Supp. 2d at 1080-81 ("'Minimize' as used in the regulation . . . refers to the *effects* of route designations, i.e. the BLM is required to place routes specifically to minimize 'damage' to public resources, 'harassment' and 'disruption' of wildlife and its habitat, and minimize 'conflicts' of uses." (footnote and citations omitted)).
[82] *See* Switalski and Jones, 2012 (cataloguing best management practices for: (1) siting/locating routes to minimize impacts; (2) implementation, including maintenance, restoration, adaptive management, and other mitigation measures; and (3) monitoring).

resources. We support that BLM would not allow any "open" areas for cross-country ORV use in the preferred alternative, and BLM should carry that decision through to the final RMP.

2. Comprehensive Travel and Transportation Management Planning

The Uncompahgre RMP defers comprehensive travel and transportation planning, as provided for in BLM's regulations. While the Draft RMP includes several important components such as a prioritization scheme for future travel planning and criteria to guide route designations, the Draft RMP is not fully compliant with BLM's policy for deferred travel planning. BLM policy provides for deferred travel planning and interim designation of "Limited to Existing Routes" as long as a preliminary network is identified and a process established to select a final travel management network. Specifically, BLM Manual 1626 provides a list of requirements for deferring travel planning:

> If the transportation network is to be deferred in the RMP, then the RMP documents the decision-making process used to develop the initial network, provides the basis for future implementation level decisions, and helps set guidelines for making transportation network adjustments throughout the life of the plan. The following tasks should be completed in the RMP for each planning area or TMA:
>
> a. Produce a map of the known network of transportation linear features, including modes of travel;
> b. Define the long term management goals for the transportation system;
> c. Define interim management objectives for areas or sub-areas where route designations were not completed concurrent with the RMP. Clearly state the process of moving from an interim designation of "limited to existing roads, primitive roads, and trails" to a designation of "limited to designated roads primitive roads and trails" upon completion of TMP.
> d. Identify any incomplete travel and transportation tasks:
> i. Outline additional data needs and a strategy to collect needed information;
> ii. Provide a clear planning sequence for subsequent road and trail selection and identification, including the public involvement process (focusing on user groups and stakeholders), initial route selection criteria, and constraints;
> iii. Provide a schedule to complete the area or sub-area road, primitive road, and trail selection process; and
> iv. Identify any easements and rights-of-way (to be issued to the BLM or others) needed to maintain the preliminary or existing road and trail network.

BLM Manual 1626 at .06(B)(2). Those components underlined above are absent from the Uncompahgre Draft RMP. Manual 1626 also provides that "If the decision on delineating travel and transportation networks is deferred in the land use plan to the implementation phase, the work should be completed within five (5) years of the signing of the Record of Decision (ROD) for the RMP." *Id*. at .06(B)(3).

The Draft RMP does not include a map of the known network of transportation linear features, and in fact indicates that BLM has not completed an inventory of the existing routes that motorized travel will be limited to. Uncompahgre Draft RMP at M-2. BLM is required to complete this inventory during the land use planning process and utilize that inventory to inform travel planning decisions, even if those decisions are being deferred from the RMP. BLM cannot limit travel to existing routes unless those routes are known and mapped. The draft RMP also does not detail long-term management goals for the transportation system or interim management objectives other than some interim management guidance

for areas limited to existing routes. *Id.* at 2-306—308. These elements must be fleshed out in the Proposed RMP to comply with agency policy.

We support BLM's commitment to identifying travel management areas, setting a prioritization scheme for completing comprehensive route designation, and completing route designations within 5 years of signing the ROD. The draft RMP identifies the following management action across the range of alternatives:

> Establish Travel Management Areas and, within five years of the Approved RMP/Record of Decision, initiate comprehensive travel management plans within each the following Travel Management Areas and in the following order unless a change is deemed necessary by the BLM Authorized Officer (Figure 2-81, Appendix A):
> 1. North Fork (71,020 acres)
> 2. South Montrose (66,180 acres)
> 3. North Delta (61,270 acres)
> 4. San Miguel (74,960 acres)
> 5. West End (289,960 acres)

Uncompahgre Draft RMP at 2-308. Furthermore, those areas may be too large for efficient and effective route designation processes, especially the West End. The draft RMP appropriately indicates that, "At the time of comprehensive travel management planning, the Travel Management Area may be broken down into subareas to address different resource management objectives." *Id.* at 2-309. We encourage BLM to retain this language in the RMP and follow through with creating smaller areas for travel management planning at the route designation stage.

We also greatly support BLM's commitment that "Route density for designated public routes will be used as an analysis tool" in future travel management planning. *Id.* at M-9. However, BLM does not set route density targets in the RMP, but seems to defer identifying those targets to comprehensive travel planning. BLM should not defer using route density as a tool but should instead utilize that important tool in the Uncompahgre RMP. Setting route density targets is an appropriate way for BLM to address habitat fragmentation in travel planning in the absence of route-by-route designations. For example, BLM must consider alternatives to minimize and mitigate impacts to habitat fragmentation in the RMP, such as closing areas to motorized use, setting route density limits, and designating wildlife corridors, conservation rights-of-way or other mitigating land use allocations. Thus, BLM should set route density limits in the RMP to guide future route designations that minimize impacts to wildlife.

Route density targets must be based on the best available science, and must meet scientifically-based thresholds or be combined with mitigating actions. BLM should complete density analysis of existing transportation network features, buffer analysis to examine the effect zone of the transportation network and core area analysis to identify habitat that remains unaffected by the transportation network. BLM should use wildlife literature to interpret fragmentation metrics developed through spatial analyses and adopt management decisions that minimize and mitigate habitat fragmentation.

Summary of Comments: The Uncompahgre RMP must comply with BLM's guidance for deferred travel planning. This includes mapping the existing route network, setting long-term goals for the transportation network and identifying interim travel management objectives. BLM should carry forward other elements of the preliminary travel plan, including the prioritization of travel management areas, route designation criteria and commitment to utilizing route density as a travel planning tool.

3. Non-motorized trail networks

BLM is not planning to make route designations through this planning process. In order to set management direction for future travel planning efforts, the RMP should specify the criteria that BLM will use to designate a non-motorized trail network. While BLM is designating routes for motorized use, pursuant to the minimization criteria and agency guidance, BLM can and should also designate non-motorized trail systems.

In implementing its 2006 Roads and Trails Terminology Report, BLM emphasized the importance of taking a "holistic" approach to the management of roads and trails (see, Instruction Memorandum 2006-173), which includes non-motorized trails. Likewise, IM 2008-014 states that the travel planning process "requires recognition and designation of non-motorized trails or routes." In this planning process, BLM should not simply addresses motorized use in individual travel management areas, but should set a broad vision for protecting and enhancing the experiences of non-motorized users.

FLPMA requires BLM to develop land use plans that "consider the relative scarcity of values involved and the availably of alternative means and sites for realization of those values." 43 U.S.C. § 1712(C)(6). Access to a "quiet use" recreation experience on our public lands through non-motorized trails is a growing need as opportunities for this use is shrinking with an increasing motorized population. As motorized recreation continues to grow in the region, BLM must be more proactive and deliberate in designing travel networks that preserve quiet recreation opportunities.

The RMP should specifically address and identify how BLM will meet the needs of quiet recreation users and provide non-motorized trail opportunities as part of its transportation system. The guidelines for deferring route designations set forth in BLM Manual 1626 should be fully incorporated by defining the goals for the use, location, and development/decommissioning; *specifically, for a long-term, non-motorized trail system*. BLM H- 8342 at 18.

In order to set management direction for future travel planning efforts, BLM should specify the process that will be used to designate a non-motorized trail network. As discussed previously in these comments, BLM's travel and transportation planning manual specifies the types of travel planning decisions that should be included in a travel planning process when route designations are being deferred. The RMP should ensure these decisions are applied specifically to non-motorized travel management, including:

- Define the long term management goals for the transportation system;
- Define interim management objectives for areas or sub-areas where route designations are not being completed
- Identify any incomplete travel and transportation tasks:
    - Outline additional data needs and a strategy to collect needed information;
    - Provide a clear planning sequence for subsequent road and trail selection and identification, including the public involvement process (focusing on user groups and stakeholders), initial route selection criteria, and constraints;
    - Provide a schedule to complete the area or sub-area road, primitive road, and trail selection process

BLM Manual 1626 at .06(B)(2). As part of developing a preliminary travel plan for the non-motorized route network, BLM should identify management goals and objectives for travel management areas where primitive recreation experiences will be emphasized and develop criteria for future non-motorized trail designation.

One of these criteria should be identifying and implementing opportunities to convert existing routes to non-motorized trails, which is less impactful than creating new trails and requires fewer resources. The initial route inventories BLM has released show that there is an abundance of existing routes in the field office and therefore plentiful opportunities to designate existing routes for non-motorized use. To minimize the impact from a non-motorized trail network, BLM should prioritize existing linear features that are in low-conflict and low-impacts places on the landscape. In any travel designation, BLM should minimize impacts to sensitive resources such take the necessary steps to avoid impacts wildlife habitat and other sensitive resources.

BLM should evaluate and include additional criteria for new trails in the RMP. One example of considering non-motorized trail networks comes from the Beaver Dam Wash NCA Draft RMP. This Draft RMP sets out criteria for designing a non-motorized trail system as follows:

> a) Addresses the needs of equestrians, hikers, climbers, and mountain bikers;
> b) Protects diverse NCA resource values from direct or indirect recreation impacts by promoting compliance with regulatory requirements and visitor use restrictions;
> c) Results in sustainable systems;
> d) Provides high quality experiences;
> e) Serves the abilities of non-motorized recreational users;
> f) Offers opportunities for looping, varying distances, linking between geographic areas and trailheads, and connecting to heritage and other educational resources.
> g) Minimizes user conflicts by separating user groups whenever feasible;
> h) Limits the desire to venture off-trail.

Beaver Dam Wash NCA Draft RMP at 150. BLM should set similar criteria in the Uncompahgre RMP.

As BLM considers any motorized use allocations and/or motorized trail designations, it should consider how those decisions might foreclose or limit an opportunity to designate the same or a nearby trail as non-motorized. Motorized trails can have far reaching impacts throughout the region. Designating an area as open to motorized use may preclude BLM's ability to effectively manage an adjacent or nearby area for quiet recreation. As such, BLM should give strong consideration to potential user-conflict generated from travel designations, in accordance with the minimization criteria. BLM should provide sufficiently large non-motorized areas to provide quality primitive recreation experiences and minimize disturbance to quiet-use activities from other forms of travel and recreation.

Summary of Comments: BLM should make allocations and designations in the RMP that provide for non-motorized recreation, and limit impacts from motorized use on quiet users. For areas that are intended to provide a semi-primitive or primitive recreation experience, the RMP should provide direction for completion of non-motorized trail systems in compliance with agency policy for completing a preliminary travel plan. BLM should prioritize lands with wilderness characteristics for non-motorized travel networks and should protect the primitive recreation resources and values found in lands with wilderness characteristics.

4. Temporary Closures

BLM has authority to institute temporary route closures to protect public lands and resources. 43 C.F.R. § 8364.1. BLM must immediately close any areas where the agency finds that OHVs are or will cause considerable adverse effects upon natural or cultural resources. 43 C.F.R. § 8341.2. BLM has policy guidance (Instruction Memorandum 2013-035) that describes how RMPs and TMPs should address

temporary closures including defining thresholds for when OHV-related closures will take place. The IM states that all RMPs and TMPs shall include the following statement in accordance with 43 C.F.R. § 8341.2 with regard to OHV use:

> Where off-road vehicles are causing or will cause considerable adverse effects upon soil, vegetation, wildlife, wildlife habitat, cultural resources, historical resources, threatened or endangered species, wilderness suitability, other authorized uses, or other resources, the affected areas shall be immediately closed to the type(s) of vehicle causing the adverse effect until the adverse effects are eliminated and measures implemented to prevent recurrence.

IM 2013-035, Attachment 1. The IM goes on to state that the RMP and TMP should also describe the resources, uses, situations, and locations likely to be adversely affected by OHV use. Moreover, the IM provides that if BLM analyzes potential for temporary closures properly, then there will be no further need for additional NEPA analysis and the temporary closure can be issued with a DNA.

Summary of Comments: The above guidance from IM 2013-035 on incorporating analysis of potential for temporary closures should be included in the RMP. BLM should issue temporary closures for any area where ORVs are currently harming or may harm natural or cultural resources in the interim.

5. Revised Statute 2477

The Draft RMP appropriately asserts that BLM does not address the validity of R.S. 2477 assertions through the planning process:

> Although the courts may recognize adjudicated Revised Statute 2477 rights-of-way as valid existing rights, current BLM policy does not allow BLM to consider adjudicated Revised Statute 2477 claims as valid existing rights. The current moratorium precluding the BLM from processing Revised Statute 2477 claims is still in effect, making Revised Statute 2477 assertions a legal issue beyond the scope of this planning effort.

Uncompahgre Draft RMP at ES-6, I-13; *see also* 2-309. We support this approach, and note it is the correct approach under relevant law and policy. BLM must ensure it does not make inappropriate decisions based on R.S. 2477 claims, and must communicate clearly to cooperating agencies and the public that BLM is prohibited from considering such claims in this planning process.

Summary of Comments: BLM should uphold its assertion that R.S. 2477 claims are not addressed in the agency's planning process.

G. Ecological Emphasis Areas and Areas of Critical Environmental Concern

We support that BLM is considering innovative planning approaches for managing natural resources at a landscape scale and implementing a comprehensive conservation framework in the Uncompahgre RMP. The networks of Ecological Emphasis Areas (EEAs) and Areas of Critical Environmental Concern (ACECs) evaluated in the range of alternatives create integrated conservation designations that, in context with other specially designated areas and allocations evaluated in the RMP, aspire to protect and enhance the ecological integrity of the Uncompahgre Field Office.

We also see this approach as consistent with BLM's Planning 2.0 initiative. The landscape-level approach committed to through the agency's Planning 2.0 initiative will guide agency planning for the foreseeable

future. While the Uncompahgre RMP is not currently being developed under Planning 2.0, consistency with the new agency direction will lead to more forward-thinking plan that aligns better with BLM's new planning rule and principles. Planning 2.0 presents an important opportunity for BLM to develop a landscape level strategy for conservation on our public lands. BLM's approach to EEAs and ACECs in the Uncompahgre Draft RMP fits well within BLM's movement towards a landscape approach to managing public lands articulated in Planning 2.0.

Developing integrated networks of land use allocations to manage ecosystems at a landscape scale is critical to addressing climate change and the future of land management, and modern science emphasizes the importance of this approach as well as provides useful data for successful implementation. The rate of land use change across the conterminous United States has been, and is projected to continue increasing into the future. These changes are resulting in habitat fragmentation, loss of biodiversity, and are negatively impacting sensitive habitats and important ecological processes. The effects of anthropogenic changes upon landscapes are no longer explicitly localized, rather the scale, speed of change, and subsequent impacts are having increasingly pronounced consequences at regional and global scales. Significant shifts in climate and climate change velocity are changing public lands, and the effects have been reliably modeled and observed across the United States. Specifically, in the Southwest region, broad scientific consensus supports an imminent shift in climate towards increasing seasonal temperatures and a significant reduction of annual precipitation, resulting in an increasingly arid climate with prolonged periods of drought.

These changes in climate and land use patterns are projected to continue causing an increase in habitat fragmentation and shifts in the distribution of plants, animals, and ecological processes across local, regional, and global scales. At the global scale, species migration and shifts in habitat range that match climate change projections have been empirically observed. At a regional level, biodiversity in the Southwest, including Colorado, are modeled to undergo significant shifts in plant distributions. It is expected that grass communities will expand and dominate in lower elevations, as the distribution of forested communities will migrate to higher elevations and potentially occupy smaller, favorable areas of refugia.

In order for species to survive, the persistence of suitable climates is necessary, but in some cases may be insufficient. Species must also have the capacity to migrate and disperse at a velocity that keeps pace with suitable climates as they shift across the landscape. The ability of ecosystems to adapt and persist in a changing climate will be dependent on the ability of species and ecological processes to migrate over and operate at broad scales. The rate at which species must adapt and migrate to keep pace with human- and climate-driven landscape change may vary widely and be difficult to predict, but migration capacity and ability will be necessary for survival.

For species and ecological processes to migrate and persist over different temporal and geographical scales, it is crucial that they have access to landscape areas capable of supporting high levels of biotic and abiotic diversity. This diversity is known as landscape heterogeneity, and includes areas with a diversity of terrestrial, riparian, and aquatic ecosystems, and the associated plants and animals they support. Landscape heterogeneity also includes a diverse range of geophysical characteristics including; topographic complexity, large elevation ranges, soil type and structure, soil chemistry, soil moisture availability, and underlying geological features. Together, all of these characteristics comprise landscape heterogeneity and are crucial for maintaining the long-term persistence of habitat, biodiversity, and ecological processes at the landscape scale, especially under changing climate and land use conditions. Landscape heterogeneity provides increased opportunities for biodiversity to occupy small habitat areas that serve as a refuge in a changing climate. Habitat 'refugia' created by a diverse and heterogeneous

landscape are important land characteristics that allow species to migrate to, persist in, and expand from during times of a rapidly changing climate.

In an effort to increase the capacity of plants, animals, and important ecological processes to migrate, adapt, and persist across the West, a systematic and increased network of conserved and protected areas needs to be implemented by conservation and land management planners. An increasingly large and diversified network of conserved areas in the West will help ensure the protection of important geophysical, biological, and ecological heterogeneity and allow for conservation management of large landscape level processes containing many important ecological processes.

A networked, connected, and dynamic regional system of protected areas will provide the greatest conservation benefit as single species conservation programs may become too costly, administratively complicated, and ultimately unsuccessful in the face of unpredictable, site-specific landscape and climate driven change. The regional approach to land conservation management, drawing from biogeography and landscape ecology, have great implications for understanding the importance of incorporating different ecological scales (single species vs. multiple ecosystems) at which biodiversity conservation will be most successful.

The BLM also can utilize EEAs and ACECs to more effectively manage ecologically valuable resources, particularly in the face of shifting climates. Many significantly large, road-less areas managed by BLM have been identified as having very high conservation value, yet much of this land is currently not allocated or managed with any type of conservation protection or special management prescriptions. Dickson et al. 2014. By utilizing a landscape level strategy for conservation planning, BLM can fulfill its responsibility and exercise its capacity to expertly manage our valuable public landscapes.

1. Ecological Emphasis Areas

The UFO Draft RMP proposes a new designation across the range of alternatives, called Ecological Emphasis Areas. BLM defines EEAs as "otherwise unprotected core wildlife and native plant habitat and associated movement, dispersal, and migration corridors," and they are identified with the intention of contributing to connectivity across the larger landscape. Uncompahgre Draft RMP at D-1. This innovative approach would complement ACECs, as well as other land use allocations and conservation designations considered and applied across the landscape. The stated objective of designating EEAs is to "manage to preserve the continuity of habitats, vegetation communities, and native wildlife within." *Id.* at 2-68. The draft RMP includes a range of alternatives for management actions to achieve that objective. This is an important and admirable management objective as the BLM is looking for new ways to manage public lands at a landscape scale in a way that facilitates climate change resilience and adaptation.

While we fully support BLM considering and designating EEAs to achieve these important management goals and objectives, we encourage the agency to utilize modern research to improve the designation and management of these areas. The scientific literature referenced in the RMP appendix addressing EEAs is decades old. The only somewhat recent research is from 2001.[83] BLM should utilize more modern science to evaluate and designate EEAs that achieve the stated goals and objectives of the EEAs and habitat management in the RMP generally. For example, The Wilderness Society has conducted recent research that would be valuable in identifying potential EEAs in the Uncompahgre Field Office, detailed below.

[83] Noss, R. 2001. Beyond Kyoto: Forest Management in a time of rapid climate change. Conservation Biology. Vol. 15, Issue 3, pg. 578-590.)

Mapping Wildland Values to Support Conservation Strategies Across the US

Overview: For over 100 years, conservation efforts have led to the establishment of hundreds of protected areas covering millions of hectares in the United States. These conservation reserves form the foundation of strategies to protect biological diversity and ecological processes upon which species and people depend. However, there is growing recognition that these existing conservation reserves may be insufficient in sustaining biodiversity as climate change and land use continues to impact natural ecosystems. Recent calls have been made to "complete the system" of protected areas by establishing an ecologically-connected network that is more inclusive of ecosystems and species currently under-represented in protected areas. Here, we conduct a national assessment of priorities for expanding conservation reserves that protect the most ecologically intact lands, establishes a national connected network, and better represents ecosystem and hotspots of range-limited species.

Ecological integrity and "wildness": The relative wildness of land is based on its ecological condition and the degree of human control over ecological processes. Places that are ecologically intact and are maintained in a natural condition with minimal influence by human impacts or management are wilder than those with degraded ecological conditions and a high degree of human influence. The Wilderness Society works to protect the last remaining wild places (Figure 3a, upper left). For our national assessment, we used a high resolution dataset on the degree of human modification and ecological integrity to serve as a surrogate for wildness. Maps of wildness are highly correlated with Theobald's map of ecological integrity, but is higher resolution and more updated than the wildness index.

Connectivity: The importance of creating a connected network of protected areas has emerged as one of the most important conservation strategies in the face of a changing climate. Our connectivity model identifies the wildest and most natural corridors linking large protected core areas across the lower 48 states. Maintaining the wildest and least human modified corridors between protected areas may give the most numbers of species the best opportunities to move and disperse as the climate change and development continues to fragment other areas (Figure 3b, upper right). We are working to bring this science to bear on additional conservation protections on federal lands so that these wild corridors are maintained or improved.

Ecosystem representation: Effectively conserving all of nature's biological diversity requires that protected areas be representative of all habitat types. Unfortunately, our protected areas systems currently do not include full representation of all habitats, but we are working to identify those places across the country that – if protected – would diversify the protected areas system making it more representative of our entire natural heritage. Lands in red and yellow represent ecological systems (i.e., different habitats) that are not well-protected in wilderness, national parks, or other protected areas (Figure 3c, lower left). As we prioritize the conservation lands of the future, adding diversity to our existing wilderness and parks will ensure that all of nature's diversity is protected.

Hotspots of endemic biodiversity: There are some places where many rare species co-occur. These lands are said to be rich in endemic biodiversity. Alarmingly, many of these places are home to species that occur nowhere else on earth and are currently unprotected in conservation lands. The index developed by Clinton Jenkins and colleagues and appearing in the Proceedings of the National Academy of Science in 2015 maps these unprotected hotspots as conservation priorities. We are including these data into our wildland conservation priority index to ensure that we work on protecting those rare and precious places that are globally significant homes to many rare species (Figure 3d, lower right).

Wildland conservation priorities: We combined the mapped data described above (ecological integrity, connectivity, representation, and hotspots of endemic biodiversity) into one index by simply adding up

the mapped layers (Figure 4). This new index allows us to identify wildland conservation priorities based on the land's relative wildness, its importance for creating a connected network of protected areas, its value in adding to the representation of habitats, and whether it has been identified as a hotspot of endemic species diversity. Ultimately, this approach will foster a national protected system of wildlands that is more prepared to handle the projected consequences of climate change.

Applying this data to the Uncompahgre Field Office, we can review how the EEAs evaluated in the draft RMP align with criteria used to map conservation priorities and overall wildland conservation values. As seen on the maps in Figure 5 (WSCC Comment Appendix I), additional or alternative areas should be considered for EEA designation to ultimately achieve a network of conservation areas that maximize their potential to contribute to connectivity across the larger landscape.

Additionally, this research could also help BLM prioritize management prescriptions for EEAs. In the draft RMP, BLM considers essentially one set of management prescriptions for all EEAs in each alternative. Given the large amount of acreage under consideration, the more reasonable approach may be to tailor management prescriptions to individual EEAs (or sets of EEAs) depending on the resource values present, their fragility and their management needs. This is how BLM develops management prescriptions for ACECs, and this approach could give the agency flexibility to designate large amounts of EEAs while giving each area the level of protective management that is required.

Summary of Comments: BLM should move forward with designating Ecological Emphasis Areas in the Uncompahgre RMP to create a network of interconnected habitat areas that contributes to the ecological integrity of the broader landscape. We encourage the agency to utilize modern research to improve the designation and management of these areas, such as the wildland values mapping information provided above. BLM should consider tailoring management prescriptions to individual EEAs (or sets of EEAs) depending on the resource values present, their fragility and their management needs.

2. Comments on Specific Ecological Emphasis Areas

a. Jumbo Mountain/McDonald Creek

We strongly support the designation of all 17,220 acres of all five zones of the Jumbo Mountain / McDonald Creek Ecological Emphasis Area included in Alternative B (DEIS Table 2-2, 103; DEIS Figure 2-2, Appendix A) As the BLM outlines in the draft RMP (DEIS Appendix D-2), these areas are highly valuable for the habitat connectivity for a number of wildlife species within our region, particularly mule deer, elk, mountain lion, and black bear.

The draft RMP describes the ecological value of these areas as follows:

> Links North Fork Valley with the National Forest and West Elk Wilderness. Adjoins several conservation easements that link the southern three parcels. Important for landscape-scale linkage. (DEIS Table D-1)

Based on the years of experience hunting, recreating, and living in close proximity to these lands, we can attest without any reservation that these lands provide exactly the quality of connectivity described. The wildlife value of these lands is difficult to overstate.

We would also like to express our strong support for overlapping designations of both the Jumbo Mountain / McDonald Creek EEA, the Jumbo Mountain SRMA, and any additional overlapping ERMA

or SRMA designations in the final plan (see WSCC and DAMB/COPMOBA Comments in support of additional recreation designations). We see no inherent conflict in these designations, which will not only protect the world-renowned mule deer herds and other wildlife, but also has the possibility of improving the recreation experience by limiting activities in late winter/early spring when recreation conditions, due to precipitation and soil moisture, are poor, and impacts to trails are greatest.

It should be clear from these comments and others (DAMB/COPMOBA), that there exists a rare degree of cooperation and enthusiasm for increased management of the lands in the North Fork Valley, with many different users supportive of careful management of multiple resources that can be mutually managed on these lands. A unifying concern, however, is that oil and gas development of these lands will be prioritized over these many other resources upon which our communities depend for quality of life, economic gain, and recreation.

b. Adobe Ecological Emphasis Area

The BLM is also proposing to manage part of the greater Adobes area under an Ecological Emphasis area designation, which as described above, we support. However, the specific proposal for the Adobe area changes drastically from Alterative B to Alternative D as it is basically gutted through the center, leaving only portions of the area designated on the northwest and far eastern boundaries.

This would leave the center of the Adobes/Desert Salt Brush Ecosystem ACEC area completely without any special designation status to protect the many unique values and resources that have been highlighted through the LWC, ACEC and EEA analysis. For the BLM to truly protect this area from further degradation and maintain the landscape scale habitat management it aspires to, the full acreage of the Adobes EEA must be restored in the Final RMP.

Taken altogether, the LWC, ACEC and EEA designations will create a holistic management proposal that will protect a large area of unique a vulnerable desert shrub lands and habitat that connect to Forest Service lands on the Grand Mesa.

c. Monitor/Potter/Roubideau

We support BLM including the Roubideau EEA as identified in both Alterative B and Alternative D in the Final RMP as it maintains its full acreage in both.

3. Areas of Critical Environmental Concern

Under FLPMA, BLM is obligated to develop and revise land use plans to manage public lands "in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values…[and] where appropriate, will preserve and protect certain public lands in their natural condition…" 43 U.S.C. §1701(a)(8). FLPMA obligates BLM to "give priority to the designation and protection of areas of critical environmental concern [ACECs]." 43 U.S.C. § 1712(c)(3). ACECs are areas "where special management is required (when such areas are developed or used or where no development is required) to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources, or other natural systems or processes." 43 U.S.C. § 1702(a).

BLM's ACEC Manual (1613) provides additional detail on the criteria to be considered in ACEC designation, as discussed in the applicable regulations, as well. *See*, BLM Manual 1613 at .1 (Characteristics of ACECs); 43 C.F.R. § 8200. An area must possess relevance (such that it has significant value(s) in historic, cultural or scenic values, fish & wildlife resources, other natural

systems/processes, or natural hazards) and importance (such that it has special significance and distinctiveness by being more than locally significant or especially rare, fragile or vulnerable). In addition, the area must require special management attention to protect the relevant and important values.

For potential ACECs, management prescriptions are to be "fully developed" in the RMP. BLM Manual 1613 at .22 (Develop Management Prescriptions for Potential ACECs). These management prescriptions include general policies and mitigation measures that "protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources…" BLM Manual 1613 at .02.

We support that BLM is considering a robust range of ACECs for designation in the Uncompahgre RMP. The fact that the proposed Planning 2.0 rule emphasizes ACECs, as well as the fact that BLM is currently updating its ACEC Manual, speaks to both the importance of incorporating ACEC designation into the agency's landscape-level strategy for land use planning and the unique position that ACECs will have in the next chapter of BLM land use planning. Therefore, the limited number and acreage of ACECs that would be designated in the preferred alternative is inadequate to support a connected landscape and maintain its ecological integrity. At the same time, we note that many of the ACECs under consideration in the draft RMP overlap with potential EEAs, particularly in Alternative B. Uncompahgre Draft RMP at Figures 2-2 and 2-64. We encourage BLM to ultimately designate a network of ACECs and EEAs that is consistent with FLPMA and agency policy, and also maximizes the ability of these designations to create a connected network of protected areas across the Uncompahgre Field Office.

Summary of Comments: In compliance with FLPMA and BLM's obligation to designate ACECs where lands exhibit relevant and important qualifying criteria, we recommend that BLM adopt a comprehensive ACEC framework that designates adequate new ACECs, applies robust management prescriptions to protect relevant and important criteria, and creates an integrated network with EEAs and other conservation allocations and designations in the planning area.

4. Comments on Specific Areas of Critical Environmental Concern

a. Needle Rock

We support managed of Needle Rock as an Area of Critical Environmental Concern.

b. Roubideau – Potter – Monitor

In BLMs ACEC analysis, the Roubideau-Potter and Monitor mesa and canyon complex is recognized as an ACEC of 20,502 acres in size with valuable resources of riparian vegetation. The area is recognized by the CNHP for its high biodiversity rating, giving it statewide and global significance.

The area also has cultural and historical sites that are vulnerable to change and warrant protection as an ACEC. If the BLM is planning to manage this area as an SRMA expecting more visitation in the future (as explained in the rational for moving it towards "front country management") these historic resources need to be managed so increased recreational use does not damage them.

The Roubideau ACEC is present in Alternative D and named "Roubideau Corridors," but is drastically reduced in size to 8,720 and only includes the canyons, not the mesa tops. This proposal would leave the mesa tops without either LWC or ACEC protection, only selectively managing to protect the riparian vegetation in the canyons and not the montane forest also identified in the area.

After leading many on the ground hikes in both the canyons and the mesa tops, it is clear the area should be treated as a holistic unit and not separated into canyons and mesas. The experience of being in this area in not complete without being able to enjoy a hike through the canyons and then climb up to the mesa tops to get a full view of the surrounding area. If BLM is not going to manage the mesa tops as part of the LWC unit, an ACEC designation should include to mesa tops to ensure the holistic management of the area to protect it and maintain the quality of the experience.

We recommend that the BLM include the full Roubideau ACEC as identified in Alternative B in the Final RMP.

d. Adobe Badlands and Salt Desert Shrub Ecosystem ACECs

i. The greater Adobe badlands in north Delta are a fascinating and vulnerable environment. It is a system based on fragile shales and soil crusts that in turn support rare high desert plant and animal species. The Colorado Natural Heritage Program considered salt desert shrub lands in the area to be globally vulnerable and locally imperiled. These fragile desert systems need a high level of preservation to retain an intact ecosystem as they have a high difficulty in recovery from disturbance.

ii. The greater adobes area has two different proposed ACECs that overlap. One is the existing Adobe Badland ACEC which basically overlaps the WSA. The other is the Salt Desert Shrub Ecosystem ACEC which is much larger in size and would go further in protecting these fragile systems. We encourage the BLM to carry the Salt Desert Shrub Ecosystem ACEC into the final RMP with the full acreage as identified in Alternative. This management decision would lessen the impacts to Special Status Species and protect a system that is already facing encroachment and fragmentation.

iii. The proposed ACEC meets BLM's ACEC criteria and should be designated as such:

a. The area has significant wildlife values: populations of white tallied prairie dogs, kit fox, burrowing owl, ferruginous hawk and pronghorn antelope. All together it has been ranked as an area of "very high biodiversity significance" by the Colorado Natural Heritage Program.
b. Natural processes or systems: significant populations of hookless cactus, adobe penstemon, and clay-loving buckwheat, all endangered or threatened endemic sensitive plants
c. More than local qualities: In addition to providing an important natural area for local residents to enjoy, the area is listed in the state and regional hiking guide books because of its scenic formations. If one looks on line, there is evidence of evidence of visitors from as far away a Europe who post photos and GPS coordinates of their trips into this area.
d. Vulnerable qualities: the area is clearly vulnerable to high levels of erosion and without special management. Issues such as illegal off road recreation, dumping and other damaging uses are difficult for systems such as these to recover from. Saline soils are vulnerable to adverse change. Without added management protection, the area could be damaged for decades to come.

H. Wild & Scenic

1. Legal and procedural requirements

We appreciate the BLM's conscientious and professional compliance with requirements regarding wild & scenic analyses and decisions within the RMP process, including section 5(d)(a) of the Wild and Scenic Rivers Act and by the BLM Manual at 8351 and 6400. Beyond mere compliance, we also thank the BLM for its thoroughness in reviewing potential rivers at each stage of its W&S analysis—including initial inventory of rivers, eligibility report, and suitability report—and for its extra efforts in community outreach and in field assessment of potential rivers.

We believe that the W&S suitability findings included in the BLM's *Wild and Scenic River Suitability Report*, February 2013 (included as Appendix P to the draft RMP), provides a fair and sound analysis and set of recommendations. We believe that the suitability findings should be fully implemented in the final RMP, as represented in the preferred alternative of the Draft RMP.

2. Critique of working groups

One component in the W&S suitability analysis was a series of public-engagement meetings and negotiations, structured separately for the Gunnison River basin and the San Miguel-Dolores River basin.

The citizens' working group focused on eligible segments within the Gunnison River basin was loosely organized and marginally facilitated, open to a frequently changing array of interested individuals, without consistent representation, and with changing protocols for discussion and decision-making.

As a result, no consensus was reached on recommendations to the BLM. Two reports were submitted from that process: One report recommended no stream segments be found suitable; the other recommended three segments be found suitable (Monitor Creek, Potter Creek, Roubideau Creek segment 1). Both reports are included on the BLM's website for the RMP, and we appreciate that fact that both were considered by the BLM in crafting its draft RMP.

For the San Miguel and upper Dolores river basin, the BLM's *Southwest Resource Advisory Council* (RAC) appointed a diverse citizens committee to review candidate rivers.

The sub-RAC, as it was known, was thoughtfully and fairly structured, was professionally facilitated and recorded, hosted nine public-comment meetings, and included a deliberately selected membership intended to represent a comprehensive spectrum of community and resource interests.

That group studied each eligible river in detail and recommended thirteen stream segments be found suitable, those recommendations later affirmed by the full RAC and forwarded to the BLM. In many instances, river segments were adjusted in length—most typically to remove private land from suitability implications—and some were adjusted in classification to better fit local water use and other resource needs.

3. Watershed approach to rivers management and protection

The BLM's suitability findings in the San Miguel-Dolores River basin are correspondingly well founded in careful analysis, in strong public engagement and support, and in a constructive spirit of compromise and mutual accommodation among protection, commodity, and community interests.

Moreover, the suitability findings for the San Miguel River, for portions of the Dolores River, and for key tributaries to both are consistent with suitability determinations in adjacent federal land management units. Specifically, W&S suitability findings recently established or affirmed in the watershed by the San Juan National Forest, the BLM Tres Rios Field Office, and the BLM Grand Junction Field Office will

now be complemented by similar findings of suitability—and corresponding protective management—in the Uncompahgre Field Office.

That consistency is further enhanced by the BLM's recent realignment of management districts, now including in the entire Dolores River watershed in one coordinating district.

The call for a comprehensive and coordinated watershed approach to rivers management and protection was a frequent and consistent refrain during the working group processes. The management decisions noted above, the BLM organization restructuring, and now strong and well-founded suitability decisions in the Uncompahgre Field Office provide affirmative response to those requests.

4. Opportunities for federal-state cooperation

The BLM's administrative management and protection for potential Wild & Scenic Rivers, through eligibility or suitability, affords an important opportunity to comprehensively address river values. A combination of federal land management prescriptions under the RMP and streamflow protections using the State of Colorado's *Stream and Lake Protection Program* will ensure the continued health and natural vibrancy of the full spectrum of river flow and river corridor features.

Correspondingly, we appreciate the position recently taken by the *Colorado Water Conservation Board* (CWCB) (which manages the state stream protection program), acknowledging the potential value of W&S suitability findings in both watersheds and requesting several specific accommodations from the BLM.

Specifically, we encourage the BLM to a) incorporate into its final RMP preparation information and documents prepared under the state's Basin Roundtable process, b) acknowledge existing state instream flow water rights affecting W&S suitable stream segments and encourage cooperation on the selective expansion of those rights and establishment of new rights to complement the suitability status, c) affirmation of stipulation between the CWCB and the Dolores Water Conservation District in the matter of CWCB staff recommendation for instream flow appropriation on the Dolores River, d) incorporate updates regarding CWCB instream flow water rights, both established and pending, e) include clarification regarding effects that W&S suitability may or may not have on potential development conditional water-storage rights held by Montrose County, and f) provide clarifications regarding the effects that W&S suitability may or may not have on continued operation of McPhee Reservoir and the Dolores Project.

While we understand that the pending RMP is probably not the correct context in which to address potential federal legislation, we encourage the BLM to otherwise acknowledge and affirm the its openness to streamflow protection for potential W&S rivers by means other than pursuit of federal reserved water rights.

At the same time, we recommend that the BLM should not adjust its RMP suitability findings for stream segments being discussed for possible federal legislation (upper Dolores River, La Sal Creek *e.g.*), leaving final or adjusted determinations to Congress or to future BLM administrative processes. It is important that legislative deliberations benefit from the BLM's professional and objective assessment of particular stream values and of their potential for inclusion in the *Wild and Scenic Rivers System* or other protective designation.

5. Comments on specific stream segments

We strongly endorse all the W&S suitability findings included in the BLM's *Wild and Scenic Suitability Report*, highlighted in Appendix P to the draft RMP, and we urge BLM to include those findings in the

final RMP, along with protective management prescriptions appropriate to suitability status and classification.

Further, we urge BLM to fully and reliably implement, in the RMP, other protection measures for rivers and river corridors determined to be W&S eligible but found not suitable. In many instances, a combination of recommendations from the citizen working groups and acknowledgements in the draft RMP have asserted that suitability was not necessary for certain stream segments specifically because other measures are in place to protect the free-flowing condition and the outstandingly remarkable values that warranted the original eligibility determination. It is important that the BLM ensure the continued protection of values identified under eligibility.

Related, the BLM, through the RMP and otherwise, should continue to monitor the presence and effectiveness of those alternative protection measures. If those measures fail or are discontinued for any stream segments that had been found eligible, BLM should promptly reconsider, through an RMP amendment, eligibility and suitability for those segments.

a. Gunnison River Segment 2
As documented the BLM's W&S eligibility report, this regionally significant river warrants strong and enduring protection as an important recreational opportunity, as the hydrologic heart of unique adjacent public lands, and as essential habitat for at least two endangered species of native fish, along with three other species of ancient native fish that are imperiled primarily because of loss of habitat or changes in river flows.

Other federal programs—primarily the Endangered Species Act—and evolving federal management efforts—including re-operation the Aspinall Unit dams upstream—contribute, or will contribute, to the reliability of those critical-habitat flows.

It therefore is not necessary to apply a finding of wild & scenic suitability to this portion of the Gunnison River, *so long as* those other federal measures are implemented and properly maintained. If those measures are either removed or fail to protect the native fish and their habitat, the BLM should reconsider a finding of suitability in future planning processes.

b. Monitor Creek
This stream is an important feature flowing through the heart of federal lands with wilderness character and wilderness characteristics, which are included in a citizens' wilderness proposal. The stream is also associated with national forest lands upstream that have been congressionally designated for protection of wilderness values. These wilderness values should be considered and protected through strong protective management for this stream and its corridor.

BLM's classification of this stream segment as wild affirms those wilderness characteristics and values, and further warrants strong protection for the stream and corridor.

Protection of this stream will benefit private lands downstream and will help ensure continued healthy streamflow and water quality contribution to the Gunnison River.

In addition to the outstandingly remarkable values identified by the BLM (vegetation), the BLM should also identify and protect the unique and outstanding wildlife and recreation values found along this stream.

The landscape surrounding Monitor Creek is naturally contiguous with, and an essential ("regionally important") component of, the wildlife habitat (and Outstandingly Remarkable Value (ORV)) identified by the BLM for nearby Roubideau Creek (*desert bighorn sheep*). The features, condition, and importance of this wildlife habitat along Monitor Creek are of importance equal to that found along Roubideau Creek.

Recreation opportunities found in and near the Monitor Creek corridor correspond to the general wilderness character and wilderness characteristics for the area—specifically outstanding opportunities for solitude and for a primitive and unconfined type of recreation. While this type of recreation opportunity is slightly different from the recreational ORV identified by the BLM for Roubideau Creek (that ORV based primarily in the popularity of that stream corridor), the version found along Monitor Creek is an outstanding recreational opportunity nonetheless. Indeed, the more primitive and solitude-preserving recreation opportunities noted here for Monitor Creek are also present in Roubideau Creek, which is included, stream and corridor, in the Roubideau (Camel Back) Wilderness Study Area, thus necessarily defined by those same backcountry recreation opportunities.

Meanwhile, a finding of wild & scenic suitability for Monitor Creek—a finding most directly applicable to the lands in the stream corridor—will provide reliable and enduring form of protection for the continued health of the rare plant communities identified in the BLM's eligibility report (*narrowleaf cottonwood/strapleaf willow/silver buffaloberry riparian forest*).

Federal ownership of 100% of this stream segment, and of 96.2% of corridor lands along the stream simplify the implementation of protective management through a finding of wild & scenic suitability. The 104.9 acres of private land within the stream corridor are actually separate from the stream, further simplifying protective management, especially if that management were applied specifically to the federal lands.

We recommend that the full length of the Monitor Creek segment be found suitable, applicable at least to the federal lands in the stream corridor. The stream's outstandingly remarkable values should be expanded to include recreational opportunities and wildlife habitat.

c. Potter Creek

This stream is an important feature associated with adjacent lands with wilderness character and characteristics, which are included in a citizens' wilderness proposal. The stream is also associated with national forest lands upstream that have been congressionally designated for protection of wilderness values. These wilderness values should be considered and protected through strong protective management for this stream and its corridor.

The BLM's classification of this stream segment as wild affirms those wilderness characteristics and values, and further warrants strong protection for the stream and corridor.

Protection of this stream will benefit private lands downstream and will help ensure continued healthy streamflow and water quality contribution to the Gunnison River.

In addition to the outstandingly remarkable values originally identified in the BLM's eligibility report (*vegetation*), the BLM should also identify and protect the unique and outstanding wildlife and recreation values found along this stream.

The landscape surrounding Potter Creek is naturally contiguous with, and an essential ("regionally important") component of, the wildlife habitat (and ORV) identified by the BLM for adjacent Roubideau

Creek (*desert bighorn sheep*). The features, condition, and importance of that wildlife habitat along Potter Creek is of importance equal to that found along Roubideau Creek.

Recreation opportunities found in and near the Potter Creek corridor correspond to the general wilderness character and wilderness characteristics for the area—specifically outstanding opportunities for solitude and for a primitive and unconfined type of recreation. While this type of recreation opportunity is slightly different from the recreational ORV identified by the BLM for Roubideau Creek (that ORV based primarily in the popularity of that stream corridor), it is an outstanding recreational opportunity nonetheless. Indeed, the more primitive and solitude-preserving recreation opportunities noted here for Potter Creek are also present in Roubideau Creek. Roubideau Creek and its corridor are included in the Roubideau (Camel Back) Wilderness Study Area, which is necessarily defined by those same backcountry recreation opportunities.

Meanwhile, the BLM's decision to remove the one outstandingly remarkable value originally identified in the agency's eligibility report is in error. The BLM's rather arbitrary distinction between a classification as critically imperiled globally (G1) and vulnerable throughout its range (G2) is not well founded.

A plant community that is currently vulnerable throughout its range warrants the highest possible level of protection in each of its occurrences, lest damage from human activity, climate change, or other harmful factors translate vulnerable to imperiled. The best way to avoid plant community failures in the future is an active protection in the present. A finding of suitability, and accompanying protective management, is an appropriate and timely tool for this plant community.

A finding of wild & scenic suitability for Potter Creek—a finding most directly applicable to the lands in the stream corridor—will provide a highly reliable and enduring form of protection for the continued health of the rare plant communities identified in the BLM's eligibility report (*narrowleaf cottonwood/strapleaf willow/silver buffaloberry riparian forest*).

Federal ownership of 100% of this stream segment, and of 98.5% of corridor lands along the stream simplify the implementation of protective management through a finding of wild & scenic suitability. The 44.3 acres of private land are located at the far lower end of the stream segment, further simplifying protective management, especially if that management were applied specifically to the federal lands.

We recommend that the full length of the Potter Creek be found suitable, applicable at least to the federal lands in the stream corridor. The stream's outstandingly remarkable values should continue to include the highlighted vegetation communities, and they should be expanded to include recreational opportunities and wildlife habitat.

d. Roubideau Creek Segment 1

This stream is an important feature flowing through and enhancing lands with wilderness character and characteristics, both within the long-standing Roubideau (Camel Back) Wilderness Study Area and in the larger citizens' wilderness proposal of the same name. The stream is also associated with national forest lands upstream that have been congressionally designated for protection of wilderness values. These wilderness values should be considered and protected through strong protective management for this stream and its corridor.

The BLM's classification of this stream segment as wild affirms those wilderness characteristics and values, and further warrants strong protection for the stream and corridor.

Protection of this stream will benefit private lands downstream and will help ensure continued healthy streamflow and water quality contribution to the Gunnison River.

A finding of wild & scenic suitability for Roubideau Creek Segment 1—a finding most directly applicable to the lands in the stream corridor—will provide a highly reliable and enduring protection for the continued health of the ORVs identified in the BLM's eligibility report, including: rare plant communities (*narrowleaf cottonwood/strapleaf willow/silver buffaloberry riparian forest*); wildlife (*northern leopard frog, desert bighorn sheep*); cultural; and recreational (*primitive and non-mechanical exploration and exercise*).

Federal ownership of 93% of this stream segment, and of 94.8% of the land in the stream corridor simplifies the effective implementation of protective management.

We recommend that the full length of the Roubideau Creek Segment 1 be found suitable, applicable at least to the federal lands in the corridor.

e. Roubideau Creek Segment 2

The continued health of this stream segment is an important community and ecological priority, and the BLM's future management of its lands along that stream should ensure the continued vibrancy of the outstanding wildlife and vegetation values found there.

The relatively low percentage of federal land ownership along the stream and in the stream corridor (45.5%, 60.2%) makes management under a finding of wild & scenic suitability difficult. Other protective designations and measures should instead be used for Roubideau Creek Segment 2.

I. Wilderness Study Areas

We support that the Uncompahgre Draft RMP identifies management actions for Wilderness Study Areas in the event they are released from wilderness consideration by Congress.

The Camel Back WSA would receive minimal protections for its natural resource values under the preferred alternative in the Draft RMP if it were to be released from WSA status. The only overlapping designations in the preferred alternative are the Roubideau Corridors ACEC and Roubideau SRMA. Uncompahgre Draft RMP at Maps 2-66 and 2-47. The Roubideau Corridors ACEC is small relative to the Camel Back WSA, and the Roubideau SRMA as considered in Alternative D would not provide adequate protection to the important public lands resources in the Camel Back WSA. Therefore, the final RMP should adopt the Roubideau SRMA as contemplated in Alternative B; designate the Roubideau-Potter-Monitor ACEC as contemplated in Alternative B; or identify specific management actions to protect the natural resources of the Camel Back WSA in the event of Congressional release similarly to how the draft RMP would manage the Sewemup Mesa WSA in the event of Congressional release.

J. Night Sky Resources

We support that the Uncompahgre Draft RMP addresses protection of dark night skies across the range of alternatives. In the alternatives table for visual resources, one of the identified objectives is to: "Maintain dark night sky conditions in areas that are generally unaffected by man-made light sources." Uncompahgre Draft RMP at 2-147. The draft RMP goes on to detail actions for achieving this objective, including prohibiting permanent outdoor artificial lighting in VRM I and II areas, requiring that permanent and temporary artificial outdoor lighting be shielded and downward-facing, and requiring that

permanent artificial outdoor lighting be turned off when it is not needed. *Id* at 2-147—148. These are appropriate actions to ensure that night sky resources, which are important visual resources of our public lands, are protected from light pollution.

BLM has been given an explicit mandate to manage the lands under its jurisdiction for their scenic and atmospheric values, which includes night skies. *See*, FLPMA, 43 U.S.C. § 1701(a)(8) (stating that "…the public lands be managed in a manner that will protect the quality of the…scenic…[and] air and atmospheric…values…"); National Environmental Policy Act, 43 U.S.C. § 4331(b)(2) (requiring measures to be taken to "…assure for all Americans...esthetically pleasing surroundings…"); National Historic Preservation Act, 36 C.F.R. § 800.1(a) (requiring federal agencies to consider measures to avoid impacts on historic properties, including their "settings"). A dark night sky is undoubtedly a scenic and atmospheric value within that term's meaning as defined in FLPMA.

Since 1984, BLM has interpreted its mandate as a "stewardship responsibility" to "protect visual values on public lands" by managing all BLM-administered lands "in a manner which will protect the quality of scenic (visual) values." Visual Resource Management Handbook, H-8400-1 at .02, .06(A). Night sky management is an inherent component of this responsibility. VRM is not restricted to land-based resources. To this end, BLM should develop minimum management prescriptions to be included in its resource management plan that give due consideration to the value of a dark night sky, consistent with BLM's multiple use mandate, as defined at 43 U.S.C. § 1702(c).

In addition to carrying forward the management actions contemplated in the Draft RMP, BLM should adopt minimal additional management actions to even better steward this important visual resource. The Arizona Strip District incorporated the following prescriptions in the RMPs for the District in 2008, which would be appropriate for the Uncompahgre Field Office:

- Impacts to dark night skies will be prevented or reduced through the application of specific mitigation measures identified in activity level planning and NEPA review. These measures may include directing all light downward, using shielded lights, using only the minimum illumination necessary, using lamp types such as sodium lamps (less prone to atmospheric scattering), using circuit timers, and using motion sensors.
- Any facilities authorized will use the best technology available to minimize light emissions.

Arizona Strip RMP at 65; Grand Canyon-Parashant National Monument RMP at 67; Vermilion Cliffs National Monument RMP at 47-48.

Furthermore, the Uncompahgre RMP should identify the areas that are "generally unaffected by man-made light sources" or at least describe in detail criteria to meet that definition so that BLM can accurately and appropriately apply the dark night sky management actions in RMP implementation.

Summary of Comments: BLM should adopt management actions contemplated in Alternative B of the Uncompahgre Draft RMP, which extends the prohibition on permanent artificial outdoor lighting to VRM II areas in addition to VRM I areas. BLM should also adopt the following management actions to further protect dark night sky resources:

- Impacts to dark night skies will be prevented or reduced through the application of specific mitigation measures identified in activity level planning and NEPA review.
- Any facilities authorized will use the best technology available to minimize light emissions.

Additionally, BLM should identify the areas that are "generally unaffected by man-made light sources" or at least describe in detail criteria to meet that definition so that these management actions can be applied in implementation.

K. Climate Change

1. BLM's Obligation and Authority to Analyze Climate Change in RMPs

BLM has a legal duty to address the impacts of climate change both from land management actions and to the resource area in the Uncompahgre RMP. The Uncompahgre Field Office will undoubtedly experience real effects of climate change during the 20-year period that the RMP is in effect and beyond. Many management decisions in the RMP may contribute to and exacerbate the impacts of human-induced global climate change, and BLM stewards many resources that must be managed so as to maximize their ability to adapt and endure in the face of climate change.

We appreciate that BLM acknowledges the need to manage for climate change impacts, analyzes some of those impacts from BLM actions and from other actions affecting the Uncompahgre Field Office, quantifies greenhouse emissions from alternatives under consideration in the RMP and proposes a goal and objective specifically related to climate change in the draft RMP. *See, e.g.,* Uncompahgre Draft RMP at 2-24; 3-14—16; 4-37—43; Appendix Q. These are all important initial steps in bringing climate change analysis and management into resource management planning. However, at this time, BLM has access to significant amounts of data and useful tools to assist with climate change analysis, relevant policy and guidance for completing robust climate analysis in environmental reviews, and an obligation to make management decisions that more comprehensively address climate change impacts and adaptation. The Uncompahgre RMP is wholly inadequate in addressing this important issue at this critical time.

a. BLM must take a hard look at climate change impacts from management decisions in the environmental impact statement for the resource management plan.

Impacts to the ecosystem from climate change include shrinking water resources; extreme flooding events; invasion of more combustible non-native plant species; soil erosion; loss of wildlife habitat; and larger, hotter wildfires. Many of these impacts have been catalogued in recent studies by federal agencies showing the impacts of climate change specifically in the United States such as the National Climate Assessment.[84]

An important source of information for impacts from climate change is BLM's Rapid Ecoregional Assessment (REA) for the Colorado Plateau.[85] BLM should be using the results of the REA to inform the RMP/EIS and to address management issues at the landscape-scale, such as climate change. The Draft RMP states that, "Data in the Colorado Plateau Rapid Ecological Assessment [sic] will be considered as appropriate." Uncompahgre Draft RMP at 1-12. However, BLM appears to rely very little on data available from the REA, as there is hardly any reference to the REA other than that vague commitment, and the RMP fails to consider management alternatives that reflect data derived from the REA. The REA should be a central tool relied upon in resource management planning to plan for climate change adaptation:

> REAs are timely in supporting planning, management, and mitigation strategies for impacts anticipated from rapidly-developing issues related to traditional and renewable energy

[84] Available at http://nca2014.globalchange.gov/
[85] Information on the REA is available at: http://www.blm.gov/wo/st/en/prog/more/Landscape_Approach/reas/coloplateau.html.

> development, the spread of invasive species, changing fire regimes, and climate change. REAs provide a foundation for an adaptive management approach that will allow implementation strategies to be adjusted for new information and changing conditions. REAs represent a baseline condition from which to evaluate the results of adaptive management and to characterize potential trends in resource condition both in the near-term (2025)—as a consequence of development activities—and in the long-term (2060) as a result of climate change. The final chapter of this REA report (Chapter 6) provides examples showing how the data and results may be arranged and manipulated using mapped and tabular results, for all land ownerships and BLM-lands only, for areas of intact habitats, resource value hotspots, and opportunities for connectivity with existing designated lands.

Colorado Plateau REA Final Report II-3-c at viii.

Unfortunately, with all of this data available, BLM fails to address climate change in a meaningful way, instead intimating that the agency is incapable of managing public lands and resources to reduce impacts to climate change or adapt to climate change impacts. For example, under the stated goal to: "Manage native vegetation and wildlife species, soil and water resources, and wildlife habitats to maintain productivity, viability, and natural processes in response to stresses induced by climate change," BLM includes the vague management action to "Address climate change effects on soil and water resources, vegetation, and habitats and apply appropriate management to protect these resource values." Uncompahgre Draft RMP at 2-24. The only other actions under the climate change goal are to seed local native species to improve survival of plan populations and to minimize soil and vegetation disturbance in ecological emphasis areas. *Id* at 2-25.

This does not meet the obligation of the agency to assess impacts from climate change and contributions to climate change from agency actions. On August 2, 2016, the Council on Environmental Quality (CEQ) released its long-awaited final guidance on considering greenhouse gas (GHG) emissions and the effects of climate change in NEPA reviews. The overarching goal of the guidance is to provide greater clarity and more consistency in how federal agencies address climate change in their NEPA reviews and to facilitate compliance with existing NEPA requirements. The guidance recognizes that "[c]limate change is a fundamental environmental issue, and its effects fall squarely within NEPA's purview." CEQ Guidance at 2. It recognizes that identifying and analyzing the interactions between our changing climate and the environmental impacts from a proposed action can have a number of benefits, including identifying opportunities to reduce and mitigate GHG emissions, to improve environmental outcomes, and to help safeguard communities, infrastructure, and resources against the effects of climate change.

The guidance counsels agencies to use the information developed during the NEPA review to consider alternatives that are more resilient to the effects of a changing climate. CEQ Guidance at 5. BLM must not only analyze greenhouse gas emissions from proposed actions, but use that information to make better decisions for public lands resources and, equally importantly, assess likely impacts to our public lands from climate changes already underway in order to respond and adapt. Notably, the guidance contains special considerations for biogenic sources of greenhouse gas emissions from land management actions, such as prescribed burning. CEQ Guidance at 18. While the final CEQ guidance was recently released, a second draft of this guidance has been out since 2014. Therefore, the Uncompahgre RMP is not exempt from considering and using this guidance in analyzing climate change, and BLM should have incorporated principles from the CEQ guidance into the draft RMP.

Additionally, BLM has other requirements to analyze climate change in NEPA analyses that are not met in the draft RMP. NEPA regulations and U.S. courts direct that BLM must fully analyze the cumulative

and incremental impacts of the proposed decisions in the RMP.[86] In *CBD v. NHTSA*, the NHTSA failed to provide analysis for the impact of greenhouse gas emissions on climate change and was rebuked by the U.S. Court of Appeals for the Ninth Circuit, which observed that "[t]he impact of greenhouse gas emissions on climate change is precisely the kind of cumulative impacts analysis that NEPA requires agencies to conduct." 538 F.3d at 1217. For example, off-road vehicle designations, oil and gas management stipulations, and renewable energy development may significantly increase or reduce greenhouse gas emissions contributing to climate change and must be analyzed under NEPA.

Further, NEPA regulations require that NEPA documents address not only the direct effects of federal proposals, but also "reasonably foreseeable" indirect effects. These are defined as:

> Indirect effects, which are caused by the action and are later in time or farther removed in distance, *but are still reasonably foreseeable*. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems." 40 C.F.R. § 1508.8(b) (emphasis added).

BLM is required to take a hard look at direct, indirect, and cumulative impacts to and from climate change in the planning area in the RMP. BLM baseline data on climate change must be sufficient to permit analysis of impacts under NEPA. Importantly, 40 C.F.R. § 1502.15 requires agencies to "describe the environment of the areas to be affected or created by the alternatives under consideration." Establishment of baseline conditions is a requirement of NEPA. In *Half Moon Bay Fisherman's Marketing Ass'n v. Carlucci*, 857 F.2d 505, 510 (9th Cir. 1988), the Ninth Circuit states that "without establishing . . . baseline conditions . . . there is simply no way to determine what effect [an action] will have on the environment, and consequently, no way to comply with NEPA." The court further held that "[t]he concept of a baseline against which to compare predictions of the effects of the proposed action and reasonable alternatives is critical to the NEPA process."

There is a growing body of scientific information already available on climate change baseline conditions, much of it generated by or available through federal agencies. Where there is scientific uncertainty, NEPA imposes three mandatory obligations on BLM: (1) a duty to disclose the scientific uncertainty; (2) a duty to complete independent research and gather information if no adequate information exists unless the costs are exorbitant or the means of obtaining the information are not known; and (3) a duty to evaluate the potential, reasonably foreseeable impacts in the absence of relevant information, using a four-step process. Unless the costs are exorbitant or the means of obtaining the information are not known, the agency must gather the information in studies or research. 40 C.F.R. § 1502.22. Courts have upheld these requirements, stating that the detailed environmental analysis must "utiliz[e] public comment and the best available scientific information."[87]

As the Supreme Court has explained, while "policymaking in a complex society must account for uncertainty," it is not "sufficient for an agency to merely recite the terms 'substantial uncertainty' as a justification for its actions."[88] Instead, in this context, as in all other aspects of agency decision-making,

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[86] *Center for Biological Diversity v. National Highway Traffic Safety Administration*, 538 F.3d 1172, 1217 (9th Cir. 2008).
[87] *Colorado Environmental Coalition v. Dombeck*, 185 F.3d 1162, 1171-72 (10th Cir. 1999) (citing *Robertson v. Methow Valley Citizens' Council*, 490 U.S. at 350); *Holy Cross Wilderness Fund v. Madigan*, 960 F.2d 1515, 1521-22 (10th Cir. 1992).
[88] *Motor Vehicle Manufacturers Ass'n v. State Farm Mutual Automobile Ins. Co., 463 U.S. 29, 52* (1983).

"[w]hen the facts are uncertain," an agency decision-maker must, in making a decision, "identify the considerations he found persuasive."[89]

BLM's duty to evaluating reasonably foreseeable significant adverse impacts includes "impacts which have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason." 40 C.F.R. § 1502.22(b). Such impacts are especially significant in the face of climate change.

Finally, BLM Instruction Memorandum 2013-094 regards management during drought. This IM requires BLM to modify uses and management to lessen impacts from drought including activities such as grazing, recreation, lands actions and minerals activities. IM 2013-094 also states that BLM should consider the information in BLM's Rapid Ecoregional Assessments in assessing drought and mitigation measures and states a preference for RMPs and other plans to proactively address potential drought and its effects.

b. BLM must craft long-term management prescriptions without permanent impairment and unnecessary or undue degradation to the resources in the face of climate change.

FLPMA gives BLM the authority to manage and plan for emerging issues and changing conditions that global climate change will affect in the planning area. FLPMA mandates that when BLM revises land use plans, it must "use and observe the principles of multiple use and sustained yield set forth in this and other applicable law" 43 U.S.C. § 1712(c).

> The term "multiple use" means the management of the public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions. . . a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and nonrenewable resources. . . and harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the quality of the environment with consideration being given to the relative values of the resources and not necessarily to the combination of uses that will give the greatest economic return or the greatest unit output. 43 U.S.C. § 1702(c) (emphasis added).

Additional pertinent requirements of FLPMA that specifically apply to land use planning include using "a systematic interdisciplinary approach to achieve integrated consideration of physical, biological, economic, and other sciences; consider[ing] relative scarcity of the values involved; and weigh[ing] long-term benefits to the public against short-term benefits. *Id*. FLPMA also provides that BLM must "take any action necessary to prevent unnecessary or undue degradation to managed resources." 43 U.S.C. § 1732(b). Collectively, the provisions of FLPMA highlighted above necessitate on-the-ground implementation of climate change policies.

In addition to the agency's duty under NEPA to take a hard look at the impacts of climate change to and from decisions in the resource management plan, BLM must also include a range of alternatives that includes a strategy for mitigating these impacts. CEQ regulations instruct agencies to consider alternatives

[89] *Small Refiner Lead Phase-Down Task Force v. EPA*, 705 F.2d 506, 520 (D.C. Cir. 1983), quoting Ind. *Union Dept., AFL-CIO v. Hodgson*, 499 F.2d 467, 476 (D.C. Cir. 1974).

to their proposed action that will have less of an environmental impact, specifically stating that "[f]ederal agencies shall to the fullest extent possible: . . . Use the NEPA process to identify and assess the reasonable alternatives to proposed actions that will avoid or minimize adverse effects of these actions upon the quality of the human environment." 40 C.F.R. § 1500.2(e) (emphasis added); *see also*, 40 C.F.R. §§ 1502.14, 1502.16.

The impacts of climate change should be a major factor in every alternative that is created since it is an undeniable reality that will drive all land use planning decisions. As provided in the Oregon/Washington BLM State Office guidance document IM OR-2010-012, "[r]esource management plans and other broad programmatic analyses are actions that would typically have a long enough duration that climate change could potentially alter the choice among alternatives."

Further, general statements that BLM will conduct monitoring are also not an appropriate form of mitigation. Simply monitoring for expected damage does not actually reduce or alleviate any impacts. Instead, a vigilant science-based monitoring system should be set out in the RMP in order to address unforeseeable shifts to the ecosystem. A detailed monitoring approach is also required under the BLM's planning regulations:

> The proposed plan shall establish intervals and standards, as appropriate, for monitoring and evaluation of the plan. Such intervals and standards shall be based on the sensitivity of the resource to the decisions involved and shall provide for evaluation to determine whether mitigation measures are satisfactory, whether there has been significant change in the related plans of other Federal agencies, State or local governments, or Indian tribes, or whether there is new data of significance to the plan. The Field Manager shall be responsible for monitoring and evaluating the plan in accordance with the established intervals and standards and at other times as appropriate to determine whether there is sufficient cause to warrant amendment or revision of the plan. 43 C.F.R. § 1610.4-9 (emphasis added).

Such vigilant monitoring is absolutely necessary in order to create an effective adaptive management framework in the face of climate change.

c. BLM must estimate the potential increase in vulnerability to climate change impacts.

As discussed above, the agency must evaluate the direct, indirect and cumulative impacts of climate change emissions from the project. The agency must also take a hard look at the impacts of climate change and the potential increase in vulnerability to the project area from climate change. As stated in the CEQ Guidance:

> The analysis of climate change impacts should focus on those aspects of the human environment that are impacted by both the proposed action and climate change. Climate change can make a resource, ecosystem, human community, or structure more susceptible to many types of impacts and lessen its resilience to other environmental impacts apart from climate change. This increase in vulnerability can exacerbate the effects of the proposed action . . . Such considerations are squarely within the scope of NEPA and can inform decisions on whether to proceed with, and how to design, the proposed action to eliminate or mitigate impacts exacerbated by climate change. They can also inform possible adaptation measures to address the impacts of climate change, ultimately enabling the selection of smarter, more resilient actions.

CEQ Guidance at 21-22. In order to fulfill its responsibilities under NEPA, the BLM must fully evaluate the potential increased vulnerabilities to the landscape and communities caused by climate change and the

impacts of this project to potentially exacerbate those vulnerabilities. This will provide the agency, the project proponent and the public with more information on possible mitigation measures that could be implemented as well as measures to boost the resiliency of the landscape.

d. BLM must evaluate climate emissions in the context of U.S. climate commitments and seek to meet those national goals.

The climate change impacts observed from GHG emissions are already evident and will worsen unless emissions of GHGs are greatly reduced. The wide range of impacts from climate change, including melting glaciers and earlier snow melts in our mountains that disrupt water supplies in the west, thawing permafrost, forest fires, widespread drought, rising sea levels, and the spread of invasive species, have been rigorously and scientifically documented by the Intergovernmental Panel on Climate Change (IPCC), as well as American researchers and agencies. These have led to substantial commitments made by this Administration to reduce our national contribution to climate change. As part of these commitments, federal agencies must begin to not just measure, but to act on the basis of potential GHG emissions.

Our public lands and minerals are held in trust for the public. We must ensure this trust is not broken when authorizing actions on our public lands that contribute to climate emissions. In particular, fossil fuel production on federal public lands and mineral estates is extensive and the production of GHGs resulting from the exploration, extraction, transportation and combustion of these fuels is significant. The federal fossil fuels program must provide assurance the public trust will not be violated by carefully considering climate change issues and taking steps to avoid, minimize and offset impacts through compensatory mitigation. In 2012, as much as 21 percent of the Nation's GHG emissions originated from coal, oil and natural gas extracted from the public lands.[90]

Leading science has firmly established the need for developing thresholds of acceptable fossil energy extraction for the planet based on expected GHG emissions. The scientific understanding that the global increase in temperature due to greenhouse gas emissions must be capped at or below 2-degree Celsius to avoid unmanageable climate change consequences is well-established. The 2-degree Celsius threshold was first enshrined in the 2009 Copenhagen Accord[91] and reaffirmed in the 2015 Paris Agreement as the limit for "acceptable" warming.[92] During that time, the international scientific community's understanding of the interaction between fossil fuel development and temperature thresholds has greatly increased, and today it is widely agreed that development of additional reserves should be considered in the context of warming goals—giving rise to the idea of a carbon budget for the planet. In fact, this notion has been assessed and supported by the IPCC in all assessment reports going

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[90] Claire Moser, Joshua Mantell, Nidhi Thakar, Chase Huntley and Matt Lee-Ashley. *Cutting Greenhouse Gas from Fossil-Fuel Extraction on Federal Lands and Waters.* March 19, 2015. Policy brief and underlying analysis is available at http://wilderness.org/blog/blind-spot-plan-reduce-emissions-slowing-progress-fight-against-climate-change (accessed July 28, 2016).

[91] Copenhagen Accord ¶ 1, *agreed* Dec. 18, 2009, FCCC/CP/2009/11/Add.1, *available at* http://unfccc.int/resource/docs/2009/cop15/eng/11a01.pdf ("recognizing the scientific view that the increase in global temperature should be below 2 degrees Celsius" relative to pre-industrial temperatures to "stabilize greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system"); *id.* at ¶ 2 (agreeing that "deep cuts in global emissions are required according to science" to meet this goal).

[92] The United States and other signatory nations committed to reducing greenhouse gas emissions "well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels." Paris Agreement art. 2, ¶ 1(a), *adopted* Dec. 12, 2015, FCCC/CP/2015/L.9, *available at* http://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf. The authority cited in the letter is being provided via regualtions.gov and it should be included in the administrative record for this decision.

back to 1990 and has yielded a methodology routinely employed and updated annually by the Global Carbon Project.[93]

The IPCC's analytic method was further advanced in January 2015 in a journal paper that evaluated known fossil fuel reserves to determine, based on current emissions factors and global warming potential, how much should be left in-place to maximize the planet's chances of remaining below 2 degrees Celsius.[94] Importantly, it quantifies the regional distribution of known fossil-fuel reserves and resources and, through modeling a range of scenarios based on least-cost climate policies, identifies geographically-specific resources that should not be burned between 2010 and 2050 to ensure the world stays within a 2-degree Celsius limit in the most cost-efficient manner.[95] Importantly, this study demonstrates that there are geographically-specific analyses available that support comparative judgments about the appropriateness of tapping into different resources and plays.

The United States has set national commitments to reduce GHG emissions. The United States has submitted its target to cut net GHG emissions to the United Nations Framework Convention on Climate Change. This Intended Nationally Determined Contribution (INDC), as provided for in the Paris Agreement, is a formal statement of the U.S. target to reduce emissions by 26 to 28 percent below 2005 levels by 2025. In addition, to achieve a no more than 2 degrees Celsius temperature increase, heat trapping gasses in the atmosphere must be kept at or below 450 parts per million CO2-eq., which means that industrialized nations like the U.S. will have to reduce their emissions an average of 70 to 80 percent below 2000 levels by 2050.

In addition, on June 29, 2016 the leaders of Canada, Mexico, and the United States committed to the North American Climate, Clean Energy, and Environment Partnership. Under this agreement, the countries will pursue an historic goal for North America to strive to achieve 50 percent clean power generation by 2025. "Canada, the U.S., and Mexico will work together to implement the historic Paris Agreement, supporting our goal to limit temperature rise this century to well below 2 degrees C, and pursuing efforts to limit the temperature increase to 1.5 degrees C."[96]

These commitments are consistent with and required by The President's Climate Action Plan (June 2013) which calls for many steps to combat climate change such as reductions in CO2 emissions from power plants, increased use of renewable energy, improved automobile efficiency standards, and reducing methane emissions, among many other things.[97] But to achieve the goals of the Climate Action Plan, which include "steady, responsible action to cut carbon pollution, [so] we can protect our children's

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[93] The IPCC has produced and reviewed a carbon budget for the planet in all assessment reports (Ciais et al., 2013; Denman et al., 2007; Prentice et al., 2001; Schimel et al., 1995; Watson et al., 1990), as well as by others (e.g. Ballantyne et al., 2012). These assessments included carbon budget estimates for the decades of the 1980s, 1990s (Denman et al., 2007) and, most recently, the period 2002–2011 (Ciais et al., 2013). The IPCC methodology has been adapted and used by the Global Carbon Project (GCP, www.globalcarbonproject.org), which has coordinated a cooperative community effort for the annual publication of global carbon budgets up to the year 2005 (Raupach et al., 2007), 2006 (Canadell et al., 2007), 2007 (published online; GCP, 2007), 2008 (Le Quéré et al., 2009), 2009 (Friedlingstein et al., 2010), 2010 (Peters et al., 2012b), 2012 (Le Quéré et al., 2013; Peters et al., 2013), 2013 (Le Quéré et al., 2014), and most recently 2014 (Friedlingstein et al., 2014; Le Quéré et al., 2015). Each of these papers updated previous estimates with the latest available information for the entire time series. From 2008, these publications projected fossil fuel emissions for one additional year using the projected world gross domestic product (GDP) and estimated trends in the carbon intensity of the global economy (Rogelj, 2016).

[94] McGlade, Christophe and Paul Ekins, *The Geographical Distribution of Fossil Fuels Unused When Limiting Global Warming to 2 °C*, 517 Nature (187) (2015).

[95] *See id.* at 187-90.

[96] See https://www.whitehouse.gov/the-press-office/2016/06/29/leaders-statement-north-american-climate-clean-energy-and-environment (presenting Leaders' Statement on a North American Climate, Clean Energy, and Environment Partnership).

[97] *See also* Climate Action Plan Strategy to Reduce Methane Emissions (March 2014) (presenting the President's methane reduction strategy).

health and begin to slow the effects of climate change so that we leave behind a cleaner, more stable environment," it will also be necessary to address issues related to fossil fuel extraction from our public lands, such as establishing a carbon management system.

The RMP must analyze climate emissions and alternatives for managing climate change in the context of these national commitments and targets, both in terms of fossil fuel management and other activities authorized under the RMP that would contribute to GHG emissions.

e. Consistent with the mitigation hierarchy, BLM must avoid, minimize and offset climate change-related impacts.

BLM has significant obligations and authority related to mitigation for all unavoidable impacts. Secretarial Order 3330 requires the development of a landscape-scale mitigation policy for the Department of the Interior. Section 4(c) of Secretarial Order 3330 directs the Task Force to: "[I]dentify any new policies or practices, revisions to existing policies or practices, or regulatory or other changes that could be implemented to incorporate landscape-scale planning into mitigation-related decisions…"

In a report to the Secretary of the Interior, the Energy and Climate Change Task Force laid out a landscape approach to mitigation.[98] This approach contained the following steps:

1. Identifying key landscape attributes, and the conditions, trends and baselines that characterize these attributes;
2. Developing landscape-scale goals and strategies;
3. Developing efficient and effective compensatory mitigation programs for impacts that cannot be avoided or minimized; and
4. Monitoring and evaluating progress and making adjustments, as necessary, to ensure that mitigation is effective despite changing conditions.

BLM is also considering new tools and approaches the agency could use to increase the effectiveness of mitigation on public lands, including layering protective management and designations and exploring creative ways existing authorities could be used for conservation benefits. Effective new mitigation tools and approaches should be integrated into planning as well.

Mitigating climate-related impacts includes avoiding and minimizing generation of GHG emissions through management prescriptions and preventing harm to carbon sinks. The CEQ guidance on considering climate change in NEPA analyses provides that agencies should analyze reasonable alternatives that would mitigate both direct and indirect GHG emissions impacts and the cumulative effects of climate change (e.g., enhanced energy efficiency, carbon sequestration, lower GHG-emitting technology). CEQ Guidance at 19. BLM must address the quality of mitigation measures as well as ensure they are additional, verifiable, durable, enforceable, and will be implemented.

It is important to underscore that, as a land manager, the federal government is facing huge and rapidly escalating costs to address the impacts caused by fossil-fuel driven climate change. Forest fires, widespread drought, unusual flooding, rising sea levels, spread of invasive species and spread of disease already result in significant costs to the federal government, and each new oil production project the BLM authorizes increases these problems and the associated costs. Research from the University of Vermont's Gund Institute for Ecological Economics and The Wilderness Society suggests that total costs in degraded

[98] Clement, J.P. et al. 2014. A strategy for improving the mitigation policies and practices of the Department of the Interior. A report to the Secretary of the Interior from the Energy and Climate Change Task Force, Washington, D.C., 25 p.

ecosystem services could exceed $14.5 billion annually under a 2-degree Celsius warming scenario.[99] These costs are ultimately borne by all American taxpayers, and BLM has a responsibility to minimize and recoup these costs when it makes decisions authorizing activities that cause these impacts and associated costs.

Summary of Comments: The Uncompahgre RMP provides BLM with an excellent opportunity to analyze the impacts from climate change to the planning area over the next two decades, including increases in vulnerability, as well as the contribution to climate change from management decisions made in the plan. This analysis should lead to the development of thoughtful management prescriptions and alternatives in the land use plan that will address how BLM will mitigate these causes and adapt its management over the coming years to prevent permanent impairment and unnecessary or undue degradation to the resources in the face of climate change. BLM must analyze climate emissions in the context of national climate commitments detailed above. Consistent with the mitigation hierarchy, BLM must avoid, minimize and offset climate change-related impacts.

2. Recommended Approach to Managing Climate Change in RMPs

Under the pressures of global change, it must be acknowledged that many objects of conservation are at risk wherever they are found, and the traditional natural resource management paradigm of modifying ecosystems to increase yield must change to a new paradigm of managing wildland ecosystems to minimize loss – specifically loss of the ecosystem composition, structure, and function that yields the benefits we seek from wildlands. Natural resource management must change from a paradigm of maximum sustained yield to a paradigm of risk management.

Although there is no widely-accepted method of assessing and managing risk, we recommend breaking risk down into its component parts—vulnerability, exposure, and uncertainty—as a useful way to think about risk to biodiversity and productive potential. In the TWS report, "Recommended Risk Assessment and Management Approach for Addressing Climate Change in BLM Land Use Planning," we recommend an approach for assessing risk in the planning area as well as an approach for management of that risk for BLM to comply with its legal obligations under NEPA and FLPMA as set out above.

3. Adapting to Climate Change

In addition to the analyzing the impacts of climate change, The Department of Interior Manual for climate change adaptation (523 DM 1) requires BLM to plan for uncertainty and risk in the face of climate change. Among other things, this policy guidance requires BLM to:

- use the best available science of climate change risks, impacts and vulnerabilities,
- use the network of Landscape Conservation Cooperatives, Climate Science Centers and other partnerships to understand and respond to climate change,
- use well-defined and established approaches for managing through uncertainty including vulnerability assessments, scenario planning and other risk management approaches,
- promote landscape-scale, ecosystem-based management approaches to enhance the resilience and sustainability of linked human and natural systems,

[99] See Esposito, Valerie; Phillips, Spencer; Boumans, Roelof; Moulaert, Azur; Boggs, Jennifer. 2011. "Climate change and ecosystem services: The contribution of and impacts on federal public lands in the United States." In: Watson, Alan; Murrieta-Saldivar, Joaquin; McBride, Brooke, comps. *Science and stewardship to protect and sustain wilderness values: Ninth World Wilderness Congress symposium*; November 6-13, 2009; Merida, Yucatan, Mexico. Proceedings RMRS-P-64. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. p. 155-164. Available at http://www.fs.fed.us/rm/pubs/rmrs_p064.pdf? (accessed July 23, 2016).

- Manage linked human and natural systems that help mitigate climate change impacts, such as:
    - protect diversity of habitat, communities and species,
    - protect and restore core, unfragmented habitat areas and key habitat linkages,
    - maintain key ecosystem services,
    - monitor, prevent and slow the spread of invasive species,
    - focus development activities in ecologically disturbed areas and avoid ecologically sensitive landscapes, culturally sensitive areas, and crucial wildlife corridors.

The biggest question that land managers face today is how we respond to uncertainty in the face of global climate change. It is especially challenging for planners to make predictions about future ecosystem dynamics 10, 20 or 50 years down the line. Adaptation to changing conditions is and will be essential. However, general statements that BLM will plan to "be adaptive" is not planning—it is a strategy that is reactive only. A true plan for climate adaptation will require applying knowledge and foresight gained from a "learn as you go" approach.

We recommend using an experimental, adaptive design known as the "portfolio approach" of management strategies (Belote et al.)[100] in the RMP. As stated by Belote et al., "[u]ncertainty about how ecosystems and species will respond to co-occurring, interactive, and synergistic impacts of the Anthropocene precludes our ability to know which strategy will best sustain wildland values in to the future." Thus, Belote et al. concludes that land managers should use an experimental zoning approach for managing certain lands that include the following zones as management strategies:

- **Restoration Zones:** areas that are devoted to forestalling change through the process of ecological restoration;
- **Innovation Zones:** areas that are devoted to innovative management that anticipates climate change and guides ecological change to prepare for it; and
- **Observation Zones:** areas that are left to change on their own time to serve as scientific "controls" and to hedge against the unintended consequences of active management elsewhere.

These strategies should be used in conjunction with each other in order to spread the risk among the different strategies and to allow for diverse outcomes to inform rapid learning about management strategies in the future. This is the kind of deliberate yet dynamic planning process that BLM should be fostering in RMPs.

The BLM is especially equipped to apply this type of portfolio approach due to its wide variety of designations and management regimes. The purpose of **restoration zones** is to sustain existing or historical ecosystems. This type of strategy lends itself to designations such as national conservation areas, ACECs and other lands that are set aside for conservation of natural and cultural resources, but that may also be appropriate for restoration in certain areas.

Due to the acknowledgement that returning to historical range of variability is an increasingly challenging concept in the study of climate change, **innovation zones** are also necessary. This is where the forecasting of climate change may drive greater intervention to experiment with things like anticipatorily boosting resiliency or facilitating transition to an altered future state where shifts seem inevitable. This strategy would be more appropriate for BLM-managed lands that have already sustained substantial change or where future impacts of climate change may severely disrupt the production of ecosystem goods and

[100] These concepts are set out in Belote, et al. "Wilderness and Conservation Strategy in the Anthropocene." The Pinchot Letter (Spring 2014).

services. Conservation designations or allocations would typically not fall within this management strategy.

The third strategy of establishing **observation zones** is necessary to allow for ecosystems to generally change without specific intervention, as a scientific control. This management strategy would be most appropriate for Wilderness, WSAs, and lands managed for wilderness characteristics, but would also be the default strategy for lands that could not be managed for treatment under the restoration and innovation zones due to budget and operational constraints or in lands between such designations where connectivity is desirable to facilitate movement in response to climate change.

Summary of Comments: BLM should implement a portfolio approach to land use planning that allows for diverse strategies and adaptive, dynamic planning as a climate change adaptation strategy. This involves establishing restoration, innovation and observation zones in order to "learn while doing."

L. Mitigation

A robust policy framework exists to guide mitigation considerations in land use planning. In addition to mitigation requirements under FLPMA and NEPA, numerous other policies and guidance documents direct the BLM to require mitigation and specify how mitigation must be employed. These include the Presidential Memorandum: Mitigating Impacts on Natural Resources from Development and Encouraging Related Private Investment (2015); Secretarial Order 3330, Improving Mitigation Policies and Practices of the Department of the Interior (2013);[101] the follow-up report entitled *A Strategy for Improving the Mitigation Policies and Practices of The Department of the Interior* (2014);[102] the Department of the Interior's Landscape-Scape Mitigation Manual (2015);[103] and BLM's Draft Regional Mitigation Manual (2013).[104]

Secretarial Order 3330 called for a departmental mitigation strategy with five central components: (1) the use of a landscape-scale approach to identify and facilitate investment in key conservation priorities in a region; (2) early integration of mitigation considerations in project planning and design; (3) ensuring the durability of mitigation measures over time; (4) ensuring transparency and consistency in mitigation decisions; and (5) a focus on mitigation efforts that improve the resilience of our Nation's resources in the face of climate change.

In response to S.O. 3330, the Energy and Climate Change Task Force issued a report that outlined a strategy for improving departmental mitigation policies and practices ("Task Force Report," April 2014[105]). The Task Force Report emphasizes the importance of landscape-scale mitigation planning to enable the Interior Department to appropriately manage and conserve our public lands resources and meet its statutory obligations:

> Consideration of the landscape-scale context provides the opportunity to see project development in the context of the larger landscape it will occupy and associated resource values it will affect; enhances the ability to evaluate cumulative effects of multiple projects; expands the capacity to avoid, minimize, and offset project impacts; and allows managers to make avoidance and

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[101] https://www.doi.gov/sites/doi.gov/files/migrated/news/upload/Secretarial-Order-Mitigation.pdf
[102] https://www.doi.gov/sites/doi.gov/files/migrated/news/upload/Mitigation-Report-to-the-Secretary_FINAL_04_08_14.pdf
[103] https://www.doi.gov/sites/doi.gov/files/uploads/TRS and Chapter FINAL.pdf
[104] http://www.blm.gov/style/medialib/blm/wo/Information_Resources_Management/policy/im_attachments/2013.Par.57631.File.dat/IM2013-142_att1.pdf
[105] Available at http://www.doi.gov/news/loader.cfm?csModule=security/getfile&pageid=526203.

compensatory mitigation site selection decisions that optimize for multiple resource values. Task Force Report at 9.

It identifies several principles to guide landscape-scale mitigation, including utilizing the full mitigation hierarchy, advance mitigation planning, ensuring durability and promoting transparency and collaboration, which are reiterated in BLM's draft mitigation manual.

Of particular relevance to resource management planning, BLM is currently implementing draft MS-1794[106], which the agency is instructed to utilize as interim policy while the guidance is finalized. Instruction Memorandum No. 2013-142.[107] Draft MS-1794 provides for BLM to use the land use planning process to identify potential mitigation sites and measures. Draft MS-1794 at 1.6(C). This would be appropriate for the Uncompahgre RMP to balance reasonably foreseeable development and the various resource values present throughout the planning area. Mitigation is most effective when planned at a regional scale so that development avoids impacting critical conservation resources and compensatory mitigation investments are directed to areas and activities that will best fully address unavoidable development impacts. In outlining a landscape-scale mitigation strategy for the Uncompahgre Field Office, BLM should apply the mitigation hierarchy of avoidance, minimization, and offsets.

BLM is directed to incorporate four elements into mitigation planning at the land use planning stage per the Task Force Report and Draft MS-1794:

a. Describe regional baseline conditions against which unavoidable impacts are assessed;
b. Establish and prioritize regional mitigation objectives for the planning area;
c. Identify appropriate land-use allocations or areas for landscape-level conservation and management actions to achieve regional mitigation objectives (e.g., Areas of Critical Environmental Concern (ACEC) or sage-grouse priority habitat); and
d. Develop long-term monitoring and adaptive management requirements to evaluate and maximize the effectiveness of mitigation projects and measures.

Ibid. Importantly, regional mitigation measures must have additionality – that is, the offsetting conservation measures would not have occurred otherwise. Task Force Report at 6. BLM should not simply cast land use allocations currently under consideration in the Draft RMP as contributing to the achievement of regional mitigation objectives. Rather, BLM must identify foreseeable unavoidable impacts, account for impacts to resource values throughout the relevant range of the resource that is being impacted, and identify conservation designations and other land use allocations that are appropriate to those impacts.

Conservation designations and other land use allocations that are intended as regional mitigation measures must have strong protective management prescriptions to ensure effective and durable conservation, restoration, and management and adequate funding for and commitment to enforcement. In directing BLM to ensure long-term durability of compensatory mitigation, the mitigation guidance notes that "the land use plan may be the most effective tool for protecting important regional mitigation sites on BLM-managed lands from future impacts in order to ensure the durability of mitigation projects." Draft MS-1794 at 1.6(D)(12). To achieve long-term durability, BLM must commit to and implement

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[106] Available at http://www.blm.gov/pgdata/etc/medialib/blm/wo/Information_Resources_Management/policy/im_attachments/2013.Par.57631.File.dat/IM2013-142_att1.pdf.
[107] Available at http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_instruction/2013/IM_2013-142.html.

management actions, such as restoration projects and enforcement, within mitigation-based conservation designations that are appropriate to specific unavoidable impacts and that provide beneficial effects that are additional to conservation that would have otherwise occurred.

Summary of Comments: BLM should include the four elements of landscape-scale mitigation planning outlined in Draft MS-1794 in the Uncompahgre RMP. By establishing regional mitigation objectives for the planning area, BLM can identify durable, additional land use allocations that appropriately mitigate likely impacts from development authorized under the RMP.

IV) Conclusion. The Preferred Alternative does not provide a necessary level of management for the North Fork Valley

Only Alternative B1 provides the scope and level of protection that is required for the North Fork's cherished and concentrated set of important and sensitive resources. This is not only the case due the better classification of resources and more protective management prescriptions in general, but also due to the nature of the stipulations themselves. Only under Alternative B1 are the protective stipulations not open to exceptions, waivers and modifications (DEIS III Appendix B-2).

And this high level of protection in Alternative B1 has the added advantage of safeguarding other resources, and of mitigating other harmful impacts beyond those directly covered by the stipulations. Under Alternative B1, for instance, 96 % of the highest potential areas for paleontological resources are protected with either No Leasing or No Surface Occupancy stipulations.[108]

Climate change is another matter—the elephant in the room, really, when it comes to questions of fossil fuel development, long term land use planning, and the resiliency many key features we cherish in the valley. Alternative B1 is the only action alternative in the draft RMP/EIS projected to contribute less to greenhouse gas emissions (and climate change) than Alternative A: No Action/Continuation of Current Management (Table 4-10, DEIS II 4-39). And B1 also has the added benefit of doing most to ensure natural system resiliency to the effects of climate change (DEIS II 4-114 and 4-151).

A. Only B1 meets the needs of the North Fork Valley

As detailed above, what is clear is that Alternative B1 provides the level of protection that best meets the needs of the public and best protects the public's resources, as the only alternative that adequately protects the resources and public land values of the North Fork Valley. As such Alternative B1 has the support of many local residents, area businesses, Delta and Gunnison County organizations and associations, local governments, water companies, irrigators, farmers, ranchers and others.

That is because, as the DEIS shows, the resources that the public, myriad stakeholders, local governments, and resource professionals have all urged be protected are in fact best protected by Alternative B1. The superior level of management that Alternative B1 provides includes better protections for special status species, delicate soils, sensitive landscapes, recreation, visual resources, plant, fish and wildlife habitat, water resources, new economic activity, agriculture, communities, public health, river systems, and other cherished features of the valley. None of the other alternatives presented in the draft RMP/EIS offer the level protection afforded by B1, and all others fail to provide adequate management for the valley's resources, public uses, and cherished features.

B. Alternative D is unacceptable

As shown above, only Alternative B1 provides the level of protection that the North Fork's resources warrant, even as compared to Alternative B—the next most protective alternative in the draft RMP/EIS.

Outside the North Fork, and on matters that B1 is silent on within the North Fork, we support much of the management proposed in Alternative B, as indicated elsewhere in these comments. But the contrast it provides in the North Fork compared to B1 is striking.

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[108] DEIS II 4-193

Moreover, the agency's identified Preferred Alternative (D) proposes a management regime for the valley that is simply unacceptable. Not only would it leave the majority of public lands open to oil and gas leasing, many with only a CSU stipulation, but its impacts would be higher across the full range of resources in the valley, including those identified by the public as most important to the community.

Problems with Alternative D are discussed elsewhere in these comments. Regarding mitigating impacts from oil and gas development, the superiority of B1 is clear as detailed above. However, some particular examples of how badly Alternative D misses the mark in protecting the North Fork are the following.

Consider Visual Resource Management, in which B1 alone has the strongest nonwaivable stipulations to protect visual resources, and the largest areas designated for their important and high quality scenic features (VRM Classifications I & II). In Alternative D, the agency Preferred Alternative, only 17,170 acres are classified in these most protective categories. In B1 it is 82,218 acres.[109]

Regarding Ecological Emphasis Areas, the DEIS notes "Protections are reduced under Alt. D" (DEIS II 4-160). On wildlife impacts: "These measures ... do not provide as much protection as Alternative B" (DEIS II 4-163). The Preferred Alternative "results in the second-highest estimated emission levels" (DEIS II 4-21), including the second highest level of greenhouse gas emissions (DEIS II Table 4-10).

The Preferred Alternative relegates over six times as much public lands to the lowest visual resource management classification. Alternative D closes less than 25% of what Alternative B does to oil and gas leasing in the resource area, and only a miniscule fraction of what B1 closes in the North Fork.

The Preferred Alternative includes far fewer protections for the valley's water supply, allowing drilling and fracking on lands adjacent to private water wells, where B1 prohibits leasing altogether and Alternative B requires No Surface Occupancy. Stipulations to protect special status species are far weaker under Alternative D than Alternative B.

On highly seleniferous soils Alternative B1 follows the recommendations of the Gunnison Basin Selenium Task Force, and applies No Leasing stipulations. Alternative D applies only the much weaker Controlled Surface Use (CSU) restriction. Unlike Alternative B and B1, the Preferred Alternative would allow oil and gas development on steep slopes of up to 40 percent. (DEIS I 2-30, Table 2-2).

At Jumbo Mountain the Preferred Alternative protects one-fifth the acreage of what Alts B and B1 do, with NSO stipulations applying to just over 1,000 acres (DEIS I Table ES-3). Across the entire range of resource identified through scoping, comment on previous agency activity, and this comment period Alternative D, the Agency Preferred, fails to provide the management required.

C. Range of alternatives might be lacking, analysis too narrow

Regarding oil and gas development, as well as in other matters, the analysis offered is limited by the somewhat narrow range of alternatives in the draft EIS. There is certainly a growing national movement, as well as strong local support, to stop leasing federal lands for oil and gas altogether.[110] A No Leasing alternative, an alternative that closes all of the North Fork, or a North Fork-like (B1) alternative across the resource area, would each alter the scope of analysis and possible decisions that could be made.

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[109] Acreages developed from analysis of GIS data downloaded from BLM.

[110] "Groups to Obama: Keep It in the Ground, Cancel Colorado Oil and Gas Sale," Great Old Broads for Wilderness website, at www.greatoldbroads.org/groups-to-obama-keep-it-in-the-ground-cancel-colorado-oil-and-gas-sale/

A range of alternatives should represent the full suite of management choices available to the decision-maker. This allows the decision-maker to consider all her options to best protect the resource while meeting other agency obligations and priorities.

> When there are conflicts among resource uses or when a land use activity could result in unacceptable or irreversible impacts on the environment, the BLM may restrict or prohibit some land uses in specific areas. When there are conflicts among resource uses or when a land use activity could result in unacceptable or irreversible impacts on the environment, the BLM may restrict or prohibit some land uses in specific areas. (DEIS II 4-2)

Regardless, the level of protection provided by B1 reduces impacts from subsequent management decisions and reduces the likelihood for an irretrievable commitment of resources (via more NSO and NL stipulations). Thus of the alternative presented, adopting Alternative B1 is the most prudent action.

D. Alternative B1 is prudent and reasonable, best fulfilling agency obligations and future resource needs

B1 best protects North Fork resources. B1 is within the scope of agency authority. The DEIS notes that:

> Implementing actions from any of the RMP alternatives would be in compliance with all valid existing rights, federal regulations, BLM policies, and other requirements. (DEIS II 4-2)

Alternative B1 would be highly protective of the North Fork Valley but leave the majority of resource area and Colorado BLM lands and federal minerals, open to oil and gas leasing. B1 barely impacts the federal mineral estate, and fulfills the purposes of all public lands and resource laws.

1. B1 is highly protective of North Fork yet represents only a small impact to oil and gas resource

Alternative B1 would have no impact on currently leased federal minerals, and a negligible impact on federal minerals overall. B1 would likely not affect energy production or jobs in the region. To anticipate the miniscule impact B1 might have, consider the overall oil and gas jobs anticipated across the resource area under Alternative D, which would allow a higher level of development in the North Fork.

> It is likely, however, that less than one percent of employment and labor income would continue to be supported by oil and gas extraction under Alternative D. (DEIS II 4-476)

Leasing in the North Fork is simply not needed. For one there is a natural gas glut, and the resource's abundance is certainly projected far beyond the life of this resource management plan.[111]
B1 is clearly the responsible choice: Given that the impact on developable resources is insignificant while the public benefit is significant, that the impacts to resources across the board from oil and gas development are reduced under B1 while the overabundance of natural gas, likely to last for another decade or longer by most accounts, remains unchanged; then closing most, or even all, of the North Fork to oil and gas leasing seems to be more than just a reasonable course of action.

[111] "Shale gas production drives world natural gas production growth," U.S. Energy Information Administration August 2016. Online at www.eia.gov/todayinenergy/detail.php?id=27512

The North Fork sits at the southern edge of the gas-rich Piceance Basin, recently subject to an updated USGS estimate for the shale resource that sits beneath the sandstone formations previously targeted.[112]

> The new estimate could mean the Piceance Basin has the second-largest natural gas reserves in the country, after the Marcellus Shale formation in Pennsylvania and neighboring states...

Leasing in the North Fork is not in the public interest, which benefits more from managing to protect the valley's unique resources and communities. There are hundreds of thousands of public lands already leased in the Piceance Basin.[113] Hundreds of thousands of additional acres are owned outright or otherwise under control of the oil and gas industry, including major companies like ExxonMobil.[114]

> Rio Blanco County, home of ExxonMobil's Piceance project, covers an area larger than 3,000 square miles and contains enough clean-burning, domestic natural gas to benefit millions of people. With interest in approximately 300,000 acres in the Piceance Basin, ExxonMobil's leases hold a potential recoverable resource of more than 45 trillion cubic feet of gas over the life of the project. That's enough natural gas to power 50 million homes for almost a decade. While this expansive gas resource will take years to produce, ExxonMobil is committed to increasing natural gas production more efficiently and with less environmental impact.

These lands in the Piceance Basin provide decades of suitable sites for drilling.[115]

> The acquired assets consist of a 200,000-net-acre position in the Piceance basin of Colorado with recent net production of 500 MMcfd of natural gas equivalent. Terra estimates that the assets contain 2 tcf of proved developed producing reserves and an extensive inventory of low-risk drilling locations. The assets also include deep rights across 150,000 net acres prospective for the emerging horizontal Mancos-Niobrara play.

Drilling in the North Fork would not materially alter the amount of gas available for development over the life of the Resource Management Plan. Adoption of the North Fork Alternative will not affect the number of jobs available in the oil and gas industry regionally, the numbers of rigs operating, or the amount of energy being produced. Rather given the abundance of resource available for exploitation, the large number of existing leases and owned minerals, and willing lessees, owners and operators—it is the market and industry's willingness alone that will determine how may rigs employ how many people.

2. B1 meets public needs, provides strong protections, and fulfills public lands and resource laws

The Federal Lands Policy and Management Act establishes public lands policy that, among other things, sets it as law that:

> (7) ...management be on the basis of multiple use and sustained yield unless otherwise specified by law;

---

[112] "40 Times More Natural Gas Underground in Colorado's Piceance Basin, USGS Report Finds," Colorado Public Radio, June 29, 2016. Online at www.cpr.org/news/story/40-times-more-natural-gas-underground-colorados-piceance-basin-usgs-report-finds

[113] "Oil & Gas Development Proposed RMPA/Final EIS," White River Field Office-Powerpoint for RAC, June 4 2015. Online at www.blm.gov/style/medialib/blm/co/resources/resource_advisory/northwest_rac/minutes.Par.30953.File.dat/WRFO%20Presentation%20to%20RAC_6.4.15a.pdf

[114] "Piceance," ExxonMobil website at http://corporate.exxonmobil.com/en/energy/natural-gas/operations/piceance

[115] "E&P startup agrees to buy WPX's Piceance unit for $910 million," Oil and Gas Journal, 2/15/16. Online at http://www.ogj.com/articles/print/volume-114/issue-2b/general-interest/e-p-startup-agrees-to-buy-wpx-s-piceance-unit-for-910-million.html

> (8) the public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition; that will provide food and habitat for fish and wildlife and domestic animals; and that will provide for outdoor recreation and human occupancy and use; and that
> (12) the public lands be managed in a manner which recognizes the Nation's need for domestic sources of minerals, food, timber, and fiber...

Alternative B1 clearly meet the requirements of the Multiple Use/Sustained Yield Act, which directs much of BLM's resource management, as per the agency's land use planning regulations:

> The term "multiple use" means the management of the public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; the use of some land for less than all of the resources; a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and non-renewable resources, including, but not limited to, recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific and historical values; and harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the quality of the environment with consideration being given to the relative values of the resources and not necessarily to the combination of uses that will give the greatest economic return or the greatest unit output.

In the case of Alternative B1 the management proposed do best meet the "present and future need" of the American people; makes judicious use of the lands for a variety of purposes both within the North Fork area and across the resource area; balances use, not allowing all uses on all lands in a manner that accounts for the needs of future generations, for recreation, watershed, wildlife and fish, natural scenic, scientific and historical values, range, timber, and minerals; and that seeks to avoid impairment of the public land resources in consideration of their relative value.

Alternative B1 clearly is superior in protecting the quality of the scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values resources of the North Fork. Finally, Alternative B1 balances the need to protect resources with ensuring that public lands provide a balance of minerals, fiber, and food: B1 is consistent with the Mineral Leasing Act (MLA), which clearly gives the agency authority to close 75% of the North Fork area, or of the entire resource area for that matter, to oil and gas leasing and development.[116]

E. BLM should select Alternative B1 for the North Fork Valley

Based on the large quantity of information provided by the WSCC, community residents, and other individuals and organizations, it is clear that the North Fork Alternative, B1, is the only reasonable alternative for the BLM to include in the final RMP that would mitigate impacts from oil and gas leasing and corresponding oil and gas development.

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[116] 10th U.S. Circuit Court of Appeals, WESTERN ENERGY ALLIANCE v. KEN SALAZAR, No. 11-8071 March 12, 2013. Online at www.eenews.net/assets/2013/03/13/document_ew_01.pdf

1. The North Fork Alternative fits a clear and pressing public need.

Alternative B1 proposes a set of strong oil and gas management stipulations and protective designations to safeguard the area's character of place, water supply, wildlife habitat and recreational opportunities.

Alternative B1, which is the DEIS' version of the North Fork Alternative Plan provides the best management options of oil and gas leasing and development presented in the draft RMP/EIS, and it should be adopted by the BLM into the final RMP.

Alternative B1 presents reasonable but strong management to protect the North Fork's most important resources and uses, and only B1 provides the level of management that is warranted to protect these resources.

Alternative B1 is a reasonable and prudent approach to managing the resources in the North Fork Valley which the agency should select as part of its final Resource Management Plan.

2. Alternative B1 is the best management decision in the face of uncertainty regarding the adoption and implementation of the final RMP.

While a challenge to the final RMP decision is likely, given the many interests and perspectives involved among organizations, industry and stakeholders the protections provided by Alternative B1 would help ensure that the resources there are secure. BLM should move to adopt and implement as much of the North Fork Alternative Plan as it can, even if it is compelled to amend, supplement, or otherwise update its NEPA analysis.

APPENDIX I

Table 1: Recommended oil and gas stipulations

*Several stipulations are recommended from other alternatives in the draft RMP/EIS, as noted.

Alt. B1+ Stipulations*	No Leasing	No Surface Occupancy	Controlled Surface Use
Character of place			
Visual resources, local economies, farms & communities, sensitive landscapes, river corridors	NL-11 Prominent landmarks; NL-13 Coal leases; NL-3 Major river corridors.	NSO-52 Travel & Scenic Corridors; NSO-5 High geologic hazards; NSO-67* High occupancy buildings (Alts. B, D); NSO-68 Community facilities; NSO-3 Agricultural operations; NSO-7 Major river corridors.	CSU-7 Moderate geologic hazards; CSU-47 Vistas.
Water supply			
Waterbodies, private wells, water systems, public water source areas, irrigation facilities, river system	NL-1 Selenium soils; NL-4 Water bodies; NL-6* Public water supplies (Alt. B); NL-7 Public water supplies; NL-9 Domestic wells and water systems; NL-5 Water ways; NL-3 Major river corridors.	NSO-2 Selenium soils; NSO-15 Domestic wells and water systems; NSO-16 Water conveyance systems; NSO-12 Public water systems; NSO-55* BuRec dams & facilities (Alts. B,C,D).	
Wildlife habitat and migration			
Wildlife and species habitat, floodplains, riparian areas	NL-4 Water bodies; NL-5 Water ways; NL-10* Gunnison sage grouse (Alt. B).	NSO-35 Raptor sites; NSO-33 Gunnison sage grouse; NSO-27 Leopard frog; NSO-25 CRCT habitat; NSO-30* Yellow billed cuckoo (Alt. B); NSO-39* Mexican spotted owl (Alt. B); NSO-21 Deer & elk habitat; NSO-17* Rare plant communities (Alt. B); NSO-20* Ecological Emphasis Area (Alt. B); NSO-8 Floodplains.	

Recreational areas and access			
Jumbo Mountain SRMA, river access, hunting opportunities, visual resource protection	NL-11 Prominent landmarks; NL-14* Parks (Alt. B); NL-3 Major river corridors.	NSO-57 Recreation-Jumbo Mountain SRMA (VRM II); NSO-52 Travel & Scenic Corridors; NSO-25 CRCT habitat; NSO-21 Deer & elk habitat; NSO-7 Major river corridors.	CSU-47 Vistas.

Table 1 provides a summary of recommended oil and gas stipulations for the North Fork area. Most are those proposed are from Alternative B1, although some other stipulations from among the other alternatives are also recommended, as noted in the table above and in the narrative.

Figure 1. Table from Public Health Risks of Oil and Natural Gas

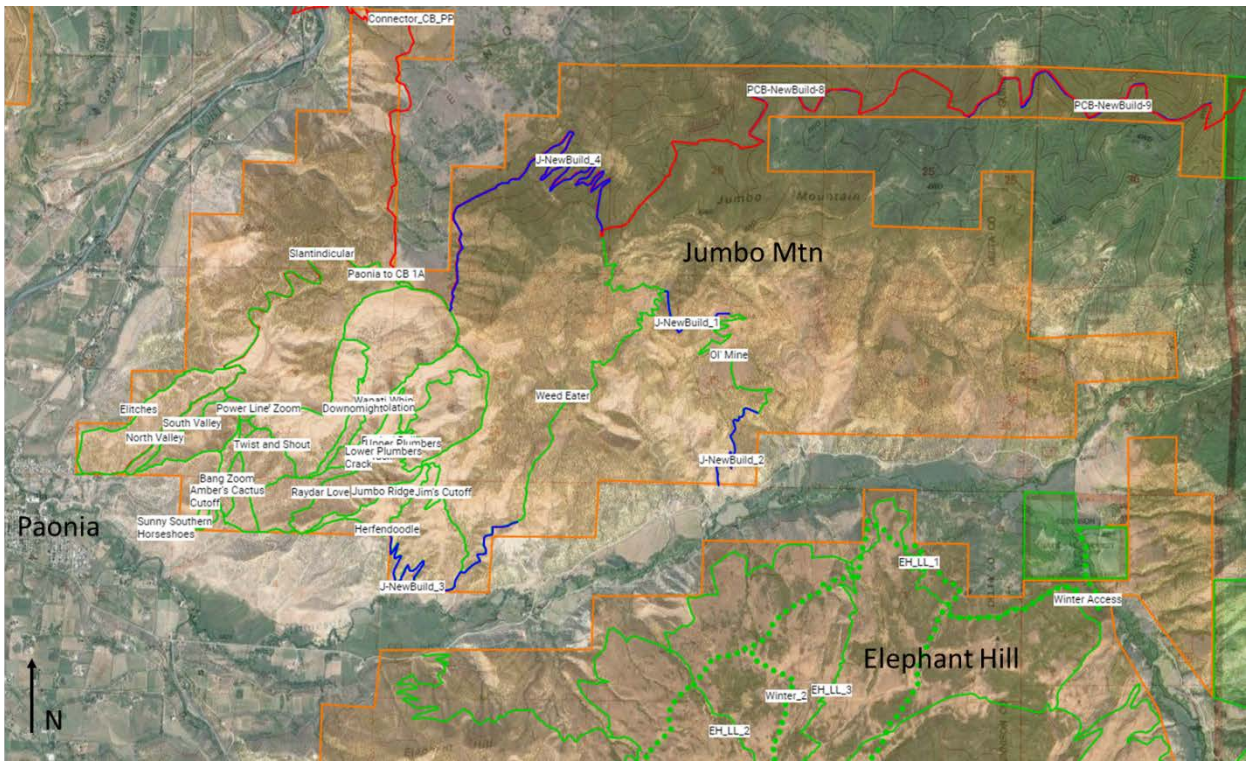
Table 1. Relationships between Sources, Processes and Hazards That May Lead to Human Exposure, Health Effects or Population Health Effects[a]

		chemical hazards					
source	process	air	ground water	surface water soil/ sediments	physical hazards	safety hazards	water scarcity hazard
large trucks	all	DE			noise, vibration	spills and accidents	
heavy equipment	well pad construction, drilling, and well abandonment	DE			noise, vibration	spills and accidents	
dust	well pad construction, well abandonment	PM					
drilling mud	drilling	DMV	DM	DM			
fracturing fluid	hydraulic fracturing, flowback	Silica, FFV	FF	FF		spills	removes water from hydrological cycle
generators	drilling, hydraulic fracturing	DE			noise		
produced water	drilling and construction, flowback	DMV, PHC	DM, PHC, IN	DM, PHC, IN		spills	
drill cuttings	drilling and construction	PM, DMV, PHC	DM, PHC, IN	DM, PHC, IN		spills	
flowback water	flowback	FFV, PHC	FF, PHC, IN	FF, PHC, IN			
deep injection	flowback				seismic activity		
gas venting	drilling, flowback, production	CH_4, H_2S, PHC				accidents	
gas flaring	drilling, flowback, production	NO_X, CO_2,			noise		
pigging[b]	production	CH_4, PHC				accidents	
pipelines	production	CH_4, PHC				accidents	
condensate tanks	production	CH_4, PHC					

[a] **CH_4**: methane; **CO_2**: carbon dioxide; **DE**: diesel emissions, including particulate matter (**PM**), nitrogen oxides (NO_x), polyaromatic, aliphatic, and aromatic hydrocarbons, aldehydes, and sulfur dioxides (SOx); **DM**: drilling muds, e.g., boric acid, borate salts, rubber-based oil, synthetic oil; **DMV**: drilling Muds, Volatile, e.g., rubber-based oil, synthetic oil, aluminum tristearate, choline chloride; **FF**: fracturing fluids, e.g., lauryl sulfate, guar gum and others (see Table 2); **FFV**: fracturing fluids, volatile: e.g., glutaraldehyde, ethylene glycol, methanol,, petroleum distillate; **H_2S**: hydrogen sulfide; **IN**: inorganic chemicals; barium, strontium, bromine, heavy metals, salts and NORM (naturally occurring radioactive materials); **NO_X**: nitrogen oxides; **PHC**: aromatic and aliphatic petroleum hydrocarbons. Refs: King, G.E., Hydraulic Fracturing 101: What Every Representative, Environmentalist, Regulator, Reporter, Investor, University Researcher, Neighbor and Engineer Should Know About Estimating Frac Risk and Improving Frac Performance in Unconventional Gas and Oil Wells. *SPE Hydraulic Fracturing Technology*; Woodlands, TX, 2012; Jiang, M., et al. Life cycle greenhouse gas emissions of Marcellus shale gas. *Environ. Res. Lett.*. 2011. 6(3); United States Department of Energy, *Modern Shale Gas Development in the United States: A Primer*; Oklahoma City, OK, 2009. [b]The process of using gauges to perform maintenance on gas lines without stopping the flow of gas in the pipe line.

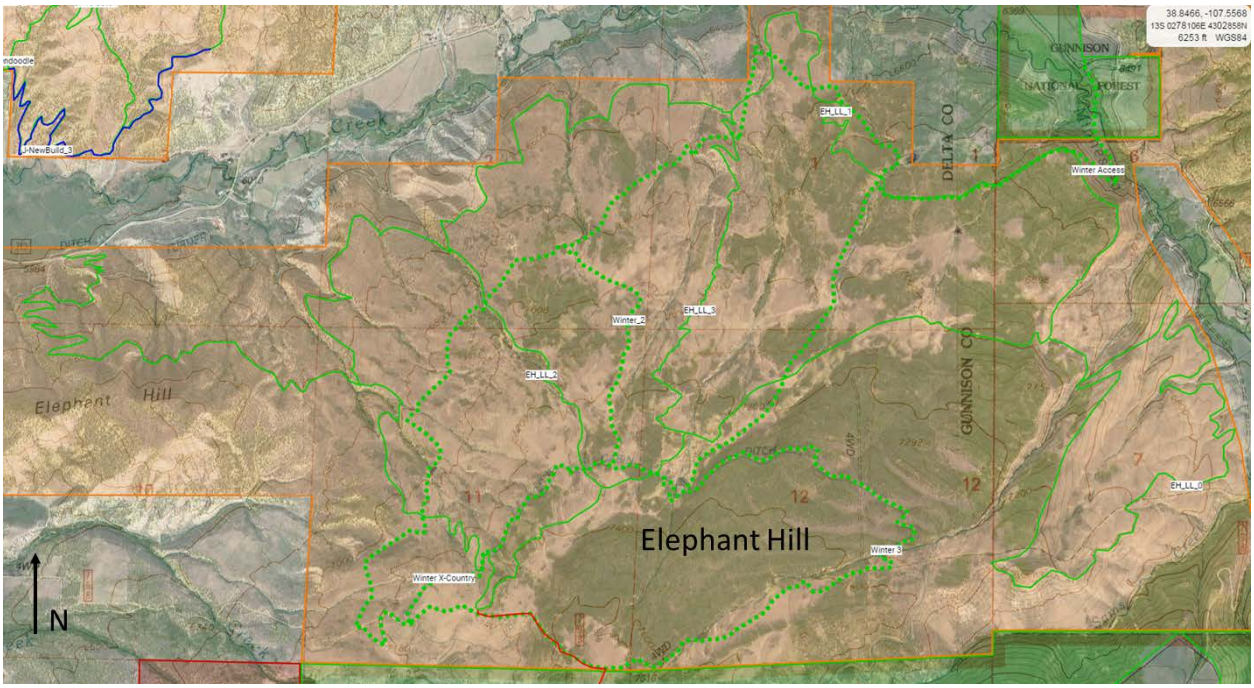
Table from Adgate_etal2014_PublicHealthRisksOilandNaturalGas

Figure 2. Maps of Jumbo Mountain, Elephant Hill, and Youngs Peak.



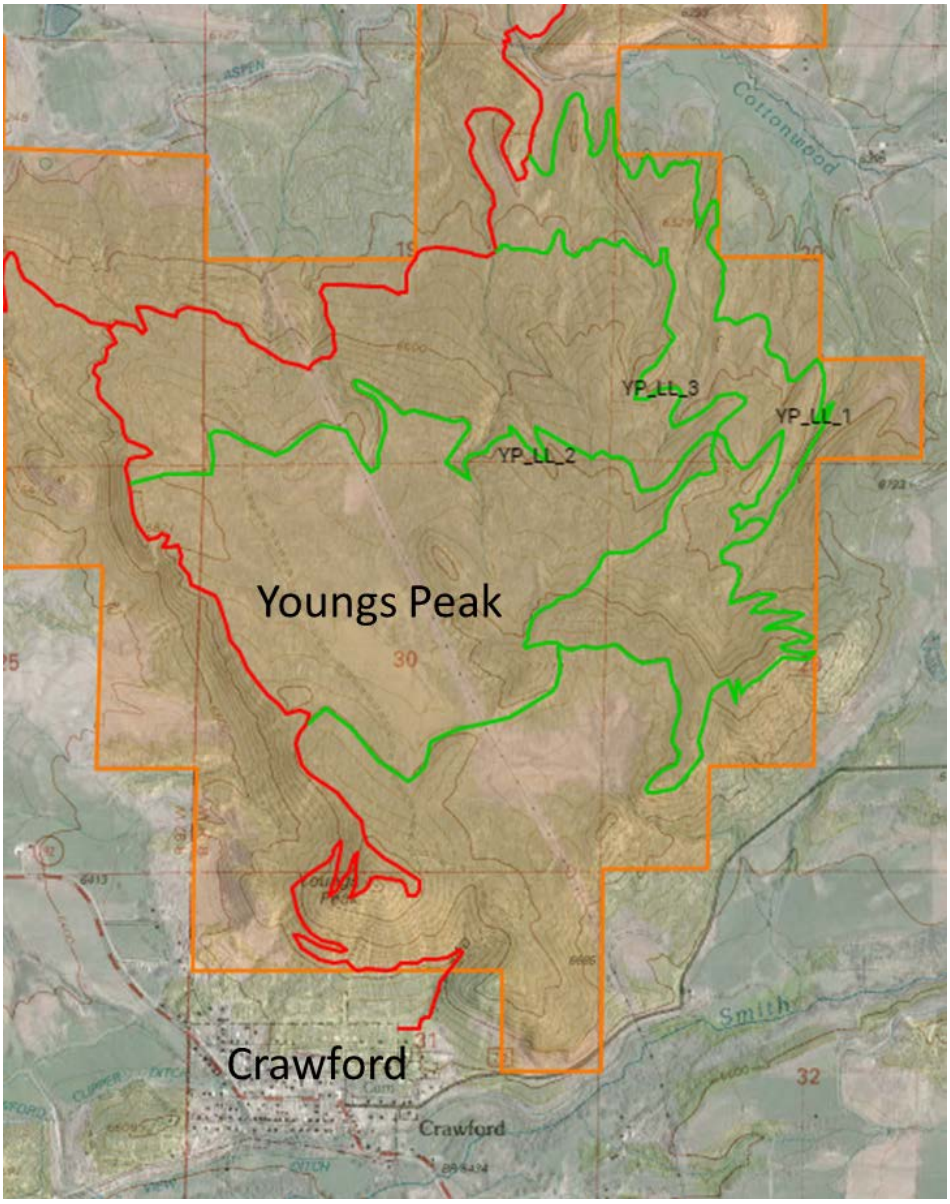
Jumbo Mountain

All routes shown in green and red are existing routes (except for the red route leading north from slantindicular). All segments in blue are proposed connector routes.



Elephant Hill

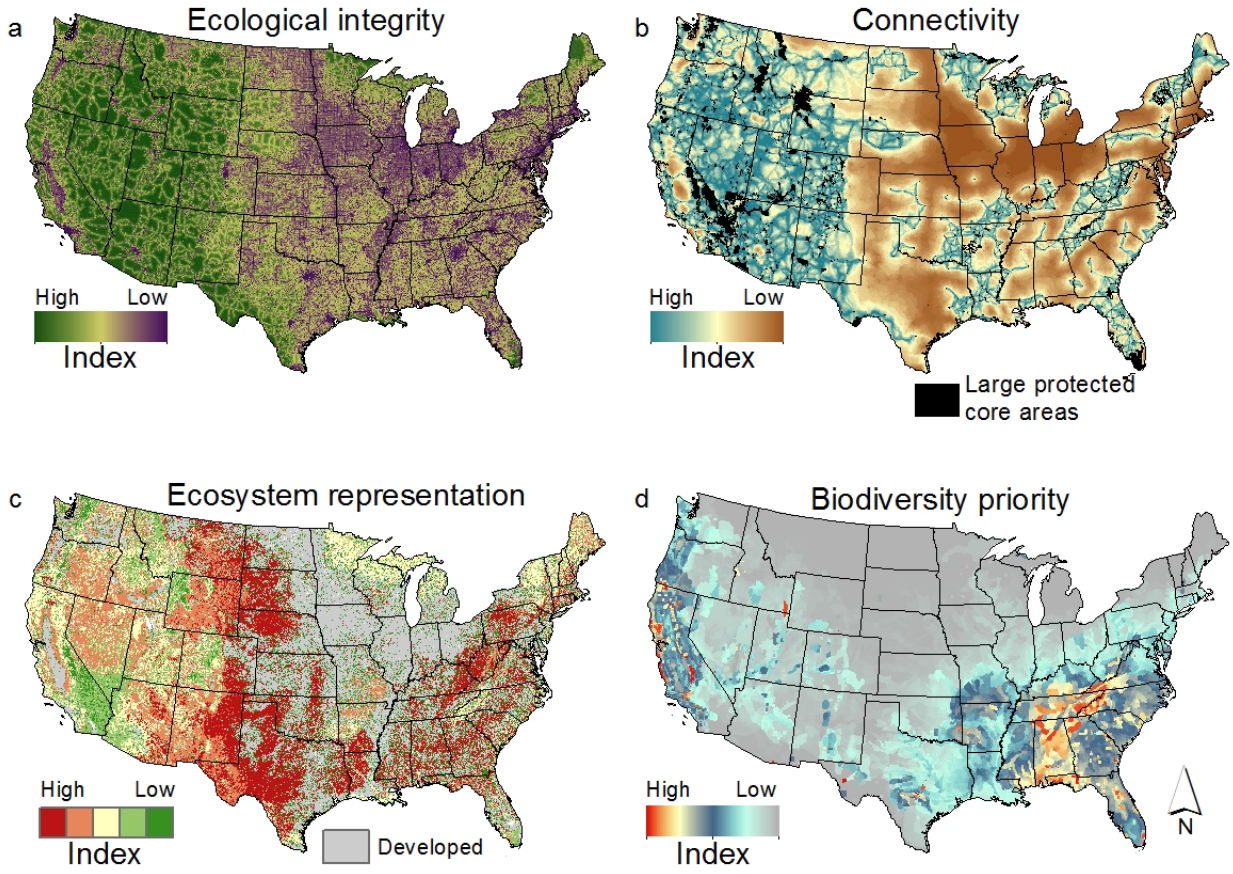
All solid green routes are proposed routes for non-motorized travel. Dotted green routes represent non-motorized winter routes located on preexisting roads.



Youngs Peak

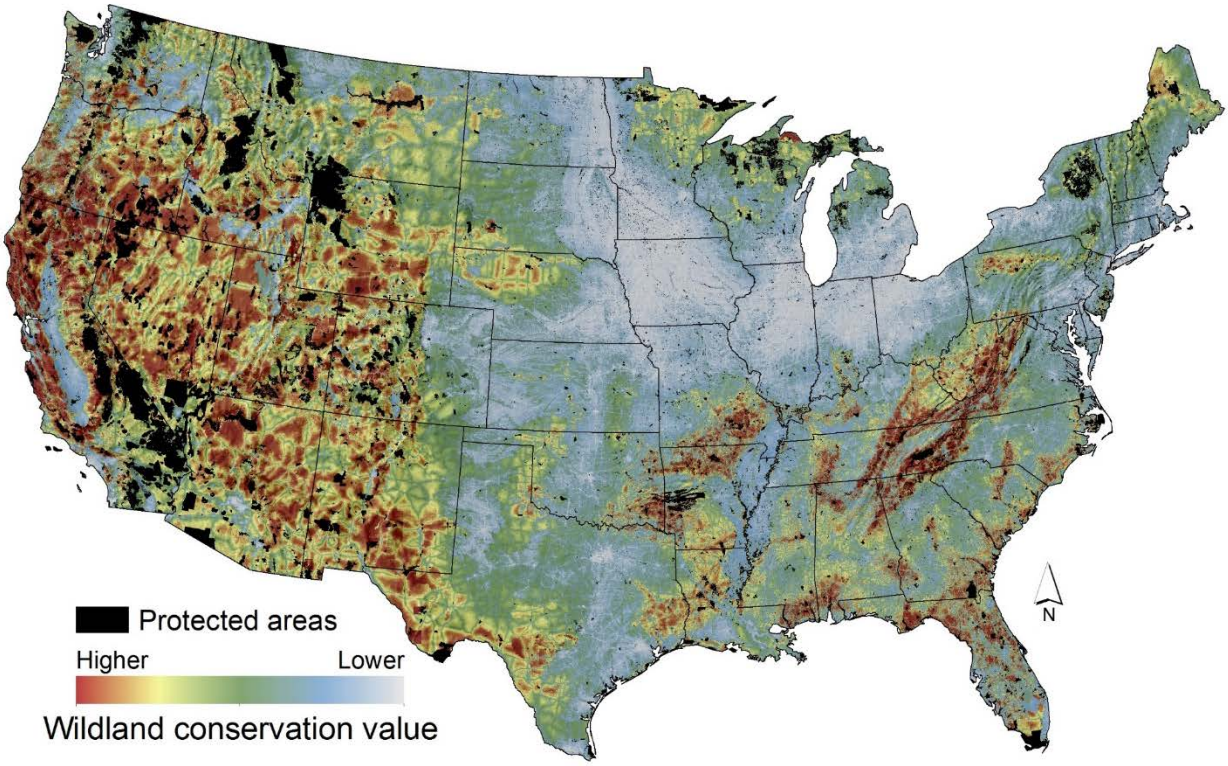
All routes shown in red or green are proposed routes. Some primitive trails exist in the western area of Young's peak.

Figure 3. Multiple criteria used to map wildland conservation priorities and values including wildness, connectivity, representation, and endemic species diversity. These criteria were combined to produce map in Figure 4.



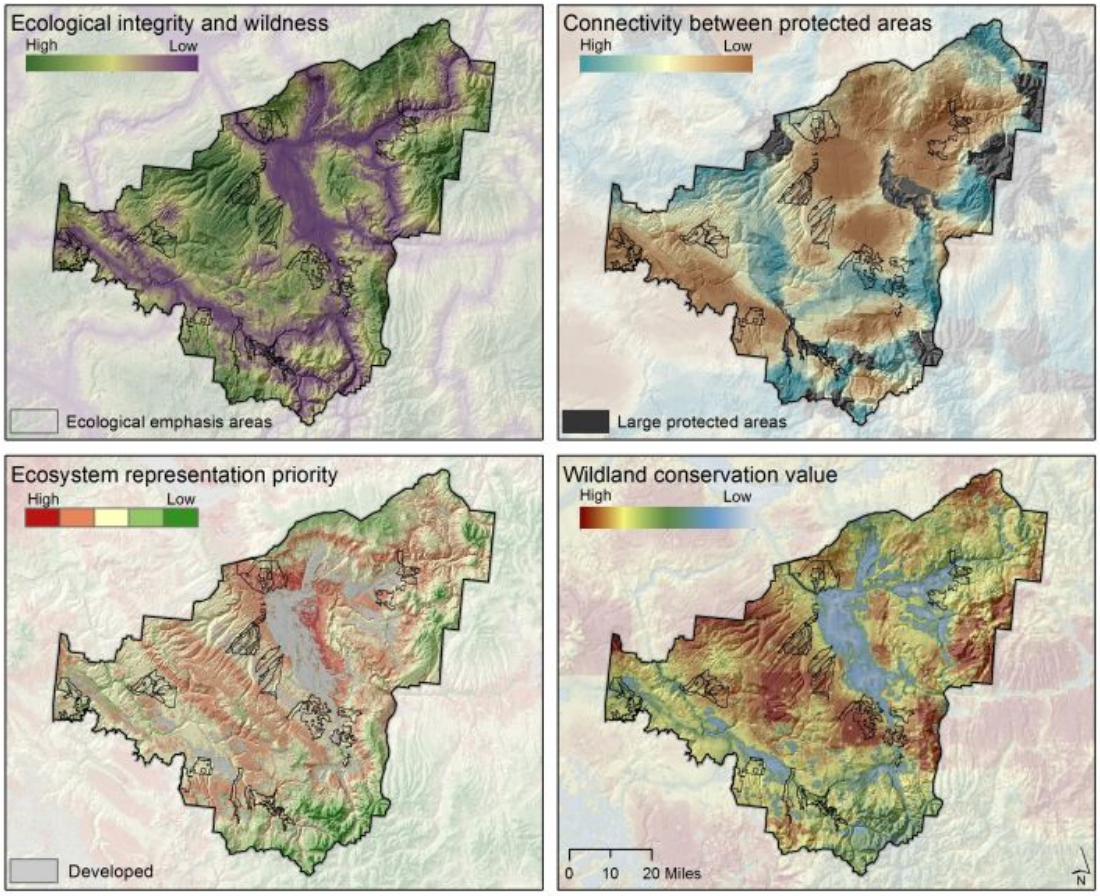
Wildland conservation priorities: We combined the mapped data described above (ecological integrity, connectivity, representation, and hotspots of endemic biodiversity) into one index by simply adding up the mapped layers (Figure 4). This new index allows us to identify wildland conservation priorities based on the land's relative wildness, its importance for creating a connected network of protected areas, its value in adding to the representation of habitats, and whether it has been identified as a hotspot of endemic species diversity. Ultimately, this approach will foster a national protected system of wildlands that is more prepared to handle the projected consequences of climate change.

Figure 4. Composite wildland values map based on criteria in Figure 3. The composite value was produced by setting each criterion to the same scale and summing.



Applying this data to the Uncompahgre Field Office, we can review how the EEAs evaluated in the draft RMP align with criteria used to map conservation priorities and overall wildland conservation values. As seen on the maps below in Figure 5, additional or alternative areas should be considered for EEA designation to ultimately achieve a network of conservation areas that maximize their potential to contribute to connectivity across the larger landscape.

Figure 5. Wildland conservation values and potential Ecological Emphasis Areas in the Uncompahgre Field Office.



APPENDIX II. North Fork Water Quality Report

See following pages.

Western Slope Conservation Center

VOLUNTEER WATER QUALITY MONITORING NETWORK

April 2001 – April 2014 Data Report

Volunteer collecting a sample on the North Fork of the Gunnison River.

Western Slope Conservation Center
204 Poplar Ave
Paonia, CO 81428

Phone: (970) 527-5307
Mailing Address: PO Box 1612 Paonia CO 81428
Street Address: 204 Poplar Ave Paonia CO 81428
Phone: 970-527-5307
Email: info@theconservationcenter.org
www.westernslopeconservation.org

Contributors:

Julia Bowman
Barbara Galloway
Mike Galloway
Alex Johnson
Dawn Reeder
Teresa Shishim
Hannah Stevens

WSCC Volunteer Water Quality Monitoring Data Report, 2016

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LIST OF ACRONYMS:

% EPT	Percent of ephemeroptera, plecoptera and trichoptera species
°C	Degrees Celsius
µg/L	Micrograms per Liter
$CaCO_3$	Calcium Carbonate
CDPHE	Colorado Department of Public Health and Environment
CPW	Colorado Parks and Wildlife
cfs	Cubic feet per second
CSU	Colorado State University
DO	Dissolved Oxygen
E. coli	Escherichia coli
EPA	Environmental Protection Agency
H^+	Hydrogen ions
HBI	The Hilsenhoff Biotic Index (HBI)
ISDS	Independent Sewage Disposal System
MCL	Maximum Contaminant Level
mg/L	Milligrams per Liter
WSCC	Western Slope Conservation Center
PCS	Permit Compliance System
O_2	Oxygen
OH^-	Hydroxyl ion
ppb	Parts per billion
PO_4	Phosphate
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
SO_4	Sulfate
SOPs	Standard Operating Procedures
TVS	Table Value Standard
USFS	US Forest Service
USGS	US Geological Survey
WS	Water Supply
WWTP	Wastewater Treatment Plant
WQCC	Colorado Water Quality Control Commission

Definitions

Acute standard — the concentration value of a contaminant or substance in water that will result in adverse effects either from a single exposure or from multiple exposures in a short period of time
Chronic standard — the concentration value of a contaminant or substance in water that is deemed to cause adverse effects as a result of long term exposure.
Dissolved solids — refer to any minerals, salts, metals, cations or anions dissolved in water. Total dissolved solids (TDS) comprise inorganic salts (principally calcium, magnesium, potassium, sodium, bicarbonates, chlorides, and sulfates) and some small amounts of organic matter that are dissolved in water. Concentrations of total dissolved solids are reflected in conductivity measurements.
Mode – The number which appears most often in a set of numbers.

1. INTRODUCTION

Western Slope Conservation Center (WSCCC)

Established in 1977, the Western Slope Conservation Center (WSCC) is a 501(c)3 non-profit group that formed to disseminate information about regional energy development and its impacts on the region's natural resources. Today, our mission is to build an active and aware community to protect and enhance the lands, air, water and wildlife of the Lower Gunnison Watershed.

WSCC Mission:
To build an active and aware community to protect and enhance the lands, air, water and wildlife of the Lower Gunnison Watershed.

As a result of our work, in 35 years the communities of the Lower Gunnison Watershed will be characterized by intact and functioning ecosystems, clean and abundant water resources, well-managed lands with the highest level of protection they deserve, and informed and an engaged citizenry that understand the connection between the vitality of its ecological and social communities.

In 2015, the Board of Directors affirmed our commitment to the following goal areas:

- Watershed Stewardship
- Advocacy for the Protection of Public Lands
- Education and Public Outreach

We distinguish ourselves by committing to four unique values.

- **Transparent, responsible, and ethical in our actions.** We strive for integrity in all of our efforts. We are accountable to our mission, membership, donors, partners, and the public.
- **Guided by science.** We use reliable, relevant, and the best-available scientific research to guide our decisions whenever possible.
- **Respect for the environment and diverse communities.** We strive to include the active involvement of the people and partners who are linked to the ecosystems we endeavor to protect. We consider the needs and values of our community. We build relationships based on trust and mutual benefit.
- **We seek tangible and enduring results.** We use informed debate and creative problem solving to develop locally appropriate solutions to complex conservation problems.

North Fork Volunteer Water Quality Monitoring Network

The North Fork Volunteer Water Quality Monitoring Network (the Network) was initiated in April 2001. The goal of the program is to obtain credible water quality information for the North Fork of the Gunnison watershed. This project is run entirely by local volunteers, with the donation of time and services from a variety of local businesses, educational institutions and state, local and federal organizations. It represents the efforts of dozens of volunteers, and thousands of hours spent preparing and analyzing samples. This report summarizes the results of water quality monitoring conducted from October 2004 to April 2014 at fifteen sites located along the North Fork of the Gunnison River and two in the Lower Gunnison watershed. The project monitors water quality parameters of concern, including fecal coliform, nutrients, sediment and metals.

Data gathered from the Network is provided to the U.S. Environmental Protection Agency (EPA), the State of Colorado, Colorado Data Sharing Network and Colorado River Watch for inclusion in their publicly available databases. In the long run, it is hoped that the information collected will encourage

informed decision-making by local citizens, government agencies, and local officials. The Network is intended to continue indefinitely and supply the people of the North Fork Valley with reliable information about the state of their watershed.

2. DESCRIPTION OF THE NORTH FORK WATERSHED

Figure 2-1: Headwaters of the North Fork

The North Fork of the Gunnison River (North Fork) is located in west-central Colorado, flowing through northwestern Gunnison and eastern Delta Counties. Flanked by the West Elk mountain range to the east, the peak elevation in the North Fork watershed is 13,687 feet. The headwaters of the North Fork are located in the Gunnison National Forest. The North Fork is formed by the confluence of Muddy Creek and Anthracite Creek downstream of the Paonia Reservoir Dam (Figure 2-2). The North Fork flows 33 miles in a southwesterly direction from this point to its junction with the Gunnison River at 4,553 ft elevation, approximately 8.5 miles west of the Town of Hotchkiss in Delta County. Terror, Hubbard, Minnesota, Roatcap, Cottonwood, and Leroux Creeks enter the North Fork between Paonia Reservoir and Hotchkiss. The North Fork watershed (HUC 14020004) drains a basin of approximately 986 square miles. Five small communities line the banks of the North Fork as it flows west towards the Gunnison River: Somerset, Bowie, Paonia, Hotchkiss, and Lazear. Figure 2-2 shows the location and topographical relief of the North Fork watershed.

The North Fork Valley consists of multiple river terraces positioned laterally along a highly dissected broad valley with gentle down-valley elevation relief. The soils along the river are deep to moderately deep, nearly level to steep, well-drained gravelly loam and stony loam that formed in outwash alluvium derived from igneous rock. Upstream of Somerset, the Mesa Verde Formation overlies the Mancos Shale. Downstream of Somerset, the North Fork Gunnison River is incised in the Mancos Shale west of Hotchkiss. Some of Leroux Creek and much of Cottonwood Creek is incised in the Mancos Shale. The vegetation is classified as northern desert scrub and consists primarily of juniper, sagebrush, western wheatgrass, muttongrass, fourwing saltbush, and bitterbrush.

Regional Map of the North Fork Watershed

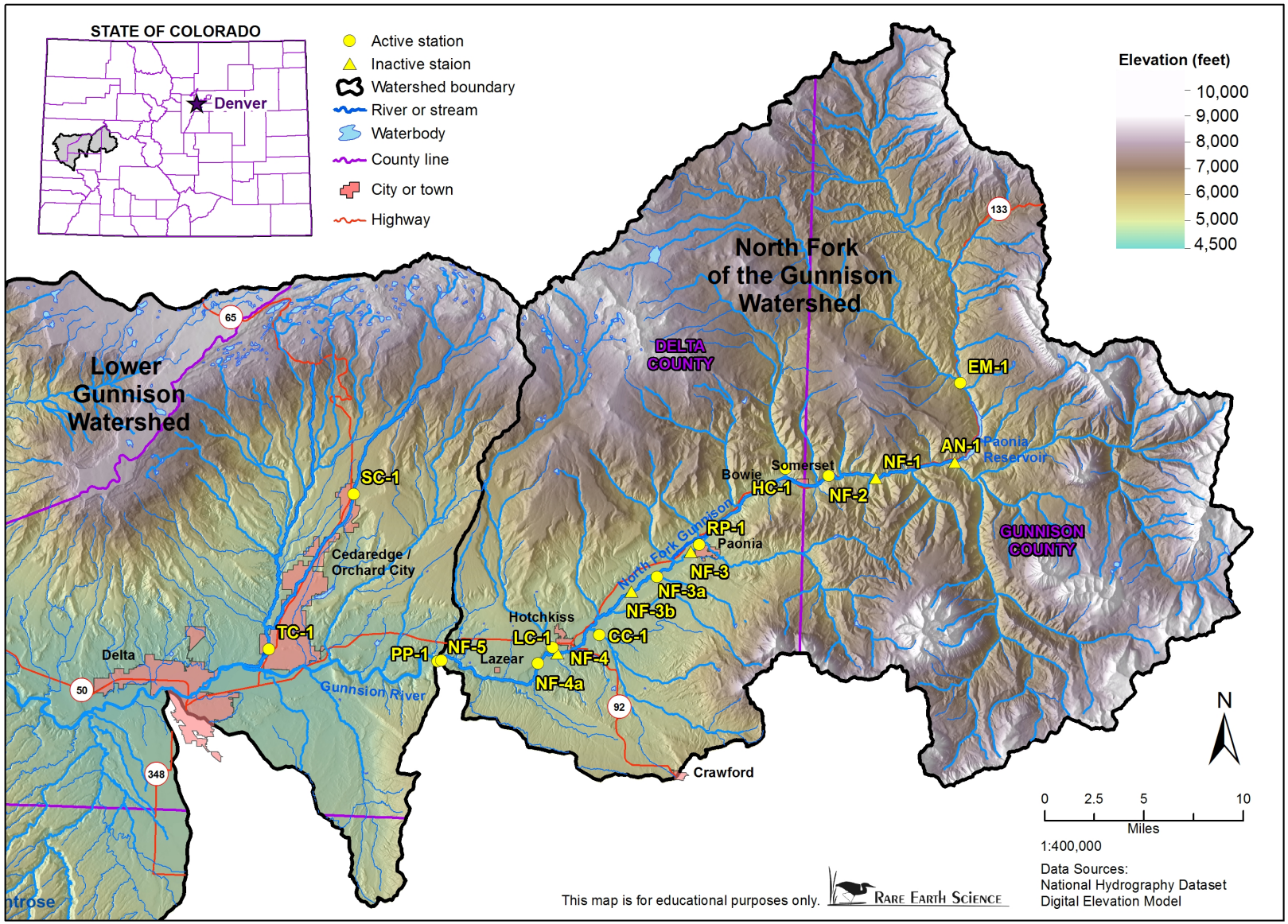

Figure 2-2: Location and Topography: North Fork Watershed

WSCC Volunteer Water Quality Monitoring Data Report, 2016

Land Use

Current land uses in the study area are predominantly agricultural. Of the more than 1,000 parcels adjoining the river, 35 percent are classified as agricultural, consisting of cattle and sheep ranches, crop production and fruit orchards. Extractive industries include hard rock coal mining, gravel mining and logging. Tourism and outdoor recreation supplement the general economy. The majority of riverfront property is privately owned and used for agriculture, recreation and gravel mining.

The land cover in the upper reaches of the watershed, above Somerset, is a mixture of aspen deciduous and coniferous forest. Much of this land is federally owned and managed by the US Forest Service and Bureau of Land Management. Beginning in Paonia and stretching downstream to the confluence with the Gunnison River, the land cover changes to agriculture and shrub/scrub. South West Regional Gap Project land cover data in the North Fork is illustrated in Figure 2-3.

Flow Data

The North Fork of the Gunnison River is a fourth order perennial stream, fed predominantly by snowmelt, with average bankfull widths of 100 to 200 feet. The average flow during spring runoff is approximately 3,000 cubic feet per second (cfs); irrigation diversions can reduce late summer flows to less than 20 cfs. The predominant alluvial landforms can produce high bedload and sediment concentrations, especially during spring runoff.

Major flooding may also occur during spring runoff months from rapid snowmelt that is sometimes augmented by rain. The Network does not manually collect flow data. The U.S. Geological Survey (USGS) and Colorado Division of Water Resources (DWR) both manage gaging stations along the North Fork of the Gunnison River and its tributaries. The gages provide real-time flow data that is electronically available. Table 1 summarizes the stream flow gaging stations utilized by the Network.

USGS/DWR Gaging Stations in the North Fork Watershed			
USGS Gage Number	**DWR Gage Name**	**Period of Record Used for this Report**	**Location**
9131490	MUDAPRCO	2001-2014	Muddy Creek above Paonia Reservoir
--	MUDBPRCO	2001-2014	Muddy Creek below Paonia Reservoir
9132960	HUBBOWCO	2001-2013	Hubbard Creek at Highway 133 at Mouth near Bowie
9132500	NFGSOMCO	2001-2014	North Fork near Somerset
9134100	NFGPANCO	2001-2014	North Fork below Paonia
9136100	--	2009-2014	North Fork Gunnison River above mouth near Lazear
9143500	SURACECO	2001-2014	Surface Creek at Cedaredge

Table 1: USGS Gaging Stations in the North Fork Watershed

Southwest Regional Gap Analysis Project Land Cover

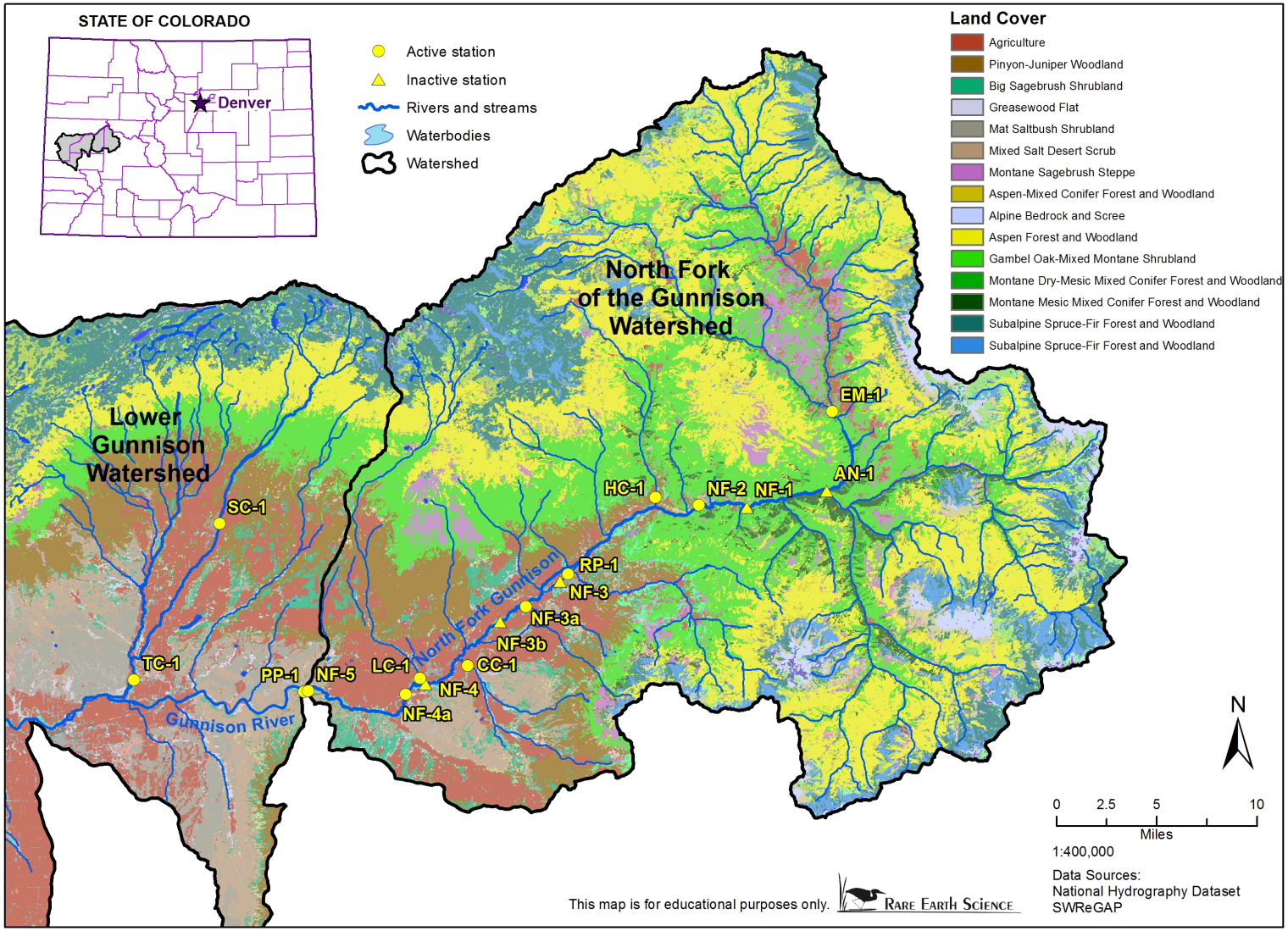

Figure 2-3: Land Cover: North Fork and Lower Gunnison Watershed

Point Sources

There are twenty discharge facilities in the North Fork watershed documented by the CDPHE. Table 2 lists all the currently permitted dischargers in the North Fork watershed. There are three permitted wastewater treatment plants (WWTPs) within the watershed: Town of Somerset, Town of Paonia and Town of Hotchkiss. All other towns, businesses and private residences in the area utilize independent sewage disposal systems (ISDS).

National Pollution Discharge Elimination System Facilities in the North Fork Watershed	
4D Gravel Pit Paonia	SH 92 Stengels Hill
Anderson Pit	Sheep Gas Gathering System
Bowie No 2 Mine	Somerset Central WTF
Hotchkiss Water Storage Facility	Spaulding Peak Production System
Hotchkiss WWTF	Town of Hotchkiss Drain Seep Line
Janet Pit	Tri County Pit
Lemoine Gravel Pit	West Elk Mine
Paonia WWTF	Williams Construction

Table 2: List of NPDES Discharge Facilities

Water Quality Pollution Risks

In addition to natural sources of pollutants, potential anthropogenic pollution sources exist in the North Fork Watershed, including, but not limited to:

- cattle and sheep ranches
- irrigation return flows
- independent sewage disposal systems
- municipal wastewater treatment discharges
- the annual bulldozing of in-stream diversion structures
- sand and gravel mining
- coal mining operations.

Other Water Quality Monitoring Efforts

The North Fork Volunteer Water Quality Monitoring Project, in conjunction with Colorado River Watch, is the only active comprehensive water quality data collection program in the North Fork watershed. The Colorado Department of Public Health and Environment (CDPHE) typically collects samples in the watershed every five years near the Town of Lazear. Other agencies, such as U.S. Geological Survey, the local mining companies and Colorado Parks and Wildlife (CPW) have collected limited water quality samples.

3. Water Quality Standards

Report Analysis Rating and Standards

This report evaluates stream health based on ratings that are dependent on conductivity and the presence and health of macroinvertebrates. These variables were used because they are good indicators of river health both independently and combined. Ratings for the two variables may not be the same for each at a particular location. Conductivity varies seasonally, so the conductivity rating typically varies seasonally.

The ratings are as follows:

Excellent -
Macroinvertebrates: No major differences in community structure and abundance between stations, high percentage of collectors and scrapers
Conductivity: 0 – 800 µS/cm

Good –

Macroinvertebrates: Some differences in community structure and abundance between stations, adequate percentage of collectors and scrapers
Conductivity: 800 – 1,200 µS/cm

Moderate -
Macroinvertebrates: Differences in community structure and abundance between stations, median percentage of collectors and scrapers
Conductivity: 1,200 – 1,800 µS/cm

Poor -
Macroinvertebrates: Major differences in community structure and abundance between stations, low percentage of collectors and scrapers
Conductivity: > 1,800 µS/cm

Stream Segment Classifications and Standards

The Colorado Water Quality Control Commission (WQCC) created a regulatory framework called Basic Standards and Methodologies for Surface Water, or Regulation 31, to protect water quality in Colorado. Excerpts of these standards are provided in Appendix B. Water quality standards are dependent on current and desired future beneficial uses and are applied on a segment-by-segment basis. The official designated uses for the North Forkwatershed include Aquatic Life Cold 1 (for water bodies supporting salmonid species), Aquatic Life Cold 2, Recreation E (existing primary contact use, such as swimming and boating), Recreation P (potential primary contact use, but uncertain until studied further), Water Supply and Agriculture.

The WQCC most recently modified designated uses and segmentation of the Upper and Lower Gunnison basins in 2012, effective March 30, 2012.

Table 4 shows the updated stream segments, or water body identification (WBIDs) from Regulation 35 Classifications and Numeric Standards for Gunnison and Lower Dolores River Basins that are sampled by the North Fork Volunteer Water Quality Monitoring Project and the state's applicable water quality standards for those segments.Table 3 shows a summary of stream segment (and subsequent station) classification. The WBID segments are also displayed in Figure 3-1. Excerpts from Regulation 35 can be found in Appendix C.

Every two years, CDPHE is required to prepare a list of impaired streams not meeting water quality standards called the 303(d) Impaired Waters List, as well as the regulatory precursor to the 303(d) list, the Monitoring and Evaluation List (M&E List). The M&E List identifies waters of questionable water quality that may be on their way to the 303(d) List. Regulation 94 lists segments in the Upper and Lower Gunnison basins (5 CCR 1002-94). The stream segments sampled by the North Fork Monitoring Network can be found in Table 5.

		CLASSIFICATION					
Stream Segment	Station	Water Supply	Agriculture	Aq Life Cold 1	Aq Life Warm 2	Recreation E	Recreation P
COGUNFO2	NF-2, NF-1	X	X	X		X	
COGUNFO3	RP-1, NF-3, NF-3a, NF-3b, NF-4, NF-4a, NF-5	X	X	X		X	X
COGUNFO4	EM-1, AN-1	X	X	X		X	
COGUNFO5A	HC-1, LC-1	X	X	X			X
COGUNFO6A			X		X		X
COGULGO7B	CC-1	X	X	X			X

Table 3: Stream Segment Classification Summary

WSCC Volunteer Water Quality Monitoring Data Report, 2016

Table 4: Stream Segments and Water Quality Standards

2. Mainstem of North Fork of the Gunnison River from its inception at the confluence of Muddy Creek and Coal Creek to the Black Bridge (41.75 Drive) above Paonia.

COGUNF02	Classifications
Designation	Agriculture
Reviewable	Aq Life Cold 1
	Recreation E
	Water Supply

Qualifiers:

Other:

Temporary Modification(s):
Arsenic(chronic) = hybrid
Expiration Date of 12/31/2021

Physical and Biological	DM	MWAT
Temperature °C	CS-II	CS-II
	acute	chronic
D.O. (mg/L)	—	6.0
D.O. (spawning)	—	7.0
pH	6.5 - 9.0	—
chlorophyll a (mg/m^2)	—	—
E. Coli (per 100 mL)	—	126

Inorganic (mg/L)	acute	chronic
Ammonia	TVS	TVS
Boron	—	0.75
Chloride	—	250
Chlorine	0.019	0.011
Cyanide	0.005	—
Nitrate	10	—
Nitrite	—	0.05
Phosphorus	—	—
Sulfate	—	WS
Sulfide	—	0.002

Metals (ug/L)	acute	chronic
Aluminum	—	—
Arsenic	340	0.02(T)
Beryllium	—	—
Cadmium	TVS(tr)	TVS
Chromium III	50(T)	TVS
Chromium VI	TVS	TVS
Copper	TVS	TVS
Iron	—	WS
Iron	—	1000(T)
Lead	TVS	TVS
Manganese	TVS	TVS
Manganese	—	WS
Mercury	—	0.01(t)
Molybdenum	—	160(T)
Nickel	TVS	TVS
Selenium	TVS	TVS
Silver	TVS	TVS(tr)
Uranium	—	—
Zinc	TVS	TVS
Zinc	—	TVS(sc)

3. Mainstem of North Fork of the Gunnison River from the Black Bridge (41.75 Drive) above Paonia to the confluence with the Gunnison River.

COGUNF03	Classifications	
Designation	Agriculture	
Reviewable	Aq Life Cold 1	
	Recreation E	4/1 - 9/30
	Recreation P	10/1 - 3/31
	Water Supply	

Qualifiers:

Other:

Physical and Biological		DM	MWAT
Temperature °C		CS-II	CS-II
		acute	chronic
D.O. (mg/L)		—	6.0
D.O. (spawning)		—	7.0
pH		6.5 - 9.0	—
chlorophyll a (mg/m^2)		—	—
E. Coli (per 100 mL)	4/1 - 9/30	—	126
E. Coli (per 100 mL)	10/1 - 3/31	—	205

Inorganic (mg/L)	acute	chronic
Ammonia	TVS	TVS
Boron	—	0.75
Chloride	—	250
Chlorine	0.019	0.011
Cyanide	0.005	—
Nitrate	10	—
Nitrite	—	0.05
Phosphorus	—	—
Sulfate	—	WS
Sulfide	—	0.002

Metals (ug/L)	acute	chronic
Aluminum	—	—
Arsenic	340	0.02(T)
Beryllium	—	—
Cadmium	TVS(tr)	TVS
Chromium III	50(T)	TVS
Chromium VI	TVS	TVS
Copper	TVS	TVS
Iron	—	WS
Iron	—	1000(T)
Lead	TVS	TVS
Manganese	TVS	TVS
Manganese	—	WS
Mercury	—	0.01(t)
Molybdenum	—	160(T)
Nickel	TVS	TVS
Selenium	TVS	TVS
Silver	TVS	TVS(tr)
Uranium	—	—
Zinc	TVS	TVS

4. Muddy Creek, including all tributaries and wetlands, from the source to the confluence with Coal Creek. Coal Creek, including all tributaries and wetlands, from the source to the confluence with Muddy Creek, All tributaries to the North Fork of the Gunnison from its inception at the confluence of Muddy Creek and Coal Creek to the confluence with the Gunnison River within national forest boundaries, except for the specific listing in Segment 1.

COGUNF04	Classifications
Designation	Agriculture
Reviewable	Aq Life Cold 1
	Recreation E
	Water Supply

Qualifiers:

Other:

Temporary Modification(s):
Arsenic(chronic) = hybrid
Expiration Date of 12/31/2021

Physical and Biological	DM	MWAT
Temperature °C	CS-I	CS-I
	acute	chronic
D.O. (mg/L)	—	6.0
D.O. (spawning)	—	7.0
pH	6.5 - 9.0	—
chlorophyll a (mg/m^2)	—	—
E. Coli (per 100 mL)	—	126

Inorganic (mg/L)	acute	chronic
Ammonia	TVS	TVS
Boron	—	0.75
Chloride	—	250
Chlorine	0.019	0.011
Cyanide	0.005	—
Nitrate	10	—
Nitrite	—	0.05
Phosphorus	—	—
Sulfate	—	WS
Sulfide	—	0.002

Metals (ug/L)	acute	chronic
Aluminum	—	—
Arsenic	340	0.02(T)
Beryllium	—	—
Cadmium	TVS(tr)	TVS
Chromium III	50(T)	TVS
Chromium VI	TVS	TVS
Copper	TVS	TVS
Iron	—	WS
Iron	—	1000(T)
Lead	TVS	TVS
Manganese	TVS	TVS
Manganese	—	WS
Mercury	—	0.01(t)
Molybdenum	—	160(T)
Nickel	TVS	TVS
Selenium	TVS	TVS
Silver	TVS	TVS(tr)
Uranium	—	—
Zinc	TVS	TVS
Zinc	—	TVS(sc)

5a. Mainstems of Hubbard Creek, Terror Creek, Minnesota Creek, and Leroux Creek from the national forest boundary to their confluences with the North Fork of the Gunnison River; mainstem of Jay Creek from its source to its confluence with the North Fork of the Gunnison River.

COGUNF05A	Classifications
Designation	Agriculture
Reviewable	Aq Life Cold 1
	Recreation P
	Water Supply

Qualifiers:

Other:

Temporary Modification(s):
Arsenic(chronic) = hybrid
Expiration Date of 12/31/2021

Physical and Biological	DM	MWAT
Temperature °C	CS-I	CS-I
	acute	chronic
D.O. (mg/L)	---	6.0
D.O. (spawning)	---	7.0
pH	6.5 - 9.0	---
chlorophyll a (mg/m^2)	---	---
E. Coli (per 100 mL)	---	205

Inorganic (mg/L)	acute	chronic
Ammonia	TVS	TVS
Boron	---	0.75
Chloride	---	250
Chlorine	0.019	0.011
Cyanide	0.005	---
Nitrate	10	---
Nitrite	---	0.05
Phosphorus	---	---
Sulfate	---	WS
Sulfide	---	0.002

Metals (ug/L)	acute	chronic
Aluminum	---	---
Arsenic	340	0.02(T)
Beryllium	---	---
Cadmium	TVS(tr)	TVS
Chromium III	50(T)	TVS
Chromium VI	TVS	TVS
Copper	TVS	TVS
Iron	---	WS
Iron	---	1000(T)
Lead	TVS	TVS
Manganese	TVS	TVS
Manganese	---	WS
Mercury	---	0.01(t)
Molybdenum	---	160(T)
Nickel	TVS	TVS
Selenium	TVS	TVS
Silver	TVS	TVS(tr)
Uranium	---	---
Zinc	TVS	TVS
Zinc	---	TVS(sc)

6a. All tributaries, including wetlands, to the North Fork of the Gunnison River from its inception at the confluence of Muddy Creek and Coal Creek to the confluence with the Gunnison River, and not within national forest boundaries, except for the specific listings in Segments 5a, 5b, and 6b.

COGUNF06A	Classifications
Designation	Agriculture
Reviewable	Aq Life Warm 2
	Recreation P
Qualifiers:	
Other:	

Physical and Biological	DM	MWAT
Temperature °C	WS-II	WS-II
	acute	chronic
D.O. (mg/L)	—	5.0
pH	6.5 - 9.0	—
chlorophyll a (mg/m^2)	—	—
E. Coli (per 100 mL)	—	205
Inorganic (mg/L)		
	acute	chronic
Ammonia	TVS	TVS
Boron	—	0.75
Chloride	—	—
Chlorine	0.019	0.011
Cyanide	0.005	—
Nitrate	100	—
Nitrite	—	0.05
Phosphorus	—	—
Sulfate	—	—
Sulfide	—	0.002

Metals (ug/L)	acute	chronic
Aluminum	—	—
Arsenic	340	100(T)
Beryllium	—	—
Cadmium	TVS	TVS
Chromium III	TVS	TVS
Chromium III	—	100(T)
Chromium VI	TVS	TVS
Copper	TVS	TVS
Iron	—	1000(T)
Lead	TVS	TVS
Manganese	TVS	TVS
Mercury	—	0.01(t)
Molybdenum	—	160(T)
Nickel	TVS	TVS
Selenium	TVS	TVS
Silver	TVS	TVS
Uranium	—	—
Zinc	TVS	TVS

7b. Mainstem of Surface Creek from the point of diversion of water supply to the confluence with Tongue Creek; mainstem of Tongue Creek from its inception at the confluence of Ward Creek and Dirty George Creek to the confluence with the Gunnison River; mainstem of Youngs Creek from the national forest boundary to the confluence with Kiser Creek; mainstem of Kiser Creek from the national forest boundary to the confluence with Youngs Creek.

COGULG07B	Classifications
Designation	Agriculture
Reviewable	Aq Life Cold 1
	Recreation P
	Water Supply
Qualifiers:	
Other:	

Physical and Biological	DM	MWAT
Temperature °C	CS-II	CS-II
	acute	chronic
D.O. (mg/L)	---	6.0
D.O. (spawning)	---	7.0
pH	6.5 - 9.0	---
chlorophyll a (mg/m^2)	---	---
E. Coli (per 100 mL)	---	205
Inorganic (mg/L)		
	acute	chronic
Ammonia	TVS	TVS
Boron	---	0.75
Chloride	---	250
Chlorine	0.019	0.011
Cyanide	0.005	---
Nitrate	10	---
Nitrite	---	0.05
Phosphorus	---	---
Sulfate	---	WS
Sulfide	---	0.002

Metals (ug/L)	acute	chronic
Aluminum	---	---
Arsenic	340	0.02(T)
Beryllium	---	---
Cadmium	TVS(tr)	TVS
Chromium III	50(T)	TVS
Chromium VI	TVS	TVS
Copper	TVS	TVS
Iron	---	WS
Iron	---	1000(T)
Lead	TVS	TVS
Manganese	TVS	TVS
Manganese	---	WS
Mercury	---	0.01(t)
Molybdenum	---	160(T)
Nickel	TVS	TVS
Selenium	TVS	TVS
Silver	TVS	TVS(tr)
Uranium	---	---
Zinc	TVS	TVS
Zinc	---	TVS(sc)

All metals are dissolved unless otherwise noted.
T = total recoverable
t = total
tr = trout
sc = sculpin
D.O. = dissolved oxygen
DM = daily maximum
MWAT = maximum weekly average temperature
WS = Water Supply
TVS = Table Value Standard
Table Value Standards (TVS) for ammonia are based on temperature and pH and for metals it is based on hardness
See WQCC Regulation 31 for details on TVS, TVS(tr), TVS(sc), WS, temperature standards

Table 5: Impaired Segments on the 303(d) List and Monitoring and Evaluation List (CDPHE Regulation 93_2016(03)

Water Body ID (WBID)	**Sampling Station**	**Segment Description**	**Portion**	**Colorado's Monitoring & Evaluation Parameter(s)**	**Clean Water Act Section 303(d) Impairment**	**303(d) Priority**
COGUNF04	EM-1, AN-1	Muddy Creek and all tributaries, Coal Creek and all tributaries; all tributaries to the North Fork of the Gunnison within the national forest boundary	East Muddy Creek	Lead, Selenium	Iron (Trec)	High
			Muddy Creek	E. coli (May-Oct)		
			Ruby Anthracite Creek		Arsenic	Low
COGUNF06b	CC-1	Bear Creek, Reynolds Creek, Bell Creek, McDonald Creek, Cottonwood Creek, Love Gulch, Cow Creek, Dever Creek, German Creek, Miller Creek, Stevens Gulch, Big Gulch, Stingley Gulch and Alum Gulch not on national forest lands from the source to the North Fork of the Gunnison River	Cottonwood Creek	Iron (Trec), Manganese, Sulfate		
COGULG07b	TC-1, SC-1	Surface Creek from the diversion of water supply to Tongue Creek; Tongue Creek to the Gunnison River; Youngs Creek from USFS boundary to Kiser Creek; Kiser Creek from the USFS boundary to the confluence with Youngs Creek	Tongue Creek		Selenium, Iron (Trec)	Medium

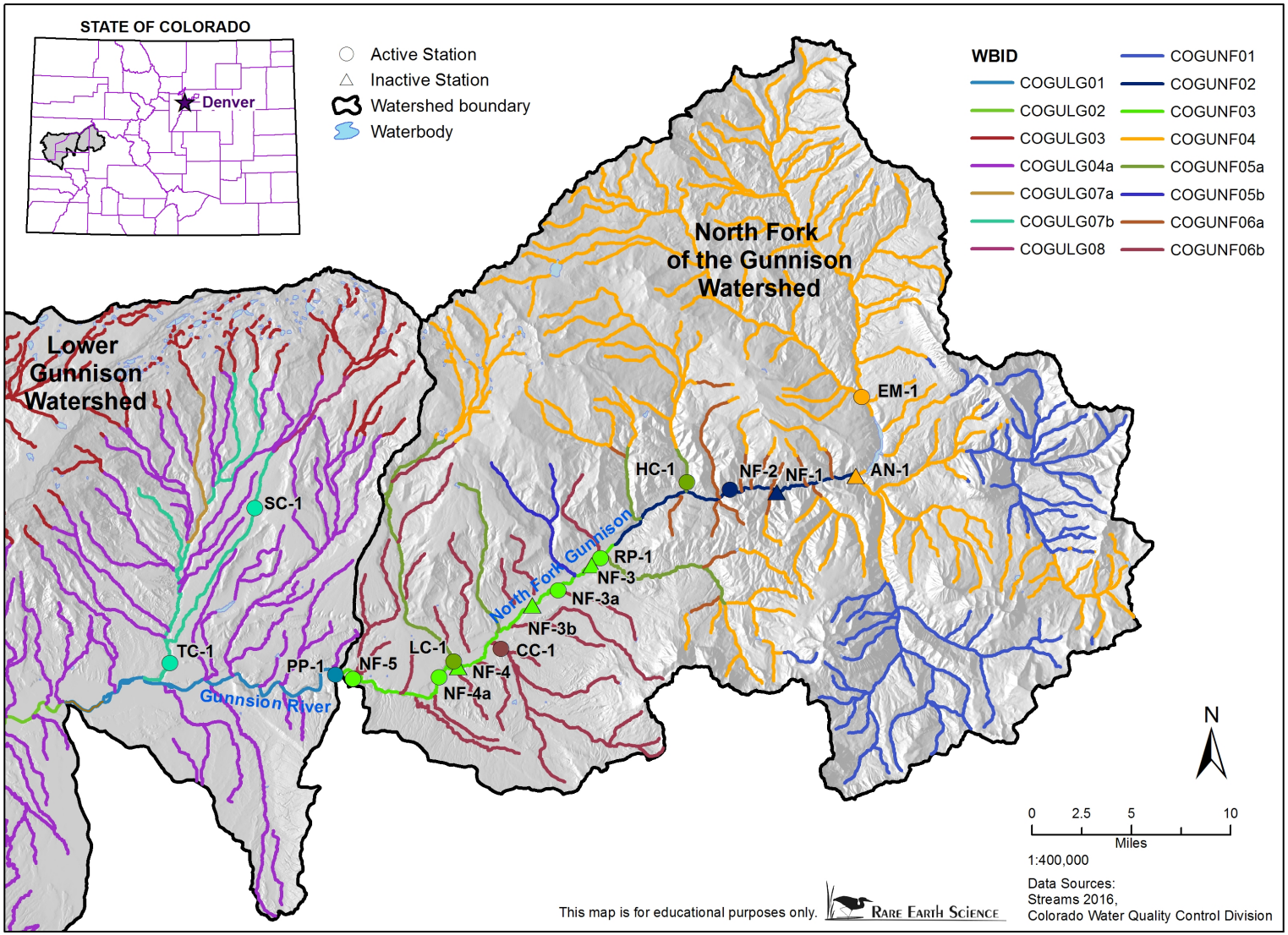

Figure 3-1: WBID Segments in the North Fork and Lower Gunnison Basin

Total Phosphorus and Total Nitrogen Standards

Both Total Phosphorus and Total Nitrogren standards are evaluated by the interim values outlined in the tables below.

Interim Total Phosphorus Values	
Lakes and Reservoirs, cold, >25 acres	25 µg/L [1]
Lakes and Reservoirs, warm > 25 acres	83 µg/L [1]
Lakes and Reservoirs, <=25 acres	RESERVED
Rivers and Streams – cold	110 µg/L [2]
Rivers and Streams - warm	170 µg/L [2]
[1] summer (July 1-September 30) average Total Phosphorus (µg/L) in the mixed layer of lakes (median of multiple depths), allowable exceedance frequency 1-in-5 years. [2] annual median Total Phosphorus (µg/L), allowable exceedance frequency 1-in-5 years.	

Table 6: Interim Total Phosphorus Values

Interim Total Nitrogen Values (Effective May 31, 2017)	
Lakes and Reservoirs, cold, >25 acres	426 µg/L [1]
Lakes and Reservoirs, warm, > 25 acres	910 µg/L [1]
Lakes and Reservoirs, <=25 acres	RESERVED
Rivers and Streams – cold	1,250 µg/L [2]
Rivers and Streams - warm	2,010 µg/L [2]
[1] summer (July 1–September 30) average Total Nitrogen (µg/L) in the mixed layer of lakes (median of multiple depths), allowable exceedance frequency 1-in-5 years. [2] annual median Total Nitrogen (µg/L), allowable exceedance frequency 1-in-5 years.	

Table 7: Interim Total Nitrogen Values

Temperature standards are based on the use of the river and the aquatic life it supports. They are included in the table below.

Site(s)	Classification	*Warm Season Maximum Weekly Average Temperature Standard(MWAT) (Deg C)	Warm Season Daily Maximum Temperature Standard (DM) (Deg C)	*Cold Season MWAT (Deg C)	Cold Season DM (Deg C)
EM-1, AN-1, HC-1, LC-1	Cold Stream I	17.0	21.7	9	13
NF-1, NF-2, NF-3, NF-3a, NF-3b, NF-4, NF-4a, NF-5, SC-1, TC-1	Cold Stream II	18.3	23.9	9	13
CC-1	Warm Stream II	27.5	28.6	13.8	14.3
*Warm and Cold season month designations vary for each standard.					

Table 8: Stream Segments Temperature Standards.

E. coli Standards

E. coli standards used in this report are based on the regulatory standard (235 organisms/mL) outlined by the CDPHE Water Quality Control Division (WQCD) for natural swimming areas.

4. NORTH FORK VOLUNTEER MONITORING NETWORK

Introductions

Since April 2001, Network volunteers have been collecting water quality samples in the North Fork Valley. As part of this joint project, coordinated by the Western Slope Conservation Center (WSCC) and Colorado River Watch, volunteers receive lab and field training on EPA-approved water sampling procedures. Volunteers travel once a month to sample different sites throughout the watershed. Stations start as high as East Muddy Creek and proceed down the North Fork of the Gunnison River as far as the confluence with the main stem of the Gunnison River. Two additional sites were adopted by the Network in 2004 in the Lower Gunnison Watershed on Tongue and Surface Creeks and are monitored every other month. The Network began sampling Hubbard Creek, Cottonwood Creek and Leroux Creek tributaries in 2011, and they are now monitored monthly.

Samples are collected for analysis of temperature, dissolved oxygen, alkalinity, conductivity, hardness, pH, metals, nutrients, other inorganic parameters, macroinvertebrates and bacteria. The majority of samples collected and analyzed by the Network are done in conjunction with Colorado River Watch (River Watch). River Watch is a state-wide volunteer monitoring program that focuses on collecting baseline water quality data. River Watch provides volunteer groups like WSCC with training, water monitoring equipment, chemicals for analysis of field parameters and lab analysis for metals, nutrients and other inorganic parameters. All River Watch data are publicly available on the River Watch website.

The Network bacteria monitoring program commenced in 2001 in partnership with the Environmental Protection Agency (EPA) after water quality standards in segments in the North Fork were upgraded to reflect recreational uses. Bacteria samples are not collected for regulatory or compliance purposes. Rather, these data (total coliforms and E. Coli) provide a screening-level assessment of bacterial concentrations.

The following sections explain the specifics of the Network's water sampling program, including the location of the water quality monitoring stations, parameters analyzed and the volunteer training program.

Water Quality Monitoring Stations

The North Fork Volunteer Monitoring Network has collected water quality data at fifteen locations throughout the North Fork watershed and two stations in the Lower Gunnison watershed. Table 9 outlines the location, description and active period for each station. The stations are strategically located to provide baseline coverage of the watershed stretching from the headwaters downstream. Monitoring locations and frequencies have changed over the years to reflect changing priorities. Figure 2-2 shows a map of all active Network monitoring stations.

Table 9: Network Water Monitoring Stations							
Station Name	**Station #**	**Lat**	**Long**	**Date Started**	**Date ended**	**Station Description**	**WBID**
AN-1	645	38.93995	-107.35796	Apr-2001	May-02	**Anthracite Creek:** Turn right on CR 135 to Kebler Pass. After bridge over Muddy Creek, access along Crystal Meadows Ranch fence, use USBOR access to Anthracite Creek.	COGUN04
EM-1	644	38.997075	-107.35712	Apr-2001	on-going	**Muddy Creek:** 1/2 mile north of Paonia State Park entrance on HWY 133, just below confluence of East and West Muddy Creeks.	COGUN04
NF-1	646	38.92595	-107.43372	Apr-2001	on-going	**North Fork of Gunnison:** USGS Gauging Station accessed off HWY 133, 2/10 of mile above entrance to West Elk Mine.	COGUN02
NF-2	649	38.927316	-107.47828	Apr-2001	on-going	**North Fork of Gunnison:** Along HWY 133, west of the town of Somerset, just below the Fire Mountain Canal irrigation diversion.	COGUN02
NF-3	238	38.8688	-107.60461	Apr-2001	Jun-08	**North Fork of Gunnison:** Off HWY 133, turn south onto the Samuel Wade Rd into Paonia. Sample just downstream of the "County Road Bridge".	COGUN03
NF-3a	875	38.8508	-107.6359	Jun-2002	on-going	**North Fork of Gunnison:** From Old River Road between Paonia and Hotchkiss, turn north on N-25 Road and then immediately left. Take this road until is crosses the railroad tracks, and then turn right into the first driveway. Follow the private road down toward the river.	COGUN03
NF-3b	272	38.83738253	-107.658315	Jul-2008	on-going	**North Fork of Gunnison:** In Hotchkiss, from the intersection of Hwy 92 and Hwy 133, travel northeast on Hwy 133, 4.9 miles to Campbell Road. Turn right on Campbell road and continue .4 miles, continue south on private road .2 miles. Park before gate. Walk .2 miles south.	COGUN03
NF-4	269	38.792	-107.72628	Apr-2001	May-02	**North Fork of Gunnison:** From downtown Hotchkiss, turn south onto Cedar Drive (3400 Rd). Follow road to bridge, turn right just before bridge, sample next to red gate.	COGUN03
NF-4a	876	38.78312	-107.74386	Jun-2002	on-going	**North Fork of Gunnison:** From downtown Hotchkiss, turn south onto Cedar Drive (3400 Rd). Follow this road across bridge, and then turn right onto River Park Road. Follow this dirt road thru gate, and then take the right fork down to the river.	COGUN03
NF-5	650	38.7839	-107.8346	Apr-2001	on-going	**North Fork of Gunnison:** From HWY 133, turnoff at the Pleasure Park entrance, follow road to river. At bottom, turn left into BLM parking area. Trails to river.	COGUN03
CC-1	10425	38.806141	-107.6878	Jan-2011	on-going	**Cottonwood Creek:** From downtown Hotchkiss, head southeast on HWY 92 and then turn left on Back River Road. Site is across from the turnoff to K-50 Ln. Sample just downstream of the culvert.	COGUNF06a
LC-1	893	38.795449	-107.731000	Jan-2011	on-going	**Leroux Creek:** From Hwy 92 in Hotchkiss, turn south on Pinion Drive. Go strait through stop sign, turn right and then quickly angle left onto Hotchkiss Ave/Riverside Dr. Turn left at 461 Riverside Dr opposite the Hotchkiss brick barn. Drive past the house and workshop on the left. Park and walk straight back to through tree line to the creek.	COGUNF05a
HC-1	892	38.927208	-107.517526	Jan-2011	on-going	**Hubbard Creek:** Head north on Hwy 133 from Paonia and turn left at Bowie Road at Industrial Building. Pass the mine, go down the hill with the North Fork River is on your right. Park on the left at cottone, go to the left of the garage, turn right down to the river.	COGUNF05a
SC-1	260	38.90159438	-107.921243	Apr-2005	on-going	**Surface Creek:** Proceed up HWY 65 to Cedaredge NE 4th Street. Turn right and pass fenced pond on left to next driveway (310 NE 4th Street). Walk over lawn down stairs to path to creek.	COGULG07b
TC-1	262	38.7877898	-107.995277	Apr-2005	on-going	**Tongue Creek:** From HWY 92 turn right at HWY 65 (toward Cedaredge). Left on Fairview Drive for ¼ mile - creek is at bottom of grade. Walk blocked road to locked barbed wire fence and go thru fence to creek.	COGULG07b

Water Quality Parameters Monitored

The Network's water quality monitoring program collects information on the chemistry, biology and physical habitat of the North Fork River. During the October 2004 to April 2014 sample period, Network volunteers collected monthly field parameter, metal, metals, nutrient and other inorganic parameter samples and bacteria samples. Macroinvertebrate/physical habitat analyses were conducted annually. Table 10 lists the water quality parameters the Network monitors, and Table 11 provides a brief description of each parameter.

Parameters Monitored by the Network			
Field Parameters	**Nutrients and Other Inorganics**	**Metals***	**Biological**
pH Temperature Conductivity Alkalinity Hardness Dissolved Oxygen Flow	Total suspended solids (TSS) Sulfate Chloride Total Phosphorus Nitrate+nitrite Ammonia	Aluminum Arsenic Cadmium Calcium Copper Iron Lead Magnesium Manganese Selenium Zinc ***Total and dissolved**	Total coliforms *E. Coli* Macroinvertebrates Physical Habitat

Table 10: Parameters Monitored by the River Watch Volunteer Water Qualty Monitoring Network

Where Are Samples Analyzed?

- Field Parameters: in field and at local River Watch laboratory
- Metals: River Watch/CPW Laboratory, Fort Collins, Colorado
- Nutrients: River Watch/CPW Laboratory, Fort Collins, Colorado
- Bacteria: EPA Region 8 Laboratory, Golden, Colorado
- Macroinvertebrates: River Watch contract laboratory in Ft. Collins, Colorado

Parameters Monitored by the Network	
Parameter	Description/Relationships Field Parameters
pH	Measure of hydrogen ion (H+) concentration. Water with a pH below 7.0 is acidic; a pH above 7.0 is alkaline.
Temperature	Varies seasonally, fish and aquatic life require specific temperatures to reproduce and thrive.
Total Alkalinity, as CaCO3	Measure of carbonate (HCO3-) and bicarbonate (CO3-) anions present. Reflects the river's buffering capacity.
Total Hardness, as CaCO3	The amount of dissolved calcium and magnesium in water. Mitigates metals toxicity for fish.
Dissolved Oxygen	Amount of oxygen in the water in its dissolved form. DO varies with temperature and flow and is indirectly related to temperature.
Nutrients and Other Inorganic Parameters	
Total suspended solids	Minerals and soil particles suspended in the water column. In slow or low flows, this material can be deposited in the streambed.
Sulfate	This form of sulfur (SO4) is most common in the oxidizing conditions of flowing waters.
Chloride	Can originate from natural sources, but also associated with evaporation, road salts or water treatment plants.
Total phosphorus	Common constituent in soil and some fertilizers.
N, Nitrate+nitrite	Nitrates and nitrites are oxidized forms of nitrogen commonly found in flowing water.
N, Ammonia	Ammonia is a common component of organic wastes (e.g., sewage) and fertilizers. Can be toxic to fish in high concentrations.
Bacteria	
Total Coliform	A family of microorganisms that originate in the intestines of humans and other warm-blooded animals. Not always pathogenic (disease-causing), although high concentrations indicate risk.
Escherichia Coli (E. Coli)	Bacteria associated with water-borne diseases such as dysentery and cholera. Many *E. Coli* bacteria cause no health problems, others may be highly pathogenic.
Metals	
Aluminum	Most abundant naturally occurring metal in the earth's surface.
Arsenic	Naturally occurring element in the earth's crust and mineral deposits. May enter the soil from natural or manmade sources. Can cause cancer and skin lesions. It has also been associated with developmental effects, cardiovascular disease, neurotoxicity and diabetes.
Cadmium	Naturally occurring, the largest source of cadmium is often burning of fossil fuels and incineration of municipal waste. Chronic exposure can cause kidney, bone and lung disease.
Calcium	The most abundant cation in the world's rivers and a common constituent of local soils. Important contributor to hardness. A major component of hardness.
Copper	Found in mineralized ore deposits. Rarely found in pristine source water, may reflect mining impacts.
Iron	Second most abundant metallic element in earth's crust. Excessive amounts may cause staining of plumbing fixtures and laundry.
Lead	Naturally occurring, highly toxic; can accumulate in fish and human tissue with negative health effects.
Magnesium	A major component of hardness and is primarily derived from the weathering of rocks.
Manganese	Essential element in plant and animal metabolism.

Selenium	A naturally occurring metal common in the Mancos shale. Leaches from soils via irrigation. Can be toxic to fish and wildlife.
Zinc	Zinc is relatively abundant, but may be released to the environment by coal burning, mining, and other industrial activities.
Macroinvertebrates	
The presence of a diverse range of macroinvertebrate species serve as "bioindicators" and are a sign of adequate habitat and a healthy river ecosystem. The presence of pollution-sensitive species is a sign that pollution is absent in a stream.	

Table 11: Parameters Monitored by the Network

Sample Collection and Analytical Procedures

The majority of Network samples are collected using the grab sample technique. Grab samples are collected by volunteers wading into the stream and collecting water using a clean, large bucket. Water from this bucket is used to fill all subsequent sample bottles. When river water levels permit, volunteers may collect composite samples. Composite samples are collected at multiple locations moving across a stream channel.

Sampling and analysis procedures utilized by the Network follow Standard Methods and/or EPA approved methods. Table 12 lists the sample method code and laboratory reporting limits for each parameter monitored.

Methods and Reporting Limits				
Parameters	**Unit**	**Method**	**Source**	**Reporting Limit**
Aluminum	µg/L	200.7	USEPA	15
Ammonia	mg/L	350.1	USEPA	.01
Arsenic	µg/L	200.7	USEPA	15
Cadmium	µg/L	200.7	USEPA	.15
Calcium	µg/L	200.7	USEPA	100
Chloride	mg/L	375.4	USEPA	1.0
Copper	µg/L	200.7	USEPA	1
DO	mg/L	421 B	SM	.5
E. coli	MPN/100 mL	9223b 24hr		1
Iron	µg/L	200.7	USEPA	10
Lead	µg/L	200.7	USEPA	3
Magnesium	µg/L	200.7	USEPA	100
Manganese	µg/L	200.7	USEPA	5
Nitrate + Nitrite	mg/L	353.2	USEPA	.02
pH	SU			.01
Potassium	µg/L	200.7	USEPA	100
Selenium	µg/L	200.7	USEPA	5
Sodium	µg/L	200.7	USEPA	100
Sulfate	mg/L	375.4	USEPA	.5
Temperature	Deg C			
Total Alkalinity	mg/L	310.1	USEPA	2
Total Coliforms	MPN/100 mL	9223b 24hr		1
Total Hardness	mg/L	314	SM	2
Total Nitrogen	mg/L	353.2	USEPA	0.02
Total Phosphorus	µg/L	365.1	USEPA	5
Total Suspended Solids	mg/L	160.2	USEPA	4
Zinc	µg/L	200.7	USEPA	3

Table 12: Methods and Reporting Limits

Volunteer Training and Certification

All volunteers must attend a River Watch training workshop before they can join the Network. The River Watch training provides in-depth instruction on all aspects of water monitoring: sample preparation, collection, analyses, shipping, data management and Quality Assurance & Quality Control (QA/QC) procedures.

The WSCC Technical Advisor accompanies volunteers on the first several sampling runs until satisfied that the volunteers can complete the sampling procedures independently. Volunteers between the ages of 10 and 18 can be trained and work alongside at least one adult in the field and lab. Figure 4-1 shows Network volunteers collecting samples and processing them in the lab.

Figure 4-1: Volunteers collecting and processing water quality samples

Quality Control/Quality Assurance Measures

Quality control measures both in the field and in the lab are detailed in Quality Assurance Project Plans (QAPPs) developed in 2001. For this project three separate QAPPs were created, one each for nutrients and other inorganic parameters, bacteria and metals. The QAPP documents are available for inspection at the WSCC office in Paonia. The River Watch Program follows the CDPHE QAPP and is updated as the CDPHE QAPP is updated.

As part of the River Watch program, the Network participates in a rigorous annual QA/QC regime. Network QA/QC controls include twenty percent duplicate and blank samples, analysis of unknown samples twice per year and an annual site visit from a River Watch staff member. The QA/QC measures evaluate techniques, chemicals and equipment. Chains-of-custody forms accompany all shippedsamples.

Data Reporting

Volunteers use standardized reporting forms developed by River Watch for every sample collection event. Hard copies documenting sample location, date, time, field conditions and field parameters are stored at the ERO Resources office in Hotchkiss and the River Watch office in Denver. Digital copies are on file at the WSCC office in Paonia. Information from the data sheets is validated and then entered into the online River Watch database (except for bacteria data), where it is eventually combined with metals, nutrients and other inorganics results. Bacteria data are stored with the EPA. The River Watch data are publicly available online at: http://wildlife.state.co.us/riverwatch/. River Watch data are also uploaded to the Colorado Data Sharing Network (www.codsnstoret.com) and EPA's STORET (www.epa.gov/storet).

Project Sponsors

The North Fork Volunteer Water Quality Monitoring Project would not be possible without the support of many different State, Federal, and local organizations. Each group provides critical support, either in the form of technical assistance, lab equipment, or volunteer recruitment. The following is a list of the project partners:

- **Western Slope Conservation Center** is responsible for water quality data management, volunteer recruitment and training, report creation and technical support to the project. In addition, WSCC advertises the project to the local community, initiates fundraising efforts and assists with map and report creation efforts.
- **River Watch Program**, co-sponsored by the *Colorado Watershed Assembly* and the *Colorado Division of Wildlife* was instrumental for the start-up of this program. The Colorado Watershed Assembly helps supply critical training, technical support, equipment, and encouragement to get activities started. They also help link this project with the numerous other volunteer water monitoring projects throughout the State.
- **U.S. Environmental Protection Agency** Region 8 provides all bacteriological sample analysis for this project, as well as significant technical assistance. They provide crucial high quality data for this key parameter of concern in the North Fork watershed.
- **ERO Resources Corporation** provides use of their facility for laboratory space in Hotchkiss, Colorado.
- **Colorado Parks and Wildlife** Aquatic Biologist Barb Horn conducts annual site visits and provides technical advice.
- **Paonia Farm and Home** provides donation to help with shipping costs.
- **Hardin's Natural Foods** provided snacks to volunteers everymonth.
- **Bureau of Reclamation** provided a WaterSMART Cooperative Watershed Management Program Grant that has helped fund the compilation and analysis of data in this report.

5. FIELD DATA

WSCC field parameters consist of those sampled and analyzed "in house" by the Network. Field parameters include: total hardness, total alkalinity, phenolphthalein alkalinity, conductivity, pH, temperature (air and stream temperature measured at the site) and dissolved oxygen. Samples are collected and analyzed by project volunteers in a laboratory at the ERO Resources Corporation building in Hotchkiss. The following section summarizes the results from April 2001 to April 2014. Many of the graphs in the sub-sections below illustrate values from selected stations. A complete water quality dataset can be found online or by getting in touch with the Conservation Center. For more information, refer to Appendix A. Please refer to Figure 2-2 for a map of all water quality monitoring stations.

Hardness

Hardness is a measure of the most prevalent polyvalent cations (ions with a positive charge greater than +1) in water: calcium (Ca^{2+}) and magnesium (Mg^{2+}). Hardness is measured in mg/L of calcium carbonate ($CaCO_3$).

The ions contributing to the hardness of water are often derived from the drainage of calcareous (calcite-rich) sediments such as limestone, dolomite or gypsum. The dissolution of calcium, magnesium and other polyvalent cations, such as iron and manganese, from rocks and soils can also contribute to hardness in natural systems. Mine drainage, certain industrial processes, sewage outflow and irrigation can artificially increase hardness in waterways.

Waters with high hardness values are referred to as "hard," while those with low hardness values are "soft". Table 4-1 shows EPA's defined hardness ranges. Hard water can prevent soap from producing lather, leaves behind undesirable films or scum on hair, fabrics and glassware, and can form scale when used in boilers and water heaters. Water softeners can make hard water functional for household purposes by replacing calcium (Ca^{2+}) and magnesium (Mg^{2+}) with sodium (Na^{+}) and potassium (K^{+}) ions.

EPA Hardness Ranges	
Hardness Level Concentration (mg/L $CaCO_3$)	
Soft	0-75
Moderate	75-150
Hard	150-300
Very Hard	300+

Table 13: EPA Hardness Ranges

Hardness is advantageous in aquatic systems because it can mitigate the toxic effects of metals. While the exact mechanism is unknown, Ca^{2+}, Mg^{2+} and other polyvalent cations prevent fish from absorbing metals such as lead, arsenic and cadmium into their bloodstream through their gills. The greater the hardness, the more difficult it is for toxic metals to be absorbed through the gills. Therefore, hardness is inversely related to metals toxicity. For this reason, many metals standards are calculated based on hardness results.

Figure 5-1, Figure 5-2, and Figure 5-3 show total hardness data from October 2004 to April 2014. Overall, stations in the upper reaches of the watershed (EM-1 and NF-1) exhibit hardness values in the "soft to "moderate" hardness range. Station EM-1 occasionally yielded maximum values in the "hard" range. Lower stations showed increasing hardness values. High hardness concentrations are due to calcium and magnesium in the soils developed from the Mancos shale[1]. The high hardness values at the

[1] Liebermann, Timothy D. *Characteristics and Trends of Streamflow and Dissolved Solids in the Upper Colorado*

lower stations may also be due to the influences of irrigated agriculture from irrigation water absorbing calcium and magnesium and being returned to the river[2].

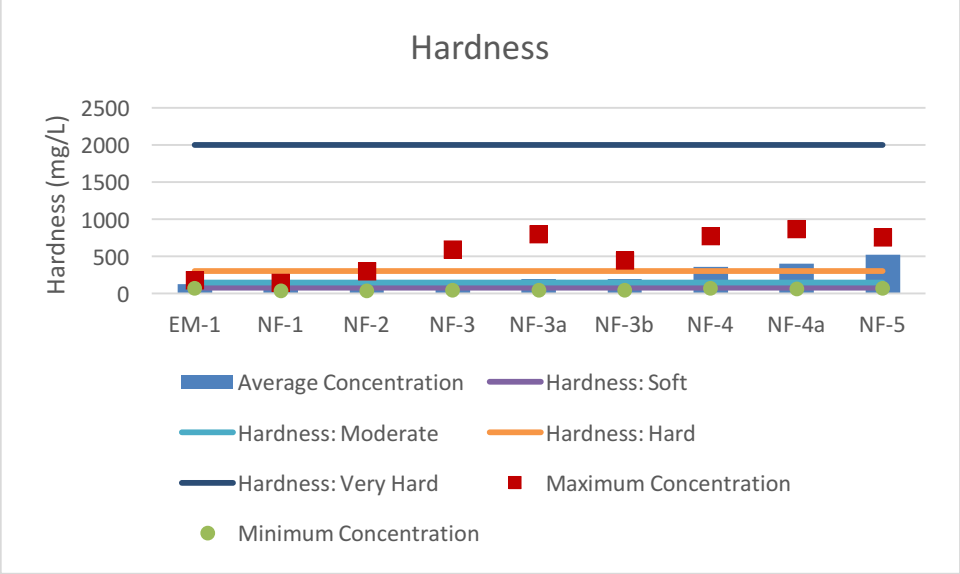

Figure 5-1: Average, maximum, and minimum total hardess concentrations for main stem and upper tributaries on the North Fork

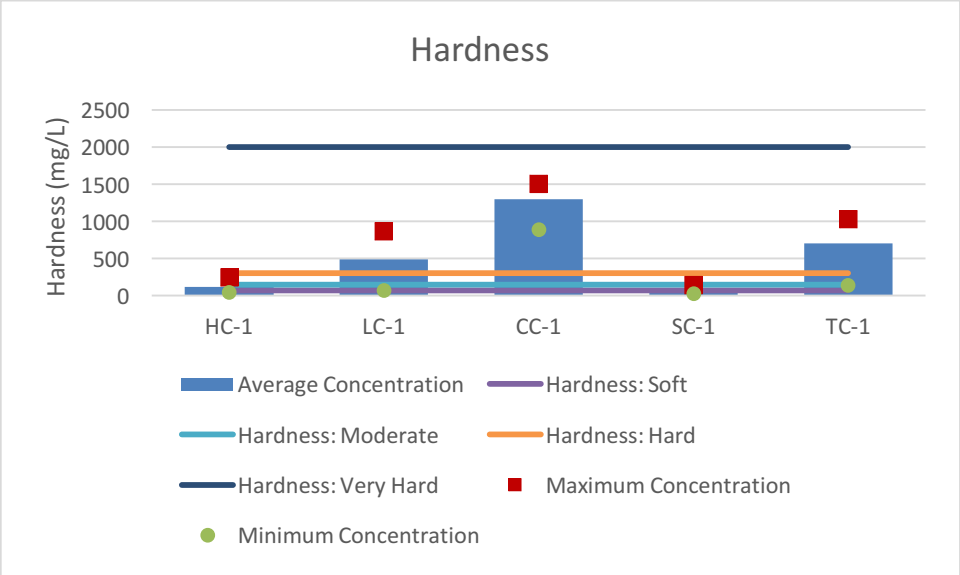

Figure 5-2: Average, max and minimum total hardness values for lower tributaries

Peak hardness concentrations typically occured between the months of July and September during low stream flow. The lowest hardness concentrations at the lower stations occurred between March and June. At high flows during snowmelt runoff, calcium and magnesium concentrations in the river and tributaries are lower due todilution.

River Basin, Arizona, Colorado, New Mexico, Utah, and Wyoming. Washington, D.C.: U.S. Dept. of the Interior, U.S. Geological Survey, 1989. 1989. Web. 28 Oct. 2016.

[2] http://www.fao.org/docrep/005/y4263e/y4263e07.htm

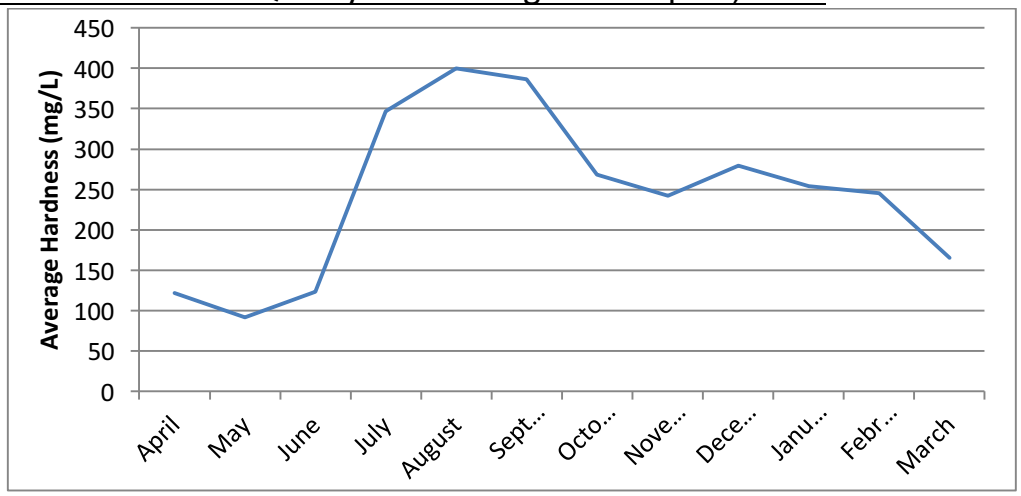

Figure 5-3: Seasonal total hardness (average of all stations by month)

Alkalinity

Alkalinity is a measure of buffering capacity, or the ability of water to resist change in pH when an acid or base is added. It represents the balance of carbon dioxide in water and is reported as mg/L $CaCO_3$, but is actually a measure of the amount of HCO_3 (bicarbonates) and $CO3^{2-}$ (carbonates) anions that are present. The presence of buffering materials such as carbonates, bicarbonates, and occasionally hydroxide (OH^-), help neutralize acids as they are added to water.

Moderate alkalinity concentrations are desirable in aquatic systems because it can limit, or buffer, the effects of acid mine drainage or acid rain. Waters with low alkalinity (below 10 mg/L) are poorly buffered and very susceptible to changes in pH. Systems with alkalinity concentrations above 100 mg/L are able to resist major shifts in pH. The North Fork drainage basin consists of Tertiary igneous rocks (as individual laccoliths) and sedimentary rocks in the headwaters, and Cretaceous sandstones, coal measures, and calcareous marine shales at the lower elevations. Alkalinity typically increases downstream as the geology changes from igneous rocks and carbonate-poor soils in the headwaters to limestone, sedimentary rock and carbonate-rich soils in lower portions of the watershed. Alkalinity is also beneficial because it can mitigate the toxic impacts of dissolved metals. Carbonate and bicarbonate ions bind with dissolved metals such as lead, arsenic and cadmium, causing them to precipitate out of solution and become unavailable for aquatic life.

The highest recorded alkalinity concentration at NF-4 is 852 mg $CaCO_3$/L, January 23, 2008. There is one recorded instance of "poor" buffering capacity (below 10 mg $CaCO_3$/L) at NF-1 on July 14, 2010.

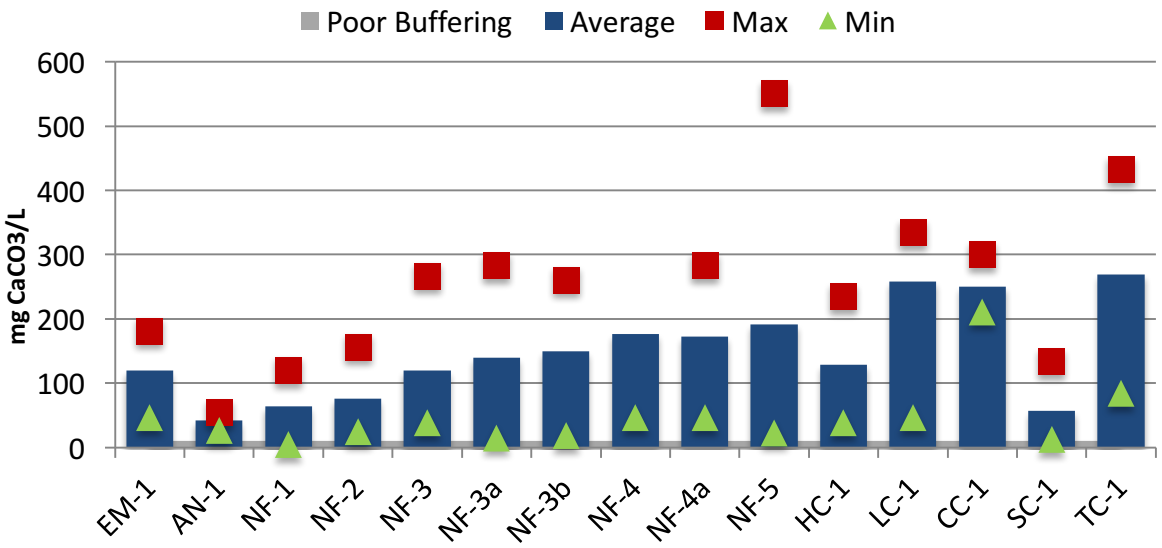

Figure 5-4: Average, maximum and minimum total alkalinity values at all stations

Like hardness, alkalinity is inversely related to flow. Peak concentrations in the lower stations occurred during low flow conditions between June and August and dips in alkalinity occurred between April and June during peak flow conditions. Alkalinity at the lower stations and EM-1 is generally adequate to buffer against changes in pH.

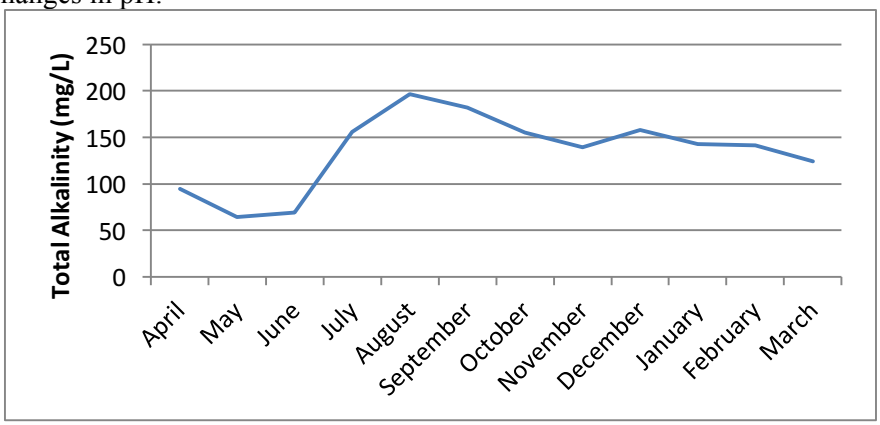

Figure 5-5 Seasonal alkalinity (average of stations by month)

pH

pH measures the acidity of a solution. It is determined by the relative concentration of hydrogen (H^+) and hydroxide (OH^-) ions. The pH scale is negatively logarithmic and ranges from 0 to 14. Solutions with low pH values, below 7, are acidic and have more H^+ than OH^-. Basic solutions have high pH values, above 7, and have more OH^- than H^+. A neutral solution has a pH of 7 and equal concentrations of H^+ and OH^-. Aquatic ecosystems have adapted to tolerate a narrow range of pH, but most prefer pH values between 6.5 and 8.0. If the pH becomes too high or too low, it can lead to problems in reproduction and even death.

pH can also influence the state of metals in water. Low pH concentrations can liberate toxic metals from rocks or sediments in a stream, which can affect fish metabolism and lead to death in juvenile fish. The WQCC has set a standard of 6.5 to 9 for pH in natural waters.

Figure 5-6 displays the maximum, average and minimum pH values of for all stations. The pH of the North Fork is slightly basic. The majority of pH values are between 8.0 and 8.5. The highest pH value exceeds the standard and occurred at station NF-1 (9.1) on August 11, 2004. The lowest recorded pH value is within the state's allowed range and was 7.0 at station NF-1 in December 2005.

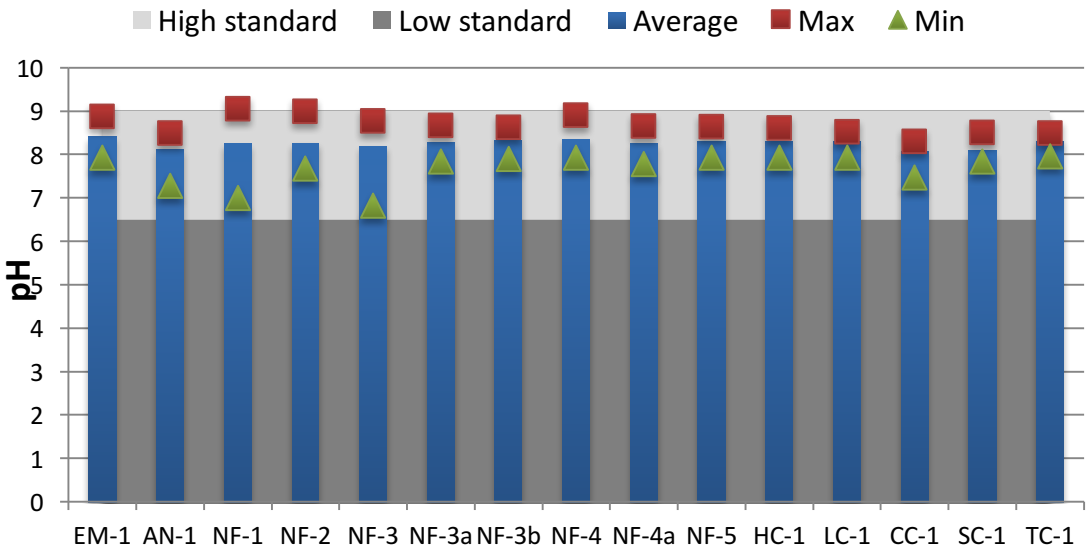

Figure 5-6 Average, maximum and minimum pH values at all stations

Conductivity

A plot of conductivity measurements from the North Fork Gunnison River sites that were sampled frequently for conductivity since 2010 (Figure 5-7) shows the progression of water quality changes that occur along the reach of the river from just downstream of Somerset (NF-2) to Pleasure Park (NF-5). Because conductivity is an analog for total dissolved solids (TDS), this method provides a good indicator as to how dissolved constituents change in the river, both seasonally and from upstream to downstream. TDS is typically 55 to 75 percent of conductivity[3], depending on the site-specific chemistry. For the purposes of this document, a midway conversion of 60 percent was used (and then the resulting TDS concentration rounded), given that River Watch does not have TDS measurements for comparison. River Watch measures and reports conductivity in micro mhos per cm, but the current practice is to use micro Siemens per cm (µS/cm), which is equivalent.

[3] Hem, J.D., 1992, Study and interpretation of chemical characteristics of natural water (3d ed.): U.S. Geological Survey Water-Supply Paper 2254

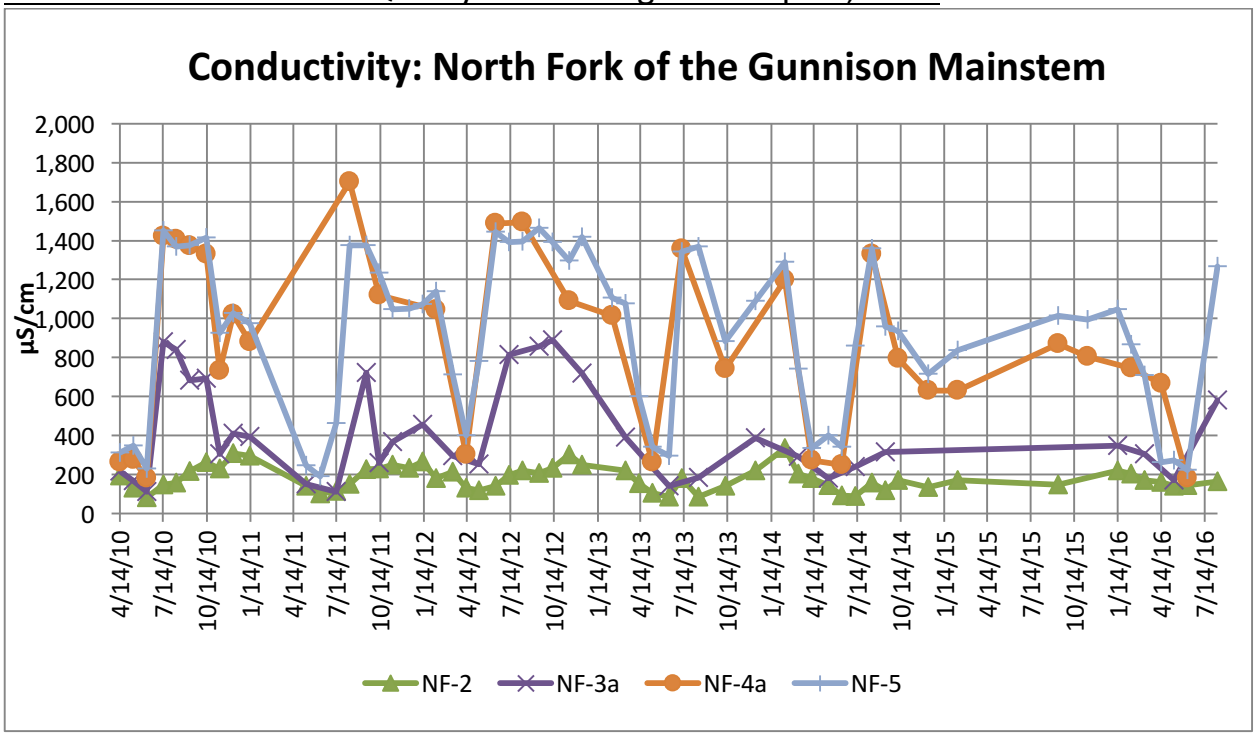

Figure 5-7: Conductivity: North Fork of the Gunnison Mainstem

The primary observation is that conductivity, and therefore TDS concentrations, vary seasonally depending on the dominant source of water to the river (see Figure 5-8). During the spring runoff/snowmelt season, conductivity values were at their lowest, increasing through the summer as runoff decreased and ground water and irrigation return flows become the dominant source of water to the river. All of the sites show this seasonal pattern, but the frequency of sampling at individual sites provide either more detail, such as at NF-2, or less detail, such as at NF-4a. In other words, apparent variance from the seasonal pattern is likely an artifact of the frequency of measurements.

Other general observations include the progression or increase in conductivity (and TDS) from upstream to downstream and the lack of any apparent long-term trend within the 2001 to 2014 period of record.

The upstream-most site (NF-2) showed a relatively small range of conductivity values (82-333 µmhos, or 50 -200 mg/L TDS) seasonally. NF-2 had the smallest range and lowest measured conductivity compared to the other River Watch sites on the North Fork. Both the range and magnitude of the conductivity measurements increased downstream, with the highest values at the NF-4a and NF-5 locations. The small range and low conductivity values at NF-2 reflects the geology, in that NF-2 is located very near to the contact between the Mancos Shale and the Mesa Verde Formation. Downstream of NF-2 the river is incised in Mancos Shale. The higher conductivities that started at NF-3a and were observed at NF-4a and NF-5 in the post runoff season reflect ground water and surface water contributions from areas of Mancos Shale. During spring runoff, all sites had relatively low conductivity (and, therefore, low TDS concentrations), typical of a snowmelt dominated flow system.

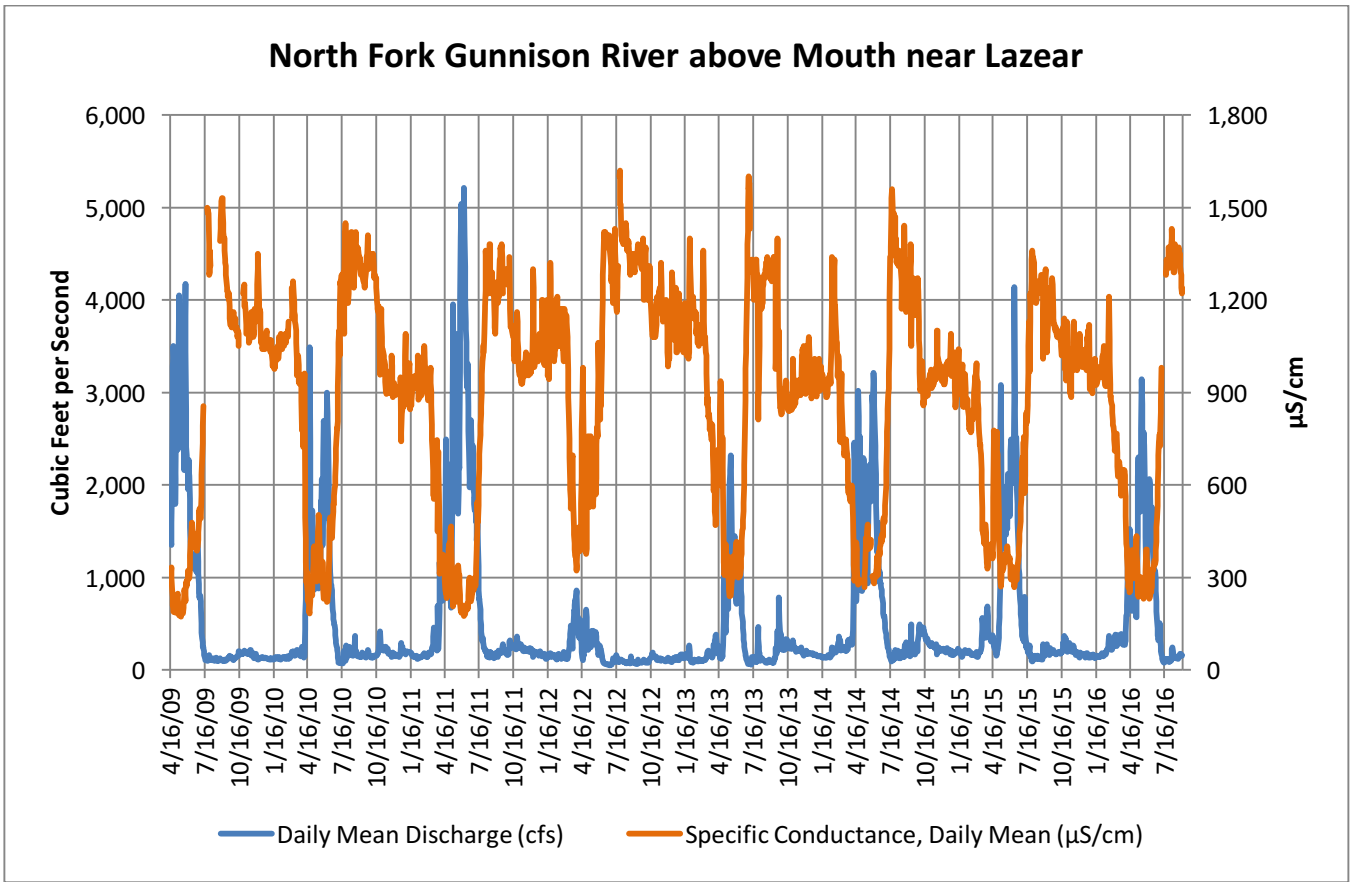

Figure 5-8: Specific Conductivity and Flow

The range of conductivity measurements (135-400 µmhos (80-240 mg/L TDS) from East Fork of the Muddy (EM-1) are similar, but slightly higher, than those observed at the upstream-most site NF-2 on the North Fork (Table 14). Other tributaries to the North Fork, such as Cottonwood Creek and Leroux Creek, contribute water with very high TDS concentrations (as measured by conductivity) to the North Fork, particularly right after the spring runoff period. Even during spring runoff, Cottonwood Creek contributes water to the North Fork with TDS concentrations of nearly 1,000 mg/L. This is a result of surface runoff from areas of Mancos Shale and ground water discharge to the creek from the Mancos Shale. Irrigation return flows from areas of Mancos shale likely also contribute water with high TDS concentrations to Cottonwood Creek, Leroux Creek, and the North Fork. These high conductivity measurements in the tributaries are reflected in the high conductivity measured at NF-4a and NF-5.

SampleLocation	Measured Conductivity Range (µmhos)	Calculated TDS Range (mg/L)
NF-2	82-333	50-200
NF-3a	109-890	65-530
NF-4a	179-1700	110-1020
NF-5	188-1466	110-880
EM-1	135-400	80-240
HC-1	51-610	30-360
CC-1	1609-3510	965-2100
LC-1	159-1354	95-810

Table 14: Range of Measured Conductivities at Sampled Locations (201-2014)

USGS Continuous Conductivity Measurements

The USGS has continuously measured conductivity (as well as flow and temperature) at a site very near NF-5 since April 2009. The conductivity range measured at this site is comparable to the range measured at NF-5. The USGS data also show the same seasonal pattern in conductivity observed by River Watch. When river flow is included in the graph (Figure 2), it is clear that the lowest conductivity occurs when the flow is the highest, and are the highest when flow is the lowest. Because the USGS data were recorded continuously, the data provide significantly more detail concerning the seasonal conductivity pattern (and thus TDS concentration pattern) along the river than the monthly measurements.

Dissolved Oxygen and Temperature

Dissolved oxygen (DO) is the amount of oxygen (O2) dissolved in water. It is an important indicator of a water body's ability to support life because most aquatic organisms require oxygen to breathe. The WQCC standard for DO for most stations is 6.0 mg/L or greater except during spawning, when it is 7.0 mg/L or greater. Cottonwood Creek (CC-1) is the exception, with a chronic standard of 5.0 mg/L or greater. Low DO concentrations are common in late summer/early fall due to low stream flow, warm water temperatures and the increased oxygen uptake of aquatic plants.

Water becomes oxygenated directly from the atmosphere and by photosynthesis of aquatic plants and algae. Oxygen is removed from the water by respiration and decomposition of organic matter. Dissolved oxygen concentrations vary with water temperature, altitude, salinity, depth and flow. Dissolved oxygen concentrations typically exhibit diurnal patterns due to cycles of photosynthesis/respiration.

Dissolved oxygen concentrations are illustrated below in Figure 5-9, Figure 5-10 and Figure 5-11.

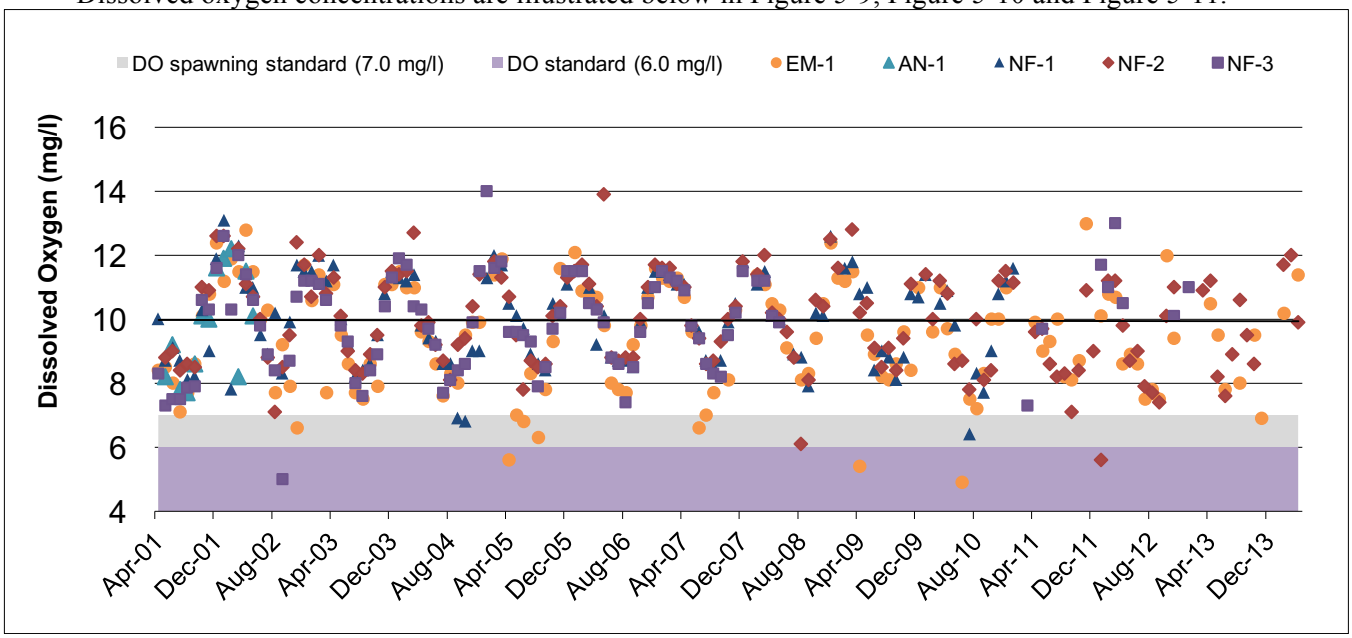

Figure 5-9 Dissolved Oxygen in the Upper North Fork and Tributaries
Note: A result of less than the state standard is in exceedance

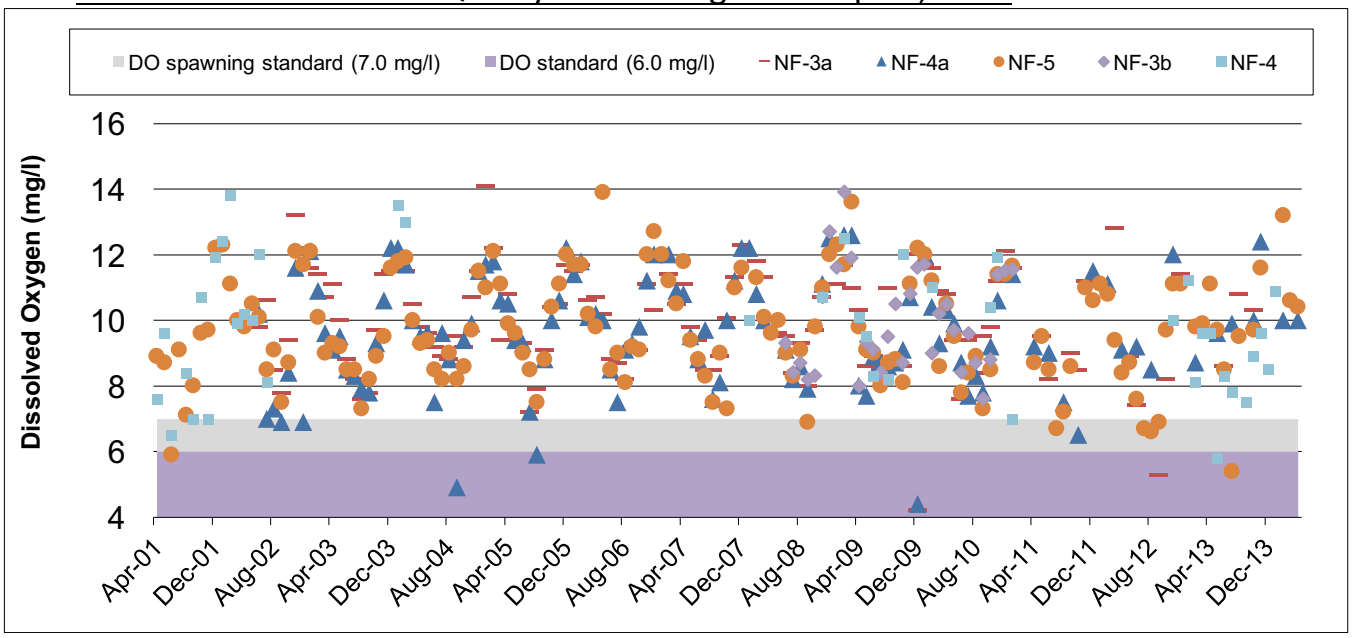

Figure 5-10 Dissolved Oxygen in the Upper North Fork
Note: A result of less than the state standard is in exceedance

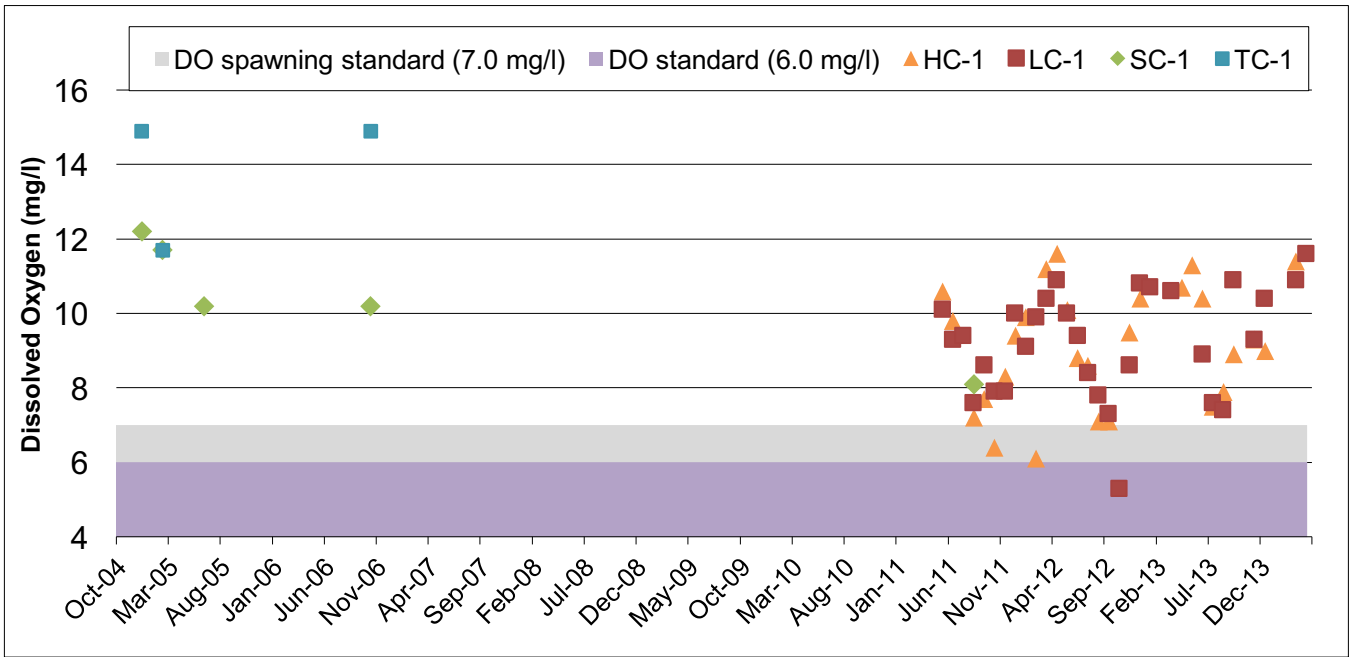

Figure 5-11 Dissolved Oxygen in Lower Tributaries
Note: A result of less than the state standard is in exceedance

Seasonal trends also occur because of the relationship between oxygen and temperature. Cold water has the ability to hold more oxygen. As a general rule, dissolved oxygen is inversely related to temperature. The dissolved oxygen and temperature relationship at station NF-3a is illustrated in Figure 5-12.

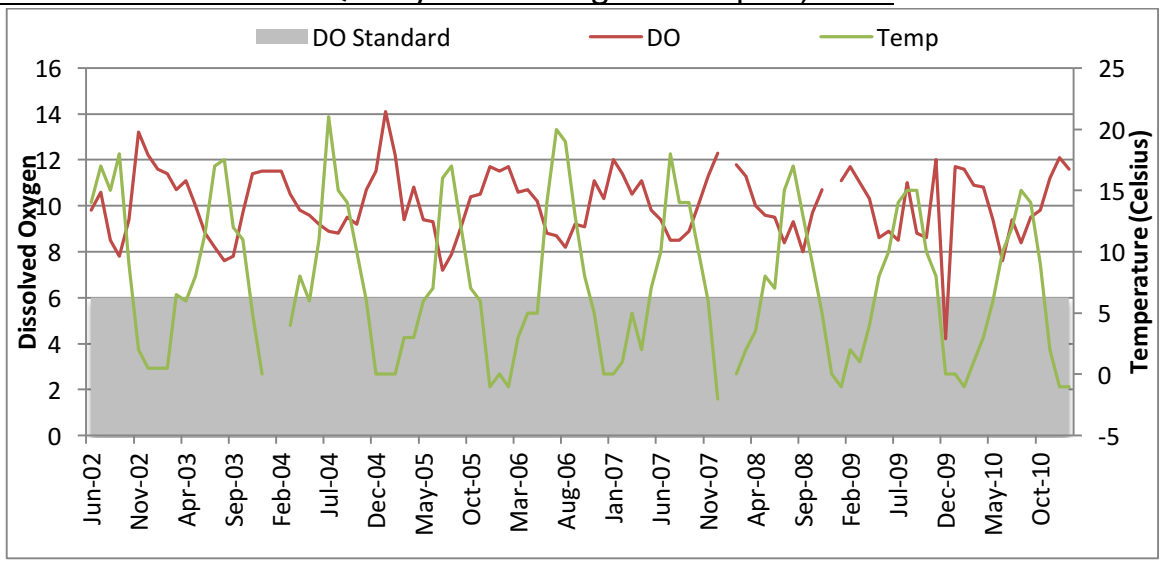

Figure 5-12 Dissolved Oxygen and Temperature at Station NF-3a
Note: A result of less than the state standard is in exceedance

Temperature

Temperature is an important factor for aquatic life. In addition to influencing how much oxygen water can hold, temperature affects the rate of metabolic and reproductive activities. Most aquatic organisms are "cold-blooded," which means they are unable to control their body temperature. Cold-blooded organisms are adapted to specific temperature ranges. The stream segments monitored by the Network's volunteer monitoring program are classified for temperature standards as shown in Table 8.

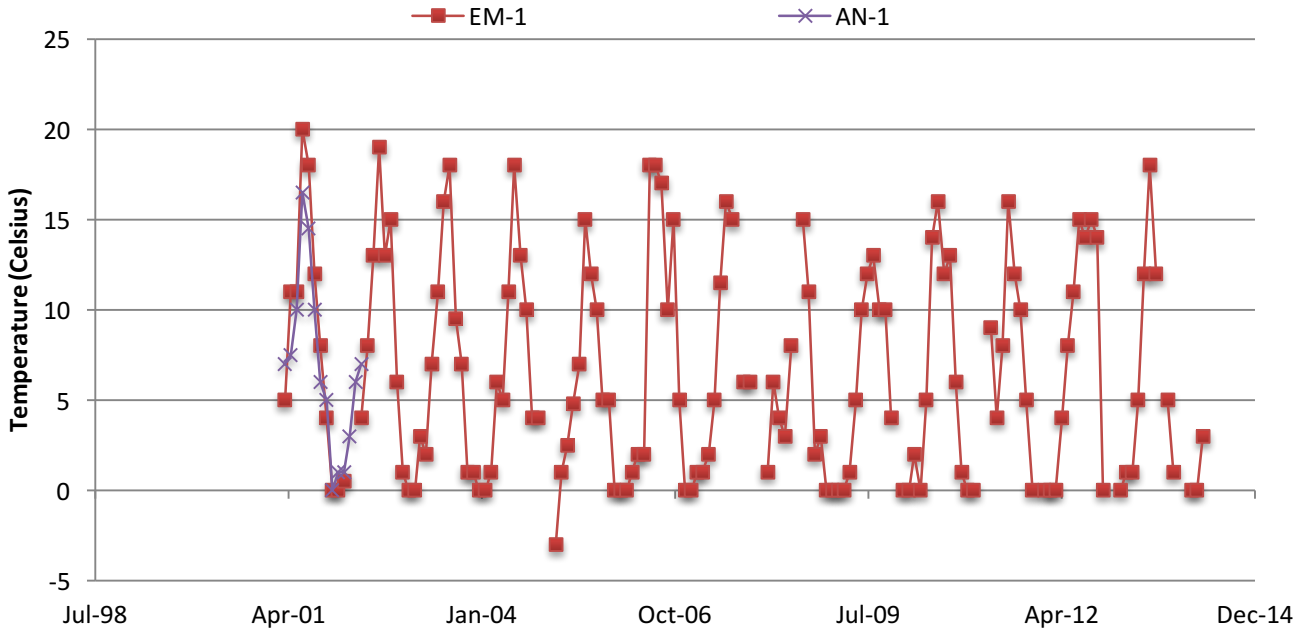

Figure 5-13 through Figure 5-16 show reported monthly temperatures in the North Fork watershed from April 2001 to April 2014. The upper stations (EM-1, AN-1, NF-1 and NF-2) had the coolest temperatures.

The volunteer program typically collects samples in the morning, thus the reported values do not represent the maximum weekly average temperature (MWAT) or daily maximum temperature (DM) to

which the temperature standards areapplied.

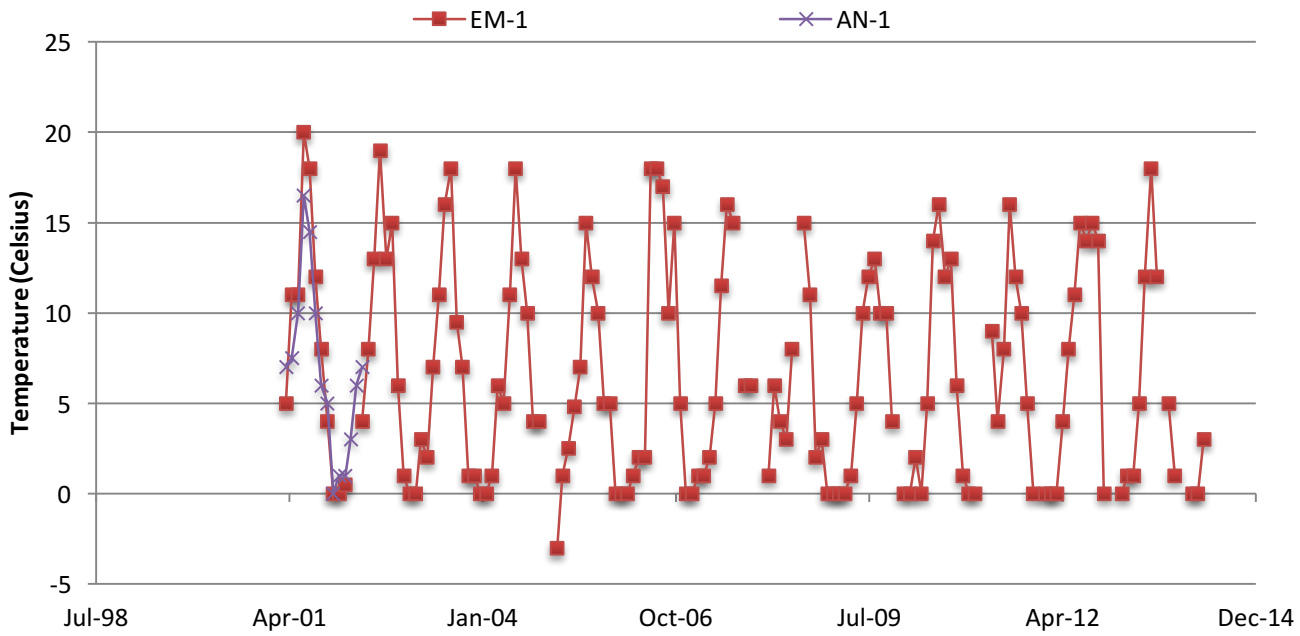

Figure 5-13 River Temperature in Upper Tributaries, Cold Stream I Classified Sites.

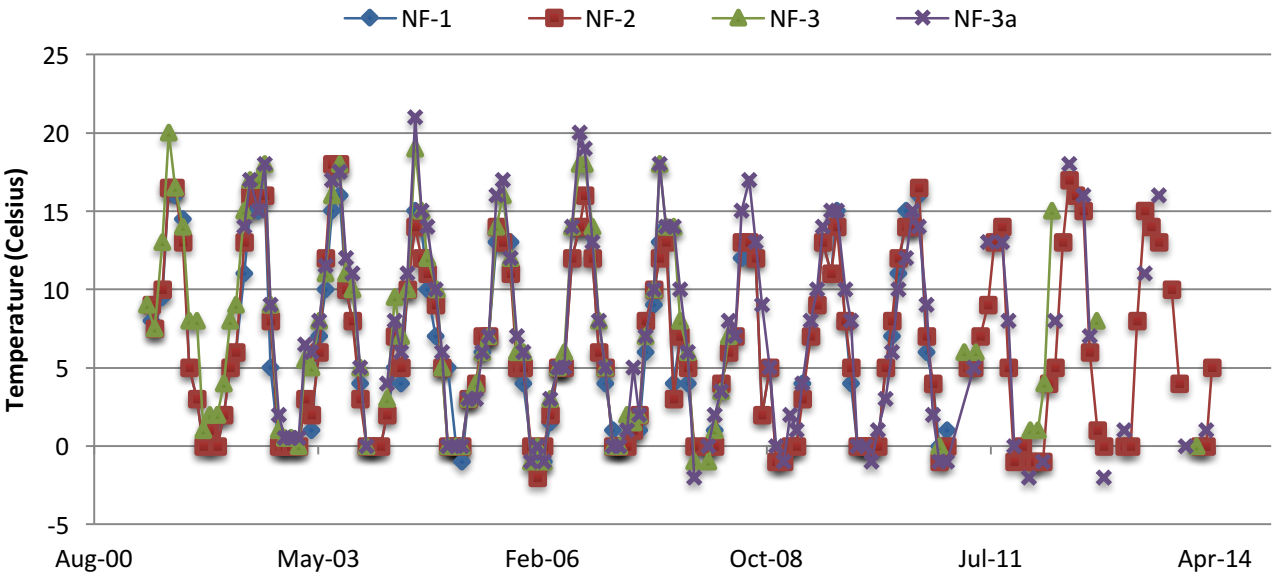

Figure 5-14 River Temperature in the Upper North Fork, Cold Stream II Classified Sites.

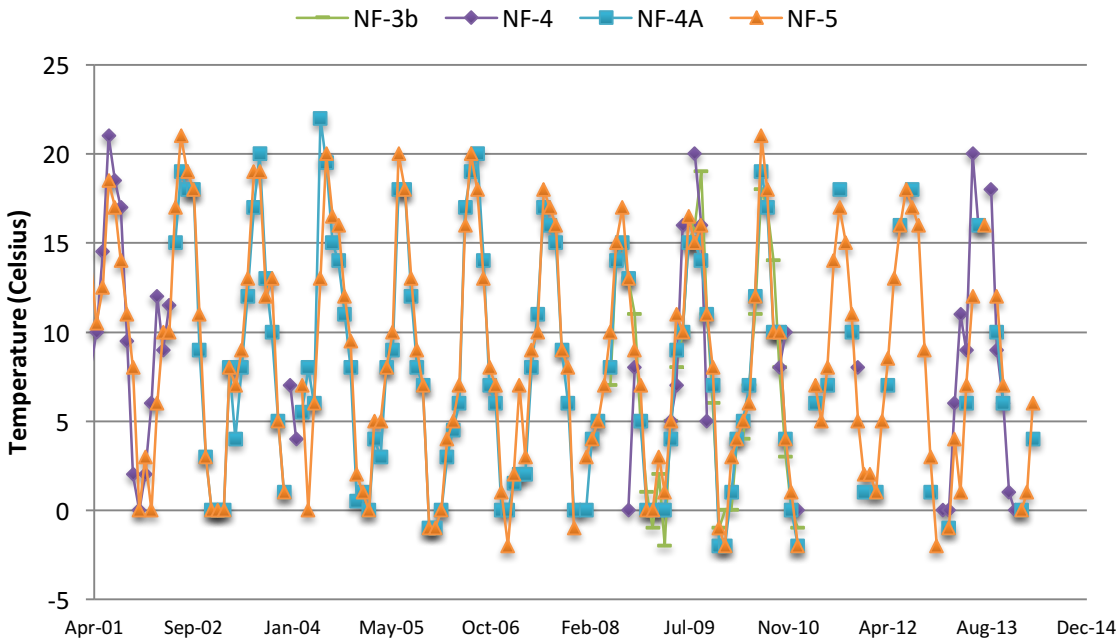

Figure 5-15 River Temperature in the Lower North Fork, Cold Stream II Classified Sites.

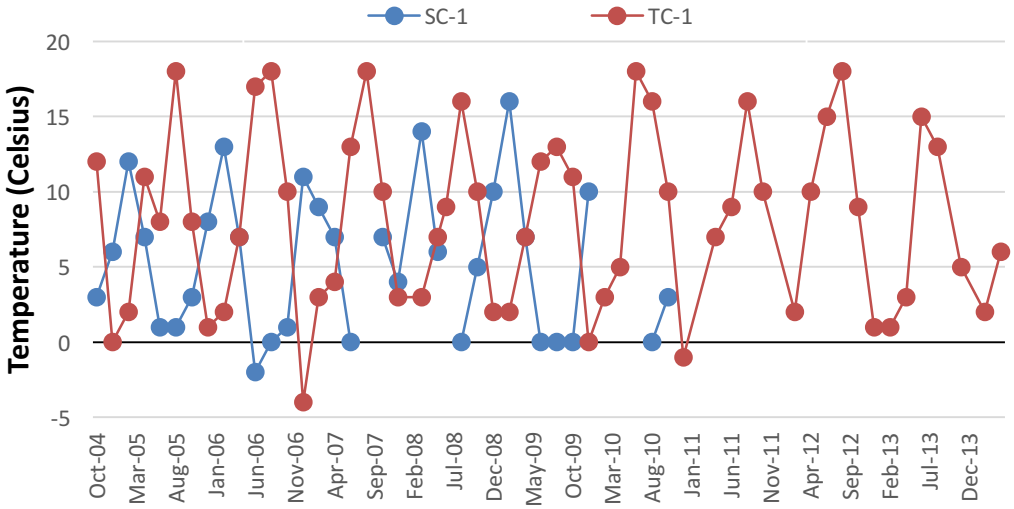

Figure 5-16 River Temperature in Lower Tributaries, Cold Stream II Classified Sites.

6. NUTRIENT AND OTHER INORGANICS DATA

Network nutrient and other inorganic parameters are collected by Network volunteers and analyzed by River Watch staff at the Division of Wildlife laboratory in Ft. Collins. Nutrient and other inorganic parameters include nitrate+nitrite, ammonia, sulfate, total phosphorus, chloride and total suspended solids. The following section summarizes the results from April 2001 to April of 2014. All stations are represented, but Anthracite Creek (AN-1) was not sampled for nutrients and is not included. Surface and Tongue Creeks have very few data points (sample size is four or less for each), but are still included where available. Many of the graphs represent data from select stations. The complete dataset can be found online on the Conservation Center's website: westernslopeconservation.org. Refer to the map in Figure 2-2 for station locations.

Sulfate

In aquatic systems, sulfate concentrations are dependent on the geochemistry of the soils and rocks that water comes in contact with. Common sources of sulfur include gypsum ($CaSO_4$), and other sulfate minerals. Atmospheric deposition from the combustion of sulfur-containing fuels by cars and industrial operations can also contribute sulfate to aquatic systems. In small amounts, sulfur is important to aquatic life. Cells require sulfur to metabolize protein compounds responsible for energy transformations. When combined with metals, sulfur reacts with dissolved oxygen to create sulfate ions and sulfuric acid, which causes the water to become more acidic. Excessive amounts of sulfate in the water, however, can be toxic.

The graph of sulfate concentrations versus time (Figure 6-20) for the North Fork River sites shows a seasonal pattern similar to that of conductivity (see
Conductivity). In addition, the graph indicates that sulfate concentrations in the river increase downstream, as does conductivity. Because conductivity is an analog for TDS and sulfate is a major contributor to the total dissolved solids concentration, the similarity between the two constituents is expected. The sulfate concentration at each site is lowest during the period of spring runoff when snowmelt is the dominant source of water to the river, and highest when there is very little runoff and the dominant source of water to the river is ground water and irrigation return flows. There are no long-term trends in sulfate concentration for the period for which data were collected.

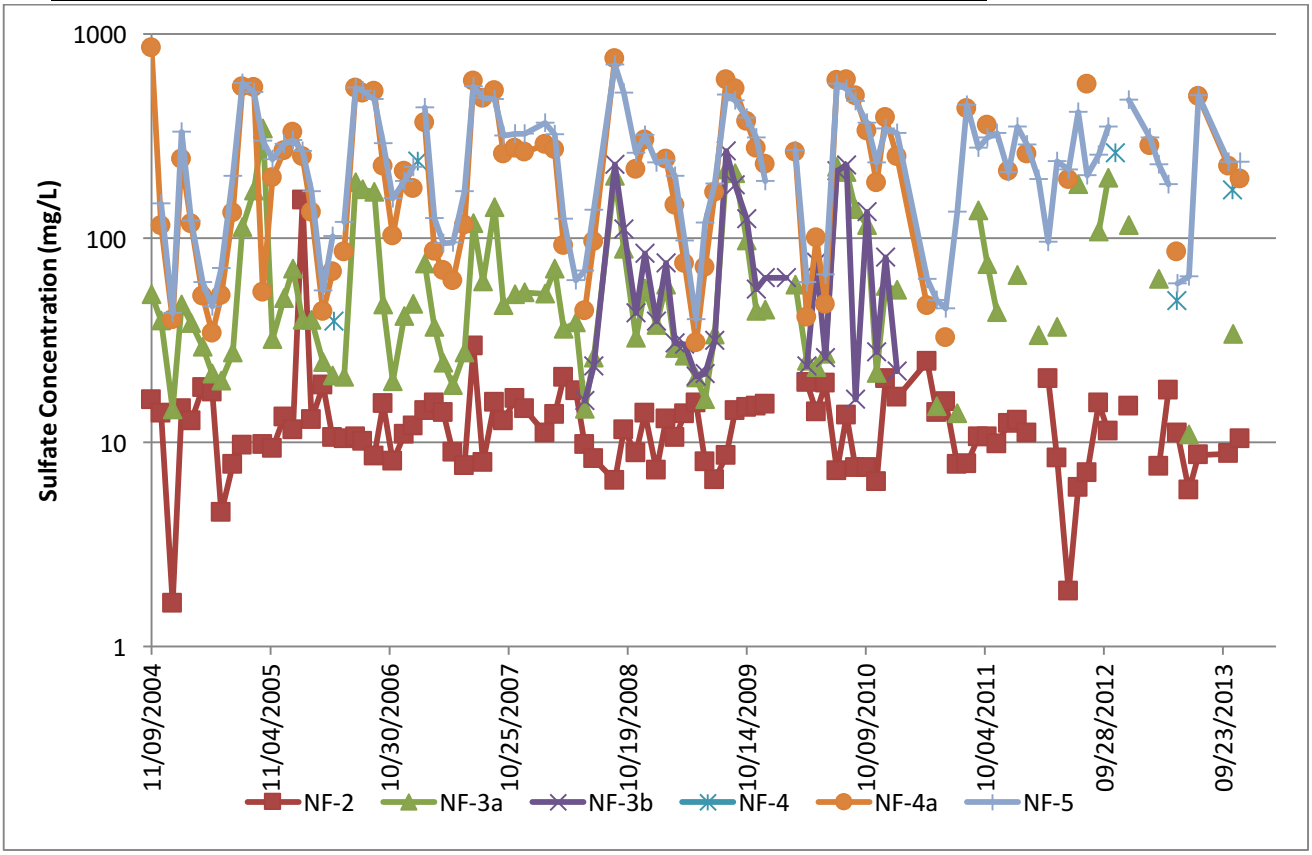

Figure 6-1: Sulfate Concentration

Interestingly, after reaching peak concentrations in July and August, the sulfate concentrations at sites NF-3a, 4a, and 5 decreased in late September/early October and through the winter season. This is consistent with the continuous USGS conductivity measurements near NF-5 and may be related to the end of most irrigation in the fall and therefore a reduction in diversions from the North Fork. Reduced diversions from the North Fork, particularly from upstream areas, would leave more water in the river from low sulfate areas upstream of the Mancos Shale to dilute water from areas draining the Mancos Shale. This observation suggests that diversions for irrigation from the upper reaches of the North Fork result in less water to dilute contributions to the North Fork from tributaries that drain areas of Mancos Shale, resulting in higher dissolved sulfate and TDS concentrations during the summer months.

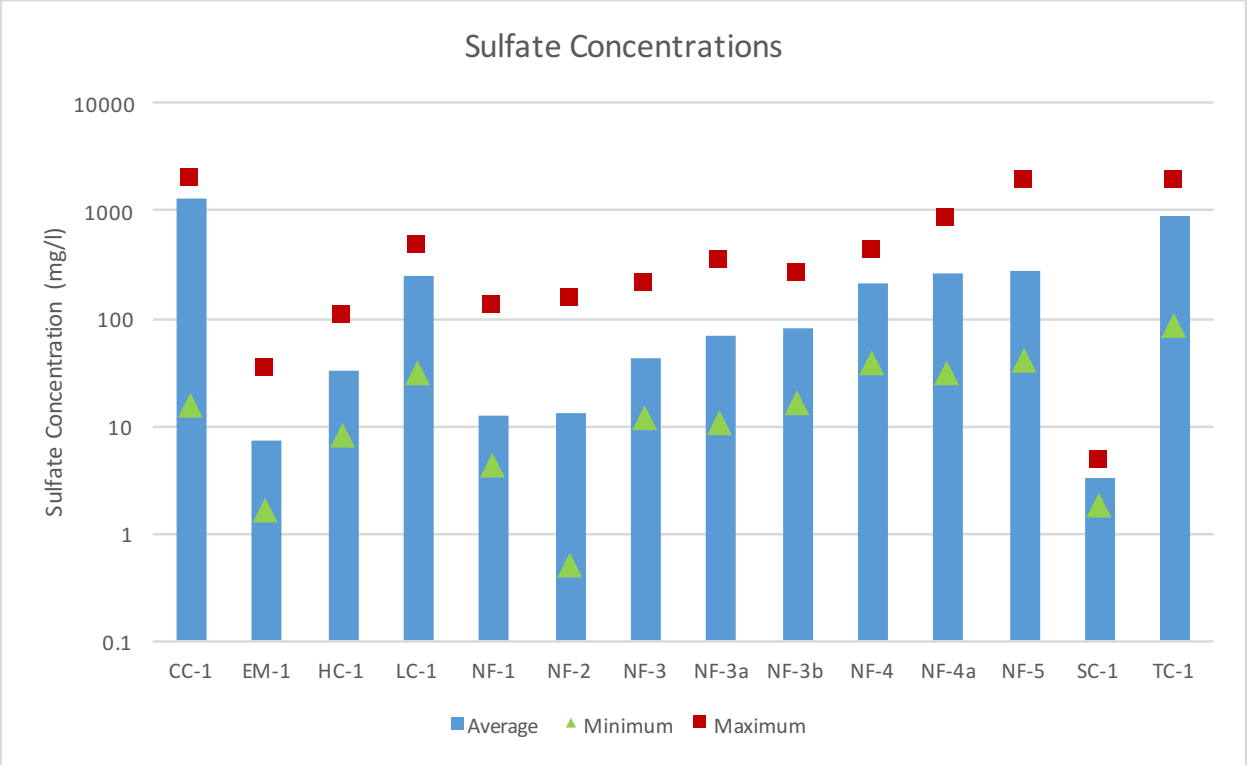

Figure 6-2: Sulfur (Sulfate) maximum, average and minimum at all stations

Sulfate has a secondary drinking water standard of 250 mg/L due to its undesirable taste above this concentration. Secondary drinking water standards are not enforceable, but are intended as guidelines to maintain aesthetic qualities relating to public acceptance of drinking water. Downstream sulfate concentrations regularly exceed the 250 mg/L standard.

Total Suspended Solids (TSS)

Total Suspended Solids (TSS) are the solids in water that are kept in suspension by turbulence in the water column. TSS can include minerals, sediment, decaying plant and animal matter, bacteria and waste material that a river transports. High concentrations of suspended solids can cause many problems for stream health and aquatic life. Suspended materials can clog fish and insect gills, smother spawning beds, impair sight dependent predation, trap sunlight, increase water temperature and possibly lower dissolved oxygen concentrations. There are currently no water quality standards for TSS, although most people consider water with a TSS concentration less than 20 mg/L to be clear. Water with TSS concentrations between 40 and 80 mg/L tends to appear cloudy, while water with concentrations over 150 mg/L usually appears "dirty" [4]. The nature of the particles that comprise the suspended solids may cause these numbers to vary.

[4] http://www.michigan.gov/documents/deq/wb-npdes-TotalSuspendedSolids_247238_7.pdf

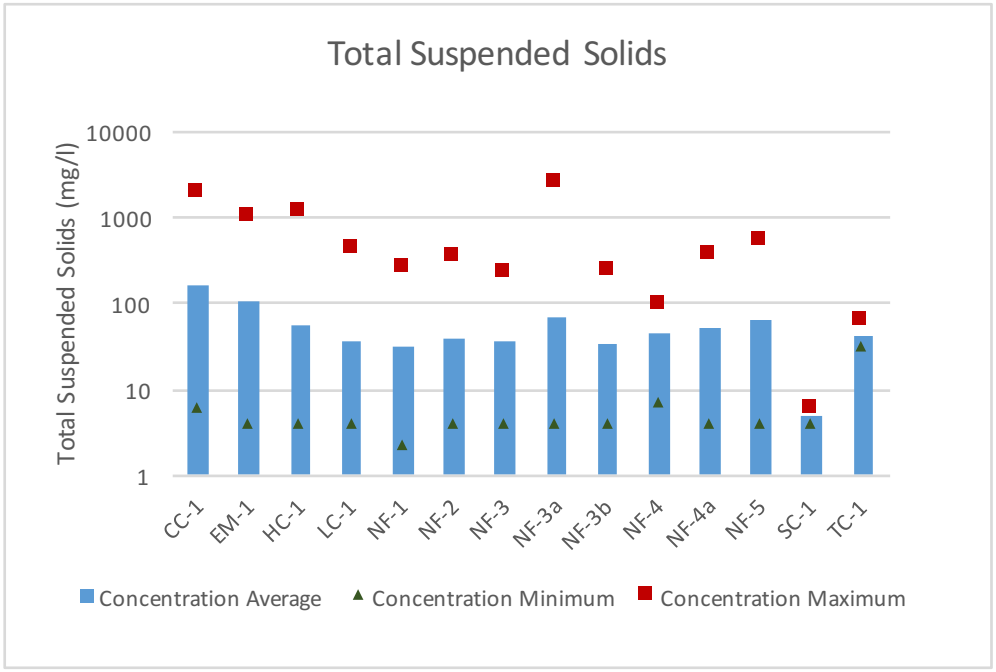

Figure 6-3 Total Suspended solids maximum, average and minimum at all stations at all stations

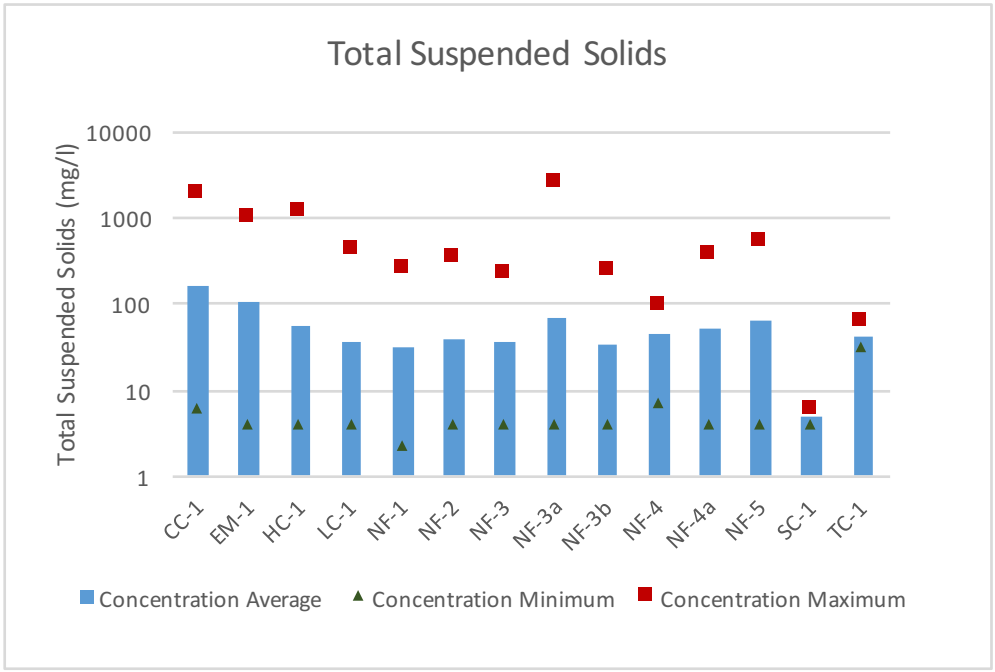

Figure 6-3 shows available data for maximum, minimum and average TSS concentrations in the North Fork for all stations. The TSS concentrations at all stations experience periods of relatively clear conditions and periods of cloudy to extremely turbid conditions. The highest recorded TSS concentration is 2,571 mg/L at station NF-3a on September 12, 2012. Stations EM-1 and CC-1 exhibit the highest TSS concentrations, which likely reflects geological conditions within their watersheds.

Stream discharge is a primary factor affecting TSS concentrations. Fast moving water can transport more particles and larger-sized sediment. As water slows, it loses its holding capacity and deposits the

suspended sediments at the bottom of a stream or lake bottom. The relationship between TSS and flow is not statistically significant, but in general increases in TSS correlate to increases in flow. This relationship is opposite of that with flow and hardness, alkalinity and sulfur; high flow events increase TSS concentrations rather than dilute them. High TSS concentrations correlate to peak flow conditions for nearly all sampling events.

Phosphorus

Phosphorus is a nutrient required by all organisms for the basic processes of life. It is a naturally occurring element found in rocks, soils and organic material. In comparison to the rich supply of the other major nutrients required for metabolism of aquatic life (carbon, nitrogen, oxygen and sulfur), phosphorus is the least abundant and most commonly limits biological productivity. Phosphorus is often referred to as a limiting nutrient in most freshwater systems.

Phosphorus binds tightly to soil particles, metal oxides and hydroxides under aerobic conditions. In clean waters, phosphorous concentrations are typically very low. However, phosphorus is used extensively in fertilizers and concentrated in sewage, so it can be found in high concentrations near human activity. The most significant form of phosphorus is dissolved inorganic phosphorus, or orthophosphate ($PO4^{3-}$). However, over 90% of the phosphorus in freshwater systems occurs as organic phosphates that adhere to inorganic particles[5]. Total Phosphorus (TP) is a measure of all phosphorus constituents in aquatic systems.

Colorado utilizes interim standards described in

Table 6 for total phosphorus that are similar to the EPA's recommendations to control eutrophication (excessive biological activity due to inputs of nutrients). Cold water rivers and streams that do not discharge directly into lakes or reservoirs[6] should not exceed 0.11 mg/L. As shown in Figure 6-4, TP concentrations are below Colorado's interim standards on average, but maximums exceeded the recommended standard.

TP concentrations increased in the spring during snowmelt/spring runoff and decreased during low flow

[5] Wetzel, Robert. 2001. Limnology: Lake and River Ecosystems, 3rd Ed. Academic Press, San Diego. pp 239-240.

[6] Mueller, David K. and Helsel, Dennis R. 1999. "Nutrients in the Nation's Waters--Too Much of a Good Thing?" U.S. Geological Survey Circular 1136. National Water-Quality Assessment Program. http://water.usgs.gov/nawqa/circ-1136.html

conditions in the late summer/fall. TC-1 had the average highest TP concentration of 0.09705 mg/L.

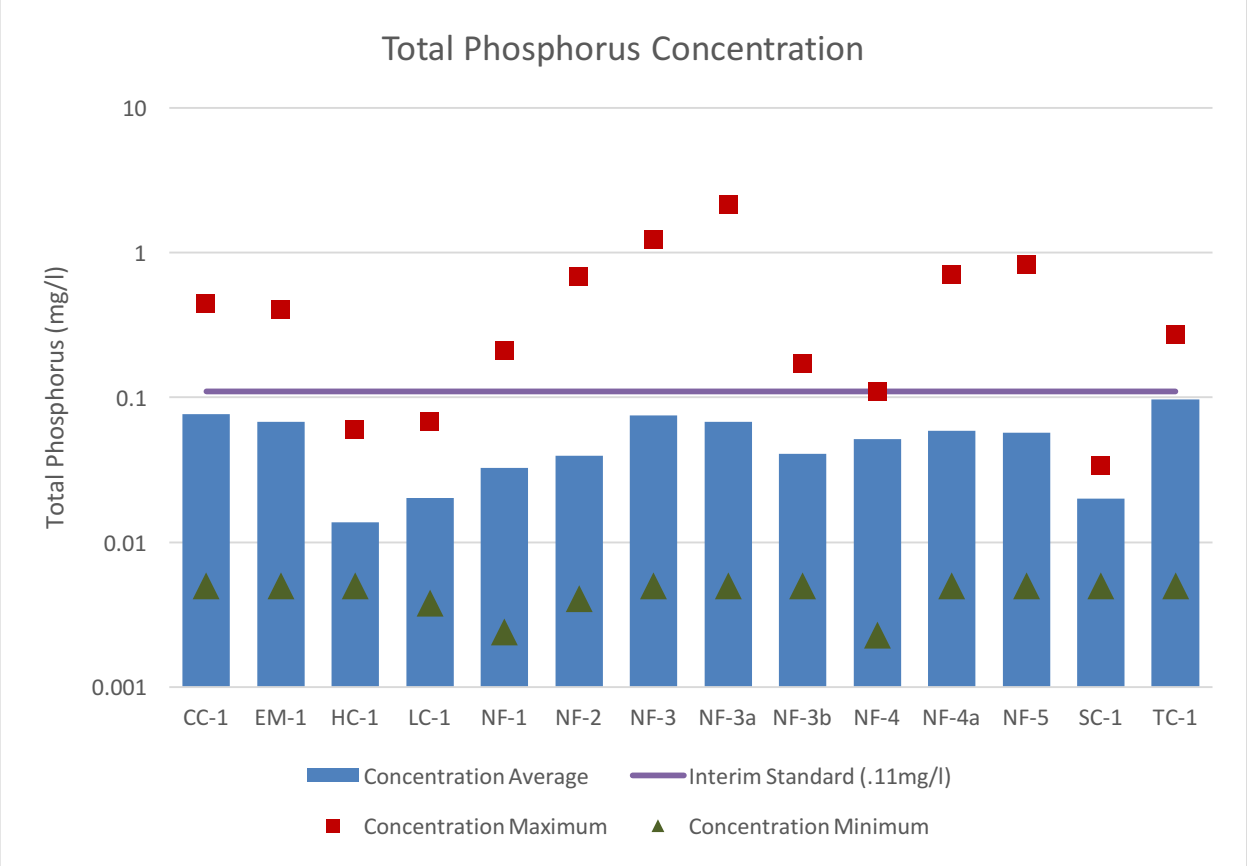

Figure 6-4 Total Phosphorus maximum, average and minimum at all stations

Nitrate and Nitrite

Nitrogen is one of the most abundant elements on earth. Gaseous nitrogen comprises about 80% of the air we breathe. Nitrogen is found in cells of all living things and is a major component of proteins. Inorganic nitrogen may exist in the free state as a gas N_2, or as nitrate NO_3^-, nitrite NO_2, or ammonia NH_3^+. Nitrate and nitrite are oxidized forms of nitrogen that together normally constitute most of the dissolved nitrogen in well aerated streams. Nitrite readily oxidizes to nitrate in natural waters; therefore, nitrate is generally by far the more abundant of the two forms.

Nitrogen-containing compounds act as nutrients in streams and rivers. At high concentrations, nitrate can overstimulate the growth of aquatic plants and algae (known as eutrophication), resulting in high dissolved oxygen consumption, causing fish and other aquatic organism mortality. At high enough concentrations, nitrate can limit the ability of red blood cells to transport oxygen. In fish, this condition is known as “brown blood disease,” and in humans it is called methemoglobinemia, or "blue baby" disease.

Nitrate concentrations at all of the monitored sites did not come close to approaching the $N0_3$ standard (10mg/L) or the interim total nitrogen standard.

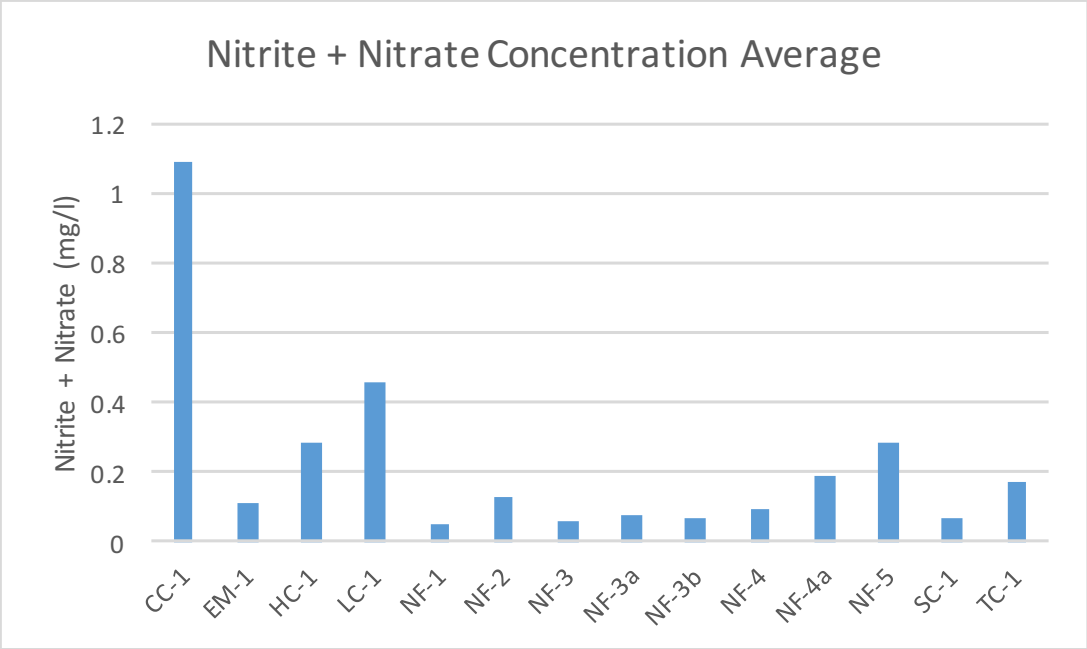

Figure 6-5 Nitrate+Nitrite average concentration at all stations

Nitrate + nitrite concentrations in the North Fork were highest during the winter, but still remained well below the standards. The data show that winter nitrate + nitrite concentrations increase moving downstream. Nitrate and nitrite are both very soluble and do not bind to soils, so they have a high potential to migrate through groundwater. Groundwater may be a source of nitrate and nitrite to the river, resulting in higher concentrations when stream flow is lower. Other sources that would be less diluted during the winter during low flow conditions may be septic systems, livestock, and wastewater treatment effluent.

Ammonia

Ammonia is a form of inorganic nitrogen. The least stable form of nitrogen in water, ammonia is easily transformed to nitrate or nitrogen gas. Ammonia is found in water in two forms: the ammonium ion (NH_4^+) and the dissolved, unionized (no electrical charge) ammonia gas (NH_3). Total ammonia is the sum of ammonium and unionized ammonia. The dominant form depends on the pH and temperature of the water.

NH_3 is the principal form of toxic ammonia. Exposure to high concentrations of ammonia in humans can cause loss of equilibrium, convulsions, coma, and death. Ammonia concentrations can affect hatching and growth rates of fish; changes in tissues of gills, liver, and kidneys may occur during structural development.

The State of Colorado has developed chronic and acute table value standards (TVS) for ammonia based on temperature and pH. The chronic standard is 2.21 mg/L, and in most instances, ammonia concentrations are very low.

7. METALS DATA

Network metal parameters are collected by Network volunteers and analyzed by River Watch staff at the Division of Wildlife laboratory in Fort Collins. Metals sampled include aluminum, arsenic, cadmium, calcium, copper, iron, manganese, lead, magnesium, selenium and zinc. The following metal results include samples collected from April 2001 through October 2014. The results are based on all available data and provide general information regarding comparison against state metal standards. The following is a chart of date ranges for each station:

Station	Beginning	End
EM-1	4/25/01	11/13/13
AN-1	4/25/01	4/10/02
NF-1	4/25/01	11/10/10
NF-2	4/25/01	11/13/13
NF-3	4/4/01	1/29/14
NF-3a	6/12/02	8/14/13
NF-3b	6/11/08	11/10/2010
***NF-4**	04/23/2001	01/29/2014
NF-4a	06/12/2002	11/13/2013
NF-5	04/25/2001	11/13/2013
***CC-1**	01/11/2005	05/24/2005
HC-1	04/13/2011	11/13/2013
LC-1	04/13/2011	11/13/2013
***SC-1**	10/19/04	10/08/14
***TC-1**	10/19/04	10/08/14

Table 15: Metals Sampling Date Ranges for Each Station

*Stations with an * have Riverwatch data available for prior dates, but it was not collected by the Network and therefore was not reported herein.*

In general, metal concentrations appear to be lower during spring runoff due to dilution and higher during late summer low flow conditions. The graphs below illustrate patterns and concentrations in relation to state metal standards.

Information regarding complete metals dataset can be found in Appendix A. Refer to the map in Figure 2-2 for station locations.

Standards in this section were calculated using State of Colorado classifications and numeric standards for the North Fork of the Gunnison River[7]. Copper, cadmium, lead, and zinc standard calculations are based on hardness values at the time the metals were collected. Aquatic life standards are generally applied to the dissolved metals because this measurement provides a better representation of the biologically available fraction of a metal than total metals, which are present in the particulates in the water. The

[7] This report identifies instances when discrete water samples exceeded state water quality standards, as determined by the WQCC. For regulatory purposes, the state applies the 85th percentile methodology when determining if segments violate water quality standards. The 85th percentile methodology allows for 15 percent of the data for a given segment to exceed standards without being in violation of water quality standards. See the WQCC Basic Standards Methodologies for Surface Water (Regulation No. 31) for more information.

formulas used to determine numeric standards are from the Colorado Department of Public Health and Environment Water Quality Control Commission, 5 CCR 1002-35, Regulation No. 35: Classifications and Numeric Standards for Gunnison and Lower Dolores River Basins. Average hardness for each site was used to calculate standards, as opposed to the hardness reading for each sample taken.

Station	Average Hardness (mg/L)
EM-1	122
AN-1	64
NF-1	75
NF-2	81
NF-3	155
NF-3a	193
NF-3b	199
NF-4	310
NF-4a	398
NF-5	518
CC-1	979
HC-1	118
LC-1	491
SC-1	105
TC-1	624

Table 16: Average Hardness used to calculate standards at each station

Aluminum

Aluminum is the most abundant naturally occurring metal in the earth's surface and comprises, on average, about eight percent of the earth's crust. Geologic formations are, therefore, common sources of aluminum in aquatic systems.

In humans, aluminum has been shown to be neurotoxic if it enters the bloodstream. Aluminum toxicity can cause encephalopathy (defect of the brain) and/or bone mineralization disorders. Aluminum toxicity is driven by pH. At low pH concentrations, aluminum toxicity has been documented in invertebrates, fish and amphibian larvae. Aluminum can interfere with cation exchange, electrolyte balance, calcium absorption and respiration in aquatic life. Aluminum is also reported to cause fragile eggs in birds.

Colorado has developed aluminum standards for aquatic life based on pH and hardness based on total recoverable aluminum; however, unless a stream segment is at risk of high dissolved aluminum concentrations, the standard is not included in stream segment standards. The stream segments evaluated do not have aluminum standards.

High total aluminum concentrations are characteristic of spring snowmelts/runoff periods. Spring snowmelt, naturally acidic, can liberate naturally occurring aluminum from geologic sources into stream systems. The highest aluminum concentrations were detected during spring runoff, when TSS concentrations were high, and the lowest concentrations were measured during summer and fall low flow.

Arsenic

Arsenic is a naturally occurring element in rocks, soils and the water in contact with them. It is known to cause cancer in high doses, and Colorado has developed numeric standards for dissolved arsenic concentrations. All stations have a water supply standard of .02 µg/L, except Cottonwood Creek (CC-1),

which is not classified for water supply and has a 100 µg/L agricultural standard. The River Watch Laboratory arsenic reporting limit is 15 µg/L.

From late 2006 to early 2008, arsenic concentrations consistently exceeded River Watch laboratory reporting limits, unlike samples collected prior to and after this period. This indicates a problem with the laboratory results during late 2006 to early 2008. After evaluating the data, the Conservation Center has not included the late 2006 to early 2008 results in its analysis.

The average and mode concentration for all stations from 2001 through 2014 was less than the reporting limit of 15 µg/L. Due to the high reporing limit, it is not known of the water supply standard was exceeded, but it is known that in Cottonwood Creek, where all results were less than the reporting limit, the agricultural standard was not exceeded. On one occasion, the total arsenic concentration exceeded the reporting limit (at CC-1 in July 2015 the total arsenic concentration was 44 µg/L) and on one occasion the dissolved arsenic concentration exceeded the reporting limit (at NF-5 in March 2013 the dissolved arsenic concentration was 40 µg/L).

Cadmium

Cadmium is an element that is non-essential for life and is a potential carcinogen. It is widely distributed in the environment at low concentrations. Colorado has hardness based aquatic life standards for cadmium, and every sample site exceeded both chronic and acute standards.

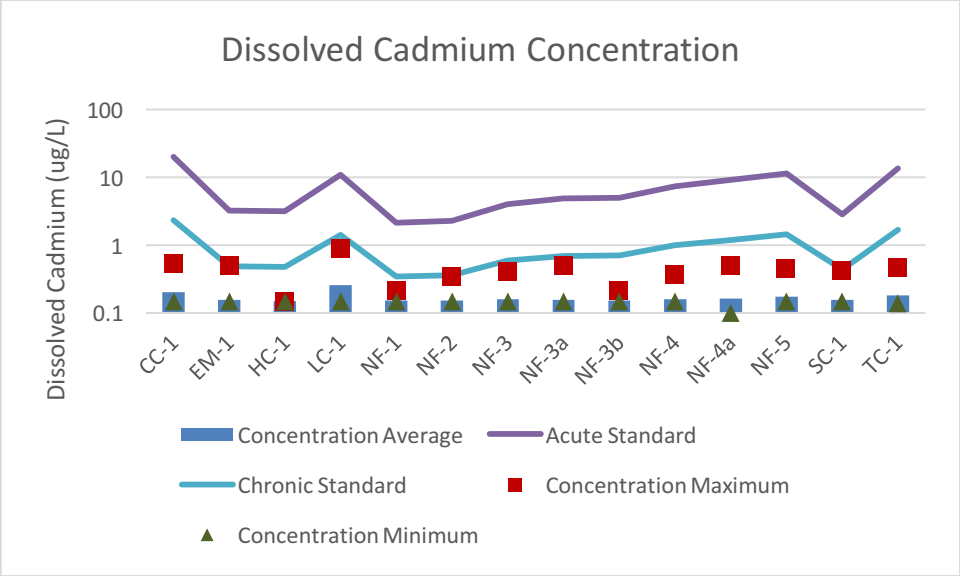

Figure 7-1: Dissolved Cadmium Concentration

Calcium

Calcium is the most abundant cation in the world's rivers. One of the most important contributors to hardness, calcium is found in water due to the leaching of soils or from anthropogenic sources such as sewage and industrial wastes. Calcium influences the growth and population dynamics of aquatic life. It is required for plant, animal and bacteria to maintain structural and functional integrity of cell membranes. There are no water quality standards for calcium.

High calcium concentrations are a characteristic of highly calcareous soils in the watershed. In general, dissolved calcium concentrations increase as water travels downstream through the watershed. Calcium concentrations at station NF-4, NF-4a, LC-1 and TC-1 are higher than other stations at all times of the year, except during spring runoff when it is diluted to nearly the same concentration as stations higher in the watershed. The highest recorded calcium concentration was 483 mg/L at station CC-1 on May 9, 2014.

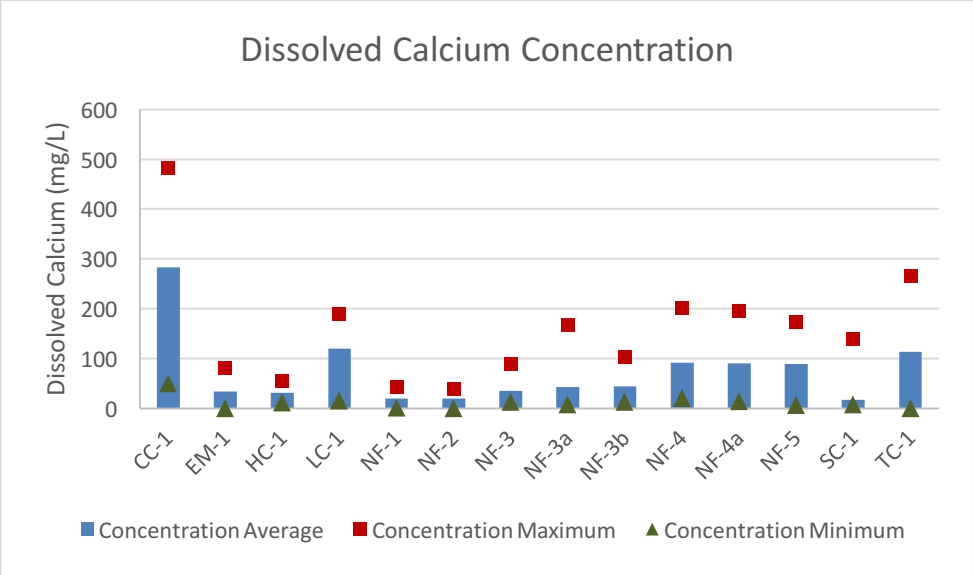

Figure 7-2 Average, Maximum and Minimum Dissolved Calcium values (mg/L)

Copper

Copper is a naturally occurring trace element. At low concentrations, copper is an essential micronutrient that is used in cellular metabolism and oxygen transport. At high concentrations, copper can be toxic to aquatic life. The state of Colorado has developed hardness-based aquatic life standards for copper.

Figure 7-3 shows dissolved copper concentrations for all stations.

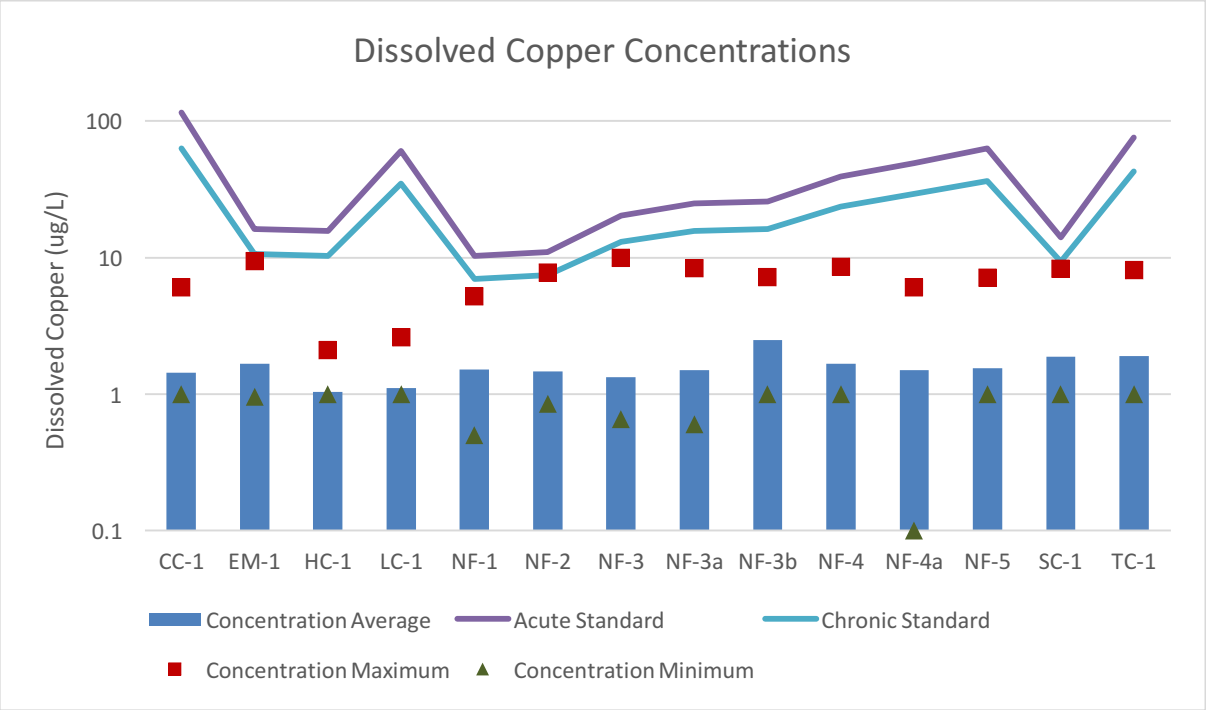

Figure 7-3: Dissolved Copper Concentrations (µg/L)

Iron

Iron is the fourth most abundant element, by weight, in the earth's crust. It is naturally present in aquatic systems but in variable amounts depending on the local geology. It is an important micronutrient that is required for life in small quantities, but can be toxic in excessive amounts. Iron is normally present in waterways in its soluble ferrous form (Fe^{2+}). However, iron is easily oxidized into its insoluble form, ferric iron (Fe^{2+}). In alkaline streams, such as the North Fork, iron primarily exists in colloidal and particulate (solid) forms. This is because iron solubility is very low above pH 5 (Wetzel 2001).

Sections of segment COGUNF06A, Cottonwood Creek (CC-1), are on the State Monitoring and Evaluation list for total recoverable iron.

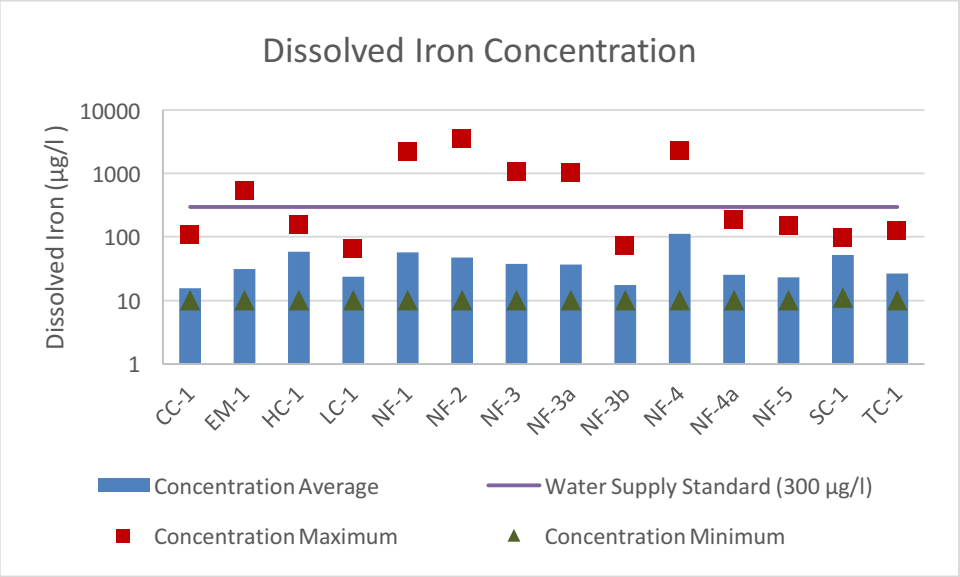

Figure 7-4 shows dissolved iron concentrations in the North Fork at all stations. The dissolved iron standard (300 µg/l) was exceeded twice at NF-1 (August 2001 and May 2009), once at NF-2 (May 2005) and multiple times at NF-3a, NF-4, NF-4a and NF-5. In many Colorado streams, high iron concentrations are due to natural occurrences.

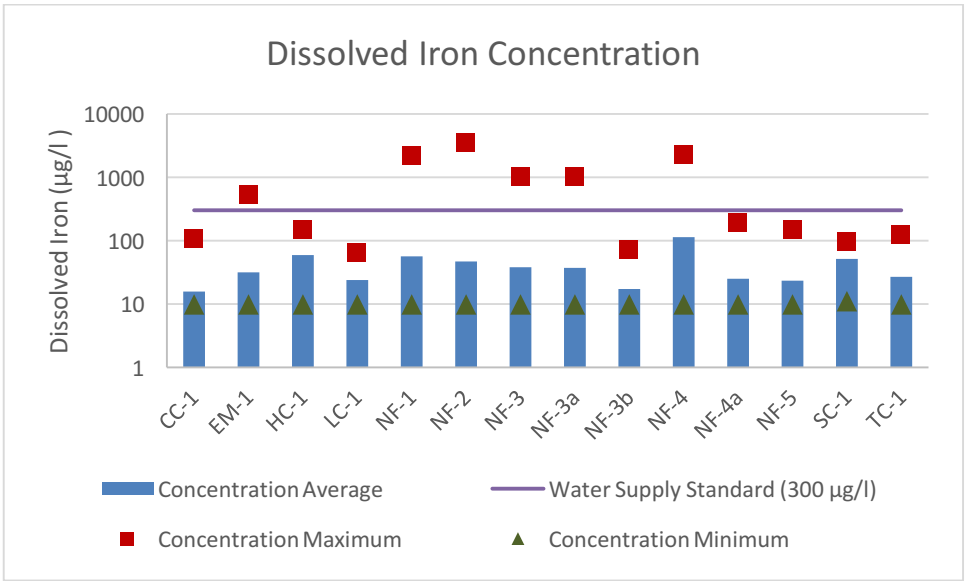

Figure 7-4 Dissolved Iron Concentrations at all Stations (µg/L)

Lead

Lead is toxic to aquatic life in the 10-100 µg/L range (River Watch 2006). Natural occurrences of lead in aquatic systems are rare. Lead commonly occur in ores with zinc, silver and copper. Lead concentrations in the North Fork are very low. Only 11% of the reported total lead concentrations exceeded the River Watch laboratory reporting limit of 3 µg/L during the reporting period.

Lead concentrations were well below the acute standard. Sample averages exceeded the chronic standard at NF-1, NF-2, and SC-1.

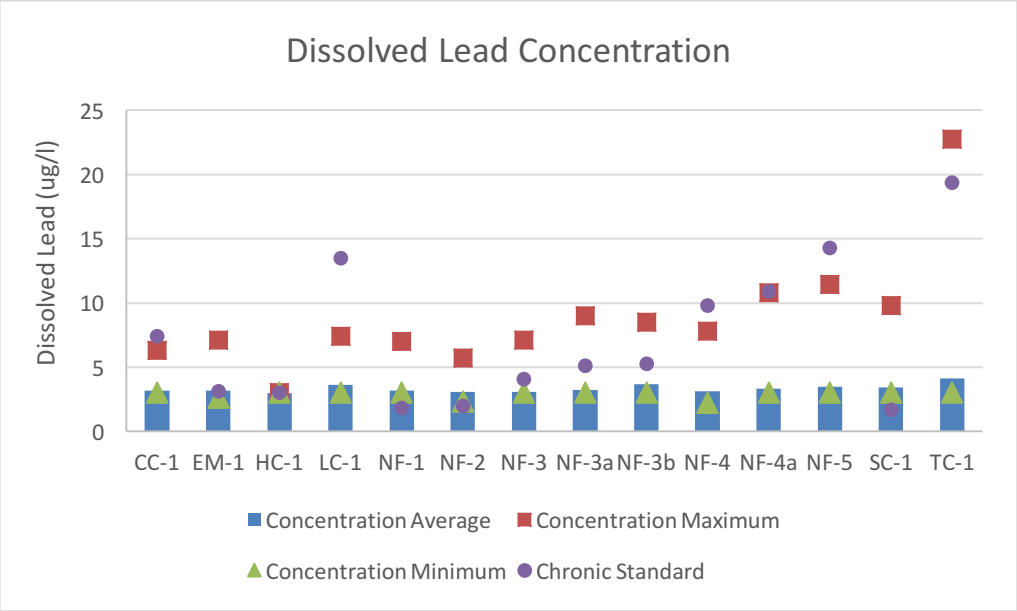

Figure 7-5: Dissolved Lead Concentration

Manganese

Manganese is a naturally occurring free (uncombined) element that usually occurs with iron. It is an essential element in plant and animal metabolism, but toxic in excessive amounts. Colorado has hardness based-standards for manganese.

Maximum dissolved manganese values exceeded the 50 µg/L drinking water standard at most sites. CC-1 is the only sampling site that is not classified as a water supply stream segments. CC-1 was evaluated against the agricultural standard of 200 µg/L, which was not exceeded.

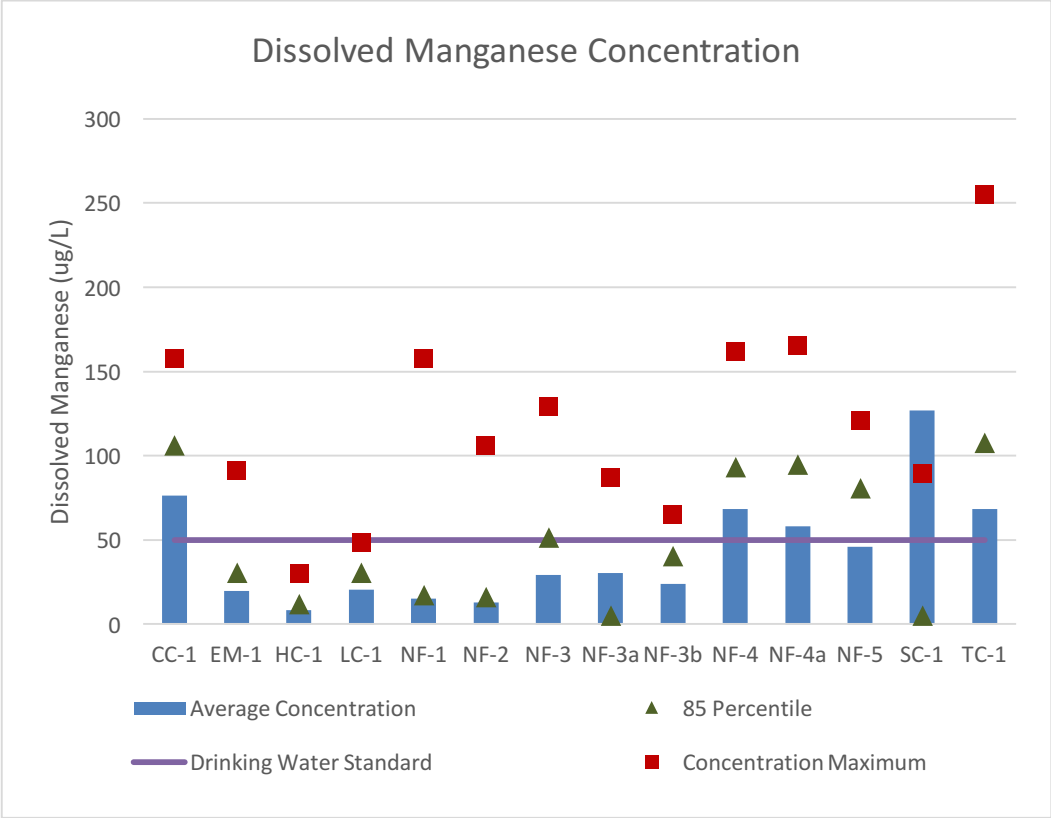

Figure 7-6 Dissolved Manganese Concentrations (µg/L)

Magnesium

Like calcium, magnesium is a major component of hardness and is primarily derived from the weathering of rocks. Magnesium is much more soluble than calcium and rarely precipitates. There are no water quality standards for magnesium.

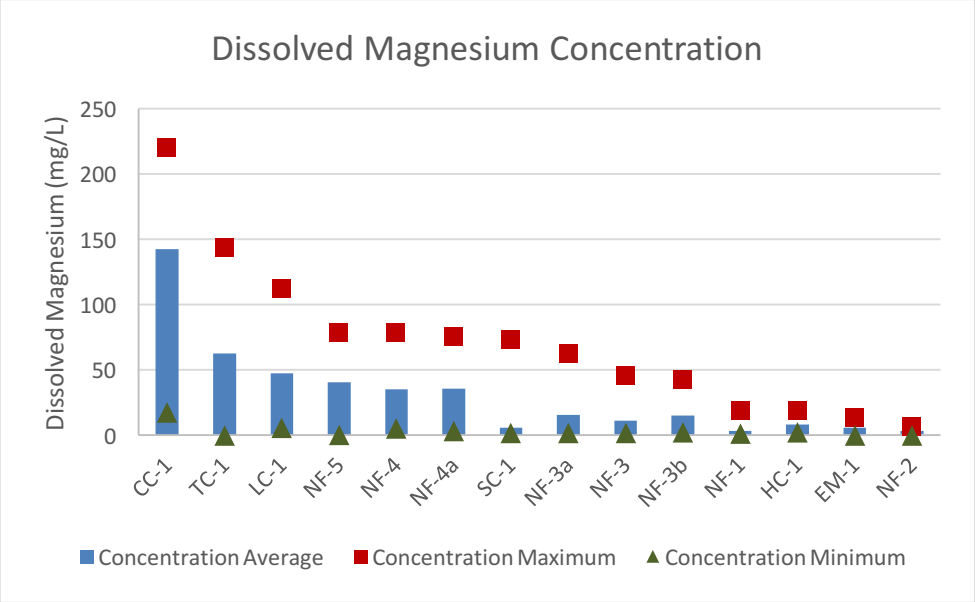

Figure 7-7 shows average, minimum and maximum magnesium concentrations. The highest reported total magnesium value in the North Fork, 220 mg/L, was on March 10, 2013 at CC-1. In general, total

magnesium concentrations increased in the lower watershed.

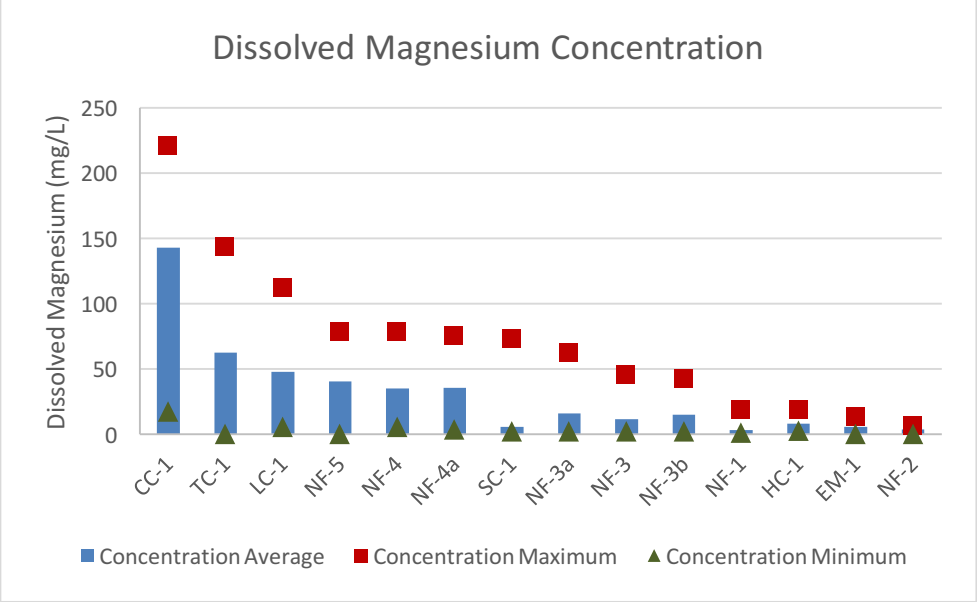

Figure 7-7 Average, Minimum, and Maximum Dissolved Magnesium Concentrations (mg/L)

Selenium

In the North Fork watershed, selenium is commonly associated with the Mancos shale, which is present throughout western Colorado. Locally, these soils are called "adobe."

Selenium is a naturally occurring trace element that is needed for metabolism in aquatic life and humans. Selenium is a bioaccumulative metal and subject to a range of toxicity values depending upon numerous site-specific variables. Selenium is known to cause reproductive failure and deformities in fish and aquatic birds[8]. Significant human consumption of fish containing high concentrations of selenium may result in human health problems. Selenium is widely distributed in rocks, soils and living organisms. Selenium may be leached from the soil into local waterways when water used for irrigation and other purposes passes through soils derived from the Mancos shale.

Irrigated agriculture can increase the amount of selenium in surface awater and groundwater. Deep percolation from irrigation can mobilize large quantities of selenium in groundwater, where it eventually may discharge to surface water. The Gunnison/Grand Valley Selenium Task Force has been studying selenium for over a decade. The Taskforce found that upstream of major irrigated areas in the Gunnison basin, selenium concentrations are generally less than 1 µg/L, but downstream from irrigated areas selenium concentrations of surface waters often exceeded 5 µg/L[7].

The State of Colorado has numeric standards for dissolved and total recoverable selenium (Table 2-7). Selenium is designated as a Colorado Monitoring and Evaluation parameter by the State for East Muddy Creek (EM-1) and Tongue Creek (TC-1) and Surface Creek are on the 303(d) list for selenium.

[8] http://www.seleniumtaskforce.org/aboutselenium/whatistheproblem.html

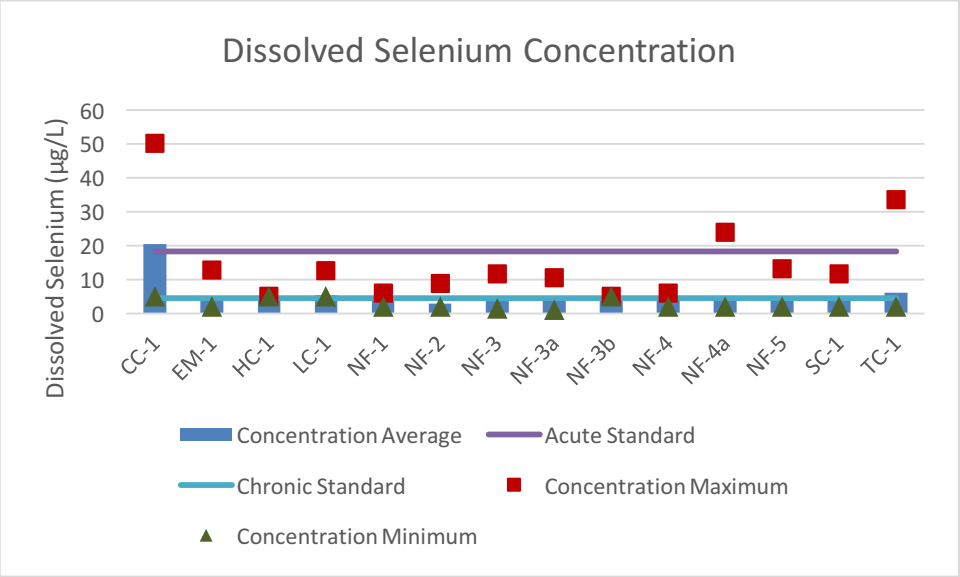

Figure 7-8 shows that dissolved selenium concentrations at all monitored stations exceeded state aquatic life standards. Due to laboratory QA/QC issues, only selenium data collected prior to 2007 were used for this report.

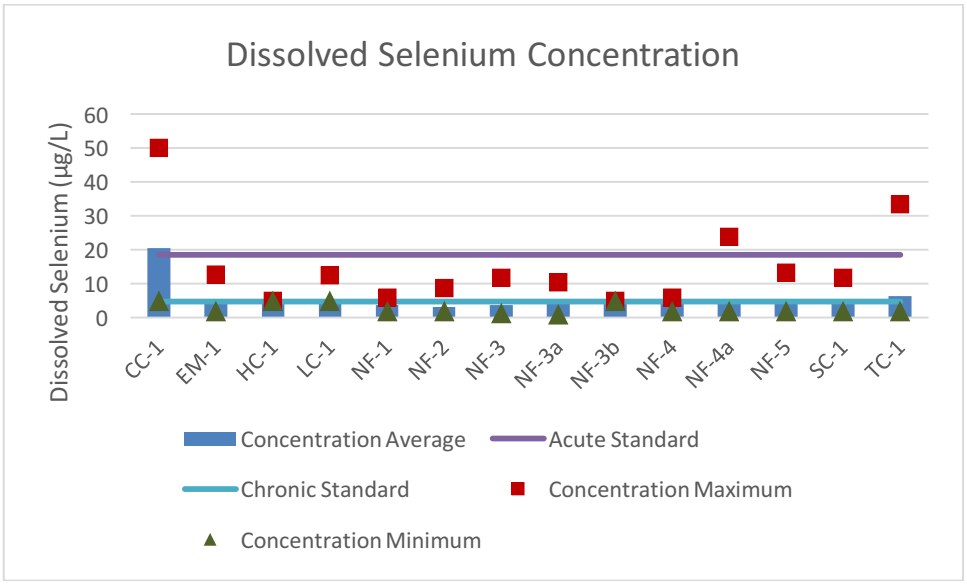

Figure 7-8 Dissolved Selenium Concentrations (µg/L)

Average concentrations for stations CC-1, HC-1, LC-1, NF-3b, NF-4, NF-4a, NF-5, SC-1, and TC-1 all exceeded the chronic water quality standard for selenium during the time of sampling up to 2007. Cottonwood Creek (Station CC-1) had the consistently highest reported selenium concentrations, with the highest being 50 µg/L for dissolved selenium and 48.5 µg/L for total selenium.

Due to the concentrated efforts of the Selenium Task force and local ranchers and farmers, irrigation water lower in the watershed is increasingly being piped rather than being moved via unlined ditches. This may decrease selenium concentrations in future water samples.

Zinc

Zinc is a naturally occurring element that is essential for cell growth. It can bioaccumulate and is toxic to aquatic life at concentrations above 50 µg/L in waters with low hardness (River Watch 2006). Dissolved zinc concentrations in the North Fork were below both the acute and chronic standards.

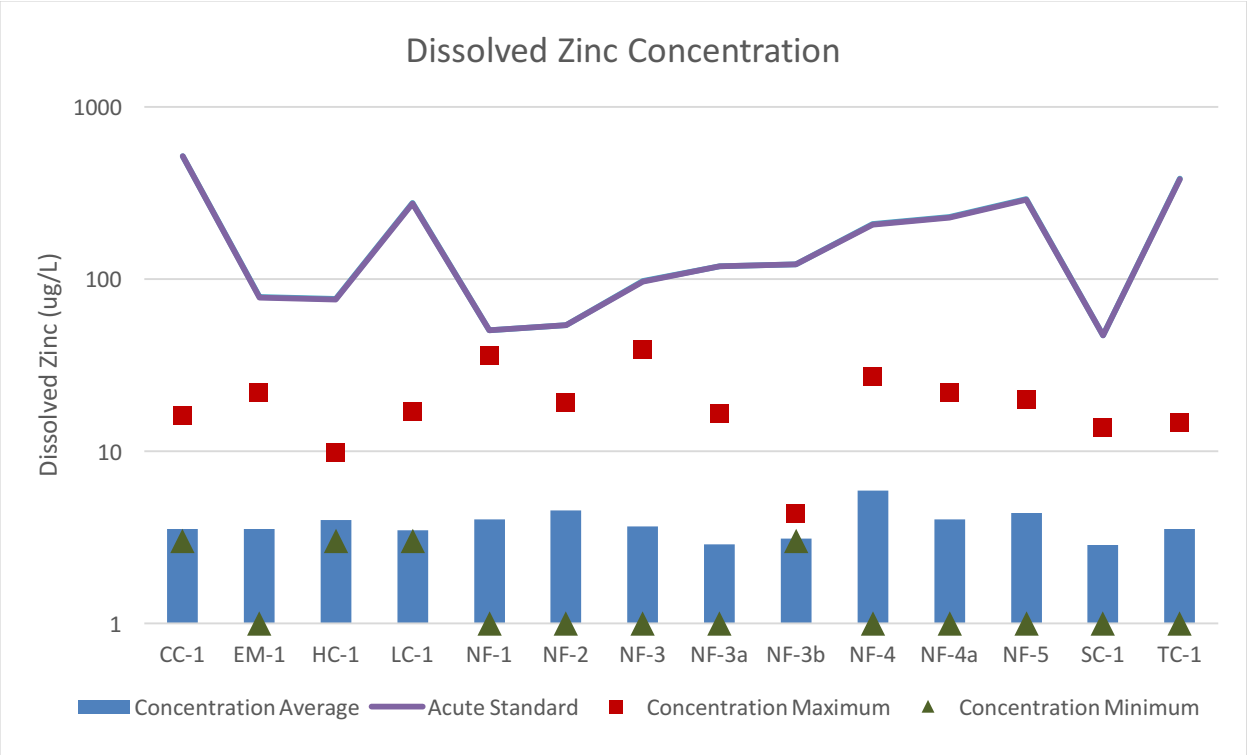

Figure 7-9 Dissolved Zinc Concentrations (µg/L)

8. BACTERIA DATA

Total coliform bacteria is a collection of relatively harmless microorganisms that live in the intestines of warm and cold blooded animals and aid in digestion. Fecal coliforms are a subset of intestinal bacteria that are associated only with the fecal material of warm-blooded animals. The most common type of fecal coliform is *Escherichia coli (E. coli).*

The presence of *E. coli* in aquatic environments indicates that water has been contaminated with fecal materials from sewage or animal waste. This is an important water quality indicator because the presence of fecal contamination means water may be contaminated by waterborne pathogenic diseases such as typhoid fever and hepatitis. *E. coli* can be washed into water ways during rainfall, snow melt and other precipitation events. Sources of *E. coli* in the North Fork watershed may include livestock, septic systems, and wildlife. The survival of waterborne pathogens, such as *E. coli*, in streams and rivers is variable. Conditions such as turbidity, oxygen, presence of nutrients and pesticides, pH, organic matter, and solar radiation can impact pathogen survival rates[9]. In particular, bacteria are known to have significantly longer survival times in sediment- laden waters[10].

Measured *E. coli* concentrations were compared to the Colorado Depatment of Public Health and Environment Water Quality Control Commission Natural Swimming Areas standard of 235 organisms/mL. Figure 8-1 and Figure 8-2 show the monthly geometric *E. coli* means for 2009 and 2010. In several reported instances, the *E. coli* results were over the quantitation value of 2,419.6 MPN/100 mL. In these instances, 2,419.6 MPN/100 mL was used to calculate the geometric mean. In general, *E. coli* concentrations peaked during summer months.

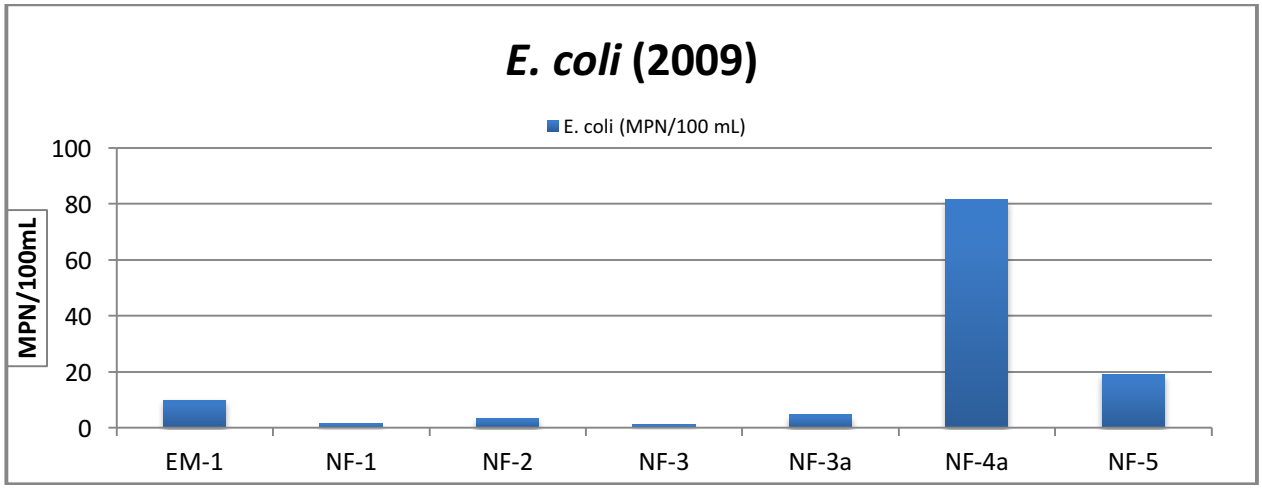

Figure 8-1 Monthly Geometric Mean of *E. coli*, (November only) 2009

[9] Moore et al, 1988, Moore, J. A., J. Smyth, S. Baker, and J. R. Miner. 1988. Evaluating coliform concentrations in runoff from various animal waste management systems. Special Report 817. Agricultural Experiment Stations Oregon State Univ. Corvallis, and USDA, Portland, OR. Pell, A. N. 1997. Manure and microbes: Public and animal health problem? J. Dairy Sci. 80:2673-2681.

[10] Sherer, B. M., J. R. Miner, J. A. Moore, and J. C. Buckhouse. 1992. Indicator bacterial survival in stream sediments. J. Environ. Qual. 21:591-595.

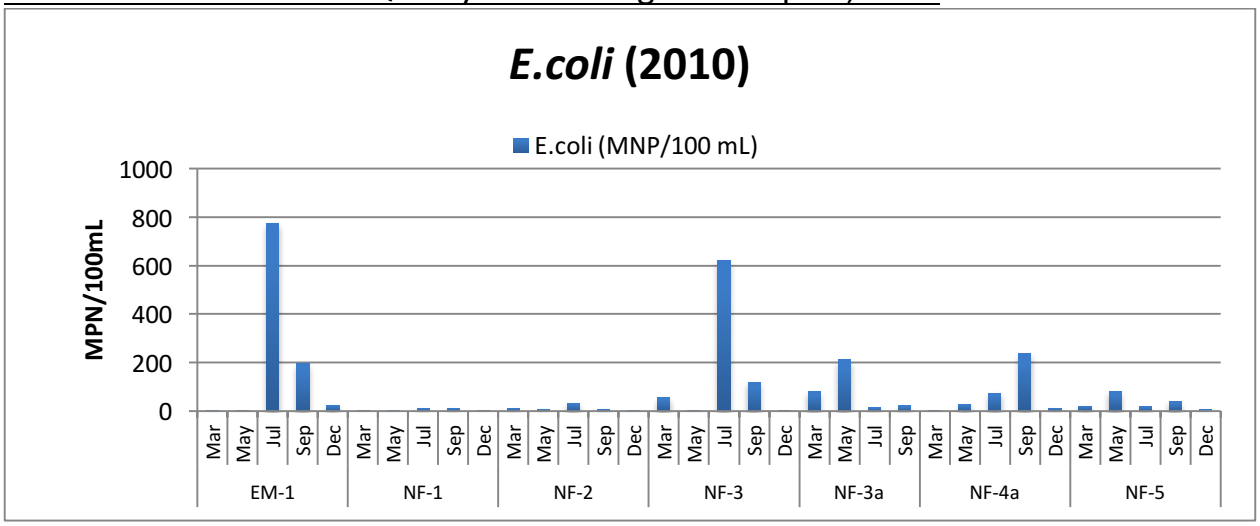

Figure 8-2 Monthly Geometric Mean of *E. coli*, 2010

In 2011, two changes to bacteria sampling took place. Instead of three replicate samples per station, one was taken and analyzed, with one duplicate taken on each sampling date that rotated between stations. Instead of three results per station per sampling date, this returned one result per station per sampling date. In addition, stations were sampled with less frequency, some years being sampled every other month, and some being sampled every third month.

In the graphs that follow, sample size (n) is provided for each geometric mean calculated and graphed.

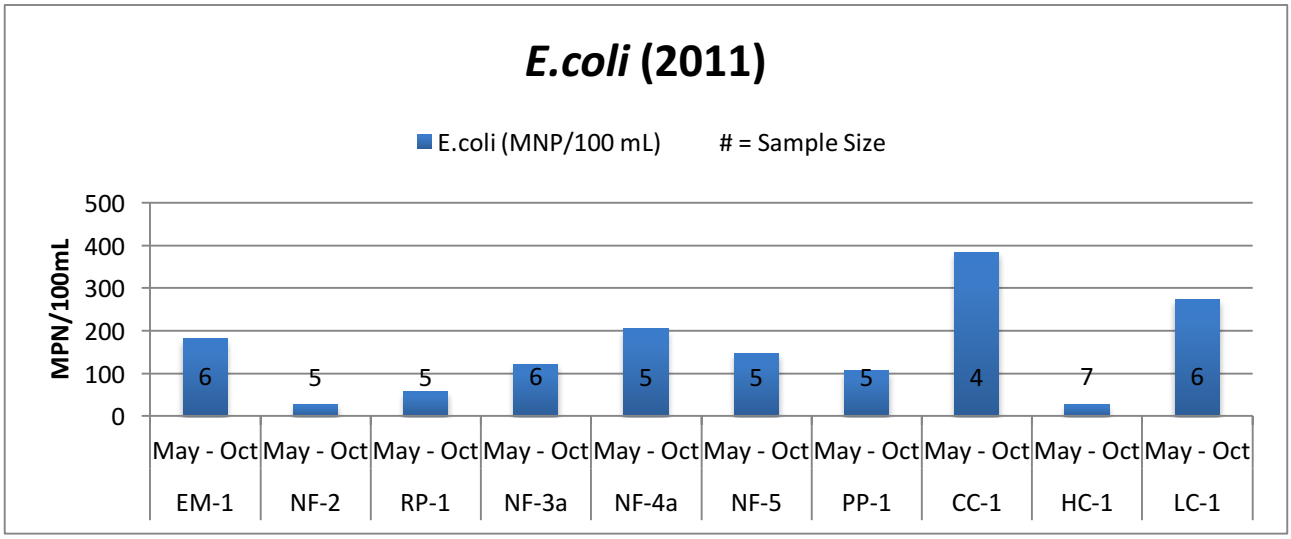

Figure 8-3 Seasonal Geometric Mean of *E. coli* in the North Fork, 2011

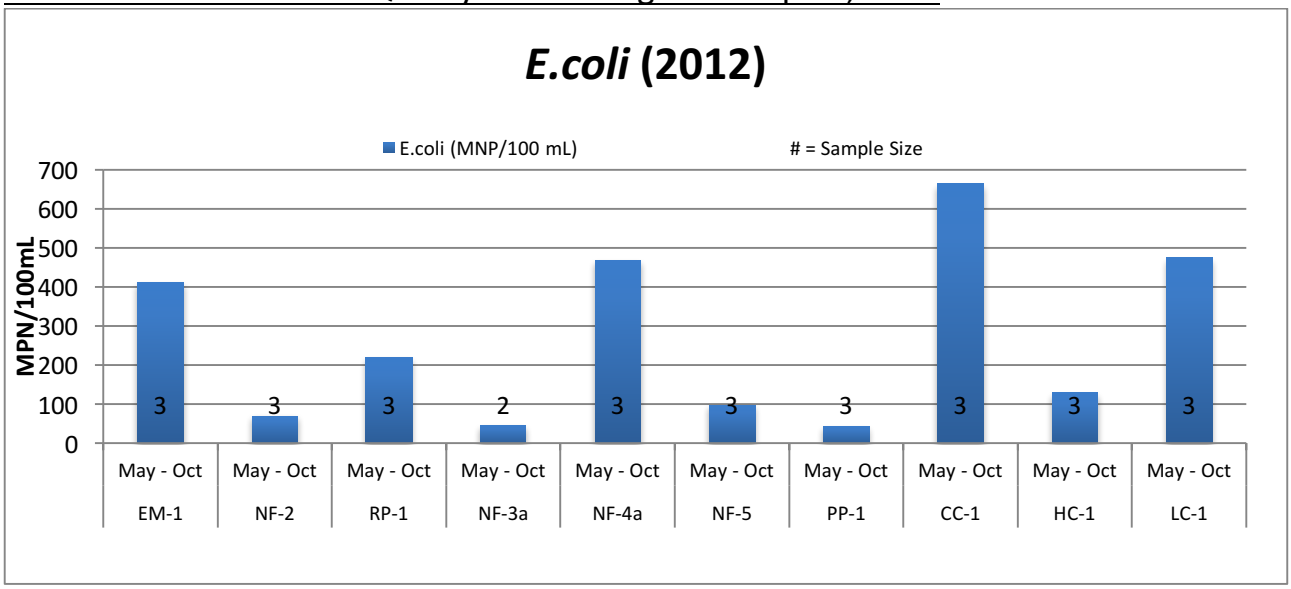

Figure 8-4 Seasonal Geometric Mean of *E. coli* in the North Fork, 2012

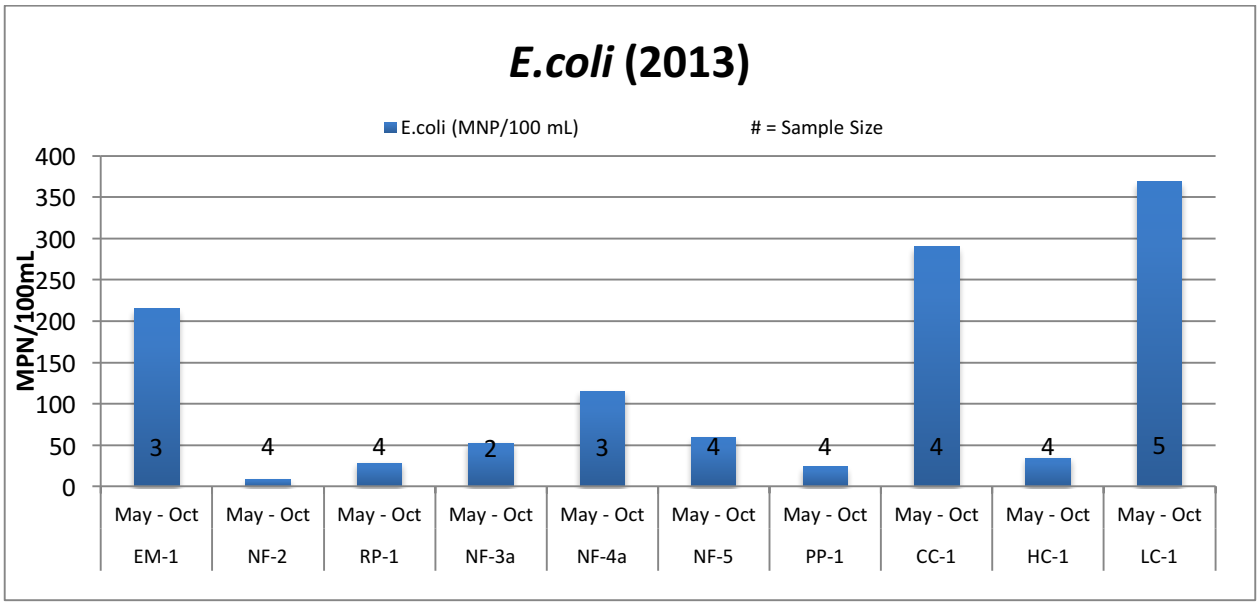

Figure 8-5 Seasonal Geometric Mean of *E. coli* in the North Fork, 2013

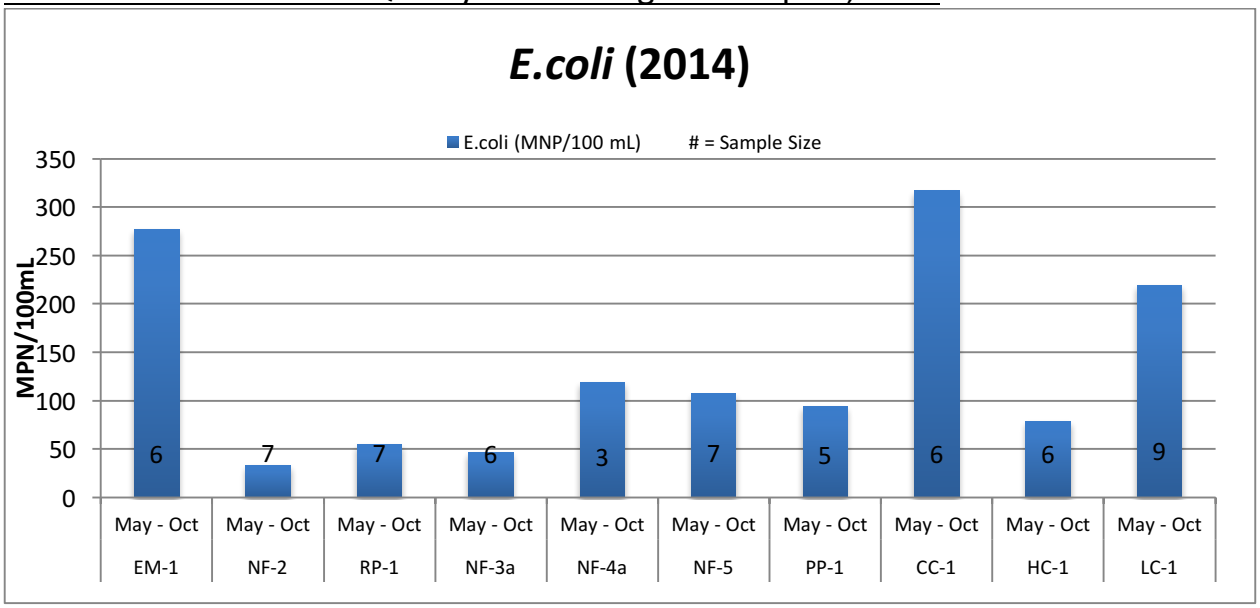

Figure 8-6 Seasonal Geometric Mean of *E. coli* in the North Fork, 2014

E. coli was consistently above the natural swimming area standard (235 organisms/mL) at East Muddy Creek (EM-1), Cottonwood Creek (CC-1) and Leroux Creek (LC-1) for the last five years of sampling, but there is little or no primary contact recreation in these streams. NF-4a on the North Fork, a location where primary contact recreation (boating) occurs, also exceeded the recreation standard in 2011 and 2012. Because sample size is less than desired, more sampling is needed at these stations in order to better assess the frequency of exceedances.

9. MACROINVERTEBRATE DATA

Biological monitoring focuses on the aquatic organisms that live in streams and rivers. Changes that occur in the number and types of organisms present in a stream system may indicate the effects of human activity in a stream. Biological monitoring is based on the fact that different species react to pollution in different ways. Pollution-sensitive organisms are more susceptible to the effects of physical or chemical changes in a stream than other organisms. These organisms act as indicators of the absence of pollution. Pollution-tolerant organisms are less susceptible to changes in the environment and act as an indirect measure of pollution. Pollution-sensitive organisms will decrease in number or disappear in polluted streams, while pollution-tolerant organisms will increase in number and variety.

Benthic macroinvertebrates are animals without backbones that are large enough to see with the naked eye and live on the river bottom. Macroinvertebrates are commonly used as water quality indicators because they are easy to sample, continuous indicators and sit near the bottom of the aquatic food web.

Macroinvertebrates were sampled ten times between October 2004 and October 2013. Network volunteers collected macroinvertebrates using the River Watch rocky substrate collection method. Samples were collected from the kick net and sent to the River Watch laboratory in Fort Collins for professional analysis.

Table 17 summarizes seven common metrics uses to evaluate macroinvertebrate communities. The table briefly defines each metric and indicates how the predicted community response to disturbance. Note that samples were collected at different stations in different years.

Overall, the metrics indicate that the North Fork has a healthy and thriving macroinvertebrate community. There are no major differences in community structure and abundance between stations, as indicated by the total number of organisms and taxa richness. This suggests that the biological community has not experienced any significant disturbance. The metrics that evaluate pollution tolerance include the percent of ephemeroptera, plecoptera and trichoptera species (% EPT) and the Hilsenhoff Biotic Index (HBI), developed by Hilsenhoff[11], indicate that the macroinvertebrate community is relatively intolerant of pollution. Nearly half of the macroinvertebrates collected are pollution-sensitive EPT taxa and the HBI values indicate good to excellent water quality.

The trophic structure in streams is often defined in comparison to the River Continuum Concept (RCC). The RCC describes the longitudinal changes that occur in a river as related to differences in size and terrestrial setting. The RCC is particularly useful for describing how ecological function varies along riverine ecosystems. Figure 9-1 illustrates the distribution of functional feeding groups at stations in the North Fork. The North Fork, a 4th order stream, functions like a RCC mid-order stream. This is expected because the North Fork does not have a wooded riparian zone to contribute shade and allochthonous material to the system. The distribution of functional feeding groups (e.g. high percentage of collectors and scrapers) suggests that the North Fork has a variety of energy inputs and is partially autotrophic.

[11] Hilsenhoff, W.L. 1988. Rapid Field Assessment of Organic Pollution with a Family Level Biotic Index. Journal of the North American Benthological Society 7:65-68.

Table 17 Evaluation Matrix of North Fork Macroinvertebrates

Metric	NF-1 10/04	NF-3 10/04	NF-4a 11/05	NF-3a 10/07	NF-3a 12/08	NF-3a 10/09	NF-3a 10/10	NF-3a 10/11	NF-3a 10/12	NF-3a 10/13	Interpretation	Predicted response to increasing disturbance
Community Structure and Abundance												
Total # of organisms	344	321	324	321	620	636	373	356	314	317	Organism density is variable and affected by loss of habitat, low pH and toxic substances	Decrease
Taxa Richness	7	7	8	6							Measures diversity.	Decrease
Pollution Tolerance												
% EPT	59%	45%	39%	53%	71%	65%	71%	78%	75%	56%	Summarizes taxa richness within the orders Ephemeroptera, Plecoptera and Trichoptera (groups considered to be pollution sensitive)	Decrease
HBI	3.04	4.64	3.6	1.81							Summarizes overall pollution tolerance to organic and sediment pollution (above 5.5= poor water quality)	Increase
Trophic Structure												
% Scrapers	18%	15%	13%	26%	13%	2%	1%	2%	2%	1%	Reflects riffle community food base, indicates availability of periphyton. Will decrease following sediment and organic pollution.	Decrease
% Collectors/ Filterers	53%	14%	16%	12%	62%	59%	65%	59%	68%	63%	Filter feeders increase in response to fine particulate organic matter (FPOM). Filter feeders can be sensitive to toxicants bound to FPOM.	Variable

Functional Feeding Groups for Macroinvertebrates in the NorthFork

RCC: Mid-Order Stream

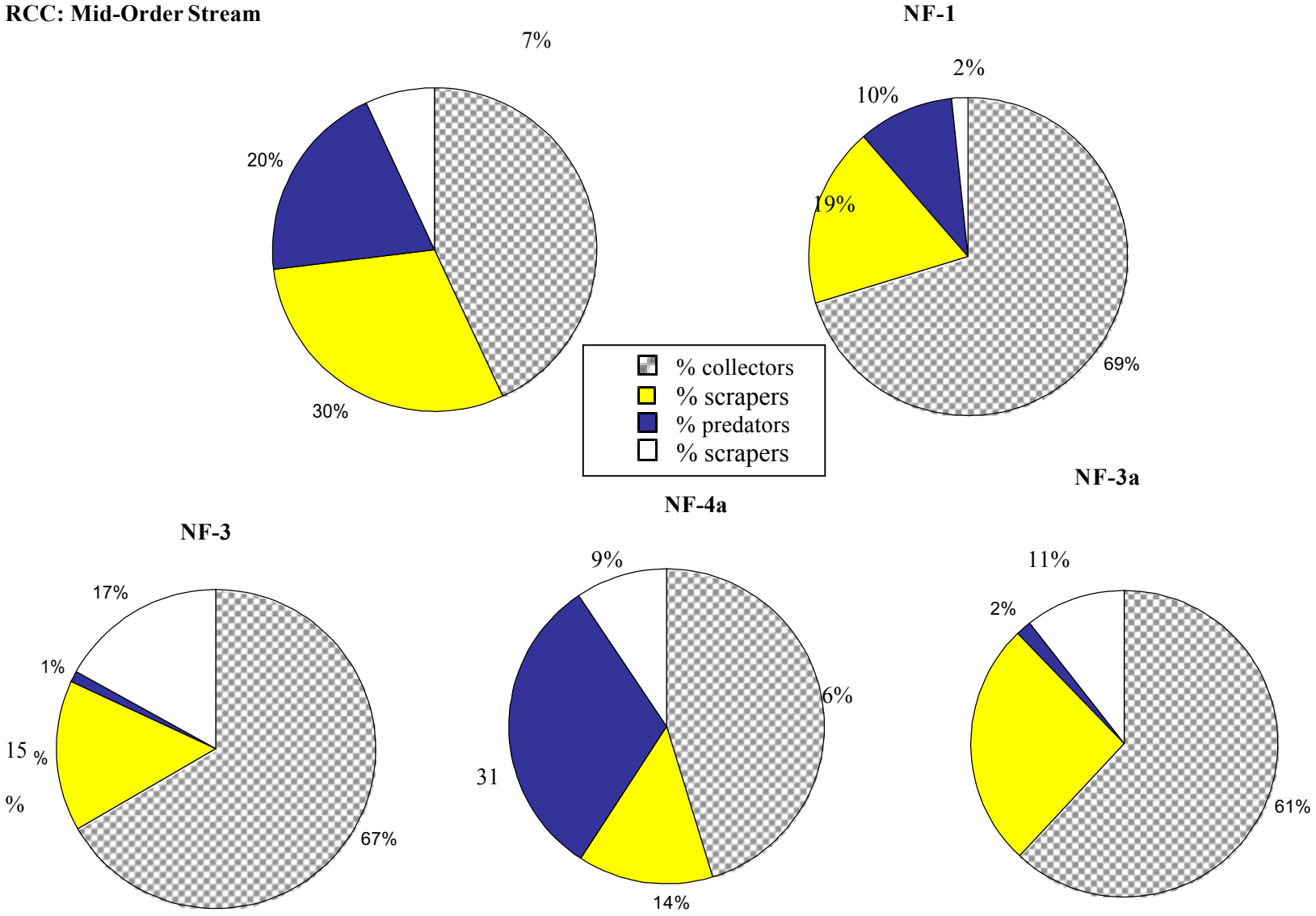

Figure 9-1: Functional Feeding Groups in the North Fork

10. Long Term Trends and Seasonal Variability

In general, the North Fork Watershed exhibits seasonal variability and lacks any particular long term trends during the time of sampling.

Conductivity measurements indicate that concentrations of TDS were at their lowest during spring runoff/snowmelt season and then increased through the summer as runoff decreased and ground water and irrigation return flows become the dominant source of water to the river. For many parameters, the increased flows associated with spring runoff correlate with lower concentration values due to dillution. For example, sulfate had the lowest concentrations during times when snowmelt was the dominant source of water and highest concentrations during times when the dominant source of water to the river is ground water and irrigation return flows. Sulfate, like the other parameters, did not exhibit any particular long term trend during the time of sampling beyond the seasonal variability described above.

While TDS decreases during spring runoff/snowmelt season indicates lower concentrations of salts, metals, minerals, etc., concentrations for parameters such as total phosphorus and iron increased during times of higher flows and decreased during lower flows. This is because both phosphorus and iron bind tightly with sediment particles in the water which increase with runoff events typical of spring. Accordingly, total suspended solids concentrations typically increase during high flow events. As TSS increases and decreases, parameters like iron and phosphorus which bind to sediment exhibit corresponding concentration increases and decreases.

Total phosphorus (TP) concentrations increased in the spring during snowmelt/spring runoff and decreased during low flow conditions in the late summer/fall. These concentrations correlate with the concentration of total suspended solids as TP binds tightly with sediments, metal oxides and hydroxides under aerobic conditions. This correlation is illustrated by Figure 10-1.

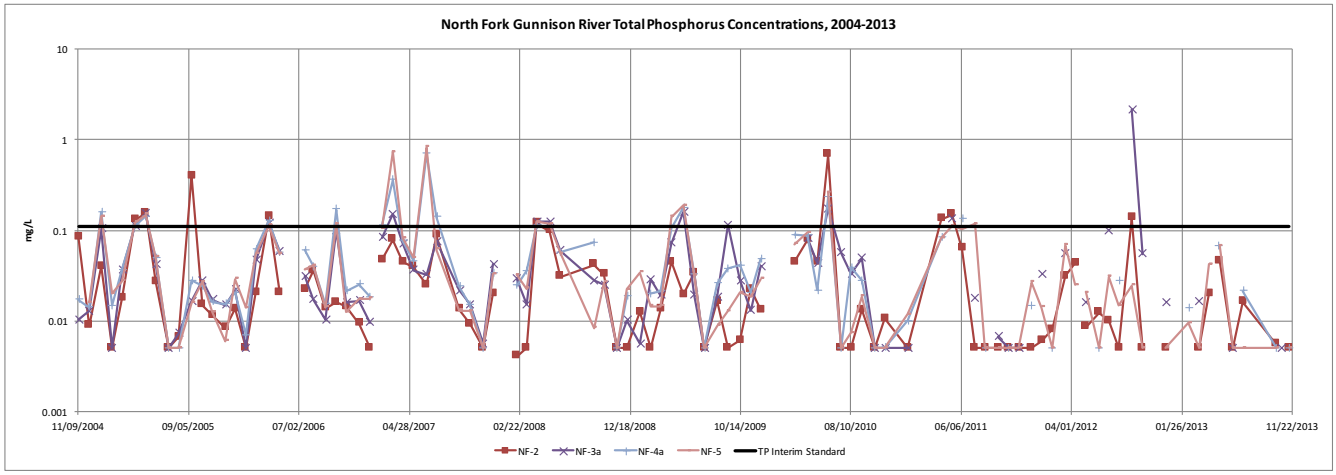

Figure 10-1: Total Phosphorus Concentrations

There is some seasonality reflected in sample concentrations of iron as concentrations increase during times of higher flow. However, there is not a clear relationship. This is likely because there are many contributing sources including storm and snowmelt runoff, ground water inflow, and potentially irrigation return flows at different locations that inhibit not only a clear seasonal trend but also any clear trend in concentration upstream to downstream. Iron concentrations are illustrated in Figure 10-2.

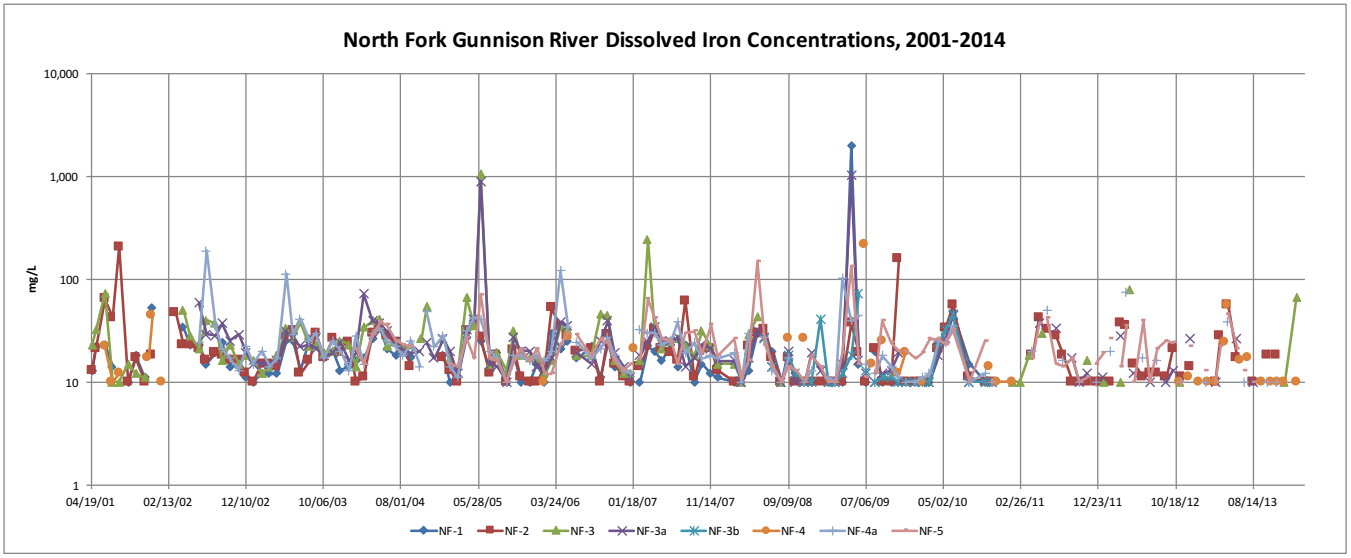

Figure 10-2: Dissolved Iron Concentration

11. CONCLUSIONS

The water quality data presented in this report were not collected for compliance or regulatory purposes; rather these data are designed to give background information on water quality conditions in the watershed, help water users understand seasonal and natural variation within the watershed, and provide a basic understanding of how the water quality of the North Fork Gunnison River compares to state stream standards.

The North Fork Watershed exhibits seasonal variability and lacks any particular long term trends. Concentrations of parameters typically decrease during times of high flows and increase during times of low flows. Parameters such as TP and iron exhibit an opposite seasonal trend, increasing during times of high flows and decreasing during times of low flows. Besides these seasonal trends of various strengths, the North Fork's lack of long term trends indicates that human-caused effects have not obviously degraded nor improved water quality during this time. One potential exception to this may regard selenium; however this report does not utilize enough data to make any conclusions that might relate to the work of the Selenium Taskforce and other salinity control efforts.

Water quality samples collected by the Network between 2001 and 2014 indicated that overall, the North Fork Gunnison River has excellent to good water quality in the upper watershed and excellent to moderate water quality in the lower watershed largely due to natural sources that increase metal and dissolved solids concentrations in the lower portions of the watershed. Increases in concentrations as water travels downstream are a reflection of the natural soils and geology of the North Fork Valley. During times of high flows, the North Fork Gunnison River and its tributaries more frequently exhibit higher water quality standards, and as flows decrease, water quality standards appear to decrease. Hubbard Creek has excellent water quality, and Leroux Creek and Surface Creek have excellent to good water quality. Tongue Creek and Lower Cottonwood Creek have moderate to poor water quality, depending on flow.

Field Parameters

The geology and natural soils of the watershed provide the North Fork with the capacity to buffer against changes in pH and the toxic effects of metals. The North Fork watershed has water that is slightly basic and pH values are within an acceptable range for aquatic life. The alkaline character of the water decreases the solubility of many of the toxic metals that are present in the North Fork. Buffering capacity, as measured by hardness and alkalinity, was highest at downstream locations. Local geology and irrigation return flows are likely the sources of the parameters that contribute to hardness and alkalinity. Conductivity reflects seasonal variability that is dependent on the dominant source of water to the river, and conductivity increases from upstream to downstream stations.

Nutrients and Other Inorganic Parameters

In general, nutrient concentrations are well below state and/or federal standards indicating there are no significant nutrient problems in the North Fork Watershed. The exception is for sulfate, with concentrations near Hotchkiss routinely exceeding the secondary drinking water.

Metals

The water quality data indicate that metals are not a significant concern in the North Fork watershed, with the exception of selenium. Concentrations of other metals have seldom exceeded applicable water quality standards. Maximum dissolved iron concentrations exceeded water supply standards at some stations, although average concentrations were below the water supply standard. Average concentrations for dissolved selenium exceeded the chronic standard at most stations during the time of sampling up to

2007.

Bacteria

The presence of *E. coli* in aquatic environments indicates that water has been contaminated with fecal materials from sewage and/or animal waste. When sampled year-round, *E. coli* values were highest during summer months.

Macroinvertebrates

Overall, the North Fork has a healthy and thriving macroinvertebrate community. The metrics that evaluate pollution tolerance, % EPT and HBI, indicate that the macroinvertebrate community is relatively intolerant of pollution. Nearly half of the macroinvertebrates collected are pollution-sensitive EPT taxa and the HBI values indicate moderate to good water quality.

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13. Appendices:

A. **2001 to 2014 Water Quality Results**
B. **CDPHE WQCC Regulation No. 31**
C. **CDPHE WQCC Regulation No. 35**
D. **Hydrographs**

A. 2001 to 2014 Water Quality Results

The data gathered by the North Fork Volunteer Water Quality Monitoring Network is available online at the Western Slope Conservation Center's website or by request. Please call (970) 527-5307 and the Conservation Center will send you the data.

B. CDPHE WQCC Regulation No. 31

Below include Colorado standards for specific physical, biological, inorganic, and metal parameters. Additional information regarding these standards can be found in the Colorado Department of Public Health and Environment's Water Quality Control Commission Regulation No. 31.

TABLE I PHYSICAL AND BIOLOGICAL PARAMETERS

Parameter	Recreational			Aquatic Life			Agriculture	Domestic Water Supply
	CLASS E (Existing Primary Contact) and CLASS U (Undetermined Use)	CLASS P (Potential Primary Contact Use)	CLASS N (Not Primary Contact Use)	CLASS 1 COLD WATER BIOTA	CLASS 1 WARM WATER BIOTA	CLASS 2		
PHYSICAL								
D.O. (mg/l)[1][9]	3.0(A)	3.0(A)	3.0(A)	6.0[2](G) 7.0(spawning)	5.0[2](G)	5.0(A)	3.0(A)	3.0(A)
pH (Std. Units)[3]	6.5–9.0 (Bm)	6.5–9.0 (Bm)	6.5–9.0 (Bm)	6.5–9.0(A)	6.5–9.0(A)	6.5–9.0(A)		5.0–9.0(A)
Suspended Solids[4]								
Temperature (°C) [5]				**Rivers & Streams: Tier I[a]:** June-Sept = 17.0 (ch), 21.7(ac) Oct –May = 9.0 (ch), 13.0 (ac) **Tier II[b]:** Apr-Oct =18.3 (ch), 23.9 (ac) Nov-Mar =9.0 (ch), 13.0 (ac) **Lakes & Res:** Apr-Dec = 17.0 (ch), 21.2 (ac) Jan-Mar = 9.0 (ch), 13.0 (ac) **Large Lakes & Res[c]:** Apr-Dec = 18.3(ch), 23.8 (ac) Jan-Mar = 9.0(ch), 13.0 (ac)	**Rivers & Streams: Tier I[a]:** Mar-Nov = 24.2(ch), 29.0 (ac) Dec-Feb= 12.1(ch), 14.5(ac) **Tier II[b]:** Mar-Nov= 27.5(ch), 28.6(ac) Dec-Feb=13.8 (ch), 14.3 (ac) **Tier III[c]:** Mar-Nov = 28.7 (ch), 31.8 (ac) Dec-Feb = 14.3 (ch), 15.9 (ac) **Lakes & Res:** Apr-Dec = 26.3 (ch), 29.5 (ac) Jan-Mar = 13.2 (ch), 14.8 (ac)	Same as Class 1		

TABLE II INORGANIC PARAMETERS

PARAMETER	AQUATIC LIFE				AGRICULTURE	DOMESTIC WATER SUPPLY
	CLASS 1 Cold Water Biota		CLASS 1 Warm Water Biota	CLASS 2		
INORGANICS:						
Ammonia (mg/l as N) Total	chronic = elsp or elsa [1] acute = sp [1] (N)		chronic = Apr 1-Aug 31=elsp[1] Sept 1-Mar 29=elsa[1] acute = sa[1] (N)	Class 2 Cold/Warm have the same standards as Class 1 Cold/Warm (N)		
Total residual Chlorine (mg/l)	0.019 (L) (1-day)	0.011 (L) (30-day)	0.019 (L) (1-day)	0.011 (L) (30-day)	0.011 (L) (30-day)	
Cyanide - Free (mg/l)	0.005(H) (1-day)		0.005(H) (1-day)		0.005(H) (1-day)	0.2(G) (1-day)	0.2(B,D[m]) (1-day)
Fluoride (mg/l)							2.0[3](E) (1-day)
Nitrate (mg/l as N)						100([2])(B)	10[4](K) (1-day)
Nitrite (mg/l as N)	TO BE ESTABLISHED ON A CASE BY CASE BASIS ([3])			A CASE BY CASE BASIS [3]	10([2])(B) (1-day)	1.0(2)[4](K) (1-day)
Sulfide as H_2S (mg/l)	0.002 undissociated(A) (30-day)		0.002 undissociated(A) (30-day)	0.002 undissociated(A) (30-day)		0.05(F) (30-day)
Boron (mg/l)					0.75(A,B) (30-day)	
Chloride (mg/l)						250(F) (30-day)
Sulfate (mg/l)						250(F) (30-day)
Asbestos						7,000,000 fibers/L[5]

NOTE: Capital letters in parentheses refer to references listed 31.16(3); numbers in parentheses refer to table II footnotes.

TABLE III METAL PARAMETERS (Concentration in ug/l)

METAL[1]	AQUATIC LIFE[1)(3)(4)(J)]		AGRICULTURE[2]	DOMESTIC WATER-SUPPLY[2]	WATER + FISH[7]	FISH INGESTION[10]
	ACUTE	CHRONIC				
Aluminum	$e^{(1.3695[\ln(\text{hardness})]+1.8308)}$ (tot.rec.)	87 or $e^{(1.3695[\ln(\text{hardness})]-0.1158}$ (tot.rec.)[11]			---	---
Antimony				6.0 (30-day)	5.6	640
Arsenic	340	150	100[A] (30-day)	0.02 – 10[13] (30-day)[14]	0.02	7.6
Barium				1,000[E](1-day) 490 (30-day)	---	---
Beryllium			100[A,B] (30-day)	4.0 (30-day)	---	---
Cadmium	$(1.136672-[\ln(\text{hardness})\times 0.9151]\times(0.041838)]\times e$ (Trout)=$(1.136672-]\ln(\text{hardness})\times 0.9151]\times(0.041838)]\times e$	$(1.101672-[\ln(\text{hardness})\times 0.7998]\times(0.041838)]\times e$	10[B] (30-day)	5.0[E] (1-day)	---	---
Chromium III[5]	$e^{(0.819[\ln(\text{hardness})]+2.5736)}$	$e^{(0.819[\ln(\text{hardness})]+0.5340)}$	100[B] (30-day)	50[E] (1-day)	---	---
Chromium VI[5]	16	11	100[B] (30-day)	50[E] (1-day)	100(30-day)	---
Copper	$e^{(0.9422[\ln(\text{hardness})]-1.7408)}$	$e^{(0.8545[\ln(\text{hardness})]-1.7428)}$	200[B]	1,000[F] (30-day)	1,300	---
Iron		1,000(tot.rec.)[A,C]		300(dis)[F] (30-day)	---	---
Lead	$(1.46203-[(\ln(\text{hardness})*(0.145712)])*e^{(1.273[\ln(\text{hardness})]-1.46)}$	$(1.46203-[(\ln(\text{hardness})*(0.145712)])*e^{(1.273[\ln(\text{hardness})]-4.705)}$	100[B] (30-day)	50[E] (1-day)	---	---
Manganese	$e^{(0.3331[\ln(\text{hardness})]+6.4676)}$	$e^{(0.3331[\ln(\text{hardness})]+5.8743)}$	200[B] (30-day)[12]	50(dis)[F] (30-day)	---	---
Mercury		FRV(fish)[6] = 0.01 (Total)		2.0[E] (1-day)	---	---
Molybdenum			300[O] (30-day)[16]	210 (30-day)		

TABLE III METAL PARAMETERS (Concentration in ug/l)						
METAL[1]	AQUATIC LIFE[1][3][4][J]		AGRICULTURE[2]	DOMESTIC WATER-SUPPLY[2]	WATER + FISH[7]	FISH INGESTION[10]
	ACUTE	CHRONIC				
Nickel	$e^{(0.846[\ln(\text{hardness})]+2.253)}$	$e^{(0.846[\ln(\text{hardness})]+0.0554)}$	200[B] (30-day)	100[E] (30-day)	610	4,600
Selenium[9]	18.4	4.6	20[B,D] (30-day)	50[E] (30-day)	170	4,200
Silver	$\frac{1}{2}e^{(1.72[\ln(\text{hardness})]-6.52)}$	$e^{(1.72[\ln(\text{hardness})]-9.06)}$ (Trout) = $e^{(1.72[\ln(\text{hardness})]-10.51)}$		100[F] (1-day)	—	---
Thallium		15[C]		0.5 (30-day)	0.24	0.47
Uranium[17]	$e^{(1.1021[\ln(\text{hardness})]+2.7088)}$	$e^{(1.1021[\ln(\text{hardness})]+2.2382)}$		16.8 – 30[13] (30-day)	---	---
Zinc	$0.978*e^{(0.9094[\ln(\text{hardness})]+0.9095)}$	$0.986*e^{(0.9094[\ln(\text{hardness})]+0.6235)}$ (sculpin)[15] = $e^{(2.140[\ln(\text{hardness})]-5.084)}$	2000[B] (30-day)	5,000[F] (30-day)	7,400	26,000
NOTE: Capital letters in parentheses refer to references listed in section 31.16(3); Numbers in parentheses refer to Table III footnote						

C. CDPHE WQCC Regulation No. 35 Classifications and Numeric Standards For Gunnison And Lower Dolores River Basins

The selected formulas below present standards for stream segments in the Gunison and Lower Dolores River Basins for various parameters examined in this report. Additional information regarding these standards can be found in the Colorado Department of Public Health and Environment's Water Quality Control Commission Regulation 35.

(3) Table Value Standards

In certain instances in the tables in Appendix 35-1, the designation "TVS" is used to indicate that for a particular parameter a "table value standard" has been adopted. This designation refers to numerical criteria set forth in the Basic Standards and Methodologies for Surface Water. The criteria for which the TVS are applicable are on the following table.

TABLE VALUE STANDARDS
(Concentrations in µg/l unless noted)

PARAMETER[1]	TABLE VALUE STANDARDS [2][3]
Aluminum (Trec)	Acute = $e^{(1.3695[\ln(\text{hardness})]+1.8308)}$ pH equal to or greater than 7.0 Chronic=$e^{(1.3695[\ln(\text{hardness})]-0.1158)}$ pH less than 7.0 Chronic= $e^{(1.3695[\ln(\text{hardness})]-0.1158)}$ or 87, whichever is less
Copper	Acute = $e^{(0.9422[\ln(\text{hardness})]-1.7408)}$ Chronic = $e^{(0.8545[\ln(\text{hardness})]-1.7428)}$
Lead	Acute = $(1.46203-[(\ln(\text{hardness})*(0.145712)])*e^{(1.273[\ln(\text{hardness})]-1.46)}$ Chronic = $(1.46203-[(\ln(\text{hardness})*(0.145712)])*e^{(1.273[\ln(\text{hardness})]-4.705)}$
Manganese	Acute = $e^{(0.3331[\ln(\text{hardness})]+6.4676)}$ Chronic = $e^{(0.3331[\ln(\text{hardness})]+5.8743)}$
Nickel	Acute = $e^{(0.846[\ln(\text{hardness})]+2.253)}$ Chronic = $e^{(0.846[\ln(\text{hardness})]+0.0554)}$
Selenium[6]	Acute = 18.4 Chronic = 4.6

Temperature

TEMPERATURE TIER	TIER CODE	SPECIES EXPECTED TO BE PRESENT	APPLICABLE MONTHS	TEMPERATURE STANDARD (^{O}C)	
				MWAT	DM
Cold Stream Tier 1	CS-I	brook trout, cutthroat trout	June – Sept.	17.0	21.7
			Oct. – May	9.0	13.0
Cold Stream Tier 2	CS-II	all other cold-water species	April – Oct.	18.3	23.9
			Nov. – March	9.0	13.0
Cold Lakes	CL	brook trout, brown trout, cutthroat trout, lake trout, rainbow trout, Arctic grayling, sockeye salmon	April – Dec.	17.0	21.2
			Jan. – March	9.0	13.0
Cold Large Lakes (>100 acres surface area)	CLL	rainbow trout, brown trout, lake trout	April – Dec.	18.3	23.8
			Jan. – March	9.0	13.0
Warm Stream Tier 2	WS-II	brook stickleback, central stoneroller, creek chub, longnose dace, Northern redbelly dace, finescale dace, razorback sucker, white sucker	March – Nov.	27.5	28.6
			Dec. – Feb.	13.8	14.3
Warm Stream Tier 3	WS-III	all other warm-water species	March – Nov.	28.7	31.8
			Dec. – Feb.	14.3	15.9
Warm Lakes	WL	black crappie, bluegill, common carp, gizzard shad, golden shiner, largemouth bass, Northern pike, pumpkinseed, sauger, smallmouth bass, spottail shiner, striped bass, tiger muskellunge, walleye, wiper, white bass, white	April – Dec.	26.3	29.5
			Jan. – March	13.2	14.8

Zinc

Acute = $0.978 * e^{(0.9094[\ln(\text{hardness})]+0.9095)}$

Chronic = $0.986 * e^{(0.9094[\ln(\text{hardness})]+0.6235)}$

Where hardness is less than 102 mg/L $CaCO^3$ and mottled sculpin are expected to be present:

Chronic (sculpin) = $e^{(2.140[\ln(\text{hardness})]-5.084)}$

Ammonia (4)

Cold Water = (mg/l as N)Total

$$acute = \frac{0.275}{1+10^{7.204-pH}} + \frac{39.0}{1+10^{pH-7.204}}$$

$$chronic = \left(\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}}\right) * MIN\left(2.85, 1.45*10^{0.028(25-T)}\right)$$

Warm Water = (mg/l as N)Total

$$acute = \frac{0.411}{1+10^{7.204-pH}} + \frac{58.4}{1+10^{pH-7.204}}$$

$$chronic\ (Apr1-Aug31) = \left(\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}}\right) * MIN\left(2.85, 1.45*10^{0.028(25-T)}\right)$$

$$chronic\ (Sep1-Mar31) = \left(\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}}\right) * 1.45*10^{0.028*(25-MAX(T,\ 7))}$$

Cadmium

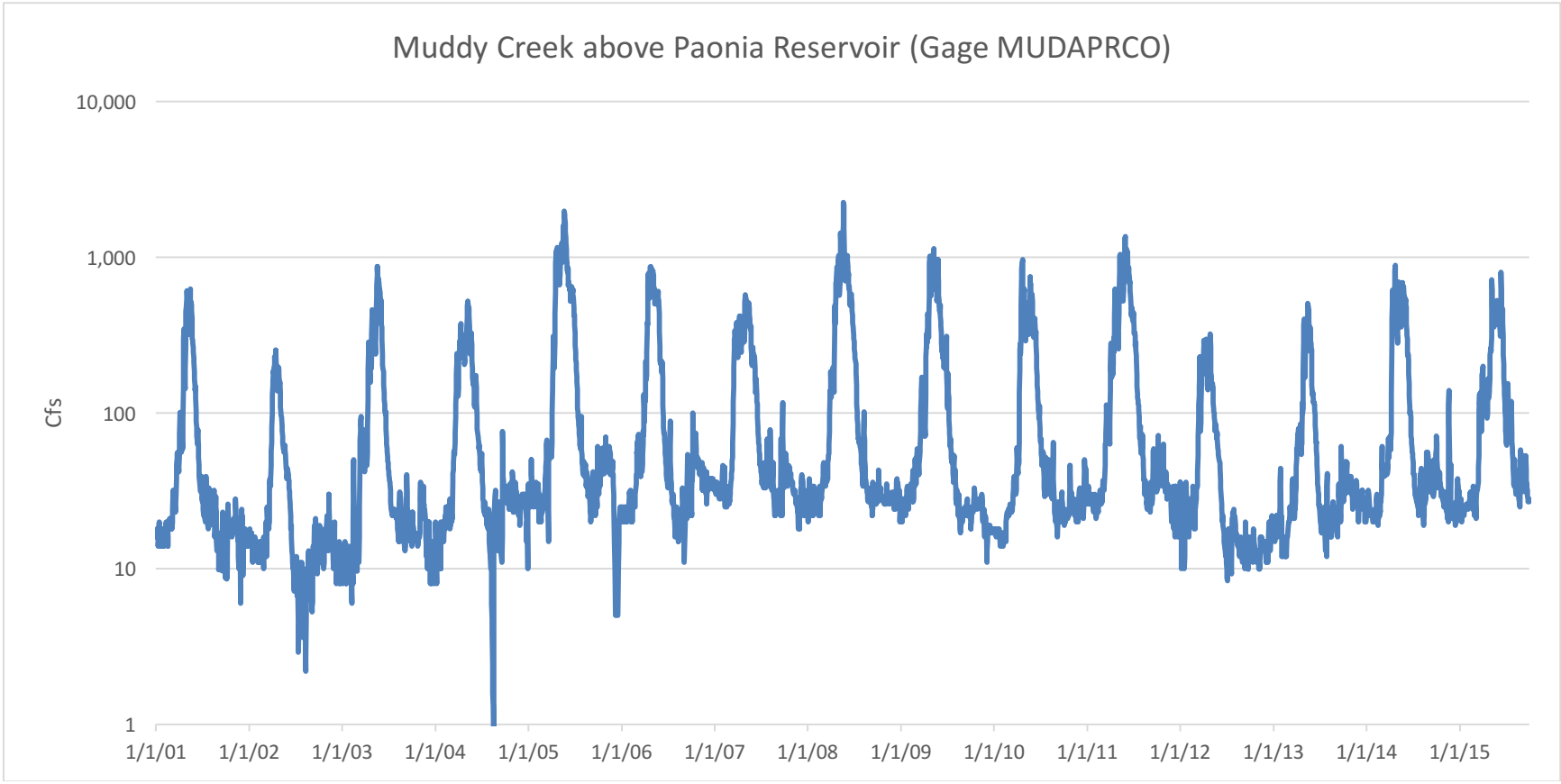
Acute = $(1.136672-[\ln(hardness) \times (0.041838)])\ x\ e^{0.9151[\ln(hardness)]-3.1485}$

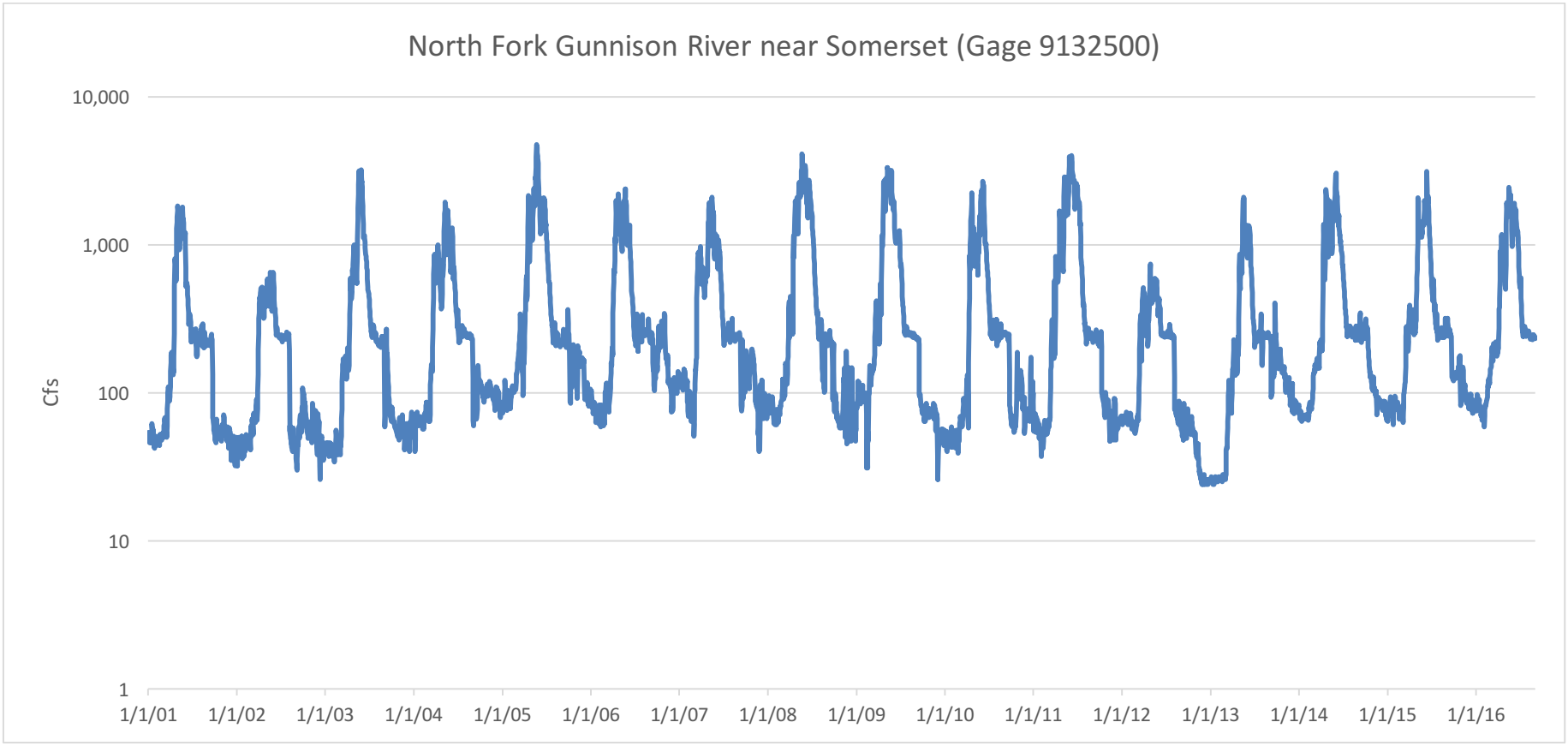
Acute(Trout) = $(1.136672-[\ln(hardness) \times (0.041838)])\ x\ e^{0.9151[\ln(hardness)]-3.6236}$

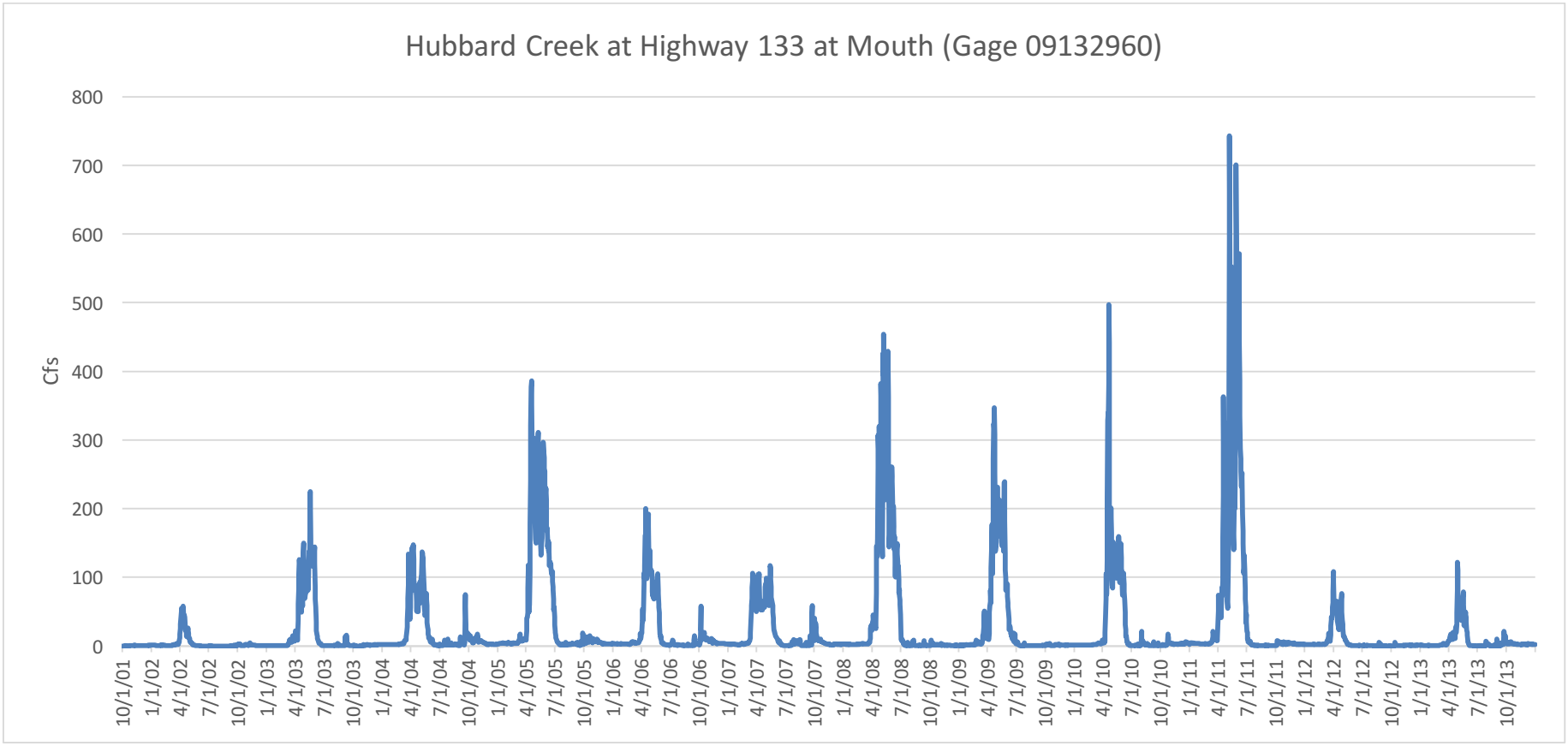
Chronic = $(1.101672-[\ln(hardness) \times (0.041838)]\ x\ e^{0.7998[\ln(hardness)]-4.4451}$

D. Hydrographs

Included below are hydrographs with data gathered from USGS gaging stations within the North Fork of the Gunnison watershed. The hydrographs illustrate the mean daily discharge rates of flow.




North Fork Gunnison River near Somerset (Gage 9132500)
Cfs
10,000
1,000
100
10
1
1/1/01
1/1/02
1/1/03
1/1/04
1/1/05
1/1/06
1/1/07
1/1/08
1/1/09
1/1/10
1/1/11
1/1/12
1/1/13
1/1/14
1/1/15
1/1/16


Hubbard Creek at Highway 133 at Mouth (Gage 09132960)
Cfs
800
700
600
500
400
300
200
100
0
10/1/01
1/1/02
4/1/02
7/1/02
10/1/02
1/1/03
4/1/03
7/1/03
10/1/03
1/1/04
4/1/04
7/1/04
10/1/04
1/1/05
4/1/05
7/1/05
10/1/05
1/1/06
4/1/06
7/1/06
10/1/06
1/1/07
4/1/07
7/1/07
10/1/07
1/1/08
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10/1/09
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4/1/10
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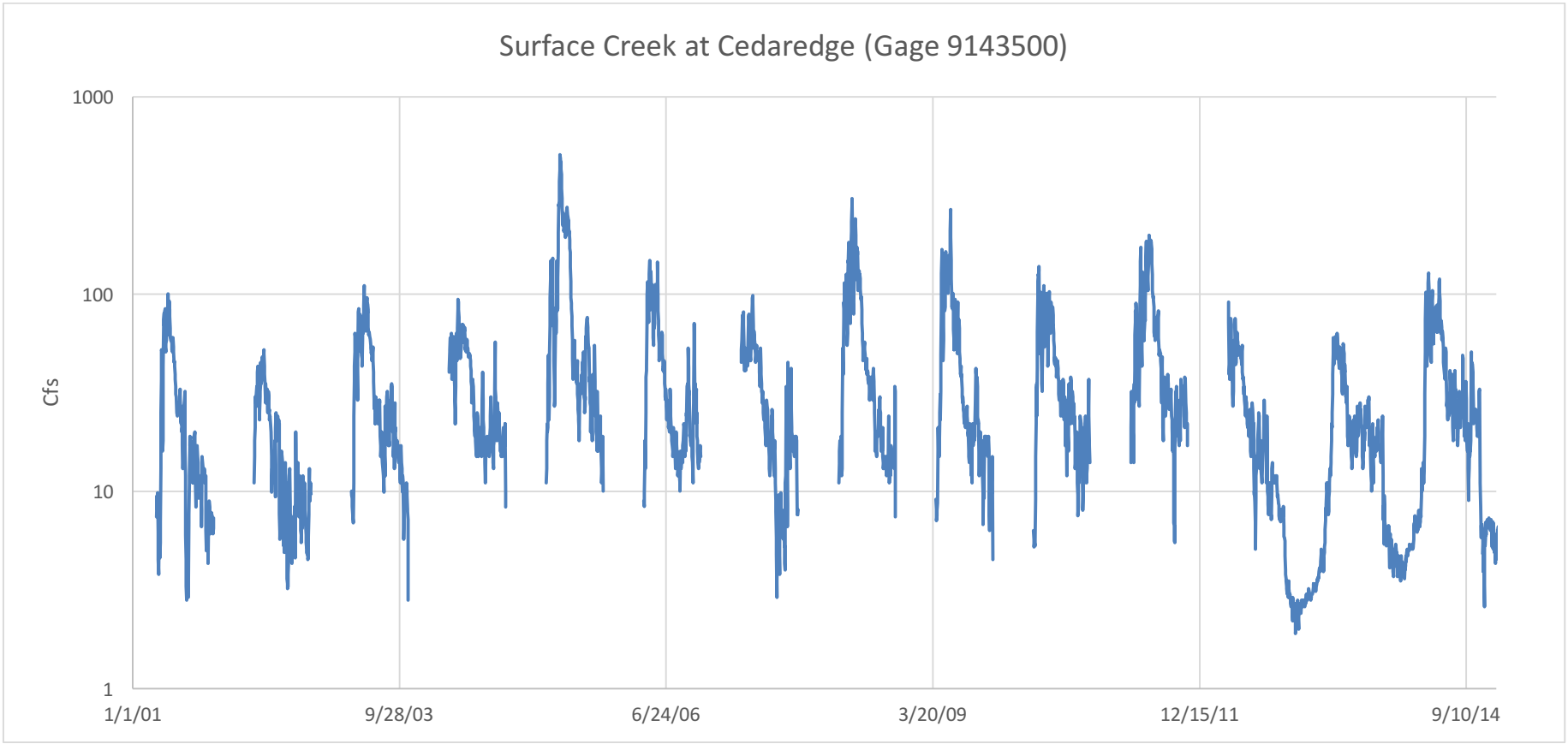
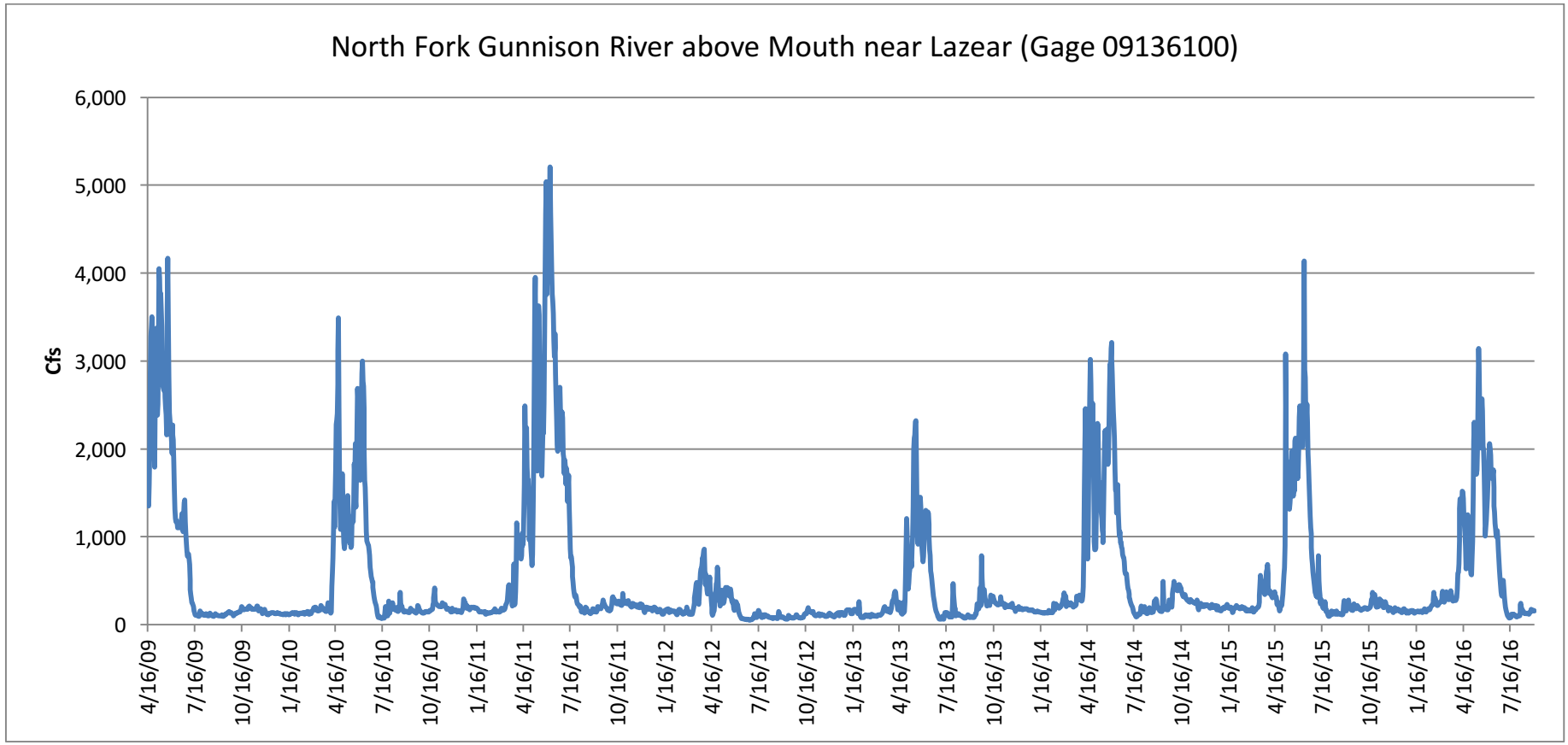
1/1/13
4/1/13
7/1/13
10/1/13


Surface Creek at Cedaredge (Gage 9143500)
1000
100
10
1
Cfs
1/1/01
9/28/03
6/24/06
3/20/09
12/15/11
9/10/14


North Fork Gunnison River above Mouth near Lazear (Gage 09136100)
Cfs
6,000
5,000
4,000
3,000
2,000
1,000
0
4/16/09
7/16/09
10/16/09
1/16/10
4/16/10
7/16/10
10/16/10
1/16/11
4/16/11
7/16/11
10/16/11
1/16/12
4/16/12
7/16/12
10/16/12
1/16/13
4/16/13
7/16/13
10/16/13
1/16/14
4/16/14
7/16/14
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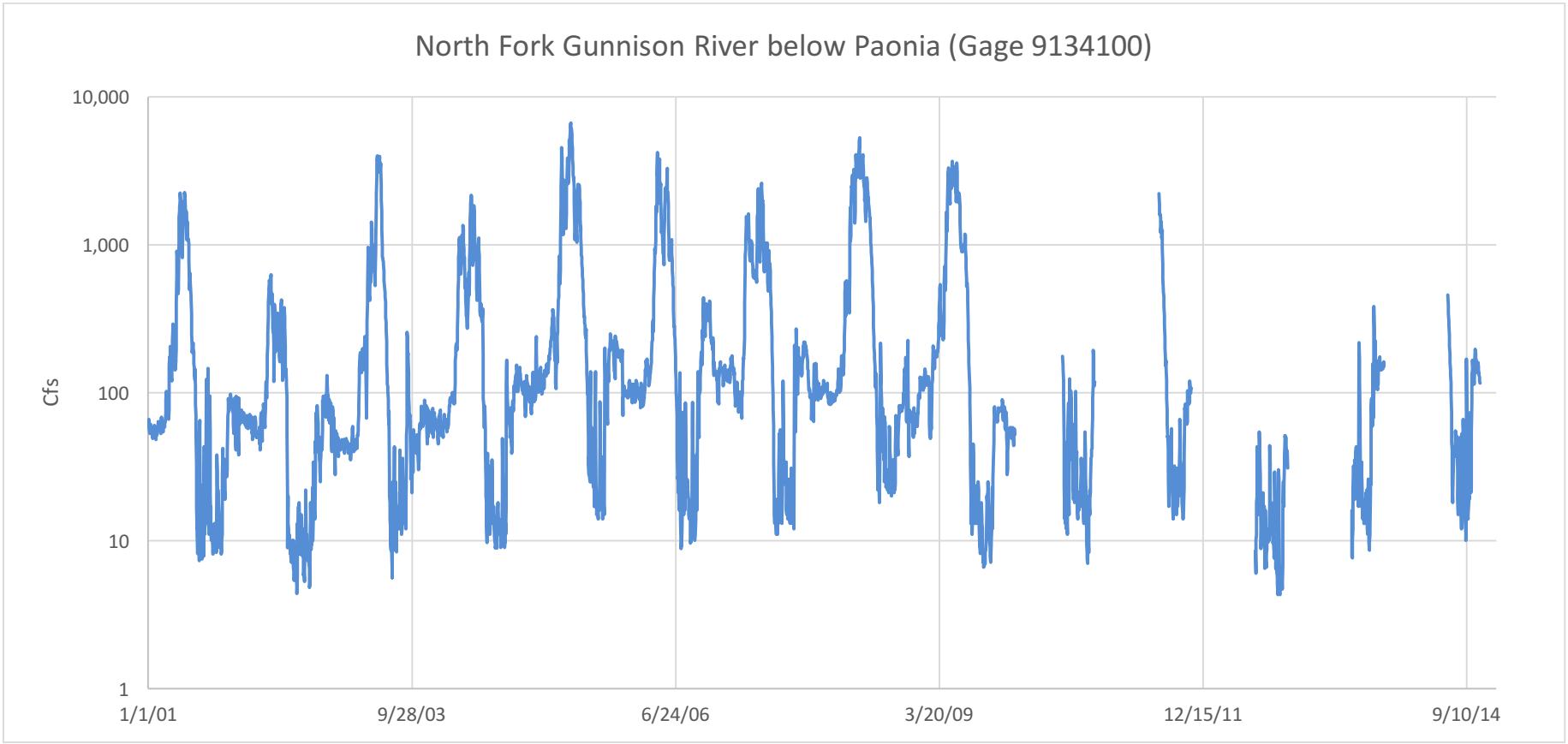
10/16/15
1/16/16
4/16/16
7/16/16


North Fork Gunnison River below Paonia (Gage 9134100)
Cfs
10,000
1,000
100
10
1
1/1/01
9/28/03
6/24/06
3/20/09
12/15/11
9/10/14