

Antora Meadows recommended wilderness

**Proposed Wilderness Designation
Rio Grande National Forest
Saguache Ranger District**

27,700 acres



General Description

One of Colorado's least-known segments of the Continental Divide runs between the San Juan and Sawatch ranges along the northern rim of the San Luis Valley. The proposed Antora Meadows wilderness contains a large portion of an easy to overlook forested length of the divide and is a primary component of one of Colorado's largest unprotected roadless areas in the Cochetopa Hills. The proposed wilderness would fill one of the largest remaining gaps in the wilderness system in the Southern Rockies, and complete the ecological connection between the large protected wilderness areas of the San Juans to the south and the equally important preserves of the Elk, Sawatch, and Sangre de Cristo ranges to the north and east. The area is generally a refuge for wildlife, including robust deer and elk herds. It is also home to a pure population of the imperiled Rio Grande cutthroat trout.

Antora Meadows lies in the Saguache Creek watershed north of Saguache. The area is bounded on the north by the Continental Divide National Scenic Trail, but the primary access point is the Middle Creek Trailhead on its south side. Fescue grasslands and open ponderosa pine forest are typical in the lowest portions of the area starting at an elevation of 8,800 feet. Large stands of aspen and lodgepole pine forest become more common as one travels deeper into the area towards the Continental Divide at 10,600 feet. The area tops out at 13,269-foot Antora Peak. The area is adjacent to a 3,600-acre wilderness-quality portion of the Starvation Creek roadless area on the Pike-San Isabel NF.

Naturalness

Antora Meadows is a compact shape comprised of several tributary watersheds. It has escaped prior intensive timber management typical of adjacent areas. The PSCO gas pipeline is excluded from the area and forms the western boundary. The boundary cherrystems areas of mineral exploration and development along with the patented mining claims and access road in the Antora Meadows vicinity. It also omits the 5 miles of the Continental Divide National



Scenic Trail open to motorized use along the northern boundary of the unit. Within these boundaries, there is no evidence of significant human imprints.

Outstanding Opportunities for Solitude or Unconfined Primitive Recreation

This large expanse of roadless landscape offers solitude that is hard to find in other mountainous regions of Colorado. Due to its dry environment and lack of large bodies of water, this is a relatively unvisited part of the state. Visitors can readily achieve solitude in any of the several tributary valleys leading to the Continental Divide.

The area's remoteness and lack of roads makes it an ideal refuge for deer and elk, a fact that provides outstanding opportunities for backcountry hunting. The area offers angling opportunities for a pure Rio Grande cutthroat trout population. The area's 20 miles of non-motorized trails in many cases parallel lush riparian zones of willow, blue spruce and aspen that makes it an outstanding destination for horseback riding, hiking and wildlife viewing. The Middle Creek trailhead is popular with backcountry horse users, and the trails are signed as closed to mountain bikes.

Size and Roadlessness

Antora Meadows contains 27,700 acres on the Rio Grande National Forest. It is contiguous with 3,600 acres of wilderness quality lands in the adjacent Starvation Creek roadless area on the Pike-San Isabel NF. The area's boundaries are the PSCO gas pipeline on the west and the edge of past timber harvests in the Slaughterhouse Creek watershed to the east, with the national forest boundary and Forest Road 880.2B on the south, and the Continental Divide/national forest boundary to the north.

Supplemental Values

While Antora Meadows provides habitat for recovering lynx and potential wolverine populations, perhaps its most important ecological role comes in the form of undisturbed watersheds for core conservation populations of Rio Grande cutthroat trout. The core conservation populations in East Middle Creek and Tuttle Creek are >99% pure, phenotypically true, and representative of the species' historic genome. East Middle Creek is also a Colorado Natural Heritage Program Potential Conservation Area of moderate biodiversity significance because of the trout population. (Conservation Plan for Rio Grande Cutthroat Trout in Colorado, CDOW, 2004; CNHP PCA Report, 2015)

Antora Meadows helps fill the largest gap in the wilderness system in the Southern Rockies. The area is part of the ecological connection between the large protected wilderness areas of the San Juans to the south and the equally important preserves of the Elk, Sawatch, and Sangre de Cristo ranges to the north and east. (SREP Wildlands Network Vision 2003; Aplet et al Indicators of Wildness 2000.)

Antora Meadows provides one of the few areas in Colorado where all of the state's major forest types coexist. Ecologists can find an abundance of conifer species here in uncommon proximity, including Douglas fir, white fir, subalpine fir, lodgepole pine, limber pine,

ponderosa pine, Colorado blue spruce and Engelmann spruce. The area is located amidst the only portion of the Rio Grande NF where lodgepole pine naturally occurs.

Antora Meadows contains several ecosystems under-represented among existing wilderness areas on the Rio Grande National Forest. The lowest slopes consist of rolling grasslands at the national forest boundary with adjacent BLM lands, while forests of lodgepole pine and Douglas fir blanket the higher slopes, above meadows and stream valleys banded by aspen groves. By protecting this area, the Rio Grande NF can increase the ecological representation within its wilderness areas of Rocky Mountain Lodgepole Pine Forest, Rocky Mountain Aspen Forest and Woodland, and Southern Rocky Mountain Montane-Subalpine Grassland. (TWS ecosystem representation report, 2016)

Manageability

Antora Meadows is a compact unit that is comprised of the Middle Creek watershed and has readily identifiable boundaries on the ground. It is bounded on the north by the motorized Continental Divide National Scenic Trail and on the south by the forest boundary, and by Forest Road 880.2B. The western boundary is readily delineated by the PSCO gas pipeline corridor, and the eastern boundary approximately by Forest Development Road 861 in the Slaughterhouse Creek watershed. The area’s eastern boundary, north of Mosquito Lake, is contiguous with several thousand acres of wilderness-quality lands on the Pike-San Isabel NF.

Patented mining claims at Antora Meadows are cherry-stemmed out of the unit boundary along with the access route via FDR 880.2B. These are on top of a ridge and out of sight of wilderness users. A short, dead-end and unmaintained motorized trail (#764) extends two miles north of Antora Meadows (see photo). The 2015 Rio Grande NF TAP ranked this trail as low value and high risk owing to its fords across four headwaters tributaries of East Middle Creek, which are inhabited by Rio Grande cutthroat trout. There are no oil and gas leases within the boundaries.

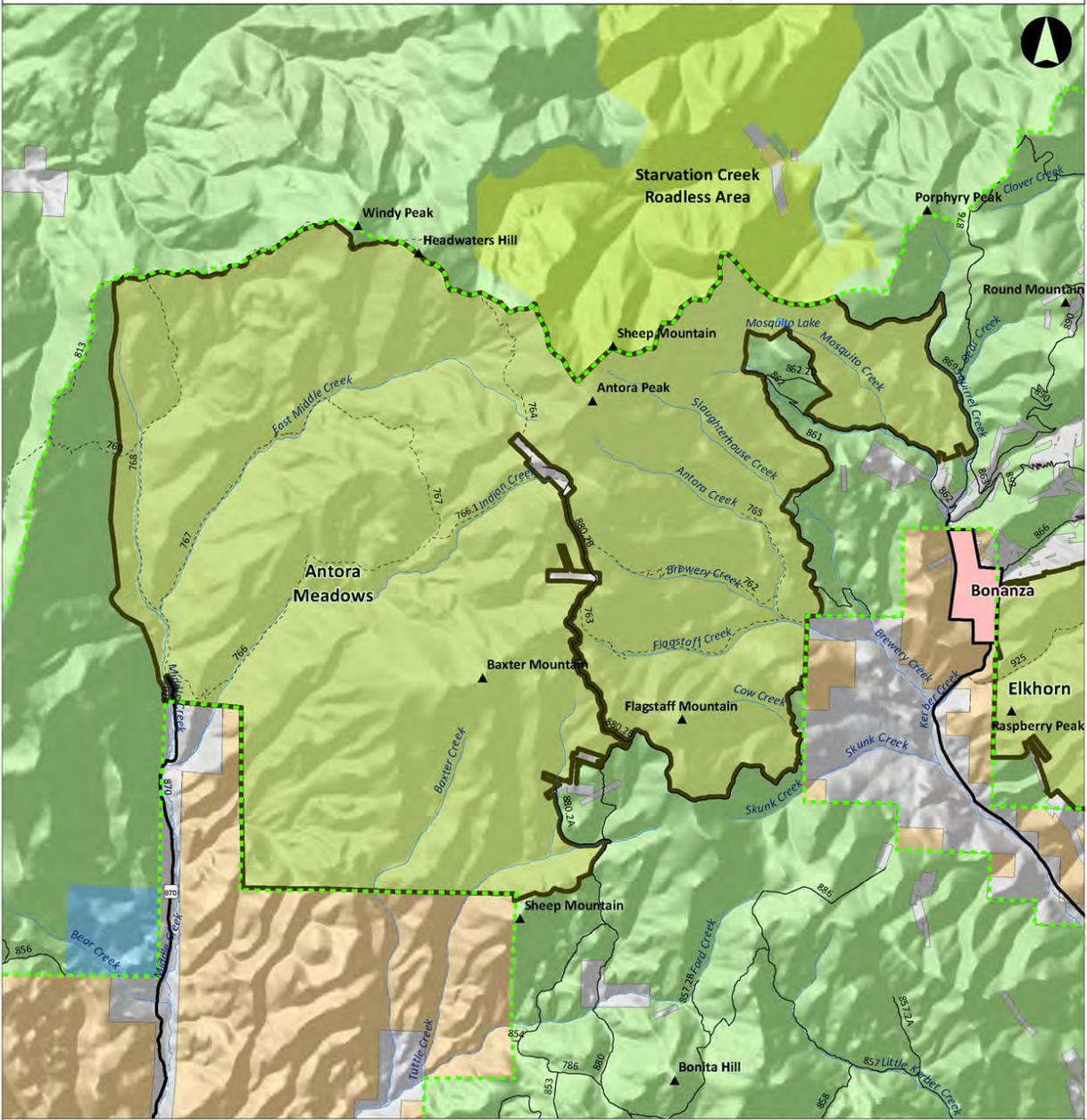


Information Resources

Item	Data Source
Roadlessness	Colorado Roadless Rule at 36 CFR 294 subpart D
	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 71
Naturalness; Outstanding Opportunities for Solitude or Unconfined Primitive	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 72

Recreation	
	USDA Forest Service, R2, Profiles of Colorado Roadless Areas 2008
	SLVEC Roadless area description 2002
Supplemental Values	
Rio Grande Cutthroat Trout	Conservation Plan for the Rio Grande Cutthroat Trout in Colorado. Colorado Division of Wildlife; CNHP PCA Report 2015
Connectivity	SREP Wildlands Network 2003, Aplet et al Indicators of Wildness 2000
Ecosystem representation	TWS Ecosystem Representation 2016

Antora Meadows Recommended Wilderness Boundary



Data Sources: BLM, CDOT, SRCA, USFS, USGS, wilderness.net
Map Prepared By: Alison Gallensky
 Rocky Mountain Wild
 9/3/2015 16-112 v7

Legend

- ▲ Summit
- RGNF District
- City
- Major Road
- USFS Road
- USFS Trail
- Lake/Pond
- Stream/River
- Recommended Wilderness
- Designated Wilderness
- Roadless Land in Adjacent Forest

Land Ownership

- USFS
- BLM
- NPS
- State
- Other Public
- Private/Tribe



Elkhorn Peak recommended wilderness

Proposed Wilderness Designation
Rio Grande National Forest
Saguache Ranger District

15,800 acres



General Description

The proposed Elkhorn Peak wilderness serves an important role in landscape connectivity between the Sangre de Cristo range and the Cochetopa Hills of the northern San Juan Mountains. Elkhorn Peak straddles the ridge between Villa Grove and Bonanza south of Poncha Pass. Sweeping vistas of the Sangre de Cristo range are obtained from the summits of Elkhorn and Hayden peaks, enhancing the outstanding sense of isolation in this remote corner of the northern San Luis Valley. Several non-motorized trails provide ready access into the heart of the area, such as the trail that traverses Kelly Creek and Elkhorn Gulch.

Elkhorn Peak extends from grasslands and ponderosa pine characteristic of the uplands of the San Luis Valley to two peaks over 12,000 feet – Elkhorn and Hayden. The elevational gradient creates a continuum of ecosystems through large stands of aspen to lodgepole pine and extensive forests of Engelmann spruce and subalpine fir. Bristlecone pine and limber pine can be found on wind blown dry rocky ridges and slopes.

Naturalness

Elkhorn Peak is a roughly square area with boundaries defined by the forest boundary and surrounding roads. The boundary excludes past mining impacts and patented mining claims in the vicinity of Bonanza and in the Kerber Creek valley. The resulting area is natural with no substantially noticeable human impacts.



Outstanding Opportunities for Solitude or Unconfined Primitive Recreation

Outstanding opportunities for solitude and ample vistas are commonplace when exploring Elkhorn Peak. The feeling of seclusion and remoteness is particularly enhanced in the area's western portion, amidst the rugged Elkhorn and Hayden peaks. Visitors can barely ascertain highways and farms more than a half-dozen miles distant in the San Luis Valley. The separation from the sights and sounds of civilization further heightens the sensation of solitude and isolation gained within the unit.

Elkhorn Peak includes approximately ten miles of non-motorized trails. These are popular destinations for horseback riding and hiking, particularly from the Kelley Creek trailhead. Scenic vistas and direct access to the crest of the area combine to create outstanding opportunities for primitive and unconfined recreation. The area's primary drainages contain beaver ponds and trout fisheries, and important deer and elk winter range sustains healthy big game herds that draw fall hunters.

Size and Roadlessness

The proposed Elkhorn Peak wilderness is a free-standing unit of 15,800 acres. The area's topography and compact boundary configuration enhances the practicality of managing it for its preservation and use in an unimpaired condition.

Supplemental Values

The proposed Elkhorn Peak wilderness contains the entirety of the 2,014-acre Kelly Creek Potential Conservation Area, a Colorado Natural Heritage Program ranked as High Biodiversity Significance. The Kelly Creek PCA includes a wetland complex with a robust montane riparian shrubland where the undergrowth is still dominated by native species, an increasingly rare occurrence. Beaver ponds expand the floodplain habitat and constitute an important component in maintaining this healthy ecosystem. Shrubland associations at lower elevations like this one in Kelly Creek are usually impacted by water diversions, livestock grazing, invasive plant species and agricultural conversion, which makes the PCA all the more unusual. (CNHP PCA Report, 2015)

Elkhorn Peak helps fill the largest gap in the wilderness system in the Southern Rockies and provides connectivity across the landscape between the northern San Juan Mountains and the Sangre de Cristo range. The area is immediately south of the important Poncha Pass lynx linkage area. (SREP Wildlands Network Vision 2003; Aplet et al Indicators of Wilderness 2000.)

Elkhorn Peak contains several ecosystems under-represented among existing wilderness areas on the Rio Grande National Forest. The lowest slopes consist of rolling grasslands and ponderosa pine woodland at the national forest boundary with adjacent BLM lands, while forests of lodgepole pine and Douglas fir blanket the higher slopes. By protecting this area, the Rio Grande NF can substantially increase the ecological representation within its wilderness areas of Southern Rocky Mountain Montane-Subalpine Grassland, Southern Rocky Mountain Ponderosa Pine Woodland, Rocky Mountain Lodgepole Pine Forest, and Rocky Mountain Aspen Forest and Woodland. (TWS ecosystem representation report, 2016)

Manageability

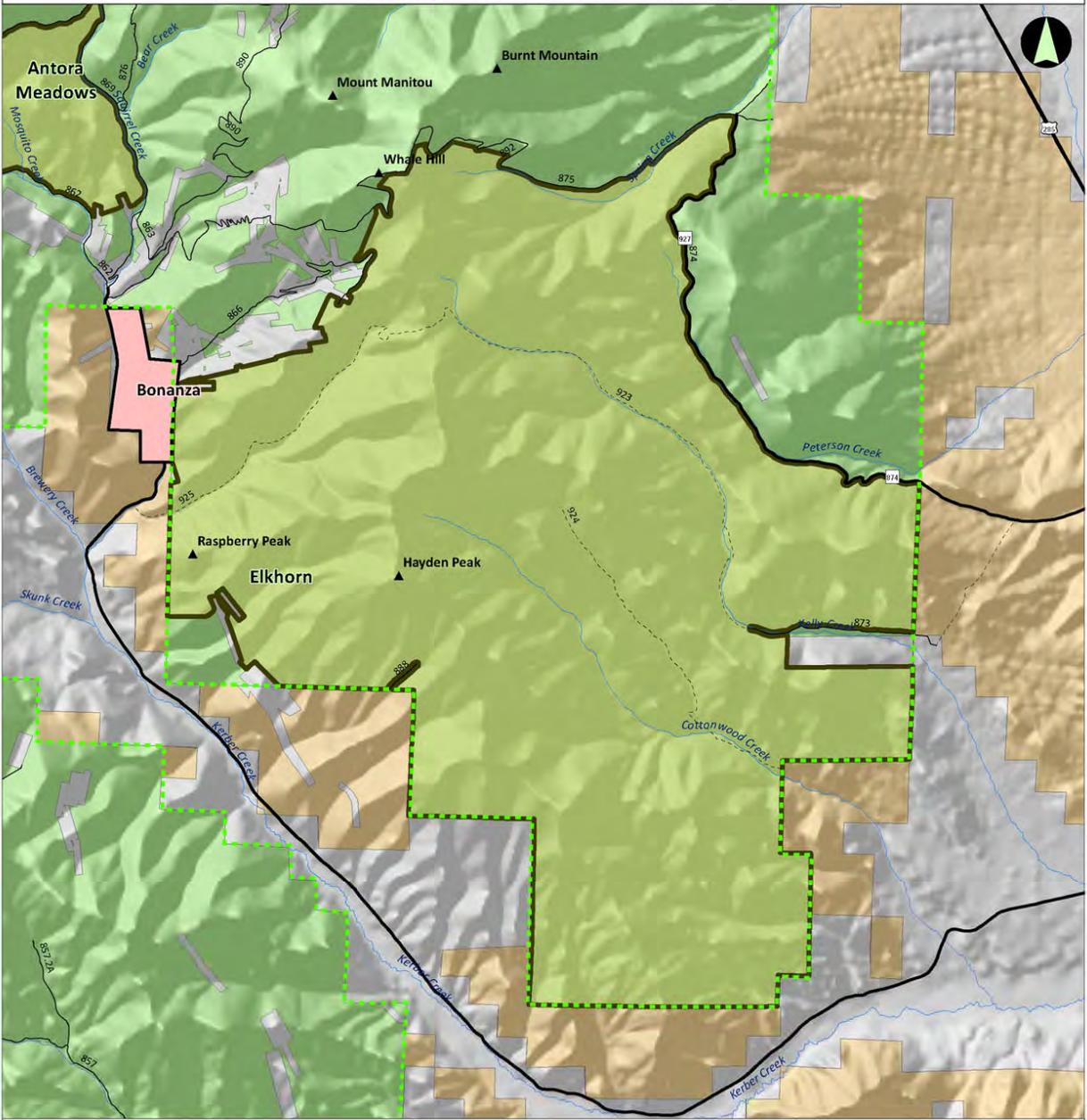
Elkhorn Peak can be easily managed to preserve its wilderness character. The area is a compact shape with readily identifiable topographic boundaries. The forest boundary defines the eastern, western and southern boundaries and are largely buffered by adjacent

BLM administered lands. The northern boundary generally consists of forest roads and patented mining claims. The area's lower reaches may be within the WUI boundary for Kelly Creek and Bonanza, which can be easily offset with a boundary cushion. There are no non-federal inholdings as all patented mining claims are excluded from the boundary. There are no oil and gas leases.

Information Resources

Item	Data Source
Roadlessness	Colorado Roadless Rule at 36 CFR 294 subpart D
	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 71
Naturalness; Outstanding Opportunities for Solitude or Unconfined Primitive Recreation	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 72
	USDA Forest Service, R2, Profiles of Colorado Roadless Areas 2008
	SLVEC Roadless area description 2002
Supplemental Values	
High Biodiversity Significance	CNHP PCA Report 2015
Connectivity	SREP Wildlands Network 2003, Aplet et al Indicators of Wildness 2000
Ecosystem representation	TWS Ecosystem Representation 2016

Elkhorn Recommended Wilderness Boundary



Data Sources: BLM, CDOT, SRCA, USFS, USGS, wilderness.net
Map Prepared By: Alison Gallensky
 Rocky Mountain Wild
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Legend

- ▲ Summit
- City
- Major Road
- USFS Road
- USFS Trail
- ☪ Lake/Pond
- Stream/River
- Recommended Wilderness
- Designated Wilderness
- Roadless Land in Adjacent Forest

Land Ownership

- USFS
- BLM
- NPS
- State
- Other Public
- Private/Tribe



Lake Fork addition to La Garita Wilderness

Proposed Wilderness Designation
Rio Grande National Forest
Saguache Ranger District

3,800 acres



General Description

The Lake Fork addition to the La Garita Wilderness finalizes wilderness protection for the watershed upstream of the remote Middle Fork trailhead on the wilderness area's eastern boundary. The addition is characterized by large aspen stands and mountain-bunchgrass parks, and completes wilderness protection for three miles of the Continental Divide. The wilderness boundary at present follows the center of the Middle Fork of Saguache Creek; this addition creates a topographically sensible wilderness boundary on both sides of the valley that incorporates the entirety of the Middle Fork watershed to the wilderness trailhead.

The added lands provide excellent range for summering elk herds, and enhance habitat protection for documented use by lynx. Machin Lake sits at the headwaters of the Middle Fork and the Middle Fork trail provides direct access to this recreation destination in the La Garita Wilderness.

Naturalness

The proposed wilderness addition applies to the Upper Tier portion of the Lake Fork Colorado Roadless Area, or about 3,800 acres of the larger 10,700-acre roadless area. The addition consists of the Middle Fork valley and adjacent forests and hillsides that are consistent in natural appearance with the adjacent wilderness lands. The aspen and grasslands result from wildfires 100 years prior. There are no vehicle routes or past management activities within the proposed wilderness addition.



Outstanding Opportunities for Solitude or Unconfined Primitive Recreation

The Middle Fork Trailhead is a remote wilderness access point into the adjacent La Garita Wilderness. It is located at the end of six miles of four-wheel-drive road. The Middle Fork trail is the gateway to a network of wilderness trails higher in the watershed and terminates in the alpine basin of Machin Lake. Multiple looping wilderness trips extend from the Middle Fork trail, such as those incorporating the Halfmoon Pass and Machin Basin trails. The Middle Fork trail provides outstanding opportunities for backpacking, fishing, horsepacking, and hunting. The remoteness of the trailhead helps guarantee outstanding opportunities for solitude, which is particularly notable along the trail-less portion of the Continental Divide and in the Lake Fork drainage in the addition's northern end.

Size and Roadlessness

The proposed Lake Fork addition to the La Garita Wilderness is 3,800 acres out of the larger 10,700-acre Colorado Roadless Area. The northern boundary of this pie-shaped addition is the Lake Fork of Saguache Creek, where the Tarbell Ditch diverts water across the Continental Divide out of the Cochetopa Creek watershed into the Saguache Creek watershed. The remainder of the roadless area boundary is the existing wilderness boundary.

Supplemental Values

The proposed wilderness addition includes a portion of the Saguache Creek Potential Conservation Area identified by the Colorado Natural Heritage Program. Saguache Creek is ranked as High Biodiversity Significance owing to its montane and subalpine willow carr associations within the creek's floodplain and valley toe slopes. The Middle Fork of Saguache Creek is noted specifically for a good stand of beaked sedge (*Carex utriculata*) wetland and numerous smaller wetlands in the upper watershed (CNHP PCA Report for Saguache Creek, 2015).

The Middle Fork of Saguache Creek hosts a high purity, recreation population for Rio Grande Cutthroat Trout that extends all the way into the headwaters at Machin Lake. (Conservation Plan for Rio Grande Cutthroat Trout in Colorado, CDOW, 2004)

The proposed Lake Fork addition enhances the ecological effectiveness of the La Garita Wilderness by expanding the size of the protected area. Larger protected areas are more likely to provide conditions for species persistence over the long term than smaller areas, as are areas with more compact boundaries. The addition increases the wilderness acreage of La Garita while reducing the length of the wilderness boundary, thereby increasing the ratio of acreage to boundary. (SREP Wildlands Network Vision 2003; Aplet et al Indicators of Wilderness 2000.)

The proposed Lake Fork wilderness addition increases the ecological representation within Rio Grande National Forest wilderness areas of Southern Rocky Mountain Montane-Subalpine Grassland, an ecosystem type currently with less than 5% representation of the overall ecosystem acreage on the forest. (TWS ecosystem representation report, 2016)

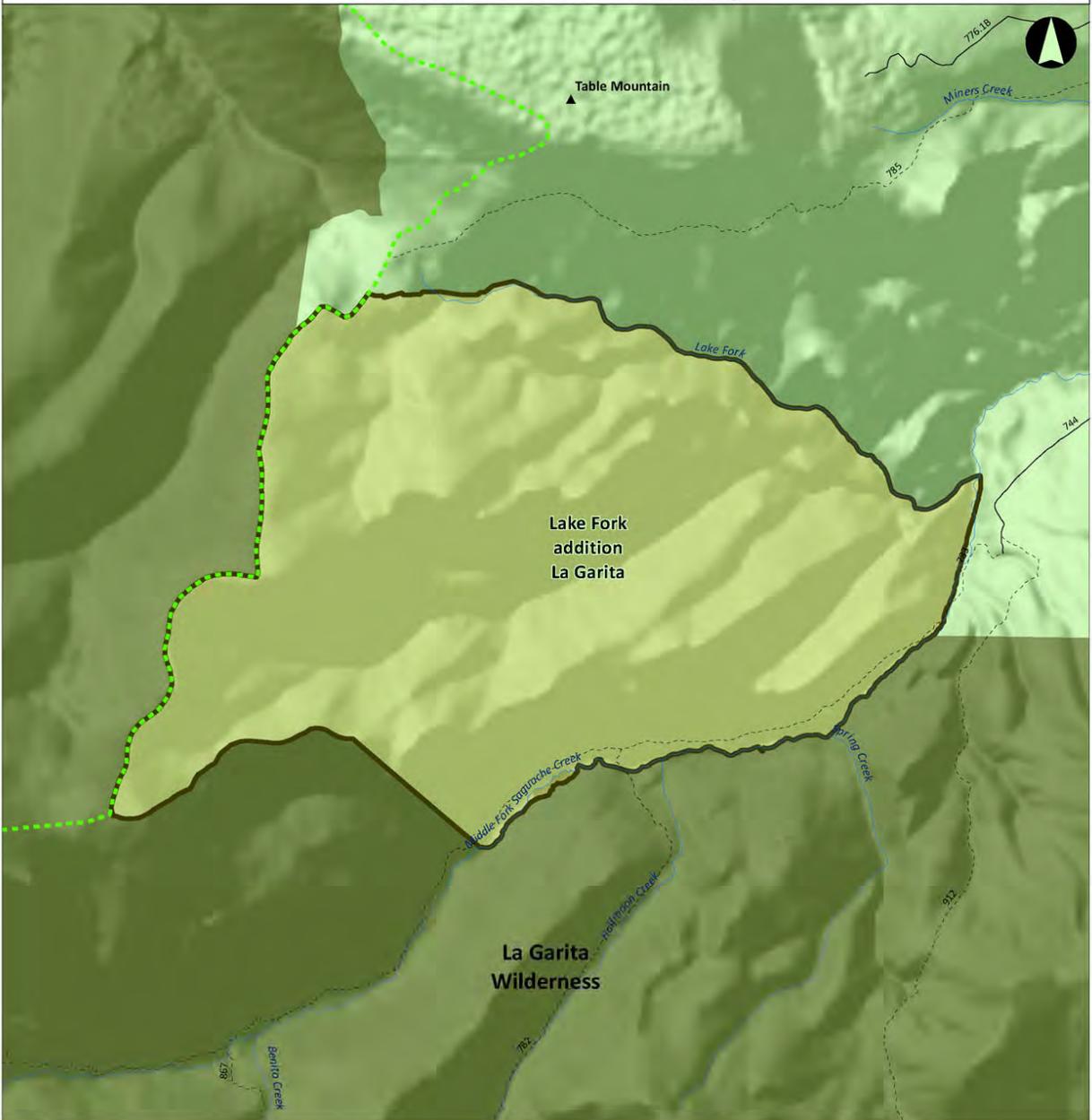
Manageability

The Lake Fork addition is readily manageable as wilderness, and increases the compactness of the adjacent La Garita Wilderness by its addition. The only trail within the area is the non-motorized Middle Fork trail leading several miles to the existing wilderness boundary. The transbasin water diversion out of Cochetopa Creek into Saguache Creek is excluded from the proposed wilderness boundary and forms the northern boundary. There are no oil and gas leases or non-federal inholdings.

Information Resources

Item	Data Source
Roadlessness	Colorado Roadless Rule at 36 CFR 294 subpart D
	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 71
Naturalness; Outstanding Opportunities for Solitude or Unconfined Primitive Recreation	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 72
	USDA Forest Service, R2, Profiles of Colorado Roadless Areas 2008
	SLVEC Roadless area description 2002
Supplemental Values	
High Biodiversity Significance	CNHP PCA Reports 2015
Rio Grande Cutthroat Trout	Conservation Plan for the Rio Grande Cutthroat Trout in Colorado. Colorado Division of Wildlife; CNHP PCA Report 2015
Connectivity	SREP Wildlands Network 2003, Aplet et al Indicators of Wildness 2000
Ecosystem Representation	TWS Ecosystem Representation 2016

Lake Fork addition La Garita Recommended Wilderness Boundary



Data Sources: BLM, CDOT, SRCA, USFS, USGS, wilderness.net
Map Prepared By: Alison Gallensky
 Rocky Mountain Wild
 9/3/2015 16-112 v7

Legend

- ▲ Summit
- City
- Major Road
- USFS Road
- - - USFS Trail
- ☪ Lake/Pond
- Stream/River
- Recommended Wilderness
- Designated Wilderness
- Roadless Land in Adjacent Forest

Land Ownership

- USFS
- BLM
- NPS
- State
- Other Public
- Private/Tribe



Wannamaker Creek-Deep Creek addition to La Garita Wilderness

Proposed Wilderness Designation
Rio Grande National Forest
Saguache Ranger District

10,900 acres



General Description

The Wannamaker Creek-Deep Creek addition to the La Garita Wilderness consists of two wild valleys draining north from the 12,000-13,000 foot escarpment of the La Garita Mountains. These two intact roadless watersheds lie adjacent to the wilderness area's eastern boundary, and support primitive recreation on more than 15 miles of backcountry trails. The trails are remote, and in some cases difficult to access, creating an experience of outstanding solitude.

At its lowermost elevations, the addition greatly enhances the ecosystems protected within the existing wilderness by incorporating thousands of acres of grasslands typical of those in expansive Saguache Park. The area provides high quality habitat for elk and deer, and angling opportunities for Rio Grande cutthroat trout. The addition encompasses almost five miles along the South Fork of Saguache Creek.

Naturalness

The proposed wilderness addition applies to the northern half of the Deep Creek-Boot Mountain Colorado Roadless Area. The private inholding and historic mining activity at Sky City is cherrystemmed out of the wilderness boundary, and past timber harvest areas east of Deep Creek are similarly excluded. There are no vehicle routes or past management activities within the proposed wilderness addition, and the area reflects unmodified naturally-occurring ecological conditions.



Outstanding Opportunities for Solitude or Unconfined Primitive Recreation

Both Wannamaker Creek and Deep Creek watersheds are remote and lightly visited. The steep northern escarpment of the La Garita Mountains creates a natural topographic barrier at the highest elevations, separating the two drainages from motorized routes

including the La Garita Stock Driveway to the south of the mountain crest. This topographic isolation maintains outstanding opportunities for solitude.

The Sky City inholding blocks public access from the lower end of Wannamaker Creek, but other trails provide several access alternatives into the upper end of Wannamaker Creek. These include the Deep Creek trail from the east, the Coyote Trail coming over the divide from the La Garita Wilderness to the west, and the Wannamaker Creek trail itself from the top of the high escarpment. The alternate access requires more effort and imagination by backcountry users, meaning the Wannamaker Creek watershed retains outstanding solitude and challenging primitive recreation opportunities. Similarly, there is a lightly-used and unobtrusive trail along the length of Deep Creek that begins at its confluence with the South Fork of Saguache Creek.

The trail systems provide access for those seeking remote backcountry hunting experiences in the fall, and Wannamaker Creek supports a hybridized Rio Grande cutthroat trout population for anglers.

Size and Roadlessness

The proposed Wannamaker Creek-Deep Creek addition to the La Garita Wilderness is 10,900 acres out of the larger 27,600-acre Colorado Roadless Area. The watershed divide atop the La Garita Mountains escarpment defines the southern boundary, while the northern boundary is the South Fork of Saguache Creek. The area adjoins the La Garita Wilderness to the west, and the Deep Creek watershed divide forms the eastern boundary.

Supplemental Values

The proposed Wannamaker Creek-Deep Creek addition includes a portion of the Saguache Creek Potential Conservation Area identified by the Colorado Natural Heritage Program. The Saguache Creek PCA is ranked as High Biodiversity Significance owing to its montane and subalpine willow carr associations within the creek's floodplain and valley toe slopes. According to CNHP, the upper watershed of Saguache Creek supports a broad diversity of aquatic and terrestrial habitats and maintains a largely undisturbed hydrological regime. The headwaters streams provide a valuable refuge for species that have been impacted by land use in the lower watershed, such as the Rio Grande cutthroat trout. (CNHP PCA Report for Saguache Creek, 2015).

Wannamaker Creek hosts a conservation population for Rio Grande Cutthroat Trout. (Conservation Plan for Rio Grande Cutthroat Trout in Colorado, CDOW, 2004)

The proposed Wannamaker Creek-Deep Creek addition enhances the ecological effectiveness of the La Garita Wilderness by expanding the size of the protected area. Larger protected areas are more likely to provide conditions for species persistence over the long term than smaller areas. (SREP Wildlands Network Vision 2003; Aplet et al Indicators of Wilderness 2000.)

The proposed Wannamaker Creek-Deep Creek wilderness addition increases by thousands of acres the ecological representation within Rio Grande National Forest wilderness areas of Southern Rocky Mountain Montane-Subalpine Grassland, an ecosystem type currently with less than 5% representation of the overall ecosystem acreage on the forest. (TWS ecosystem representation report, 2016)

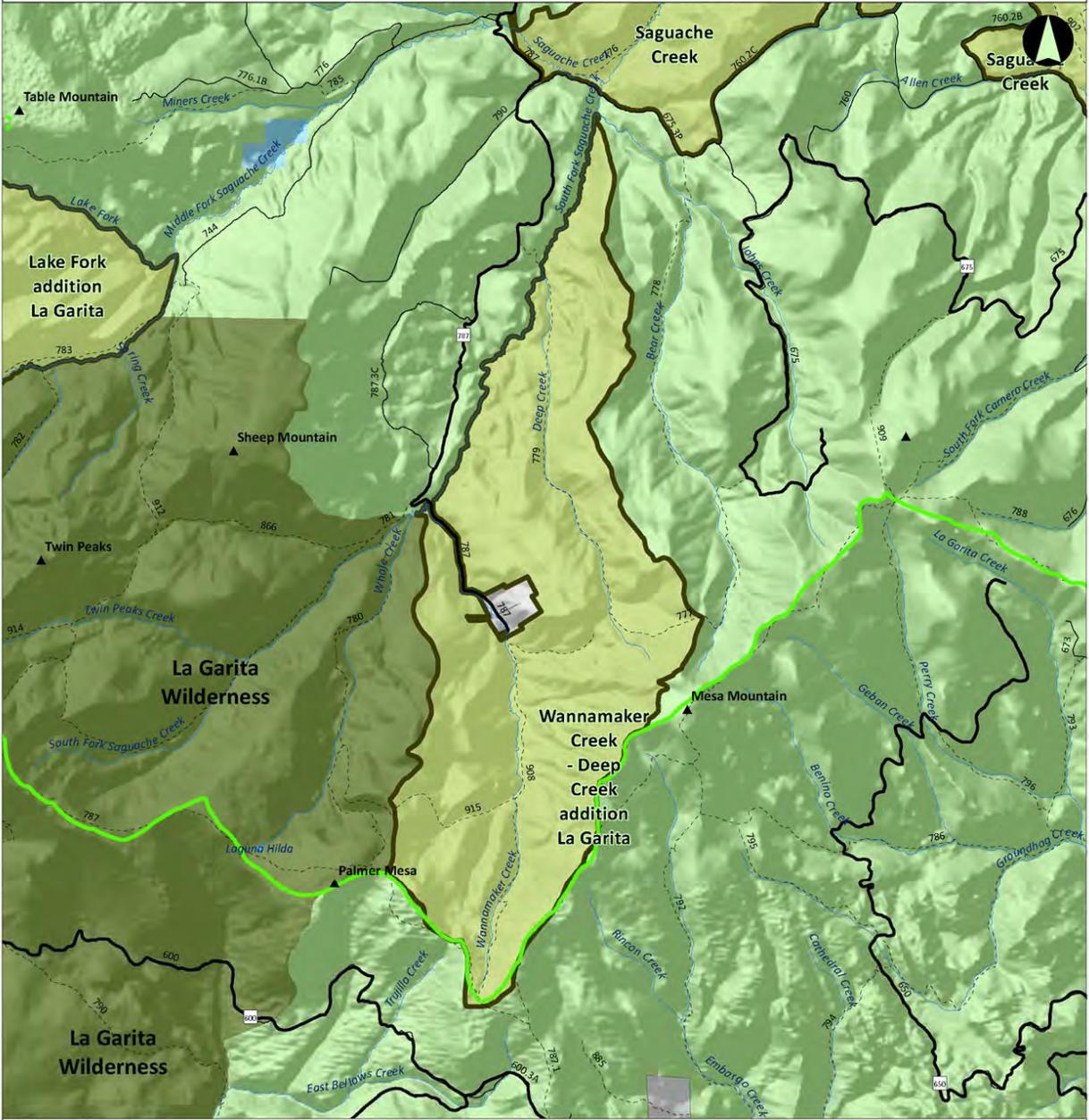
Manageability

The Wannamaker Creek-Deep Creek wilderness addition has a clearly defined topographic boundary denoted by watershed divides to the east and south, and by the South Fork of Saguache Creek to the north (the existing wilderness boundary is to the west). This boundary readily excludes incompatible uses such as motorized vehicles. This subset of the larger Deep Creek-Boot Mountain Colorado Roadless Area eliminates the irregularities of shape and also excludes all motorized trails characteristic of the southern half of the roadless area. The Sky City private inholding and its mile-long access road #787 are cherrystemmed out of the lower end of the six-mile long Wannamaker Creek valley. There are no oil and gas leases in the area.

Information Resources

Item	Data Source
Roadlessness	Colorado Roadless Rule at 36 CFR 294 subpart D
	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 71
Naturalness; Outstanding Opportunities for Solitude or Unconfined Primitive Recreation	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 72
	USDA Forest Service, R2, Profiles of Colorado Roadless Areas 2008
	SLVEC Roadless area description 2002
Supplemental Values	
High Biodiversity Significance	CNHP PCA Reports 2015
Rio Grande Cutthroat Trout	Conservation Plan for the Rio Grande Cutthroat Trout in Colorado. Colorado Division of Wildlife; CNHP PCA Report 2015
Connectivity	SREP Wildlands Network 2003, Aplet et al Indicators of Wildness 2000
Ecosystem Representation	TWS Ecosystem Representation 2016

Wannamaker Creek - Deep Creek addition La Garita Recommended Wilderness Boundary



Data Sources: BLM, CDOT, SRCA, USFS, USGS, wilderness.net
Map Prepared By: Alison Gallensky
 Rocky Mountain Wild
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- Legend**
- ▲ Summit
 - City
 - Major Road
 - USFS Road
 - - - USFS Trail
 - ☪ Lake/Pond
 - Stream/River
 - ▭ Recommended Wilderness
 - ▭ Designated Wilderness
 - ▭ Roadless Land in Adjacent Forest

- Land Ownership**
- ▭ USFS
 - ▭ BLM
 - ▭ NPS
 - ▭ State
 - ▭ Other Public
 - ▭ Private/Tribe

Wason Park addition to La Garita Wilderness

Proposed Wilderness Designation
Rio Grande National Forest
Divide Ranger District

22,000 acres



General Description

Wason Park is a large roadless area adjacent to the La Garita Wilderness' western boundary and just outside of Creede. Wason Park adds wilderness protection for up to 8 miles of the Continental Divide on the Rio Grande National Forest, significantly enhancing the presence of the La Garita Wilderness south of the divide. The La Garita Wilderness at present is situated predominately north of the Continental Divide on the neighboring Gunnison National Forest.

Wason Park's addition to the wilderness would greatly expand ecological representation of the La Garita Wilderness by incorporating south-facing slopes dominated by grasslands and ponderosa characteristic of the Rio Grande valley that transition continuously through aspen and spruce-fir to the Continental Divide. The addition spans an elevation range from 8,700 feet in the valley to over 13,000 feet on the Continental Divide. Its western flank consists of the steeply incised valley of East Willow Creek. Several non-motorized trails lead through the area to the adjacent wilderness boundary, including Farmers Trail from the valley floor, the Wason Trail from Creede, and the La Garita Stock Driveway from Phoenix Park.

Naturalness

Wason Park is a broad, unfragmented area of undisturbed habitat blanketing the western approaches to the La Garita Wilderness. While some mining remnants are visible adjacent to the lower Bachelor Loop Road at its lowest elevations near Creede, Wason Park is otherwise free of any substantial unnatural impacts.



Outstanding Opportunities for Solitude or Unconfined Primitive Recreation

Wason Park is a large landscape with intact forests and drainages leading to a remote section of the Continental Divide. The Continental Divide National Scenic Trail is located north of the actual divide in this section, thus making the southern flanks of the Divide in Wason Park an area of outstanding isolation and solitude. Upper East Willow Creek is

exceedingly remote and trail-less, and invokes a sense of vastness and impenetrability that further enhances the impression of solitude.

Wason Park contains over a dozen miles of non-motorized trails. These trails near Creede offer the closest wilderness access into the La Garita Wilderness from any surrounding communities. Several trails traverse the roadless area before reaching the existing wilderness boundary and provide excellent routes for hikers, backpackers, and horse users heading into the adjacent wilderness. These include the Farmers Creek Trail from the valley floor, the Wason Trail from Creede, and the La Garita Stock Driveway from Phoenix Park. The expansive, intact wildlife habitat provides outstanding opportunities for remote backcountry big-game hunting experiences.

Size and Roadlessness

Wason Park contains 22,000 acres. It is bounded on the east and north by the existing La Garita Wilderness, and on the south by the forest boundary in the Rio Grande valley. The area's western boundary is generally defined by roads and patented mining claims.

Supplemental Values

Wason Park contains outstanding supplemental values for a variety of wildlife species. It is in close proximity to high use lynx areas, contains lynx habitat, and provides an important landscape connectivity link for lynx. Wason Park provides important winter range for elk, deer, and bighorn sheep. Wason Park encompasses a migration route for bighorn sheep from the Bellows Creek herd to the San Luis Peak and Bristol Head herds. Wason Park also is adjacent to priority habitat for moose in West Willow Creek.

The proposed Wason Park wilderness addition enhances the ecological effectiveness of the La Garita Wilderness by expanding the size of the protected area. The Wason Park addition would boost the size of the La Garita Wilderness by 15%. Larger protected areas are more likely to provide conditions for species persistence over the long term than smaller areas. (SREP Wildlands Network Vision 2003; Aplet et al Indicators of Wilderness 2000.)

Wason Park contributes thousands of acres of one of the most under-represented ecosystem types among existing wilderness areas on the Rio Grande National Forest. By protecting this area, the Rio Grande NF can significantly increase the ecological representation within its wilderness areas of Southern Rocky Mountain Montane-Subalpine Grassland. (TWS ecosystem representation report, 2016)

Wason Park includes a pair of scenic waterfalls above Phoenix Park that are popular focal points for photographers.

Manageability

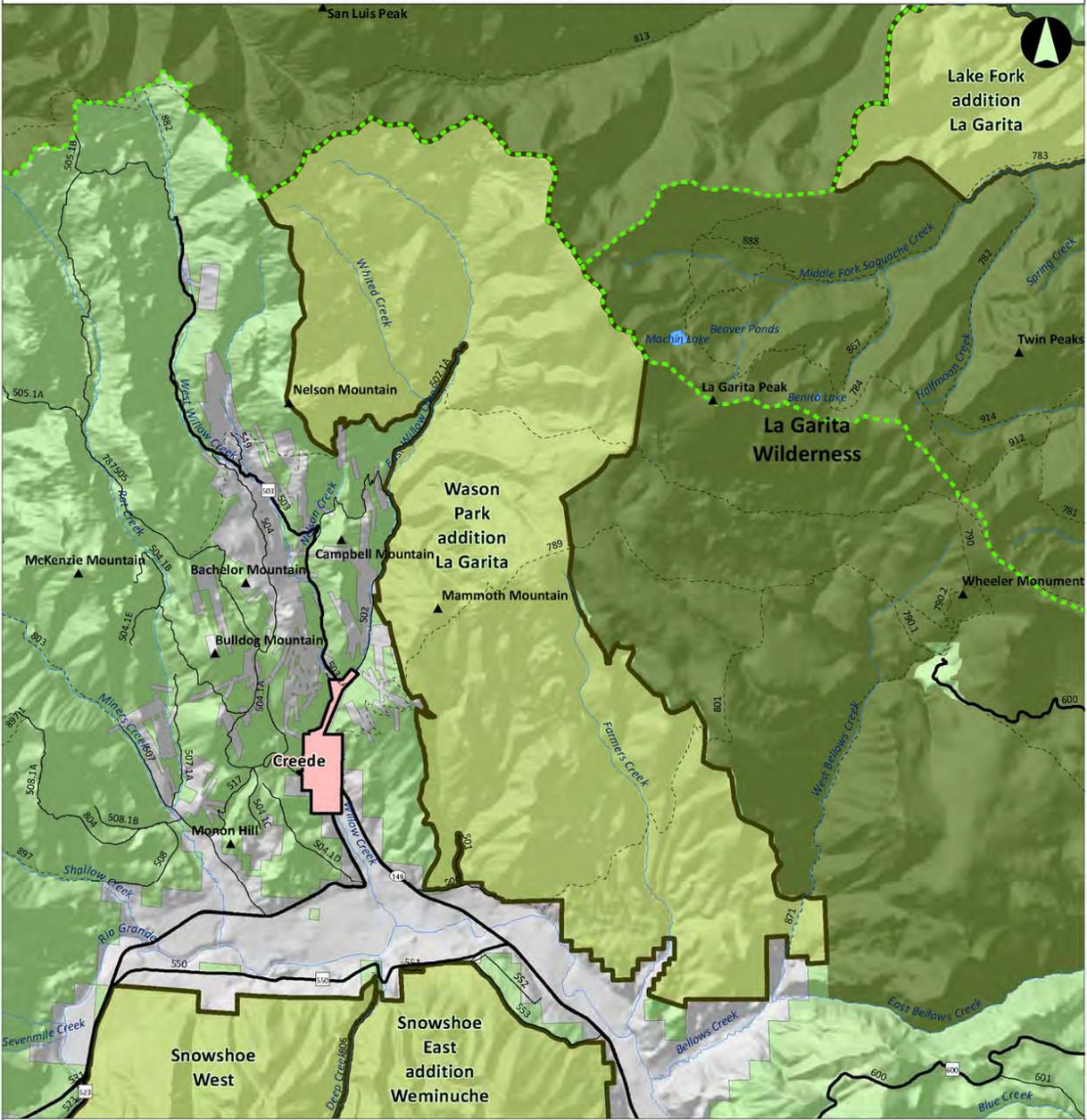
Wason Park is readily manageable as wilderness. It is characterized by a broad, three-mile-wide belt of forests and streams banding the southern and western boundary of the

existing La Garita Wilderness. Steep topography out of the East Willow Creek drainage precludes ready trespass by motorized vehicles. Adjacent patented mining claims are excluded from the boundary, and access to those private lands is via non-wilderness lands from the west. The primary Creede mineral belt along the famous Amethyst silver vein is situated along West Willow Creek and lies significantly outside the proposed wilderness addition. All of the existing trails are designated non-motorized. There are no oil and gas leases or non-federal inholdings within the area.

Information Resources

Item	Data Source
Roadlessness	Colorado Roadless Rule at 36 CFR 294 subpart D
	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 71
Naturalness; Outstanding Opportunities for Solitude or Unconfined Primitive Recreation	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 72
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Connectivity	SREP Wildlands Network 2003, Aplet et al Indicators of Wildness 2000
Ecosystem representation	TWS Ecosystem Representation 2016

Wason Park addition La Garita Recommended Wilderness Boundary




ROCKY MOUNTAIN WILD
 Data Sources: BLM, CDOT, SRCA, USFS, USGS, wilderness.net
 Map Prepared By: Alison Gallensky
 Rocky Mountain Wild
 9/3/2015 16-112 v7

- Legend**
- ▲ Summit
 - RGNF District
 - City
 - Major Road
 - USFS Road
 - USFS Trail

-  Lake/Pond
-  Stream/River
-  Recommended Wilderness
-  Designated Wilderness
-  Roadless Land in Adjacent Forest

- Land Ownership**
-  USFS
 -  BLM
 -  NPS
 -  State
 -  Other Public
 -  Private/Tribe



North Fork Rock Creek recommended wilderness

Proposed Wilderness Designation
Rio Grande National Forest
Divide Ranger District

16,500 acres



General Description

The proposed North Fork Rock Creek wilderness consists of the northeastern portion of the Bennet Mountain Colorado Roadless Area unit. It neatly encompasses the watershed of the North Fork of Rock Creek along with adjacent lands to the north. The area provides coverage of a lower elevation ecological transition in the foothills of the southern San Luis Valley south of Del Norte. In the fall, spectacular displays of colorful aspen foliage dominate the landscape.

Elevation ranges from a low of 8,880 feet at the national forest boundary along Rock Creek to 12,800-feet atop Pintada Mountain. Fescue dominated grasslands are common in the lowest elevations, then transition into pinyon-juniper habitats. Depending on slope aspect and elevation, mixed-conifer habitats of ponderosa pine, Douglas fir can be enjoyed at low to mid elevations. The highest elevations include alpine terrain above timberline. Two non-motorized trails offer abundant opportunities for hiking, angling, hunting, and horseback riding.

Naturalness

North Fork Rock Creek is a subset of a much larger, and more convoluted, roadless area. This smaller component is free of human imprints and displays a substantial level of naturalness throughout the area.



Outstanding Opportunities for Solitude or Unconfined Primitive Recreation

The North Fork of Rock Creek watershed provides an isolated setting shielded from the San Luis Valley. Visitors can readily experience outstanding opportunities for solitude. The area's high points above timberline atop Windy Mountain and Pintada Mountain offer outstanding vistas and similarly impart a sense of isolation amidst a large, undeveloped landscape.

The area is traversed by two non-motorized trails, North Rock Trail #701 and Dry Creek Trail #700. These trails each offer a half-dozen miles of exploration for hikers, anglers and equestrians. One trail parallels the creek and crosses back and forth multiple times, while the other trail navigates the high slopes above treeline and meanders down through a

range of forest transitions. The area provides important winter range for deer and elk, which translates also into outstanding opportunities for backcountry hunting.

Size and Roadlessness

The proposed North Fork Rock Creek wilderness unit is 16,500 acres in size.

Supplemental Values

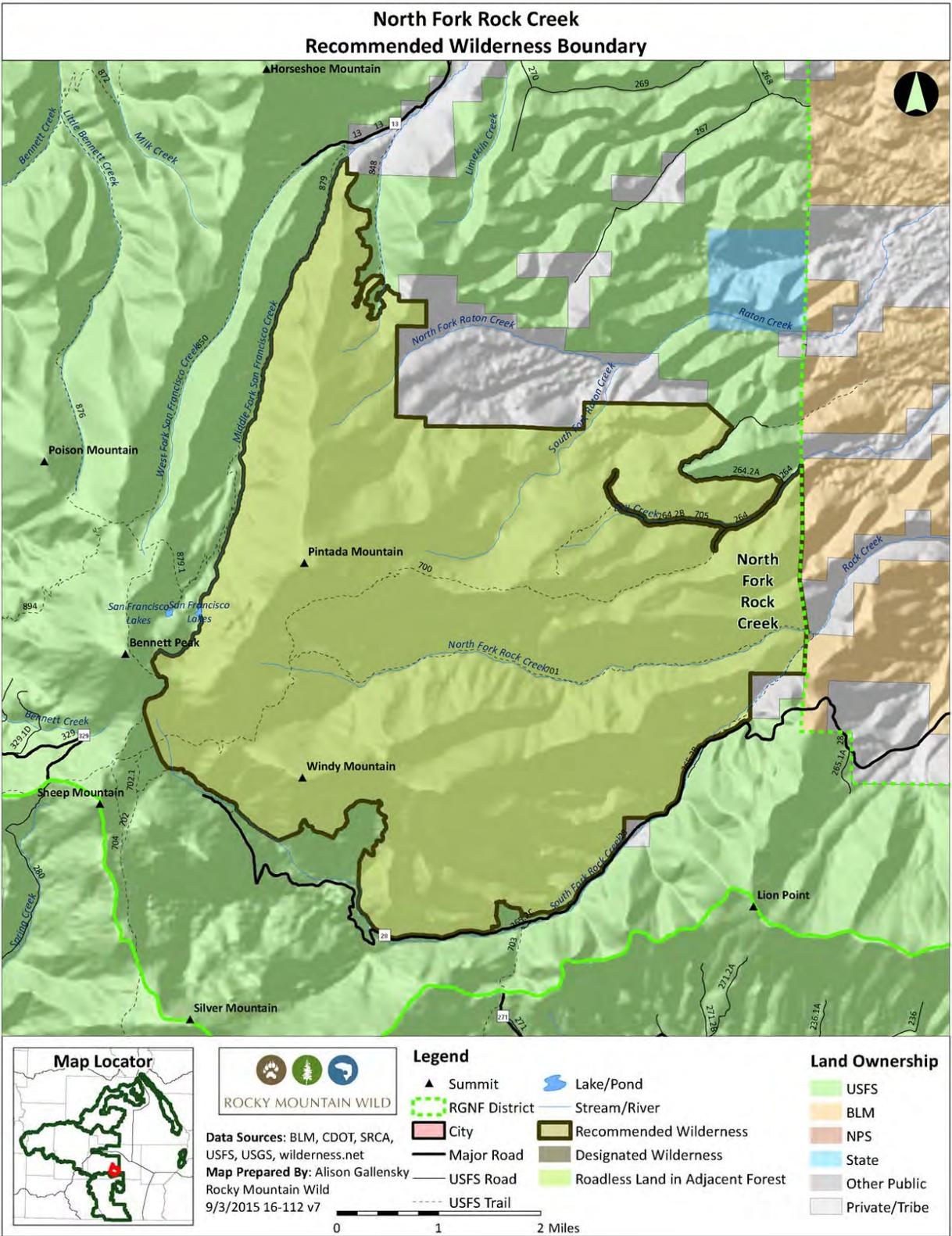
North Fork Rock Creek provides good representation of several ecosystem types under-represented among existing wilderness areas on the Rio Grande National Forest. The area covers the ecological transition from the San Luis Valley to alpine slopes, and at its lowest margins includes grasslands and pinyon-juniper woodlands, as well as ponderosa pine and dry mixed-conifer forests. Recommending this area for wilderness designation will increase the ecological representation on the Rio Grande NF of Southern Rocky Mountain Montane-Subalpine Grassland, Southern Rocky Mountain Ponderosa Pine Woodland, Rocky Mountain Pinyon-Juniper Woodland, and Southern Rocky Mountain Mesic Montane Mixed-Conifer Forest and Woodland, all of which are currently represented at less than 5% on the forest. (TWS ecosystem representation report, 2016)

Manageability

North Fork Rock Creek can be readily managed to preserve its wilderness character. The boundary is clearly delineated on three sides by easily identifiable topographic features such as ridgelines and streams, and is bounded on the east by the national forest boundary with adjacent undeveloped rural landscapes and BLM administered lands. The western boundary excludes the Middle Frisco Creek trail, which is utilized by mountain bikes. The area includes no non-federal inholdings and there are no oil and gas leases.

Information Resources

Item	Data Source
Roadlessness	Colorado Roadless Rule at 36 CFR 294 subpart D
	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 71
Naturalness; Outstanding Opportunities for Solitude or Unconfined Primitive Recreation	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 72
	USDA Forest Service, R2, Profiles of Colorado Roadless Areas 2008
	SLVEC Roadless area description 2002
Supplemental Values	
High Biodiversity Significance	CNHP PCA Report 2015
Connectivity	SREP Wildlands Network 2003, Aplet et al Indicators of Wilderness 2000



Pole Creek Mountain – Sheep Mountain recommended wilderness

Proposed Wilderness Designation
Rio Grande National Forest
Divide Ranger District

24,800 acres



General Description

The Pole Creek Mountain roadless area is an important piece of the puzzle in protecting landscape connectivity across the San Juan Mountains. The area fills a critical gap between the Weminuche Wilderness to the south and La Garita, Uncompahgre, Handies Peak and Red Cloud Peak wildernesses and wilderness study areas to the north. The roadless area incorporates an uncommon triple watershed divide, the high point amidst the Rio Grande, Lake Fork of the Gunnison, and Animas Rivers. The vast, sweeping expanses of upper Pole Creek bring to mind the immensity of Alaskan wilderness. Three distinct landscapes define the area: vertical cliffs rise out of the Lake Fork valley on the north, with numerous waterfalls and grottoes; rolling tundra interspersed with rugged volcanic peaks characterizes the central portion; while the southern end contains several deep, glaciated valleys.

The proposed Pole Creek Mountain and Sheep Mountain wilderness units are along 12 miles of the Continental Divide, from Stony Pass to Cataract Lake. The Colorado Trail and the Continental Divide National Scenic Trail traverse the area, paralleling the divide, and draw numerous hikers and backpackers. Others find Pole Creek equally intriguing for its oddly eroded volcanic formations called beehives and hoodoos.

The proposed wilderness consists of two units. Pole Creek Mountain is the central core of the roadless area, and is defined by the motorized trails along Pole Creek and West Lost Trail Creek, which are excluded. The Sheep Mountain unit is west of Pole Creek, largely within San Juan County, and extends to the Continental Divide.

Naturalness

Pole Creek Mountain is a large, primarily alpine roadless area along the Continental Divide. The imprints of human activity are few and substantially unnoticeable. There are a few scattered remnants of historic mining activity at the headwaters of the Rio Grande near Sheep Mountain. The area is generally indistinguishable in natural character from the adjacent Weminuche Wilderness to the south.



Outstanding Opportunities for Solitude or Unconfined Primitive Recreation

Pole Creek Mountain and Sheep Mountain form the core of Colorado's largest alpine expanse of tundra. Visitors experience a sensation of vastness and isolation unparalleled amongst existing wilderness areas across the Southern Rockies. From many vantage points, all one can see is undulating tundra ridges retreating into the distance, interrupted here and there by soaring peaks.

The Continental Divide National Scenic Trail/Colorado Trail defines the northern boundary of the proposed wilderness and is a popular with hikers and backpackers. Most long-distance backpackers through this segment are completing the entirety of the Colorado Trail from Denver to Durango. The route of the trail from Stony Pass to Cataract Lake follows a generally moderate grade above tree-line making it one of the most accessible high routes in Colorado. The trail system in Pole Creek Mountain is part of a larger interconnected trail system over the Continental Divide with the non-mechanized trails in Cuba Gulch and Cataract Gulch on the Grand Mesa-Uncompahgre-Gunnison National Forest and nearby lands managed by BLM within the Handies Peak Wilderness Study Area.

Size and Roadlessness

The Pole Creek Mountain roadless area is one of the largest freestanding areas on the Rio Grande National Forest. Even with separating the larger roadless area into two units along the motorized Pole Creek trail, the two separate Pole Creek Mountain and Sheep Mountain units are still 16,500 acres and 8,300 acres, respectively. The areas are bounded by the Stony Pass road to the south, the Continental Divide trail to the west and north, and West Lost Trail Creek/Lost Trail Creek to the east.

Supplemental Values

Pole Creek Mountain is important for several species of significant conservation concern. It is an area of high use by lynx and provides connections for lynx moving through the heart of the core population of the San Juan Mountains. The area contains one of the few known populations of the Uncompahgre fritillary butterfly, and also the only known global occurrences of the stonecrop gilia. Pole Creek Mountain provides high quality habitat for future wolverine populations.

Pole Creek Mountain includes portions of two Potential Conservation Areas identified by the Colorado Natural Heritage Program. Two globally vulnerable riparian plant communities, Booth's willow (*Salix boothii*)/mesic forbs shrubland and Wolf's willow (*Salix wolfii*)/mesic forbs shrubland, occur within a large subalpine willow carr along the upper reaches of the Pole Creek PCA and are ranked as High Biodiversity Significance. The Sheep Mountain portion includes the entirety of the Sheep Mountain in San Juans PCA, which is ranked as Very High Biodiversity Significance owing to the existence of one of only two known global occurrences of the critically imperiled stonecrop gilia (*Aliciella sedifolia*). The

best known worldwide occurrence of stonecrop gilia is located in the Half Peak PCA along the northern edge of the proposed wilderness (CNHP PCA Report, 2015).

Pole Creek Mountain includes over 20 miles of streams managed for recreation populations of Rio Grande cutthroat trout. Pole Creek, Lost Trail Creek, and West Lost Trail Creek create a large connected population along with adjacent streams in the headwaters of the Rio Grande below Stony Pass. (Conservation Plan for Rio Grande Cutthroat Trout in Colorado, CDOW, 2004)

The lower slopes of Pole Creek Mountain along the Rio Grande would increase the ecological representation within Rio Grande National Forest wilderness areas of Southern Rocky Mountain Montane-Subalpine Grassland, an ecosystem type currently with less than 5% representation of the overall ecosystem acreage on the forest. (TWS ecosystem representation report, 2016)

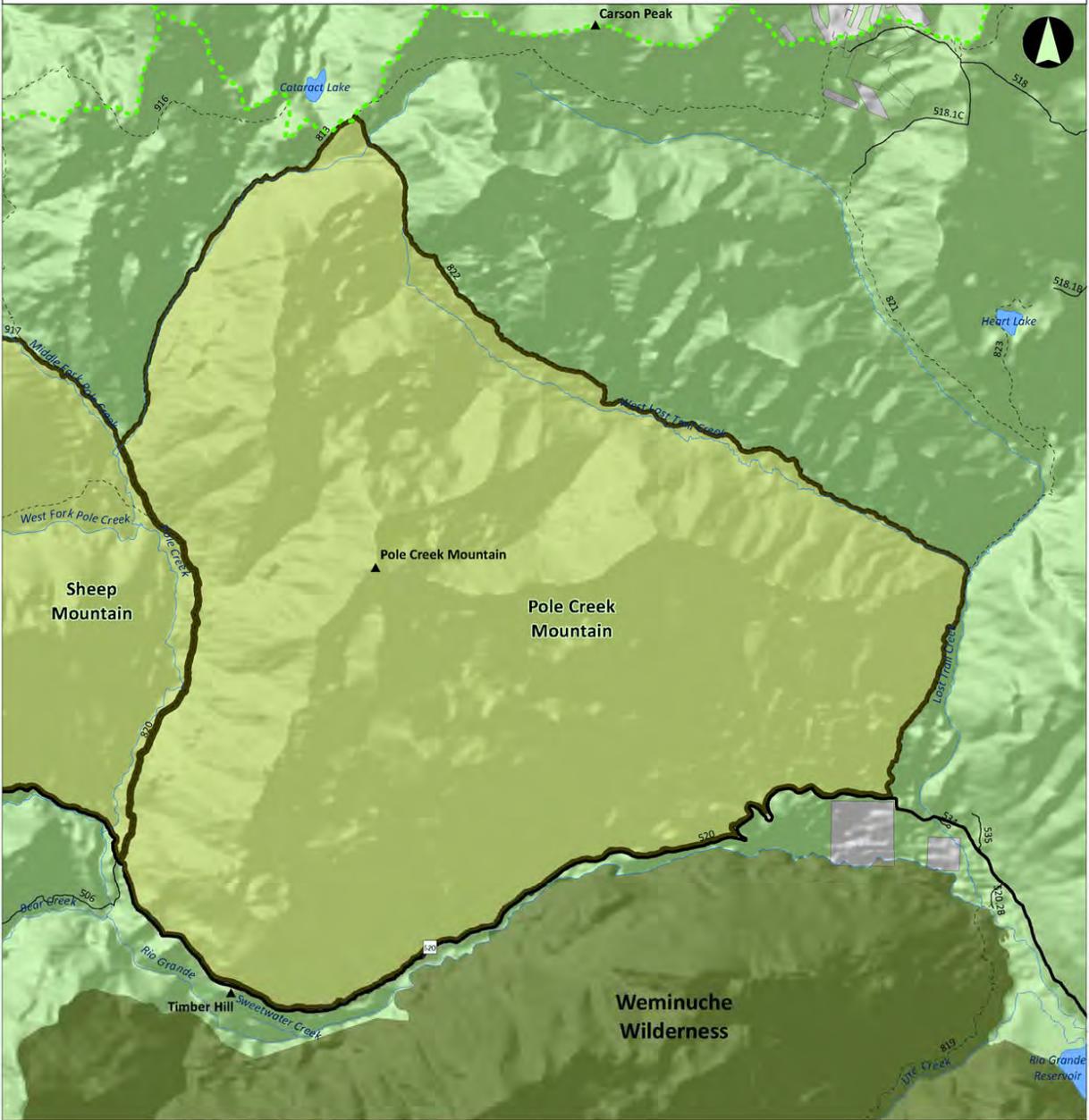
Manageability

The proposed Pole Creek Mountain and Sheep Mountain wilderness units are readily manageable as wilderness. The areas have compact boundaries and are situated in perhaps the most remote location in the Rio Grande National Forest, at the very headwaters of the Rio Grande. One cluster of non-federal inholdings in the form of patented mining claims is located in the Sheep Mountain unit near the Continental Divide but is presently under negotiation for federal acquisition. There are no oil and gas leases.

Information Resources

Item	Data Source
Roadlessness	Colorado Roadless Rule at 36 CFR 294 subpart D
	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 71
Naturalness; Outstanding Opportunities for Solitude or Unconfined Primitive Recreation	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 72
	USDA Forest Service, R2, Profiles of Colorado Roadless Areas 2008
	SLVEC Roadless area description 2002
Supplemental Values	
High Biodiversity Significance	CNHP PCA Reports 2015
Rio Grande Cutthroat Trout	Conservation Plan for the Rio Grande Cutthroat Trout in Colorado. Colorado Division of Wildlife; CNHP PCA Report 2015
Connectivity	SREP Wildlands Network 2003, Aplet et al Indicators of Wildness 2000

Pole Creek Mountain Recommended Wilderness Boundary



Data Sources: BLM, CDOT, SRCA, USFS, USGS, wilderness.net
Map Prepared By: Alison Gallensky
 Rocky Mountain Wild
 9/3/2015 16-112 v7

Legend

- ▲ Summit
- RGNF District
- City
- Major Road
- USFS Road
- USFS Trail
- Lake/Pond
- Stream/River
- Recommended Wilderness
- Designated Wilderness
- Roadless Land in Adjacent Forest

Land Ownership

- USFS
- BLM
- NPS
- State
- Other Public
- Private/Tribe



Sheep Mountain Recommended Wilderness Boundary




ROCKY MOUNTAIN WILD
 Data Sources: BLM, CDOT, SRCA, USFS, USGS, wilderness.net
 Map Prepared By: Alison Gallensky
 Rocky Mountain Wild
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- Legend**
-  Summit
 -  RGNF District
 -  City
 -  Major Road
 -  USFS Road
 -  USFS Trail
 -  Lake/Pond
 -  Stream/River
 -  Recommended Wilderness
 -  Designated Wilderness
 -  Roadless Land in Adjacent Forest

- Land Ownership**
-  USFS
 -  BLM
 -  NPS
 -  State
 -  Other Public
 -  Private/Tribe



Saguache Creek recommended wilderness

Proposed Wilderness Designation
Rio Grande National Forest
Saguache Ranger District

27,100 Acres



General Description

The proposed Saguache Creek wilderness offers the opportunity to add thousands of acres of high quality wilderness landscapes among grasslands and ponderosa pine woodlands that are poorly represented ecosystem types within the National Wilderness Preservation System. Saguache Creek is an unusual wild landscape – an undeveloped lower elevation stream corridor lacking road access. A Saguache Creek wilderness would fill both a geographic and ecological gap in the system of designated wilderness in the Southern Rocky Mountains. It is a large, intact wild landscape located in one of the largest remaining gaps in the wilderness system in the Southern Rockies.

The proposed Saguache Creek wilderness offers both popular and remote recreation opportunities. Saguache Creek itself is an identified wild and scenic river candidate whose seven-mile canyon is frequented by fly-fishing anglers, while the grasslands and ponderosa forests of lower Fourmile Creek and Luders Creek provide quiet sanctuaries for hikers, horse users, and wildlife watchers. The Colorado Natural Heritage Program ranks the area's high-quality riparian willow-carr and shrublands ecosystems along Saguache Creek and Luders Creek as possessing high biodiversity significance.

Naturalness

The central feature of the proposed Saguache Creek wilderness is the undeveloped seven-mile long canyon of Saguache Creek immediately below the confluence of its source forks. A several-mile long tributary of California Gulch enters from the south. The grasslands, forests, and riparian zones extending a half-dozen miles north of Saguache Creek are dissected by the lower reaches of Fourmile Creek and Luders Creek. The deep valleys of Saguache Creek and its tributaries are topographically isolated from access roads above the canyon rims, and the western boundary excludes roads, past timber sales, and grazing developments in the Fourmile Creek and Luders Creek watersheds. The area within the defined boundary appears natural.



Outstanding Opportunities for Solitude or Unconfined Primitive Recreation

Saguache Creek is a premier destination for angling with trout fishing a popular recreational activity in the proposed wilderness. Fly fishermen avidly cast the seven-mile length of Saguache Creek for brown and rainbow trout using flies and lures only. Hikers and backpackers enjoy the stream corridor as well, relishing the rugged grandeur of the 1,500-foot deep canyon. Hikers can find complete isolation trekking into the lower reaches of Fourmile Creek and Luders Creek amidst lush riparian zones surrounded by stately ponderosa pines along infrequently maintained trails.

The area's eastern boundary is effectively blocked by private land, so access is restricted to the west via Saguache Park. A network of rugged four-wheel drive routes define the area's western boundary, and these receive light use other than during hunting season. Even in the peak of the summer camping season, just a handful of visitors explore the remote road network and even fewer venture cross-country into the surrounding roadless landscape. The area's topography enhances the sensation of outstanding solitude owing to rocky fin-shaped ridges that separate small meadows and canyons in between.

Size and Roadlessness

The proposed Saguache Creek wilderness is 27,100 acres, which places it among the largest stand-alone roadless areas on the forest. The boundary excludes all roads ML2 and above. Even some of these excluded ML2 roads are effectively just ATV trails at this point owing to significant erosion and deterioration such as FDR 736 to Duck Creek.

Supplemental Values

The proposed wilderness centered on Saguache Creek, lower Fourmile Creek, and Luders Creek includes significant portions of two Colorado Natural Heritage Program Potential Conservation Areas (PCAs) – Saguache Creek and Luders Creek. The seven miles of Saguache Creek's mainstem comprises the lowest segment of the Saguache Creek PCA. Saguache Creek is ranked as High Biodiversity Significance owing to its montane willow carr associations within the creek's floodplain and valley toe slopes. The lower half of the Luders Creek PCA within the proposed wilderness is also ranked as High Biodiversity Significance because of its montane riparian shrublands, which combined with aspen forests and shrubby cinquefoil shrublands on adjacent terraces creates a structurally and floristically diverse assemblage of riparian and moist toe slope plant communities. (CNHP PCA Reports for Luders Creek, Saguache Creek, 2015).

Saguache Creek through the proposed wilderness was previously determined eligible for Wild and Scenic River designation under the wild classification owing to its outstandingly remarkable scenic, historic, and cultural values. (Rio Grande Forest Plan, 1996)

The proposed Saguache Creek wilderness helps fill the largest geographic gap in the wilderness system in the Southern Rockies. The area is part of the ecological connection between the large protected wilderness areas of the San Juans to the south and the equally

important preserves of the Elk, Sawatch, and Sangre de Cristo ranges to the north and east. The proposed wilderness also provides ecological continuity from the grasslands along lower Saguache Creek extending up through to its headwaters amidst the alpine tundra of the nearby La Garita Wilderness. (SREP Wildlands Network Vision 2003; Aplet et al Indicators of Wildness 2000.)

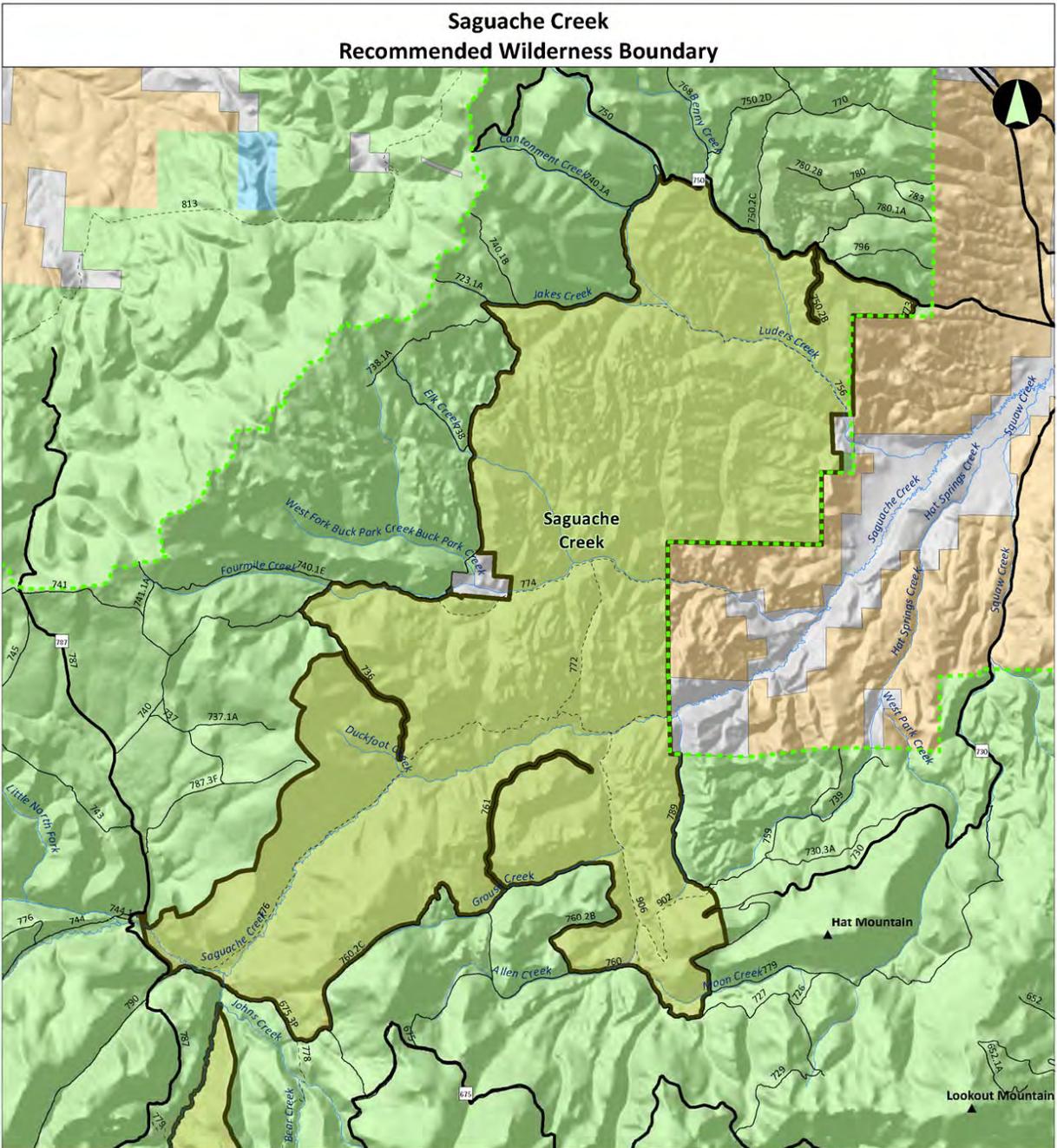
The proposed Saguache Creek wilderness includes the largest expanses of grassland and ponderosa pine forest available for addition to the National Wilderness Preservation System among all of the available candidate areas on the Rio Grande National Forest. These two ecosystem types are critically under-represented among existing wilderness both regionally within the Southern Rockies and at the national level. By protecting this area, the Rio Grande NF can increase the ecological representation within its wilderness areas of Southern Rocky Mountain Montane-Subalpine Grassland and Southern Rocky Mountain Ponderosa Pine Woodland from less than 5% of the overall ecosystem acreage on the forest. (TWS ecosystem representation report, 2016)

Manageability

Saguache Creek along with its neighboring Fourmile Creek and Luders Creek is a relatively compact unit with one or two cherrystemmed routes penetrating its boundary. The area’s eastern boundary is largely inaccessible to public use owing to private lands controlling the valley bottom along Saguache Creek. The boundary along Saguache Creek section is the topographically distinct canyon rim. The western boundary in the Fourmile Creek and Luders Creek watersheds is defined along remote four-wheel-drive routes, primarily Forest Development Road 740. All trails in the proposed wilderness are designated non-motorized. There are no oil and gas leases or non-federal inholdings.

Information Resources

Item	Data Source
Roadlessness	Colorado Roadless Rule at 36 CFR 294 subpart D
	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 71
Naturalness; Outstanding Opportunities for Solitude or Unconfined Primitive Recreation	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 72
	USDA Forest Service, R2, Profiles of Colorado Roadless Areas 2008
	SLVEC Roadless area description 2002
Supplemental Values	
High Biodiversity Significance	CNHP PCA Reports 2015
Wild and Scenic River Eligibility	Rio Grande Forest Plan, 1996
Connectivity	SREP Wildlands Network 2003, Aplet et al Indicators of Wildness 2000



ROCKY MOUNTAIN WILD

Data Sources: BLM, CDOT, SRCA, USFS, USGS, wilderness.net
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Legend

- ▲ Summit
- Lake/Pond
- Stream/River
- City
- Major Road
- USFS Road
- USFS Trail
- Recommended Wilderness
- Designated Wilderness
- Roadless Land in Adjacent Forest

Land Ownership

- USFS
- BLM
- NPS
- State
- Other Public
- Private/Tribe



Blanca Peak addition to Sangre de Cristo Wilderness

Proposed Wilderness Designation
Rio Grande National Forest
Conejos Peak Ranger District

4,200 acres



General Description

The Blanca Peak addition to the Sangre de Cristo Wilderness includes two prominent Colorado fourteeners – 14,345-foot Blanca Peak and its neighboring 14,037-foot Little Bear Peak. The proposed addition abuts a contiguous wilderness addition that is comprised of Lily Lake and the Huerfano River headwaters on the adjacent San Isabel National Forest. Most mountaineers probably assume these rugged peaks are already included within the wilderness, but a comprehensive boundary expansion that incorporates that portion of the Blanca massif on national forest lands would significantly enhance the integrity of existing wilderness.

Blanca Peak is revered by many indigenous cultures in the Southwest, and has been identified as a potential Special Interest Area in recognition of its tribal cultural significance. The addition's landscape consists of sweeping glaciated valleys, soaring granitic peaks, and high alpine lakes. Elevations range from the pinyon-juniper dominated lower slopes of the San Luis Valley through a seamless transition of ecotypes to the rock summits of the high peaks. The challenging jeep trail to Lake Como is excluded from the wilderness addition.

Naturalness

The proposed Blanca Peak wilderness addition is remote and protected from prior development by its ruggedness, sheer topography and the adjacent private ranch that precluded access from the south. The Lake Como jeep trail forms the northern boundary of the proposed wilderness addition and is excluded from the wilderness. A block of patented mining claims on Little Bear Peak's west shoulder show scant evidence of surface disturbing activity and does not impair the appearance of naturalness across the larger area.



Outstanding Opportunities for Solitude or Unconfined Primitive Recreation

The Blanca Peak addition at its highest point rises almost 7,000 feet above the San Luis Valley. The area's soaring elevation, precipitous alpine ridges, and secluded glacial valleys conspire to create outstanding opportunities for solitude. This is particularly the case for the trail-less valley of Little Bear Lake.

Blanca Peak and Little Bear Peak draw mountaineers hoping to reach the summits and test their mountaineering abilities in highly challenging circumstances. Little Bear Peak ranks among the most technically difficult summits among Colorado's 54 fourteeners, which enhances the outstanding character of this primitive recreational pursuit. An estimated 1,000-3,000 climbers attempt Blanca Peak annually, while less than 1,000 pursue Little Bear's summit (Colorado Fourteeners Initiative, 2015). A half-dozen alpine lakes draw hikers, campers, and photographers keen on experiencing jaw-dropping mountain scenery.

Size and Roadlessness

The proposed Blanca Peak wilderness addition is 4,200 acres in size. The area is bounded on the north by the adjacent Sangre de Cristo Wilderness.

Supplemental Values

Blanca Peak has outstanding value to native peoples of the Southwest. The Navajo, Ute, and Jicarilla Apache consider the peak sacred, and it is also important within the cultural landscape of the Upper Rio Grande pueblos. The tribes have a strong interest in maintaining the area's pristine nature. The Navajo Nation has proposed designation as a Traditional Cultural Property. (Rio Grande NF tribal assessment, 2015)

The proposed Blanca Peak addition enhances the ecological effectiveness of the Sangre de Cristo Wilderness by expanding the size of the protected area. It specifically interconnects to the Huerfano River headwaters and Lily Lake on Blanca Peak's northern slope, creating overarching protection for the entirety of the Blanca Peak massif when considered in conjunction with the conserved lands on the adjacent Trinchera Ranch to the south. Larger protected areas are more likely to provide conditions for species persistence over the long term than smaller areas. (SREP Wildlands Network Vision 2003; Aplet et al Indicators of Wilderness 2000.)

Ecosystem types along the lower slopes of the proposed addition are poorly represented within the Rio Grande's existing wilderness areas. Wilderness designation of the Blanca Peak addition would increase ecological representation of Southern Rocky Mountain Montane-Subalpine Grassland, Southern Rocky Mountain Ponderosa Pine Woodland, and Southern Rocky Mountain Pinyon-Juniper Woodland, each of which occur in designated wilderness at less than 5% on the forest. (TWS ecosystem representation report, 2016)

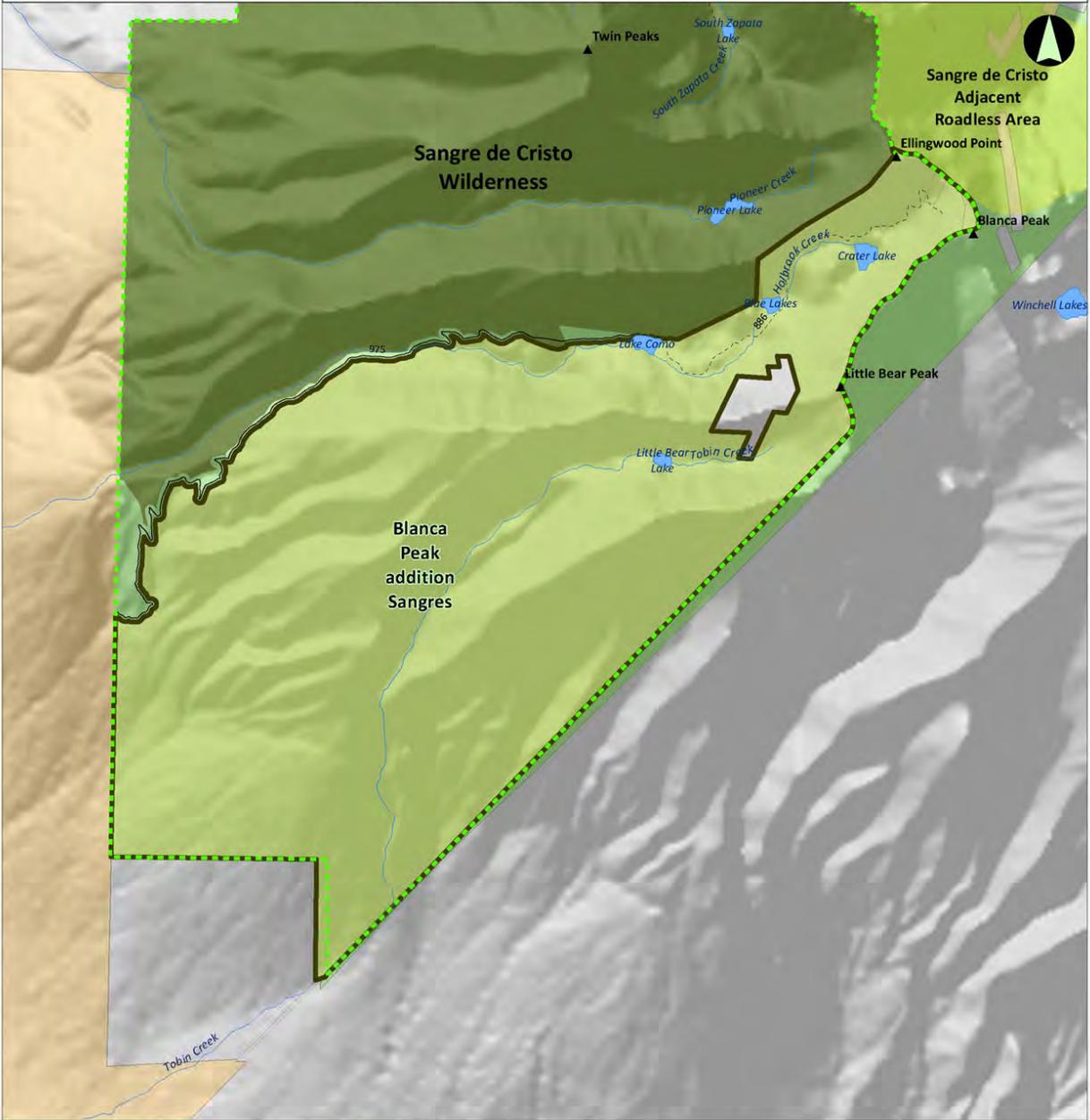
Manageability

The Blanca Peak addition is comprised of remote and steep ridges and peaks of the Sangre de Cristos, and intervening glaciated valleys. The area is generally bounded on the north by the adjacent Sangre de Cristo Wilderness. The southerly and easterly boundary is the private Trinchera Ranch, which is managed compatibly under a conservation easement. Rural lands administered by BLM abut the area’s western boundary. The northeast slopes of Blanca Peak are contiguous with adjacent wilderness-quality lands managed by the Pike-San Isabel National Forest at the headwaters of the Huerfano River. The rugged jeep trail to Lake Como is adjacent to the existing wilderness boundary and forms the northern boundary of the addition, and would be a cherry-stem into the Sangre de Cristo Wilderness boundary once the addition is completed. There are no oil and gas leases in the area. There is a 51.65-acre block of largely inaccessible patented mining claims on the precipitous western ridge of Little Bear Peak for which there is no vehicular access. Is it unlikely these will pose a conflict with wilderness as many similarly situated inholdings have been acquired in wilderness areas throughout Colorado and elsewhere, and historic access has been by foot and horse.

Information Resources

Item	Data Source
Roadlessness	Colorado Roadless Rule at 36 CFR 294 subpart D
	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 71
Naturalness; Outstanding Opportunities for Solitude or Unconfined Primitive Recreation	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 72
	SLVEC Roadless area description 2002
	Colorado Fourteeners Initiative hiker use estimates, 2015
Supplemental Values	
Cultural significance	Rio Grande NF Assessment 12, Areas of Tribal Importance, 2015
Connectivity	SREP Wildlands Network 2003, Aplet et al Indicators of Wildness 2000
Ecosystem representation	TWS Ecosystem Representation 2016
Manageability	
Sangre de Cristo Conservation Area	USFWS Sangre de Cristo Conservation Area Land Protection Plan, 2012

Blanca Peak addition Sangres Recommended Wilderness Boundary



Data Sources: BLM, CDOT, SRCA, USFS, USGS, wilderness.net
Map Prepared By: Alison Gallensky
 Rocky Mountain Wild
 9/3/2015 16-112 v7

Legend

- ▲ Summit
- City
- Major Road
- USFS Road
- USFS Trail
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- Recommended Wilderness
- Designated Wilderness
- Roadless Land in Adjacent Forest

Land Ownership

- USFS
- BLM
- NPS
- State
- Other Public
- Private/Tribe

0 1 2 Miles

Butterfly Creek–Miller Creek addition to Sangre de Cristo Wilderness

Proposed Wilderness Designation
Rio Grande National Forest
Saguache Ranger District

4,100 acres



General Description

The Butterfly Creek and Miller Creek additions bring the Sangre de Cristo Wilderness boundary to a more logical contour along the range's lower slopes in the northern San Luis Valley. Large undulating alluvial fans characterize the wilderness additions, and a rare oak savanna ecosystem occurs across the lower slopes and riparian corridors of the two areas. It also includes sagebrush habitat for the only population of Gunnison sage grouse in the San Luis Valley.

The additions create a continuous wilderness ecosystem transition from sagebrush, oak and grasslands at the foot of the range through aspen and spruce-fir forests to the crest of the Sangre de Cristo mountains. This is a remote and lightly visited portion of the Sangres, with outstanding sensation of isolation.

Naturalness

Butterfly Creek and Miller Creek have intact ecological processes in a setting free of substantially noticeable human imprints. Roads and ways are excluded from the boundary.

Outstanding Opportunities for Solitude or Unconfined Primitive Recreation

The draws and riparian corridors found within Butterfly Creek and Miller Creek create immediate opportunities to experience outstanding solitude and remoteness. For those willing to scale the steeply rising slopes, the elevation quickly establishes a strong sense of separation from the San Luis Valley's rural landscapes and distant Highway 285.

Butterfly Creek and Miller Creek are both free of trails, but two-track vehicle ways provide access through adjacent BLM lands and terminate at



the area's boundary. Visitors take advantage of the area's remote character for high-quality, backcountry hunting opportunities in fall.

Size and Roadlessness

The proposed Butterfly Creek and Miller Creek wilderness additions comprise about 4,100 acres and both share extensive boundaries with the adjacent Sangre de Cristo Wilderness. The boundary includes the now closed and revegetating ends of several forest roads. Forest Road #993 along Eaglebrook Creek does not exist on the ground, is marked as closed to motorized use, and there is no evidence that any motorized use has occurred on this route for many years (see photo). The last one-third mile of Forest Road #992 along Butterfly Creek receives no motor vehicle use after it crosses Butterfly Creek, and is being reclaimed by vegetation. The former road (#994) along Raspberry Creek ends on BLM land one-half mile below the national forest boundary.



Supplemental Values

The rare oak savanna at the lowest elevations of the Butterfly Creek and Miller Creek additions lies within the Sangres Alluvial Fan Potential Conservation Area, ranked by the Colorado Natural Heritage Program as High Biodiversity Significance. The Sangres Alluvial Fan PCA supports an excellent and large occurrence of an unusual association of Gambel's oak (*Quercus gambelii*) with needle-and-thread grass (*Hesperostipa comata*), the only documented occurrence in the world. In addition, the creeks that run through the savanna from the Sangre de Cristo mountains exhibit unusually high quality occurrences of riparian forest dominated by either aspen or oak. (CNHP PCA Report, 2015)

The lower portion of the Butterfly Creek addition is also within the Decker Creek PCA, which Colorado Natural Heritage Program also ranks as High Biodiversity Significance. This PCA was identified for its value as sagebrush habitat for the small and only population of Gunnison sage grouse in the San Luis Valley. (CNHP PCA Report, 2015)

The proposed Butterfly Creek and Miller Creek additions enhance the ecological effectiveness of the Sangre de Cristo Wilderness by expanding the size of the protected area. In these locations, the current wilderness boundary extends less than one mile down from the crest of the range. With the additions, the boundary would double in width and incorporate a more defensible topographic contour. Larger protected areas are more likely to provide conditions for species persistence over the long term than smaller areas. (SREP Wildlands Network Vision 2003; Aplet et al Indicators of Wilderness 2000.)

Butterfly Creek and Miller Creek are particularly valuable wilderness additions for their contribution of Rocky Mountain Gambel Oak-Mixed Montane Shrubland to the range of ecological representation within Rio Grande National Forest wilderness areas. This is a very poorly represented ecosystem both within the Rio Grande as well as nationally. Wilderness designation of these two additions will bring representation of this oak savanna ecosystem to over 20% on the forest. (TWS ecosystem representation report, 2016)

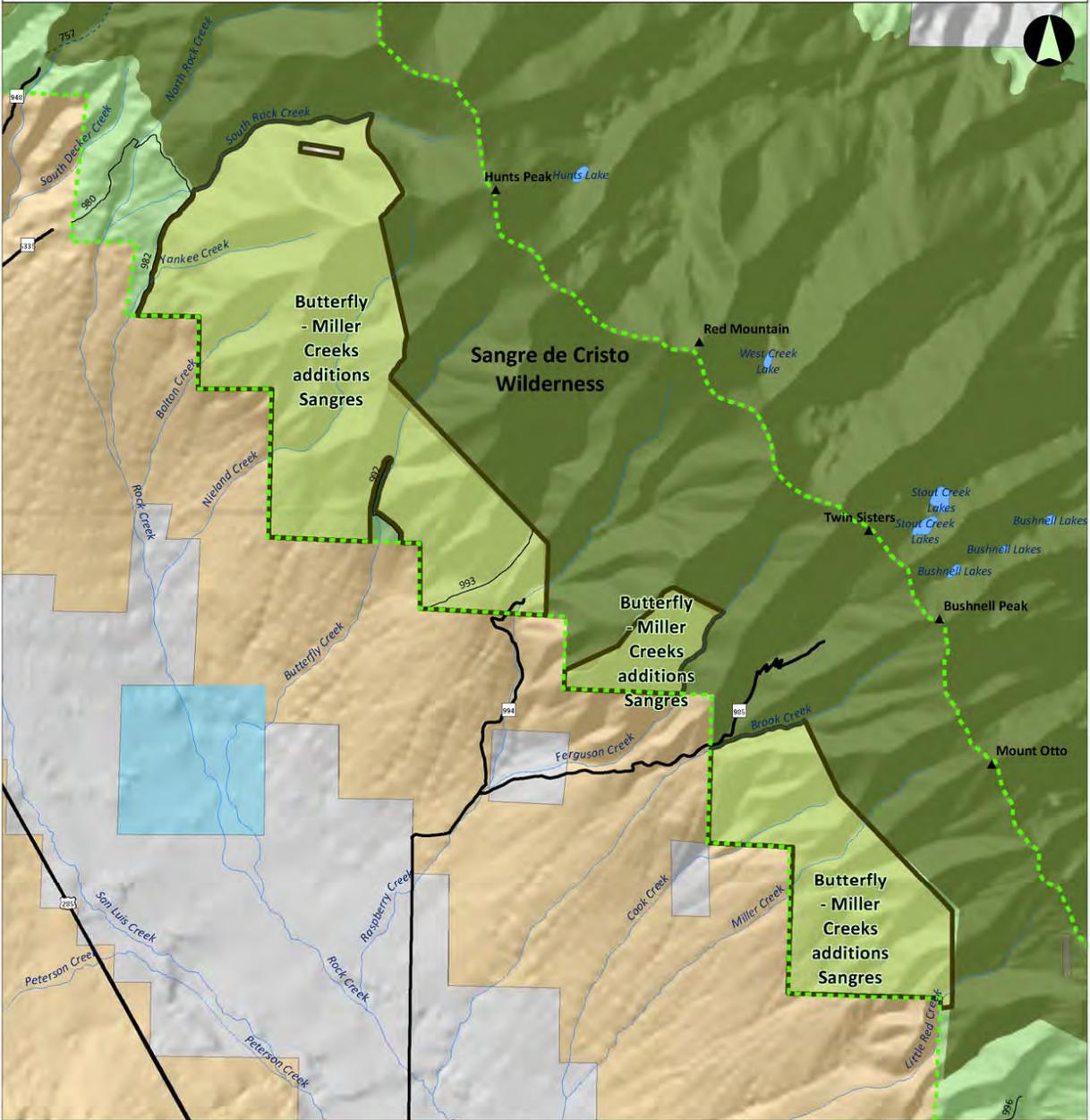
Manageability

The Butterfly Creek and Miller Creek additions can be managed to preserve their wilderness characteristics. The additions are bounded on one side by the existing wilderness and on the other by undeveloped lands managed by BLM. There is one patented mining claim in the steep headwaters of South Rock Creek that lacks vehicle access, but the only two other similar inholdings in the Sangres were quickly acquired 20 years ago soon after wilderness designation. There are no oil and gas leases.

Information Resources

Item	Data Source
Roadlessness	Colorado Roadless Rule at 36 CFR 294 subpart D
	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 71
Naturalness; Outstanding Opportunities for Solitude or Unconfined Primitive Recreation	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 72
	USDA Forest Service, R2, Profiles of Colorado Roadless Areas 2008
	SLVEC Roadless area description 2002
Supplemental Values	
High Biodiversity Significance	CNHP PCA Report 2015
Connectivity	SREP Wildlands Network 2003, Aplet et al Indicators of Wildness 2000
Ecosystem representation	TWS Ecosystem Representation 2016

Butterfly - Miller Creeks additions Sangres Recommended Wilderness Boundary



Data Sources: BLM, CDOT, SRCA, USFS, USGS, wilderness.net
Map Prepared By: Alison Gallensky
 Rocky Mountain Wild
 9/3/2015 16-112 v7

Legend

- ▲ Summit
- RGNF District
- City
- Major Road
- USFS Road
- USFS Trail
- Lake/Pond
- Stream/River
- Recommended Wilderness
- Designated Wilderness
- Roadless Land in Adjacent Forest

Land Ownership

- USFS
- BLM
- NPS
- State
- Other Public
- Private/Tribe

0 1 2 Miles

Cotton Creek–Crestone addition to Sangre de Cristo Wilderness

Proposed Wilderness Designation
Rio Grande National Forest
Saguache Ranger District

11,000 acres



General Description

The proposed Cotton Creek–Crestone addition refers to approximately 11,000 acres along the front of the Sangre de Cristo mountains ranging over a dozen miles between Crestone and Valley View Hot Springs. This one or two-mile wide strip extends the wilderness boundary to a more obvious contour at the national forest boundary.

This addition incorporates the lower few miles of six or seven trails leading into the adjacent wilderness from wilderness trailheads at the forest boundary. The addition is extremely rich in biodiversity, encompassing significant portions of a half-dozen conservation areas identified for their biodiversity value by the Colorado Natural Heritage Program largely because of the excellent condition and uncommon quality of the riparian corridors. Not surprisingly, these low elevation lands are dominated by ecosystem types poorly represented within existing wilderness, such as pinyon-juniper woodlands, montane grasslands, and ponderosa pine.

Naturalness

The Cotton Creek–Crestone addition is characterized by steep slopes and deep canyons with few apparent unnatural impacts. The riparian corridors in these canyons are almost uniformly pristine and in excellent ecological condition. The few areas with more substantial historic mineral prospecting impacts situated nearby clusters of patented mining claims are excluded from the boundary.



Outstanding Opportunities for Solitude or Unconfined Primitive Recreation

The Cotton Creek–Crestone addition is a region of rugged terrain, with steep mountainsides and plunging valley bottoms. Each of the parallel valleys is topographically isolated from its neighbors, and each provides an outstanding sense of remoteness and solitude.

The Cotton Creek–Crestone wilderness addition abuts a half-dozen wilderness trailheads along the lower flanks of the Sangre de Cristo mountains between Crestone and Valley View Hot Springs. The addition takes in the first mile or two of these wilderness access trails that include Cotton Creek, Wild Cherry Creek, Rito Alto Creek, San Isabel Creek, Major Creek, Garner Creek, and Hot Springs Canyon. Many of these trails lead to high alpine basins and lakes and find great popularity among hikers, anglers, and horsepackers enjoying the outstanding opportunities for primitive recreation pursuits. Most of the high lakes accessed by these trails contain recreational populations of Rio Grande cutthroat trout. The wilderness addition provides key winter range for bighorn sheep, mule deer, and elk and draws backcountry hunters in fall seeking an outstanding primitive hunting experience.

Size and Roadlessness

The proposed Cotton Creek–Crestone wilderness addition spans about 11,000 acres and shares over a dozen miles of boundary with the adjacent Sangre de Cristo Wilderness.

Supplemental Values

The long length of the proposed Cotton Creek–Crestone wilderness addition spans six Potential Conservation Areas identified by the Colorado Natural Heritage Program. Each of these incorporate several miles of drainages that possess uncommon riparian forest and streamside ecological communities in excellent condition.

- Starting at the northernmost end of the addition, Valley View PCA is a site of High Biodiversity Significance that includes the slopes and stream bottom of Hot Springs Canyon. The site was identified because of the excellent example of bristle cone pine distributed throughout the canyon.
- The Garner Creek PCA supports a dense stand of Douglas-fir with an understory of Rocky Mountain maple. Garner Canyon is wider than most of the other gorges draining the western flank of the Sangre de Cristo Mountains, and the valley bottom is less steep. It is of Moderate Biodiversity Significance.
- The lower end of the Cotton Creek PCA includes a streamside community that is a very diverse collection of aspen, river birch, Rocky Mountain maple, Drummond's willow, and Woods rose. A key feature of the Cotton Creek PCA is its unusually healthy and large stands of river birch occurring in a high-quality montane riparian forest, along with adjacent foothills riparian shrubland. It ranks as a site of High Biodiversity Significance.
- The addition includes the lower segment of the Wild Cherry Creek PCA, where a good example of a quaking aspen and red-osier dogwood community fills the canyon and ranks as Moderate Biodiversity Significance.
- The upper portion of Rito Alto Bosque PCA is located within the wilderness addition and ranks as High Biodiversity Significance. Extensive stands of aspen/western birch and narrow-leaf cottonwood/western birch riparian forests line the riparian corridor that extends along the alluvial fan from the mouth of Rito Alto Canyon.

- The Dimick Gulch PCA is the highest ranked site within the wilderness addition, and is considered of Very High Biodiversity Significance. The entirety of this 1,747-acre conservation area is situated within the proposed wilderness addition. The site contains very uncommon narrowleaf cottonwood and Rocky Mountain juniper dominated riparian areas, and occurs here because of the narrow character of this steep-sided canyon. (CNHP PCA Report, 2015)

Mill Creek is a seventh drainage of biodiversity significance. The lower half of the designated Mill Creek Research Natural Area is located within the proposed wilderness addition. The RNA is notable for its extensive and high quality pinyon-juniper woodlands on gentle alluvial fan slopes as well as adjacent steeper bedrock.

The proposed Cotton Creek–Crestone addition enhances the ecological effectiveness of the Sangre de Cristo Wilderness by expanding the size of the protected area. This addition would create the widest portion of the entire Sangre de Cristo Wilderness, expanding the boundary to a full 10 miles across the range for almost the entire length of this dozen-mile long expansion. Larger protected areas are more likely to provide conditions for species persistence over the long term than smaller areas. (SREP Wildlands Network Vision 2003; Aplet et al Indicators of Wildness 2000.)

As to be expected with the abundance of lower elevation slopes along the foot of the Sangre de Cristo mountains, the Cotton Creek–Crestone addition would significantly contribute to several ecosystem types most under-represented within the Rio Grande’s existing designated wilderness. The most substantial increases in ecological representation occur for Southern Rocky Mountain Montane-Subalpine Grassland, Southern Rocky Mountain Ponderosa Pine Woodland, and Southern Rocky Mountain Pinyon-Juniper Woodland. Collectively, the addition would add over 6,000 acres of these poorly represented ecosystem types for which less than 5% of available acreage is presently contained within designated wilderness. (TWS ecosystem representation report, 2016)

Manageability

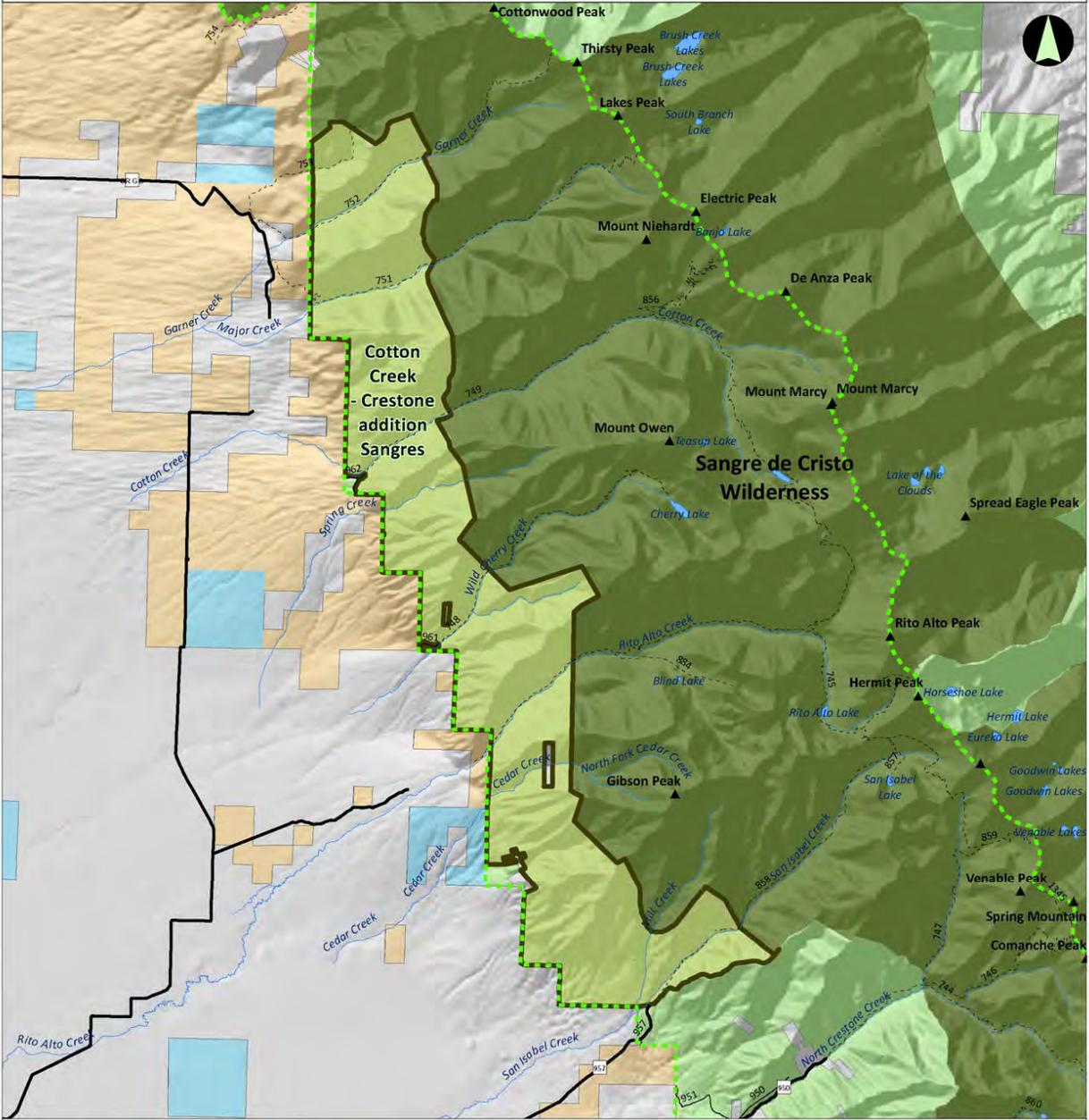
The Cotton Creek–Crestone addition can be readily managed to preserve its wilderness characteristics. The additions are bounded on one side by the existing wilderness and on the valley side either by undeveloped lands managed by BLM or rural agricultural lands. The proposed boundary generally excludes the patented mining claims in North Crestone Creek, but does include the single isolated patented mining claims in Cedar Creek and Wild Cherry Creek. These inholdings lack vehicle access. The Forest Service successfully acquired similar inholdings after the Sangre de Cristo Wilderness was first designated in 1993. There are no oil and gas leases.

Information Resources

Item	Data Source
Roadlessness	Colorado Roadless Rule at 36 CFR 294

	subpart D
	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 71
Naturalness; Outstanding Opportunities for Solitude or Unconfined Primitive Recreation	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 72
	USDA Forest Service, R2, Profiles of Colorado Roadless Areas 2008
	SLVEC Roadless area description 2002
Supplemental Values	
High Biodiversity Significance	CNHP PCA Report 2015
Connectivity	SREP Wildlands Network 2003, Aplet et al Indicators of Wildness 2000
Ecosystem representation	TWS Ecosystem Representation 2016

Cotton Creek - Crestone addition Sangres Recommended Wilderness Boundary



Data Sources: BLM, CDOT, SRCA, USFS, USGS, wilderness.net
 Map Prepared By: Alison Gallensky
 Rocky Mountain Wild
 9/3/2015 16-112 v7

Legend

- ▲ Summit
- City
- Major Road
- USFS Road
- - - USFS Trail
- Lake/Pond
- Stream/River
- Recommended Wilderness
- Designated Wilderness
- Roadless Land in Adjacent Forest

Land Ownership

- USFS
- BLM
- NPS
- State
- Other Public
- Private/Tribe



Kit Carson Peak addition to Sangre de Cristo Wilderness

Proposed Wilderness Designation
Rio Grande National Forest
Saguache Ranger District

12,300 acres



General Description

The proposed Kit Carson Peak wilderness addition is most renowned for the three 14,000-foot summits of the Kit Carson massif, including Challenger Point and Columbia Point. The 12,300-acre addition consists entirely of that portion of the Baca Mountain Tract conveyed into Forest Service jurisdiction by the Great Sand Dunes National Park Act of 2000. The peaks form the backdrop of one of the San Luis Valley's most photogenic settings as the towering crest at the heart of the Sangre de Cristos.

As this was previously part of a private ranch for the prior hundred years, there are no formal forest recreation trails, though the summits of the peaks draw numerous mountaineers. This isolation has helped preserve an area of remarkable biological significance, with the four major drainages all encompassed by one of a half-dozen conservation areas identified for their biodiversity value by the Colorado Natural Heritage Program. Each stream corridor has an excellent condition narrowleaf cottonwood–Rocky Mountain juniper montane riparian forest. A designated Research Natural Area is located immediately adjacent within the existing wilderness.



Photo USDA Forest Service

Naturalness

The proposed Kit Carson Peak wilderness addition has been isolated and largely inaccessible to most development activities owing to its private status. The area is characterized by the steep western slopes of the Sangre de Cristo mountains and deep

canyons with few apparent unnatural impacts. The riparian corridors in these valleys are almost uniformly pristine and in excellent ecological condition. The southern end of the area with impacts associated with historic mining activity around Liberty and Duncan is cherry-stemmed out of the proposed wilderness boundary.

Outstanding Opportunities for Solitude or Unconfined Primitive Recreation

The Kit Carson Peak proposed wilderness addition consists of the rugged west slope of the Sangre de Cristo range south of Crestone. The fault block uplift creates a region of craggy terrain, with steep mountainsides and plunging valley bottoms. The area includes several parallel valleys, each topographically isolated from its neighbors, and each provides an outstanding sense of remoteness and solitude.

The Kit Carson Peak addition has no designated national forest system trails owing to its prior status as part of a private ranch, and thus receives significantly less use than other valleys on the western slope of the Sangres. The Baca Grande subdivision blocks public access from the west, but there are informal routes along several of the valleys, including Cottonwood, Spanish, and Deadman creeks. These routes provide some of the most challenging primitive recreation opportunities for hikers and backpackers in the Sangre de Cristo mountains. Lower Deadman Creek does have public access from the Liberty Road and provides outstanding opportunities for equestrians as well as hikers and backpackers. A substantial number of mountaineers climb the collection of fourteeners as part of the Kit Carson Peak massif, and while the summits are within the wilderness addition in its far northeast corner, the hiking access routes to the summits such as along Willow Creek are located in the existing wilderness. (Baca Mountain Tract EA, 2009)

Size and Roadlessness

The proposed Kit Carson Peak wilderness addition is about 12,300 acres in size, and is bounded on the north and east by the adjacent Sangre de Cristo Wilderness.

Supplemental Values

The proposed Kit Carson Peak wilderness addition spans six Potential Conservation Areas identified by the Colorado Natural Heritage Program. These encompass each of the primary drainages that flow west off the crest of the Sangres – Willow Creek, Spanish Creek, Cottonwood Creek, and Deadman Creek. As with the drainages farther north of Crestone, the biodiversity values are associated with healthy riparian corridors.

- The upper portion of the Willow Creek-Western Sangres PCA in Copper Gulch is located within the proposed wilderness addition. The PCA is ranked as High Biodiversity Significance, but primarily for a narrowleaf cottonwood–Rocky Mountain juniper woodland at the lowest elevations below the proposed wilderness. At the elevation of subalpine forest within the potential wilderness unit, the riparian corridor is a mixed conifer and deciduous forest and shrubland that includes Douglas-fir, white fir, blue spruce, Engelmann spruce, aspen, Rocky Mountain maple, and mountain spray.

- The Head of Spanish Creek PCA site encompasses the ridge and south-facing open slopes above Spanish Creek and below Challenger Point, and is entirely within the proposed wilderness. This 110-acre site is ranked as High Biodiversity Significance for a globally rare mustard species.
- The entire length of the Spanish Creek drainage comprises the Spanish Creek PCA, most of which is located within the proposed wilderness. This is a site of Very High Biodiversity Significance owing to its narrowleaf cottonwood–Rocky Mountain juniper montane riparian forest. The upstream watershed is included within the site boundary to protect the floodplain and the sources of both surface and groundwater recharge and flow, which are responsible for supplying water to the riparian plant community.
- Cottonwood Creek–Western Sangres is another PCA of Very High Biodiversity Significance, also for its globally imperiled narrowleaf cottonwood–Rocky Mountain juniper montane riparian forest. In addition, the site includes a Douglas fir–water birch community, which is considered globally rare. As with Spanish Creek, the majority of the PCA is within the proposed wilderness, and the upstream watershed is included to protect water sources.
- The central portion of the Deadman Creek–Western Sangres PCA is located within the proposed wilderness. Deadman Creek is ranked as Very High Biodiversity Significance owing to the state’s exemplary and largest occurrence of narrowleaf cottonwood–Rocky Mountain juniper montane riparian forest. The PCA also includes an excellent example of aspen–Rocky Mountain maple, a breeding colony of the pale lump-nosed bat and a hybridized Rio Grande cutthroat trout population.
- Cedar Canyon is another PCA with a quality example of narrowleaf cottonwood–Rocky Mountain juniper montane riparian forest. It is also ranked Very High Biodiversity Significance. The creek is a clear stream that runs over the alluvial fan at the canyon’s mouth. (CNHP PCA Report, 2015)

Immediately upstream on Deadman Creek is a designated Research Natural Area. The RNA was designated for its good representation of aspen over a wide range of elevations, slopes, and aspects. The RNA includes the riparian corridor and source water for the downstream CNHP Potential Conservation Area.

The higher elevations of the proposed wilderness are bighorn sheep habitat, which is relatively uncommon on the Rio Grande National Forest. Bighorn sheep habitat comprises about one-half of the proposed wilderness addition.

The proposed Kit Carson Peak addition enhances the ecological effectiveness of the Sangre de Cristo Wilderness by expanding the size of the protected area. This addition would complete the wilderness boundary and eliminate the unnatural 90-degree corner boundary of the existing wilderness that is a relic of the Baca Grant. The addition would also take this portion of the Sangre de Cristo Wilderness to a width of eight miles or more. Larger protected areas are more likely to provide conditions for species persistence over the long term than smaller areas. (SREP Wildlands Network Vision 2003; Aplet et al Indicators of Wilderness 2000.)

The area's prevalence of lower elevation slopes along the foot of the Sangre de Cristo mountains means the Kit Carson Peak addition would greatly expand several ecosystem types most under-represented within the Rio Grande's existing designated wilderness. Substantial increases would occur in ecological representation for Southern Rocky Mountain Montane-Subalpine Grassland, Southern Rocky Mountain Ponderosa Pine Woodland, and Southern Rocky Mountain Pinyon-Juniper Woodland. Collectively, the addition would add over 5,000 acres of these poorly represented ecosystem types for which less than 5% of available acreage is presently contained within designated wilderness. (TWS ecosystem representation report, 2016)

Manageability

The Kit Carson Peak addition is comprised of remote, steep, and largely inaccessible western slopes of the Sangre de Cristos. The topography creates impediments to incompatible activities, and allows managers to preserve its wilderness characteristics. The area is bounded on north and east by the existing wilderness and on the valley side by Great Sand Dunes National Park and by the agricultural-zoned open space component of the Baca Grande.

The mineral estate beneath the wilderness addition is privately held. A Mineral Assessment Report completed in 2011 concluded slight likelihood of development of metallic minerals beneath the proposed wilderness, although there could be high potential for occurrence of gold, silver or other metallic minerals. The low prospect of development is predicated on several factors – lack of mining infrastructure, societal resistance as per experience from other large mining operations around the San Luis Valley, and likely removal of high-grade deposits by historic mining operations. Although the current mineral owner drilled several prospecting holes in the early 1990s, there has not been any viable commercial mineral extraction from the Sangre de Cristos since the 1930s. (Rare Earth Science Mineral Assessment Report, 2011)

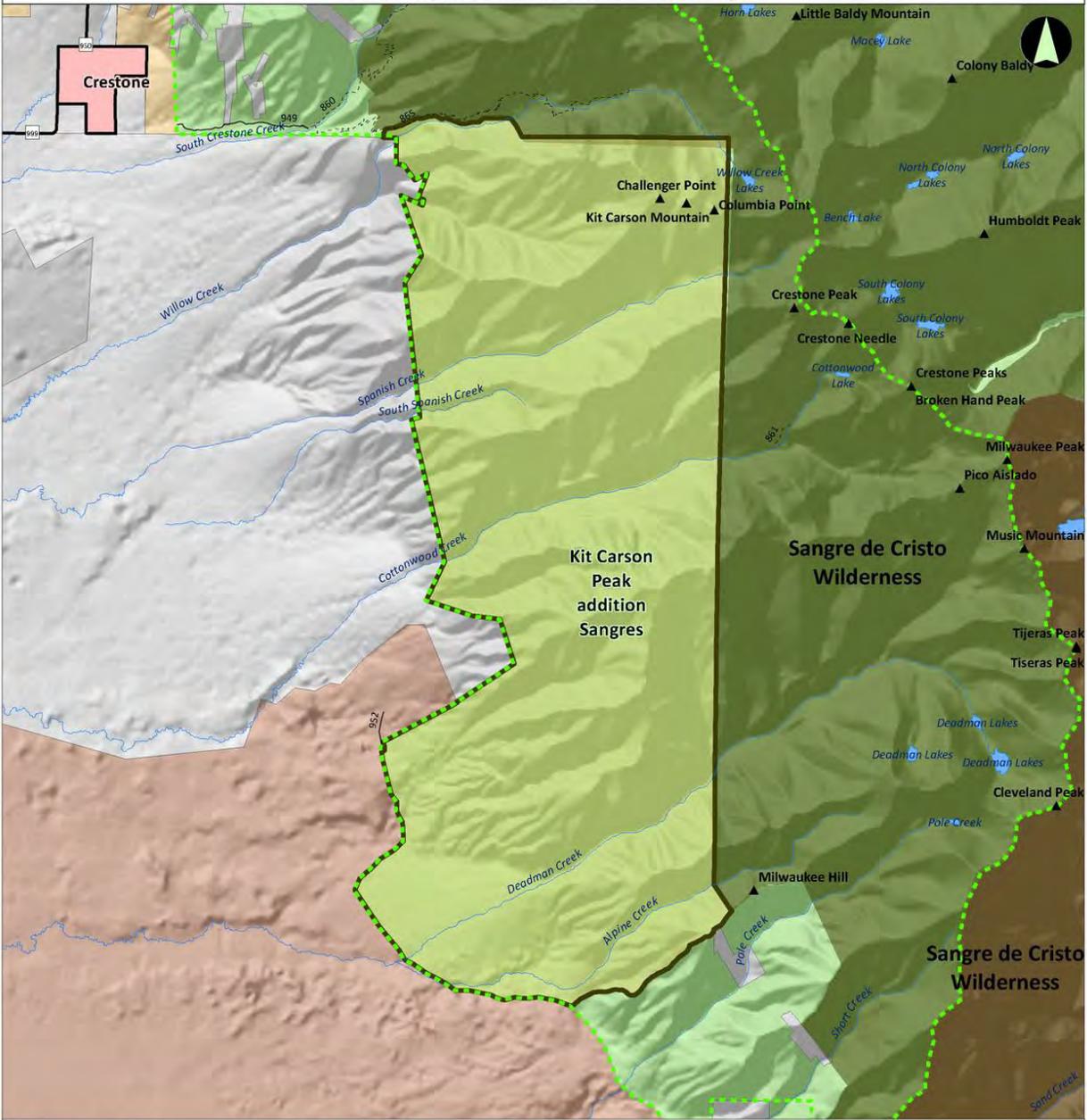
The National Park Service identified 53,000 acres of adjacent lands as wilderness eligible in Great Sand Dunes National Park with the identical split-estate mineral ownership as the Kit Carson Peak unit. The National Park Service concluded likelihood of mineral extraction was low, and combined with the expected eventual acquisition of the mineral interests, NPS determined its lands wilderness-eligible and formally recommended its lands overlying the private mineral estate for wilderness designation. The NPS recommended wilderness is directly adjacent to the Kit Carson Peak unit south of the Liberty Road. If the Forest Service declines to pursue wilderness designation for the Kit Carson Peak area, it will still be surrounded on three sides by designated and recommended wilderness. (Great Sand Dunes NP GMP/Wilderness Study, 2007)

The Great Sand Dunes National Park Act of 2000 authorized the acquisition of lands and interests therein, such as mineral rights, and transfer to the appropriate agency jurisdiction for management. The Forest Service has the authority, as does the National Park Service, to pursue future acquisition of the split-estate minerals in proposed or potential wilderness.

Information Resources

Item	Data Source
Roadlessness	Colorado Roadless Rule at 36 CFR xx
	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 71
Naturalness; Outstanding Opportunities for Solitude or Unconfined Primitive Recreation	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 72
	USDA Forest Service, R2, Profiles of Colorado Roadless Areas 2008
	SLVEC Roadless area description 2002
Supplemental Values	
High Biodiversity Significance	CNHP PCA Report 2015
Connectivity	SREP Wildlands Network 2003, Aplet et al Indicators of Wildness 2000
Ecosystem representation	TWS Ecosystem Representation 2016
Manageability	
Mineral Assessment Report	Rare Earth Science, 2011
NPS Wilderness Recommendation	Great Sand Dunes NP General Management Plan/Wilderness Study, 2007
Wilderness eligibility analysis	Baca Mountain Tract EA, 2009

Kit Carson Peak addition Sangres Recommended Wilderness Boundary




ROCKY MOUNTAIN WILD
 Data Sources: BLM, CDOT, SRCA, USFS, USGS, wilderness.net
 Map Prepared By: Alison Gallensky
 Rocky Mountain Wild
 9/3/2015 16-112 v7

- Legend**
- ▲ Summit
 - City
 - Major Road
 - USFS Road
 - - - USFS Trail
 - 🌊 Lake/Pond
 - Stream/River
 - ▭ Recommended Wilderness
 - ▭ Designated Wilderness
 - ▭ Roadless Land in Adjacent Forest

- Land Ownership**
- USFS
 - BLM
 - NPS
 - State
 - Other Public
 - Private/Tribe



Sawlog recommended wilderness

Proposed Wilderness Designation
Rio Grande National Forest
Saguache Ranger District

17,900 acres



General Description

The proposed Sawlog wilderness generally encompasses the watershed of the North Fork of Carnero Creek, northwest of La Garita. It extends from the foothills of the San Luis Valley to 10,849-foot Storm King Mountain, spanning ecosystems ranging from grasslands and ponderosa pine woodlands at the lowest elevations to aspen and spruce-fir at highest elevations.

The North Fork of Carnero Creek is a stronghold for Rio Grande cutthroat trout and its headwaters have been identified as one of the premier wetland complexes on the Rio Grande National Forest. Sawlog provides important big game habitat year-round for elk, deer, and bighorn sheep, and offers excellent backcountry hunting for those willing to invest the effort.

Naturalness

The proposed Sawlog wilderness includes areas with prior two-track vehicle routes made by hunters and wood gatherers that have since been closed and rehabilitated. The boundary is drawn to exclude exterior roads and timber harvest areas.

Outstanding Opportunities for Solitude or Unconfined Primitive Recreation

The valley of the North Fork of Carnero Creek and its tributary creeks are isolated by rugged surrounding ridges, creating outstanding opportunities for solitude. The area lacks a well-developed trail system other than the non-motorized trail along the North Fork, a factor that enhances opportunities for solitude in tributaries including Sawlog Creek and Poison Gulch.



Sawlog provides abundant, quality opportunities for primitive backcountry hunting and fishing. The areas of Sawlog Creek and the North Fork of Carnero Creek provide important production habitat for the local bighorn sheep herd. Elk and deer winter on the southern aspects and will move up and down in elevations depending on the winter and are often

discovered during the remainder of the year. The prime habitat draws hunters seeking a more remote and challenging hunting opportunity during fall months.

Size and Roadlessness

The proposed Sawlog wilderness is ample size at 17,900 acres. It is bounded on the east and south by the national forest boundary and adjacent BLM lands for the most part. The western boundary is well-delineated by County Road 41G along Carnero Creek's Middle Fork, and the northern boundary is defined by Forest system roads and past areas of timber harvest.

Supplemental Values

The proposed Sawlog wilderness includes a portion of the Carnero Creek Potential Conservation Area identified by the Colorado Natural Heritage Program. Carnero Creek is ranked as High Biodiversity Significance owing to its bristlecone pine woodland, a montane grassland, and a Rio Grande cutthroat trout population, all of which are state rare. This population of Rio Grande cutthroat progresses in quality as one continues up the stream. (CNHP PCA Report for Saguache Creek, 2015).

The North Fork of Carnero Creek hosts a high purity, core conservation population for Rio Grande cutthroat trout. (Conservation Plan for Rio Grande Cutthroat Trout in Colorado, CDOW, 2004)

The proposed Sawlog wilderness addition greatly increases the ecological representation within Rio Grande National Forest wilderness areas of several of the most under-represented ecosystem types on the forest. Sawlog includes thousands of acres of Southern Rocky Mountain Montane-Subalpine Grassland, Southern Rocky Mountain Ponderosa Pine Woodland, and Southern Rocky Mountain Pinyon-Juniper Woodland – all ecosystem types currently with less than 5% representation of the overall ecosystem acreage on the forest. (TWS ecosystem representation report, 2016)

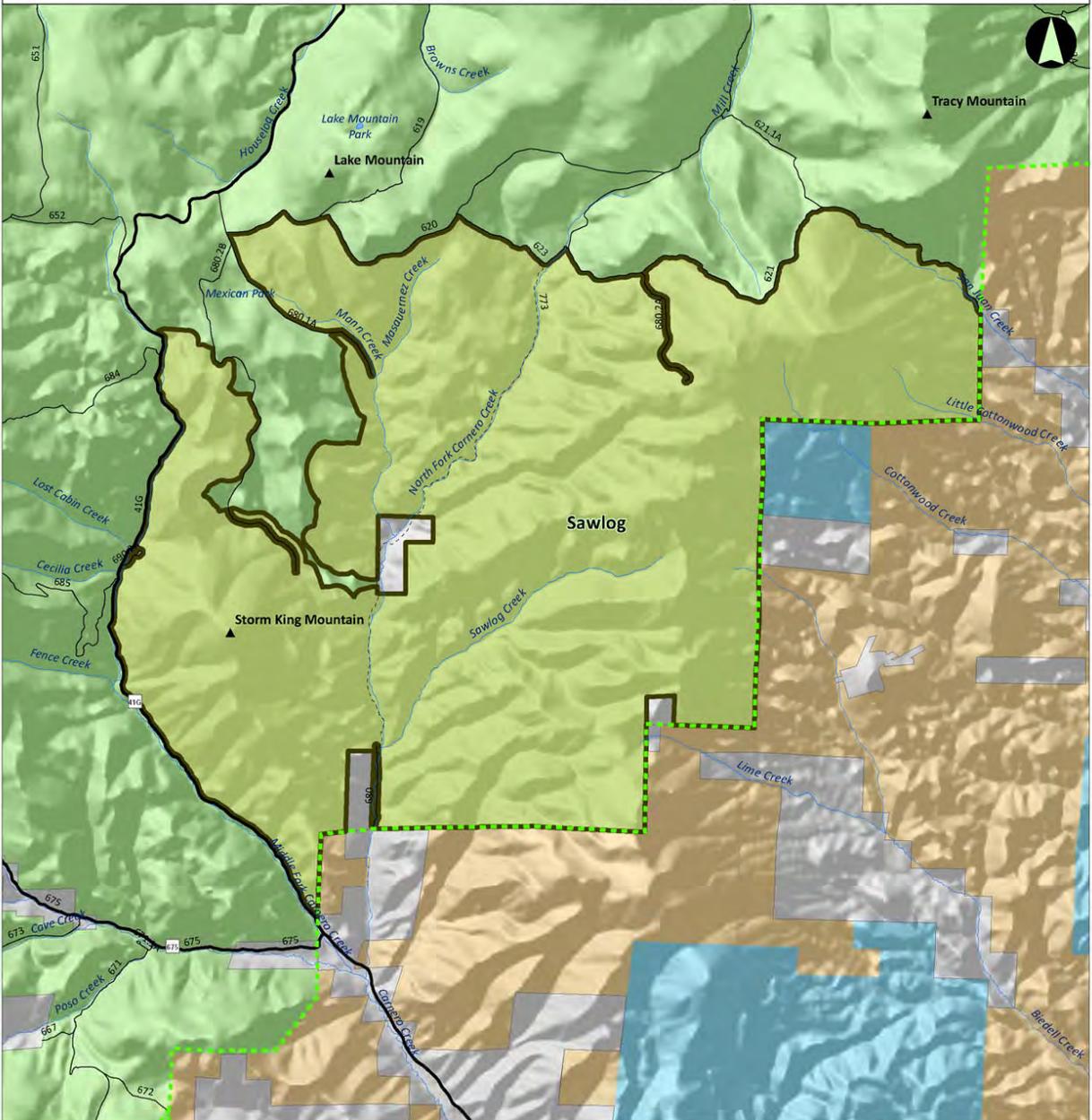
Manageability

The proposed Sawlog wilderness is manageable as wilderness. The area is bounded on two sides by adjacent unroaded BLM lands. The western boundary is well-defined by County Road 41G and the steep slopes of Storm King Mountain. Forest system roads and past timber management areas define the northern boundary. There is just one trail within the area, the non-motorized trail along the North Fork of Carnero Creek. One 160-acre private inholding exists in the center of the area, but there is presently no motorized access to it. There are no oil and gas leases.

Information Resources

Item	Data Source
Roadlessness	Colorado Roadless Rule at 36 CFR 294 subpart D
	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 71
Naturalness; Outstanding Opportunities for Solitude or Unconfined Primitive Recreation	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 72
	USDA Forest Service, R2, Profiles of Colorado Roadless Areas 2008
	SLVEC Roadless area description 2002
Supplemental Values	
High Biodiversity Significance	CNHP PCA Reports 2015
Rio Grande Cutthroat Trout	Conservation Plan for the Rio Grande Cutthroat Trout in Colorado. Colorado Division of Wildlife; CNHP PCA Report 2015
Connectivity	SREP Wildlands Network 2003, Aplet et al Indicators of Wildness 2000
Ecosystem Representation	TWS Ecosystem Representation 2016

Sawlog Recommended Wilderness Boundary



ROCKY MOUNTAIN WILD

Data Sources: BLM, CDOT, SRCA, USFS, USGS, wilderness.net

Map Prepared By: Alison Gallensky
Rocky Mountain Wild
9/3/2015 16-112 v7

Legend

- ▲ Summit
- ⬜ RGNF District
- ⬜ City
- Major Road
- USFS Road
- USFS Trail
- 🌊 Lake/Pond
- Stream/River
- ▭ Recommended Wilderness
- ▭ Designated Wilderness
- ▭ Roadless Land in Adjacent Forest

Land Ownership

- 🟩 USFS
- 🟨 BLM
- 🟪 NPS
- 🟦 State
- 🟤 Other Public
- ⬜ Private/Tribe



Snowshoe Mountain addition to Weminuche Wilderness

Proposed Wilderness Designation
Rio Grande National Forest
Divide Ranger District

34,300 acres



General Description

Snowshoe Mountain is the largest roadless area adjacent to the Weminuche Wilderness. Moderate to steep forested slopes rise out of the Rio Grande valley immediately south of Creede, with the mountain bisected by the long undeveloped watershed of Deep Creek. The proposed wilderness addition is split into two units along the Deep Creek trail in order to accommodate mountain bike use of the trail.

This large forested extension north of the Weminuche comprises important and highly utilized habitat for lynx. Snowshoe Mountain also provides valuable habitat for big game and outstanding backcountry recreation opportunities at Creede's doorstep. The mountain offers intriguing geologic interest as a resurgent dome within the Creede caldera bisected by conspicuous graben faults.

Naturalness

Snowshoe Mountain is a compact oval-shaped unit nearly 9 miles across. The Lime Creek Road (FDR #528) accesses areas previously managed for timber harvest at the southern end of the area, but the road and past timber management areas are excluded from the proposed wilderness addition. The area is free of noticeable human improvements and possesses ecologically intact forest and grassland ecosystems.



Outstanding Opportunities for Solitude or Unconfined Primitive Recreation

Snowshoe Mountain consists of steeply forested slopes looming over the Rio Grande valley. The area's size and forbidding slopes create ideal opportunities for outstanding solitude.

This large area is bisected by a non-motorized trail along Deep Creek. The Deep Creek Trail is easily accessible from Creede and is popular among hikers, anglers, and horse users. It offers an easy gradient for recreationists to quickly penetrate the area's remote interior. A second trail atop the mountain descends to a dead-end at private property on Pierce Creek. This trail provides access to a very remote and lightly visited portion of the area. Both trails provide access to outstanding opportunities for primitive and unconfined recreation.

Size and Roadlessness

The proposed Snowshoe Mountain wilderness addition contains 34,300 acres. It is bounded on the north, west and east by the private lands of the Rio Grande valley. The area is split into two units by the Deep Creek Trail. The Lime Creek Road and associated past timber harvest areas define the remainder of the boundary. The area connects at the south to the adjacent Weminuche Wilderness across a two-mile wide neck of forest and ridges.

Supplemental Values

The existence of highly utilized, high-quality lynx habitat comprises a significant supplement wilderness value for Snowshoe Mountain. Important habitat for western boreal toad occurs at the southern end of the area.

Snowshoe Mountain provides geologic features of interest. The mountain is a resurgent volcanic dome formed in the Creede caldera, and the Deep Creek graben is conspicuous at the mountain's crest. (USGS pamphlet Central San Juan Caldera Cluster, 2006)

Snowshoe Mountain includes the entirety of the 417-acre Deep Creek Uplands West PCA, which is a Potential Conservation Area ranked as Very High Biodiversity Significance. This PCA includes one of the best known populations of Smith whitlow-grass, a Colorado endemic and globally imperiled species, as well as a population of globally imperiled black canyon gilia. Snowshoe Mountain includes a portion of the 3,346-acre Spar City Potential Conservation Area identified by the Colorado Natural Heritage Program. Spar City PCA is ranked as Moderate Biodiversity Significance owing to its large and excellent quality occurrence of a state rare bristlecone pine/Thurber fescue (*Pinus aristata/Festuca thurberi*) montane woodland, a plant association limited to the southern Rocky Mountain ecoregion. (CNHP PCA Report, 2015).

Snowshoe Mountain enhances the ecological effectiveness of the Weminuche Wilderness by expanding the size of the protected area by over 30,000 acres. Larger protected areas are more likely to provide conditions for species persistence over the long term than smaller areas. (SREP Wildlands Network Vision 2003; Aplet et al Indicators of Wildness 2000.)

Snowshoe Mountain contributes thousands of acres of one of the most under-represented ecosystem types among existing wilderness areas on the Rio Grande National Forest. By protecting this area, the Rio Grande NF can significantly increase the ecological

representation within its wilderness areas of Southern Rocky Mountain Montane-Subalpine Grassland. (TWS ecosystem representation report, 2016)

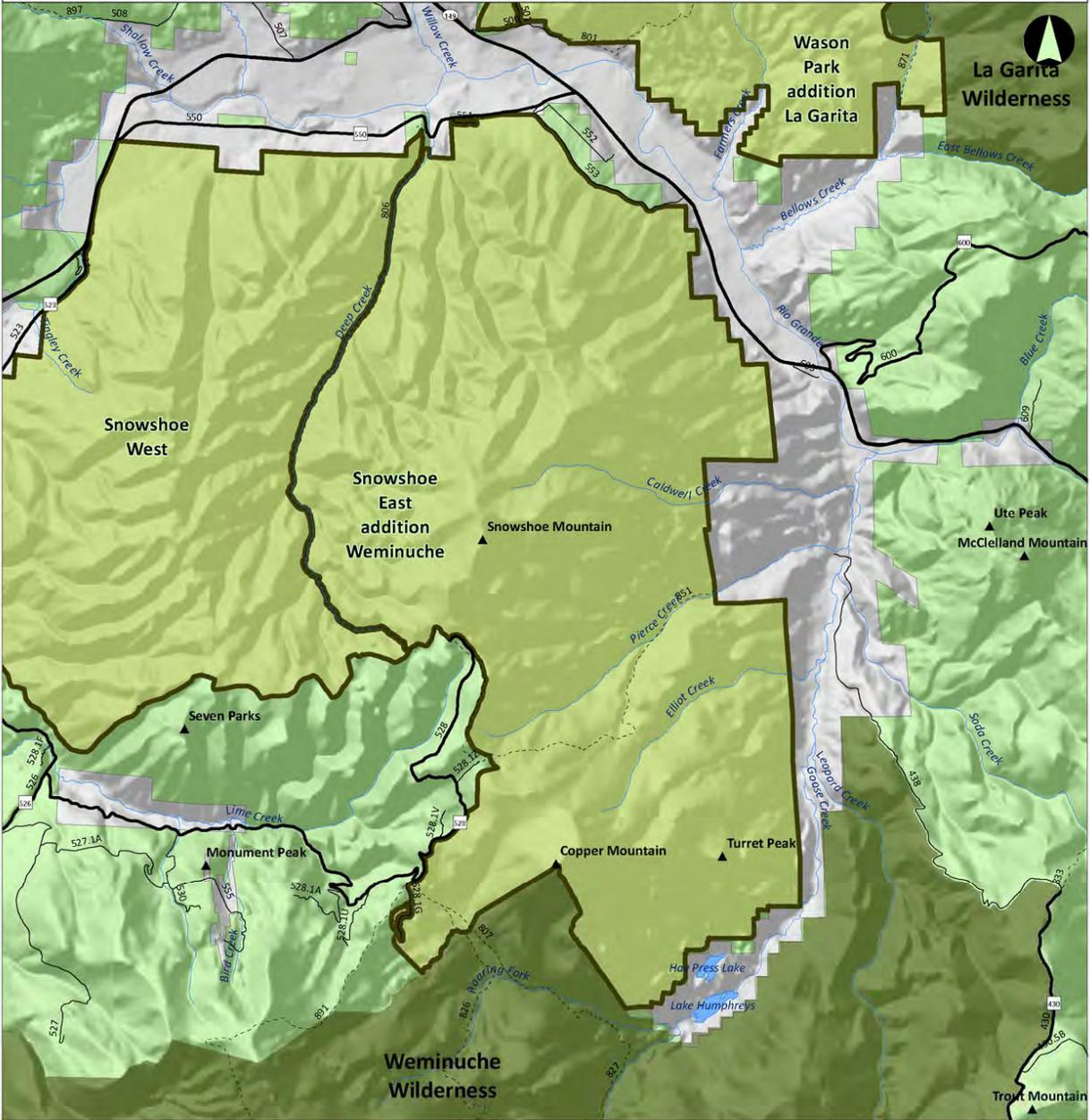
Manageability

Snowshoe Mountain is readily manageable as wilderness owing to its compact configuration. The mountain rises steeply from the surrounding valley floor on the north and east, which offers an imposing topographic delineation. The proposed wilderness addition excludes the Deep Creek Trail in order to avoid conflicts with mountain biking. Identified areas of potential snowmobiling interest in the Seven Parks are excluded along the southern boundary. The area has no geologic potential for oil and gas resources, and there are no oil and gas leases or non-federal inholdings within the area. Portions of Snowshoe Mountain are within a Wildland Urban Interface area along the national forest boundary at Kid Peak Estates and at Wagon Wheel Gap identified within the Mineral County Community Wildfire Protection Plan. These can be buffered out of the wilderness boundary if determined necessary.

Information Resources

Item	Data Source
Roadlessness	Colorado Roadless Rule at 36 CFR 294 subpart D
	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 71
Naturalness; Outstanding Opportunities for Solitude or Unconfined Primitive Recreation	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 72
	USDA Forest Service, R2, Profiles of Colorado Roadless Areas 2008
	SLVEC Roadless area description 2002
Supplemental Values	
High Biodiversity Significance	CNHP PCA Reports 2015
Geologic	USGS pamphlet Central San Juan Caldera Cluster, 2006
Connectivity	SREP Wildlands Network 2003, Aplet et al Indicators of Wildness 2000
Ecosystem representation	TWS Ecosystem Representation 2016

Snowshoe East addition Weminuche Recommended Wilderness Boundary



Data Sources: BLM, CDOT, SRCA, USFS, USGS, wilderness.net
Map Prepared By: Alison Gallensky
 Rocky Mountain Wild
 9/3/2015 16-112 v7



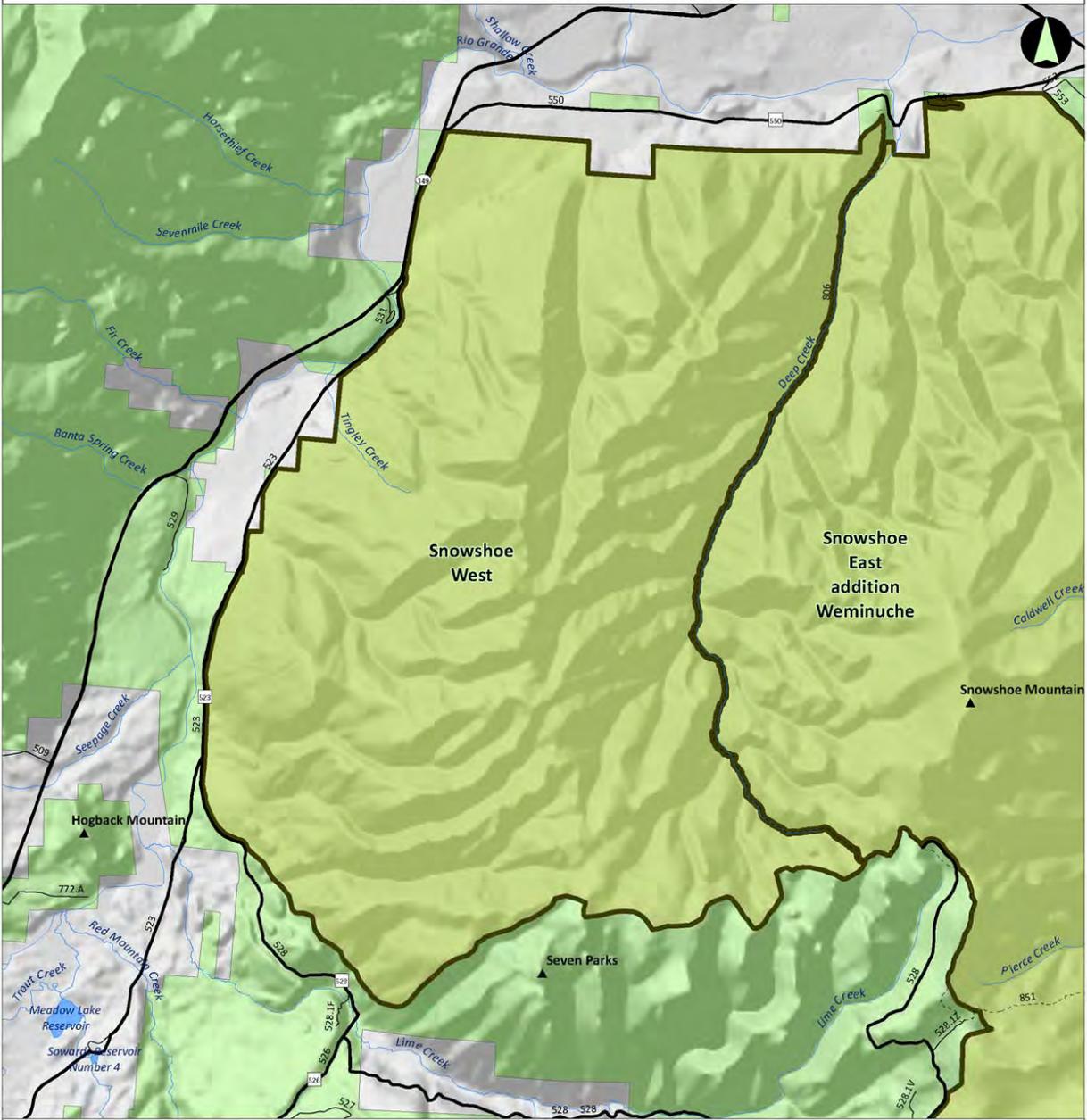
Legend

- ▲ Summit
- RGNF District
- City
- Major Road
- USFS Road
- USFS Trail
- Lake/Pond
- Stream/River
- Recommended Wilderness
- Designated Wilderness
- Roadless Land in Adjacent Forest

Land Ownership

- USFS
- BLM
- NPS
- State
- Other Public
- Private/Tribe

Snowshoe West Recommended Wilderness Boundary




ROCKY MOUNTAIN WILD
 Data Sources: BLM, CDOT, SRCA, USFS, USGS, wilderness.net
 Map Prepared By: Alison Gallensky
 Rocky Mountain Wild
 9/3/2015 16-112 v7

- Legend**
-  Summit
 -  RGNF District
 -  City
 -  Major Road
 -  USFS Road
 -  USFS Trail
 -  Lake/Pond
 -  Stream/River
 -  Recommended Wilderness
 -  Designated Wilderness
 -  Roadless Land in Adjacent Forest

- Land Ownership**
-  USFS
 -  BLM
 -  NPS
 -  State
 -  Other Public
 -  Private/Tribe



Adams Fork – Three Forks Addition to South San Juan Wilderness

Proposed Wilderness Designation
Rio Grande National Forest
Conejos Peak Ranger District

2,700 acres



General Description

The proposed Adams Fork–Three Forks addition to the South San Juan Wilderness consists of the slopes surrounding the Three Forks and Adams Fork trailheads at the headwaters of the Conejos River above Platoro Reservoir. The addition incorporates the lowest mile of the Adams Fork trail into the adjacent wilderness and encompasses steep and forested slopes of the Conejos River valley. This addition enhances wilderness protection for the area surrounding these two wilderness trailheads that are popular with anglers, hikers, backpackers and horse users. The additions are part of two larger Colorado Roadless Areas, Gold Creek-Cascade Creek and Tobacco Lakes.

Naturalness

The proposed Adams Fork–Three Forks wilderness addition is affected primarily by the forces of nature. Much of the unit’s mature spruce has succumbed to beetles, similar to surrounding forests. The Adams Fork component consists of the lower mile of the Adams Fork creek corridor. The Three Forks portion includes the steep, forested slopes rising to hanging glacial valleys looming over the Conejos River valley. Topography excludes roads or any other management activities.

Outstanding Opportunities for Solitude or Unconfined Primitive Recreation

The Adams Fork is a deep, forested stream corridor where visitors immediately encounter a sense of remoteness and solitude upon departing the trailhead. The steep slopes of the Three Forks component is free of trails and consequently receives little to no recreational use, but from the highest points above the Conejos River valley visitors experience an enhanced sense of solitude owing to the separation from the valley floor and expansive vistas.



The Adams Fork trail provides outstanding opportunities for primitive and unconfined recreation in the form of wilderness-related activities such as hiking, backpacking, horsepacking, angling, and backcountry hunting. The Three Forks addition enhances the primitive recreation experience by ensuring protection of the wilderness qualities of the landscape that envelops the Three Forks wilderness trailhead. Both trailheads are easily accessed from Platoro Reservoir.

Size and Roadlessness

The Adams Fork-Three Fork wilderness addition is 2,700 acres and is adjacent to the existing South San Juan wilderness to the west and south. The wilderness addition surrounds forest road #247 and effectively creates a short cherry-stem along the road to the Three Forks trailhead.

Supplemental Values

The Adams Fork addition is a documented high use area for lynx and was part of one of the initial core areas lynx established after reintroduction. The steep north-facing slopes and drainages of the Adams Fork-Three Forks addition potentially support lynx reproduction and serve as hunting territory. (USDA Forest Service, R2, Profiles of Colorado Roadless Areas, 2008)

The Adams Fork addition includes a portion of the Adams Fork of the Conejos River Potential Conservation Area identified by the Colorado Natural Heritage Program. The PCA is drawn to include the riparian habitat necessary to support the Rio Grande cutthroat trout, and the PCA is ranked as High Biodiversity Significance. The Adams Fork supports a recreation population of Rio Grande cutthroat trout. (Conservation Plan for Rio Grande Cutthroat Trout in Colorado, CDOW, 2004; CNHP PCA Report, 2015)

The proposed Adams Fork-Three Forks wilderness addition enhances the ecological effectiveness of the South San Juan Wilderness by expanding the size of the protected area. Larger protected areas are more likely to provide conditions for species persistence over the long term than smaller areas. (SREP Wildlands Network Vision 2003; Aplet et al Indicators of Wildness 2000.)

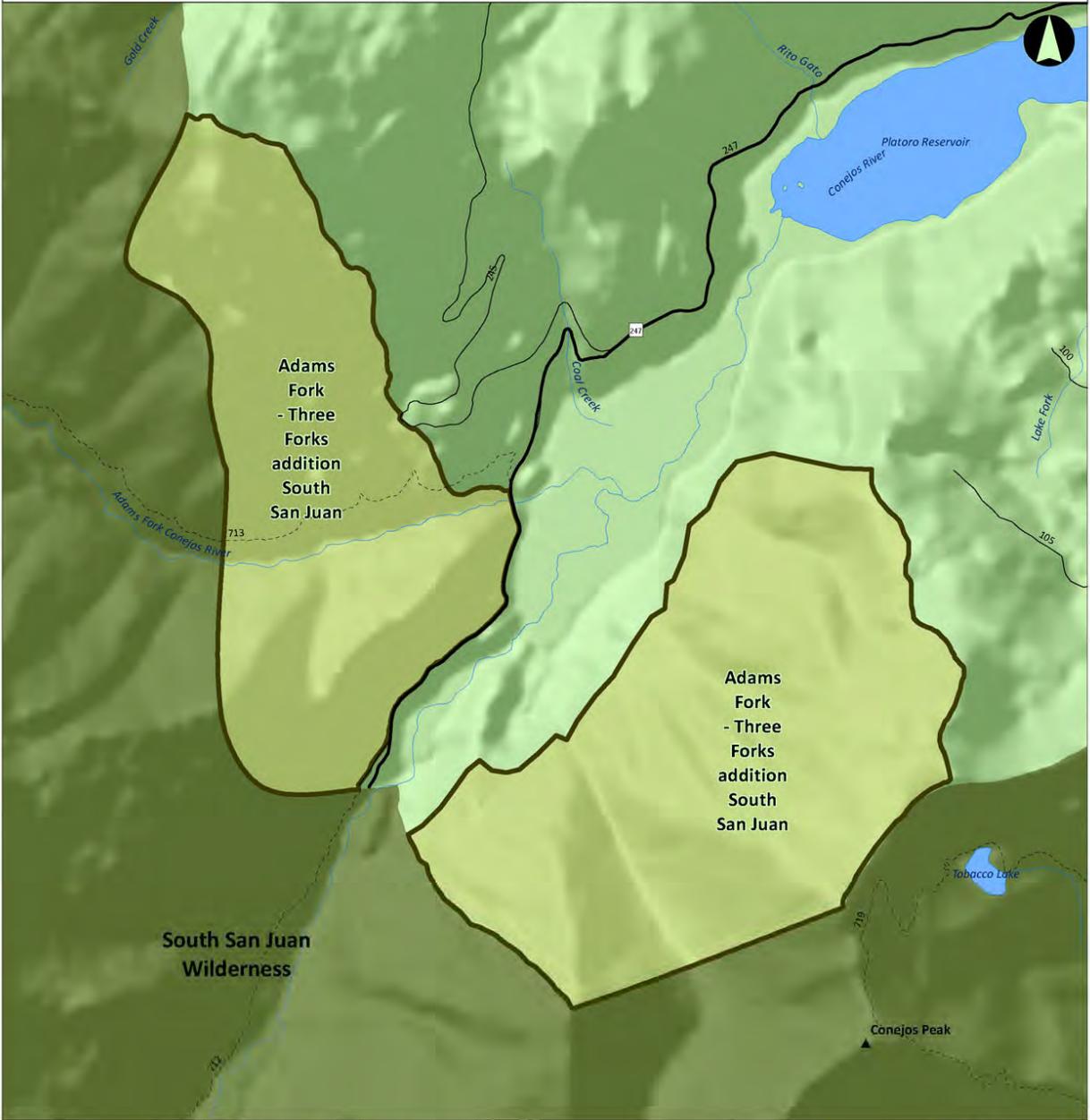
Manageability

The Adams Fork-Three Forks unit adds areas with easily distinguishable boundaries to the adjacent South San Juan Wilderness. The Adams Fork portion extends the existing wilderness boundary about one mile downstream to a new boundary along forest road #247 and effectively results in the entirety of the Adams Fork drainage being included within the wilderness boundary. The Three Forks component lies east of the Conejos River and its steep slopes provide a topographic barrier to incompatible uses. There are no oil and gas leases and no non-federal inholdings within the area.

Information Resources

Item	Data Source
Roadlessness	Colorado Roadless Rule at 36 CFR 294 subpart D
	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 71
Naturalness; Outstanding Opportunities for Solitude or Unconfined Primitive Recreation	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 72
	USDA Forest Service, R2, Profiles of Colorado Roadless Areas 2008
	SLVEC Roadless area description 2002
Supplemental Values	
High Biodiversity Significance	CNHP PCA Reports 2015
Rio Grande Cutthroat Trout	Conservation Plan for the Rio Grande Cutthroat Trout in Colorado. Colorado Division of Wildlife; CNHP PCA Report 2015
Connectivity	SREP Wildlands Network 2003, Aplet et al Indicators of Wildness 2000
Ecosystem Representation	TWS Ecosystem Representation 2016

Adams Fork - Three Forks addition South San Juan Recommended Wilderness Boundary



Data Sources: BLM, CDOT, SRCA, USFS, USGS, wilderness.net
Map Prepared By: Alison Gallensky
 Rocky Mountain Wild
 9/3/2015 16-112 v7

Legend

- ▲ Summit
- RGNF District
- City
- Major Road
- USFS Road
- USFS Trail
- Lake/Pond
- Stream/River
- Recommended Wilderness
- Designated Wilderness
- Roadless Land in Adjacent Forest

Land Ownership

- USFS
- BLM
- NPS
- State
- Other Public
- Private/Tribe

0 1 2 Miles

Elk Creek addition to South San Juans Wilderness

Proposed Wilderness Designation
Rio Grande National Forest
Conejos Peak Ranger District

3,200 acres



General Description

The proposed Elk Creek addition to the South San Juan Wilderness adds the lower four miles of the stream valley to the wilderness. The lowermost elevations of Elk Creek at less than 9,000 feet include impressive stands of several-hundred-year-old ponderosa pines, many of which display old-growth characteristics. The low-elevation ponderosa pine-grassland ecosystem adds substantial diversity to the existing wilderness, and the majestic trees offer an appealing contrast to the generally subalpine and alpine character of the wilderness.

Elk Creek is a large tributary of the Conejos River and drains the southern quadrant of the wilderness. The Elk Creek trail is a gentle gradient along a clear tumbling stream that provides a popular wilderness access point for hikers, anglers, and horse users. The proposed wilderness addition creates a topographically defined boundary that incorporates the entirety of the stream valley into the wilderness, as opposed to only a portion of the south half as is currently within the wilderness.

Naturalness

The Elk Creek addition to the South San Juans is a smaller subset of the Cumbres roadless area. The addition is entirely natural with no evidence of past management activities. The unit's ponderosa pine-grasslands are a particularly good example of a pine forest in the condition expected from a natural fire regime. Other portions of the Cumbres roadless area that might display more evidence of noticeable human activities are excluded from the proposed wilderness addition.



Outstanding Opportunities for Solitude or Unconfined Primitive Recreation

The Elk Creek watershed is a premier destination within the existing South San Juan Wilderness owing to its outstanding opportunities for solitude. The lower Elk Creek addition contributes to that through its topographic isolation as it carves a deep and

narrow valley downstream of the existing wilderness boundary. Soon after departing the Elk Creek trailhead, visitors round into the valley's secluded confines and immediately leave behind civilization's hustle and bustle.

The non-motorized Elk Creek trail traverses the length of the proposed wilderness addition to the wilderness boundary approximately four miles distant from the trailhead. Elk Creek is an easily accessible and popular wilderness access point for both hikers and horse users. Many day-hikers and overnight backpackers enjoy outstanding opportunities for fishing, photography, and wildlife viewing. Horsepackers share the trail and similarly enjoy access to the longest wilderness valley in the South San Juans. The area provides excellent habitat for elk and mule deer, which in turns leads to high-quality backcountry hunting opportunities in the fall.

Size and Roadlessness

The proposed Elk Creek addition to the South San Juan Wilderness consists of 3,200 acres adjacent to the existing wilderness. Elk Creek is bounded on the west by the wilderness boundary, and significant topographic features in the form of cliff rims and precipitous ridge tops create boundaries to the north and south.

Supplemental Values

Adding lower Elk Creek to the wilderness notably expands the range of ecosystems present within the existing wilderness because of the presence of uncommon stands of robust ponderosa pine at its lower end. These classic stands of stately ponderosa pine intermixed with park-like grasslands create a welcome entrance to the wilderness. This is an ecosystem type noticeably absent within the existing wilderness on the Rio Grande National Forest. (TWS ecosystem representation report, 2016)

The proposed Elk Creek addition enhances the ecological effectiveness of the South San Juan Wilderness by expanding the size of the protected area. Larger protected areas are more likely to provide conditions for species persistence over the long term than smaller areas. (SREP Wildlands Network Vision 2003; Aplet et al Indicators of Wilderness 2000.)

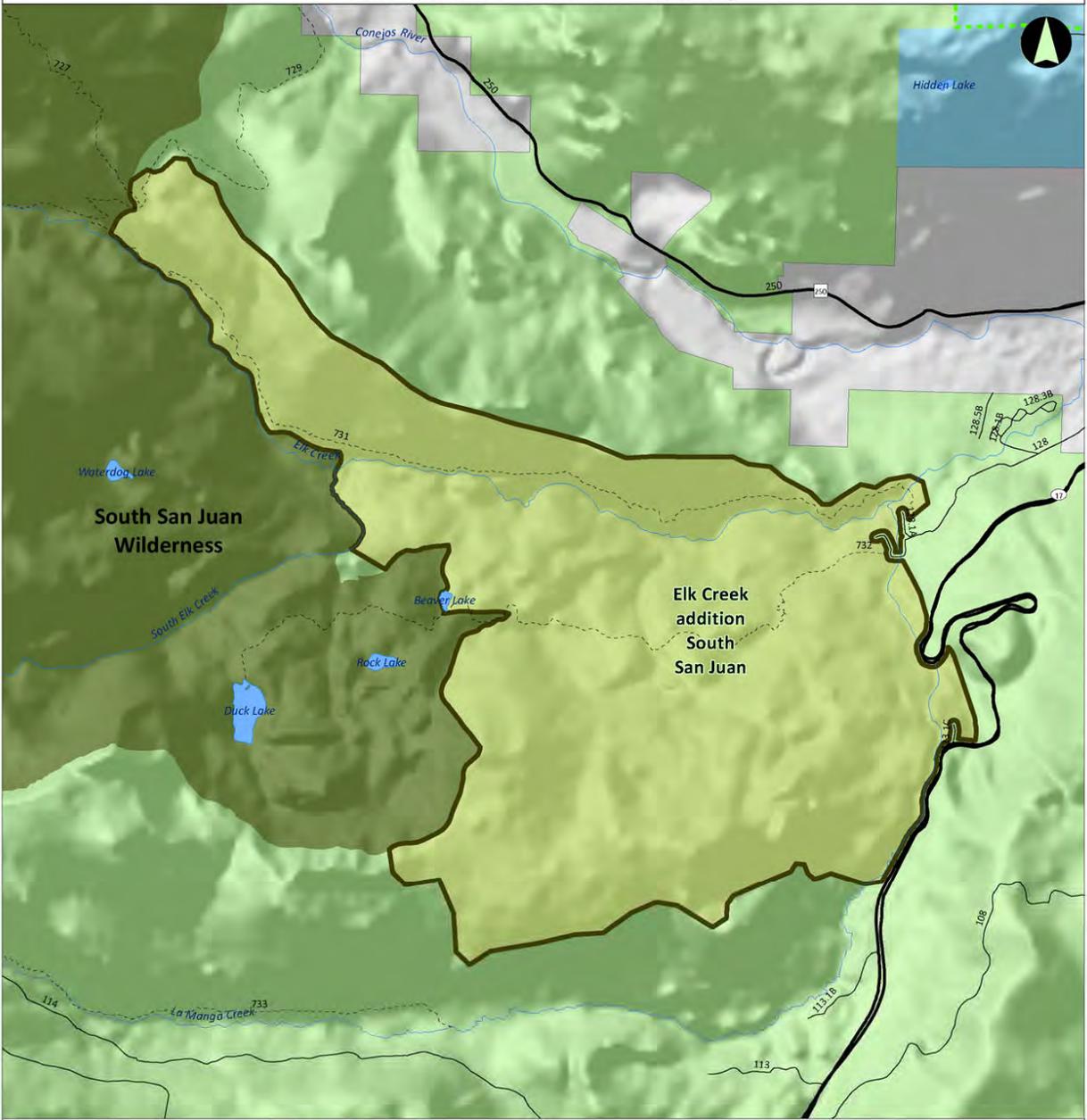
Manageability

The Elk Creek addition is readily manageable as wilderness and significantly enhances the existing wilderness boundary by bringing the entirety of the Elk Creek valley into the wilderness as compared to the current boundary that protects only the southern half of the valley. The significant topographic barriers of the proposed addition separate the addition from influences on adjacent national forest lands. There are no oil and gas leases or non-federal inholdings.

Information Resources

Item	Data Source
Roadlessness	Colorado Roadless Rule at 36 CFR 294 subpart D
	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 71
Naturalness; Outstanding Opportunities for Solitude or Unconfined Primitive Recreation	Forest Service inventory pursuant to FSH 1909.12,chapter 70, section 72
	USDA Forest Service, R2, Profiles of Colorado Roadless Areas 2008
	SLVEC Roadless area description 2002
Supplemental Values	
Connectivity	SREP Wildlands Network 2003, Aplet et al Indicators of Wildness 2000
Ecosystem representation	TWS Ecosystem Representation 2016

Elk Creek addition South San Juan Recommended Wilderness Boundary



Data Sources: BLM, CDOT, SRCA, USFS, USGS, wilderness.net
Map Prepared By: Alison Gallensky
 Rocky Mountain Wild
 9/3/2015 16-112 v7

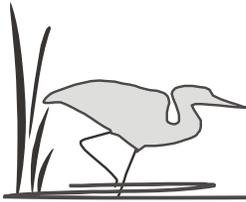
Legend

- ▲ Summit
- RGNF District
- City
- Major Road
- USFS Road
- USFS Trail
- ☪ Lake/Pond
- Stream/River
- Recommended Wilderness
- Designated Wilderness
- Roadless Land in Adjacent Forest

Land Ownership

- USFS
- BLM
- NPS
- State
- Other Public
- Private/Tribe





RARE EARTH SCIENCE

www.rareearthscience.com

August 1, 2011

Christine Canaly
San Luis Valley Ecosystem Council
Post Office Box 223
Alamosa, Colorado 81101

**Re: Mineral Assessment Report
Luis Maria Baca Grant No. 4 Property - Saguache County, Colorado**

Dear Christine:

Rare Earth Science, LLC (Rare Earth) has completed this Mineral Assessment Report (MAR) for the Luis Maria Baca Grant No. 4 (Baca Grant) property located in southeast Saguache County. The purpose of the MAR was to evaluate the mineral-resource and mineral-development potential in those areas of the Baca Grant, and adjoining lands, where Lexam Explorations (USA) Inc. (also known as Lexam VG Gold Inc. [hereafter, "Lexam"]) holds the subsurface mineral rights.

1. Project Overview

The MAR project included a review of documented historical, or currently-permitted and active, mineral mining or drilling operations in Baca Grant vicinity. A general location map for the study area is attached as Figure 1. For this project, Rare Earth reviewed a variety of published geologic, mining and economic mineral-resource data. Available maps, mining-related permit files, and scientific literature were acquired from sources that include the U.S. Geological Survey (USGS); Bureau of Land Management (BLM); U.S. Forest Service (USFS); U.S. Fish & Wildlife Service (USFWS); National Park Service (NPS); Colorado Division of Reclamation, Mining and Safety (DRMS); Colorado Geological Survey (CGS); Colorado Oil & Gas Conservation Commission (COGCC); San Luis Valley Ecosystem Council and their associates; and Alamosa & Saguache Counties.

This report presents a brief description of the Baca Grant and the local geology, a review of various economic mineral resources (categorized separately as locatable, leasable and saleable minerals), along with a summary of our findings. Rare Earth did not perform a detailed review of land-ownership records or title information for any of the study area; nor was site reconnaissance performed, or sampling & analysis of geologic materials. This MAR is in no way intended to be a mineral appraisal or mineral-examination report. Nor is this report considered to be an opinion on mineral title, mineral valuation or mining-claim validity; or a quantitative analysis of actual mineral resources and/or reserves.

2. Site Location & Description

The attached Figures 1 & 2 show the boundaries of the Baca Grant, which encompass approximately 100,000 acres (12.5 square miles) in all, or portions of, Townships 41 to 43 North and Ranges 10 to 12 East (New Mexico Principal Meridian). Surface ownership and administration of the Baca Grant includes NPS (Great Sand Dunes National Park), USFWS (Baca National Wildlife Refuge [NWR]), Rio Grande National Forest, and numerous private landowners in the Baca Grande Subdivision adjacent to the town of Crestone.

The Baca Grant is located about 25 miles north-northeast of the City of Alamosa and 4 miles east of Colorado State Highway 17. Adjoining lands to the south-southeast are administered by the NPS, by the USFWS to the south and west, and by the Rio Grande National Forest to the north and east. Smaller tracts of privately-owned land also adjoin the Baca Grant in all directions. The terrain is quite varied and encompasses part of the level San Luis Valley floor, upslope over the mountain front and to the crest of the Sangre de Cristo Range.

USGS topographic maps show the ground surface elevation ranging from a low point of approximately 7,500 feet above mean sea level along the west boundary, to a high point of more than 14,000 feet near the northeast corner of the Baca Grant on Kit Carson Mountain and Challenger Point. Numerous drainages traverse all or part of the Baca Grant in a general northeast-to-southwest direction, including (from north to south): Crestone Creek, Willow Creek, Spanish Creek, Cottonwood Creek, Deadman Creek, Pole Creek and Sand Creek. The Baca Grant area is also located within the San Luis Creek district within a closed basin having no known external drainage.

3. Geologic Overview of the Baca Grant Area

The Baca Grant is positioned within the Southern Rocky Mountains physiographic province, with its characteristic rugged, high-elevation peaks and broad intermontane basins. In general, the topography and geology of this area were influenced by several major features including the Sangre de Cristo Range to the east and the San Juan Volcanic Field to the west-southwest. The Baca Grant also lies on the eastern margin of the San Luis Valley and along the western front of the Sangre de Cristo Range. The San Luis Valley coincides with the structural feature called the San Luis Basin, which is a broad, east-dipping half graben that is hinged on the west in the San Juan Mountains and bounded on the east by the Sangre de Cristo Fault at the base of the Sangre de Cristo Range. The San Luis Basin is part of the Rio Grande Rift, a major intracontinental extensional feature from Mexico to central Colorado that originated about 26 to 27 million years ago late during the Oligocene Epoch.

The study area lies on the Baca Half Graben adjacent to the Sangre de Cristo Range to the east. Two major southeast-northwest-trending faults traverse the Baca Grant, in the western part of the property and at the base of the mountains to the east (known as the Sangre de Cristo Fault). Thrust faulting is a common feature in the east-central and northeast corner of the Baca Grant, in those areas east of the Sangre de Cristo Fault.

The *Geologic Map of Saguache County* (CGS Resource Series 44, 2007) was reviewed for an understanding of local surface and subsurface geologic conditions. According to the map, a

majority of the Baca Grant is comprised of Quaternary- to Oligocene-age rocks in the Santa Fe Group (Map Unit QTs), described as red sand and conglomerate, volcanic-rich conglomerate, and interbedded basaltic andesite flows in the lower part. Map Unit QTs ranges in thickness from 300 to 11,000 feet. Along the mountain front to the east, there are Holocene & Pleistocene glacial and alluvial surficial deposits (Map Units Qa and Qpt), along with Quaternary eolian deposits ([transverse & parabolic dunes] Map Units Qdt, Qdpf, and Qdpa) in the southeast corner of the Baca Grant in Great Sand Dunes National Park.

Bedrock Paleoproterozoic exposures in the rugged Sangre de Cristo Range along the east boundary and northeast corner of the Baca Grant include a broad area of mafic & felsic gneiss (Map Unit Xgn), and a lesser amount of quartz monzonite of Music Pass (Map Unit Xqm) found between Deadman and Pole Creeks. An overturned bed of Lower Mississippian to Upper Cambrian Leadville Limestone, Chaffee Group, Fremont Dolomite, Harding Quartzite, Manitou Formation and isolated patches of Sawatch Quartzite, undivided (Map Unit MOR) is also exposed at the Deadman Creek thrust fault, which forms an asymmetric east-verging anticline. The northeast corner (and highest reach) of the Baca Grant consists primarily of Middle or Upper Pennsylvanian & Lower Permian Sangre de Cristo Formation (Map Unit PPsc), with a lesser amount of Middle Pennsylvanian Minturn Formation (Map Unit Pm).

3.1. Review of Regional Geology

Precambrian rocks, also known as basement rocks, underlie the entire Baca Grant. They crop out in the Sangre de Cristo Range and are buried by younger rocks and deposits west of the mountains. Most of the Precambrian rocks are estimated to be around 1.7 billion years old. A thick package of younger rocks overlies these Precambrian rocks at the Baca Grant. A sequence of relatively thin clastic and carbonate rocks were deposited over the Precambrian during the lower and middle Paleozoic throughout much of Colorado, probably including the Baca Grant area. During the Pennsylvanian Period the Ancestral Rocky Mountains rose in a series of uplifted highlands and depositional basins developed between the uplifts. Lower and Middle Paleozoic rocks were stripped off the Ancestral Rocky Mountain highlands, and Pennsylvanian sediments accumulated in the basins.

Much, and perhaps all, of modern San Luis Valley was a highland during the Pennsylvanian Period (known as either the San Luis or San Luis-Uncompahgre highland). The exact eastern margin of the ancestral San Luis Highland is not well constrained. Lower and Middle Paleozoic rocks, as well as Pennsylvanian sediments are preserved in the Sangre de Cristo Range, so these areas were likely in the depositional basin known as the Central Colorado Trough, which lay east of the ancestral San Luis Highland.

During Late Cretaceous time, the Western Interior Seaway transgressed across the region depositing sand along the shoreline that would eventually become sandstone; mud beneath the bottom of the sea that would lithify into shale; and local deposits of limestone. These sediments would later become the source and host of much of the oil & gas in Colorado. More sediment was deposited as the seaway retreated from the area, including thick beds of peat on the landward side of the retreating seaway. The peat beds turned into coal as they were subsequently buried by younger sediment.

Another major period of mountain-building, the Laramide Orogeny, was initiated around 70 million years ago (mya). Rocks were again eroded off the uplifts, including the Mesozoic rocks, and sediment deposition occurred in adjacent basins. Modern San Luis Valley was again the site of an ancient mountain uplift whose boundaries are also poorly understood. Drill holes scattered across much of the San Luis Valley encountered Precambrian rocks beneath the Tertiary fill, indicating those locations were the site of the Laramide uplifts. However, two small remnants of the Mesozoic rocks reportedly crop out in arroyos cut into the alluvial fans in the vicinity of Deadman Creek on the Baca Grant, and Lexam has reported the existence of Mesozoic rocks in the subsurface beneath the Baca Grant based on their Baca Nos. 1 and 2 drill holes (discussed below in Section 4.2.1.) and geophysical studies, suggesting those areas did not undergo mountain uplift and erosional stripping of the Mesozoic sediment.

These Laramide uplifts formed in response to compressional squeezing of the earth's crust. This led to the development of large, low-angle, thrust faults along the flanks of the uplifts where Precambrian rocks were thrust up and over younger rocks. Scattered igneous intrusions were also emplaced during the Laramide Orogeny, which ended around 45 mya. Starting about 35 mya, widespread volcanism began in the San Juan Mountains west of the San Luis Valley.

Initially the volcanic activity involved andesitic lava flows and volcanic mudflows associated with stratovolcanoes. Rocks from this period of volcanism are commonly called the Conejos Formation; they extended eastward from the San Juan Volcanic Field, perhaps as far east as the Baca Grant. Around 30 mya the volcanism became more silicic and explosive, resulting in the formation of multiple calderas, many of which collapsed when large volumes of ash-flow tuff were violently erupted. Thick sequences of ash-flow tuff filled many of the collapsed calderas, and rapidly moving flows of ash flowed downslope away from the calderas, extending locally at least as far as the modern range front of the Sangre de Cristo Range. Available data suggest ash-flow tuffs may exist in the subsurface beneath the Baca Grant.

Minor precious metal deposits developed in and near the igneous intrusions associated with the Conejos Formation stratovolcanoes, and major precious metal deposits such as those at Creede, Bonanza and Summitville formed in and near the calderas. These types of metal deposits are unlikely to exist at the Baca Grant because neither the Conejos stratovolcanoes nor the calderas associated with the ash-flow tuffs are known to exist in the vicinity of the Baca Grant.

Starting about 27 to 26 mya, the earth's crust began to pull apart in response to east-west-directed extension. A major tear in the earth's crust called the Rio Grande Rift broke open from Mexico at least as far north as central Colorado. San Luis Valley coincides with one of the major structural depressions that formed along the rift, the San Luis Basin. Subsurface sediments and volcanic rocks in the San Luis Basin and beneath the Baca Grant property include Map Unit QTs along with other formations. Attached Figure 3 presents a geologic cross-section (from Brister & Gries, 1994), which depicts the subsurface geology in an east-west alignment just south of the Baca Grant. The cross-section indicates that Oligocene ash-fluffs likely overlie Precambrian rocks beneath much of the Baca Grant, and the western part of the property may have an eastward-thinning wedge of Oligocene Conejos Formation volcanics (mostly andesitic flows and volcanoclastic rocks) between the Precambrian rocks and the ash-flow tuffs. These

rocks were deposited in San Luis Basin prior to initiation of rifting; and, rift-related Map Unit QTs overlies the ash-flow tuffs.

4. Evaluation of Mineral Resources

Although Rare Earth did not review land-title records or County assessor's records as part of this project, it is understood that Lexam holds an undivided 75% interest in the subsurface oil & gas rights, and ConocoPhillips owns the remaining 25% oil & gas interests on the 100,000-acre Baca Grant. Lexam also apparently holds 100% of the subsurface rights for all other minerals on the entire Baca Grant. According to Watts, et al (2006), 50% of the hard mineral rights were acquired from Baca Minerals, Inc. in 1987, and the other 50% interest in the hard mineral rights and 50% of the oil & gas rights were purchased from the Newhall Land and Farming Company in 1997. Lexam's additional 25% interest in oil & gas rights were acquired from the Baca Corporation in 1996.

For this project, mineral resources were evaluated on the Baca Grant where Lexam holds a majority interest in subsurface oil & gas rights, and 100% interest in the rights to other minerals. This study also includes a lesser amount of acreage to the west and north of the Baca Grant (in Townships 42 & 43 North, Range 10 East; and Township 43 North, Range 11 East) where Lexam apparently owns mineral rights (ranging from an undivided one-sixth to one-half interest) on a patchwork of Baca NWR and private lands (see attached Figure 2) totaling roughly 5,400 acres.

A number of information sources were reviewed for documented historical, or currently permitted, mining activities at the Baca Grant and adjoining properties, and for determining the likelihood of potential on-site mineral resources. For purposes of this report, "minerals" do not include surface water or groundwater. Mineral resources are typically divided by USGS and other Federal agencies into three distinct categories: locatable, leasable and saleable. Each of these categories is described in detail below in the following Sections 4.1., 4.2. and 4.3.

Examples of the geological & mineral-resource data sources utilized for this project include:

- *Mineral and Surface Management Status Map, Blanca Peak* (BLM, 2010);
- *Great Sand Dunes National Monument, Colorado: A Preliminary Literature Search, Inventory, and Assessment of Mines and Prospects in and near the National Monument with Emphasis on Potential Water Quality Degradation* (Colorado Division of Water Resources [DWR], 1995);
- *Colorado's Hydrothermal Resource Base - An Assessment* (CGS Resource Series 6, 1979);
- *Inventory of Nonmetallic Mining and Processing Operations in Colorado* (CGS Map Series 17, 1981);
- *Location Map and Descriptions of Metal Occurrences in Colorado with Notes on Economic Potential* (CGS Map Series 28, 1994);

- *Evaluation of Mineral and Mineral Fuel Potential of Saguache County, State Mineral Lands Administered by the Colorado State Land Board* (CGS Open-File Report 00-11, 2000);
- *Oil and Gas Fields Map of Colorado* (CGS Map Series 33, 2002);
- *Radioactive Mineral Occurrences of Colorado* (CGS Bulletin 40, 2005);
- *Coal Resource Maps of Colorado* (CGS Map Series 43, 2006);
- *Geology and Mineral Resources of Saguache County, Colorado* (CGS Resource Series 44, 2007);
- *Critical and Strategic Minerals - Can Colorado Play a Role?* (CGS Information Circular, 2011);
- BLM's National Integrated Land System transaction applications (online at www.geocommunicator.gov/GeoComm/index.shtm) and Land & Mineral Legacy Rehost 2000 System (online at www.blm.gov/lr2000/index.htm);
- DRMS database for active and inactive mines (online at www.mining.state.co.us/GIS%20Data.htm);
- COGCC database for oil & gas wells (online at www.oil-gas.state.co.us/);
- 7.5-minute series *Crestone, Deadman Camp, Deadman Camp Southwest, Hooper East, Medano Ranch, Moffat South, Sand Camp and Sheds Camp, Colorado* topographic maps (USGS, 1967-2010);
- *Mineral Resource Potential of the Sangre de Cristo Wilderness Study Area, South-Central Colorado* (USGS Miscellaneous Field Studies Map MF-1635-A, 1984);
- *An Assessment of the Mineral Resource Potential of the San Isabel National Forest, South-Central Colorado* (USGS Bulletin 1638, 1984);
- *Petroleum Geology and Hydrocarbon Plays of the Albuquerque-San Luis Rift Basin, New Mexico and Colorado* (USGS Open-File Report 87-450-S, 1988);
- *Copper and Uranium in Pennsylvanian and Permian Sedimentary Rocks, Northern Sangre de Cristo Range, Colorado* (USGS Bulletin 2116, 1995);
- *The Principal Rare Earth Element Deposits of the United States - A Summary of Domestic Deposits and a Global Perspective* (USGS Scientific Investigations Report 2010-5220, 2010);

- *Final Scoping Report - San Luis Valley Geothermal Leasing Analysis, Environmental Assessment and Resource Management Plan Amendment* (BLM San Luis Valley Public Lands Center, November 2010);
- *Environmental Assessment of Proposed Oil and Gas Exploration, Baca National Wildlife Refuge, Saguache County, Colorado* (USFWS, April 2011);
- *Tertiary Stratigraphy and Tectonic Development of the Alamosa Basin (Northern San Luis Valley), Rio Grande Rift, South-Central Colorado* (Brister & Gries [in Geological Society of America Special Paper 291], 1994);
- *General Geology of the Northern San Luis Valley, Colorado* (GEO-HAZ Consulting, 1996);
- *A Summary Review Including A Work Plan And Budget Proposal To Test Oil And Gas Prospects On The San Luis Basin Property, Colorado, USA - For Lexam Explorations Inc.* (Watts, Griffis and McQuat Limited, June 2006); and
- Personal communication with Federal- and State-agency geologists and permitting representatives, along with local geologist Robert Kirkham (GeoLogical Solutions [Alamosa, CO]).

The following sections present an overview of mining and drilling history in the Baca Grant vicinity along with a discussion of known/documented mineral resources, which primarily include precious metals and sand & gravel.

4.1. Locatable Minerals

This category includes all minerals for which exploration, production and development are regulated by the Federal General Mining Law of 1872, including most of the metallic minerals (e.g., gold, silver, copper, molybdenum, lead, rare-earth elements, zinc, tungsten, uranium, vanadium, etc.) and some industrial minerals (e.g., high-calcium limestone, gypsum, fluorite, perlite, vermiculite, pegmatite-hosted non-metallics, etc.). Locatable minerals are typically found in lode, vein, disseminated, or placer deposits. The known metallic-mineral deposits in Colorado have been widely studied and are well documented in the literature.

4.1.1. Precious & Base Metals

The Baca Grant is located outside and southeast of the Colorado Mineral Belt, a 10- to 60-mile-wide southwest-northeast-trending zone of hydrothermal mineral deposits that extends roughly from the La Plata Mountains near Durango to the Front Range north of Boulder. However, the eastern part of the Baca Grant falls within two mineralized areas and named mining districts known as Crestone and Liberty (see attached Figure 4). The east-central boundary and northeast corner of the Baca Grant (comprised of both Rio Grande National Forest and privately-owned surface estates) contain both known and geologically-favorable areas for the occurrence of base & precious metal deposits. USGS has assigned a moderate potential for the

occurrence of locatable mineral deposits in this mineralized area following the northwest-trending fault zone on the east side of the Sangre de Cristo Fault.

Archaeological evidence in the Crestone area indicates that oxidized quartz veins containing limonite and pyrite were first worked by Spanish explorers (USGS, 1984). Mining activity peaked during the years 1880 to 1904 from numerous underground and placer mines throughout the surrounding mountainous and outwash areas. The largest mine and primary producer was the Independence Mine (also known as the Independent Mine) situated south of Spanish Creek in the northeast corner of the Baca Grant, about 4 miles southeast of Crestone in the mountain foothills. Between 1890 and 1900, several prospectors began mining operations in the Crestone area and produced precious metals worth approximately 7 to 8 million US dollars (CGS, 2007).

The former townsite of Duncan (approximately 9.5 miles southeast of Crestone on the east-central boundary of the Baca Grant, north of Pole Creek) was another base for mining operations in the area during the 1880's and 1890's. Since it was court-determined that mineral rights were privately owned on the Baca Grant, the trespassing miners were forced to relocate around 1900-1904 to the newly-created Liberty townsite about 1.4 miles southeast of Duncan and immediately east of the Baca Grant boundary. At least five different mining & milling companies operated out of Liberty until about 1915 at the Myrtle K, Aztac [*sic*], Irena A lode mines and the Revenue placer claim (DWR, 1995). The cyanide process was also used in the 1930's for gold extraction in the Crestone District prior to World War II. According to CGS 1,337 ounces of gold and 533 ounces of silver, plus minor amounts of copper and lead, were produced from the Crestone District between 1932 and 1939.

Mining in the Crestone and Liberty Districts is generally associated with northwest-trending quartz veins and thrust faults commonly found along the west flank of the Sangre de Cristo Range in Proterozoic rocks. The dominant mineral deposits are quartz-hematite and quartz-pyrite-chalcopyrite veins, with some of the veins having grades as high as 5 ounces of gold per ton (CGS, 2007). These polymetallic veins host important base & precious metals such as gold, silver, copper, lead, zinc and iron. Historic placer gold mining is also reported southeast of the Baca Grant in the Great Sand Dunes vicinity along Medano Creek in the 1927-1938 timeframe. The placer mining proved to be unsuccessful on a commercial basis.

Around 1990, Lexam's predecessor ("Challenger Gold Inc."; referred to as Lexam in this report) began prospecting for gold in the Deadman Creek area of the Baca Grant, about 8 miles southeast of Crestone, by drilling and sampling 42 shallow boreholes. Gold mineral deposits at this prospect are related to a low-angle detachment fault similar to that found at the San Luis Gold Mine, which is about 50 miles south in Costilla County (CGS, 2007). The Deadman Creek prospect is located in strongly silicified breccia of feldspar and quartz in a chloritic matrix; the gold is associated with pyrite, and the gold grades are as rich as 0.13 ounces per ton (CGS, 2007). Lexam had apparently obtained a DRMS prospecting permit (No. P1992-002) for this project; however, no information was available in the online DRMS database. Rare Earth also contacted DRMS' Grand Junction office and was told that these prospecting files were confidential and could not be released to the public. Therefore, no actual borehole or assay data were available for review.

Another large, historic mine in the Baca Grant vicinity is the Orient Mine, approximately 15 miles north in Section 25, T46N, R10E. The Orient Mine was the only commercially important iron mine ever developed in Colorado (CGS, 2000). The mine produced about 2 million tons of iron ore (limonite) from an oxidized replacement deposit in a sheared zone in the lower part of the Mississippian Leadville Limestone, just east of the Sangre de Cristo Fault. Colorado Fuel & Iron Company (CF&I) acquired the mine in 1880 and shipped the iron ore to their Pueblo smelter via railroad until 1905, when there was an apparent exhaustion of high-grade ore. The mine was operated intermittently by CF&I and other lessees until 1931. According to USGS, the Orient Mine still contains identified resources estimated at 5 million tons of 43 percent iron.

The most recent mining permit identified in the DRMS database for the surrounding area was issued in 1981 at the Blue Moon Mine, about 10 miles north of the Baca Grant (in the SE $\frac{1}{4}$ of the NE $\frac{1}{4}$ of Section 20, T45N, R11E). This was a small gold, silver and copper operation owned by Demure Mining Company, Inc. (Villa Grove, CO) on 9.8 acres of Rio Grande National Forest land. The permit has since been revoked & terminated by DRMS. The nearest active gold & silver mine listed in the DRMS database is Indian Creek Mining Corporation's Profit Mine, located near the Bonanza District (T47N, R7E in northeastern Saguache County), more than 28 miles northwest of the Baca Grant.

4.1.2. Other Locatable Minerals

Historically, Saguache County has been a fairly large uranium-producing county in Colorado, primarily from the Cochetopa, Marshall Pass, and Kerber Creek mining districts. The nearest active uranium mine listed in the DRMS database is Homestake Mining Company's Pitch Project, located in the Marshall Pass Uranium District (T48N, R6E in northern Saguache County & southern Gunnison County), more than 35 miles northwest of the Baca Grant. Open-pit mining at the Pitch Project occurs in the Pennsylvanian Belden Formation on or near the Chester Fault, which displaces Precambrian rocks against remnants of Paleozoic rocks (CGS, 2007).

Other favorable uranium host rocks in Saguache County include the Lower Cretaceous Dakota Sandstone and Jurassic Morrison Formation. There are small USGS-reported occurrences of uranium mapped about 2 miles northeast of Crestone, known as the historic Mercury-Alpine and Venus 1-14 claims (in Section 33, T44N, R12E); and 1.5 miles east of the Baca Grant in Custer County at the King Midas, Damn Fool and Bonanza claims near the east foot of Crestone Needle (in Section 17, T24S, R73W). These uranium occurrences are typically found in bedded carbonaceous sandstone deposits of the Permian Sangre de Cristo Formation. According to CGS, there are no reported uranium occurrences in nearby Alamosa County.

No actively-permitted rare-earth elements (REE) mines were identified in the study area or in Colorado. The geology of this study area in the San Luis Valley and north-central Sangre de Cristo Range does not fit the USGS profile for REE occurrences on a commercially-minable scale. The majority of viable REE deposits in Colorado are found in Fremont, Gunnison and Moffat Counties. USGS classifies the major United States REE deposits as occurring only in four distinct geologic associations:

- Carbonatites & alkaline igneous complexes;

- Veins related to alkaline intrusions;
- Some iron-ore deposits associated with magmatic-hydrothermal processes; and
- Stream and beach deposits (placers) derived from the erosion of alkaline igneous terranes.

Pegmatites (i.e., dike- or vein-like features characterized by coarse grain sizes & interlocking crystal texture with bulk feldspar, high-purity quartz, and several mica minerals) are known to intrude Proterozoic rocks found north-northwest of the Baca Grant in the Crestone District on the west flank of the Sangre de Cristo Range. CGS reports that small amounts of thorium, REE, uranium and vanadium were produced from pits at the Bob Cat Mine pegmatite area, about 4 miles north of the Baca Grant. Accessory minerals in pegmatites can also include beryl, lithium, garnet, and tourmaline. In Colorado, the known REE mineral deposits in pegmatites are found in Chaffee County (Mount Antero) and Jefferson County (South Platte Pegmatite District).

Outcrops of high-purity limestone & dolomite are also known to be present east of Villa Grove and in the Hayden Pass area. However, these resources are probably not economically competitive with larger deposits found close to railroad & highway transportation routes, and commercial markets, near Salida and along the Arkansas River valley to the north.

No currently-permitted locatable mineral operations were identified in the DRMS database for the study area in Saguache County, or nearby lands in Alamosa and Custer Counties. At the time of preparing this mineral assessment report, no plans, permits or proposals were identified for metallic-mineral, REE, uranium or other locatable-mineral mining operations that would impact the Baca Grant.

4.2. Leasable Minerals

This category includes oil, natural gas, coal, coalbed methane, oil shale, geothermal energy, and several other minerals (e.g., potash, sodium, phosphate, native asphalt, bitumen or bituminous rock, etc.). These minerals are defined as “leasable commodities” by the Mineral Leasing Act of 1920 and the Geothermal Steam Act of 1970.

4.2.1. Oil & Gas Resources

According to CGS, Saguache County does not contain any commercial oil & gas resources. A total of 17 oil and gas wells were drilled in the County since the early 1920's, mostly in the San Luis Basin, with total depths ranging from 365 to 12,000 feet. All failed in discovery of producible hydrocarbons and accordingly all these wells were plugged and abandoned. The only productive oil well in the San Luis Basin was the Kirby Jynnifer No. 1, which was drilled in 1985 just south of the Saguache County line in Section 9, T40N, R 5E. This well produced 30 barrels of oil per day from a volcanic sill in the Cretaceous Mancos Shale. (CGS, 2000 & 2007)

No oil & gas fields have been mapped in the area by USGS & CGS or are known to underlie the Baca Grant. A search of the COGCC database revealed two wells that were drilled on the Baca Grant by Lexam in September & October 1995. Both wells are reported as dry & abandoned, meaning they were either “dry holes” (with no hydrocarbons) or unable to produce marketable quantities of oil and/or gas. The wells, known as Baca Nos. 1 & 2, were drilled immediately west

of the Deadman Creek area (see attached Figure 2) where Lexam had performed its gold prospecting program that was discussed previously in Section 4.1.1. of this report. During their gold prospecting activities in 1992 & 1993, Lexam apparently encountered biodegraded crude-oil shows in several (either 17, 27 or 28, depending upon the publication) of the 42 shallow boreholes that were drilled in breccia and fractured gneiss.

At the time, Lexam's laboratory analysis claimed that the crude oil was sourced from Cretaceous sediments underlying the thrust-fault zone. Lexam also claimed that they had identified surface outcrops of Jurassic-Cretaceous sediments (i.e., Morrison Formation, Dakota Sandstone, and Mancos Shale) along the west flank of the Sangre de Cristo Range. Portions of these outcrops have apparently been viewed by local geologists and NPS employees.

The Baca Nos. 1 & 2 wells were drilled as wildcats to explore the underlying Cretaceous section on the Deadman Creek block. Both wells encountered a thin, faulted section of Mancos Shale in the hanging wall of the detachment fault, and traces of biodegraded oil were observed in thick intervals (including the Santa Fe Formation, Mancos Shale, and Precambrian gneiss) of both wells. The strongest oil shows were present in a 350-foot interval of the Baca No. 2 well starting at 6,620 feet. (Watts, et al, 2006)

According to the COGCC well-completion reports, the Baca No. 1 was drilled to a total depth of 4,322 feet into Precambrian rock, with 3,566 feet of overlying Santa Fe Formation and 18 feet of Mancos Shale. And, the Baca No. 2 was drilled to a total depth of 6,932 feet into Precambrian rock, with 6,272 feet of Alamosa & Santa Fe Formations and 115 feet of Mancos Shale. The COGCC completion report indicates that the Baca No. 2 was converted to a water well. DWR records show that the well was abandoned by Lexam to a depth of 1,000 feet and converted to a monitoring well for use by Stockman's Water Company.

Lexam continued their evaluation of the Baca Grant through geophysical exploration programs in 1996 and 1998-2004. From this data they delineated the Crestone Prospect, which was further divided into eastern and western fault blocks known as the Crestone East and Crestone West Prospects. Between 2000 and 2009, Lexam filed COGCC Applications for Permit to Drill (APDs) on five single-zone gas wells located generally 6-7 miles northwest of the Baca No. 2 in the newly-created Baca NWR. Baca Nos. 3 & 4 are identified by COGCC as abandoned locations, and Baca Nos. 5-7 all have expired APDs as of May 2010.

The Baca Nos. 5 & 7 wells (see Figure 2) became the subject of the USFWS' April 2011 Environmental Assessment (EA) for proposed oil & gas exploration in the Baca NWR. Lexam's proposal calls for two 14,000-foot-deep vertical wells with the Dakota Sandstone as the objective formation on the Crestone East Prospect. Their 2006 *Work Plan and Budget Proposal* estimated the costs for drilling & completion of one of these wells to be roughly \$8.8 million. It should be noted that two of the three authors of the work plan & budget include a former Lexam employee (Tom Watkins) and a Lexam shareholder (Kim Parsons). On April 1, 2011 USFWS issued a Finding of No Significant Impact (FONSI) for Lexam's drilling proposal. A FONSI is issued when the environmental analysis & interagency review find a project proposal to have no significant impacts on the quality of the environment.

The EA's preferred alternative outlines 43 terms & conditions to be imposed upon Lexam by USFWS in addition to those required by COGCC and Saguache County, which ensure the exploration program will not have a significant impact on the natural and human environment. Of particular interest are those measures intended to minimize disturbance to wildlife by restricting the seasons of exploration activity to reduce or eliminate interference with migratory bird breeding and big game calving; minimize the risk of ground and surface water contamination; minimize or eliminate impacts to wetland habitat, sensitive fish populations and plant types; reduce probability of noxious weed infestations; manage fugitive dust; and reduce air, noise and light pollution from exploration activities. Appendix D of the final EA contains a full description of the required protective measures. (USFWS, 2011)

About half of the Baca Grant is mapped as "Sensitive Wildlife Habitat" (SWH) for all species, and the northeast high-elevation corner and Sand Creek drainage corridor are mapped by COGCC as "Restricted Surface Occupancy" (RSO), as defined and regulated by their 1200-Series Rules. These rules require oil & gas operators to consult with the Colorado Division of Wildlife, the surface owner, and the COGCC Director whenever a new oil & gas location is proposed in SWH or RSO areas. The proposed Baca No. 5 well location is included in the SWH area.

According to CGS, Saguache County is considered to have only two hypothetical hydrocarbon plays: the San Luis Valley Biogenic Gas Play, and the San Juan Sag. The gas play covers an elongate area about 70 miles long and 20 miles wide in the east-central part of the San Luis Valley where shallow biogenic gas has been historically produced from the underlying Alamosa Formation. Whether or not a commercial accumulation of gas exists in this play is speculative. The San Juan Sag is located on the west side of the San Luis Valley in hydrocarbon traps found below a thick section of volcanic rocks along the foothills of the San Juan Mountains. The Sag extends from the Del Norte area westward beneath the San Juan volcanic field and connects with the San Juan Basin. The San Juan Sag in Saguache County is considered to have a fair potential for hydrocarbon accumulations (CGS, 2000).

No active Federal oil & gas leases are indicated on adjoining lands with Federal-owned oil & gas rights. As mentioned above, the only reported hydrocarbon production activity in the regional area was the Jynnifer No. 1 well located in the small Del Norte Field, about 33 miles west-southwest of the Baca Grant. Due to sub-economic production, the well was abandoned in July 1998 by Faith Energy Exploration Inc. (Ennis, TX); however, the wellsite has yet to be reclaimed. The nearest oil and/or gas production occurs about 32 miles northeast in the Florence-Cañon City Field in Fremont County, where oil is produced from numerous wells in the Upper Cretaceous Pierre Shale. The Sheep Mountain Field (more than 20 miles southeast in Huerfano County) has also produced more than a trillion cubic feet of carbon dioxide (CO₂) since its discovery in 1971.

4.2.2. Coal Resources

No on-site or nearby coal mines, coal fields, or coalbed methane operations were identified in the CGS, DRMS, or USGS literature. The Upper Cretaceous Vermejo Formation or Mesaverde Group coal-bearing intervals do not underlie the Baca Grant, nor is coalbed methane known to be present beneath the area. The nearest historic coal mines are located more than 35 miles

east-northeast in the Cañon City Coal Field in Fremont County, where coal was produced from more than 175 mines in the lower part of the Vermejo Formation. In 2000, the last underground mine in the field closed, ending 122 years of continuous coal production. The nearest, active coal mining currently occurs more than 60 miles southeast of the Baca Grant at the New Elk Mine located west of Trinidad in Las Animas County (in the Trinidad Coal Field).

4.2.3. Other Leasable Minerals

Because the Rio Grande Rift is characterized by high heat flow, there are several geothermal springs identified in the San Luis Valley. The nearest geothermal resource is located about 2.5 miles northeast of Hooper in Section 27, T41N, R10E, known as the Sand Dunes Swimming Pool Hot Water Well. The operation includes public pools, a restaurant, and RV/camping facilities. The hot-water well was originally drilled as an oil & gas test by San Luis Valley Oil & Gas Company in 1924, to a total depth of 4,308 ft in the deepest part of the San Luis Valley where there are 20,000+ feet of valley-fill sediments.

This artesian well flows at a rate of 340 gallons per minute and can be pumped at a rate of 1,480 gallons per minute; the temperature of the water flowing from the well is 111° to 115° F (CGS, 2007). In 1979, CGS estimated that this is a sedimentary reservoir with an areal extent of approximately 1.5 square miles around the well. More than 10 miles north of the Baca Grant (and east of the town of Saguache), Valley View Hot Springs and Mineral Hot Springs are also developed as spa resorts for public use.

The Baca Grant is not currently identified by BLM as a known geothermal leasing area or geothermal lease nomination area. However, BLM and USFS lands in Colorado include about 5.8 million acres that are open to geothermal leasing. And, there are current nominations for geothermal leases in Chafee and Gunnison Counties on both public & private lands with Federal mineral estates. The San Luis Valley Public Lands Center is also currently preparing an EA to consider whether to issue geothermal leases. The EA includes an amendment to BLM's San Luis Resource Management Plan, which is necessary since their 1991 plan did not adequately address geothermal resources.

4.3. Saleable Minerals

This category includes both nonmetallic and several industrial minerals (e.g., dimension stone, sand & gravel, clay, petrified wood, volcanic cinders, etc.), falling under the purview of the Materials Act of 1947 and the Multiple Surface Use Mining Act of 1955. None of these commodities has been commercially mined at the Baca Grant according to the CGS, DRMS and USGS literature reviewed for this report, other than possible small historic borrow-pit areas that were utilized for extraction of road-fill material during construction of local ranch roads.

According to DRMS, the nearest active sand & gravel mine (known as the Skoglund Pit) is located about 2 miles north of the Baca Grant in the SE ¼ of Section 34, T44N, R11E, in Pleistocene outwash (Map Unit Qpf) and Holocene/Pleistocene eolian sand (Map Unit Qes) deposits found south of San Isabel Creek. This 30-acre pit is operated by Skoglund Excavating Inc. near Crestone and was permitted by DRMS in 1997 under Permit No. M1996089. Another nearby pit (about 3.5 miles southwest of the Baca Grant near Hooper) is identified as the Curtis

Pit in the SE ¼ of Section 33, T41N, R10E. This 9.5-acre pit is operated by the Colorado Department of Transportation near Highway 17 and was permitted by DRMS in 1985 under Permit No. M1985084. The pit appears to be located in similar geologic materials as those found at the Baca Grant (i.e., Map Unit QTs).

Local streams have created large alluvial-fan gravel deposits where they emerge from steep mountain fronts into the San Luis Valley, and there are large deposits of valley-fill alluvium (i.e., common varieties of sand & gravel, with abundant silt & clay in Map Unit QTs). However, all of these resources have only been used to a very small degree due to the remoteness of major population and growth centers to the County (CGS, 2000). Saleable minerals generally have a low unit value (i.e., value per ton), and their exploitation is dependent on easy access to transportation and local markets.

USGS also reports that a small vein near Crestone was historically worked for decorative quartz. Pegmatites and gneiss (and other Precambrian rocks) can be utilized for decorative materials or building stone. No clay, dimension stone, high-purity silica sand (i.e., oil- & gas-field fracking sand) or other saleable mineral mining activities were identified near the Baca Grant.

5. Conclusion

Rare Earth prepared this MAR for the Baca Grant property located within southeast Saguache County in south-central Colorado. The project included a review of published documents related to historical and currently-permitted mining and drilling operations for the study area. This report is intended to provide an overview of the various mineral resources and the mineral-development potential for those areas of Lexam's holdings on and near the Baca Grant. Based upon our findings during this MAR process, we conclude the following:

5.1. Oil & Gas Resource Development Potential

The potential for commercial oil & gas reserves beneath the Baca Grant is reliant on limited data and is the subject of geologic controversy regarding the likelihood of underlying Cretaceous sediments. Unfortunately, the controversy between Lexam's data and the published literature extends beyond the scope and budget of this MAR. The reality is that Lexam's former attempt at locating oil & gas by drilling the Baca Nos. 1 & 2 wells proved unsuccessful, and other geologic studies in the area by CGS and USGS have similarly concluded that there is a low probability of discovering commercial oil & gas reserves at the Baca Grant. In January 2005, BLM prepared a *Mineral Potential Report* as part of a land-exchange program which involved approximately 61,000 acres of State-owned surface and mineral estates located west and south of the Baca Grant, including adjoining lands to the west. BLM stated that the oil & gas resource potential on these lands was low, based upon insufficient data; however, they concluded that "the lands are prospectively valuable for oil and gas."

As owner of the subsurface oil & gas rights on the Baca Grant and other nearby & adjoining lands, Lexam is entitled to make continued use of the surface lands for exploration activities according to Colorado's split-estate laws. Since their failed attempt at locating oil & gas in 1995, Lexam has committed additional resources for acquiring seismic data and preparing well-planning and -permitting documents. In our opinion, this could be viewed as: A) a method of

attracting potential investors for funding drilling on the high-risk Crestone East Prospect; B) a way to justify the valuation of underlying mineral rights on the Baca Grant; or, C) a legitimate attempt at locating previously undiscovered oil & gas resources in the San Luis Valley.

Because a majority of the surface estate at the Baca Grant is owned by the Federal government, there are additional protections in place for wildlife and surface usage as prescribed by USFWS, USFS and NPS. Given the high level of concern for protection of wildlife and their habitat on these lands, not to mention protection of water quality & quantity, any future drilling plan at the Baca Grant would be carefully evaluated by those Federal agencies along with COGCC and possibly the Colorado Division of Wildlife.

As evidenced by USFWS' recent EA for the proposed Baca Nos. 5 & 7 wells, this results in increased overall costs for Lexam and longer time frames to complete the necessary site analysis and permitting process; stricter conditions on siting well pads, roads, flow lines and other infrastructure; and stringent mitigation measures. Further complicating the situation and increasing any production costs are the lack of hydrocarbon infrastructure and transportation (i.e., pipelines) options in the San Luis Valley. All of this adds up to an expensive and challenging location for economical recovery of hydrocarbons.

Future oil and/or natural-gas exploration activities are very difficult to project & predict since they are primarily market-driven. Lexam's APDs for the Baca Nos. 5, 6 and 7 wells expired in May 2010. And, as of July 26th, Lexam has filed for COGCC bond release on the Baca Nos. 6 & 7 wells, which are now shown as "abandoned locations." Lexam would need to resubmit an APD to COGCC in order to restart the permitting process for the Baca No. 5 well. The COGCC website and permitting records should be monitored for future oil & gas activities that may adversely affect the Baca Grant and adjoining lands. This also includes the potential for additional geophysical or seismic exploratory programs.

Since ConocoPhillips owns 25% of the oil & gas rights on the Baca Grant, their involvement in the Crestone East Prospect should also be evaluated. Oil & gas operators sometimes have lease agreements and funding mechanisms amongst themselves, which are not recorded or transparent to the public. ConocoPhillips' level of interest or involvement for oil & gas exploration on the Baca Grant is unknown. The Saguache County Assessor's records should also be checked for the status of Lexam's mineral-estate tax assessments.

5.2. Metallic Mineral Resource Development Potential

There is a moderate to high potential for the occurrence of metallic mineral deposits (predominantly gold & silver, with lesser amounts of copper & lead) along the east-central boundary and northeast corner of the Baca Grant property (primarily in the Rio Grande National Forest [Baca Mountain Tract] and underlying parts of the Baca Grande Subdivision), due to identified resources and nearby historic mining activity in the Crestone and Liberty Districts. The development potential is also moderate to high, based largely on the sustained high market price for gold (currently at \$1,630 per ounce). Typically, as market prices rise and fall, so do the levels of exploration & production. Additionally, Lexam has already acquired on-site borehole and assay data from their previous exploration activities in the Deadman Creek area during the early 1990's, and CGS reports gold grades up to 0.13 ounces per ton on the Lexam prospect.

The viability of any mineralized area is usually dependent more on economic factors rather than local geology. USGS describes typical impediments to future hard-rock mining that include: A) lack of mining infrastructure, including mills and mining experience; B) fluctuating market prices for metals; and C) societal resistance to mining and fear of environmental pollution from mining. In order for commercial mining of vein deposits to produce a significant tonnage, a large mining & milling operation is mandated.

Because of the mixed surface land status in the Baca Grant area (i.e., Baca NWR, Great Sand Dunes National Park, private lands, nearby Sangre de Cristo Wilderness), a large mining & milling operation would face enormous public resistance and a lengthy permitting process. Modern-day gold-mining operations in the regional area (including Galactic Resources' Summitville mine [to the southwest in Rio Grande County] and the Battle Mountain/Newmont San Luis Project [to the south-southeast in San Luis County]) have all realized severe environmental limitations due to permitting & litigation costs, surface- and groundwater contamination, and mine waste disposal issues.

It is likely that many of the historic mining operations in the Baca Grant area have extracted the highest-grade ores; however, small-scale mining of local pockets of rich ore may be viable, particularly if an operator can find a way to mill and smelt their ore off site. At the time of preparing this MAR, no plans, permits or proposals were identified for metallic-mineral mining operations that would impact the Baca Grant property.

5.3. Aggregate Resource Development Potential

There is a moderate to high potential for large deposits of aggregate in Map Unit QTs at the Baca Grant property; however, the commercial demand is deemed to be fairly low. It is not known whether these mineral rights for common varieties of sand & gravel are united with the current surface estate (which includes the Federal government and other private landowners), or owned by Lexam. Typically in Colorado, the mineral rights for sand & gravel remain united with the current surface estate unless those rights have been expressly reserved in mineral deeds affecting the Baca Grant. However, a legal opinion would be necessary in order to make that determination.

It is our opinion that commercial sand & gravel mining would not be a permissible or permittable activity at the Baca Grant since an access agreement, lease or easement (i.e., a legal "right-to-enter") must be in place with all affected landowners prior to DRMS issuing a mining permit.

5.4. Geothermal Resource Development Potential

There is also a moderate potential for private development of geothermal resources beneath the Baca Grant property. Subsurface geothermal fluids are considered to be part of Colorado's groundwater resources, and are therefore administered by the State Engineer. As a result, well drilling for direct-use geothermal projects (e.g., greenhouse heating, warm-water aquaculture, space heating, swimming pools & spas) is regulated by DWR. However, it is our opinion that private development of geothermal resources for direct-use or electrical power generation would not be a compatible use with the existing surface estates on the Baca Grant.

The Geothermal Steam Act of 1970 also authorizes BLM to lease development rights to the “heat” of the public’s mineral estate which could, at some point, potentially affect lands adjoining the Baca Grant with Federal subsurface mineral ownership. SLVEC or other stakeholders should continually monitor the BLM geothermal EA process and their leasing & permitting activities on adjoining lands, which have the potential to adversely affect the surface and subsurface of the Baca Grant.

We appreciate the opportunity to provide SLVEC with these mineral assessment services. Please contact me at 970/241-1762 or jim@rareearthscience.com if you have any questions or need additional information about the content of this report.

Respectfully Submitted,

Rare Earth Science, LLC



James C. Armstrong
Principal Geologist

cc: J. Corzine (TPL)

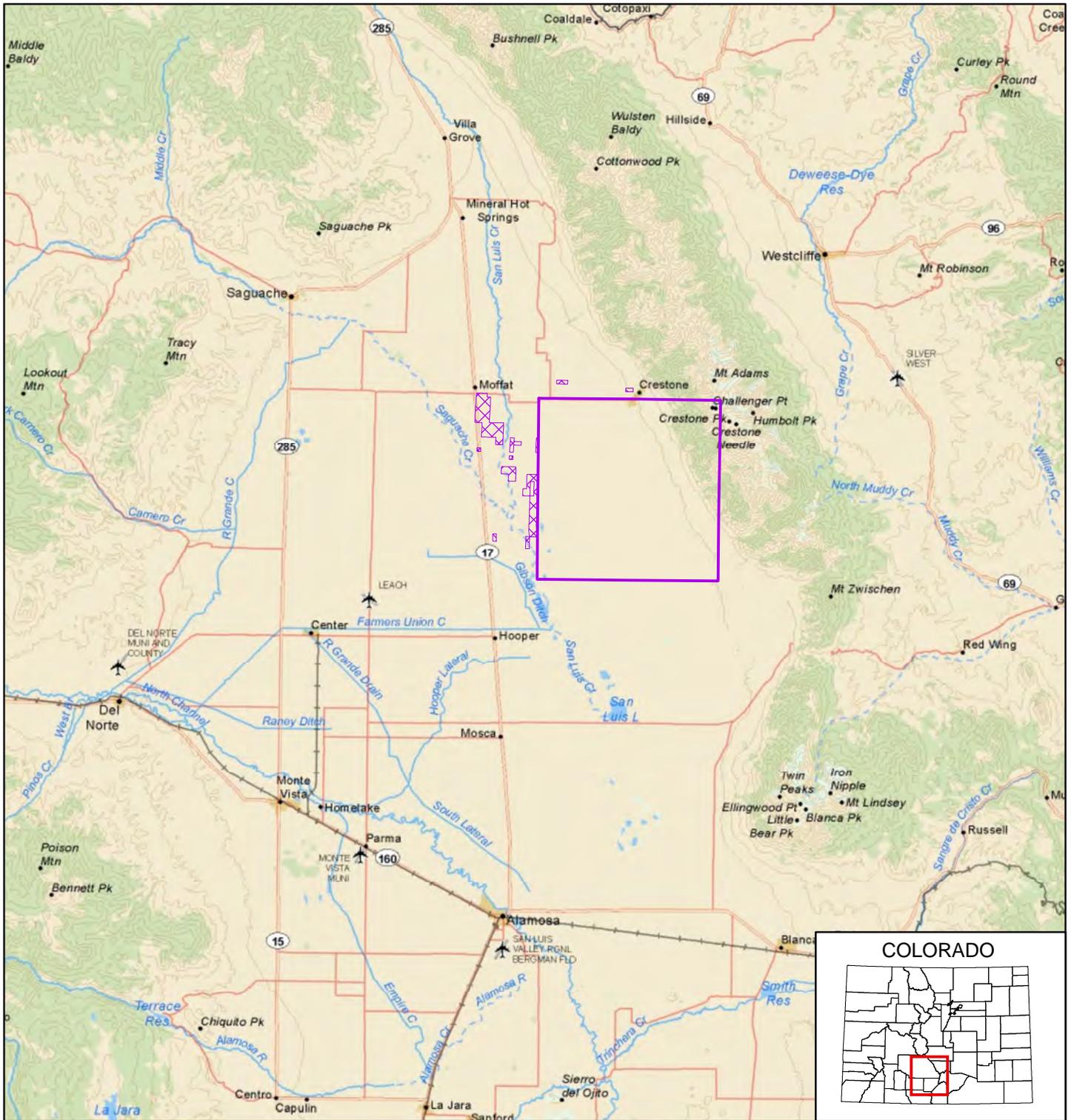
Attachments

- Preparer’s Qualifications
- Figure 1 - Locator Map
- Figure 2 - Lexam Mineral Rights
- Figure 3 - Geologic Cross Section
- Figure 4 - Map Showing Mineralized Areas

Preparer's Qualifications

James Armstrong is a professional geologist with 18 years residency in Colorado, and has lived in Grand Junction and Gunnison since 1998. He received a BS in Petroleum Geology from Kansas State University in 1983, and completed additional graduate-level coursework in environmental and natural resource studies at the University of Alaska/Anchorage. Mr. Armstrong spent 7 years working in various private-industry technical positions related to oil and gas exploration & production, geophysical consulting, and petroleum refining & marketing operations in the central U.S., Texas and the Gulf of Mexico.

Since 1990, he has been employed as a consulting geologist and environmental scientist serving oil & gas, mining, private-sector, non-profit, and government-agency clients in Alaska, Hawaii, and the central & western United States. Mr. Armstrong is accomplished in field studies, mineral-reserve evaluations, project management and regulatory compliance, and has prepared numerous mineral assessment reports for conservation-easement and habitat-protection projects. He has completed mineral studies for a diverse client base in south-central Colorado that includes Colorado Division of Wildlife, Colorado Open Lands, Costilla County, Orient Land Trust, Rocky Mountain Elk Foundation, and The Nature Conservancy. Mr. Armstrong is the founder of (and a partner in) Rare Earth Science, LLC.



Locations of boundaries and features are approximate.

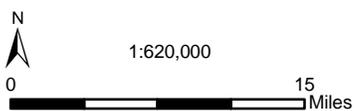
Figure 1: Locator Map
Baca Grant No. 4

Base Map Source:
<http://services.arcgisonline.com/>
World Base Map

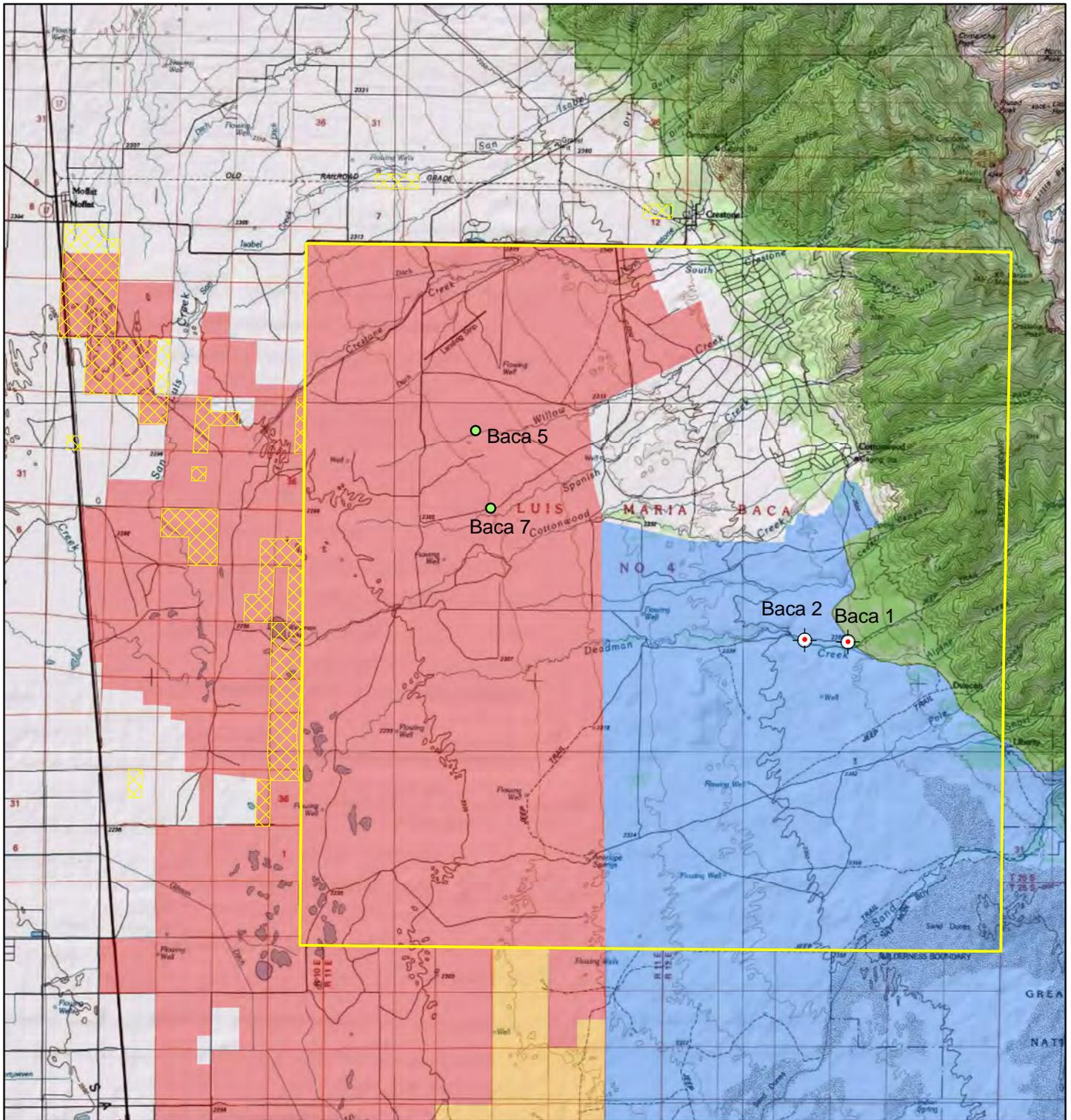
Legend

- Luis Maria Baca Grant No. 4
- Additional Lexam Mineral Holdings

July 25, 2011



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Phone: 970/241-1762



Locations of boundaries and features are approximate.

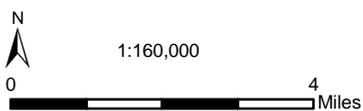
Figure 2: Lexam Mineral Rights
Baca Grant No. 4

Base Map Source:
<http://services.arcgisonline.com/>
USA Topographic Map

Legend

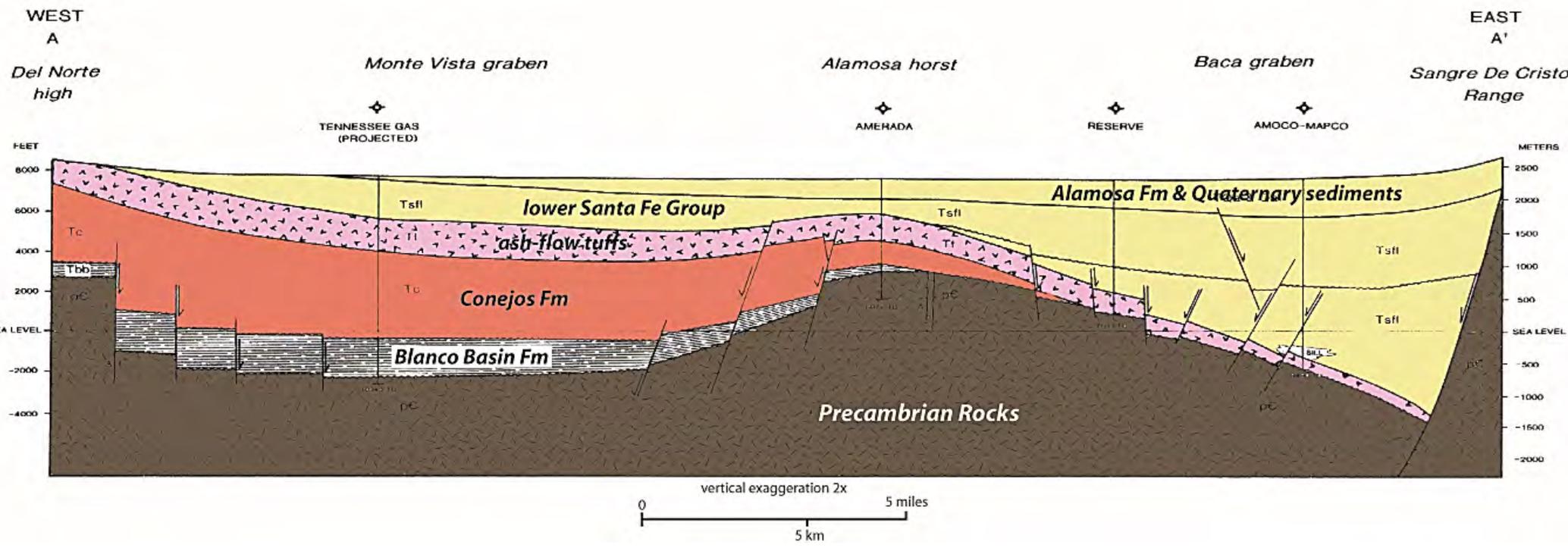
-  Dry and Abandoned Lexam Wells
-  Proposed Lexam Well Locations
-  Luis Maria Baca Grant No. 4*
-  Additional Lexam Mineral Holdings**
-  Baca National Wildlife Refuge
-  Great Sand Dunes National Park
-  Rio Grande National Forest
-  TNC Conservation Easement

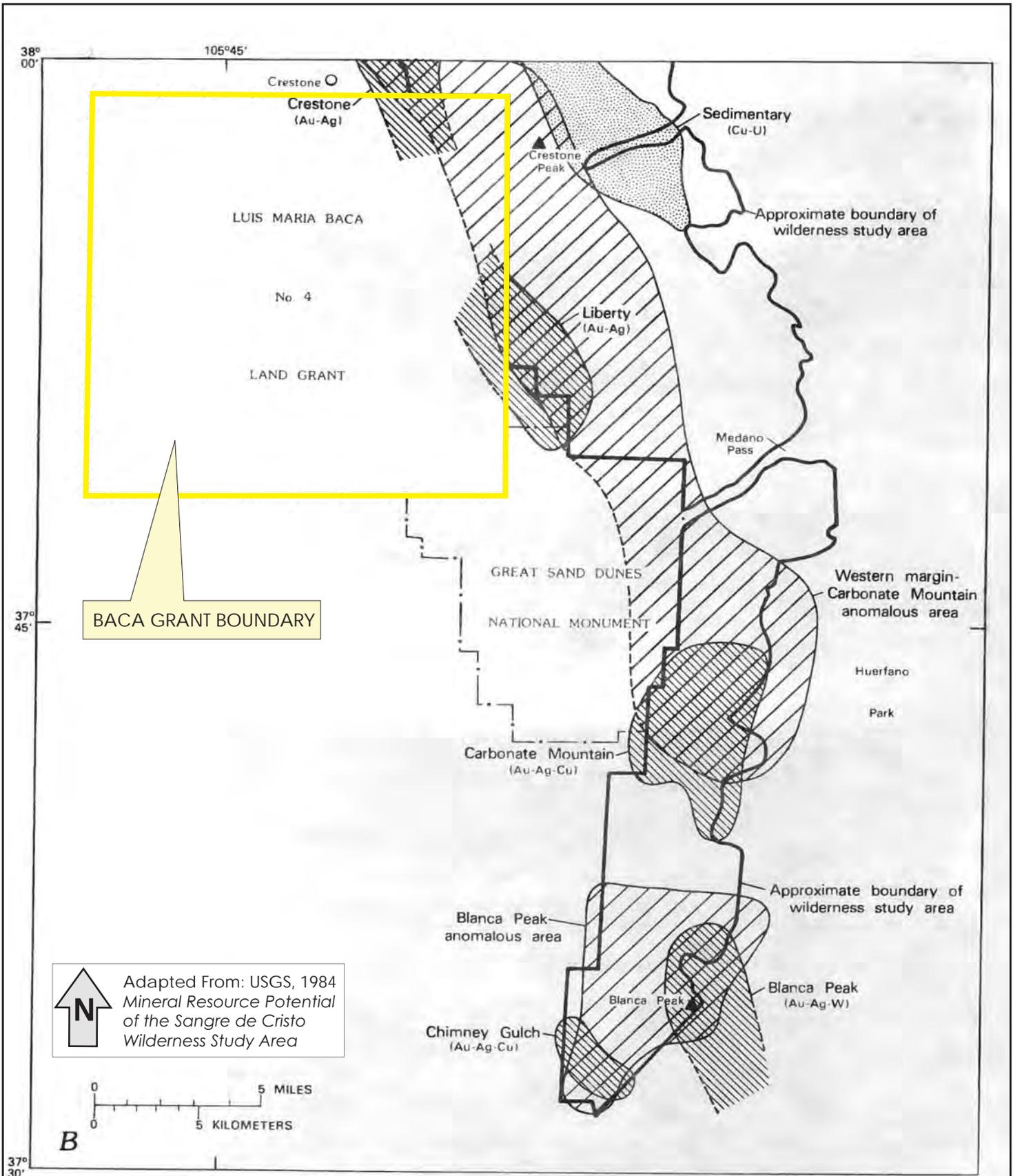
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MAP SHOWING CRESTONE & LIBERTY MINERALIZED AREAS
ON THE BACA GRANT NO. 4 PROPERTY
Saguache County, Colorado

FIGURE
4

Indicators of Wildness: Using Attributes of the Land to Assess the Context of Wilderness

Gregory Aplet
Janice Thomson
Mark Wilbert

Abstract—Land can be described in a space defined by two fundamental qualities: naturalness and freedom. The axis of naturalness describes the wholeness of the ecosystem relative to a historical norm, while the axis of freedom describes the degree to which land remains outside of human control. Some land can be natural but not free, and vice versa, but the most natural and free are the most wild — they are the lands we recognize as wilderness. These concepts are illustrated through the mapping of indicators of wildness, derived from readily available data in a Geographic Information System.

The past few years have witnessed considerable attention to conceptions of wilderness. Generally, this attention has taken the form of a “debate” between critics of wilderness as *idea* on one side and defenders of wilderness as *place* on the other (see for example, Callicott and Nelson 1998). Critics contend that white, male, American minds have produced a concept that separates humans from nature, denigrates native peoples, and freezes ecosystems in time. Defenders point out all the myriad values, including wildlife habitat, watershed protection and spiritual healing, provided by the places we call wilderness and conclude that wilderness therefore must be good. Both sides assume they understand what they mean by wilderness; neither states it clearly.

Robert Marshall begins his classic 1930 essay, *The Problem of the Wilderness*, “It is appalling to reflect how much useless energy has been expended in arguments which would have been inconceivable had the terminology been defined.” Seventy years after Marshall offered his observations, it appears we are still suffering from the same misunderstandings. The debate over the value of wilderness is being conducted without a common understanding of its meaning. Before any more “useless energy” is expended, it is worthwhile to stop and consider what exactly we mean by wilderness.

One of the first places to look, of course, is the Wilderness Act itself. The Act (Public Law 88-577) defines wilderness straightforwardly enough as:

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...an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man’s work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

But this is a carefully crafted legal definition resulting from years of debate and compromise. Surely, we are not to believe that all the places wild enough to count as wilderness are limited to federal land. And why 5,000 acres? These are legal constraints necessary for the implementation of the Wilderness Act. A general definition of wilderness remains elusive.

In his exploration of the legislative direction provided by the Wilderness Act, ecologist David Cole (1996) notes that wilderness is expected to be both “untrammeled,” or uncontrolled and free, and “pristine,” or “what would have existed in the absence of post-aboriginal humans.” Cole concludes that these two goals provide conflicting direction for managers, as manipulation is often needed to repair damage caused by overuse, exotic species invasions, fire exclusion and other processes that have altered ecosystems away from natural conditions. Cole argues that these goals are “to some extent mutually exclusive” and suggests that we must choose one or the other of these goals to emphasize when managing wilderness.

Alternatively, Aplet (1999) suggests that these two outcomes, freedom and naturalness, rather than providing conflicting direction, actually describe two independent qualities of wilderness. Wilderness is that portion of the land that is most wild, and wildness is a function of both naturalness and freedom from human control. This dualistic nature of wildness can be illustrated with a simple figure (fig. 1) that represents landscapes in the two-dimensional space created by freedom and naturalness. In this conception, wildness increases in two directions: from the controlled to the “self-willed” along a gradient of freedom, and from the artificial to the pristine along a gradient of naturalness. At the most controlled and artificial ends of the continuum are the least wild lands – the built environment of the city. Where freedom and naturalness are highest is the wilderness, regardless of size or ownership. In between, lands can possess any combination of freedom and naturalness, and an intermediate

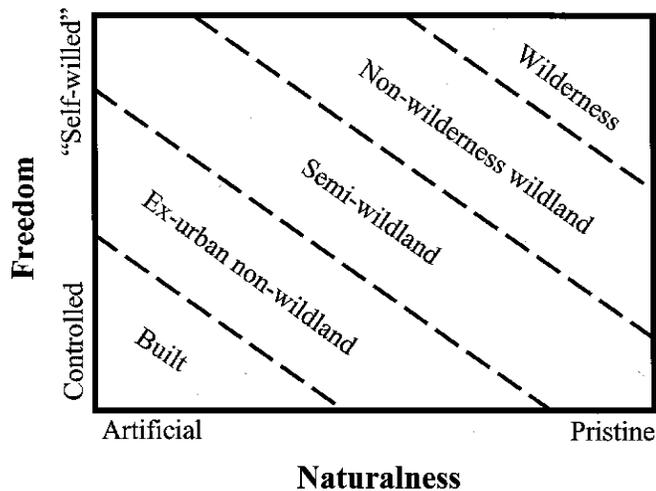


Figure 1—The “continuum of wildness.” Wildness increases as a function of both its naturalness and its freedom from human control.

degree of wildness. All lands fall somewhere within this two-dimensional continuum of wildness.

If wilderness is that portion of the landscape that is most natural and free, it follows that the wilderness manager’s job is to maximize *simultaneously* both of these characteristics. This is where the job becomes difficult, and tradeoffs arise. Maintaining freedom may compromise naturalness — for example, where exotic species are allowed to invade from the outside. Likewise, restoring natural conditions often requires bringing the land under tighter control. Just like the parent who simultaneously struggles to instill discipline and independent thought, the key for managers is to strive always toward both goals. When intervention is required, heed Wilderness Watch president Bill Worf’s good advice: “Manipulation should generally be limited to those minimum actions that will establish conditions that will allow natural processes to hold sway once again” (Worf 1997).

These qualities of freedom and naturalness help clarify what we mean by wildness, but they themselves are rather vague descriptors that cry out for further explanation. Managers need to know what exactly to pay attention to in order to achieve these twin goals. The remainder of this paper is devoted to exploring the attributes of the land that contribute to its naturalness and freedom from control. Ultimately, we would like to be able to measure these qualities to ensure that we are protecting and sustaining the wildness of wilderness. The measurement of wildness raises the possibility of mapping the wildness of the land, and this paper presents the results of some recent progress toward this goal and discusses how this method differs from other approaches to mapping our precious wild places.

Indicators of Wildness

Throughout the history of the idea, wilderness has been thought of both as a place *that is* free and as a place *in which* to be free. In other words, wilderness has been thought of both as a real place and as an experience. For example, Nash (1982) notes the value of wilderness to the Romantics of the

19th century as a place to escape the stranglehold of civilization. In contrast, The Wilderness Act speaks of wilderness as “an area where the earth and its community of life are untrammelled by man,” suggesting that it is the land itself that is free in wilderness. While wilderness will likely always be highly valued for the experience it provides, it is this second sense, the character of wild land itself, that is the focus of the following discussion.

Though perceptions of wildness vary with each individual, there appears to be a limited set of characteristics that contribute to the freedom and naturalness of a place. Generally, the literature exploring wild land characteristics suggests that the attributes of the land that contribute to its freedom are 1) the degree to which land provides opportunities for solitude, 2) the remoteness of the land from mechanical devices and 3) the degree to which ecological processes remain uncontrolled by human agency. The attributes that contribute to the naturalness of the land are 1) the degree to which it maintains natural composition, 2) the degree to which it remains unaltered by artificial human structure and 3) the degree to which it is unpolluted. Each of these attributes need not exist at an absolute maximum in wilderness, but, collectively, they define the qualities of freedom and naturalness and therefore facilitate the measurement of wildness.

Solitude

Solitude has been described as “the opportunity to meet the wilderness, or its maker, personally, quietly, on terms only you prescribe” (Whitney 1997). The “outstanding opportunities for solitude” afforded by wilderness have long been recognized as a key part of the “wilderness experience.” Thoreau (1862) enjoyed his opportunity to “walk ten, fifteen, twenty, any number of miles, commencing at my own door, without going by any house, without crossing a road except where the fox and mink do.” Robert Marshall (1933) required that wilderness have “no permanent inhabitants,” and Sigurd Olson (1938) exalted in “the ordinary phenomena of life in the open.” Though solitude is clearly an experience of the wild, the ability to provide it is a measurable attribute of the land. That the most wild land must be the least inhabited follows naturally from the notion that, at some population density, people necessarily bring land under control to serve their purposes (such as occupancy, transportation, recreation and hygiene). The degree of human-to-human contact is one of the defining measures of the freedom of the land.

The requirement that wilderness be uninhabited has been interpreted by some as ignoring or even subjugating indigenous people, who occupied (or occupy) the land even as it was (or is) considered wilderness (see Bayet 1994; Birch 1990; Denevan 1992; Gomez-Pompa and Kaus 1992; Nabhan 1995; Plumwood 1998). But it need not be. As the poet Gary Snyder (1990) has pointed out, every landscape has its “fire in the kitchen” and its “place less traveled.” Where population density is high, whether in the pre-Columbian or modern era, the ability of the land to afford solitude is diminished. In the “kitchen,” the land may still be “natural” (see below), but it will not be as free.

In practice, we may gauge opportunity for solitude by measuring population density. Over large areas, such as states or continents, we are usually limited to looking at

where people reside, but how people use the land is also a factor. Over smaller landscapes, we may be able to gauge the opportunity for solitude by examining recreation use patterns. In any case, we look to represent some measure of the probability of encountering others.

Remoteness

Roadlessness is also widely recognized as a defining characteristic of wilderness. Aldo Leopold (1921) insisted that wilderness be “devoid of roads,” while his son Starker’s Commission on Wildlife Management in the National Parks considered the roadgrader to be “the most dangerous tool of all” (Leopold and others 1963). Marshall’s (1933) definition required wilderness to “possess no means of mechanical conveyance” in order that wilderness remain “free from mechanical sights and sounds and smells.” Environmental historian Michael Cohen (1984) believes road construction is the first act of “trammeling” the wilderness. He writes, “I am troubled by the term ‘untrammelled’. At what point have we caught and trapped the wilderness? I would presume that a process of capturing or trapping begins when men try to ‘open out routes’ among the mountains.” Thus, the very presence of a road diminishes the freedom of the land, and distance from roads is clearly a time-honored measure of wildness.

The measurement of remoteness is fairly straightforward where we know the location of the road system. Land may be assigned a value depending on the distance from roads of various types, assuming that roads vary in their impact on remoteness. For example, an interstate highway is louder and will bring more people near an area than will a dirt road. Of course, measuring remoteness requires an accurate description of an area’s road system, which often is not available for the most remote lands.

Uncontrolled Processes

The most free land is the least controlled land. With the invasion of new technologies that attended the recent settlement of North America, ancient ecological processes were radically altered in many parts of the country. Where once fires (whether lightning-caused or anthropogenic), floods and migrations marked the passage of the seasons, fire suppression, dams and extermination replaced them. If wilderness is to live up to one of its definitions, “self-willed land” (Turner 1996), its historical ecological processes must be maintained.

The importance of uncontrolled processes to wilderness is amply noted in the literature. Wilderness has been described as a place where “a diversity of beings [flourish] according to their own sorts of order” (Turner 1996) and “where nature prevails or might prevail given the passage of time...so long as active ecological succession, structural diversity, and naturalness are permitted” (Frome 1997). Wilderness pioneer Arthur Carhart (1961) asserts, “[L]ands called ‘wild’ have retained the attribute of freedom. They have their own integrity intact. They have not been skinned, scraped, dug up, regimented and pounded into shapes and services desired and demanded by ‘civilized’ man.” Even the Wilderness Act itself insists that wilderness “retain its primeval character and *influence*” (emphasis added).

The equation of uncontrolled processes with presettlement influences again raises the question of the role of indigenous people in landscape dynamics. Clearly, indigenous people have had tremendous influence on the character of the land in localized instances and may have altered the nature of ecosystems over broad areas through the use of fire and hunting practices (see, for example, Denevan 1992). Where this influence was intensive, we must view the land as under tight control and not free. However, where influence was extensive, aboriginal fire and hunting joined other sources of ignition and mortality, making it very difficult to distinguish between aboriginal control and “the will of the land.” In this case, if only for practical purposes, we should consider extensive aboriginal influences to be part of the processes altered by the invasion of modern technological society.

Alteration of processes is probably the most difficult to measure of the six attributes that contribute to wildness. The science of historical ecology is just beginning to reveal the degree to which disturbance, hydrology, nutrient cycling, long-range migration and other ecological processes have been changed over the past few centuries. And even when we know something about rates of change, it is difficult to ascribe that information to the broader landscape. Nevertheless, progress has been made in mapping altered fire regimes, indices of watershed integrity and other metrics that may allow us to quantify land’s freedom from control of ecological processes.

Natural Composition

Composition, the relative abundance of genes, species, communities and other components of ecosystems, is one of the defining characteristics of ecosystems. An ecosystem that has lost its native species or has been invaded by non-natives has been altered in a fundamental way. In general, we recognize as most natural those ecosystems that have retained their full complement of native species and harbor no exotics.

The protection of intact native ecosystems has long been recognized as a goal of wilderness designation. The Wilderness Act specifically intended to protect “the earth and its community of life...” The protection of species that are easily harmed by, or are harmful to, human contact is a role often relegated to wilderness. Eliminated from much of their historical range, native predators, especially, are considered by many to be a vital part of the wilderness experience. As Turner (1996) says, “Predators are perhaps our most accessible experience of the wild.”

The invasion of non-native species also can decrease the naturalness and therefore the wildness of an area. Severe invasions can even alter the structure and function of ecosystems. As wilderness manager Andy Kulla (1998) has said about invasive exotic plants, “Weeds take the wild out of the wilderness.” Growing realization of the damage to native ecosystems done by exotic species has led many managers to implement weed control programs, halt stocking of fish, especially non-natives, and to insist on the use of weed-free hay and revegetation mixes.

The measure of natural composition is reasonably straightforward, to a point. Most species are understood to be either native or the result of recent artificial introduction. The species composition of any area, therefore, can be quantified

in terms of proportion of native species. Determining the degree to which native species composition has changed as a result of human agency is more difficult. Recent developments in historical ecology and (recent) paleobotany are shedding light on changes in species composition.

Unaltered Structure

Ecosystem structure refers to the spatial arrangement of the components of ecosystems. This can refer to the gross-scale features of geomorphology, the arrangement of vegetation patches or the arrangement and spacing of trees in a forest stand. The degree to which ecosystem components retain their historical arrangement contributes to the naturalness of the system.

The maintenance of unaltered structure has long been a litmus test of wilderness character and is the most familiar criterion for designation. The Wilderness Act requires wilderness to be “without permanent improvements or human habitation...with the imprint of man’s work substantially unnoticeable.” Bob Marshall’s (1933) definition stressed that “all roads, settlements, and power transportation are barred.”

Again, the standard against which alteration is to be judged is the condition of the ecosystem prior to the invasion by modern technological society, begun in North America 300-400 years ago. As has been noted, pre-Columbian North America was a network of trails and settlements (Denevan 1992; Snyder 1990). Some structures, such as the earthworks of the Southeast, were large by any standard. These structures were part of the historical ecosystem and should be considered natural. Interestingly, Marshall (1933) recognized historical structures as entirely consistent with his view of wilderness: “Trails and temporary shelters, features such as were common long before the advent of the white race, are entirely permissible.”

As with composition, the measurement of alteration of structure is fairly straightforward. Roads, dams, airstrips, mines, stockponds and other built structures diminish naturalness. Also, the substitution of square blocks of perfectly spaced plantations for natural forest, even if they comprise native species, alters ecosystem structure and diminishes naturalness. The science of landscape ecology has developed rapidly in the past few decades and has yielded a number of metrics that can be applied to land to measure its departure from historical structure.

Pollution

Wilderness carries with it an expectation of purity: clean water, fresh air, clean soil, darkness. When air, streams and the night sky are dirtied with coal exhaust, road dust, bovine feces and distant industrial light, it diminishes the naturalness of the land and the experience it provides. The poet Mark Strand (1996) makes clear the relationship between pollution and wilderness when he writes, “First we pollute the wilderness, then we pollute our minds with the belief that we’ve done the right thing. Then we pollute the wilderness more because we’ve lost our ability to see it. Soon the wilderness ceases to exist.” Some forms of pollution have direct effects on the ecosystem, such as ozone and nitrogen

deposition; others, such as the influence of city lights, affect mostly the quality of the visitor experience. Even where the effect is only on experience, pollution remains a measurable attribute of the land that affects its wildness.

Because of national laws like the Clean Air Act and the Clean Water Act, pollution is one of the best studied and best documented of the indicators of wildness. Depending on the part of the country, good maps are available for a number of air pollutants and for the quality of surface waters. The Environmental Protection Agency monitors sources of pollution across the country and maintains data in a Geographic Information System. In addition, NASA has used remote sensing to measure from space the light emitted to the night sky. It should be possible to quantify the degree to which any piece of land remains free from pollution.

Each of these attributes contributes to the freedom or the naturalness of a place and therefore to its wildness. But just because they contribute does not mean there will not be cases when they conflict. For example, the maintenance of highly anthropogenic vegetation types (such as indigenous agricultural fields), which would be natural by the above definition, would require such intensive manipulation that it would diminish freedom. Nevertheless, these attributes, when considered in aggregate, should indicate much about the wildness of any given area.

Mapping Wildness

In this section, we present results of an application of the attributes discussed above to the measurement of relative wildness at one scale – that of the contiguous United States. Though there are no hard and fast rules guiding how to apply these concepts, their application does require the selection of a consistent approach. In this case, our approach was to locate the best spatial data we could find to represent each attribute in a GIS data layer, assign each raster cell of the data layer a value for each attribute and, finally, sum the values to derive the “wildness index” for each cell. To accommodate work at a continental scale, we represented the United States as a matrix of just less than 8 million one-square-kilometer cells for analysis. The analysis was conducted with the GRID module of Arc/Info GIS software. Each attribute was represented with a value ranging between one and five. Some attributes (for example, solitude) were derived from a single data set; others resulted from a combination of several data sets (see below). Although our wildness index suffers from many of the same shortcomings attending other indices (such as the addition of unlike units as though they were commensurate), we feel it represents much of what contributes to the wildness of a place.

Solitude

Ideally, the spatial representation of opportunity for solitude would display the probability distribution of encountering another person over a landscape. It would account not only for the presence of occupants of the land, but for visitors to popular locations like national parks. Unfortunately, there are no such data sets available for the entire continental United States. However, the U.S. Bureau of the Census keeps track of the distribution of the resident population

across the country. Map 1 shows the distribution of census block groups assigned to five classes, where the value 1 (lightest) was assigned to cells with a 1990 population density greater than 1,000 persons/km², the value 2 was assigned to cells with a population density between 100 and 1,000 persons/km² and so on to the value 5 (darkest), which was assigned to census block groups with a population density of less than one person/km². Not surprisingly, the results show high population densities along the Eastern seaboard and very few residents in vast parts of the West. This map represents only where people live; it does not consider the accessibility of the land to visitors. Future renditions of the data may take accessibility into account by representing distance from population centers as well as their location.

Remoteness

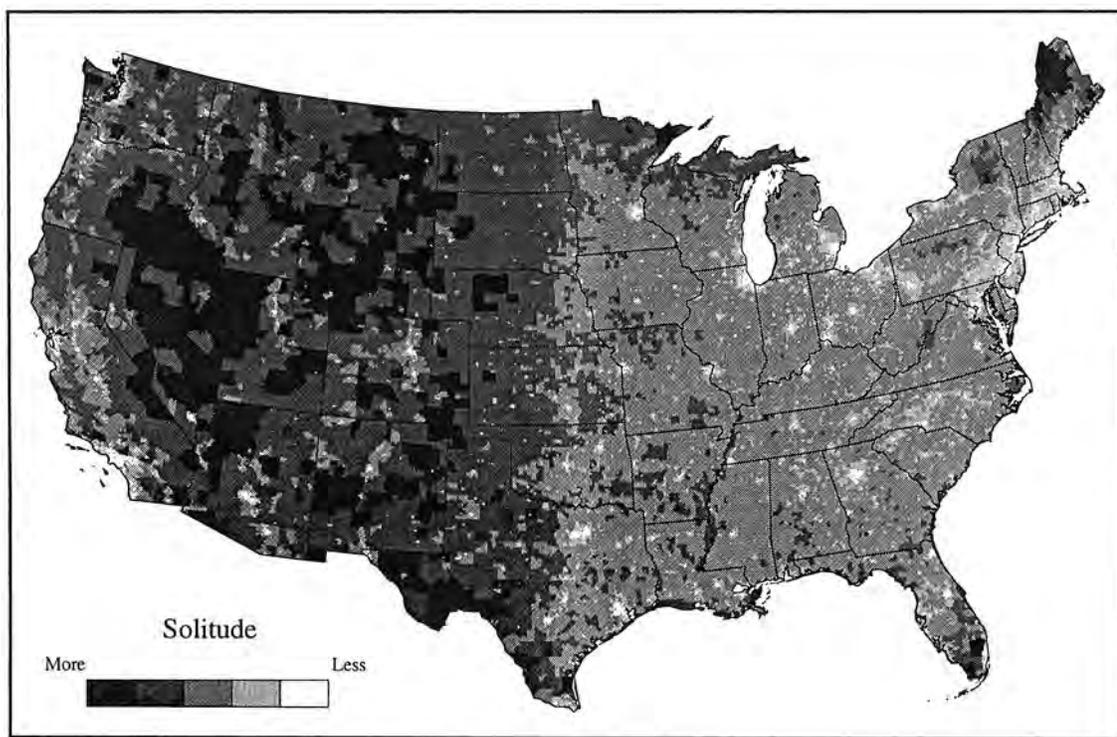
An ideal road data set would include all roads from interstate highways to natural surfaces and include all of the attributes needed to assess their relative influence on remoteness. Unfortunately, such a data set does not exist for the continental United States. Instead, we used a “major highways” (essentially paved intercity routes) data set compiled by the U.S. Geological Survey (USGS). To assign a remoteness value to each cell, we “buffered” the road system at five different distances. Cells within 2 km of a road were assigned a value of 1; between 2 and 5 km a value of 2; 5-10 km a value of 3; 10-25 km a value of 4; and greater than 25 km a value of 5. The results are displayed in map 2. Future

versions may dissolve the five distance classes into one continuous distance “surface.”

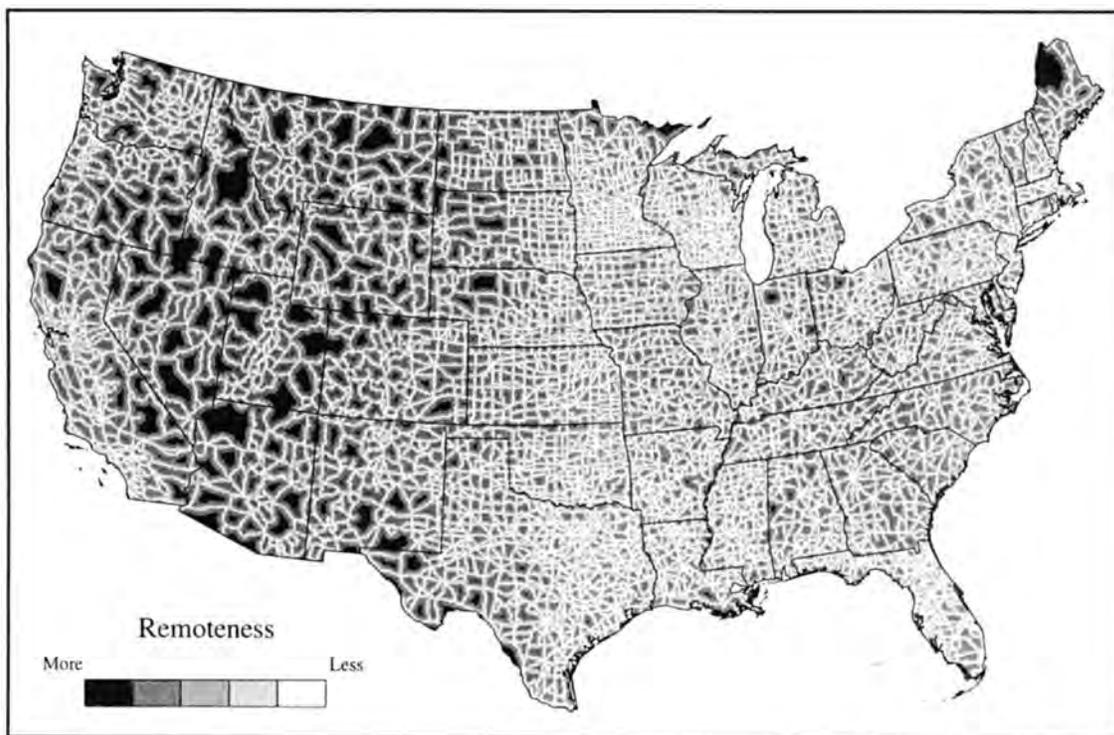
Uncontrolled Processes

Ecological processes are inherently difficult to measure, since we rarely are able to measure rates directly; instead, we generally measure states at different times and infer rates. Mapping processes is even more difficult, as it requires tying process measurements to particular places. Such data with national coverage are extremely difficult to obtain. One of the few data sets that suggests process impacts is the national inventory of dams available from the USGS. To account for changes in hydrologic function, we evaluated the number of dams in major hydrologic units (watersheds) and divided the nation into five classes. We assigned a value of 5 to cells within watersheds with no dams; a value of 4 to watersheds with 1-6 dams; a value of 3 to watersheds with 7-20 dams; a value of 2 to watersheds with 21-50 dams; and a value of 1 to watersheds with more than 50 dams per watershed.

In future renditions, we plan to build on concepts developed by The Nature Conservancy (1998) to develop a surrogate for terrestrial processes based on patch metrics (area, distance to edge, major axis) for polygons of natural vegetation (see below) delimited by major highways, agricultural lands and urban areas. The approach assumes that ecological processes in larger, well-connected patches are under less human control than in smaller, disconnected patches.



Map 1—Opportunity for solitude. Population density by census block group.



Map 2—Remoteness. Distance from major highways.

Natural Composition

There are a number of ways in which ecosystem composition can be measured. Conceptually, one of the most straightforward is species composition. Data sets should provide information on the degree to which ecosystems retain the species typical of the area and the degree to which exotic species have displaced natives. One of the few data sets available with coast-to-coast coverage of species composition is the North American Land Cover Characteristics satellite image classification conducted by the USGS, which assigns surface vegetation to over 200 different classes of natural and anthropogenic vegetation. We combined this data set with the urban classes from a separate USGS Land Use and Land Cover data set. To conduct our analysis, we assigned each one-square-kilometer cell to one of five classes, from unnatural (urban and cropland) to natural vegetation types. Cells exhibiting a mixture of use/cover fell in between. Map 3 illustrates the distribution of natural (darkest) and unnatural (lightest) vegetation across the United States.

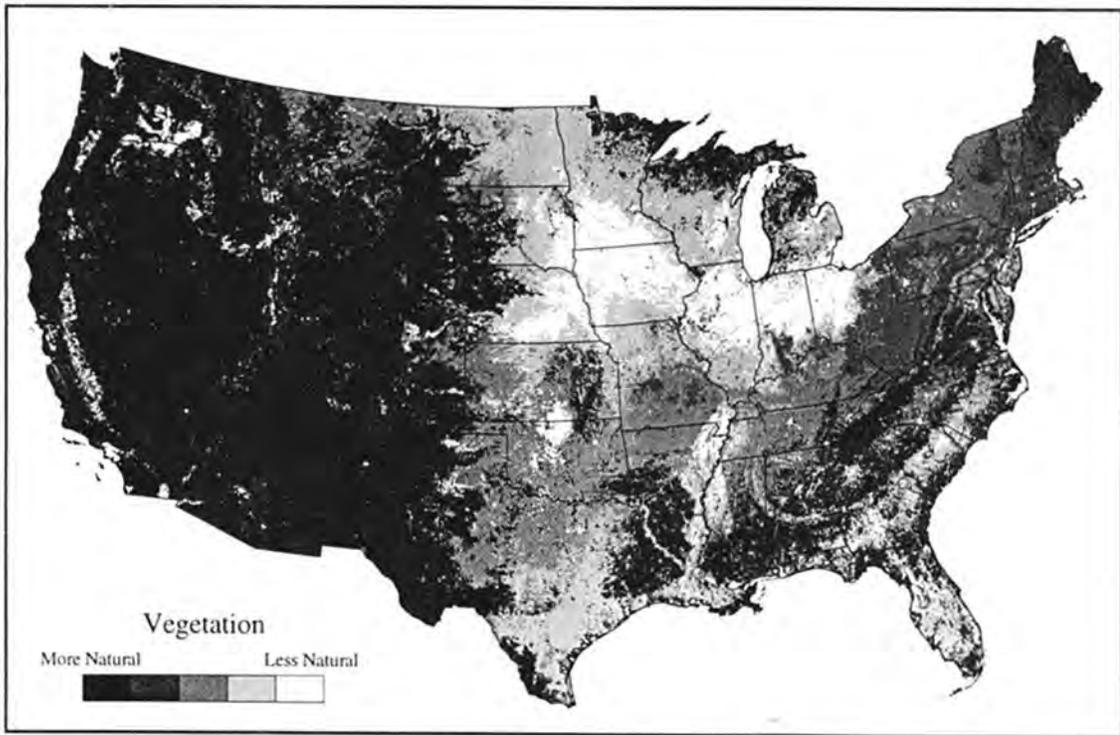
Unaltered Structure

Humans alter ecosystem structure in a number of ways, from the construction of buildings, dams and roads to the leveling of agricultural fields and the clearcutting of forests. An ideal data set would account for all these effects. Unfortunately, available data for the nation as a whole are limited to “built structures.” We mapped the location of cities, towns, highways, dams and airstrips across the country. Cells that included built structures were assigned a value of one; all others were assigned a value of five.

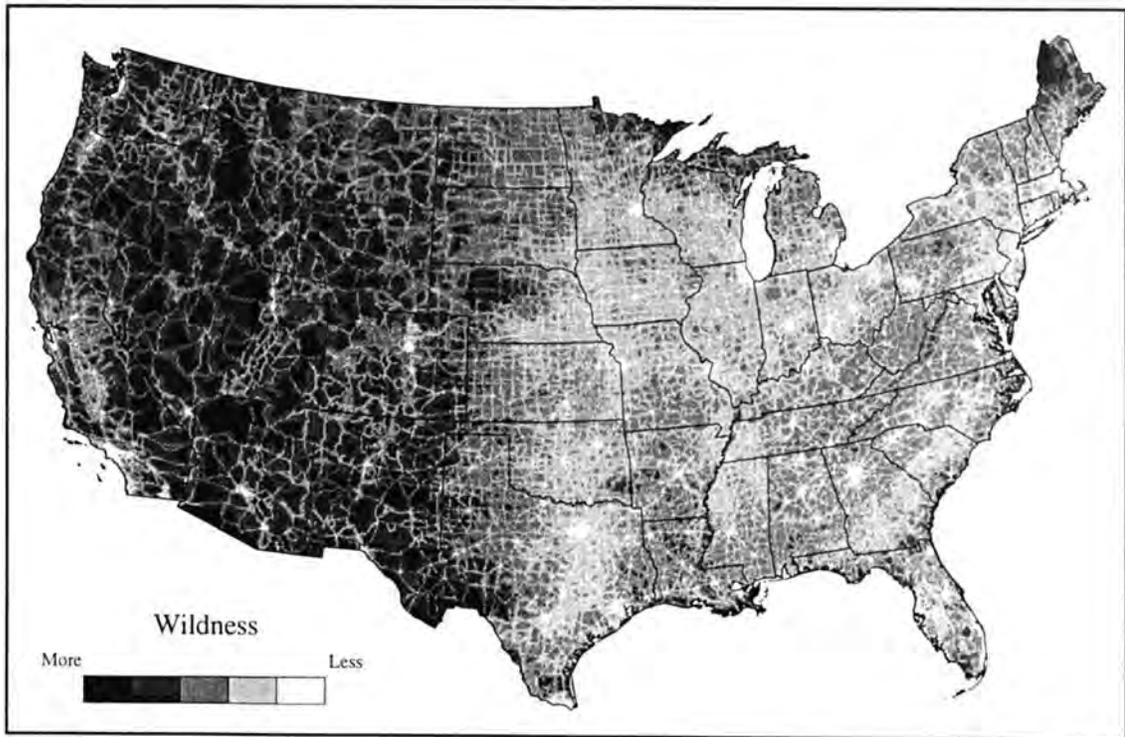
Pollution

Despite the abundance of data on pollution compiled for various locations, there exist very little data describing the distribution of pollution across the entire country in a GIS format. The EPA maintains a “national priority list” in GIS format, recording the locations of all sites they regulate as sources of pollution. In order to assess the influence of light pollution, we evaluated NASA’s image of “lights at night” for the U.S. Again, cells were assigned a value from one to five based on a combination of these data sets. As we further refine the map, we intend to bring in data that reflect actual air and water quality, not simply sources.

To construct the map of wildness (map 4), we summed the values of the six attributes into an overall “wildness index” and displayed that index spatially. Beyond the trivial result showing that the West is notably more wild than the East, some results were somewhat surprising. Because the map was generated without regard for ownership or physiography, it bears little resemblance to maps of the distribution of wilderness areas, federal lands, mountain ranges or river basins. Instead, the map exhibits “features,” such as the swaths of wild land running from southwestern Arizona to eastern Utah and from Death Valley to southwest Idaho, that have nothing in common but their wildness. Other places, like eastern New Mexico and central Nebraska, jump out as particularly wild, though they are traditionally unheralded. The map also confirms what we already knew about places like the Boundary Waters, northern Maine, Okefenokee and the Everglades: These are very special wild places in an otherwise highly developed landscape.



Map 3—Natural composition. Natural and artificial land cover.



Map 4—Wildness.

As interesting as this map is, it is important to remember that it is simply one analysis at one scale. Wild land exists in all landscapes at all scales. Aldo Leopold said it best when he wrote, “[W]ilderness exists in all degrees, from the little accidental wild spot at the head of a ravine in a Corn Belt woodlot to vast expanses of virgin country.... Wilderness is a relative condition” (Leopold 1925). Figure 2 illustrates this sentiment by showing that the wild land continuum does not exist only at the scale of large landscapes from city to wilderness. Within the portion of the land that we call rural are land uses ranging from agribusiness to ranch. We may determine that tilled or developed land is not wild, but that a large ranch is. Even on the nonwild farm landscape, land can range from developed homesites to uncultivated pasture and forest. Within this landscape, these uncultivated areas provide a glimpse of the natural and free and are highly prized for their wildness.

The next step in our process will be to repeat this type of analysis at the scale of a region (a state) and a subregion to show that patterns of wildness emerge at all scales. At these scales, new (and hopefully better) data sets will be applied to show that relatively wild land exists all around us. For example, though it appears as a highly developed patch at the scale of the nation, the city of Chicago is home to hundreds of thousands of acres of precious wild places whose protection is being sought by a coalition known as “Chicago Wilderness.” The next stage of our analysis will demonstrate that the wildness of places like these can be illustrated through the application of the very same approach to smaller landscapes.

At the same time that we are moving forward with these other analyses, we will be working to improve our analytical approach. Currently, the analysis is plagued by a number of problems. For example, by displaying the data in a one-square-kilometer grid, we have implied a level of precision to the data that is inappropriate for an index based on data collected at a number of scales, some of them quite coarse. We are currently working to identify an appropriate level of precision for display. Also, the current approach has the potential to overemphasize the influence of some factors. For example, roads factor in the estimation of remoteness, uncontrolled processes and unaltered structure. We are working toward a more sophisticated way to combine data sets to account for all six attributes without unduly emphasizing any particular factor.

Relationship to Other Efforts

The approach to mapping wildness described above is based on an understanding that wildness inheres in varying degrees in all lands as a function of the relative freedom and naturalness of the place. This allows the mapping of all lands as possessing some degree of wildness and the production of a continuous surface describing the wildness of any landscape. Such an approach allows us to discern connections across wild landscapes that are not readily apparent in maps based on any one of the attributes (for example, land use/land cover) or on land ownership. As a result, our method represents a new approach to the study of wild lands, complementary to other existing efforts.

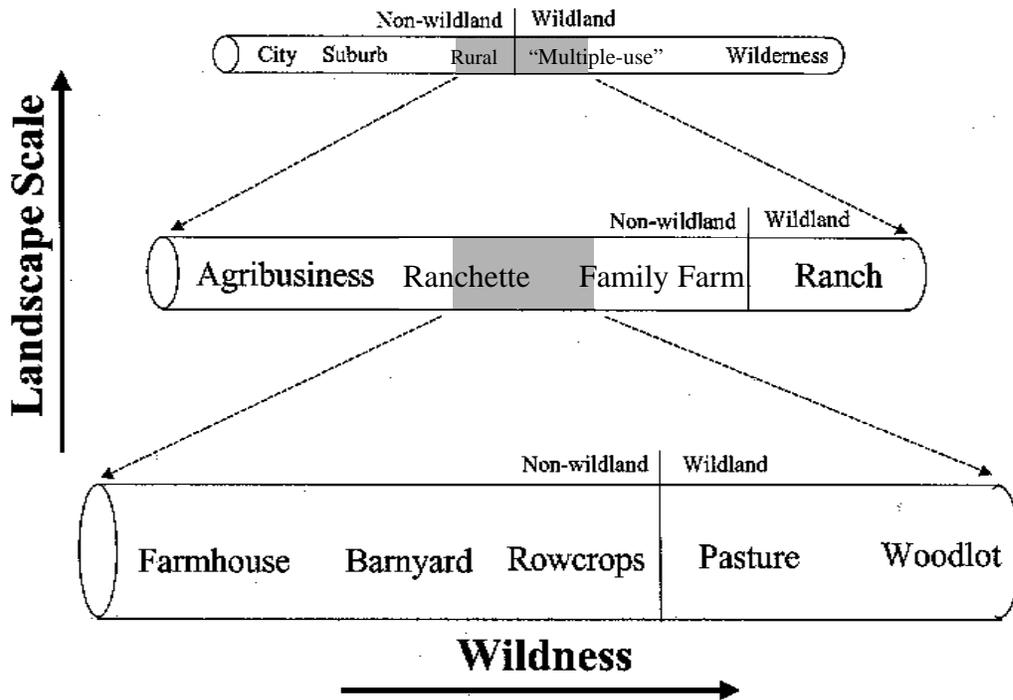


Figure 2—Wild lands can be found in any landscape at any scale.

Generally, efforts to map wild places have been of two sorts: those that focus on biological diversity and those that identify special wild places. Traditionally, mapping efforts have identified special wild places such as nature sanctuaries (Kendeigh and others 1950-51) and wilderness areas (The Wilderness Society 1989), with the implication that lands not identified in the map are not wild. Similarly, a 1997 report by the World Resources Institute characterized the world's forests as either "frontier" or "non-frontier," based on their ability to support a full complement of native species and ecological processes (Bryant and others 1997). Our method allows us to identify lands of particularly high value, while acknowledging the wildness inherent in all lands.

One of the most sophisticated wildland mapping efforts is the National Wilderness Inventory of Australia (Lesslie and Maslen 1995). This effort represents a significant advance over previous efforts because it provides an objective protocol for evaluating the wildness ("Total Wilderness Quality Index") of any particular place based on four indicators: "remoteness from settlement, remoteness from access, apparent naturalness, and biophysical naturalness." The approach described in the Australian National Wilderness Inventory Handbook (Lesslie and Maslen 1995) shares much in common with ours but still must be considered in the traditional mode, as it evaluates the wilderness quality of distinct land units identified as "natural."

The past decade or so has witnessed great progress in the mapping of areas critical to biological diversity. Efforts like the Gap Analysis Project of the USGS Biological Resources Division (Caicco and others 1995, Edwards and others 1995) and similar initiatives, such as that undertaken by the Florida Game and Freshwater Fish Commission (Cox and others 1994), have sought to identify lands of particular conservation value for protecting wildlife in each state. Studies like these improve on traditional conservation mapping initiatives because they acknowledge a continuum or gradient in wildland quality, irrespective of ownership. By including natural composition and uncontrolled processes in our analysis, we, too, recognize biodiversity as critical to wildland quality (although we do not pretend to achieve the level of detail of these other approaches). However, by also recognizing factors like solitude and unaltered structure, we assert that biodiversity is a necessary, but not a sufficient component of wildness.

One particularly noteworthy biodiversity-oriented mapping effort is The Wildlands Project, whose founders believe that "wilderness is absolutely essential to the comprehensive maintenance of biodiversity" (The Wildlands Project 1992). Such a philosophy turns the liabilities of other biodiversity mapping approaches into assets for the mapping of wild places. Because wilderness is essential to biodiversity, protecting biodiversity necessarily must result in the protection of nonbiological wilderness values.

Mapping under The Wildlands Project begins with the identification of "core reserves" essential to the conservation of wildlife – often large predators that have been exploited to extinction elsewhere. To these core reserves are added nonwilderness "buffer zones" and "corridors" to connect the core reserves. Core reserves are usually national parks and existing wilderness areas, augmented with roadless areas and places of particular conservation concern. By adding

buffer zones, The Wildlands Project begins to address some of the shortcomings of traditional wild land mapping, but because mapping generally begins with existing designated areas and builds out, it is a very "bottom-up" approach in the traditional mode of wild land identification. Our approach, in contrast, is very "top down," representing wildness unanchored by existing land designations. We believe our approach complements the "bottom-up" approach and will bring a new perspective to understanding the context of wilderness.

Wild Land Mapping: Toward a Blueprint for Wilderness

The identification of quantifiable attributes of wildness makes possible the representation of wildness and the mapping of wildness across the landscape. The mapping of wildness is important for a number of reasons. First, it allows us to point to specific places, places that are important because they are wild, whether those places occur at the scale of a region, as they do in southern Utah, or at the scale of open space in such urban gems as L.A.'s Santa Monica Mountains or Washington, D.C.'s Rock Creek Park. Maps help make places tangible and the subject of action. They can help educate about wilderness, and they can help conservationists visualize the scope of their work. Maps can also serve as a graphic record of our success.

Second, a map of where the wild places are can help us, as conservationists, set priorities for our limited resources. The wildest places are not necessarily the highest priorities for attention, but we should understand the context of the places that we do work to protect. Also, maps that show the relative importance of various wild land tracts can provide convincing arguments for wild land protection. Maps that show a tract or subregion (for example, Okefenokee or the Grand Staircase-Escalante National Monument) to be the "wildest in the land" contribute to the argument for protection.

Third, maps of wild places can be powerful tools of inclusion. Wild land maps can help direct people who wish to contribute to wilderness protection toward high-priority lands. They can also help recruit new voices for wild land protection by showing people who otherwise think of wild lands only in the abstract just how close these places are.

Finally, maps can help illuminate possibility. As The Wildlands Project has shown, dreaming with a map and crayon can motivate people to work toward a future that is better than the present. A wild land map can show not just where the wild lands are, but where they could be. If done well, wild land maps based on the attributes described above can help identify the specific changes necessary to restore wildness to degraded landscapes and begin the job of building a system of wild lands, rather than simply defending an ever-shrinking wild land base.

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