

**Rediscovery of Colorado's Historic
Festuca hallii (Hall Fescue) Sites
on Cameron Mountain and in Shipman Park
Roosevelt National Forest
September 9, 2014**



Festuca hallii on Cameron Mountain.

Prepared for:
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"Integrating species conservation with project planning"

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1.0 Introduction

Festuca halli is a U.S. Forest Service Region 2 sensitive status species (Forest Service 2013) known in Region 2 from five sites in Colorado. All but one of these sites have not been revisited in over 20 years and thus are considered historic sites. Two historic sites are from the Roosevelt National Forest: Cameron Mountain, not observed since 1956, and Shipman Park, not observed since 1954 and poorly documented. Spatial data for the two sites was vague, particularly the Shipman Park site, and thus relocating the sites posed a difficult task. Under a service agreement with the Arapaho-Roosevelt National Forest, field surveys to relocate the historic sites on Forest lands were initiated in August 2013 by Brian Elliott of Elliott Environmental Consulting and both sites were rediscovered, mapped, photographed, vouchered, and documented. As a result of these surveys two of Colorado's four historic *Festuca halli* sites are now known to be extant and can be studied and managed.

2.0 *Festuca hallii*

2.1 Natural History

Hall fescue is a perennial graminoid that inhabits alpine and subalpine grasslands and meadows. It is found in Canada, Washington, Montana, Wyoming, North Dakota, Colorado, and New Mexico where it reaches its southernmost Rocky Mountain distribution. The species has a global rank of G4, indicating that the species is considered apparently secure globally but rare in portions of its range. Prior to 2005 *Festuca hallii* was ranked SH in Colorado (state historical, a rank applied to taxa that have not been observed within the state for more than 20 years). However, after rediscovery of the species at Cordova Pass in 2003 (Elliott 13,596 accession number 801294, 13,597 accession number 801295, and 13,609 un-accessioned, all deposited at the Rocky Mountain Herbarium) the Colorado rank was changed to S1 due to the extreme rarity of the species in the state.

Festuca hallii is considered a climax species and it recovers slowly from disturbance. Threats include livestock grazing, invasion by exotic species, residential development, recreation, effects of small population size, pollution, and global climate change. Moderate to heavy livestock grazing, in particular, appears to be detrimental to *Festuca hallii* (Anderson 2006).

Due to the economic importance of fescue grasslands, more information regarding population trends is available for *Festuca hallii* compared to other rare species. A decline of fescue grasslands, in Region 2 and throughout North America, has been documented since the 1930s. The decline has been primarily caused by habitat loss (conversion to agriculture) and historic grazing regimes. Indeed, one observer wrote, “Already an estimated 90 percent of the fescue grassland has been greatly or moderately modified, and much of the surrounding forest suffers damage to some extent. Unless some suitable areas are placed in Nature Preserves, the time is not far off when the fescue grassland will have followed the true prairie into extinction.” (Looman 1969).

2.2 Distribution

According to Anderson (2006):

“The presence of Festuca hallii in Wyoming and Colorado is probably relictual (Tweit and Houston 1980). The southward migration of vegetation zones during the Pleistocene probably resulted in fescue grasslands developing at lower latitudes. Warmer conditions following glacial retreat 10,000 years ago caused vegetation zones to move north again but left remnant populations in patches of suitable habitat (Johnston 1958).”

As expected from a relictual species, the distribution of *Festuca hallii* in the southern Rocky Mountains is discontinuous. In the southern portion of its range it is known from twelve occurrences in Wyoming, five in Colorado, and one in New Mexico. According to Anderson (2006):

“In Colorado, F. hallii has been seen at only one location within the last 20 years, at Cordova Pass on the San Isabel National Forest. Two other occurrences are known from the Roosevelt National Forest, but these have not been seen since the 1950s. Two other vague records report F. hallii from Custer and Park counties.”

The above referenced site this site was rediscovered by the author, Brian Elliott, in 2003.

3.0 Field Survey Methods and Results

Prior to performing field surveys pre-field research was performed to focus the survey. All available documentation was reviewed, including dichotomous keys for identification of *Festuca* as well as information regarding the two historic sites. David Anderson's species assessment (Anderson 2006) and Dr. Weber's description of the Cameron Mountain site (Weber and Wittman 2012b) were particularly valuable. Vouchers at the Rocky Mountain Herbarium were also studied and photographed to develop a search image for the species.

Once in the field focused surveys were performed with the search effort concentrated in areas that were considered the most likely habitat. On Cameron Mountain this consisted of areas of rodent disturbance and also patches of *Kobresia*. In Shipman Park no description of the plant's habitat was available, so the search was concentrated in areas similar to the plant's habitat on Apishipa Pass (i.e., areas of rodent disturbance with a diverse mix of grasses and forbs). On Cameron Mountain the search image was correct, but in Shipman Park the species was found on large hummocks, a habitat where the species has never been documented.

Festuca hallii was relocated on the Roosevelt National Forest at the historic Cameron Mountain and Shipman Park sites. *Festuca hallii* was identified in the field by Brian Elliott. Vouchers were collected at each site and upon further study were confirmed as *Festuca hallii* by Brian and Emily Elliott. Dr. Ron Hartman and B. Ernie Nelson at the Rocky Mountain Herbarium independently confirmed the identification on February 18, 2014. Jennifer Ackerfield at the Colorado State University Herbarium also independently confirmed the identification on February 18. Dr. William Weber at the University of Colorado herbarium was offered an

opportunity to review the vouchers, but he deferred to the identifications made by Dr. Hartman, Ernie Nelson, and Jennifer Ackerfield.

The rediscovered sites at Cameron Mountain and Shipman Park sites are described in more detail both below and in the Natural Resource Information System (NRIS) forms in Appendix 1. Overview maps are given in figures 2 and 3, below.

Figure 1: Inflorescence of *Festuca hallii* from Cameron Mountain.



Figure 2: Location of Cameron Mountain and Shipman Park Sites (Topo).

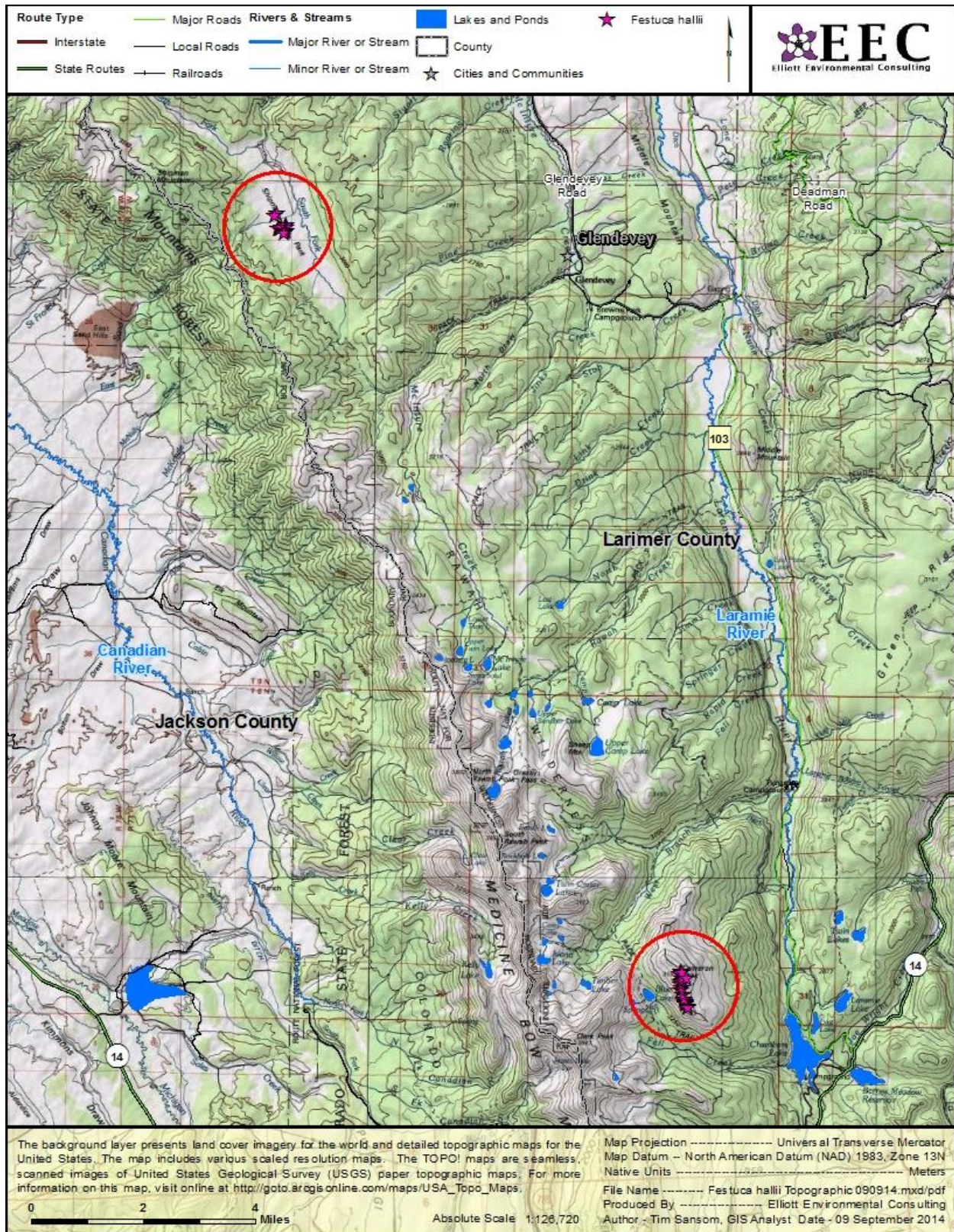
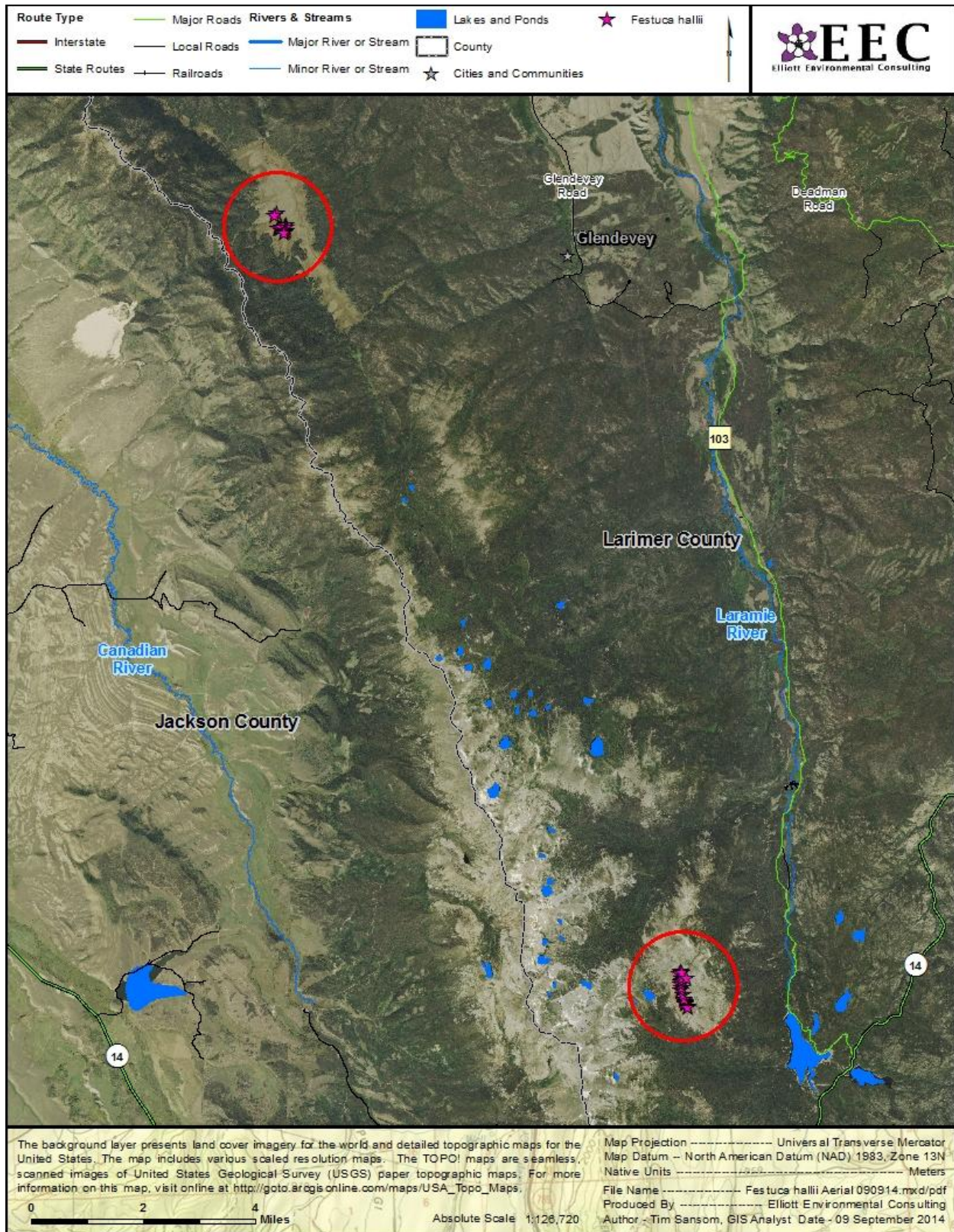


Figure 3: Location of Cameron Mountain and Shipman Park Sites (Aerial).



Cameron Mountain

Festuca hallii was first found on the north and east sides of Cameron Mountain at approximately 11,600 feet by Dr. William Weber and Mr. G.D. Pickford of the Roosevelt National Forest on August 25, 1956 (Anderson 2006). Initially identified as *F. scabrella* Torrey ex. Hooker ssp. *hallii* (Piper) W.A. Weber, this specimen (Weber 15,442 University of Colorado accession number 318552), housed at COLO, was annotated by Jan Looman in 1976 and again by Susan Aiken in 1983 as *Festuca hallii* (Anderson 2006).

In the ensuing 57 years no documented site visit was made. This gap was broken on August 13, 2013, when the site was relocated during my directed survey for *Festuca hallii*. Nineteen subpopulations of *Festuca hallii* were found at Cameron Peak and on the ridge south of Cameron Peak at elevations ranging from 11,600 to 12,100 feet. The total estimated population size was 2,140 individuals. Forty percent of the plants were vegetative while the remaining 60% were in fruit. Full site details are documented in the NRIS forms found in Appendix 1. However, the following observations should be emphasized.

Dr. Weber states that the species is known "...from the summit of Cameron Peak where it grows in an island of *Kobresia*." As a result of this statement, surveys were intended to be focused on areas with *Kobresia*. However, the species was located prior to entering any *Kobresia* stands. As the survey progressed and more sites were identified, the lack of *Kobresia* began to cause concern. At last, however, stands of *Kobresia* with *Festuca hallii* were located near the summit of Cameron Peak. Of the nineteen *Festuca hallii* subpopulations located on Cameron Mountain, only four were with *Kobresia*, indicating that Dr. Weber most likely saw only the uppermost sites.

Several observers have reported that *Festuca hallii* is often found in areas with soil turned by gophers or other rodents (Anderson 2006). Several of the nineteen sites on Cameron Peak showed signs of soil churning by rodents (see Figure 5, below).

One characteristic that all nineteen sites shared was deep soils. *Festuca hallii* was always found on the lee (east) side of the ridge in patches of deep soil. Whether the soil was deep due to the presence of *Festuca hallii* or whether *Festuca hallii* simply colonized patches of deeper soil is unknown. In Figure 6, below, *Festuca hallii* is growing on deep soils in the lower right portion of the photograph. Immediately adjacent to and surrounding the *Festuca hallii* are thin, rocky, and barren soils often dominated by a cushion plant community markedly different from the *Festuca hallii* stand immediately adjacent to it. Deep soils can also be seen in Figure 5. The depth and looseness of the soils was remarkable; when vouchers were collected an attempt was made to collect underground rhizomes and the collecting tool (a Japanese gardening tool called a hori-hori) with a 6.5 inch blade sank with ease to the hilt.

Threats at the site were few. Old mining activity was seen, but was limited to a few exploratory pits dug over 50 years ago. No non-native plant species were seen, and little recreational activity takes place on the ridge. Hikers occasionally climb Cameron Peak but little disturbance was seen at the summit. During the course of the day-long survey not a single person was seen.

Finally, Dr. Weber stated (Weber and Wittman 2012b) that “If anyone goes there to see it [*Festuca hallii* on Cameron Peak], please pick up the collecting pick I left by a rock there after eating lunch on 25 August 1956, and return it to me or my heirs.” I regret to report that an extensive search failed to reveal the location of Dr. Weber’s collecting tool, a Marsh Pick.

Figure 4: *Festuca hallii* on Cameron Peak



Figure 5: *Festuca hallii* site showing rodent disturbance and soil churning.



Figure 6: *Festuca hallii* site, showing change in soil depth.

Festuca hallii is found in deeper soils and occupied habitat is circled in red.



Figure 7: *Festuca hallii* with *Kobresia*.

Festuca hallii is in the background and *Kobresia* is the yellowish, low graminoid in the foreground.



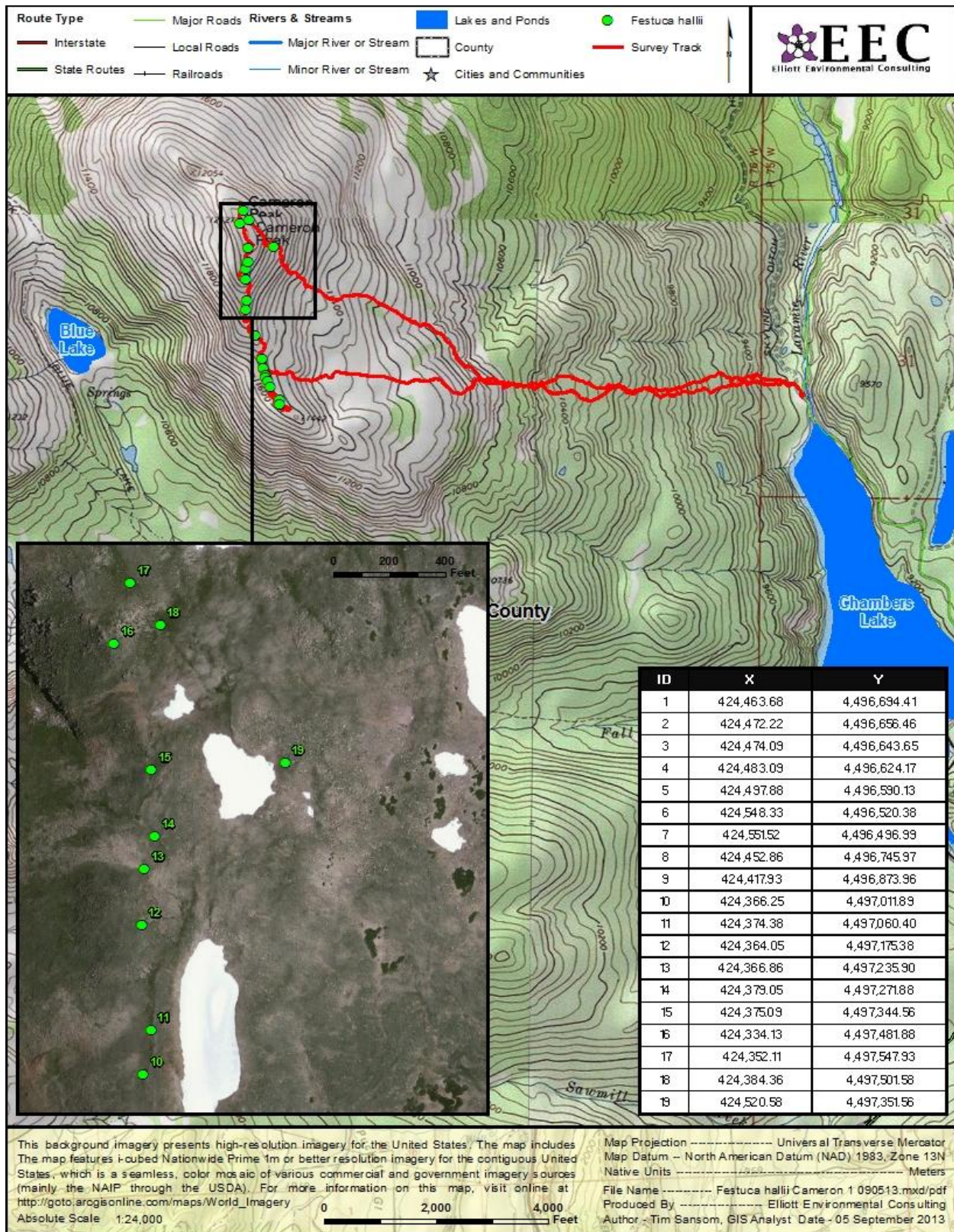
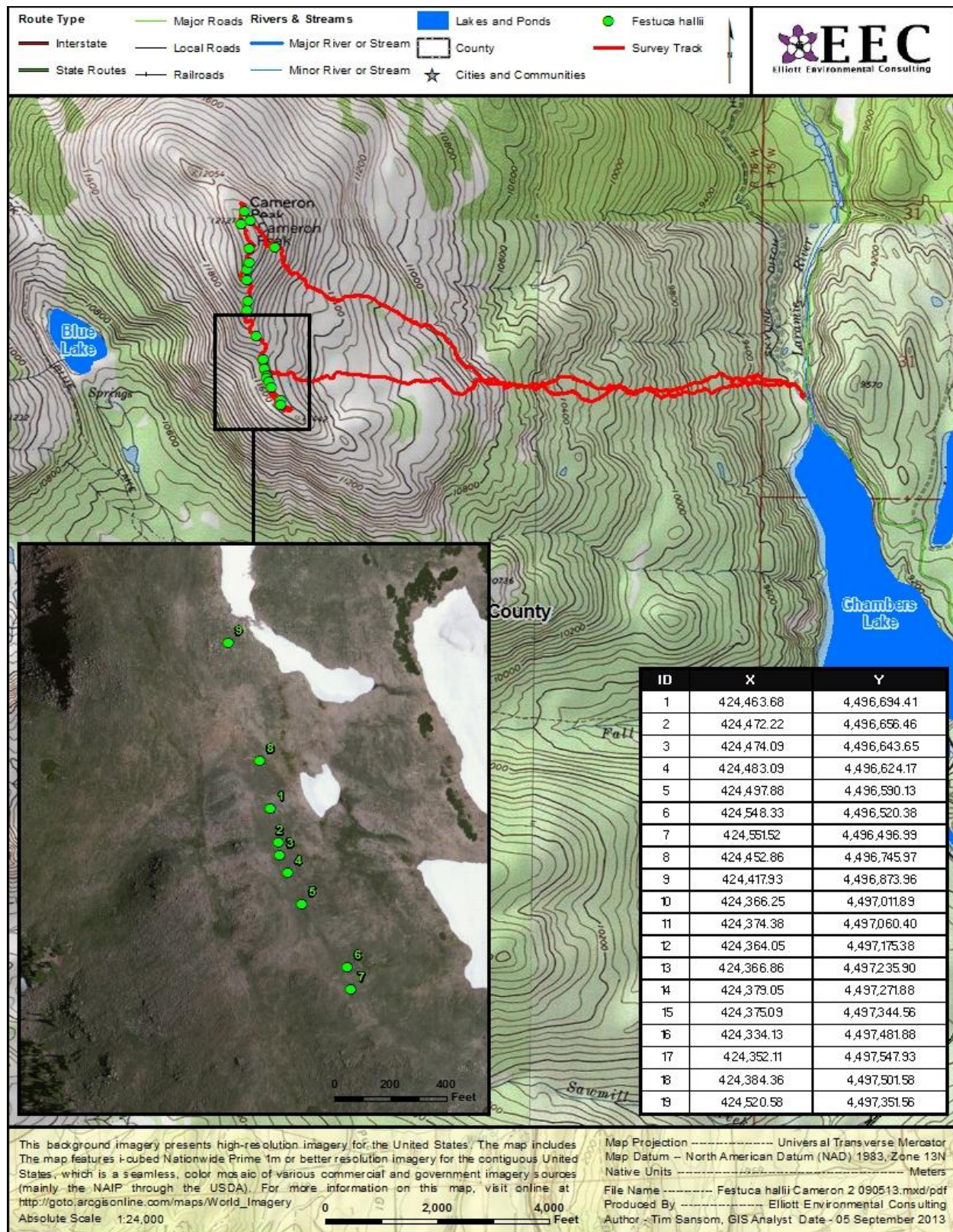
Figure 8: Map of *Festuca hallii* on Cameron Peak, northern portion.

Figure 9: Map of *Festuca hallii* on Cameron Peak, southern portion.

Shipman Park

The history of *Festuca hallii* in Shipman Park is complicated and best explained by David Anderson (Anderson 2006):

Another record of a member of the Festuca scabrella complex was found among the archived notes of H.D. Harrington, author of the Manual of the Plants of Colorado (1954). Harrington's notes, which are remarkably well organized, are housed at the COLO. Among Harrington's papers is a memo (dated September 20, 1954) from Clinton H. Wasser, who was a professor in the Forestry Department at Colorado State University. The memo, regarding a F. scabrella specimen, reads,

"You may recall that I was over checking a Festuca scabrella specimen with you. Upon checking I find that this was collected on the Roosevelt National Forest, between the Laramie River and Medicine Bow Range in Shipman Park, at about 9,500 feet elevation, by Assistant Supervisor Robert Gardner. They promised to collect enough for some herbarium collections."

There are no known specimens from this occurrence at any of the herbaria searched for this assessment [Anderson 2006]. Attempts were made to contact Dr. Wasser, who now resides in California (Shaw personal communication 2005), but these were not successful. Because it was originally identified as Festuca scabrella and has not been seen since 1954 or earlier, the identity of this record remains uncertain.

In the ensuing 59 years no documented site visit was made. The identity of the record is no longer uncertain as the 59 year gap was broken on August 23, 2013, when the site was relocated during my directed survey for *Festuca hallii*. Thirteen subpopulations were located and 316 plants were counted. However, this population count certainly represents a significant undercounting of the population resulting from the majority (>65%) of plants being vegetative and difficult to accurately differentiate from other grass taxa present. The remainder of plants identified (<35%) were in fruit. Full site details are documented in the NRIS form found in Appendix 1. However, the following observations should be emphasized.

Shipman Park is a large graminoid-dominated montane-subalpine opening comprised of the following habitat types (in descending order of estimated acreage):

- vernal wet hummocks dominated by *Deschampsia caespitosa*.
- willow carr, occasionally with bog birch.
- dry grassland dominated by *Danthonia intermedia* and *Carex rossii*.
- wet sedge/rush meadows.
- dry hummocks.
- *Potentilla fruticosa* shrubland.
- wetland.

Festuca hallii was located solely on dry hummocks, and this habitat comprises less than 10% (and probably less than 5%) of the area in Shipman Park. These hummocks are vernal moist but were completely dry on August 23. In contrast to the loose and friable soils found on Cameron Mountain (and on Cordova Pass as well) these soils were extremely hard-packed and

great difficulty was encountered in collecting roots and rhizomes. It appeared that the hummocks had been in place for many years and the plants inhabiting them had become root bound within the limited available space.

The dry hummock habitat is visible on aerial imagery and is faintly discernable on the inset located in Figure 13. Dark green in the center of the inset is a willow carr, while the large light-colored areas are dry *Danthonia/Carex* grasslands. *Festuca hallii* is found on the light green sections of the map.

A relatively low estimated percentage (35%) of plants at the site bore flowers or fruits. It is possible that this low percentage results from nutrient exhaustion of the limited soil within the large and dense hummocks inhabited by *Festuca hallii* at the site, but this is speculative. *Festuca hallii* is usually a large and robust grass, but vouchers taken from the site are smaller, also possibly due to nutrient exhaustion. An analysis of soil nutrients from within soil cores taken from hummocks at the site would be a fascinating study.

Threats at the site are few. No cattle grazing has taken place for many years, although wildlife use by deer and elk is heavy. No herbivory of *Festuca hallii* was observed during the survey, however. Within Shipman Park, little additional appropriate habitat (i.e., large dry hummocks) appeared to be available for colonization by *Festuca hallii*. Thus, maintenance of the existing limited population may be critical. The only non-native species observed was *Cirsium arvense* (Canada thistle), although it was uncommon. Common dandelion (*Taraxacum officinale*) was also seen.

Figure 10: Inflorescence of *Festuca hallii* from Shipman Park.



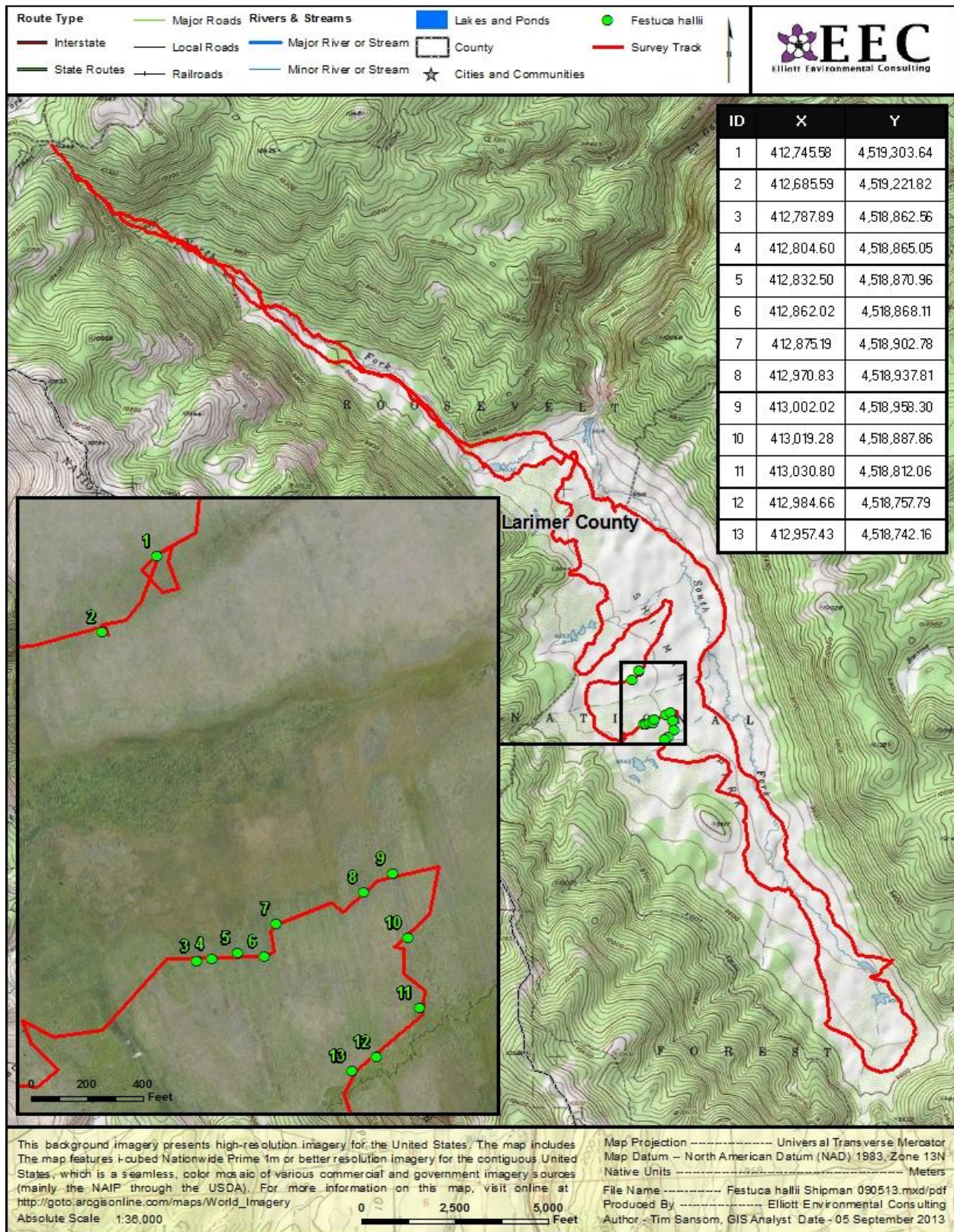
Figure 11: *Festuca hallii* site at Shipman Park.

Hummocking is clearly visible in the photograph below, and *Festuca hallii* is visible on the hummock circled in red.



Figure 12: Large, dry, and dense hummock inhabited by *Festuca hallii*.



Figure 13: Map of *Festuca hallii* in Shipman Park

4.0 *Festuca hallii* Field Identification Characters

Field identification of *Festuca hallii* can be difficult. The taxon does not resemble other species of *Festuca* and was once included in the genus *Melica* as *Melica hallii* Vasey. If one is not specifically looking for *Festuca hallii*, one can easily overlook or mis-identify individuals. In the author's experience, dichotomous keys to the genera of grasses work poorly for *Festuca hallii* due to its tiny or absent lemma awn. Once the plant is recognized as a *Festuca*, however, individuals are easily keyed to the correct species in the common plant identification manuals of Colorado.

The following morphological characters have been used with success by the author to identify *Festuca hallii* in the field:

1. Plants are usually large and robust for a fescue, reaching about 0.5-meter in height. *Festuca thurberi* is also a robust fescue, reaching 1-meter in height, but the two are easily differentiated by the size of the ligule (<1 mm in *Festuca hallii* and 2–5 mm or more in *Festuca thurberi*).
2. All Colorado populations located thus far bear a contracted panicle. Populations in Montana and Wyoming often bear more open panicles. This contrast is shown beautifully in the two photographs displayed on the cover page of the species assessment (Anderson 2006).
3. Leaves are generally one-half to more than one-half the height of the stem. In many fescue species the leaves are less than one-third the height of the stem.
4. Leaves are involute and quite narrow, usually between 1 and 2 mm wide.
5. Plants often, but not always, have a purplish basal stem.
6. Plants are densely caespitose and bear a short and brittle rhizome. This rhizome is easily broken during collection of vouchers.
7. Spikelets are relatively large for a fescue, and are straw-colored at maturity.
8. Glumes are nearly equal to exceeding the lemma, an unusual character in *Festuca*.
9. In many species of *Festuca* the glumes often spread widely at anthesis. In all of the *Festuca hallii* seen by the author in the field or the herbarium the glumes have remained erect throughout anthesis. This character is not discussed in any of the plant identification references for *Festuca*, but may be a valuable character for field identification.
10. The lemma is often unawned and acute, or it may bear a short awn up to approximately 1 mm long. In the authors experience, the awn is generally absent or less than 0.5 mm.

Festuca hallii could be confused with *Festuca campestris*, and one *Festuca hallii* site in Colorado (Apishipa Pass near the Spanish Peaks) was originally identified as *Festuca campestris*. At this time there is some disagreement on whether *Festuca campestris* is present in Colorado. Some references (e.g., Weber and Wittman 2012a and 2012b, Shaw 2012) include *Festuca campestris* as part of the Colorado flora while other references (e.g., FNA 2007, Ackerfield 2013) do not. Region 2 of the Forest Service (2007) dropped *Festuca campestris* from its sensitive species list during a 2007 revision due to the lack of known occurrences on Forest Service lands. Regardless of the presence or absence of *Festuca campestris* in Colorado, the two taxa can be differentiated by the presence of rhizomes in *Festuca hallii* (lacking in *Festuca campestris*) as well as the length of the glumes. In *Festuca hallii* the glumes are subequal to exceeding the uppermost floret, while in *Festuca campestris* the glumes are shorter

than the uppermost floret. Finally, in all of the material seen by the author, the glumes of *Festuca hallii* have remained erect at maturity while the glumes of *Festuca campestris* have been widely spreading at maturity.

5.0 Other Botanical Discoveries

A previously unknown *Cypripedium fasciculatum* population was encountered in shaded subalpine spruce-fir forest while accessing Cameron Peak. Approximately 40 plants were located on a steep east-facing slope in relatively dense spruce-fir forest. The forest understory is depauperate with much bare ground, and many bryophytes are present. Two patches approximately 150 feet apart were found. Plants were scattered (i.e., not in dense patches) and appeared healthy and vigorous. About half of the plants were bearing flowers. The site is off-trail and no human or livestock presence or impact was noted. Additional plants and populations are likely present in the area, probably in a band at about the same elevation.

Figure 14: *Cypripedium fasciculatum*



Figure 15: *Cypripedium fasciculatum* habitat



6.0 Contact Information

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7.0 References

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Appendix 1: NRIS Forms

National Resource Information System (NRIS) Survey and Element Occurrence forms were populated at the two *Festuca hallii* sites found during the survey. These forms expand on information presented in the report and were submitted to the Forest Botanist, Arapaho-Roosevelt National Forest.

2012 Rare Plant Survey Form
Arapaho & Roosevelt National Forests
& Pawnee National Grassland

Survey Information		<i>Bold fields are required</i>
NRIS Survey ID:		NRIS Survey Name: Cameron Peak directed survey. (Project Name & Unit No.)
Survey date: 08/13/2013 (Month/day/year, e.g. 01/01/2001)	Survey start/stop time: 0600/2100 (24 hr. military time)	State/County/Region/Forest/District CO/Larimer/R2/ARNF/Canyon Lakes
Observer name(s): Brian Elliott		Observer qualifications: ☒ Exp ☐ Lmtd Exp ☐ No Exp ☐ Unk
Survey protocol: Field Check ☒ Focused (Intuitive Controlled) Complete (NRIS 'General') Systematic		
Entered in NRIS by: Primary Data Steward: Steve Popovich, ARP Forest Botanist		Date:

TESP/Species of Local Concern Information
Circle target species, ☒ = survey showed habitat present: <i>Aletes humilis</i> ☐, <i>Aralia nudicaulis</i> ☐, <i>Asclepias uncialis</i> ☐, <i>Astragalus kentrophyta</i> ☐, <i>A. leptaleus</i> ☐, <i>A. osterhoutii</i> ☐, <i>Botrychium ascendens</i> ☐, <i>B. campestre</i> (suite) ☐, <i>B. furculatum</i> ☐, <i>B. simplex</i> ☐, <i>Botrychium</i> spp. ☐, <i>Calypto bulbosa</i> ☒, <i>Carex diandra</i> ☐, <i>C. lasiocarpa</i> ☐, <i>C. leptalea</i> ☐, <i>C. limosa</i> ☐, <i>C. livida</i> ☐, <i>Cornus canadensis</i> ☒, <i>Cypripedium fasciculatum</i> ☒, <i>C. parviflorum</i> ☐, <i>Cystopteris montana</i> ☐, <i>Drosera rotundifolia</i> ☐, <i>Eriogonum exifolium</i> ☐, <i>Eriophorum</i> spp. ☐, Rare Ferns ☐, <i>Fritillaria atropurpurea</i> ☐, <i>Goodyera repens</i> ☐, <i>Kalmia microphylla</i> ☐, <i>Lewisia rediviva</i> ☐, <i>Lilium philadelphicum</i> ☐, <i>Listera borealis</i> ☐, <i>L. convallarioides</i> ☐, <i>L. cordata</i> ☐, <i>Lycopodium annotinum</i> ☐, <i>L. dubium</i> ☐, <i>Machaeranthera coloradensis</i> ☐, <i>Malaxis brachypoda</i> ☐, <i>Mimulus gemmiparus</i> ☐, <i>Parnassia kotzebuei</i> ☐, <i>Pellaea atropurpurea</i> ☐, <i>Penstemon cyathophorus</i> ☐, <i>P. haringtonii</i> ☐, <i>P. penlandii</i> ☐, <i>Petasites sagittatus</i> ☐, <i>Potentilla ambigens</i> ☐, <i>P. rupicola</i> ☐, <i>Pyrola picta</i> ☒, <i>Rubus arcticus</i> ssp. <i>acaulis</i> ☐, <i>Salix candida</i> ☐, <i>Salix serissima</i> ☐, <i>Sceptridium multifidum</i> ☐, <i>Sphagnum</i> spp. ☐, <i>Stipa pinetorum</i> ☐, <i>Utricularia minor</i> ☐, <i>Viola selkirkii</i> ☒, other spp: <i>Festuca hallii</i>
TESP/Local Concern species found (or state "none"): <i>Festuca hallii</i> and <i>Cypripedium fasciculatum</i> (See EO for additional information)

Survey Location Data				6 th Principal Meridian
7.5-minute Quad Name Clark Peak	Township 8N	Range 76W	Section 35 and 36	¼ Section
GPS data: ☒ Complete route tracked ☐ Partial route tracked ☐ Point only ☐ Polygon(s) ☐ No GPS data				

Site Description		
Elevation range (ft.) 9,235 to 12,100	Approx. area of unit (acres) not applicable	Approx. area of survey (acres) 400
Previously harvested? Yes / No / Unk not applicable Year:	Other past disturbances? ☒ Yes / No If yes, describe: Minor old mining disturbance consisting of a few exploratory pits.	

2012 Rare Plant Survey Form
Arapaho & Roosevelt National Forests
& Pawnee National Grassland

Habitat description:

Forested slopes are composed of dense, shady, and moist spruce-fir forest. Alpine slopes are dry and rocky with patches of cushion plant communities at higher elevations.

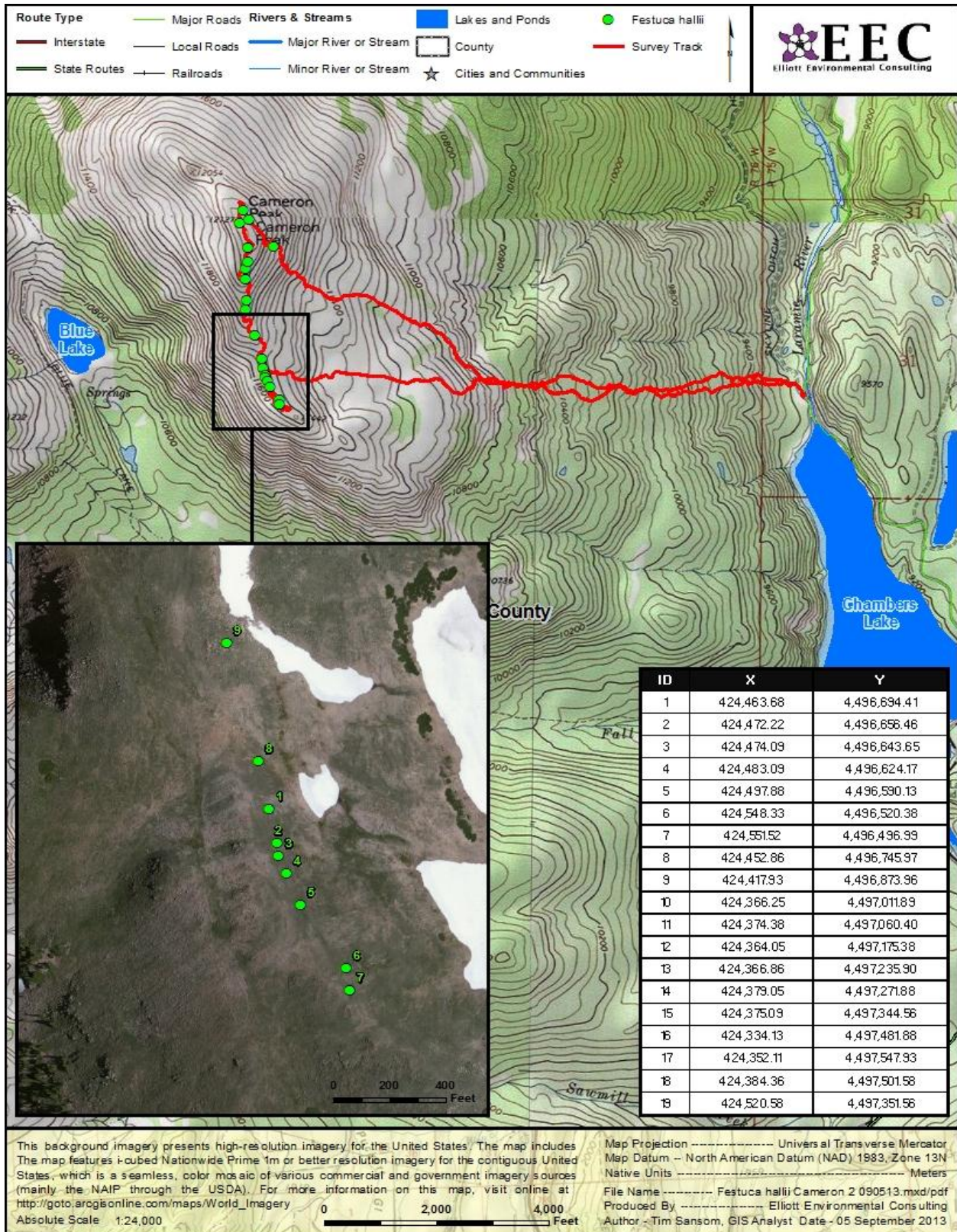
	Species** Note: Species list is solely from the alpine portion of the survey.	Plant Code	Cover, %	Exotic?	Notes
1	<i>Juniperus communis</i>	JUCO6	2	☐	
2	<i>Poa alpina</i>	POAL2	4	☐	
3	<i>Trisetum spicatum</i>	TRSP2	8	☐	
4	<i>Deschampsia cespitosa</i>	DECE	15	☐	
5	<i>Luzula spicata</i>	LUSP4	3	☐	
6	<i>Elymus scribneri</i>	ELSC4	5	☐	
7	<i>Silene acaulis</i>	SIAC	5	☐	
8	<i>Eriogonum umbellatum</i> var. <i>subalpinum</i>	ERUMS7	7	☐	
9	<i>Tetrandeum grandiflora</i>	TEGR3	3	☐	
10	<i>Sibbaldia procumbens</i>	SIPR	5	☐	
11	<i>Eremogone fendleri</i>	ERFE3	5	☐	
12	<i>Campanula groenlandica</i>	CAGR39	2	☐	
13	<i>Achillea millefolium</i>	ACMI2	5	☐	
14	<i>Solidago simplex</i>	SOSI3	5	☐	
15	<i>Eremogone congesta</i>	ERCO24	2	☐	
16	<i>Poa secunda</i> var. <i>secunda</i>	POSES6	8	☐	
17	<i>Geum rossii</i>	GERO2	5	☐	
18	<i>Nocca montana</i>	NOMO2	2	☐	
19	<i>Cryptogramma acrostichoides</i>	CRAC3	2	☐	
20	<i>Oreoxis alpina</i>	ORAL	2	☐	
** List at minimum three most common species of tree, shrub, forb, and graminoid (as well as additional significant associates) and check ☒ habitat					

Survey Comments

Site was accessed from the more direct but far steeper (over 30 degree slopes) and off-trail eastern side due to concerns about thunderstorms. Access is easier but longer on the western side. Habitat for closed canopy forest species is located on lower elevation east-facing slopes.

2012 Rare Plant Survey Form **Arapaho & Roosevelt National Forests** **& Pawnee National Grassland**

-- ATTACH MAP OF SURVEY AREA & UNITS SURVEYED --



2012 Rare Plant Element Occurrence Form
Arapaho & Roosevelt National Forests
& Pawnee National Grassland

General Information		Bold fields are required	
NRIS Site ID: ☐ EO Poly? 021000E_ ☐ through 021000E_		Scientific Name: <i>Festuca hallii</i>	
NRIS Survey ID:		NRIS Survey Name: Cameron Peak directed survey. (Project Name & Unit No.)	
Survey date: 08/13/2013 (Month/day/year, e.g. 01/01/2001)	State/County/Region/Forest/District CO/Larimer/R2/ARNF/Canyon Lakes	GPS Data: ☒ Yes ☐ No If Yes: ☒ Point(s) ☐ Polygon(s)	
Observer name(s): Brian Elliott		Observer qualifications: ☒ Exp ☐ Lmted Exp ☐ No Exp ☐ Unk	
Entered in NRIS by: Primary Data Steward: Steve Popovich, ARP Forest Botanist		Date:	

Element Occurrence Data			
Number of Individuals: 2,140 ☒ Estimated / ☐ Actual ☐ Genets / ☐ Ramets		Number of subpopulations: Nineteen	
		EO sent to CNHP? ☐ Yes ☒ No Date sent:	
Phenology by % (sum to 100%): Vegetative.....40____ Flower/Bud....._____ Fruit/Dispersed.....60____ Seedling/Juvenile.....____		Population Comments (e.g. distribution, vigor, density, phenology, dispersal): Nineteen patches scattered along an alpine ridge at and south of Cameron Peak. Plants robust, vigorous, and producing seed. Patches are dense and discrete. Plants in late flower/early fruit. Evidence of disease, competition, predation, collection, trampling, or herbivory: ☐ Yes ☒ No If yes, comments:	
Specimen Collected? ☒ Yes ☐ No	Collection Number: 16,291 and 16,292 Repository:	Verification: ☒ No ☐ Yes. Authority: Date:	
Photo taken: ☒ Yes ☐ No	Photographer: Brian Elliott Repository: EEC files and ARNF	Photo Number: Numerous photos, see photo log.	Photo Description: Numerous photos, see photo log.

Site Description			
Elevation range (ft.): 11,600–12,100 feet	Slope: ☐ flat ☐ 1°–10° ☐ 10°–25° ☐ 25°–50° ☐ 50°–90° ☒ other: 10–30°	Aspect: ☐ flat ☒ variable East to south-southwest ☐ N ☐ NE ☐ E ☐ SE ☐ S ☐ SW ☐ W ☐ NW	Light Exposure: ☐ shaded ☐ partial shade ☒ open ☐ other:
Slope shape: ☐ concave ☐ convex ☐ straight ☒ other: undulating	Soil moisture: ☒ dry ☐ moist ☐ saturated ☐ inundated ☐ seasonal seepage ☐ other:	Soil type/texture: ☐ clay/silt ☒ loam ☐ sand ☒ gravel/cobble ☒ rocky ☐ bare rock ☐ unknown ☐ other:	
Community Canopy Cover by %: <u>Life form (sum to 100%)</u> Tree.....0____ Shrub.....0____	Habitat Description: Alpine slope and ridgeline with a mix of grasses and forbs. Gravelly with about 20% cover of rock-gravel-bare ground. Current Land Use: Light recreational use.		

2012 Rare Plant Element Occurrence Form
Arapaho & Roosevelt National Forests
& Pawnee National Grassland

Forb.....55_ Graminoid.....40_ Non-vascular.....1_ Lichen.....4_ Algae.....0_	Disturbance/Threats: Potential but minor impact from hikers trampling plants while using ridgeline to access Cameron Peak. Mountain goats present but no herbivory noted. Old mining activity consisting of a few exploratory pits probably over 50 years old. Rodent disturbance common in the area but probably beneficial to <i>Festuca hallii</i> due to soil churning.
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Location Data					6 th Principal Meridian
7.5-minute Quad Name Clark Peak		Township 8N	Range 76W	Section 35	¼ of ¼ Section NE ¼ and SW ¼
UTM (Zone 13S/T) ☒ NAD83 ☐ other:	N E Elevation: pt name: see table below	N E Elevation: pt name see table below	N E Elevation: pt name see table below	N E Elevation: pt name see table below	N E Elevation: pt name see table below
GPS equipment (make and model): ☐ Garmin 76Cx ☒ other: Trimble GEO XT					
Attach a separate sheet for additional points.					

Sci_Name	State	County	ID	# Plants	UTM_N	UTM_E	Elev. (ft.)
<i>Festuca hallii</i>	CO	Larimer	FEHA1	250	4496694.410700	424463.682906	11677
<i>Festuca hallii</i>	CO	Larimer	FEHA2	100	4496656.464470	424472.219325	11669
<i>Festuca hallii</i>	CO	Larimer	FEHA3	150	4496643.647310	424474.090321	11672
<i>Festuca hallii</i>	CO	Larimer	FEHA4	200	4496624.167740	424483.093910	11679
<i>Festuca hallii</i>	CO	Larimer	FEHA5	25	4496590.133380	424497.881893	11686
<i>Festuca hallii</i>	CO	Larimer	FEHA6	250	4496520.380570	424548.325404	11657
<i>Festuca hallii</i>	CO	Larimer	FEHA7	50	4496496.988520	424551.523592	11636
<i>Festuca hallii</i>	CO	Larimer	FEHA8	50	4496745.973060	424452.858104	11678
<i>Festuca hallii</i>	CO	Larimer	FEHA9	100	4496873.963740	424417.931510	11782
<i>Festuca hallii</i>	CO	Larimer	FEHA10	75	4497011.889910	424366.246549	11882
<i>Festuca hallii</i>	CO	Larimer	FEHA11	200	4497060.395110	424374.380084	11944
<i>Festuca hallii</i>	CO	Larimer	FEHA12	100	4497175.380080	424364.049281	12011
<i>Festuca hallii</i>	CO	Larimer	FEHA13	20	4497235.900520	424366.856934	12044
<i>Festuca hallii</i>	CO	Larimer	FEHA14	30	4497271.879350	424379.053944	12069
<i>Festuca hallii</i>	CO	Larimer	FEHA15	150	4497344.561370	424375.093182	12094
<i>Festuca hallii</i>	CO	Larimer	FEHA16	150	4497481.880170	424334.126905	12114
<i>Festuca hallii</i>	CO	Larimer	FEHA17	50	4497547.927250	424352.107265	12089
<i>Festuca hallii</i>	CO	Larimer	FEHA18	150	4497501.583780	424384.355065	12090
<i>Festuca hallii</i>	CO	Larimer	FEHA19	40	4497351.558160	424520.579546	11933

2012 Rare Plant Element Occurrence Form
Arapaho & Roosevelt National Forests
& Pawnee National Grassland

Comments

Plants are near top of ridge south of Cameron Peak. Plants usually growing in a low swale with a high percentage of vegetative cover compared to adjacent ground that has more rock and bare ground. Patches are small, usually about 100–1,000 square feet.

Dr. Weber states that the species is known "...from the summit of Cameron Peak where it grows in an island of *Kobresia*." As a result of this statement surveys were intended to be focused on areas with *Kobresia*. However, the species was located prior to entering any *Kobresia* stands. As the survey progressed and more sites were identified, the lack of *Kobresia* began to cause concern. At last, however, stands of *Kobresia* with *Festuca hallii* were located near the summit of Cameron Peak. Of the nineteen *Festuca hallii* sites on Cameron Mountain, only four were with *Kobresia*, indicating that Dr. Weber most likely saw only the uppermost sites.

Several observers have reported that *Festuca hallii* is often found in areas with soil turned by gophers or other rodents (Anderson 2006). Several of the nineteen sites on Cameron Peak showed signs of soil churning by rodents (see Figure X, below).

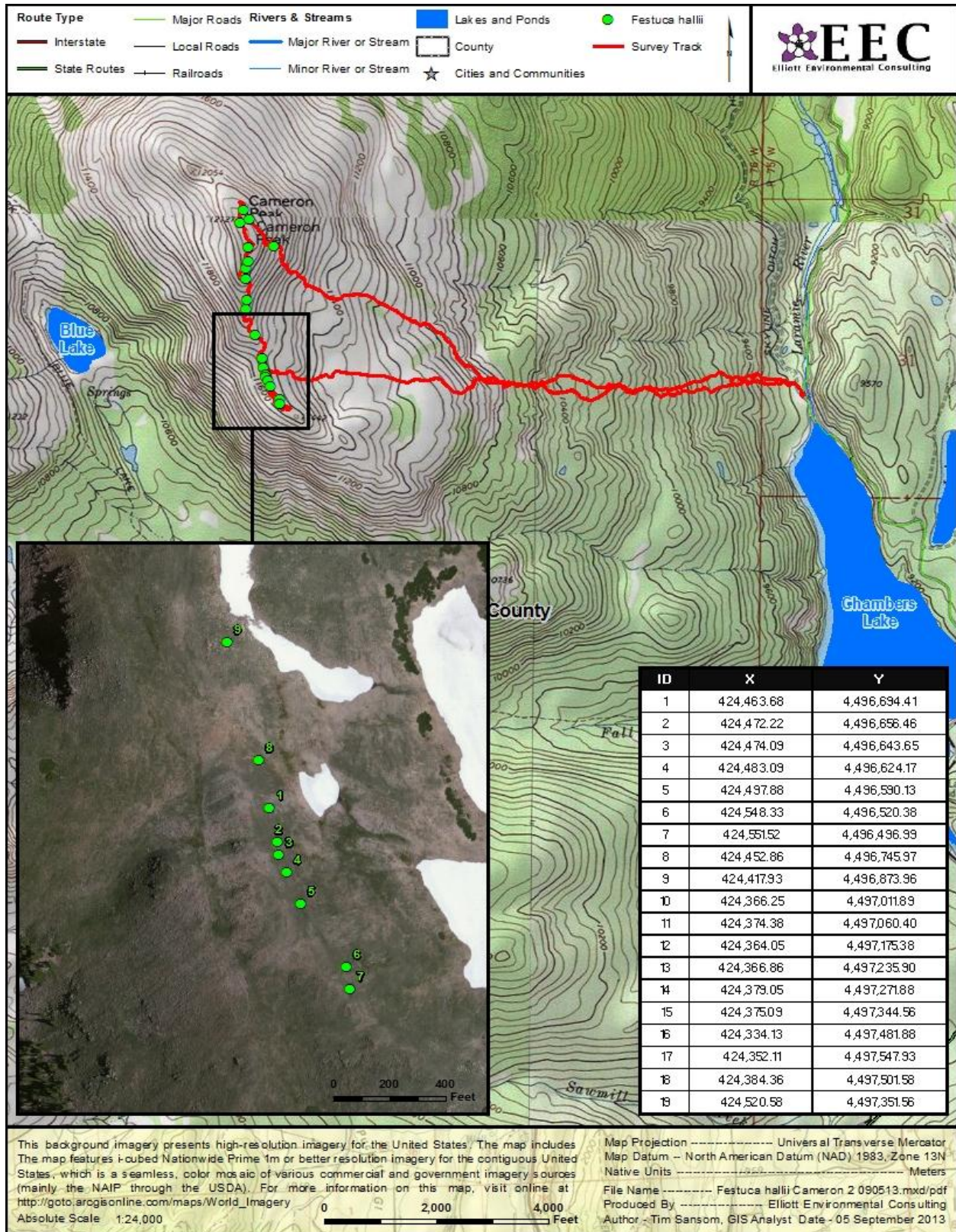
One characteristic that all nineteen sites shared was deep soils. *Festuca hallii* was always found on the lee (east) side of the ridge in patches of deep soil. Whether the soil was deep due to the presence of *Festuca hallii* or whether *Festuca hallii* simply colonized patches of deeper soil is unknown. In Figure x, below, *Festuca hallii* is growing on deep soils in the lower left portion of the photograph. Immediately adjacent to and surrounding the *Festuca hallii* are thin, rocky, and barren soils often dominated by a cushion plant community markedly different from the *Festuca hallii* stand immediately adjacent to it. The depth and looseness of the soils was remarkable; when vouchers were collected an attempt was made to collect underground rhizomes and the collecting tool (a Japanese gardening tool called a hori-hori) with a 6.5 inch blade sank with ease to the hilt.

Most common associates were *Trisetum spicatum* ssp. *congdonii*, *Poa secunda* var. *secunda*, and *Achillea millefolium*.

	Species**	Plant Code	Cover, %	Exotic?	Notes
1	<i>Geum rossii</i>	GERO2	15	☐	
2	<i>Sedum lanceolatum</i>	SELA	5	☐	
3	<i>Poa secunda</i> var. <i>secunda</i>	POSES6	10	☐	
4	<i>Achillea millefolium</i>	ACMI2	15	☐	
5	<i>Campanula groenlandica</i>	CAGR39	5	☐	
6	<i>Eremogone fendleri</i>	ERFE3	5	☐	
7	<i>Artemisia scopulorum</i>	ARSC	5	☐	
8	<i>Trisetum spicatum</i> ssp. <i>congdonii</i>	TRSPC	5	☐	
9	<i>Minuartia obtusiloba</i>	MIOB	10	☐	
10				☐	
11				☐	
12				☐	
13				☐	
** List at minimum three most common species of tree, shrub, forb, and graminoid (as well as additional significant associates), and check ☒ habitat					

**2012 Rare Plant Element Occurrence Form
Arapaho & Roosevelt National Forests
& Pawnee National Grassland**

ATTACH MAP OF SURVEY AREA & UNITS SURVEYED -



2012 Rare Plant Element Occurrence Form
Arapaho & Roosevelt National Forests
& Pawnee National Grassland

General Information		Bold fields are required
NRIS Site ID: ☐ EO Poly? 021000E_ ☐ through 021000E_	Scientific Name: <i>Cypripedium fasciculatum</i>	NRCS Plant Code: CYFA
NRIS Survey ID:		NRIS Survey Name: Cameron Peak directed survey. (Project Name & Unit No.)
Survey date: 08/13/2013 (Month/day/year, e.g. 01/01/2001)	State/County/Region/Forest/District CO/Larimer/R2/ARNF/Canyon Lakes	GPS Data: ☒ Yes ☐ No If Yes: ☒ Point(s) ☐ Polygon(s)
Observer name(s): Brian Elliott		Observer qualifications: ☒ Exp ☐ Lmt'd Exp ☐ No Exp ☐ Unk
Entered in NRIS by: Primary Data Steward: Steve Popovich, ARP Forest Botanist		Date:

Element Occurrence Data			
Number of Individuals: 40 ☐ Estimated / ☒ Actual ☐ Genets / ☐ Ramets	Number of subpopulations: Two were documented approximately 150 feet apart, and more subpopulations are likely.	EO sent to CNHP? ☐ Yes ☒ No Date sent:	
Phenology by % (sum to 100%): Vegetative....._50_ Flower/Bud..... Fruit/Dispersed....._50_ Seedling/Juvenile.....	Population Comments (e.g. distribution, vigor, density, phenology, dispersal): Two patches approximately 150 feet away were found. Plants were scattered (i.e. not in dense in dense patches) and appeared healthy and vigorous. About ½ of the plants were bearing flowers. Evidence of disease, competition, predation, collection, trampling, or herbivory: ☐ Yes ☒ No If yes, comments:		
Specimen Collected? ☐ Yes ☒ No	Collection Number: Repository:	Verification: ☐ No ☐ Yes. Authority: Date:	
Photo taken: ☒ Yes ☐ No	Photographer: Brian Elliott Repository: EEC files and ARNF	Photo Number: Numerous photos, see photo log.	Photo Description: Numerous photos, see photo log.

Site Description			
Elevation range (ft.): 9,300–9,400 feet	Slope: ☐ flat ☐ 1°–10° ☒ 10°–25° ☐ 25°–50° ☐ 50°–90° ☐ other: 10–30°	Aspect: ☐ flat ☐ variable ☐ N ☐ NE ☒ E ☐ SE ☐ S ☐ SW ☐ W ☐ NW	Light Exposure: ☒ shaded ☐ partial shade ☐ open ☐ other:
Slope shape: ☐ concave ☐ convex ☐ straight ☒ other: undulating	Soil moisture: ☐ dry ☒ moist ☐ saturated ☐ inundated ☐ seasonal seepage ☐ other:	Soil type/texture: ☐ clay/silt ☒ loam ☐ sand ☐ gravel/cobble ☐ rocky ☐ bare rock ☐ unknown ☐ other:	
Community Canopy Cover by %: Life form (sum to 100%) Tree....._70_	Habitat Description: Dense spruce-fir forest with a shaded understory. Current Land Use: Site is steep and off-trail. No use was observed.		

2012 Rare Plant Element Occurrence Form
Arapaho & Roosevelt National Forests
& Pawnee National Grassland

Shrub.....15____ Forb.....7____ Graminoid.....2____ Non-vascular.....4____ Lichen.....2____ Algae.....0____	Disturbance/Threats: No disturbance or threats were noted.
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Location Data					6 th Principal Meridian
7.5-minute Quad Name Clark Peak	Township 8N	Range 76W	Section 36	¼ of ¼ Section NE ¼ of SW ¼	
UTM (Zone 13S/T) X NAD83 ☐ other:	N: 4496635 E: 427116 Elevation: 9,300 feet pt name: CYFA1	N: 4496617 E: 427093 Elevation: 9,390 feet pt name: CYFA2	N E Elevation: pt name	N E Elevation: pt name	N E Elevation: pt name
GPS equipment (make and model): ☐ Garmin 76Cx X other: Trimble GEO XT Attach a separate sheet for additional points.					

Comments
Plants are on a steep east-facing slope in relatively dense spruce-fir forest. Forest understory is depauperate with much bare ground. Many bryophytes are present. Site is off-trail and no human presence or impact was noted. Additional plants and populations are likely present in the area, probably in a band at about the same elevation.

	Species**	Plant Code	Cover, %	Exotic?	Notes
1	<i>Picea engelmannii</i>	PIEN	40	☐	
2	<i>Abies lasiocarpa</i> var. <i>lasiocarpa</i>	ABLAL	30	☐	
3	<i>Vaccinium scoparium</i>	VASC	10	☐	
4	<i>Orthilia secunda</i>	ORSE	2	☐	
5	<i>Arnica cordifolia</i>	ARCO9	2	☐	
6	<i>Rosa woodsii</i>	ROWO	5	☐	
7	<i>Carex geyeri</i>	CAGE2	3	☐	
8				☐	
9				☐	
** List at minimum three most common species of tree, shrub, forb, and graminoid (as well as additional significant associates), and check ☒ habitat					

ATTACH MAP OF SURVEY AREA & UNITS SURVEYED -



**2012 Rare Plant Survey Form
Arapaho & Roosevelt National Forests
& Pawnee National Grassland**

Survey Information		Bold fields are required	
NRIS Survey ID:		NRIS Survey Name: Shipman Park directed survey. (Project Name & Unit No.)	
Survey date: 08/23/2013 to 08/24/13 (Month/day/year, e.g. 01/01/2001)	Survey start/stop time: 0500/1800 each day (24 hr. military time)	State/County/Region/Forest/District CO/Larimer/R2/ARNF/Canyon Lakes	
Observer name(s): Brian Elliott		Observer qualifications: ☒ Exp ☐ Lmtd Exp ☐ No Exp ☐ Unk	
Survey protocol: Field Check ☒ Focused (Intuitive Controlled) Complete (NRIS 'General') Systematic			
Entered in NRIS by:		Date:	
Primary Data Steward: Steve Popovich, ARP Forest Botanist			

TESP/Species of Local Concern Information
Circle target species, ☒ = survey showed habitat present: <i>Aletes humilis</i> ☐, <i>Aralia nudicaulis</i> ☐, <i>Asclepias uncialis</i> ☐, <i>Astragalus kentrophyta</i> ☐, <i>A. leptaleus</i> ☐, <i>A. osterhoutii</i> ☐, <i>Botrychium ascendens</i> ☐, <i>B. campestre</i> (suite) ☐, <i>B. furculatum</i> ☐, <i>B. simplex</i> ☐, <i>Botrychium</i> spp. ☐, <i>Calypso bulbosa</i> ☐, <i>Carex diandra</i> ☐, <i>C. lasiocarpa</i> ☐, <i>C. leptalea</i> ☐, <i>C. limosa</i> ☐, <i>C. livida</i> ☐, <i>Cornus canadensis</i> ☐, <i>Cypripedium fasciculatum</i> ☐, <i>C. parviflorum</i> ☐, <i>Cystopteris montana</i> ☐, <i>Drosera rotundifolia</i> ☐, <i>Eriogonum exifolium</i> ☐, <i>Eriophorum</i> spp. ☐, Rare Ferns ☐, <i>Fritillaria atropurpurea</i> ☐, <i>Goodyera repens</i> ☐, <i>Kalmia microphylla</i> ☐, <i>Lewisia rediviva</i> ☐, <i>Lilium philadelphicum</i> ☐, <i>Listera borealis</i> ☐, <i>L. convallarioides</i> ☐, <i>L. cordata</i> ☐, <i>Lycopodium annotinum</i> ☐, <i>L. dubium</i> ☐, <i>Machaeranthera coloradensis</i> ☒, <i>Malaxis brachypoda</i> ☐, <i>Mimulus gemmiparus</i> ☐, <i>Parnassia kotzebuei</i> ☐, <i>Pellaea atropurpurea</i> ☐, <i>Penstemon cyathophorus</i> ☐, <i>P. haringtonii</i> ☐, <i>P. penlandii</i> ☐, <i>Petasites sagittatus</i> ☐, <i>Potentilla ambigens</i> ☐, <i>P. rupicola</i> ☐, <i>Pyrola picta</i> ☐, <i>Rubus arcticus</i> ssp. <i>acaulis</i> ☐, <i>Salix candida</i> ☐, <i>Salix serissima</i> ☐, <i>Sceptridium multifidum</i> ☐, <i>Sphagnum</i> spp. ☐, <i>Stipa pinetorum</i> ☐, <i>Utricularia minor</i> ☐, <i>Viola selkirkii</i> ☐, other spp: <i>Festuca hallii</i>
TESP/Local Concern species found (or state "none"): <i>Festuca hallii</i> (See EO for additional information)

Survey Location Data				6 th Principal Meridian
7.5-minute Quad Name Shipman Peak	Township 10N	Range 77W	Section 21, 22, 27, and 28	¼ Section
GPS data: ☒ Complete route tracked ☐ Partial route tracked ☐ Point only ☐ Polygon(s) ☐ No GPS data				

Site Description		
Elevation range (ft.) 9,500 to 9,600	Approx. area of unit (acres) not applicable	Approx. area of survey (acres) 800
Previously harvested? Yes / No / Unk not applicable Year:	Other past disturbances? ☒ Yes / No If yes, describe: Historic livestock grazing.	

2012 Rare Plant Survey Form
Arapaho & Roosevelt National Forests
& Pawnee National Grassland

Habitat description:

Large graminoid dominated montane-subalpine parkland composed of:

- vernal wet hummocks dominated by *Deschampsia caespitosa*.
- willow carr, occasionally with bog birch.
- dry grassland dominated by *Danthonia intermedia* and *Carex rossii*.
- wet sedge/rush meadows.
- dry hummocks.
- *Potentilla fruticosa* shrubland.
- wetland.

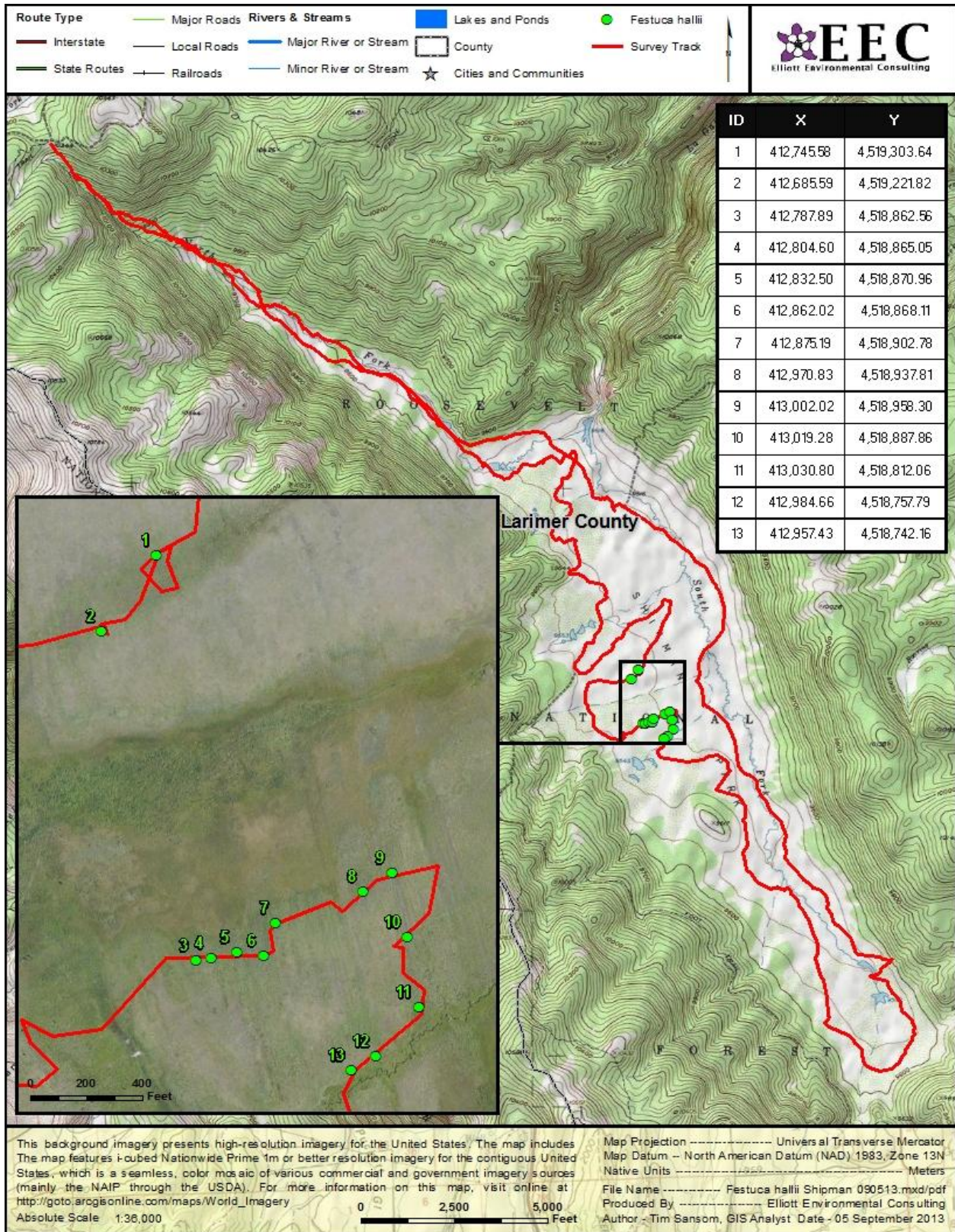
	Species** Note: Species list is solely from the alpine portion of the survey.	Plant Code	Cover, %	Exotic?	Notes
1	<i>Salix brachycarpa</i>	SABR	15	☐	
2	<i>Salix boothii</i>	SABO2	15	☐	
3	<i>Dasiphora floribunda</i>	DAFR6	3	☐	
4	<i>Betula glandulosa</i>	BEGl	1	☐	
5	<i>Deschampsia cespitosa</i>	DECE	15	☐	
6	<i>Danthonia intermedia</i>	DAIN	20	☐	
7	<i>Trisetum spicatum</i>	TRSP2	2	☐	
8	<i>Poa fendleriana</i>	POFE	3	☐	
9	<i>Poa palustris</i>	POPA2	5	☐	
10	<i>Poa alpina</i>	POAL2	1	☐	
11	<i>Bromus lanatipes</i>	BRLA6	3	☐	
12	<i>Leucopoa kingii</i>	LEKI2	3	☐	
13	<i>Carex cf rossi</i>	CARO515	5	☐	
14	<i>Festuca idahoensis</i>	FEID	7	☐	
15	<i>Elymus elymoides</i>	ELEL5	3	☐	
16	<i>Cirsium scariosum</i>	CISC2	1	☐	
17	<i>Polygonum douglasii</i>	PODO4	1	☐	
18	<i>Agoseris glauca</i>	AGGL	1	☐	
19	<i>Achillea millefolium</i>	ACMI2	3	☐	
20	<i>Solidago simplex</i>	SOSI3	1	☐	
** List at minimum three most common species of tree, shrub, forb, and graminoid (as well as additional significant associates) and check ☒ habitat					

Survey Comments

Shipman Park is in the RAWAH Wilderness. Trail access from the south is quite long, while off-trail access from the north is considerably shorter. Due to the desire to spend as much time as possible performing surveys for *Festuca hallii* (rather than hiking in to the site) the survey site was accessed from the north. The entire Park was surveyed, although areas of higher potential habitat received closer scrutiny.

**2012 Rare Plant Survey Form
Arapaho & Roosevelt National Forests
& Pawnee National Grassland**

-- ATTACH MAP OF SURVEY AREA & UNITS SURVEYED --



2012 Rare Plant Element Occurrence Form
Arapaho & Roosevelt National Forests
& Pawnee National Grassland

General Information		Bold fields are required	
NRIS Site ID: ☐ EO Poly? 021000E_ ☐ through 021000E_		Scientific Name: <i>Festuca hallii</i>	
NRIS Survey ID:		NRIS Survey Name: Shipman Park directed survey. (Project Name & Unit No.)	
Survey date: 08/23/2013 (Month/day/year, e.g. 01/01/2001)	State/County/Region/Forest/District CO/Larimer/R2/ARNF/Canyon Lakes	GPS Data: ☒ Yes ☐ No If Yes: ☒ Point(s) ☐ Polygon(s)	
Observer name(s): Brian Elliott		Observer qualifications: ☒ Exp ☐ Lmted Exp ☐ No Exp ☐ Unk	
Entered in NRIS by: Primary Data Steward: Steve Popovich, ARP Forest Botanist		Date:	

Element Occurrence Data			
Number of Individuals: 316 (this is likely a significant undercounting of the population resulting from the majority (>65%) of plants being vegetative and difficult to accurately count. ☒ Estimated / ☐ Actual ☐ Genets / ☐ Ramets		Number of subpopulations: Thirteen	EO sent to CNHP? ☐ Yes ☒ No Date sent:
Phenology by % (sum to 100%): Vegetative..... 65____ Flower/Bud..... _____ Fruit/Dispersed..... 35____ Seedling/Juvenile..... _____	Population Comments (e.g. distribution, vigor, density, phenology, dispersal): Thirteen patches in central Shipman Park. Plants inhabit large, densely packed dry hummocks and are depauperate and mostly vegetative. Plants in late flower/early fruit.		
Evidence of disease, competition, predation, collection, trampling, or herbivory: ☐ Yes ☒ No If yes, comments:			
Specimen Collected? ☒ Yes ☐ No	Collection Number: 16,294, 16,295, 16,296, and 16,297 Repository:	Verification: ☒ No ☐ Yes. Authority: Date:	
Photo taken: ☒ Yes ☐ No	Photographer: Brian Elliott Repository: EEC files and ARNF	Photo Number: Numerous photos, see photo log.	Photo Description: Numerous photos, see photo log.

Site Description			
Elevation range (ft.): 11,600–12,100 feet	Slope: ☒ flat to ☒ 1°–10° ☐ 10°–25° ☐ 25°–50° ☐ 50°–90° ☐ other: 10–30°	Aspect: ☒ flat ☐ variable ☐ N ☐ NE ☒ E ☐ SE ☐ S ☐ SW ☐ W ☐ NW	Light Exposure: ☐ shaded ☐ partial shade ☒ open ☐ other:
Slope shape: ☐ concave ☐ convex ☒ straight ☐ other: undulating	Soil moisture: ☒ dry ☐ moist ☐ saturated ☐ inundated ☐ seasonal seepage ☐ other:	Soil type/texture: ☐ clay/silt ☒ loam ☐ sand ☐ gravel/cobble ☐ rocky ☐ bare rock ☐ unknown ☐ other:	
Community Canopy Cover by %: <u>Life form (sum to 100%)</u> Tree..... 0____ Shrub..... 3____	Habitat Description: Large montane-subalpine park dominated by graminoids but with a minor forb component. Current Land Use: Shipman Park is in the Rawah Wilderness Area and little human use was noted. It is an important wildlife area (deer, elk, and moose were seen) and is likely a popular hunting area.		

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Forb.....30_ Graminoid.....62_ Non-vascular.....2_ Lichen.....3_ Algae.....0_	Disturbance/Threats: None. Historic livestock grazing but no recent evidence of cattle.
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Location Data					6 th Principal Meridian
7.5-minute Quad Name Shipman Mountain		Township 10N	Range 77W	Section 21	¼ of ¼ Section
UTM (Zone 13S/T) ☒ NAD83 ☐ other:	N E Elevation: pt name: see table below	N E Elevation: pt name see table below	N E Elevation: pt name see table below	N E Elevation: pt name see table below	N E Elevation: pt name see table below
GPS equipment (make and model): ☐ Garmin 76Cx ☒ other: Trimble GEO XT Attach a separate sheet for additional points.					

Sci_Name	State	County	ID	# Plants	UTM_E	UTM_N	Elev. (ft.)
<i>Festuca hallii</i>	CO	Larimer	FEHA1	6 plants	412745.575156	4519303.636880	9579
<i>Festuca hallii</i>	CO	Larimer	FEHA2	50 plants	412685.593853	4519221.819430	9585
<i>Festuca hallii</i>	CO	Larimer	FEHA3	25+ plants	412787.889364	4518862.555820	9511
<i>Festuca hallii</i>	CO	Larimer	FEHA4	10+ plants	412804.604462	4518865.050420	9552
<i>Festuca hallii</i>	CO	Larimer	FEHA5	20+ plants	412832.504183	4518870.963440	9552
<i>Festuca hallii</i>	CO	Larimer	FEHA6	40+ plants	412862.022846	4518868.105390	9559
<i>Festuca hallii</i>	CO	Larimer	FEHA7	5+ plants	412875.194025	4518902.782200	9551
<i>Festuca hallii</i>	CO	Larimer	FEHA8	50+ plants	412970.834439	4518937.811330	9549
<i>Festuca hallii</i>	CO	Larimer	FEHA9	20+ plants	413002.017084	4518958.301120	9543
<i>Festuca hallii</i>	CO	Larimer	FEHA10	20+ plants	413019.276747	4518887.855620	9571
<i>Festuca hallii</i>	CO	Larimer	FEHA11	20+ plants	413030.804657	4518812.056320	9554
<i>Festuca hallii</i>	CO	Larimer	FEHA12	10+ plants	412984.660947	4518757.790940	9529
<i>Festuca hallii</i>	CO	Larimer	FEHA13	40+ plants	412957.430945	4518742.159770	9529

Comments
Shipman Park is a large montane-subalpine opening comprised of the following habitat types (in descending order of estimated acreage): • vernal wet hummocks dominated by <i>Deschampsia caespitosa</i>. • willow carr, occasionally with bog birch. • dry grassland dominated by <i>Danthonia xxx</i> and <i>Carex rossii</i>. • wet sedge/rush meadows. • dry hummocks. • <i>Potentilla fruticosa</i> shrubland. • wetland. <i>Festuca hallii</i> was located solely on dry hummocks, and this habitat comprises less than 10% (and probably less than 5%) of the area in Shipman Park. These hummocks are vernal moist but were completely dry on August 23. In contrast to the loose and friable soils found on Cameron Mountain (and on Cordova Pass as well) these soils were extremely hard-packed and great difficulty was encountered in collecting roots and rhizomes. It appeared that the hummocks had been in place for

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many years and the plants inhabiting them had become root bound within the limited available space. The most common species sharing the hummock were *Muhlenbergia wrightii* and *Elymus trachycaulus*.

The dry hummock habitat is visible on aerial imagery and can be seen on the inset located in Figure X. Dark green in the center of the inset is a willow carr, while the large light-colored areas are dry *Danthonia/Carex* grasslands. *Festuca hallii* is found on the light green sections of the map.

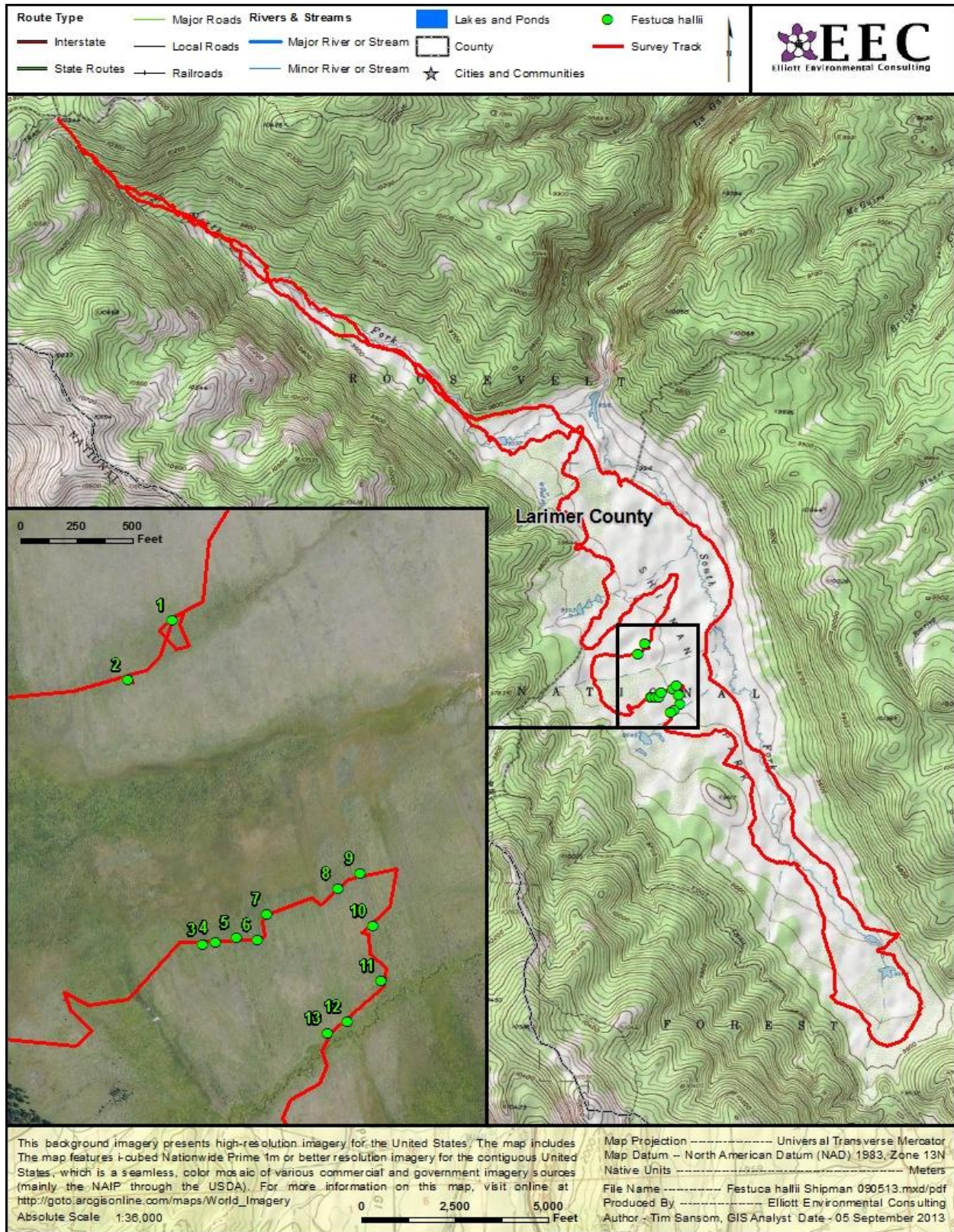
A relatively low estimated percentage (35%) of plants at the site bore flowers or fruits. It is possible that this low percentage results from nutrient exhaustion of the limited soil within the large and dense hummocks inhabited by *Festuca hallii* at the site. *Festuca hallii* is usually a large and robust grass, but vouchers taken from the site appear dwarfed, also possibly due to nutrient exhaustion. An analysis of soil nutrients from within soil cores taken from hummocks at the site would be a fascinating study.

	Species**	Plant Code	Cover, %	Exotic?	Notes
1	<i>Muhlenbergia wrightii</i>	MUWR	20	☐	A common associate.
2	<i>Juncus balticus</i>	JUBA	5	☐	
3	<i>Achillea millefolium</i>	ACMI2	5	☐	
4	<i>Thalictrum alpinum</i>	THAL	5	☐	
5	<i>Antennaria</i> sp.	ANTEN	5	☐	Vegetative.
6	<i>Taraxacum officinale</i>	TAOF	15	☒	Plants database lists the species as both introduced and native in the lower 48 states.
7	<i>Festuca</i> cf <i>idahoensis</i>	FEID	5	☐	Vegetative.
8	<i>Carex</i> sp.	CAREX	2	☐	Vegetative.
9	<i>Cirsium scariosum</i>	CISC2	5	☐	
10	<i>Swertia perennis</i>	SWPE	3	☐	
11	<i>Oxytropis splendens</i>	OXSP	3	☐	
12	<i>Elymus lanceolatus</i>	ELTR7	15	☐	A common associate.
13				☐	
14				☐	
15				☐	

** List at minimum three most common species of tree, shrub, forb, and graminoid (as well as additional significant associates), and check ☒ habitat

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-- ATTACH MAP OF SURVEY AREA & UNITS SURVEYED --



Appendix 2: Herbarium Labels

Herbarium labels were created for vouchers collected during the survey. To date vouchers have been deposited at the University of Colorado Herbarium (COLO accession number 54511 for Elliott 16,299 and COLO accession number 545112 for Elliott 16,295). Duplicate sheets will be deposited in other herbaria, likely including the Rocky Mountain Herbarium (RM), Colorado State University Herbarium (CS), and the ARP working herbarium located at the ARP Forest Supervisor's Office located in Fort Collins, Colorado.

FOREST SERVICE HERBARIUM
U.S. DEPARTMENT OF AGRICULTURE
Arapaho-Roosevelt National Forest

***Festuca hallii* (Vasey) Piper**

Common name: Plains rough fescue

United States: Colorado: Larimer County: Roosevelt National Forest. Plants are scattered along an alpine ridge at and south of Cameron Peak. Plants growing in small areas of relatively deeper soil amongst rocky alpine habitat. Some rodent disturbance in the area.

T8N R76W Section 35 NW ¼, 6th P.M.
UTM 13N (NAD83): 4496694.4 N, 424463.7 E.

Habitat: Rocky alpine ridgeline.

Associates: *Poa secunda* var. *secunda*, *Trisetum spicatum* ssp. *congdonii*, *Geum rossii*, *Achillea millefolium*, *Eremogone fendleri*.

Elevation: 11,680 feet.

Brian Elliott Collection Number: 16,291

August 13, 2013

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T8N R76W Section 35 SW ¼, 6th P.M.
UTM 13N (NAD83): 4496520.4 N, 424548.3 E.

Habitat: Rocky alpine ridgeline.

Associates: *Poa secunda* var. *secunda*, *Trisetum spicatum* ssp. *congdonii*, *Geum rossii*, *Achillea millefolium*, *Eremogone fendleri*.

Elevation: 11,660 feet.

Brian Elliott Collection Number: 16,292

August 13, 2013

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***Festuca hallii* (Vasey) Piper**

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***Festuca hallii* (Vasey) Piper**

Common name: Plains rough fescue

United States: Colorado: Larimer County: Roosevelt National Forest. Plants are located in Shipman Park approximately 5 miles east-northeast of Glendevey, Colorado. *Festuca hallii* grows in large, dense, dry hummocks.

T10N R77W Section 21 SE ¼, 6th P.M.
UTM 13N (NAD83): 4519303.6 N, 412745.6 E.

Habitat: Vernally moist portion of graminoid dominated montane-subalpine park.

Associates: *Muhlenbergia wrightii*, *Elymus trachycaulus*, *Achillea millefolium*.

Elevation: 9,580 feet.

Brian Elliott Collection Number: 16,294

August 23, 2013

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Arapaho-Roosevelt National Forest

***Festuca hallii* (Vasey) Piper**

Common name: Plains rough fescue

United States: Colorado: Larimer County: Roosevelt National Forest. Plants are located in Shipman Park approximately 5 miles east-northeast of Glendevey, Colorado. *Festuca hallii* grows in large, dense, dry hummocks.

T10N R77W Section 21 SE ¼, 6th P.M.
UTM 13N (NAD83): 4519221.8 N, 412685.6 E.

Habitat: Vernally moist portion of graminoid dominated montane-subalpine park.

Associates: *Muhlenbergia wrightii*, *Elymus trachycaulus*, *Achillea millefolium*.

Elevation: 9,585 feet.

Brian Elliott Collection Number: 16,295

August 23, 2013

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Associates: *Muhlenbergia wrightii*, *Elymus trachycaulus*, *Achillea millefolium*.

Elevation: 9,585 feet.

Brian Elliott Collection Number: 16,295

August 23, 2013

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T10N R77W Section 21 SE ¼, 6th P.M.
UTM 13N (NAD83): 4518862.6 N, 412787.9 E.

Habitat: Vernally moist portion of graminoid dominated montane-subalpine park.

Associates: *Muhlenbergia wrightii*, *Elymus trachycaulus*, *Achillea millefolium*.

Elevation: 9,510 feet.

Brian Elliott Collection Number: 16,296

August 23, 2013

FOREST SERVICE HERBARIUM
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Arapaho-Roosevelt National Forest

***Festuca hallii* (Vasey) Piper**

Common name: Plains rough fescue

United States: Colorado: Larimer County: Roosevelt National Forest. Plants are located in Shipman Park approximately 5 miles east-northeast of Glendevy, Colorado. *Festuca hallii* grows in large, dense, dry hummocks.

T10N R77W Section 21 SE ¼, 6th P.M.
UTM 13N (NAD83): 4518887.9 N, 413019.3 E.

Habitat: Vernally moist portion of graminoid dominated montane-subalpine park.

Associates: *Muhlenbergia wrightii*, *Elymus trachycaulus*, *Achillea millefolium*.

Elevation: 9,570 feet.

Brian Elliott Collection Number: 16,297

August 23, 2013

FOREST SERVICE HERBARIUM
U.S. DEPARTMENT OF AGRICULTURE
Arapaho-Roosevelt National Forest

***Festuca hallii* (Vasey) Piper**

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UTM 13N (NAD83): 4518887.9 N, 413019.3 E.

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Associates: *Muhlenbergia wrightii*, *Elymus trachycaulus*, *Achillea millefolium*.

Elevation: 9,570 feet.

Brian Elliott Collection Number: 16,297

August 23, 2013