

A Review of *Carex* in New Mexico: Initial Findings

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During January 8-10, 2014 four botanists convened at the University of New Mexico Herbarium (UNM) to review New Mexico plant specimens in the genus *Carex*. The purpose of the review was 1) to annotate misidentified specimens, and 2) to clarify the status of *Carex* species known to occur in the state of New Mexico. This initial 3-day event launched formation of the Southwest *Carex* Working Group (SWCWG).

SOUTHWEST *CAREX* WORKING GROUP (SWCWG)

The four authors of this paper are all experienced botanists with diverse backgrounds who have over the years developed a particular interest in sedge species in the genus *Carex* while working in states other than New Mexico. James (“Jim”) McGrath has been studying *Carex* species since his days mapping wetlands in Yellowstone National Park in the mid 1990’s. McGrath has specialized in wetlands and has discovered and documented the existence of six *Carex* species previously unrecorded in New Mexico, originally reported under Plant Distribution Reports in The New Mexico Botanist newsletter, and later included in the Flora Neomexicana series (Allred 2012). In 2013 he co-presented (with Bill Norris and Russell Kleinman) a *Carex* identification workshop in New Mexico sponsored by the Native Plant Society of New Mexico. Glenn Rink and Max Licher are based at the Deaver Herbarium at Northern Arizona University in Flagstaff. They have studied *Carex* extensively in Arizona and neighboring states. Their studies have included reviewing the *Carex* collections in 20 herbaria and examining nearly 6,000 *Carex* specimens during the past four years. The culmination of their

efforts has resulted in a document entitled “*Carex* of Arizona” (Rink and Licher 2015 – currently submitted for publication). This document includes a key to Arizona *Carex* species, full descriptions of each species and discussions of various taxonomic, identification, ecological, and habitat issues pertaining to these species. William R. (“Bill”) Norris has studied *Carex* extensively in Iowa, where he has annotated more than 12,000 *Carex* specimens, prepared an unpublished dichotomous key to Iowa’s 120 *Carex* taxa, and co-presented six *Carex* identification workshops. Norris is currently a biology professor at Western New Mexico University in Silver City. He is the author of the *Carex* key in Flora Neomexicana III (Allred & Ivey 2012), a manual dedicated to the identification of New Mexico flora.

Botanist Charles (“Chick”) Keller is also a member of SWCWG, but he has not been as deeply involved in specimen annotation. Like McGrath, Keller discovered several *Carex* species previously unrecorded in the state of New Mexico and he published these in The New Mexico Botanist under Plant Distribution Reports. Keller is the founder of and primary contributor to the Jemez Mountain Herbarium in Los Alamos, New Mexico.

NEW MEXICO SPECIMENS REVIEWED AND ANNOTATED AT SIX REGIONAL HERBARIA

Our 3-day event at the UNM herbarium was just the beginning of our review of New Mexico *Carex*. During 2014 through January 2015, New Mexico *Carex* specimens deposited in the Biology Herbarium (NMC) and the Range Science Herbarium (NMCR) at New Mexico State

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Botanice` est Scientia Naturalis quae Vegetabilium cognitiorem tradit.

— Linnaeus



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University, and at the University of Texas at El Paso Herbarium (UTEP), were reviewed and annotated by Licher, Rink and Norris. All four of us reviewed and annotated New Mexico *Carex* specimens at San Juan College (SJNM) in Farmington, New Mexico in early January 2015. Licher and Rink reviewed a similar collection at the Brigham Young University Herbarium (BRY) in Provo, Utah. Licher and McGrath extended our study of New Mexico *Carex* to the field by making the first Southwest *Carex* Working Group's sedge collecting trip to the Vermejo Park Ranch in Taos County about 25 miles northeast of Questa, New Mexico in late July 2014.

ANNOTATIONS – RULE OF THREE

During our review of UNM, NMC and SJNM specimens, we adopted a Rule of Three regarding the annotation of specimens. That is, we affix an annotation label listing our four names to a given specimen sheet if three of us agree on a determination. We decided that if three of us agreed on a determination, then confirmation by a fourth reviewer was unnecessary. This procedure evolved because sometimes it was logistically difficult for all four of us to review every single specimen.

GOALS

It is our intent to improve the understanding of the large and complex genus *Carex*, which is the second most diverse genus (after *Astragalus*) in the New Mexico vascular plant flora. It is our intention that this paper will be the first of a series of publications focused on New Mexico *Carex* taxa. In this paper we first summarize our findings during reviews of the UNM, NMC and SJNM collections based on databases that we developed for those collections. Secondly, we identify and discuss additions, deletions and nomenclature upgrades to the New Mexico flora based on our review of all of the above-described herbaria. In this discussion, we clarify the status of several *Carex* taxa previously thought to exist in New Mexico, but for which verification of their existence in this state is needed.

Future publications will focus on specific sections of genus *Carex* as described in Volume 23 of Flora of North America (Ball and Reznicek 2002). Each publication will focus on a particular section or sections of genus *Carex*. By focusing on a few closely related species we can highlight the morphological, ecological and habitat characteristics that distinguish these species from one another as well as from other species of *Carex*.

REVIEW OF UNM, NMC, AND SJNM COLLECTIONS – A SUMMARY

UNM

We annotated 714 specimens at UNM representing 48 *Carex* taxa. In this process, we determined 26 specimens (3.6%) for which there was no specific epithet. Furthermore, we annotated 17 specimens as *Carex* sp. because of their immature and/or fragmentary condition that precluded their accurate determination to species level. Among these 17

specimens were 15 that we downgraded from a previous species determination. We determined that 51 of 671 specimens (7.6%) which had a previous determination were misidentified. An additional 27 specimens are currently under review by Norris and eight highly questionable specimens were sent to North American *Carex* expert Anton A. Reznicek (University of Michigan) for determination. The most commonly misidentified specimens were *Carex emoryi*, *C. nebrascensis*, *C. petasata*, *C. praegracilis* and *C. siccata*.

Finally, we set aside for later review all UNM specimens representing taxa in *Carex* section *Acrocystis* (i.e., *Carex geophila*, *C. inops* subsp. *heliophila*, *C. pityophila*, *C. rossii*) and many specimens in *Carex* section *Ovales* because they were too difficult for us to confidently determine in a short time period.

NMC

The Southwest *Carex* Working Group reviewed all 159 *Carex* specimens in the NMC collection. We upgraded the nomenclature of 24 specimens (15.1%), and corrected the identification of 39 (24.5%) misidentified specimens. The most commonly misidentified species were *Carex inops* subsp. *heliophila*, *C. occidentalis*, *C. praegracilis*, and *C. wootonii*. We could not reach consensus on determinations of 11 specimens due to immature or poor quality specimens or to taxa that are not clearly defined. Nor could we reach agreement on the identity of two additional specimens, which will be sent to A.A. Reznicek for determination.

SJNM

We annotated 166 *Carex* specimens representing 40 taxa during our review of the *Carex* collection in the San Juan College Herbarium. We provided nomenclature upgrades for eight (4.8%) specimens and we decided that two specimens were not identifiable and annotated them as *Carex* sp. We determined that 63 of the remaining 164 specimens (38.4%) were misidentified. The most commonly misidentified species were *C. microptera*, *C. occidentalis* and *C. siccata*. Less commonly misidentified taxa included *C. bella*, *C. douglasii*, *C. duriuscula*, *C. inops* subsp. *heliophila* and *C. praegracilis*.

ADDITIONS AND DELETIONS TO THE NEW MEXICO FLORA

Carex kelloggii W. Boott – Nomenclatural Upgrade

A recent publication by Dragon and Barrington (2009) recognized *Carex lenticularis* Michaux var. *lipocarpa* (Holm) L. Standley as *Carex kelloggii* W. Boott. We have accepted this nomenclatural change. Dragon and Barrington (2009) recognized other varieties of *Carex lenticularis*, but we have encountered none of these in our review of *Carex* collections in New Mexico. The treatment of *Carex* Section *Phacocystis* by Standley et al. (2002) reports that the other varieties of *C. lenticularis* occur in geographic regions (Pacific northwest, Pacific coast states, northern U.S and Canada) far distant from New Mexico.

A collections search on SEINet (2014), an on-line searchable database of plant specimens housed in more than

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100 herbaria mostly in the southwestern United States, revealed only eight *Carex kelloggii* specimens collected in New Mexico. Our review of UNM specimens revealed several specimens identified as what we now recognize as *C. kelloggii* to be other members of section *Phacocystis*, especially *C. aquatilis* Wahlenberg var. *aquatilis*, *C. nebrascensis* Dewey and *C. emoryi* Dewey. *Carex kelloggii* is cespitose, whereas the latter two species are long-rhizomatous. *C. kelloggii* normally has only one staminate spike, while *C. aquatilis* var. *aquatilis* and *C. emoryi* typically have more than one staminate spike (Rink and Licher 2015; Standley et al. 2002).

***Carex aureolensis* Steudel (Verified as part of the New Mexico flora) and**

***Carex frankii* Kunth (Dropped from the New Mexico flora)**

Several sedge specimens originally determined as *Carex frankii* Kunth and collected in New Mexico are housed in five western herbaria (UNM, NMC, BRY, UTEP and UCR – University of California, Riverside). All of these specimens have been reviewed by us except for two deposited at UCR. However, the UCR specimens are duplicates of specimens that we reviewed at other herbaria. Based on our review of these specimens we conclude that all New Mexico specimens originally determined as *Carex frankii* Kunth are, in fact, *Carex aureolensis* Steudel. Hence, we conclude that *Carex frankii* Kunth does not exist in New Mexico. Our conclusion is consistent with the treatment of *Carex* section *Squarrosae* by Ford and Reznicek (2002), who present the distribution of *C. frankii* as extending no further west than Oklahoma, Kansas and Nebraska and who show the distribution of *C. aureolensis* to include the state of New Mexico. Allred (2012) has recognized *C. aureolensis* as part of the New Mexico flora, citing Ball and Reznicek (2002), which includes Ford and Reznicek (2002).

Ford and Reznicek (2002) provided characteristics that distinguish *C. aureolensis* from *C. frankii*. *Carex aureolensis* is long-rhizomatous, while in contrast *C. frankii* is cespitose and short-rhizomatous. *C. aureolensis* is also distinguished from *C. frankii* by slightly wider and translucent pistillate scale bodies (0.4-0.9 mm wide compared to 0.1-0.4 mm wide) and wider staminate scales. According to a SEINet (2014) collections search and a review of UTEP *Carex* collections, *C. aureolensis* has been found only at a few springs in southern New Mexico: Sitting Bull Falls in the Guadalupe Mountains, Oak Springs in Carlsbad Caverns National Park, both in Eddy County, and at a spring in the Florida Mountains of Luna County.

***Carex stricta* Lamarck – Dropped from the New Mexico Flora**

In their treatment of *Carex* section *Phacocystis* in Flora of North America vol. 23, Standley et al. (2002) indicated at the end of their description of *Carex senta* Boott that “Collections from New Mexico identified as *C. senta* are *C. stricta*.” They, therefore, exclude New Mexico from the geographical range of *Carex senta* Boott. However, in this same publication they contradict the above statement by excluding New Mexico

from the geographic range for *Carex stricta*. Since the above publication, Norris (2012a) verified the existence of *C. senta* in New Mexico based on a specimen collected in Grant County with determination verified by A.A. Reznicek. Later, Norris (2012b) reported that *Carex senta* is “typically encountered and fairly common along high energy streams and rivers in the Gila National Forest...”

The presence of *C. stricta* in New Mexico has been an unanswered question since the publication of Flora of North America Vol. 23 in 2002. Norris (2012b) included *C. stricta* in his treatment of New Mexico *Carex*, basing his decision on an on-line collections search (SEINet, accessed late 2011) that revealed specimens determined as *C. stricta* were “collected in northern (border of small pond, Mora; in canyon, Union) and southwestern (sandy gravel bar, Catron) counties in New Mexico.” However, one or more members of SWCWG has reviewed *Carex* specimens collected in New Mexico at UNM, NMC, NMCR, SNM (Dale A. Zimmerman Herbarium at Western New Mexico University), UTEP and BRY herbaria. We have found no specimens identified as *C. stricta* nor any specimens of *C. stricta* misidentified as other taxa. Furthermore, a collections search on SEINet (2014) failed to reveal any *C. stricta* specimens collected in New Mexico. In fact, SEINet revealed only two *C. stricta* specimens collected in the entire state of Texas. An examination of the distribution of *C. stricta* on maps found on The PLANTS Database (USDA, NRCS 2014) indicated that *C. stricta* is known no further west than central Texas and western Kansas. *C. stricta* is apparently unrecorded in Oklahoma (Standley et al. 2002; USDA, NRCS 2014). Standley et al. (2002) reported that *C. stricta* may be “the most common wetland sedge in eastern North America,” but it is apparently very uncommon to absent in the southern U.S.

McGrath searched the New Mexico Biodiversity Collections Consortium website (NMBCC 2007) in late December 2014 and found records of seven *C. stricta* specimens that matched the habitat and location information described by Norris (2012b) in his treatment of New Mexico *Carex*. However, a search of the determination history of these specimens revealed that five of them had subsequently been annotated to *C. aquatilis* in 1998 by Miriam Fritts and we agreed with the Fritts determinations during our early 2014 review of UNM *Carex* specimens. We annotated the other two such *C. stricta* specimens to *C. emoryi* and *C. lenticularis* var. *lipocarpa* (*C. kelloggii*) during our review of NMC specimens in early 2014.

Based on the above evidence, we conclude that *Carex stricta* does not now exist nor has it ever existed in New Mexico. We base our conclusion on 1) no evidence of specimens documenting the existence of this species in New Mexico, 2) an apparent error by Standley et al. (2002) resulting in contradictory information regarding the distribution of *C. stricta* in New Mexico, and 3) the likelihood that New Mexico is substantially outside the range of *C. stricta*.

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***Carex buxbaumii* Wahlenberg, *Carex magellanica* Lamarck subsp. *irrigua* (Wahlenberg) Hiitonen, and *Carex saxatilis* Linnaeus – Additions to the New Mexico Flora**

Specimens of all three of these taxa were collected by Keller, Roy Greiner and McGrath in the San Pedro Parks Wilderness in Rio Arriba County, New Mexico in mid-August, 2012. The identities of the *Carex buxbaumii* Wahlenberg, *Carex magellanica* Lamarck subsp. *irrigua* (Wahlenberg) Hiitonen, and *Carex saxatilis* Linnaeus specimens were confirmed by Norris and the identities of the *C. buxbaumii* and *C. saxatilis* specimens were also confirmed by Reznicek. All three taxa are represented in the key to New Mexico *Carex* developed by Norris (2012b) because they are among more than 20 *Carex* taxa that have been collected in adjacent counties in Arizona, Utah and/or Colorado, implying that they might occur in New Mexico.

Chick Keller has for several years hypothesized that the flora of the San Pedro Parks Wilderness is a relict left over from the Ice Age. The San Pedro Parks Wilderness is at approximately 10,000 feet elevation and contains numerous springs and associated wetlands. In addition, two UNM specimens collected from what we now recognize as the San Pedro Parks Wilderness in the mid 1960's have been verified by Reznicek as *Carex macloviana* d'Urville. The recent documentation of *C. macloviana*, *C. magellanica* subsp. *irrigua* and *C. saxatilis* at high elevation sites in the San Pedro Parks Wilderness supports Keller's hypothesis because the range of each is centered in Colorado and states further north (Ball and Reznicek 2002).

An additional specimen most recently determined as *Carex* sp. by Julian Starr was annotated to *Carex saxatilis* Linnaeus by SWCWG in 2014. Paula Durkin collected this specimen on September 7, 1997 at Glacier Lakes on the Vermejo Park Ranch in northern New Mexico. Licher and McGrath attempted to return in late July 2014 to the Glacier Lakes to collect and photograph *C. saxatilis* and *C. limosa* Linnaeus. Durkin, now a wetland specialist with the Colorado Department of Transportation, graciously provided an aerial photo showing the sampling sites where she thought she made collections on behalf of the New Mexico Natural Heritage Program in the UNM Biology Department. The sampling sites are approximately 500 feet south of the New Mexico-Colorado state line. During their July 2014 visit to Glacier Lakes, Licher and McGrath failed to re-locate *C. saxatilis* at either of the two presumed sampling sites or in two wetlands on the Colorado side of the Glacier lakes area. It may have been too early to find this species in suitable collecting condition given that Durkin's specimen was collected about six weeks later in the growing season than our visit.

We found a record of another *Carex saxatilis* specimen supposedly collected in New Mexico during a SEINet Collections Search (SEINet 2015). However, Cortez, Colorado botanist Marian Rohman, the collector of this specimen (SJNM catalog # 63928, [Marian Rohman 3473](#), San Juan College Herbarium), has reported (personal communication 2015) that the locality information for this specimen reported on SEINet is incorrect, and that the specimen was, in fact,

collected in the San Juan Mountains of Colorado.

Details of the collected specimens as well as the annotated 1997 specimen follow:

***Carex magellanica* Lamarck subsp. *irrigua* (Wahlenberg) Hiitonen** (*Cyperaceae*, boreal bog sedge): [Rio Arriba County](#): San Pedro Parks Wilderness, Santa Fe National Forest, Vega del Oso; very seepy wetland in heavily grazed meadow with *Eleocharis*; sec 26, T22N, R1E, 36.10872, -106.80833 (datum: NAD 27 CONUS), 10,420 feet, 16 August 2012, [J. McGrath 1199](#) (UNM). Verified by SWCWG. [first report for New Mexico].

***Carex buxbaumii* Wahlenberg** (*Cyperaceae*, Buxbaum's sedge): [Rio Arriba County](#): San Pedro Parks Wilderness, Santa Fe National Forest, Rio de Las Vacas, near trail. 36.105556, -106.823611, sec 27, T22N, R1E, 10,350 feet, 17 August 2012. [C. Keller & R. Greiner 03530h](#) (Jemez Mountain Herbarium). Verified by W. R. Norris and A.A. Reznicek. [first report for New Mexico]

***Carex saxatilis* Linnaeus** (*Cyperaceae*, rock sedge): [Rio Arriba County](#): San Pedro Parks Wilderness, Santa Fe National Forest, Rio de Las Vacas, streamside near trail. 36.105556, -106.823611, sec 27, T22N, R1E, 10,300 feet, 17 August 2012. [C. Keller & R. Greiner 03529h](#) (Jemez Mountain Herbarium). Verified by W.R. Norris and A.A. Reznicek [first report for New Mexico].

***Carex saxatilis* Linnaeus** (*Cyperaceae*, rock sedge): [Taos County](#): Vermejo Park Ranch, Glacier Lakes; fine sandy loam, fen, *Carex limosa*-*Eleocharis quinqueflora* herbaceous vegetation. Associated species: *Carex aquatilis*, *Carex limosa*, *Eleocharis quinqueflora*. 11,560 feet, 7 September 1997. [P. Durkin 97MB024-G5](#) (UNM). Determination by SWCWG. [first report for New Mexico].

The *Carex tetrastachya* – *Carex crus-corvi* Conundrum

Our 2014 review of 159 *Carex* specimens at the New Mexico State University Herbarium (NMC) revealed specimens of two *Carex* species for which there are no other records in the state of New Mexico. These are *Carex tetrastachya* Scheele and *Carex crus-corvi* Shuttleworth. Label data for specimens of both species indicate that these sedges were collected from Bosque del Apache National Wildlife Refuge, Socorro County, in central New Mexico. *Carex tetrastachya* has been recognized as part of the New Mexico flora since Miriam Fritts annotated the specimen to this species in 1998. During our 2014 review of NMC *Carex* specimens, we annotated a specimen identified as *Carex stipata* Muhlenberg ex Willdenow var. *maxima* Chapman to *C. crus-corvi* Shuttleworth (subsequently verified by Reznicek). However, closer examination of the two specimen labels raises considerable doubt about the authenticity of these two collections.

As it turns out, NMC also contains two additional specimens representing these same two species, but which

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were collected by apparently the same collector (at least two of the four specimens) at “Hageman Refuge” near Denison, Texas. “Hageman Refuge” is Hagerman National Wildlife Refuge, which is located about 75 miles north of Dallas, Texas. The information on the labels of the four specimens is minimal and sometimes incomplete.

The detailed information on the four specimens follows, but we will first discuss the *Carex tetrastachya* specimens.

***Carex tetrastachya* Specimens**

Unknown collector 153. No date of collection. Bosque del Apache NWR, Socorro County, San Antonio, NM. NMC catalog # 42333. Original determination *Carex brittoniana* Bailey by F. J. Hermon. Determined as *Carex tetrastachya* Schule (*C. brittoniana* L.H. Bailey) by M.C. Fritts in 1998 and by A.A. Reznicek in 2012. Determined *Carex tetrastachya* Scheele by SWCWG in 2014.

F.J. Herman 153. 03 May 1955. Hageman Refuge, Grayson County, Denison, TX. NMC catalog # 39572. Original determination *Carex brittoniana* Bailey. Annotated to *C. tetrastachya* Schule (*C. brittoniana*) by M.C. Fritts in 1998. Annotated to *Carex tetrastachya* Scheele by J. McGrath Jan 2015 and by other members of SWCWG via examination of digital images of the specimen.

Note that the New Mexico *C. tetrastachya* specimen label does not provide the collector or date of collection. However, the Texas specimen label has the same collector number as the New Mexico specimen. This coincidence suggests that F.J. Herman was the unknown collector and that the collection date for the New Mexico specimen was sometime in 1955. The coincidence of the collector number and the incomplete label information on the New Mexico specimen also raises doubt that the specimen was actually collected at Bosque del Apache National Wildlife Refuge. It is possible that the specimen was collected at Hagerman National Wildlife Refuge and that somehow during processing the specimen was mixed up with material collected from Bosque del Apache National Wildlife Refuge. A SEINet (2015) collections search revealed that the New Mexico specimen is the only such record of this species in New Mexico. According to a PLANTS database (USDA, NRCS, 2015) distribution map, *C. tetrastachya* is known no further west than west central Texas.

***Carex crus-corvi* Specimens**

F.J. Herman 157. No date of collection. Bosque del Apache National Wildlife Refuge, San Antonio, NM. NMC catalog # 41697. Original determination *Carex stipata* var *maxima* Chapm. and annotated by M. C. Fritts in 1998 as *Carex stipata* Muhlenberg var. *maxima* Chapman. Determined as *Carex crus-corvi* Shuttleworth by SWCWG 2014 and verified by A.A. Reznicek via examination of digital images of the specimen in 2014.

Unknown collector #151. 03 May 1955. Wet Place Hageman Refuge, Denison, TX. NMC catalog # 39573. Original determination *Carex stipata* var. *maxima* Chapman by F.J. Herman. Annotated to *Carex stipata* Muhlenberg var. *maxima* Chapman by M. C. Fritts in 1998. Determined as *Carex crus-corvi* Shuttleworth by McGrath in 2015 and by other members of SWCWG via examination of digital images of the specimen.

Note that, like the New Mexico *C. tetrastachya* specimen, the New Mexico *C. crus-corvi* specimen label lacks critical information, including the date of collection. Note also that the Texas *C. crus-corvi* specimen was collected in the same location and on the same date as the Texas *C. tetrastachya* specimen by presumably the same collector. However, the Texas *Carex tetrastachya* specimen lists F. J. Herman as the apparent collector, but the Texas *Carex crus-corvi* specimen specifically states “Det. By F. J. Herman.” The incomplete label of the New Mexico *C. crus-corvi* specimen again raises doubt that the specimen was actually collected at Bosque del Apache National Wildlife Refuge. The similarity of the collector's name “F.J. Herman” to that of F. J. Hermann, the author of “Manual of the Carices of the Rocky Mountains and Colorado Basin” (Hermann 1970) suggested that perhaps F. J. Hermann was the collector of these specimens. We consulted A. A. Reznicek of the University of Michigan Herbarium (where Hermann's field notes are housed), who informed us that F. J. Hermann collected specimens 153 and 157 in 1926 in Ann Arbor, Michigan. Reznicek speculated that perhaps F.J. Hermann determined the identity of the subject specimens collected by someone else, and that during the processing of the specimens he (Hermann) was incorrectly listed as the collector of these plants, with his name misspelled. A PLANTS Database distribution map reveals that *C. crus-corvi* is not known further west of east central Texas (USDA, NRCS, 2015).

Based on the poor label information, the confusion surrounding the identity of the collector, the absence of additional specimens and the fact that the New Mexico specimens of both *C. tetrastachya* and *C. crus-corvi* are from a locality substantially outside the normal range of both species, we conclude that their presence in New Mexico is highly doubtful both at present and in the past. We conclude that *Carex tetrastachya* Scheele should be dropped from and *Carex crus-corvi* Shuttleworth should not be added to the New Mexico flora pending verification of their existence in New Mexico.

[Footnote: *Carex stipata* Muhlenberg ex Willdenow var. *maxima* Chapman ex Boott, the original determination for the two *Carex crus-corvi* specimens described above, has never been recognized as part of the New Mexico flora (Allred 2012; Allred and Ivey 2012; Martin and Hutchins 1980, Wootton and Standley 1915). The distribution of this taxon was recognized no further west than Alabama by Standley (2002). A SEINet (2015) collections search revealed no other specimens of this taxon west of the Carolinas and Florida.]

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VERIFICATION OF TAXA IN THE NEW MEXICO FLORA

Carex petasata Dewey

Carex petasata Dewey has been a source of confusion in New Mexico. Allred (2012) and Norris (2012b) indicate this species as part of the New Mexico flora. At the same time Allred (2012) states that "In naming *Carex wootonii*, Mackenzie (1915) argued that his new *Carex wootonii* replaced what had been called *Carex petasata* in NM; merits verification." Mastroggiuseppe et al. (2002) in Volume 23 of Flora of North America do not include New Mexico as part of the range of distribution for *Carex petasata*.

Our review of the collections at UNM and NMC revealed that only two out of 12 *C. petasata* specimens were previously identified correctly as *C. petasata*. Our ability to accurately identify *C. petasata* derives from Licher and Rink's extensive study (herbarium specimens and in the field) of *C. petasata* and the very similar *Carex wootonii* in Arizona.

Both of these species are in Section *Ovales*, which is characterized by gynaeandrous spikes and winged perigynia (Ball and Reznicek 2002). Both species have large perigynia (more than 5.5 mm long), have ovoid or obovoid to fusiform-shaped spikes and occur in mountain meadows and clearings within forests (Rink and Licher 2015). However, these two species each also occur in other, non-overlapping habitats: *C. petasata* in non-montane grasslands (Mastroggiuseppe et al. 2002) and *C. wootonii* in forests. The distribution of *C. wootonii* includes southeastern and east central Arizona and adjacent southwestern and west central New Mexico. However, *C. wootonii* has been found as far north as the Kaibab Plateau in Arizona (Rink and Licher 2015) and the Valles Caldera National Preserve in New Mexico, but it is unknown in Utah (SEINet 2015). During our review of SJNM specimens in January 2015, we annotated a specimen collected in Colorado as *C. wootonii* – a state record, since SEINet (2015) reveals no other *C. wootonii* specimens collected in that state. *C. petasata* occurs in northern Arizona and northern New Mexico and ranges as far north as Alaska (SEINet 2015; Mastroggiuseppe et al. 2002). The general region of overlap between the distributions of *C. wootonii* and *C. petasata* is east central Arizona and west central New Mexico and the northern portions of both states for as far north as the range of *C. wootonii* extends. In New Mexico both species are known to occur in the Valles Caldera National Preserve and the area around Mount Taylor (SEINet 2015).

Key differences between the two species as derived from Rink and Licher (2015) are described below:

<i>Carex petasata</i>	<i>Carex wootonii</i>
Perigynia light olive green, contrasting less with tan pistillate scales	Perigynia forest green, contrasting sharply with brown pistillate scales
Perigynia usually with evident nerves	Perigynia usually nerveless
Hyaline margins on pistillate scales 0.2-0.8 mm wide	Hyaline margins on pistillate scales 0-0.4 mm wide
Spikes narrowly fusiform to narrowly obovoid with many staminate flowers at base of each spike	Spikes broadly fusiform to ovoid with few staminate flowers at the base of each spike
Lowest inflorescence bract never longer than inflorescence	Lowest inflorescence bract sometimes longer than inflorescence

Near the conclusion of Licher and McGrath's sedge collecting trip to the Vermejo Park Ranch in July 2014, Licher indicated he wanted to walk up a grassy valley east of the broad Costilla Creek valley. He thought he might find *Carex petasata* because the valley was the right habitat. McGrath did not accompany Licher, but several days later Licher reported that he found *C. petasata* at about 9,650 feet elevation in that grassy valley.

Carex macloviana d'Urville

McGrath (2003) reported finding *Carex macloviana* d'Urville at timberline on the eastern shore of the uppermost lake of the Latir Lakes, Taos County, New Mexico. However, this single specimen collected by McGrath was determined by Reznicek and is housed in the University of Michigan Herbarium (MICH).

Following our review of UNM specimens, Reznicek further verified the existence of *C. macloviana* as part of the New Mexico flora by annotating two UNM specimens as *Carex macloviana* d'Urville. These specimens were originally collected in the San Pedro Parks Wilderness by Annehara Fleck in the mid-1960's. These specimens are as follows:

Rio Arriba County: San Pedro Cabin. [36 deg. 6' 59" N, 106 deg. 49' 24" W, ca 3150 m – hand written in pencil] (10,335 feet). 11 July 1964. A. Fleck s.n. (UNM). Determined *C. macloviana* by A. A. Reznicek 2015. Originally determined *C. festivella* Mackenzie presumably by collector in 1964, det. *C. microptera* Mackenzie by M.C. Fritts 1998, det. *C. macloviana* d'Urville by A. Hipp 2012.

Rio Arriba County: San Gregorio. 19 September 1964. A. Fleck s.n. (UNM). Determined *C. macloviana* by A. A. Reznicek 2015. Originally determined *C. festivella* Mackenzie presumably by collector in 1964, det. *C. macloviana* d'Urville by M.C. Fritts 1998, det. *C. macloviana* d'Urville by A. Hipp 2012.

Presumably, Fleck's collection of *C. macloviana* at San Gregorio refers to San Gregorio Reservoir in the San Pedro Parks Wilderness.

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CURRENT STATUS OF NEW MEXICO *CAREX*

With this report we add three new *Carex* taxa to the New Mexico flora: *C. buxbaumii* Wahl., *C. magellanica* Lam. subsp. *irrigua* (Wahlenberg) Hiitonen, and *C. saxatilis* Linnaeus. We also verify the existence of *Carex aureolensis* Steudel, *C. macloviana* d'Urville and *C. petasata* Dewey in the New Mexico flora. We provide evidence to drop three species from the New Mexico flora: *Carex frankii* Kunth, *C. stricta* Lamarck, and *C. tetrastachya* Scheele. In the case of *C. tetrastachya*, poor labeling of a single specimen collected substantially outside its normal range of distribution precludes it from being considered part of the New Mexico flora. Similarly, a single poorly labeled specimen of *Carex cruscovii* Shuttleworth also collected well outside its normal range of distribution precludes its addition to the New Mexico flora at this time. Therefore, the existence of the latter two species in New Mexico must be verified beyond the above-mentioned poorly labeled specimens. Finally, we provide a nomenclatural upgrade for one species. *Carex lenticularis* Michaux var. *lipocarpa* (Holm) L. Standley is now recognized as *Carex kelloggii* W. Boott.

Based on the findings reported in this paper and the species reported in Allred (2012), there are apparently 92 *Carex* species documented in New Mexico. Additional field searches will very likely add more *Carex* species to the New Mexico flora. However, at least 10 species in the New Mexico flora are based on very few records, sometimes as few as a single specimen. In fact, we have encountered no records of specimens collected in New Mexico for one species, *Carex ultra* L.H. Bailey (recognized as such by Rink and Licher 2015, listed as *Carex spissa* L.H. Bailey in Allred 2012 and Allred and Ivey 2012). However, we have had an undocumented report of this species occurring in the Peloncillo Mountains of southwestern New Mexico (Richard Worthington - personal communication to McGrath in 2003). The few documented New Mexico records of some *Carex* species (e.g., *C. blanda* Dewey, *C. rosea* Schkuhr ex Willdenow, *C. leptalea* Wahlenberg, *C. garberi* Fernald) are substantially outside their normal range of distribution (Norris 2012b; USDA, NRCS 2015; SEINET, 2015). Additional field work and tracking down and examination of plant specimens will be necessary to determine whether these species actually exist within the state. Two other *Carex* species tentatively recorded from New Mexico (*Carex tenera* Dewey, *Carex tahoensis* Smiley) do not match precisely the expected characteristics of these two species despite their determination by *Carex* expert A.A. Reznicek. Furthermore, one *Carex* species (*Carex pityophila* Mackenzie), currently included in the New Mexico flora (Allred 2012) and under current systematic study elsewhere, may be merged with another taxon in *Carex* section *Acrocystis* sometime in the future (Bruce Ford, University of Manitoba Herbarium, Derick Poindexter, University of North Carolina Herbarium - personal communication). We also suspect that *Carex chihuahuensis* Mackenzie may eventually become subsumed into *Carex alma* L. H. Bailey, but more research is required to substantiate this

supposition.

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- Kelly Allred, editor

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— *Linnaeus*