

CYPERACEAE SEDGE FAMILY

PART 1: FAMILY DESCRIPTION, KEY TO THE GENERA, AND *CAREX* L.

Glenn Rink
801 West Birch
Flagstaff, AZ 86001
faroutbotany@gmail.com

and

Max Licher
Box 1456
Sedona, AZ 86339
mlicher@wildapache.net

Perennial (sometimes annual) grass-like herbs, caespitose or rhizomatous, with fibrous roots. CULMS usually triangular, occasionally round, polygonal, or rarely compressed in cross section, usually solid, occasionally hollow or septate, not jointed. LEAVES simple, linear, parallel-veined, entire, alternate, 3-ranked (rarely 2 or multi-ranked), basal and/or cauline, occasionally reduced to bladeless sheaths only; sheath closed. INFLORESCENCE composed of 1–many spikelets (spikes in *Carex*), arranged in panicles, umbels, or racemes, sometimes compressed into a compact head; usually subtended by a leaf-like or scale-like bract. FLOWERS usually spirally arranged, occasionally 2-ranked along the axis of a spikelet (spike in *Carex*), small, bisexual (unisexual in *Carex*), each subtended by a single scale, with perianth lacking or reduced to bristles and/or scales; ovary superior (encased in a sac-like structure called a perigynium in *Carex*); stamens (1–)3, exerted at anthesis; anthers basifixed; stigma 1, either 2 or 3-branched. FRUIT an achene, either biconvex or trigonous, corresponding to the number of style branches. —Ca. 100 genera and 5000 species worldwide, 13 genera and ca.140 species in AZ. Usually associated with wetlands, but some species adapted to alpine or dryland habitats. Several genera include species that have been traditionally used for food: *Cyperus esculentus* (Chufa, Nut sedge), a native species, and *Cyperus rotundus* (Nut grass), introduced in North America, both have edible tuberous nodules on the rhizomes that have been used by many different cultures. *Schoenoplectus acutus*, *S. californicus*, and *S. tabernaemontani* (Bulrush, Tule) all have rhizomes that were a traditional food (along with the tender young shoots) used by Native Americans. *Cyperus longus* (Galingale) was a widely used spice in medieval Europe, and *Eleocharis dulcis* (Chinese Water Chestnut) corms are widely used in Chinese cooking. Neither of the latter two plants occur in AZ. (Facciola 1998).

1. Achene enclosed in a sac-like structure (perigynium); flowers all unisexual, with staminate and pistillate flowers in different spikes or at opposite ends of the same spike, rarely randomly mixed in a spike*Carex*

- 1' Achene not enclosed in a perigynium; flowers usually perfect, or when unisexual, not distinctly separated 2
2. Spikelets flattened, flowers arranged in two opposite ranks on either side of the rachis *Cyperus*
- 2' Spikelets terete in cross section, flowers arranged spirally around the rachis...3
3. Inflorescence of a single spikelet, terminal on the culm without an involucre bract *Eleocharis*
- 3' Inflorescence of multiple spikes, or if single, appearing lateral with a bractlike extension of the culm surpassing the spike, or with a noticeable involucre bract subtending the spike 4
4. Perianth of bristles only (do not confuse with remnants of filaments after anthers have fallen) 5
5. Leaves to above the middle of the culm; all leaves with obvious blades 6
6. Culms with corm-like bases; leaves lacking a ligule; spikelets large (4–10 mm diam.); achenes 2.3 mm or more long *Bolboschoenus*
- 6' Culms without cormlike bases; leaves with a ligule, mostly fused to the blade; spikelets relatively small (less than 4 diam.); achenes 1.8 mm or less long *Scirpus*
- 5' Leaves either all basal or confined to the bottom third of the culm; leaves with obvious blades, or significantly reduced to little more than basal sheaths..... 7
7. Basal cluster of leaf blades obvious; leaf blades 0.5 to 1 times as long as culm *Amphiscirpus*
- 7' Basal leaves mostly reduced to sheaths; longest leaf blade much less than half the length of the culm *Schoenoplectus*
- 4' Perianth absent, or mainly composed of scales (remnants of filaments often present) 8
8. Perianth of 3, stipitate based, spatulate scales, alternating with 3 much shorter bristles *Fuirena*
- 8' Perianth absent 9
9. Large perennial plants usually 1–2 m tall; cauline leaves present; inflorescences terminal and often lateral (from upper leaf axils), conspicuously branched and rebranched; spikelets 100–1000..... *Cladium*
- 9' Small annuals to larger perennial plants (up to 1+ m tall in *Fimbristylis thermalis*); leaves all basal (from the lower ¼ of the culm); inflorescences terminal only, simple to branched; spikelets 50 or fewer 10
10. Style base not enlarged in fruit; 2nd inner transparent scale often present behind the thicker primary floral scale *Lipocarpha*
- 10' Style base enlarged in fruit; inner transparent scale lacking 11

11. Style base persistent in fruit; stigmas 3 *Bulbostylis*
 11' Style base deciduous in fruit; stigmas 2 in our species *Fimbristylis*

Carex L. Sedge

Plants grass-like, perennial, mostly monoecious, but some species dioecious, densely caespitose from short rhizomes to colonial from long-creeping rhizomes. CULMS mostly trigonous, occasionally subterete, usually without nodes, usually solid (rarely hollow), phyllopodic (bearing leaves to the base), or aphyllopodic (lower leaves bladeless and reduced to sheaths only). LEAVES three-ranked (blades spirally diverging from the triangular culm 120 degrees apart at each of the angles), simple, linear, flat to V- or M-shaped in cross section, less commonly filiform or revolute; ligule present and attached to blade; sheaths usually closed, the fronts hyaline and ripping or shredding in age. INFLORESCENCES simple or compound, composed of one or more sessile or pedunculate spikes, each containing a number of staminate or pistillate flowers; spikes entirely staminate, entirely pistillate, androgynous (a mixture of staminate and pistillate with the staminate flowers above the pistillate ones, or more rarely, intermixed), or gynecandrous (a mixture of staminate and pistillate with the pistillate above the staminate flowers), subtended by a bract or not, the bracts either leaf-like or reduced to a scale (awned or not). FLOWERS without a perianth, each subtended by a scale, either staminate, with 3 stamens, or pistillate, with pistil and style 1, and stigmas either 2 or 3 (in ours); ovary surrounded by a perigynium (a sac-like structure open only at the top with the style and/or stigmas exposed); characters of the mature perigynia being essential to differentiate species. FRUITS achenes, one per flower, enclosed in the perigynium, either lenticular in flowers with 2 stigmas, or trigonous in flowers with 3 stigmas. —ca. 2000 species worldwide, ca. 480 listed in the Flora of North America, 68 in AZ (including 2 presently unpublished species). (from the Greek keirein, meaning to cut, based on the sharp leaves or culm edges of many species). Principle reference: Ball and Reznicek (2002).

Carex is the 4th largest genus in the state, surpassed in diversity only by *Astragalus*, *Eriogonum*, and *Penstemon*. Worldwide in distribution, ranging from sea level to above timberline, *Carex* is known primarily as a wetland genus, although nearly one third of AZ species inhabit drier sites. The genus ranges from high elevation deserts, woodland and forest floors, to meadows, prairies, and to alpine tundra. Many species are widespread on the continent, but have very specific habitat requirements. A quarter of the AZ species are known from only one or several localities in the state, and half are known from only a few areas. Only one *Carex* species, *Carex* sp. nov. A, is endemic to AZ, though both *Carex curatorum* and *Carex specuicola* are endemic to the Colorado Plateau/Four Corners area, with the majority of known locations in AZ. *Carex endlichii* is nearly endemic to the Chiricahua Mountains in s Arizona, with only a few outlying populations in Mex. and one in the Santa Catalina Mountains. *Carex specuicola* is listed as “threatened” under the Endangered Species Act, although it is now known from many more locations than when it was so designated.

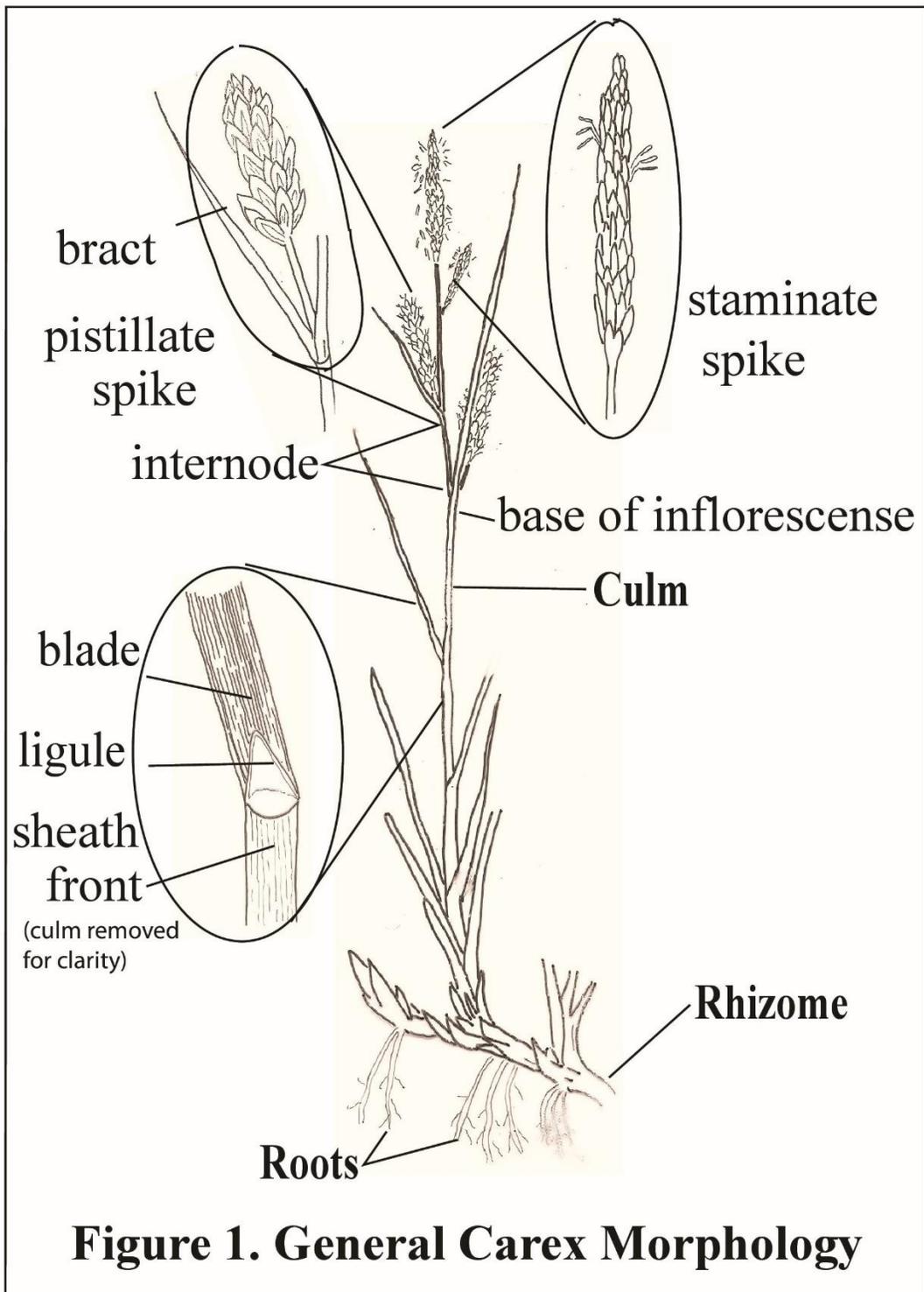
Many *Carex* species find the limit of their ranges within AZ. *Carex thurberi*, *C. leucodonta*, and *C. endlichii* are known in the U.S. only from AZ, but are present to

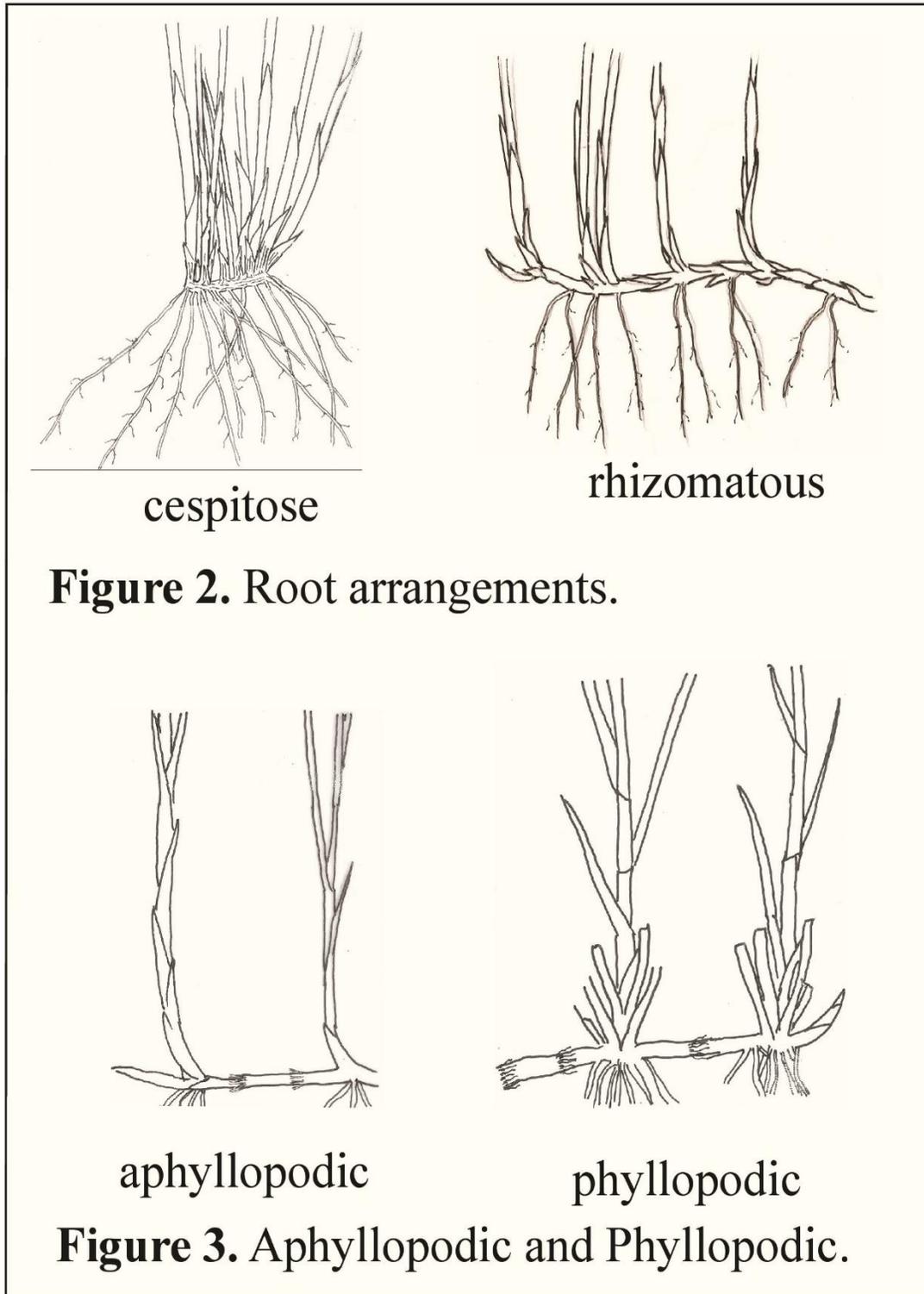
the s in Mex. *Carex senta* is mostly a CA species which reaches its e limit in AZ and w NM. *Carex serratodens* is a CA and OR edaphic endemic species with just one outlying population in AZ. It grows at springs and along watercourses on the e slopes of Four Peaks in central AZ, and is possibly introduced there. Oddly, in AZ, *Carex serratodens* grows on weathered granite substrates, contrasting with the serpentine soils it is known from in CA and OR. Perhaps the Rocky Mountains exert the strongest influence on AZ *Carex* biogeography with five Rocky Mountain species known in AZ only from the San Francisco Peaks, *C. albonigra*, *C. chalciolepis*, *C. deflexa*, *C. elynoides*, and *C. haydeniana*. Two other Rocky Mountain species reach the sw limit of their ranges in AZ; *C. oreocharis* is widespread at upper elevations in n and e AZ, while *C. geyeri* is known only from Pastora Peak in the Carrizo Mountains at the far ne corner of AZ. Several species known from further e in the U.S., are known from only one, or several localities in AZ. *Carex emoryi* reaches its w limit in Marble Canyon in n AZ, while *C. conoidea* reaches its w limit in the White Mountains. *Carex lativena*, and *C. microdonta* both reach their w limits in se AZ mountains. *Carex buxbaumii* and *C. crawei* are widespread in the U.S., but only are known to occur in one location each in AZ.

This treatment recognizes a number of new species to the Arizona Flora, including 22 not listed for the state in Ball & Reznicek (2002): *Carex aurea*, *C. bebbii*, *C. buxbaumii*, *C. conoidea*, *C. crawei*, *C. deflexa*, *C. diandra*, *C. disperma*, *C. douglasii*, *C. echinata*, *C. elynoides*, *C. emoryi*, *C. geyeri*, *C. haydeniana*, *C. hystericina*, *C. jonesii*, *C. obtusata*, *C. oreocharis*, *C. pachystachya*, *C. scoparia*, *C. stevenii*, and *C. vesicaria*. Regional floras have recognized some of the species listed above for Arizona; however, 10 of these represent either new collections or new annotations of existing collections that have never appeared for the state previously. In addition, 22 taxa are listed as no longer recognized for Arizona at the end of this treatment, some of which were included in the previous regional floras, and the others representing mis-determinations that have now been annotated.

Carex morphology—Identifying *Carex* to species requires an understanding of the morphology of the plants and understanding the terms that we use in the keys and descriptions. What follows is a discussion of *Carex* morphology, from **roots** and **rhizomes**, **culms** (stems), **leaves**, **inflorescence arrangement**, **spike** morphology, gender arrangement, and **perigynia** characters. See Fig. 1, General *Carex* Morphology (all figures in this document were prepared by Glenn Rink).

All *Carex* have **rhizomes** (underground stems) which allow the plants to reproduce asexually. Rhizomes vary from short to long-creeping. The short-rhizomatous species are **cespitose** (clump-forming) and those with long-creeping rhizomes are **colonial** or turf-forming. See Fig. 2, Root arrangements. Cespitose species often have stems so close together that the rhizomes are indiscernible. Some species with longer rhizomes still grow in clumps, with the rhizomes crossing each other in an interwoven mass. Other species with longer rhizomes grow in small clumps (3-6 culms), but can have long rhizomes between clumps. This may or may not be apparent on an herbarium sheet, in which case observational notes derived in the field can be crucial. Rhizome color can be an important diagnostic character, and this is found in the outer layers and in the lowest below-ground basal sheaths where





the culm begins. Sometimes these layers may be missing on a poorly collected or prepared specimen. Other important rhizome characters include thickness, distance between culms along the rhizome, and whether the rhizomes are straight or what we call knotty, that is, with irregular bends. Rhizomes (which have sheaths) need to be discerned from **roots**, which do not have sheaths. **Culms** (stems) can be short or tall, stiff and erect, or flexuous and drooping.

All fertile shoots of *Carex* die after fruiting. But for vegetative shoots, the situation is more complex. In many species, the vegetative shoots are also annual, with the apical meristem dying at the end of the growing season. In these species, during the next growing season, new buds form both fertile and vegetative shoots laterally, below the dead apical meristem and vegetative shoot from the year before. In this case, both fertile and vegetative shoots have bladeless basal sheaths (cataphylls—in essence, bud scales) at their bases, and the fertile culms are said to be aphyllopodic (lacking leafy bases). In other species, the apical meristem of vegetative shoots overwinters, and the next year produces either more leaves or flowers. If it flowers, the new flowering stem comes up through the center of the previous year's vegetative shoot, and the base of the flowering stem does not have cataphylls, but rather is clothed in the old leaf bases from the previous years and is said to be phyllopodic (leafy based). See Fig. 3, Aphyllopodic v. Phyllopodic.

Carex **leaves** are composed of both **sheaths** and **blades**. *Carex* **sheaths** are closed, without any break or opening. They completely surround the culm from the plant base to their upper end at the point where the **blade** diverges from the culm. See Fig. 1. Leaf **sheath fronts**, which are on the opposite side of the culm from the blade, are usually thin and hyaline, often becoming ripped, torn, or shredded in age. Some species have red (or other color) spots on the hyaline sheath fronts. Sometimes the spots don't appear on every culm, so it is important to look closely at several culms. In some species, the sheath front fibers remain when the sheath tears apart, and these fibers can be connected, forming a pattern called **ladder-fibrillose**.

See Fig. 4, Ladder-fibrillose Sheath. This character varies from fairly obvious to obscure, and is not present on every base, so it is important to look closely at many bases, especially the more mature ones. Other species have **fibrillose bases**, where in age, the tissue between the fibers weathers away leaving just the disconnected, parallel fibers of the thicker basal portion of the sheaths. The basal portion of the sheaths is often colored in various shades of red and brown which can be diagnostic. Leaf sheaths can be **septate-nodulose** or not. Septate-nodulose refers to a pattern between parallel leaf veins that can look like brickwork. In this treatment, we refer to this as the bases having “**crosswalls**” or not. See Fig. 5, Septate-nodulose sheath. Other parts of leaves include **ligules**, which are short upright membranes attached to the inside face of the blade where the sheaths end. **Ligules** often have diagnostic shapes and lengths. **Leaf blades** can have a prominent midvein and be \pm flat,

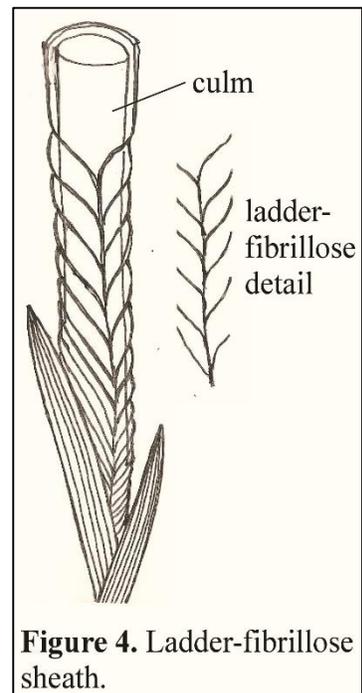


Figure 4. Ladder-fibrillose sheath.

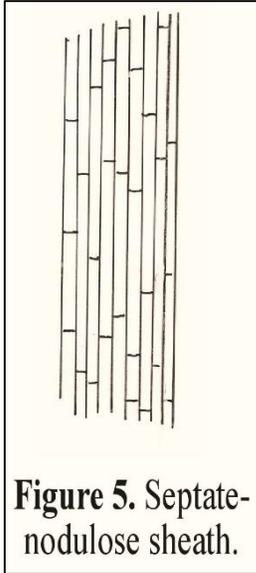


Figure 5. Septate-nodulose sheath.

folded into a “V” shape or an “M” shape (with an additional fold at a vein on either side of the midvein), or inrolled.

Carex **inflorescences** are composed of one to many **spikes**. **Spikes** are composed of two to many spikelets, each spikelet composed of just one flower, each flower attached to the same central axis. See Fig. 1. Because each *Carex* spikelet is reduced to only one flower, the term spikelet is rarely used in describing *Carex*, (although it is relevant for other Cyperaceae genera). Inflorescences are usually found at the top of the culm, although some groups have additional inflorescences at the base of the plant. Inflorescence arrangement is highly variable in *Carex*, from single-spiked plants, to plants with many spikes. Single-spiked species of *Carex* could be confused with *Eleocharis*. However, in *Carex*, the flowers are all unisexual, with the staminate and pistillate flowers in different portions of the spike, or on different plants, while in *Eleocharis*, each

flower has both staminate and pistillate parts. In *Carex* species that have inflorescences composed of many spikes, the inflorescence can be either **racemose** or **paniculate**. In **racemose** inflorescences, each spike is attached directly to the main axis of the inflorescence with no branching. **Paniculate** inflorescences have lower branches with two or more spikes attached to them. See Fig. 6, Inflorescence arrangement.

Each *Carex* spike is usually subtended by a **bract**. **Bracts** on the lower spikes are generally more developed, and the bract subtending the lowest spike, called the **inflorescence bract**, is often prominent. See Fig. 1. **Inflorescence bracts** vary from nonexistent, to the size of a scale, to the size of the largest leaf, this either shorter or longer than the flower-producing part of the inflorescence. Many treatments use bract length as a diagnostic character, but we do not. We have found that bract length is highly variable within species and thus not a reliable character, except as part of the overall gestalt. Also, second flush or late season shoots can produce inflorescences with atypical bracts (often much longer, especially in the *Ovales* section).

Individual spikes in an inflorescence can be either sessile (attached directly to the inflorescence axis) or pedunculate (with a naked stem between the inflorescence axis and the flower-producing part of the spike). In plants with pedunculate spikes, the lowest spikes often have the longest peduncles, with upper spikes having progressively shorter peduncles, to the uppermost spike(s), which can be sessile. Sometimes the peduncles are short and hidden behind the bracts, requiring close examination to see if peduncles are present. *Carex* terminal spikes may be

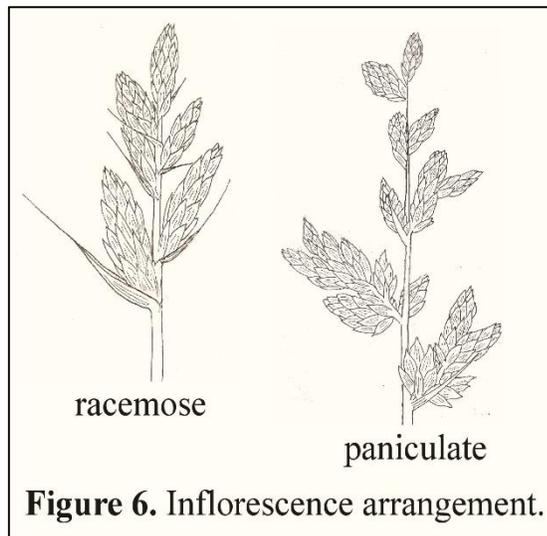


Figure 6. Inflorescence arrangement.

born directly above the uppermost lateral spikes, appearing sessile, or be elevated well above the lateral spikes on the inflorescence axis. **Internode length** between spikes can vary from being long enough so that each spike is well-separated and easily discernable along the inflorescence axis to so short that it is nearly impossible to distinguish one spike from the next. In the latter case, we call them **indistinguishable**. Some species in the Section *Ovales* have individual sessile spikes closely arranged along the inflorescence axis, but with each spike distinct as if they were “**beaded**” on a string. The length of the internode between the lowest spikes is a useful character in the *Ovales* section. See Fig. 1 for spike internode measurement.

Each **spike** contains a number of spirally arranged unisexual flowers. Flowers are subtended by **scales**, small bracts which protect the reproductive parts of the flower. Individual spikes can be composed of flowers that are all staminate (male), all pistillate (female), or of both staminate and pistillate flowers. In spikes with flowers of both genders, it is crucial to determine where the staminate and pistillate flowers are in relation to each other. A spike is **androgynous** if the staminate flowers are above the pistillate flowers. A spike is **gynecandrous** if the pistillate flowers are above the staminate flowers. See Fig. 7, Gynecandrous v. Androgynous Spikes and Flower Details. In gynecandrous spikes, the staminate flowers are often few, and the anthers readily deciduous, leaving only a few filaments protruding from behind the lower scales on the spike. Likewise, in some androgynous spikes, there may be only a few withered staminate scales at the tip of the spike, making it appear as a unisexual spike. Determining whether a spike is gynecandrous or androgynous can require careful investigation. In immature specimens, the anthers or styles are hidden under the scales, requiring folding back the scale to see. Some species occasionally have odd arrangements of staminate and pistillate flowers in a spike, which can lead to incorrect determinations. It is important to look at the overall population, and collect enough inflorescences to see the patterns.

Staminate flowers are composed of a scale and usually three filaments with anthers. **Pistillate flowers** are composed of a scale, the **perigynium** (the sac-like structure surrounding the ovary/achene; unique to the genus), and a style which can have either two or three stigmas. All of these parts have characters that are critical for determining *Carex*. See Fig. 7. The styles of the pistillate flowers are often early deciduous. In this case, achene shape may offer the best clue about stigma number since pistillate flowers with two stigmas produce **lenticular** achenes, and tend to have flattened perigynia (with notable exceptions in Section *Bicolores*), while those with three stigmas produce **trigonous** achenes, and have perigynia more inflated or subcircular in cross section (with notable exceptions in some species of Section *Racemosae*). See Fig. 8, Perigynia and Achene Shapes.

Perigynia characters include size, shape, color, surface features (hairs, texture), and nervation. Perigynia measurements should be taken on fully mature perigynia recovered from just below the middle portion of one of the lower spikes. Perigynia from higher in the spike often do not have the diagnostic shape for the species, being more elongate, and the lowest perigynia are often aborted or deformed. Perigynia lengths are measured from the bottom of the perigynia to the tip of the beak. Some species have perigynia with **wings**, which are thin extensions of the lateral margins. **Plano-convex** refers to a cross sectional shape that is convex on the **dorsal** side (away

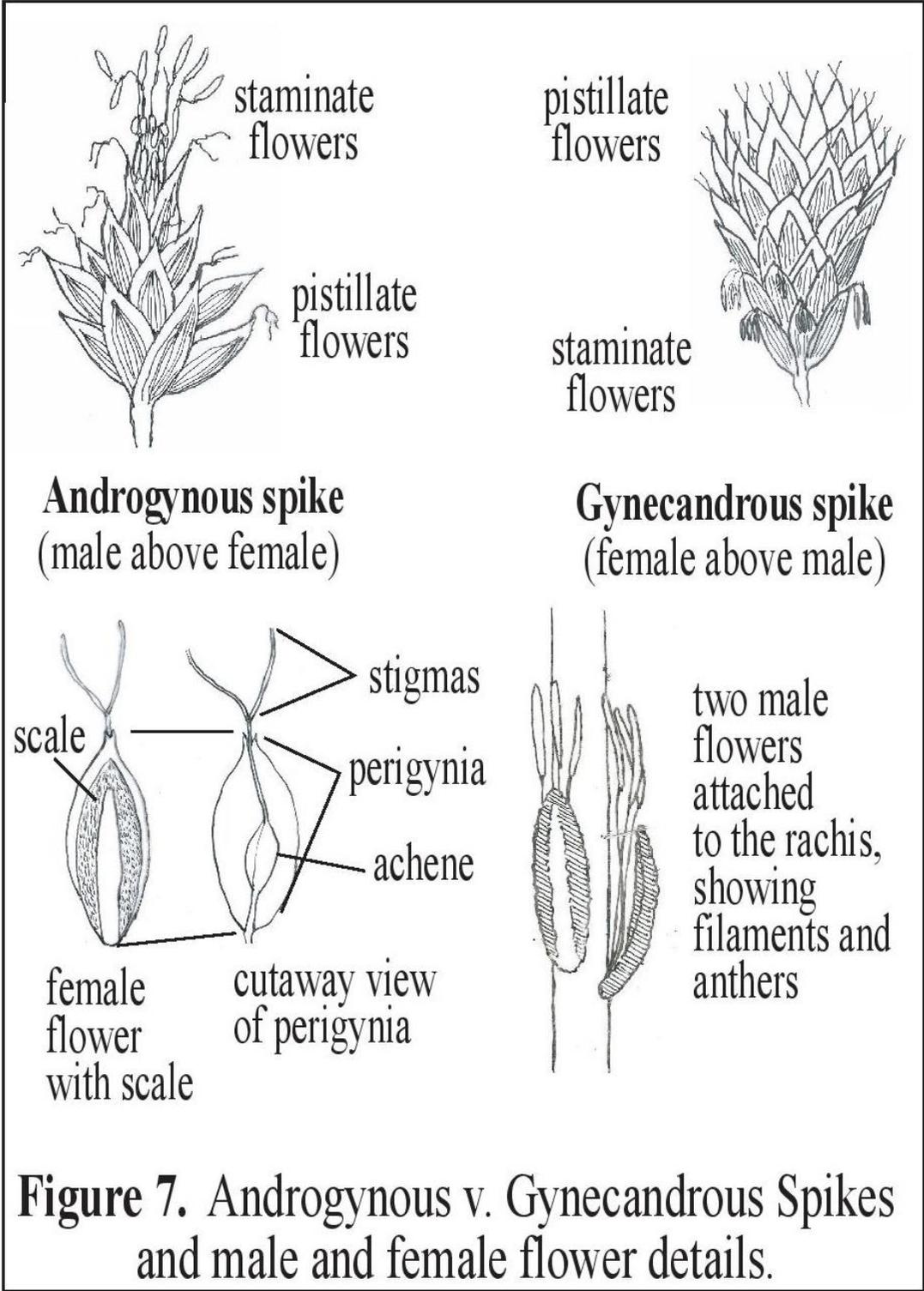


Figure 7. Androgynous v. Gynecandrous Spikes and male and female flower details.

from the axis), and flat on the **ventral** side (toward the axis). In the *Ovales* section, plano-convex is contrasted against perigynia that are “flat except where distended over the achene.” These latter species tend to have perigynia with wide **wings** and a bulge over the achene on both the dorsal and ventral side. See Fig. 8. These character states

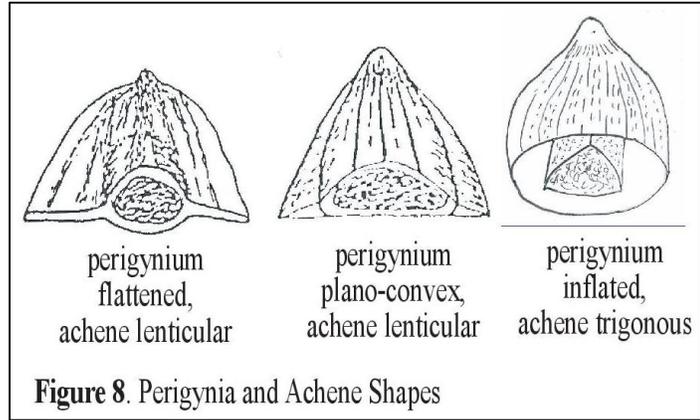


Figure 8. Perigynia and Achene Shapes

intergrade to some extent, but for many species, this will be a useful character. Perigynia **nerves** (including presence/absence, number, length, and strength) are important in many keys. We have found nervation to be quite variable within species, and most useful only in conjunction with other more important characters. There will often be some perigynia that exhibit the opposite of the general rule for a species. Profile shapes of perigynia are described with many of the same adjectives used in botanical leaf terminology. Refer to botanical texts for the meanings of ovate, lanceolate, cordate, truncate, cuneate, etc. See Fig. 9 for the difference between acute and acuminate. The **beak** is defined as the upper portion of the perigynia from where the perigynia outline transitions from convex to concave upwards to the tip. Perigynia beak tips can be **entire**, like a tube evenly cut off, or **bidentate**, where the front and back are both notched, leaving two “teeth.” See Fig. 9. The beak can be ciliate (with minute surface hairs), and/or serrulate (with serrations on the upper margin of the perigynia). Beaks can be flattened or round in cross section. These characters can be uniform to the tip, or transition at some point towards the tip. In many species the achenes completely fill the perigynia, but in others they only occupy a small portion of the space within the perigynia. The amount of space within the perigynia occupied by the achene is sometimes an important character to discern. Also, some species have

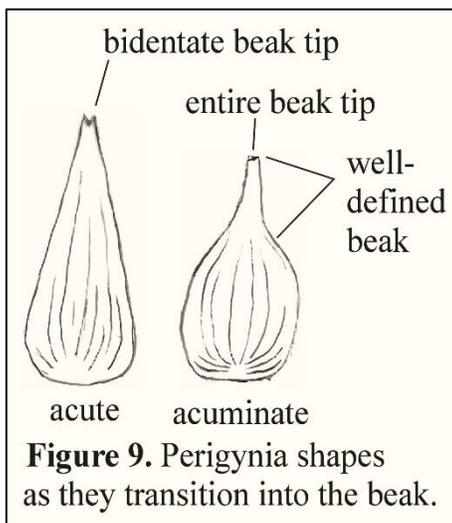


Figure 9. Perigynia shapes as they transition into the beak.

spongy tissue adjacent to the achene that distends the lower part of the perigynia making it appear ‘puffy.’

Carex have a reputation of being difficult to identify. Many of the key traits are quite variable, requiring a good cross section of collected material to understand the predominant trends in morphological characters. Often, determinations require considering the gestalt of all characters, with some not matching the ideal described in this or any other treatment. Complete collections which include all diagnostic parts are extremely important. For tips on making complete *Carex* collections, see Appendix B at the end of this treatment.

Using this treatment—Several approaches can be used to identify *Carex* species using this guide. If your sedge has distinctive characters, you might be able to shortcut to a determination easily using the list of *Carex* with special attributes in Appendix A, or alternatively, the photographs in “A Visual Guide to *Carex* of Arizona.” Otherwise, use the key. In either case, it will be important to compare your specimen to the species description. In the keys and species descriptions, we use round parentheses () to denote measurements or character states that we have observed in AZ specimens, but that are less common. We use square parentheses [] to denote more extreme measurements or character states taken from Ball and Reznicek (2002), but not yet observed in AZ specimens. We have found that in many cases, AZ specimens do not fit the descriptions we have found in regional treatments. You may find that when you start trying to identify your sedge specimens, you do not have the parts of the plants needed to identify them. Rather than finding yourself in this predicament, we suggest following our recommendations in Appendix B for collecting adequate specimens for later identification and documentation. We have chosen to leave unidentified, some incomplete sheets in our review of AZ collections, so as not to compromise our understanding of species’ ranges with guesswork.

We do not treat hybrids here, but believe we see hybrids between *Carex vesicaria* and *C. pellita* at both Pomeroy Tanks on the w Mogollon Rim and at Little Park Lake on the Kaibab Plateau and we have a single specimen that we believe is a hybrid between *Carex bella* and *C. chalciolepis* from the San Francisco Peaks.

KEY TO MAJOR GROUPS OF *CAREX*

1. Spikes solitary per culm..... **GROUP A**
- 1’ Spikes multiple per culm 2
2. Spikes of two types, the terminal spike(s) staminate or gynecandrous, the lower spikes predominantly pistillate and often pedunculate (sometimes spikes looking similar in shape in Group D, but lower spikes pedunculate)..... 3
3. Perigynia hairy (at least some hairs present on the upper half) **GROUP B**
- 3’ Perigynia glabrous 4
4. Stigmas 3, achenes trigonous..... 5
5. Terminal spike staminate **GROUP C**
- 5’ Terminal spike gynecandrous **GROUP D, SECT. RACEMOSAE**
- 4’ Stigmas 2, achenes lenticular..... **GROUP E**
- 2’ Spikes similar to each other in gender arrangement, all sessile..... 6
6. Perigynia hairy; spikes usually solitary, but sometimes with one to several smaller spikes below *Carex curatorum*
- 6’ Perigynia glabrous; spikes multiple..... 7
7. Terminal spike androgynous or staminate or pistillate, lateral spikes androgynous or staminate or pistillate **GROUP F**
- 7’ Terminal spike gynecandrous (sometimes appearing wholly pistillate after anthers have fallen), lateral spikes gynecandrous or wholly pistillate..... 8
8. Perigynia not winged **GROUP G**
- 8’ Perigynia winged **GROUP H, SECT. OVALES**

GROUP A — SINGLE SPIKE PER CULM

1. Plants usually dioecious, (with staminate and pistillate plants occurring on separate plants, and usually also in separate populations); inflorescences usually with only one unisexual spike, rarely with 1–2 additional short spikes below (these lower spikes sometimes androgynous); perigynia densely pubescent with hairs averaging 0.2 mm long; hanging gardens, springs, and rivulets in Grand and Glen Canyons below 2100 m (6900 ft).....*Carex curatorum* (Sect. *Scirpinae*)
- 1' Plants monoecious; spikes always solitary, androgynous; perigynia glabrous or pubescent, if pubescent, hairs shorter than 0.2 mm long; dry areas above 1800 m (6000 ft) 2
2. Plants caespitose, densely tufted, without rhizomes; basal sheaths ladder-fibrillose 3 (Sect. *Filifoliae*)
 3. Leaves folded, 1–2 mm wide near base, dull green; culms mostly scabrous below the inflorescence; proximal pistillate scale usually with an awn 0.5–35 mm long, but this often broken off in older material; basal sheaths brown to dark brown *Carex oreocharis*
 - 3' Leaves involute-cylindric, filiform, 0.2–0.8 mm wide near base, yellow-green; culms mostly smooth; proximal pistillate scales awnless or occasionally with awns to 2 mm long; basal sheaths straw to light brown 4
 4. Perigynia glabrous or very sparsely short hirsute/ciliate only on the margins near beak; culms about as long as the leaves, less than 20 cm tall; plants of alpine tundra, above 3050 m (10,000 ft)..... *Carex elynoides*
 - 4' Perigynia usually short-pubescent all over, but at least on the distal portion; culms as long or longer than the leaves, up to 35 cm tall; in pinon-juniper or desert scrub, below 2300 m (7,500 ft) *Carex filifolia*
- 2' Plants rhizomatous, with culms arising singly (rarely several from one node); basal sheaths not ladder-fibrillose..... 5
 5. Perigynia 2–4 mm long, with a rounded base and prominent bidentate beak; leaf 0.5–1.5(2) mm wide; sheaths often red-purple *Carex obtusata* (Sect. *Obtusatae*)
 - 5' Perigynia 4–5 mm long, with long-tapered base and short to obsolete beak; leaf 1.5–3.5 mm wide; sheaths brown *Carex geyeri* (Sect. *Firmiculmes*)

GROUP B — MULTIPLE SPIKES PER CULM, PERIGYNIA PUBESCENT

1. Plants colonial from long rhizomes; wetland habitats usually in ponds or streams; pistillate spikes 1.5–6 cm long, with 40 or more perigynia *Carex pellita* (Sect. *Paludosae*)
- 1' Plants loosely to densely caespitose; dry to mesic woodland, forest, or prairie habitats; pistillate spikes 1.5 cm long or less, with less than 20 perigynia..... 2

2. Perigynia strongly many-nerved, with most veins 0.1 mm wide, hispidulous distally, glabrous proximally; beak often abruptly bent; se mountains only
..... *Carex lativena* (Sect. *Hallerianae*)
- 2' Perigynia finely-nerved or nerveless (but with 2 prominent raised margins), pubescent all over; beak bent or straight; widespread in AZ.....
..... 3 (Sect. *Acrocystis*)
3. Culms significantly longer than the leaves; pistillate spikes cauline only; perigynia finely 10–25 nerved at least to mid-body; beak straight.....
..... *Carex leucodonta*
- 3' Culms shorter than to as long as the leaves; pistillate spikes both basal on solitary peduncles, often hidden in the dense base of the plant, and cauline near the terminal staminate spike; perigynia nerveless or faintly-nerved near the base only, except for two strong marginal nerves; beak bent or straight..... 4
4. Old leaf bases persisting as coarse fibers, tan; cauline pistillate spike bract usually shorter than the inflorescence; pistillate scales shorter than to as long as the perigynia; beak usually straight *Carex geophila*
- 4' Old leaf bases only slightly fibrous, reddish; cauline pistillate spike bract usually longer than the inflorescence; pistillate scales shorter than perigynia; beak bent or straight..... 5
5. Perigynia 2.3–3.3 mm long; beaks 0.6–1.0 mm long; plants loosely cespitose; above 3200 m (10,500 ft) *Carex deflexa*
- 5' Perigynia 3.2–4.5 mm long; beaks 0.9–1.7 mm long; plants densely cespitose; below 3660 m (12,000 ft)..... *Carex rossii*

GROUP C — STIGMAS 3, PERIGYNIA GLABROUS,
TERMINAL SPIKE STAMINATE, WETLAND PLANTS

1. Robust plants from 50 to 100+ cm tall; perigynia with beaks greater than 1 mm long (except in *Carex ultra*); pistillate spikes appearing dense and prickly due to either long awns on the scales or long beaks on the perigynia, usually with more than 50 perigynia; mature styles persistent on achene..... 2
2. Perigynia widest in the upper half, with a short beak ca. 0.5 mm long; leaf sheaths and perigynia with red-brown spots *Carex ultra* (Sect. *Hispidae*)
- 2' Perigynia widest in lower half, tapering to long beak 1.0–3.0 mm long; leaf sheaths often with reddish purple tinge but no spots; perigynia without spots 3
3. Upper leaf sheaths usually pubescent, becoming ladder-fibrillose with age; abaxial surface of leaves minutely glandular papillose; perigynia beak teeth 1.2–3.0 mm long *Carex atherodes* (Sect. *Carex*)
- 3' Upper leaf sheaths not pubescent, not becoming ladder-fibrillose; abaxial surface of leaves not minutely glandular papillose; perigynia beak teeth to 1.3 mm long 4 (Sect. *Vesicariae*)
4. Apex of pistillate scales abruptly contracted into a long and scabrous awn..... 5
5. Perigynia 5–7 mm long; beak 1.9–2.8 mm long; pistillate scale bodies truncate or retuse at apex, with an awn usually longer than body..... *Carex hystericina*

- 5' Perigynia 3.5–5.0 mm long; beak 0.9–1.8 mm long; pistillate scale bodies obtuse to acuminate, tapering to an awn shorter than the body *Carex thurberi*
- 4' Apex of pistillate scales acuminate, generally awnless 6
6. Basal leaf sheaths with many crosswalls between the veins, appearing like brickwork; widest leaves 4.5–12 mm wide; ligules of lowest fully developed leaf less than 1.5 times as long as wide with a rounded or emarginate top; culms often thick, often clothed in old leaf bases; sheaths thick and spongy-based, the thickest culms rarely with reddish sheaths, the narrower culms more commonly with reddish sheaths; plants colonial from long rhizomes; perigynia strongly spreading at maturity *Carex utriculata*
- 6' Basal leaf sheaths with few or no crosswalls between the veins, not appearing like brickwork; widest leaves 1.8–6.5 mm wide; ligules of lowest fully developed leaf twice as long as wide and pointed at top; culms thin, usually not clothed in old leaf bases; sheaths not spongy-based, often reddish; plants cespitose from short, stout, rhizomes; perigynia ascending to spreading at maturity *Carex vesicaria*
- 1' Small to moderate sized plants, generally 15–50(–75) cm tall; perigynia with beaks less than 1 mm long; pistillate spikes not robust or prickly, usually with less than 45 perigynia; mature styles deciduous from achene 7
7. Beak of perigynia bent or straight; culms arching to pendant in age; lowest cauline pistillate spike usually emerging in the upper half of culm (some populations of *Carex* sp. nov. A with a basal pistillate spike on a long filiform peduncle) 8
8. Perigynia with nerves impressed into the surface, not papillose; beak straight or absent; basal spikes absent *Carex conoidea* (Sect. *Griseae*)
8. Perigynia with many fine raised nerves (or nerves absent), papillose toward the apex; beak bent or almost absent; sometimes with basal spikes on long filiform peduncles *Carex* sp. nov. A (Sect. *Paniceae*, pgs. 76 and S-15)
- 7' Beak of perigynia straight; culms erect; lowest pistillate spike often near base, or at least in lower half of the culm 9 (Sect. *Granulares*)
9. Widest leaves 2.8–8.3 mm wide; staminate scales with apex acute to awned; perigynia beaks 0.3–0.9 mm long *Carex microdonta*
- 9' Widest leaves 1.8–3.0 mm wide; staminate scales with apex rounded to obtuse; perigynia beaks 0.1–0.3 mm long *Carex crawei*

GROUP D — STIGMAS 3 (2), PERIGYNIA GLABROUS,
TERMINAL SPIKE GYNECANDROUS (SECT. *RACEMOSAE*)

1. Plants of moist areas at lower elevation regions in the canyon country of the Colorado Plateau, or s of the Mogollon Rim, below 2300 m (7600 ft); terminal spike mostly staminate with pistillate flowers only at the top or randomly placed, sometimes wholly staminate or appearing so after the perigynia have fallen, often longer than the lateral spikes 2

2. Cespitose plants of the central AZ highlands, s of the Mogollon Rim; culms stiffly upright; less than half of the inflorescences in a clump with gynecandrous terminal spikes; perigynia ovate, twice as long as wide *Carex serratodens*
- 2' Loosely cespitose to rhizomatous plants of hanging gardens and streamsides on the Colorado Plateau; culms often slender and arching so that the inflorescence is often drooping in maturity; nearly all inflorescences on a plant with gynecandrous terminal spikes; perigynia obovate or orbicular, less than twice as long as wide3
3. Perigynia predominantly two-styled (up to 5% three-styled), dark tinged only near the base of the beak, faces whitish hyaline; achene predominantly lenticular (up to 5% trigonous); culms flexuous, spreading and arching; hanging gardens*Carex specuicola*
- 3' Perigynia predominantly three-styled, dark tinged somewhat below the base of the beak, faces opaque; achene predominantly trigonous; culms usually more stiffly upright; various wet habitats *Carex utahensis*
- 1' Plants of montane or alpine habitats, above 1980 m (6500 ft); terminal spike gynecandrous with the staminate flowers only in the bottom third (rarely the bottom half) or less, similar to the lateral spikes in size and shape 4
4. Pistillate scales lanceolate, typically with awns 0.5 to 3.5 mm long; lateral spikes sessile to short peduncled; plants rhizomatous, with light reddish bases, becoming ladder-fibrillose with age *Carex buxbaumii*
- 4' Pistillate scales elliptic to ovate, acute to acuminate, without awns; lateral spikes short to long pedunculate; plants loosely to densely cespitose, with reddish brown to brown bases, not becoming ladder-fibrillose with age 5
5. Lowest lateral spike gynecandrous (though often with only a few staminate flowers at the base), often more pendant on a long peduncle than the upper spikes (may remain erect or spreading in dwarfed alpine plants); spikes generally long and cylindrical, often more than 3 times as long as wide *Carex bella*
- 5' Lowest lateral spike wholly pistillate (rarely gynecandrous in *Carex chalciolepis*), short pedunculate; spikes ovate or elliptic in shape, generally less than 2.5 times as long as wide 6
6. Perigynia 2.0–2.5 mm long, usually bright green or tan and contrasting with the dark scales; scales shorter than the perigynia; plants of moist meadow or forest habitats*Carex stevenii*
- 6' Perigynia 2.5–4.0 mm long, usually partially suffused with darker color and not contrasting strongly with the dark scales; scales usually as long or longer than the perigynia; plants of rocky alpine habitats..... 7
7. Pistillate scales lanceolate, significantly exceeding the perigynia in the upper half of the spike, giving the inflorescence a 'shaggy' appearance; achene filling approximately half of the perigynia; whole inflorescence often nodding in maturity *Carex chalciolepis*
- 7' Pistillate scales broadly lanceolate or ovate, about equaling the perigynia, not giving the inflorescence a 'shaggy' appearance;

achene filling most of the perigynia; inflorescence usually remaining erect..... *Carex albonigra*

GROUP E — STIGMAS 2, PERIGYNIA GLABROUS,
TERMINAL SPIKE STAMINATE OR GYNECANDROUS

1. Plants relatively slight; culms thin and flexuous, generally less than 60 cm tall; leaves mostly less than 3(–4) mm wide; rhizomes 0.7–1.9 mm thick; single terminal spike always staminate or gynecandrous (rarely entirely pistillate in *C. specuicola*); lateral pistillate spikes less than 2.5 cm long; stigmas usually 2, but sometimes with a few flowers (up to 20%) with 3 stigmas 2
 2. Perigynia flat, not fleshy, densely packed and ascending, with a well-defined beak to 0.4 mm long; terminal spike usually gynecandrous (rarely entirely staminate or pistillate)..... *Carex specuicola* (Sect. *Racemosae*)
 - 2' Perigynia subspherical, somewhat fleshy when ripe, loosely packed and spreading, rounded at apex with little or no beak; terminal spike usually entirely staminate (rarely gynecandrous) 3 (Sect. *Bicolores*)
 3. Mature perigynia succulent throughout, yellow to orange (sometimes drying brown on herbarium sheets), subspherical *Carex aurea*
 - 3' Mature perigynia succulent only at base, green, tan, or whitish, somewhat tapered to the base..... *Carex hassei*
- 1' Plants more robust or coarse; culms thick and upright, ranging from 10–120 cm tall; leaves 1–10(–12) mm wide; rhizomes 1.5–6 mm thick; terminal spike staminate (often gynecandrous in *Carex endlichii*), often with 1–3 staminate (less commonly androgynous) spikes below; lateral pistillate spikes 0.7–10 cm long; stigmas always 2 4 (Sect. *Phacocystis*)
 4. Basal sheaths becoming ladder-fibrillose in age (not always apparent on all culms; check for this character on the older culms); bases often shiny red- or orange-brown 5
 5. Terminal spike staminate, often with 1–2 of the subtending spikes staminate (or androgynous), with upper pistillate spikes often with some staminate flowers at their apex; perigynia pale green at maturity, often nerved; beak 0.2–0.3 mm long, pale green, but often with a brown tip; orifice entire; achenes loosely filling the perigynia, giving the perigynia a flat, lenticular shape; widespread in AZ..... *Carex senta*
 - 5' Terminal spike often gynecandrous (80% of AZ specimens), with all subtending spikes pistillate; perigynia sometimes orange-brown at maturity, nerveless or lightly few-nerved; beak 0.3–0.6 mm long, lighter colored than the body but with a dark tip; orifice oblique or bidentate to 0.1–0.2 mm long; achenes filling the perigynia, giving them a puffy, inflated look; restricted to se AZ..... *Carex endlichii*
 - 4' Basal sheaths not ladder-fibrillose; bases usually tan to brown, never shiny red- or orange-brown 6
 6. Plants densely cespitose from short rhizomes; terminal spike often the only staminate spike; lateral spikes usually (70% of AZ specimens) all pistillate

- with no staminate flowers at their apex; perigynia green, usually without spots, sometimes turning light brown with age *Carex kelloggii*
- 6' Plants with more obvious longer rhizomes, culms usually single or in small (large in *Carex emoryi*) clumps between long rhizomes; terminal staminate spike often subtended by 1–2 additional staminate spikes; upper lateral pistillate spikes often with some staminate flowers at the tip; perigynia color various, with or without spots 7
7. Leaves 3–10(–12) mm wide, often glaucous; perigynia 3–7 nerved on each face, with beak 0.3–0.6 mm long, often slightly bidentate and ciliate at the orifice; pistillate scales often with a scabrous awn 1 mm long or more on the lower scales, the midvein usually reaching the tip of the scale; plants often associated with cattle *Carex nebrascensis*
- 7' Leaves 2–6 mm wide, green to occasionally glaucous; perigynia with 3–5 light nerves on each face, or nerveless, with beak 0.1–0.4 mm long, entire; pistillate scales without an awn, the midvein rarely reaching the tip of the scale; plants of more pristine habitats 8
8. Mature perigynia nerveless (sometimes with few, very light nerves), often with reddish brown spots or suffused with reddish brown; pistillate scales with narrow (rarely wide) green midvein and dark brown to black margins; flowering shoots phyllopodic (central), clothed with old leaf bases; plants above 2130 m (7000 ft) *Carex aquatilis*
- 8' Perigynia lightly 3–5 nerved on each face, spotless; pistillate scales with broad pale green midvein and light brown margins; flowering shoots aphyllopodic (lateral), with bladeless basal sheaths only at base; plants below 1070 m (3500 ft) *Carex emoryi*

GROUP F — STIGMAS 2, PERIGYNIA GLABROUS, TERMINAL SPIKE
ANDROGYNOUS OR STAMINATE OR PISTILLATE, SPIKES SESSILE

1. Rhizomes extremely fine, 0.2–0.6 mm thick and often tangled; plants often appearing in clumps, but definitely long rhizomatous; culms arching, flexible, and fine; inflorescence of 1–6 spikes; all spikes with only 1–2 staminate flowers above 1–3 pistillate flowers; perigynia round in cross-section *Carex disperma* (Sect. *Dispermae*)
- 1' Rhizomes coarser, greater than 0.6 mm thick, colonial from long creeping rhizomes to cespitose from short rhizomes; culms more stiffly upright; inflorescence composed of 3–12 spikes; most spikes with more than five flowers, gender arrangement various; perigynia not round in cross-section 2
2. Plants rhizomatous, with clear separation between small groups of 1–several culms; distance between the culms along the rhizome mostly greater than 1 cm 3
3. Distance between the culms along the rhizome greater than 5 cm, rhizomes flexible, 0.8–2.0 mm thick; plants of dry habitats 4
4. Plants mostly bisexual; inflorescence 2–9 mm wide, heads not appearing shaggy 5

5. Inflorescence compact, 0.7–2 cm long; all spikes indistinguishable; perigynia 2.8–3.8 mm long; beak 0.3–0.8 long; culms smooth just below the inflorescence *Carex duriuscula* (Sect. *Divisae*)
- 5' Inflorescence elongate, 1–3.5 cm long; lowest spikes distinguishable; perigynia 3.6–6.0 mm long; beak 1.2–2.5 mm long; culms scabrous just below the inflorescence..... *Carex siccata* (Sect. *Ammoglochin*)
- 4' Plants mostly unisexual; inflorescence 7–27 mm wide, heads appearing shaggy *Carex douglasii* (Sect. *Divisae*)
- 3' Distance between the culms along the rhizome less than 5 cm, rhizomes stout, 1.2–3.0 mm thick; plants of wet or mesic habitats 6
6. Perigynia beaks 0.25–0.5 mm long; perigynia 1.8–2.8 mm long, dark reddish brown; of wetter habitats..... *Carex simulata* (Sect. *Divisae*)
- 6' Perigynia beaks greater than 0.5 mm long; perigynia 2.5–3.7 mm long, brown to black at maturity; plants usually of moist areas that dry out seasonally..... *Carex praegracilis* (Sect. *Divisae*)
- 2' Plants mostly cespitose, forming clumps; distance between the culms along the rhizome short, rarely up to 2 cm long in *C. alma* and *C. chihuahuensis*..... 7
7. Inflorescence obviously paniculate, with at least one lower branch bearing multiple sessile spikes..... 8
8. Beaks of perigynia light colored and contrasting with the dark and shiny bodies *Carex diandra* (Sect. *Heleoglochin*)
- 8' Beaks of the perigynia same color as the bodies
.....9 (Sect. *Multiflorae sensu latu*, including Sect. *Vulpinae*)
9. Inflorescence usually with many fine, long, setaceous bracts in the proximal 2/3 of the length; perigynia green to yellow-orange at maturity *Carex vulpinoidea*
- 9' Inflorescence with only one long basal bract; perigynia light tan to dark brown at maturity 10
10. Culms 4–6 mm wide with the angles narrow-winged; sheath fronts cross-corrugated; leaves 4–11 mm wide; inflorescence robust, dense, spiky with long acute perigynia pointing in all directions; perigynia 3.5–6.0 mm long, strongly many-nerved .. *Carex stipata*
- 10' Culms 1.5–3.5 mm wide, sharp angled but not winged; sheath fronts not cross-corrugated; leaves 1.5–6.4 mm wide; inflorescence softer, if spiky then not so robust; perigynia 2.2–5.0 mm long, sometimes strongly many-nerved, sometimes not nerved..... 11
11. Widest leaves 3.5–6.3 mm wide; longest perigynia 3.4–5.0 mm long, usually strongly many-nerved, with acute apices, without a definite shoulder; mature inflorescences more than (10–)15 mm wide, often with a 'silky' look *Carex alma*
- 11' Widest leaves 1.4–4.4 mm wide; longest perigynia 2.5–4.2 mm long, with nerve pattern various, with acuminate or acute apices, with or without a definite shoulder; mature inflorescences up to 15(–20) mm wide, often 'spiky' rather than 'silky'..... *Carex chihuahuensis*
- 7' Inflorescence racemose, all spikes sessile on the main axis only 12

12. Plants of wet habitats; perigynia widest at the base, often distended with spongy tissue at the base 13
13. Inflorescence elongate, greater than 15 mm long, with some spikes evident to the naked eye; perigynia with light colored beaks that contrast with the dark and shiny bodies, with two prominent nerves on either side of a central dorsal groove.....
..... *Carex diandra* (Sect. *Helioglochin*)
- 13' Inflorescence compact, less than 15(25) mm long, with spikes indistinguishable to the naked eye; perigynia with beaks similar to or darker colored than the bodies, with several nerves on each side all similar, without a central dorsal groove
..... *Carex jonesii* (Sect. *Vulpinae*)
- 12' Plants of dry habitats (occasionally approaching moist areas); perigynia widest near the middle, without spongy tissue at the base
..... 14 (Sect. *Phaestoglochin*)
14. Pistillate scales as long and wide as the perigynia, mostly hiding them; mature perigynia plano-convex, with marginal nerves usually at the edge of the body, rarely one nerve pushed over onto the ventral face, mostly unnerved on the surfaces, prominently (often doubly) serrulate on the margins of the beak; beak obviously bidentate; perigynia all similarly arranged in the spikes, giving the inflorescence a regular appearance *Carex occidentalis*
- 14' Pistillate scales usually shorter than the perigynia, the perigynia readily visible; mature perigynia plumply plano-convex, with at least one of the marginal nerves pushed over onto the ventral surface, many-nerved dorsally and often ventrally, smooth or finely serrulate on the margins of the beak; beak obliquely cleft or only slightly bi-dentate; some of the perigynia with random orientations in the spikes, giving the inflorescence an irregular appearance *Carex vallicola*

CAREX GROUP G — STIGMAS 2, PERIGYNIA GLABROUS, TERMINAL SPIKE
GYNECANDROUS, SPIKES SESSILE, PERIGYNIA UNWINGED

1. Spikes short and with perigynia spreading in all directions (star-shaped) at maturity (see *Carex interior* and *C. echinata* in “A Visual Guide to Carex of Arizona”); inflorescence of 3–5 spikes; lateral spikes often wholly pistillate; perigynia widest near base, with spongy-thickened tissue at the base apparent .. 2 (Sect. *Stellulatae*)
2. Perigynia 1.9–3.0 mm long, about 2 times as long as wide; beaks 0.4–1.0 mm long *Carex interior*
- 2' Perigynia 3.0–3.5 mm long, about 2.5–3 times as long as wide; beaks 1.2–1.6 mm long *Carex echinata*
- 1' Spikes not appearing star-shaped at maturity, with lower spikes and perigynia ascending; inflorescence of 4–6 spikes; lateral spikes gynecandrous (rarely androgynous or wholly staminate); perigynia widest above the base, spongy-thickened tissue at base not apparent 3

3. Margins of the perigynia rounded; perigynia ovoid, about 2 times (or less) as long as wide, the surface minutely papillate; beak 0.2–0.5 mm long, entire or with teeth up to 0.2 mm long; achenes filling the body of the perigynia
..... *Carex canescens* (Sect. *Glareosae*)
- 3' Margins of the perigynia with a definite edge; perigynia plano-convex, lanceolate, 2.5 (or more) times as long as wide, the surface smooth; beak 0.9–1.5 mm long, bidentate with teeth 0.2–0.6 mm long; achenes not quite filling the body of the perigynia *Carex bolanderi* (Sect. *Deweyanae*)

GROUP H — STIGMAS 2, PERIGYNIA GLABROUS, ALL SPIKES
SESSILE AND GYNECANDROUS, PERIGYNIA WINGED (SECT. *OVALES*)

1. Inflorescences mostly elongate, 2 cm long or longer, the upper spikes separated enough to be easily distinguishable without magnification, the lowest internode usually greater than 3 mm..... 2
2. Perigynia less than 5.5 mm long; spikes ovoid, elliptic, or sub-spherical; plants growing in riparian areas or damp meadows 3
3. Perigynia less than 2 times long as wide, suborbicular; spikes often rough-textured due to prominent beaks on more widely spreading perigynia), ovoid to subspherical, less commonly ellipsoid *Carex brevior*
- 3' Perigynia more than 2 times long as wide, elliptic to ovate; spikes smooth textured (perigynia more appressed than in the former), ovoid to ellipsoid 4
4. Perigynia plano-convex, 2.2–3.8 mm long; distance from top of achene to tip of beak 2 mm or less..... *Carex subfusca*
- 4' Perigynia flat except where distended by the achene, 3.5–5.5 mm long; distance from top of achene to tip of beak greater than 2 mm..... 5
5. Pistillate scales very narrow and colored like the perigynia, hyaline, tan or green; perigynia lanceolate *Carex scoparia*
- 5' Pistillate scales almost as broad as the perigynia, dark brown and contrasting with the green perigynia; perigynia ovate to elliptic *Carex sp. nov. B* (pgs. 77 and S-15)
- 2' Perigynia greater than 5.5 mm long; spikes ovoid to fusiform; plants growing in dry meadows and forests, rarely in riparian areas 6
6. Perigynia usually nerveless, forest green, creating a contrast to the brown scales; hyaline margins on scales 0–0.4 mm wide; spikes broadly fusiform to ovoid, with few staminate flowers at the base of each spike; lowest inflorescence bract sometimes longer than inflorescence.....
..... *Carex wootonii*
- 6' Perigynia usually nerved, light olive green, so less contrasting with the tan scales; hyaline margins on scales 0.2–0.8 mm wide; spikes narrowly fusiform to narrowly obovoid, with many staminate flowers at the base of each spike; lowest inflorescence bract never longer than inflorescence
..... *Carex petasata*
- 1' Inflorescences mostly compact, 2 cm long or less, the upper spikes often tightly clustered and not separated enough to be easily distinguishable without

- magnification (often separated and distinguishable in *Carex bebbii* and *C. scoparia*), the lowest internode usually 3 mm or less..... 7
7. Spikes separate along the axis (but can be overlapping), appearing “beaded,” each one distinct from the rest 8
8. Spikes obovoid to globose, 4–8 mm long; perigynia less than 3.3 mm long, 1.0–1.4 mm wide..... *Carex bebbii*
- 8’ Spikes smoothly ellipsoid, 6–12 mm long; perigynia greater than 3.4 mm long, 1.2–2.2 mm wide *Carex scoparia*
- 7’ Spikes in a more compact “head,” not appearing “beaded,” not easily distinguished from each other 9
9. Perigynia greater than 5.5 mm long *Carex ebenea*
- 9’ Perigynia less than 5 mm long 10
10. Base of head truncate to retuse 11
11. Culms 4-40 cm tall; perigynia never green, distance from the beak tip to the top of the achene (2.3–)2.6–3.8 mm; plants growing high on the San Francisco Peaks, in alpine tundra, above 3350 m (11,000 ft) *Carex haydeniana*
- 11’ Culms 15-110 cm tall; perigynia often green, distance from the beak tip to the top of the achene 1.5–2.0(–2.4)[–2.8] mm; plants growing in forested areas or meadows below 3350 m (11,000 ft) ..
..... *Carex microptera*
- 10’ Base of head usually tapered, sometimes nearly truncate 12
12. Lowest inflorescence bract longer than the head 13
13. Clumps with most heads having 1-3 bracts longer than the head (can be broken off on dried specimens); wide, usually hyaline basal portion of the lowest bract greater than 1/2 the length of the lowest spike it subtends; perigynia flat to plano-convex, with a narrowed extension at the base; leaves 1.5–4.0 mm wide
..... *Carex athrostachya*
- 13’ Clumps occasionally with a few heads having one bract longer than the head; wide, usually hyaline basal portion of the lowest bract less than 1/2 the length of the lowest spike it subtends; perigynia plano-convex (achene filling the perigynia more fully than in *C. athrostachya*), with rounded to tapered bases; leaves 0.8–2.0 mm wide *Carex subfusca*
- 12’ Lowest inflorescence bract shorter than the head 14
14. Perigynia flat except where distended by the achene
..... *Carex microptera*
- 14’ Perigynia plano-convex 15
15. Perigynia wide-spreading, sometimes shiny, with a copper tinge at maturity, 3.6–4.5 mm long
..... *Carex pachystachya*
- 15’ Perigynia appressed, dull, green to straw colored at maturity, 2.2–3.8 mm long *Carex subfusca*

Carex albonigra Mack. (black and white, referring to pistillate scales with contrasting coloration). Blackandwhite sedge. —Plants loosely cespitose from short rhizomes. CULMS [10–]15–25[–30] cm tall, stiff, erect, longer than the leaves, acutely scabrous-angled, glandular below the inflorescence. LEAVES 1.5–4.2[–5] mm wide, glaucous; basal sheaths dark reddish brown; apex triangular in cross section, scabrous-margined. INFLORESCENCE 1.8–3.4 cm long, 0.5–1.0 cm wide, condensed, dark, elliptic, composed of 2–3[–4] erect, overlapping but distinct, similar-looking oblong spikes; terminal spike gynecandrous, 10–17[–20] mm long, 5–8 mm wide; lateral spikes pistillate, [8–]10–21 mm long, 3–4[–6] mm wide, with peduncles 2–8 mm long; proximal bract shorter than or equal to the inflorescence, leaf-like, strongly scabrous-margined, dorsal surface glandular, with a sheath 0.5–3.0 mm long; basal bracts of each spike brown with a tan midvein. PISTILLATE SCALES slightly shorter than, equal to, or slightly longer than the perigynia, ovate, dark brown to black throughout or with a lighter midvein; hyaline margins up to 0.3(–0.6) mm wide; tip obtuse, entire. PERIGYNIA 2.5–3.0[–3.5] mm long, 1.4–1.9 mm wide, ascending, dark brown to black, rarely light brown, ovate to elliptic, rounded to tapered at the base, abruptly contracted to beak; beak 0.2–0.4 mm long, papillate-margined toward the summit. ANTHERS 2.2 mm long. STIGMAS 3. ACHENES trigonous, 1.6–1.7[–1.9] mm long, 0.8–1.1[–1.3] mm wide, minutely papillate, nearly filling the body of the perigynia. $2n = 52, 54$. —Alpine rock fields and meadows above timberline: Coconino Co.; 3550–3700 m (11,700–12,100 ft); Jul–Aug; AK, Yukon, and Northwest Territories, Can.; s to CA and n NM. In AZ, only known from the summit of the San Francisco Peaks. SECTION: Racemosae. Group/Key D.

Carex albonigra has been confused with immature specimens of both *C. bella* and *C. chalciolepis*. *Carex chalciolepis* has scales that are much longer than the perigynia and most often acute at the tips, with culms that often droop with age. *Carex bella* has lower spikes that are usually more elongate, and are always gynecandrous, though often with only a few staminate flowers at the base.

Carex alma L. H. Bailey (nourishing, bountiful). Sturdy sedge, Bountiful sedge. —Plants cespitose or rhizomatous with thick, straight, smooth, brown rhizomes; rhizomes 1.4–3.6 mm thick; distance between the culms along the rhizome up to 1(–2) cm. CULMS 30–130 cm tall, usually exceeding the leaves, bluntly triangular to scabrous above, green to brown at the base, 2.5–6 mm thick at the base. LEAVES widest leaf blades on a specimen 3.5–6.3 mm wide, flat, but becoming triangular in cross section toward the tip; basal sheaths green to brown, 0–3 bladeless sheaths at the base; old sheaths persistent; hyaline sheath fronts often with red spots. INFLORESCENCE [4.0–]4.5–13 cm long, 10–35 mm wide, elongate, composed of 3–12[–20] lower multiple-spiked branches, and several upper spikes sessile on the main rachis; lowest branches 8–33 mm long, 3–20 mm wide; internode between lowest branches 3–30 mm; individual spikes 4–8 mm long, 2–5 mm wide, androgynous, rarely unisexual, often with just a few opposite gender flowers in a head, the staminate flowers in androgynous heads often inconspicuous; lowest inflorescence bract 0.6–5.0 cm long, with an expanded broad hyaline-margined basal portion; spike bracts becoming smaller and less awned toward the top of the inflorescence. PISTILLATE SCALES about the size of the perigynia, ovate, bronze with a green midvein and broad hyaline margins,

turning pale in age giving the inflorescence a ‘silky’ look, usually not clasping the perigynia at the base so that the perigynia are early deciduous; apex acute to awned with awns rarely up to 0.7 mm long. PERIGYNIA 2.6–5.0 mm long, 1.4–2.4 mm wide, appressed to spreading, green or pale, turning tan to nearly black at maturity, dull, strongly nerved, or rarely weakly nerved or unnerved, with up to 15 dorsal veins and up to 11 ventral veins, broadly lanceolate, sometimes violin-shaped, plano-convex to concavo-convex; base spongy, rounded, truncate, or slightly cordate, with stipe 0–0.2(–0.4) mm long; apex usually acute with no definite shoulder, though some perigynia in a head often with apex acuminate, sharp-margined and serrulate distally; beak obscurely bidentate to deeply bidentate, the dorsal side cut as deep as 0.5(–0.8) mm; ventral side cut to 0.2(–0.4) mm. ANTHERS 2.0–3.5 mm long; apiculus up to 0.5 mm long. STIGMAS 2. ACHENES lenticular, 1.4–1.8 mm long, 0.8–1.2 mm wide, obovoid, tan to dark brown, polished, finely punctulate, jointed to a short style. [*Carex agrostoides* Mackenzie] —Stream banks, springs, seeps; Cochise, Coconino, Gila, Graham, Greenlee, La Paz, Mohave, Pima, Santa Cruz, and Yavapai cos.; 880–2260 m (2900–7400 ft); May–Sep; CA, NV, NM, TX; s to Son. and Chih., Mex. Found at mid-elevations from se to nw AZ, where it is found from the sky islands to the w desert mountain ranges, and in the Grand Canyon. SECTION: *Multiflorae*; Group/Key G.

Carex alma and *Carex chihuahuensis* appear to intergrade in AZ, and may ultimately best be described as one highly variable species. Past treatments of these taxa have been complicated by the inclusion of *Carex agrostoides*, which Standley (2002a) subsumed into *Carex alma*, on the basis of the type now being determined as an immature specimen of that species. In our assessment, many of the specimens originally determined as *Carex agrostoides* fall better on the side of *C. chihuahuensis*. We have had the advantage of looking at well over 200 specimens of these taxa from AZ, a much larger group than any previous author. This review has allowed us to realize that many of the characters used in the past to separate the two taxa are questionable, especially in regards to perigynia color, veining, and inflorescence bract length, which are the characters used in Standley (2002a). Currently, we believe that the best characters we can use to separate these taxa are leaf and inflorescence width (both wider in *Carex alma*), and perigynia shape, but even these characters do not always hold up. The perigynia of both species are variable in shape, but those of what we are currently calling *Carex chihuahuensis* have a greater percentage of perigynia that contract abruptly to the beak (acuminate), and less that taper gradually to a longer beak (acute). In *Carex alma*, most of the perigynia are acute, and the plants that typify the *Carex alma* side of the spectrum best (in the Grand Canyon) have acute perigynia almost exclusively.

In AZ, this taxonomic issue has also been complicated by these species (especially *Carex chihuahuensis*) having traits that overlap with *Carex praegracilis*. Both *Carex alma* and *C. chihuahuensis* can have dark rhizomes, as does *Carex praegracilis*, although the rhizomes of the former tend to be slightly more robust, less “knotty,” and a richer brown compared to the blackish brown of *C. praegracilis*. *Carex praegracilis* also has inflorescences that can be paniculate (up to 4–5 of the lower branches having multiple spikes, typically fewer than we see in either *Carex alma* or *C. chihuahuensis*). This is a trait that has never been described for this species before,

other than Peter Zika's mention of the lowest branch occasionally having more than one spike in *Carex praegracilis* in the The Jepson Manual, Second Edition (Baldwin et al. 2012). This has caused some *Carex praegracilis* specimens to be determined as *C. agrostoides* or *C. chihuahuensis* in the past. *Carex praegracilis* perigynia uncommonly have bases distended with pithy tissue (usually on the sides of the base), and thus appear similar to the perigynia of *C. alma* and *C. chihuahuensis*. In the field, *Carex praegracilis* is obviously rhizomatous, usually forming larger stands, while both *Carex alma* and *C. chihuahuensis* tend to form clumps and would usually be observed as cespitose. Confusion comes from collections where the habit is not described, as all three species can appear "rhizomatous" on an herbarium sheet. On poor specimens with no bases, the paniculate character of *Carex praegracilis* has caused misdeterminations.

We are not yet comfortable with formally combining *Carex alma* and *C. chihuahuensis* in this treatment, given how different both ends of the spectrum appear. However, the range of variation in the middle makes determination of many specimens problematic. This is an example of where the human sense of what constitutes 'species' falls short of describing reality.

Carex aquatilis Wahlenb. (aquatic, growing in or near water). Water sedge. — Plants rhizomatous; culms arising singly or several together from stout, scaly rhizomes. CULMS 20–120 cm tall, obtusely to acutely angled, smooth or scabrous, usually shorter than the leaves. LEAVES 2.5–6.0[–8.0] mm wide, long-tapering, light green to glaucous green; basal sheaths red-brown or brown; sheath fronts thin, membranous-white, rupturing early, becoming red-spotted distally, veinless, the apex U-shaped. INFLORESCENCE (4–)7–16(–21) cm long, elongate, composed of 1–2(–4) terminal staminate spikes and 2–4[–7] lateral, mostly pistillate spikes; upper pistillate spikes sometimes with a few staminate flowers on top; proximal pistillate spike 1–4.5[–10] cm long, 2.5–4[–7] mm wide, with base cuneate, the peduncle up to 1 cm long, rarely longer; proximal bract 1–3.5 mm wide, frequently longer than the inflorescence. PISTILLATE SCALES shorter to longer and often narrower than the perigynia, ovate to lanceolate, dark red-brown to purplish black with a pale green, narrow (rarely broad) midvein, or with midvein lacking; apex truncate to acuminate, awnless. PERIGYNIA 2–3.6 mm long, 1.3–2.3 mm wide, ascending, pale, often with reddish brown spots or suffused with reddish brown, nerveless or nearly so, somewhat flattened, loosely enclosing achenes, elliptic or obovate, dull; apex obtuse or acute, papillose; beak 0.1–0.4 mm long, pale brown, entire. STIGMAS 2. ACHENES lenticular, 1–1.8 mm long, 0.7–1.6 mm wide, dull to glossy. $2n = 72–80$. —4 vars., only var. *aquatilis* in AZ — Wet meadows, ponds and lakeshores, growing in or on the banks of sluggish streams; Apache, Coconino, and Navajo cos.; 2300–2900 m (7500–9500 ft); Jun–Aug; circumboreal, coast to coast in N. Amer. from the arctic s to CA, n AZ and NM, New Brunswick to VA, absent from TX and the South. Infrequent in AZ, with records only from Bear Lake on the Kaibab Plateau, and the White Mountains; previously thought to be more widespread, primarily based on misdeterminations of *Carex senta* and *C. emoryi*. SECTION: *Phacocystis*; Group/Key E.

Carex aquatilis is distinguished from *C. senta* by the sheaths not becoming ladder-fibrillose, and having veinless perigynia. It can be separated from *Carex emoryi* by having perigynia that lack veins and having darker pistillate scales (usually) with

narrower midveins. *Carex emoryi* seems to be restricted to Marble Canyon along the Colorado River upstream of river mile 40 at elevations below 4000 ft, whereas *C. aquatilis* is restricted to elevations greater than 7000 ft in AZ.

Carex atherodes Spreng. (resemblance to a wheat spike). Awned sedge. — Plants colonial from long-creeping rhizomes with distance between the culms along the rhizome that can exceed 5 cm, usually forming large stands. CULMS 30–90[–150] cm tall, often shorter than the leaves, sharply triangular. LEAVES 3–8[–12] mm wide, flat, dull green, glabrous to pubescent; leaf bases brown to reddish purple to black, sparsely to densely hairy near the top, rarely glabrous; sheath fronts red-spotted, becoming strongly ladder-fibrillose in age, concave at top; ligule as long as wide to 3 times longer than wide, with a rounded tip and free portion about 1 mm long. INFLORESCENCE 12–35[–60] cm long, elongate, composed of (1–)2–8 erect terminal staminate spikes (sometimes 1–4 of these androgynous) and 1–3[–5] erect, remote, proximal pistillate spikes; staminate spikes 1.5–5(–10) cm long, 3–5 mm wide; proximal pistillate spikes 4–6[–12] cm long, about 10[–15] mm wide, with peduncles up to 10 cm long; proximal pistillate bract appearing as a normal leaf, the bracts above similar, each longer than the inflorescence. PISTILLATE SCALES shorter to longer than the perigynia, lanceolate to ovate, with a 3–nerved greenish midvein and hyaline margins, abruptly narrowed to a scabrous awn almost as long as the body of the scale. PERIGYNIA (6.5–)7–9[–12] mm long, 1.0–1.8[–3.8] mm wide, ascending to spreading, green to straw colored, with [12–]16–18[–21] strong nerves, lanceolate to lance-ovate, rounded below, smoothly tapered above to a deeply bidentate beak; beak 2.1–4.0 mm long, with long, slender, divergent teeth [1.2–]2.0–3.0 mm long. ANTHERS 3.7–4.2 mm long. STIGMAS 3. ACHENES [2.0–]2.3[–3.2] mm long, [1.2–]1.5 mm wide, obovoid, trigonous with blunt angles. —Lake margins, wet meadows and marshes; Apache, Coconino, Gila, and Navajo cos.; 2050–2850 m (6700–9300 ft); May–Aug; AK to ME, through most of Can. and the U.S., but absent from the Southeast. In AZ, from the base of the San Francisco Peaks, along the Mogollon Rim country to the White Mountains. SECTION: *Carex*; Group/Key C.

Potentially more common in AZ than the 15 vouchers indicate; most of the populations seen by Rink and Licher were not flowering, thus easy to overlook, and unlikely to be collected. *Carex atherodes* is distinct from similar species in AZ in its combination of hairy sheaths with ladder-fibrillose sheath fronts, and prominent bidentate perigynia with longer teeth than any other species. Sterile stands might be mistaken for *Carex utriculata* due to similarities in habit and habitat, but the often papillate and hairy sheaths will be diagnostic. We believe this is the only species in AZ that has vegetative shoots that are true culms with nodes and internodes and that are hollow.

Carex athrostachya Olney (with spikes crowded together). Slenderbeak sedge. —Plants densely cespitose. CULMS (5–)20–60(–80) cm tall, longer than the leaves. LEAVES 1.5–4[–5] mm wide, green. INFLORESCENCE [1.0–]1.2–2.2[–2.5] cm long, dense and head-like, rarely elongate, rarely paniculate, composed of (4–)7–10(–15) tightly aggregated sessile gynecandrous spikes, the spikes often hard to distinguish; each spike 6–10 mm long, 4.5–7 mm wide, broadly ovoid; proximal internode 1.5–3(–

5) mm long; proximal bract generally much longer than the inflorescence, leaf-like, with base up to 3.5 mm wide, with broad hyaline margins, the upper bracts leaf-like to bristle-like, the second bract also often as long or longer than the inflorescence. PISTILLATE SCALES narrower and shorter than the perigynia, lanceolate to ovate, golden to reddish brown with a pale center and whitish hyaline margins, the apex acuminate to awned. PERIGYNIA 2.8–4.0[–4.8] mm long, (0.8–)1.0–1.5(–1.8) mm wide, appressed to ascending, cream, green, or light brown, strongly 7+ nerved ventrally and dorsally or nerveless ventrally, flat except where distended by the achene to somewhat plano-convex, wing-margined with wings folded slightly inward to make a boat-like shape, tapering to a stipitate base, wing-margined and serrulate distally, tapering gradually to the beak; beak tip gold to red-brown, entire for distal 0.2–0.8 mm, 1.9–2.5 mm from tip of beak to top of achene. STIGMAS 2. ACHENES lenticular, (1.0–)1.2–1.6 mm long, 0.7–1.0 mm wide. $2n = 68$. —Pond margins, seasonally wet streambanks and meadows; Apache and Coconino cos.; 1850–2750 m (6000–9000 ft); Jun–Sep; AK to n Baja C., Mex., throughout all the w states. In AZ, locally abundant on the Kaibab Plateau, in the Flagstaff/San Francisco Peaks area, and along the Mogollon Rim country, with a few scattered locations in the White Mountains and the Chuskas. SECTION: *Ovales*; Group/Key H.

In AZ, *Carex athrostachya* is often a short plant forming large populations around wetlands, but occasionally taller individuals can be found. It is most often confused with *Carex subfusca* and *C. microptera*, which can occasionally have the elongated proximal bract on one to a few of the inflorescences, and rarely on most. *Carex subfusca* perigynia are filled by the achenes, usually have narrow wing margins, making them distinctly plano-convex, while *C. athrostachya* perigynia have flatter, wider margins and taper more gradually to the beak. *Carex microptera* is similar, but it does not have the elongated proximal bracts as frequently, and its lower spikes tend to spread a little more, with the inflorescence having a truncate base, giving the compact head more of a globose look, compared to the more cuneate base of *C. athrostachya* heads.

Carex aurea Nutt. (golden, referring to the color of the ripe perigynia). Golden sedge. —Plants rhizomatous to loosely cespitose from long, slender rhizomes; rhizomes about 1 mm thick. CULMS 5–20(–40) cm tall, usually shorter than the leaves, but occasionally longer. LEAVES (1.5–)2.0–3.5 mm wide, light green to somewhat glaucous; basal sheaths cream to brown. INFLORESCENCE 2–13 cm long, condensed to elongate, composed of a single erect terminal staminate spike (this spike rarely gynecandrous), and 1–4 lateral pistillate spikes; terminal spike 3–12(–26) mm long, [0.9–]1.4–2.5 mm wide; lateral pistillate spikes 4–28 mm long, 2.5–4[–5] mm wide, with 4–20 perigynia loosely spaced on the rachis with middle internodes 0.5–1.2 mm long, the lower lateral spikes long-peduncled to 12 cm long or more; proximal bract leaf-like and longer than the inflorescence, with a sheath [2–]3–15[–20] mm long. PISTILLATE SCALES about as wide and as long as the perigynia, ovate to orbicular, brownish with pale green midvein and hyaline margins; tip obtuse to cuspidate. PERIGYNIA 1.4–2.6[–3.2] mm long, 1.0–1.5[–2.0] mm wide, spreading to divergent in mature fruit or sometimes falling before perigynia mature, succulent when mature, bright yellow-orange, drying brownish on herbarium sheets, pale green earlier,

typically nerved, but sometimes not, globose to obovoid, smooth or minutely papillose, beakless or nearly so; orifice entire. ANTHEIRS 1.4–1.9 mm long. STIGMAS 2. ACHENES 1.3–1.8(–2.0) mm long, 0.9–1.4[–1.6] mm wide, suborbicular, lenticular. $2n = 52$. —Moist to wet meadows, seepage slopes and springs, streambanks, often on alkaline substrates; Apache, Coconino, Mohave, and Navajo cos.; 1200–2520 m (3900–8280 ft); Jun–Aug; AK to Newfoundland, Can.; s to CA, n AZ, NM, and TX, absent from the Southeast. Occasional in n AZ, with scattered records from the Colorado Plateau; previously thought to be more widespread, based on misdeterminations of *Carex hassei* and *Carex* sp. nov. A. SECTION: *Bicolores*; Group/Key E.

In reviewing specimens for this treatment, Anton Reznicek determined that collections from AZ previously determined as *Carex meadii* (an e species in Section *Paniceae*), were not that species, and were most likely an undescribed taxon (which he annotated as *C.* sp. nov. aff. *Klamathensis*). We refer to these specimens in this treatment as *C.* sp. nov. A, but we have followed Reznicek in annotating specimens as *C.* aff. *klamathensis*. True *C. klamathensis* is a newly described *Paniceae* species endemic to serpentine substrates in the Klamath Mountains of CA and OR. These plants appear very similar to *Carex aurea* and *C. hassei* (Section *Bicolores*), but differ by having flowers with three stigmas rather two; in usually having slightly wider leaves; and a more upright habit.

Carex sp. nov. A, *C. klamathensis*, *C. aurea* and *C. hassei* have a mix of flowers with two and three stigmas, the percentage of flowers with three stigmas being greater in the two *Paniceae* plants, and lesser in the two *Bicolores*. We have observed yellowish colored perigynia bases in both *Carex hassei* and *C.* sp. nov. A, a trait that reaches its maximum in *C. aurea*, where the entire perigynia becomes succulent and yellow at maturity. Many (but not all) populations of *C.* sp. nov. A have basal spikes on long filiform peduncles, a trait that is occasional in both *C. aurea* and *C. hassei*. Some specimens previously determined as both *Carex aurea* and *C. hassei* have also turned out to be *C.* sp. nov. A.

Our current understanding is that all plants in AZ from the Mogollon Rim s are *C.* sp. nov. A, and that those of the Colorado Plateau are mostly a mix of *C. aurea* and *C. hassei* (although we have a few specimens from the Grand Canyon and Hopi Reservation that have mostly three stigmas, and are therefore determined as *C.* sp. nov. A). Chromosome counts have not been helpful (they can be in Section *Paniceae*), with preliminary results showing *C.* sp. nov. A, *C. klamathensis* and *C. hassei* as having the same chromosome number. We continue our search for morphological characters that may be useful for differentiating these.

We have found that distinguishing *Carex aurea* and *C. hassei* is impossible without mature perigynia. The perigynia veining and pistillate scale characters used in other keys to distinguish the two do not hold up, in our experience. We are concerned that many of our *Carex hassei* specimens may be simply immature specimens of *C. aurea*. Both Cronquist (1977) and Goodrich (2003) have merged *Carex hassei* with *C. aurea*, while Ball (2002) and Zika et al. (2012) separate the two.

Carex bebbii (L. H. Bailey) Olney ex Fernald (for Michael Schuck Bebb, 1833–1895). Bebb's sedge. —Plants densely caespitose. CULMS [20–]40–55[–90] cm tall,

longer than the leaves. LEAVES 1–2.5[–4.2] mm wide, green. INFLORESCENCE 1.1–2.0[–3.0] cm long, 8–10[–15] mm wide, ovoid to linear-oblong, composed of 3–8[–10] overlapping sessile gynecandrous spikes, each distinguishable from the others; spikes 4–8[–10] mm long, 3–5[–7] mm wide, broadly ovoid to globose; proximal internode 1–3[–4] mm; proximal bract scale-like or setaceous-prolonged. PISTILLATE SCALES narrower and shorter than or equal to the perigynia, lanceolate or oblong-lanceolate, reddish brown with a pale or bright green midvein, occasionally with very narrow hyaline margins; apex acuminate or acute. PERIGYNIA 2.5–3.2[–3.8] mm long, 1.0–1.4[–2] mm wide, ascending to spreading-ascending, light to dark reddish brown, finely nerved dorsally, nerveless ventrally or with several nerves at the base only, plano-convex, winged to the base, wing-margined and serrulate distally, tapering gradually to the beak; beak tip red-brown, flat and serrulate to the tip, [1.2–]1.5–2.0[–2.2] mm from beak tip to top of achene. STIGMAS 2. ACHENES lenticular, 1.0–1.3 mm long, 0.6–0.9 mm wide. $2n = 68, 70$. —Wet meadows and streambanks; Coconino Co.; 2000 m (6550 ft); Jun–Aug; AK to n AZ; from coast to coast in Can. and the n half of the U.S. In AZ, known only from two locations n of the Mogollon Rim. SECTION: *Ovales*; Group/Key H.

In AZ, *Carex bebbii* is most likely to be confused with *Carex subfusca*. *Carex bebbii* spikes are more evenly distinct and rounded, giving it a “beaded” look, while *C. subfusca* spikes are more dense and irregular and sometimes hard to distinguish (at least the terminal ones). *Carex subfusca* has plano-convex perigynia, but *C. bebbii* perigynia are flat except where distended by the achene.

Carex bella L. H. Bailey (handsome). Southwestern showy sedge. —Plants cespitose from short rhizomes. CULMS 15–75[–90] cm tall, longer than the leaves, with rounded smooth angles, rarely scabrous, glabrous below the inflorescence, often drooping with age. LEAVES [0.8–]1.2–5.5[–6] mm wide, green; basal sheaths green to dark reddish brown, slightly ladder-fibrillose. INFLORESCENCE 4–11 cm long, 0.7–2.5 cm wide, generally elongate, to more condensed in dwarfed specimens from high elevations, composed of 2–5 cylindrical or narrowly elliptic spikes; terminal spike 13–28 mm long, 4–6 mm wide, gynecandrous; lateral spikes 8–35 mm long, 2–5 mm wide, also gynecandrous, mostly pistillate with 1–30 staminate flowers at the base, with progressively fewer staminate flowers on lower spikes, on peduncles (1–)2–90(–140) mm long, the peduncles progressively longer on the lower spikes; spikes either appressed or progressively drooping from the upper to lower spikes; spikes with contrasting colors due to dark scales that are shorter than the bright green perigynia. PISTILLATE SCALES shorter than the perigynia so that at least the tips of the perigynia are visible, ovate, dark reddish brown with a lighter tan or green midvein, sometimes with hyaline margins to 0.2 mm wide; tip acute, rarely obtuse, entire, or with the midvein extending as an awn up to 0.6 mm long. STAMINATE SCALES sometimes lighter colored than the pistillate scales. PERIGYNIA 2.4–3.6[–4.0] long, 1.3–2.4 mm wide, ascending, somewhat flattened, light green or beige, sometimes with black mottling, elliptic or obovate, nerveless or obscurely several nerved, tapered or pointed at the base, rounded at the apex, beakless or more often beaked; beak up to 0.3[–4.0] mm long, sometimes toothed to a depth of 0.2 mm, smooth. ANTHERS 1.9–2.8 mm long. STIGMAS 3. ACHENES 1.8–2.6 long, 0.9–1.4 mm wide, trigonous,

ovoid or oblong-ovoid, light green to light tan, nearly filling the perigynia when mature, minutely papillate. $2n = 40$. —Montane conifer woodlands to alpine rock fields and meadows, but most common in subalpine woodlands; Apache, Coconino, and Graham cos.; 2100–3200 m (6800–12,600 ft.); May–Oct; c and s Rocky Mountains from UT and CO to NM and AZ, with an outlying populations in SD; two sites in n Mex. In AZ, moderately abundant on the Kaibab and Coconino Plateaus (San Francisco Peaks), and in the White and Pinaleño Mountains, with a few records from the Mogollon Rim country. SECTION: Racemosae. Group/Key D.

Carex bella is an attractive sedge, forming large clumps with gracefully pendant inflorescences in its preferred forest habitat. At high elevations on the San Francisco Peaks, it sometimes grows in smaller patches, several culms together, and has shorter inflorescences that remain more upright, leaning slightly in maturity but not nodding. These plants might be confused with *Carex albonigra*, which usually has shorter culms that do not droop with age. However, *Carex albonigra* perigynia and scales are both dark in color, and the spikes are usually shorter and more ovate. *Carex chalciolepis* has scales longer than the perigynia and the perigynia usually are not bright green. Both *Carex albonigra* and *C. chalciolepis* have lower spikes that are wholly pistillate. *Carex bella* occurs more commonly at lower elevations, has bright green perigynia that are longer than the scales, and has gynacandrous lower spikes (at least one or two staminate flowers at the base). We have one specimen from the San Francisco Peaks (ASC#42160, Little 4707) that has the scales of *Carex chalciolepis*, but the gynecandrous and longer lower spikes of *C. bella*. Peter Zika has postulated this specimen to be a hybrid between those two taxa.

Carex bolanderi Olney (for Henry Nicholson Bolander, 1831–1897). Bolander's sedge. —Plants densely to loosely caespitose. CULMS 20–70[–115] cm tall, longer than or shorter than the leaves, thin, flexuous, sharp-edged. LEAVES 0.6–3.5[–5.0] mm wide, green. INFLORESCENCE 1.5–4.5[–10.3] cm long, 0.5–1.2 cm wide, moderately elongate, usually with a tighter cluster of spikes at the top and several more distant below, composed of 4–6[–9] sessile, easily distinguishable from each other, gynecandrous spikes; spikes 8–12[–25] mm long, 3–5[–6.5] mm wide), linear-elliptic; proximal internode 5–15(–20)[–32] mm; proximal bract awn-like 10–35[–43] mm long, shorter than or longer than the inflorescence. PISTILLATE SCALES about as long as the body of the perigynia but exposing the beaks, ovate to oblong-ovate, thin, light colored to hyaline with a greenish midvein, with wide hyaline margins; apex acuminate to short-awned up to 2 mm long. PERIGYNIA 2.8–3.8[–5.2] mm long, 1.1–1.4 mm wide, 2.5–2.8[–4.0] times as long as wide, ascending, green to brown when mature, strongly to weakly nerved both dorsally and ventrally, plano-convex and spongy-thickened below, lanceolate, sharp-edged, but not wing-margined, tapering gradually to the beak; beak tip bidentate, with teeth (0.2–)0.3–0.6[–1.0] mm, distance from beak tip to the top of the achene 1.4–1.8[–2.5] mm. STIGMAS 2. ACHENES 1.5–2.1 mm long, 0.9–1.3 mm wide, suborbicular, lenticular. [*Carex deweyana* Schweinitz var. *bolanderi* (Olney) W. Boott]. —Moist to wet forests, especially along streams; Apache, Cochise, Coconino, Gila, Graham, and Pima cos.; 1900–2700 m (6250–8800 ft); Jun–Aug; British Columbia, Can.; and MT s to CA and NM; sparse in n Mex., s to Dgo. Uncommon in AZ, found in canyons n of the Mogollon Rim, and s

in the Chiricahua, Huachuca, Mazatzal, Pinaleño, and Santa Catalina Mountains. SECTION: *Deweyanae*; Group/Key G.

Carex bolanderi is most likely to be confused with species in Section *Ovales*, which have winged perigynia. The spikes and inflorescence architecture are similar, but the perigynia beaks appear more prominent in *Carex bolanderi*. The wide hyaline margins of the pistillate scales also emphasizes the perigynia more than in the *Ovales* species. This species was formerly included in *Carex deweyana* Schweinitz. In AZ, most collections were formerly identified as *Carex deweyana* subsp. *leptopoda*, or *Carex leptopoda* Mackenzie. Current understanding of this group places the entire range of *Carex leptopoda* much further n, with all of our plants belonging to *C. bolanderi*.

Carex brevior (Dewey) Mack. (shorter, for the perigynium beak length). Shortbeak sedge. —Plants densely caespitose. CULMS 20–70[–100] cm tall, longer than the leaves. LEAVES 1.0–2.8[–3.5] mm wide, green. INFLORESCENCE (1.3–)2.0–3.5(–6.5) cm long, 5–15[–18] mm wide, elongate, sometimes interrupted, and occasionally more congested, composed of 3–6[–10] overlapping sessile gynecandrous spikes, each spike clearly distinguishable; spikes 4–13(–17) mm long, 4–7[–8] mm wide, ellipsoid to globose; proximal internode 2–8(–11.5) mm; proximal bract scale-like or setaceous-prolonged, shorter than or occasionally as long as the inflorescence. PISTILLATE SCALES much narrower and shorter than the perigynia, ovate or ovate-lanceolate, pale yellowish brown with a green center (that pales with time) and narrow hyaline margins; apex acute to obtuse. PERIGYNIA (2.6–)3.4–4.6(–5.2) mm long, (2.0–)2.2–3.0[–3.2] mm wide, stiffly spreading-ascending, greenish to tan, sometimes nerved dorsally and nerveless ventrally, distended only over the achene, broadly winged to the base of the almost orbicular body, serrulate distally, abruptly narrowed to the beak; beak flat, serrulate to the tip, the tip gold to red-brown, distance from beak tip to the top of the achene 1.4–2.4 mm. STIGMAS 2. ACHENES lenticular, 1.5–2.2 mm long, 1.3–1.5[–1.8] mm wide. $2n = 48, 52, 56, 60, 64, 68$. —Moist meadows and swales, and along streambanks and lakeshores; Coconino, Gila, Navajo, and Yavapai Cos.; 1140–2230 m (3750–7320 ft); Jun–Sep; British Columbia, Can.; to n Mex., and eastward to the Atlantic. Infrequent in c AZ, mostly n of the Mogollon Rim. SECTION: *Ovales*; Group/Key H.

Mature *Carex brevior* is easy to distinguish from the other AZ sedges in Section *Ovales* due to its coarse textured, somewhat spiky, almost globose spikes, and very broad perigynia with nearly orbicular bodies. Immature spikes (before the perigynia spread and look spiky) can resemble those of *C. scoparia*, but even the immature perigynia already begin to show the broadly winged bodies, while *C. scoparia* has perigynia that are more than twice as long as wide.

Carex buxbaumii Wahlenb. (for German botanist Johann Christian Buxbaum, 1693–1730). Buxbaum's sedge, Brown bog sedge. —Plants loosely caespitose to colonial from long, slender rhizomes. CULMS 25–60[–100] cm tall, stiffly upright, shorter to longer than the leaves, with sharply triangular, scabrous margins above. LEAVES 1.5–3.0[–4.0] mm wide; basal sheaths reddish brown; sheath fronts sometimes with reddish brown dots on the ventral side, becoming ladder-fibrillose in

age. INFLORESCENCE 3–5.5(–8.5) cm long, 0.5–1.0 cm wide, elongate, composed of (2–)3–4(–5) oblong-ovoid spikes, with a remote proximal spike and several overlapping spikes above; terminal spike [1.0–]1.5–3.0 cm long, 6–10 mm wide, gynecandrous; lateral spikes 5–16[–20] mm long, 4–6[–8] mm wide, pistillate, sessile to short pedunculate; lowest bract about as long as the inflorescence. PISTILLATE SCALES usually much longer than the perigynia, lanceolate to lance-ovate, light to dark brown with a pale center and raised midvein, tapering to an awned tip 0.5–3.5 mm long. STAMINATE SCALES similar to the pistillate scales but more narrowly lanceolate. PERIGYNIA 2.5–3.0[–4.0] mm long, 1.2–1.6[–2.0] mm wide, ascending, slightly flattened, light green maturing to brown, elliptic or obovoid, with strong marginal nerves and smooth to faintly nerved on the faces, densely papillose throughout, rounded to slightly tapered at the base and top, beakless or more often beaked; beak up to 0.2 mm long, entire to minutely bidentate. STIGMAS 3. ACHENES 1.5–2.2 mm long, 1.1–1.5 mm wide, trigonous, suborbicular-obovoid, brown, almost filling the perigynia, densely punctate. $2n = ca. 106$. —Wet meadows, bogs; Graham Co.; 2740 m (9000 ft.); May–Sep; circumboreal, throughout Can. and the U.S. except in the Southeast, widespread but uncommon or rare in most states. In AZ, known only from the Pinaleño Mountains. SECTION: *Racemosae*. Group/Key D.

Carex buxbaumii is a distinctive sedge; the combination of lanceolate to prominently awned scales, stiffly upright culms with bright reddish bases, rhizomatous habit and wetland habitat distinguish it from the other species in Section *Racemosae*.

Carex canescens L. (grayish). Silvery sedge. —Plants densely cespitose. CULMS [15–]25–60 cm tall, mostly equal to or longer than the leaves. LEAVES 0.6–3.5[–4.0] mm wide, glaucous to grey-green, sometimes green. INFLORESCENCE 1.5–3(–5)[–7] cm long, 5–12 mm wide, elongate, composed of 4–6(–8) sessile, easily distinguishable from each other, gynecandrous spikes, usually with a tighter cluster of spikes at the top and several more distant below; spikes 5–10(–15) mm long, 3–4[–5] mm wide, oblong; proximal internode 4–14 mm; proximal bract shorter to longer than the inflorescence. PISTILLATE SCALES a little shorter and about the width of the perigynia, broadly ovate, green or white-hyaline with a green midvein, becoming more hyaline with age; apex acute. PERIGYNIA 1.8–2.4(–2.8)[–3.0] mm long, (0.8–)1.0–1.4[–1.7] mm wide, appressed to spreading-ascending, usually pale grey-green, sometimes green to yellowish brown when mature, finely many-nerved on both sides, or nerveless ventrally, minutely papillate, plano-convex, elliptic-ovate, round-margined, widest at or near the middle, tapering to an ill-defined beak; beak blunt, distance from the beak tip to the top of the achene, 0.4–0.8 mm. STIGMAS 2. ACHENES 1.2–1.4 mm long, 0.7–1.2 mm wide, oblong-obovate, lenticular. $2n = 56$. SUBSPECIES 2; AZ specimens belong to subsp. *canescens*. —Wet meadows, bogs, and lake margins; Apache Co.; 2350–2900 m (7700–9500 ft); Jun–Aug; from AK and Greenland s to CA and NM, absent in TX and the Southeast. In AZ, known only from a few locations in the White Mountains and one location in the Lukachukai Mountains. SECTION: *Glareosae*; Group/Key G.

Carex canescens is unlikely to be mistaken for any other sedge in AZ. The small, wingless perigynia in tight, ascending gynecandrous spikes, pale green to

whitish in color, along with its clumping habit and wetland habitat, should make its identification easy.

Carex chalciolepis Holm (for coppery scales). Holm's sedge. —Plants cespitose, from short rhizomes. CULMS 10–60[–100] cm tall, longer than or equal to the leaves, acutely angled, smooth-margined, rarely scabrous-angled, glabrous, or sometimes slightly glandular below the inflorescence, often drooping with age. LEAVES 0.8–3.6[–6.0] mm wide, green, often glandular; basal sheaths dark red-brown. INFLORESCENCE 1.0–3.5(–5.5) cm long, 0.6–1.5 cm wide, condensed, dark, elliptic, often nodding when mature, composed of 2–4[–7] overlapping but distinct, similar-looking oblong spikes, the proximal spike sometimes slightly remote; terminal spike 9–21 mm long, 5–9 mm wide, gynecandrous; lateral spikes 10–26 mm long, 3–6[–10] mm wide, pistillate, lowest rarely gynecandrous, with peduncles (1–)2–10(–15) mm long; basal bracts of each spike hyaline to dark brown, sometimes with a tan midvein, acute, rarely obtuse, to awned with awns up to 7 mm long; proximal bract shorter than or equal to the inflorescence, leaf-like, smooth to scabrous-margined, dorsal surface glandular, sometimes originating up to 3 cm below the point of attachment of the lowest spike, with sheath 2–3 mm long. PISTILLATE SCALES up to 0.5 mm or more longer than the perigynia, elliptic, dark reddish brown to black throughout or with a lighter midvein, sometimes with hyaline margins or entirely hyaline; tip acute and entire, or rarely obtuse. STAMINATE SCALES same as pistillate scales or entirely hyaline. PERIGYNIA 2.1–3.6[–4.0] mm long, 1.5–2.3[–2.5] mm wide, ascending, flattened, dark red-brown to black, sometimes with marginal portions bright green or tan, or entirely tan, broadly ovate, nerveless, rounded at the base, abruptly contracted to the beak; beak 0.2–0.4[–0.5] mm long, minutely papillate. ANTHERS 1.5–2.3 mm long. STIGMAS 3. ACHENES 1.5–2.5 long, 0.8–1.4 mm wide, trigonous, tan, minutely papillate. [*C. heteroneura* W. Boott var. *chalciolepis* (Holm) F. J. Hermann, *C. atrata* L. var. *chalciolepis* (Holm) Kukenthal]. —Subalpine and alpine meadows, rock fields, and conifer woodlands; Coconino Co.; (3200–)3500–3850 m ([10,500–]11,480–12,600 ft.); Jun–Sep; CO to NV, AZ and NM, with a disjunct population in MT. In AZ, known only from the summit of the San Francisco Peaks. SECTION: *Racemosae*. Group/Key D.

The long pistillate scales covering the perigynia give the spikes of *Carex chalciolepis* a distinctive "shaggy" appearance. The compact and dark inflorescence could be confused with that of *Carex albonigra*, but *C. albonigra* usually has shorter culms that do not droop with age, scales that are close in length to the perigynia, and are ovate and blunt on the ends. *Carex bella* occurs more commonly at lower elevations (though the two do overlap on the San Francisco Peaks), has longer, more cylindrical spikes, bright green perigynia that are longer than the scales, and gynacandrous lower spikes. We have one specimen from the San Francisco Peaks (ASC#42160, Little 4707) that has the scales of *Carex chalciolepis*, but the gynacandrous lower spikes of *C. bella*. Peter Zika has postulated this specimen to be a hybrid between those two taxa.

Carex chihuahuensis Mack. (of Chihuahua). Chihuahuan sedge. —Plants cespitose or with thick, straight, smooth, short, brown rhizomes with distance between the culms along the rhizome of up to 1(–2) cm; rhizomes 1–4 mm thick. CULMS 20–110 cm tall, usually exceeding the leaves, smooth-angled to scabrous above, green to

brown at the base, 2–4 mm thick. LEAVES 0.7–4(–4.4) mm wide, flat, becoming triangular in cross section toward the tip; basal sheaths green to brown, old sheaths persistent, 0–4 bladeless sheaths at base; sheath fronts hyaline, often with red spots. INFLORESCENCE (2.5–)3.2–9(–13) cm long, 5–15(–20) mm wide, often elongate, composed of 2–9 lower multiple-spiked branches, and several upper spikes sessile on the main rachis; internode between lowest branches (5–)10–30 mm; spikes 5–40 mm long, 3–10 mm wide, sessile, androgynous, (occasionally unisexual), the few staminate flowers in androgynous heads often inconspicuous; lowest inflorescence bract (0.4)1.0–7.5(–9.5) cm long, with an expanded broad hyaline-margined basal portion; spike bracts of each branch becoming smaller and less awned toward the top of the inflorescence. PISTILLATE SCALES about the same size as the perigynia, sometimes wrapping around the perigynia at the base, ovate, apex acute to rarely awned with awns up to 0.5 mm long, bronze with a green midvein and broad hyaline margins, turning pale in age. PERIGYNIA 2.6–4.2 mm long, 1.0–1.8 mm wide, appressed to spreading, green or pale, turning tan to nearly black at maturity, shiny to dull, weakly, or rarely strongly nerved, with up to 7 ventral nerves and up to 15 dorsal nerves, ovate to lanceolate, plano-convex to concavo-convex, round-margined basally to sharp-margined upwards; base spongy, usually truncate to cordate, usually stipitate, the stipe up to 0.2(–0.4) mm long; apex acuminate, but some also acute, these shapes often both present in the same spike, serrulate to nearly entire distally; beak 0.6–0.8[–1.5] mm long, obscurely bidentate to deeply bidentate, dorsal side cut as deep as 0.4(–0.6) mm, and the ventral side cut to 0.2(–0.4) mm. ANTHERS 1.4–3.3 mm long, apiculus mostly 0.1–0.3 mm long, bumpy to bristly. STIGMAS 2. ACHENES [1.2–]1.5–1.8[–2.0] mm long, 0.8–1.2 mm wide, obovoid, tan to dark brown, polished, finely punctulate, jointed to a short style. —Stream banks, springs, seeps, rarely in cienegas; Cochise, Gila, Graham, Greenlee, Pima, Pinal, Santa Cruz, and Yavapai cos.; 1150–3110 m (3800–10,200 ft); Apr–Jun; AZ & NM; Son. and Chi., Mex. Found from se to c AZ. SECTION: *Multiflorae*; Group/Key F.

See discussion under *Carex alma*.

Carex conoidea Willd. (cone-shaped). Openfield sedge. —Plants densely cespitose from short rhizomes 1.2–2.8 mm thick. CULMS [2–]15–35[–75] cm tall, slender, scabrous on the angles, brown to light green at base. LEAVES 2.4[3.0–5.6] mm wide, light green, smooth abaxially or sparsely antrorsely scaberulous on the main veins; sheaths glabrous, brown-streaked [red dotted]; top of sheath front slightly convex, [the ligules 0.8–2.9(–3.7) mm long]. INFLORESCENCE 3–8 cm long, elongate, composed of 1 terminal staminate spike, and 1–3 lateral pistillate spikes, these widely separate or sometimes congested; terminal spike [5–]7–12[–30] mm long, [1–]2–5 mm wide; pistillate spikes [5–]8–15[–29] mm long, [10.2–]35 mm wide, sessile to pedunculate, each with 5–12[–86] perigynia; proximal bract leaf-like, much exceeding the terminal spike. PISTILLATE SCALES shorter to slightly longer than the perigynia, broadly ovate, entire, or with an awn 0.1–1.2[–2.7] mm long, straw colored with centers that are often red-spotted, with red-brown to hyaline margins. PERIGYNIA 2.4–3.4[–4.3] mm long, 1.2–1.8 mm wide, ascending to spreading, spirally imbricate, with 16–20[–25] impressed nerves, oblong-ovoid to oblong-obovoid, orbicular or suborbicular in cross section, lustrous and textured, often red-

spotted, base and apex gradually tapered; beak up to 0.2[–0.5] mm long, straight. ANTHERS [1.8–3.6 mm long]. STIGMAS 3. ACHENES [1.8–2.6 mm long, (1–)1.2–1.4 mm wide, obovoid, loosely enveloped by perigynia; stipe 0.1–0.3(–0.4) mm long. —Moist meadows; Apache Co.; 2500 m (8200 ft); Aug; e U.S., but not in the s; se Can. In AZ, known from just one locality on the lower w slopes of Mt. Baldy on White Mountain Apache Tribal lands. SECTION: *Griseae*; Group/Key C.

The perigynia with impressed nerves would distinguish this species from all others in AZ. We visited the only AZ collection site for this plant twice in 2012 and were unable to relocate any plants of this species. *Carex conoidea* may persist there, but it will be difficult to tell as long as grazing persists during the flowering season. *Carex conoidea* is an uncommon plant throughout most of its wide range and is most frequent in New England. Naczi and Bryson (2002) consider the one AZ collection (ARIZ#174355, Granfelt 69-221, 1969) to be an introduction, and they do not believe it to be persisting, but they give no evidence for this assumption. Jonathan Coop at Western State Colorado University reports that this taxon has been collected since 2002 in both CO & NM, but is uncertain whether these collections represent extensions of its known native range, or introductions. These collections lend impetus to continuing the search for *Carex conoidea* in AZ.

Carex crawei Dewey ex Torr. (for Ithamar B. Crawe, 1792–1847). Crawe's sedge. —Plants with culms rising singly, or occasionally two, from long-creeping rhizomes with distance between the culms along the rhizome of up to 4 cm or more. CULMS [2–]9–30[–40] cm tall, slender but stiffly upright, longer than the leaves. LEAVES 1.5–3.8[–4.4] mm wide, stiff, flat to M-shaped, light to drab green; bases light brown, sometimes reddish, the sheath fronts truncate to convex at the mouth. INFLORESCENCE 6–18 cm long long, elongate, composed of 1 erect terminal staminate spike, sometimes with a second closely subtending androgynous spike, and 2–3[–4] erect, short to long pedunculate, remote, pistillate spikes; terminal spike [0.5–]0.8–2.0[–3.0] cm long, 2–4 mm wide, rarely androgynous with 1–2 basal pistillate flowers, or pistillate flowers mixed in; pistillate spikes [0.5–]0.8–2.0[–3.0] cm long, [3–]4–6 mm wide, the lowest, long pedunculate spike arising from the lower half of the culm, sometimes almost basal; pistillate bracts leaf-like, shorter than the inflorescence. PISTILLATE SCALES [1.2–]1.5–2.5[–2.9] mm long, shorter the perigynia, or rarely slightly exceeding the perigynia, broadly ovate to ovate triangular, green with broad hyaline margins; midvein often becoming excurrent as a short awn 0.1–0.7 mm long. STAMINATE SCALES green fading to tan with broad hyaline margins, these often brown-spotted; apex rounded. PERIGYNIA [2.2–]2.4–3.4[–3.7] mm long, 0.9–1.4[–2.0] mm wide, ascending, yellowish green to pale brown, sometimes with brown spots, obscurely many-nerved, ellipsoid to oblong-ovoid, rounded below, contracted above to a short, entire beak; beak 0–0.2[–0.3] mm long. ANTHERS 2.0–2.9 mm long. STIGMAS 3. ACHENES obovoid, trigonous, 1.3–2.0 mm long, 1.0–1.8 mm wide, not including prominent bent apiculus 0.2–0.4 mm long. $2n = 38, 59, 60$. —Wet soil at seeps and springs, often associated with limestone; Apache Co.; 2070 m (6800 ft); May–Aug; British Columbia to Newfoundland, Can.; s to OK, MS and GA, absent from the w coast states. Disjunct in AZ, known from just one location in the upper reaches of Canyon de Chelly. SECTION: *Granulares*; Group/Key C.

Carex crawei is most closely related to *Carex microdonta*, which it resembles greatly, but differs in its narrower leaves, staminate scales with an obtuse apex, and perigynia with shorter beaks. In habit, the plants superficially share appearance and stature with those of *Carex aurea*, *C. hassei*, and *C. sp. nov. A*, but the scale and perigynia characteristics separate these groups.

Carex curatorum Stacey (for Alice Eastwood, 1859–1953, and John Thomas Howell, 1903–1994, Eastwood being curator of the herbarium at the California Academy of Sciences). Canyonlands sedge, Kaibab sedge. —Plants caespitose; rhizomes present but not conspicuous; usually dioecious. CULMS (20–)35–75[–91] cm tall, shorter or longer than the leaves, erect to decumbent. LEAVES 2.0–3.0(–4.0) mm wide, flat, glabrous to densely pilose on the sheaths; basal sheaths deep red-purple, red-spotted. INFLORESCENCE most often a single unisexual terminal spike, but occasionally with 1–2(–5) shorter lateral spikes of the same gender, sometimes with lateral androgynous spikes; staminate spikes 23–43 mm long, (2–)3–5 mm wide; pistillate spikes 14–51 mm long, 3–7 mm wide; inflorescence bract lacking or a scabrous awn 3–15(–28) mm long. STAMINATE SCALES 4–6 mm long, lanceolate, red-brown with a tan or green midvein and hyaline margins; apex acute to obtuse, lowest ones sometimes short-awned tipped to 1.5 mm long. PISTILLATE SCALES usually shorter than, but sometimes equaling or slightly exceeding and usually narrower, but sometimes as wide as the perigynia, oblong to lance-ovate, reddish purple to brown, hyaline-margined, with a green midvein, sometimes ciliate fringed on the upper half; apex acute to acuminate to mucronate; lower scales clasping the inflorescence axis. PERIGYNIA [2.0–]3.0–4.2 z long, 1.5–2.2 mm wide, appressed-ascending, densely pubescent with translucent hairs up to 0.2 mm long on the upper half, flattish, narrowly oblanceolate to orbicular, often misshapen, tawny to green, sometimes darker distally or red-spotted, marginally nerved, sometimes with 3–7 nerves on both faces; apex abruptly, or less commonly, gradually contracted to a bidentate or entire, hyaline-tipped beak; beak 0.2–0.5 mm long. ANTHERS 2.2–3.0 mm long. STIGMAS 3. ACHENES [1.2–]1.6[–2.0] mm long, [0.8–]0.9[–1.2] mm wide, trigonous, loosely enveloped by the perigynium; vestigial rachilla often present inside the perigynium. $2n = 62$. [*Carex scirpoidea* Michaux var. *curatorum* (Stacey) Cronquist; *Carex haysii* S.C. Welsh]. —Riparian areas and hanging gardens; Coconino and Mohave cos.; 525–2100 m (1725–6900 ft); Mar–Jun; a Colorado Plateau endemic, found only in tributaries to the Colorado and San Juan Rivers in n AZ and s UT. In AZ, restricted to the Grand Canyon. SECTION: *Scirpinae*; Group/Key A.

This is a variable taxon in terms of gender and inflorescence arrangement. It can easily be recognized due to its distinctively long-hairy perigynia in mostly single-spiked inflorescences, and its predominantly dioecous nature. We have seen anthers within a perigynium, either representing an androgynous spike, or possibly a synoecious flower, which would be very rare in the genus.

Carex deflexa Hornem. (deflexed culms). Northern sedge. —Plants loosely caespitose from spreading to ascending rhizomes. CULMS 5–17[–31] cm tall, slender, arching to spreading, sharply triangular, usually shorter to occasionally longer than the leaves, smooth to scabrous distally. LEAVES 0.9–2.4[–3.2] mm wide, pale to bright

green, herbaceous; leaf bases reddish brown; old sheaths forming a weakly fibrous base and sometimes slightly ladder-fibrillose. INFLORESCENCE of two types, both basal and terminal; basal inflorescence composed of 0–1 staminate terminal spikes and 0–2 pistillate spikes on a slender peduncle; terminal inflorescence 1.5–4 cm long, composed of a single staminate terminal spike, subtended by 1–4 lateral, pistillate spikes; terminal spike 5–7 mm long, 0.8–1.0 mm wide, on a peduncle 0.6–3.0(–10.0) mm long; lateral pistillate spikes 3–8 mm long and 1.5–5 mm wide, 1–5 flowered, the lowest sometimes on peduncles up to 15 mm long; proximal pistillate bract of the terminal inflorescence 0.8–6.0+ cm long, leaf-like, shorter to longer than the inflorescence, with a sheath 0.2–1 mm long; basal spikes apparently bractless. PISTILLATE SCALES shorter than the perigynia, ovate, pale to dark reddish brown with a green center and hyaline margins; apex acute to cuspidate. PERIGYNIA [2.2–]2.8–3.3 mm long, 0.8–1.4 mm wide, ascending, yellow to gray-green to green, with two marginal nerves, pubescent, obovoid to ellipsoid, suborbicular in cross section, contracted to a narrow stipe-like base, abruptly contracted to an often bent, ciliate-serrulate, acuminate beak; beak [0.4–]0.6–1.0 mm long, bidentate, with teeth 0.1–0.4 mm long. ANTHERS [1.2–2.5] mm long. STIGMAS 3. ACHENES [1.3–]1.6–1.8 mm long, 0.9–1.2[–1.4] mm wide], obovoid, obtusely trigonous in cross section. VARIETIES 2; see discussion below. — Dry to moist sandy, gravelly, or rocky alpine meadows, near to above timberline; Coconino Co.; 3290–3840 m (10,800–12,600 ft.); Aug; British Columbia and Alberta, Can.; s through the w US to CA and n AZ. In AZ, known only from the San Francisco Peaks, but likely overlooked in similar habitats elsewhere. SECTION: *Acrocystis*; Group/Key B.

Carex deflexa would most likely be mistaken for a diminutive *C. rossii*. *Carex rossii* is similar, with reddish bases and sometimes with inflorescence bracts longer than the inflorescence, but overall is smaller and finer, and can be more mat-like. *Carex rossii* has perigynia > 3.2 mm long and beaks > 0.8 mm long, while *C. deflexa* has perigynia < 3.3 mm long and beaks < 1.0 mm. According to Crins and Rettig (2002), our specimens represent a s range extension. AZ plants probably belong to var. *boottii* L. H. Bailey [*Carex rossii* Boott var. *brevipes* (W. Boott ex Mackenzie)], which should have longer staminate spikes than the more n var. *deflexa*. However, our specimens have terminal spikes more similar in length to those of var. *deflexa* and so do not fit well with var. *boottii* as described by Crins and Rettig (2002).

Carex diandra Schrank (two-stamened [a misnomer]). Lesser paniced sedge. —Plants densely cespitose from short fibrillose rhizomes. CULMS 2–100 cm tall, usually longer than the leaves, sharply triangular and scabrous above, or rarely smooth above. LEAVES: widest leaf blades on a specimen 1.0–2.8[–3.0] mm wide, flat; sheath fronts hyaline, red-spotted. INFLORESCENCE 1.5–5.0[–6.0] cm long, 7–14[–17] mm wide, composed of 1–6 lower multiple-spiked branches, and several upper spikes sessile on the main rachis, branches with 2–10[–12] spikes; spikes 4–7 mm long, 1.5–4 mm wide, small, few-flowered, androgynous; internode between lowest branches 3–12 mm; lowest inflorescence bract elongate, setaceous, sometimes not setaceous, shorter than the inflorescence. PISTILLATE SCALES about the same size as the perigynia, sometimes narrower at the top and a little shorter, ovate to oblong-ovate, straw colored to brownish, with a pale midvein and hyaline margins; apex acute to

cuspidate. PERIGYNIA (2.0–)2.3–2.8(–2.9) mm long, 1.0–1.4 mm wide, spreading to ascending, olive- to dark chestnut-brown, shiny, turning nearly black at maturity, with two prominent nerves (raised ridges) on either side of a dorsal central groove, often several nerved on the distal sides of this prominent nerve, often with a distinct overlapping flap along the distal suture, unnerved ventrally, deltoid-ovoid, unequally bi-convex, basally rounded, with a stipe up to 0.3 mm long, usually acuminate upwards; beak 1–1.3 mm long, pale to white, contrasting with the dark body, obscurely bidentate to truncate, dorsal side cut as deep as 0.2 mm, ventral side entire. ANTHERS 1.6 mm long. STIGMAS 2. ACHENES 1.0–1.4 mm long, 0.8–1.0 mm wide, lenticular, broadly obovate, brown, jointed to a short style. $2n = 48, 50, 54, 60$. —Swamps, lake margins, and wet meadows, sometimes forming floating mats in deeper water; Apache Co.; 2225–2255 m (7300–7400 ft); Jun–Aug; AK to Newfoundland, Can.; s to the middle of the U.S., and widely scattered in the sw. In AZ, only known from two locations in the White Mountains. SECTION: *Heleglochis*; Group/Key F.

Carex diandra could be confused with *C. simulata*. They share the same habitats and inflorescence architecture. In *Carex diandra*, inflorescences are longer with greater first internode lengths. Both species have small perigynia, but the beaks are longer, pale in *Carex diandra*, and are short and of the same color and texture as the body in *C. simulata*. *Carex diandra* is caespitose, while *C. simulata* forms large rhizomatous stands. *Carex diandra* could also be confused with *C. chihuahuensis*, but the perigynia of *C. chihuahuensis* are spongy-based, and often cordate, while *C. diandra* perigynia bases are rounded. *Carex chihuahuensis* perigynia can be nerved, but not with the two prominent nerves on each side of a dorsal groove as with *C. diandra*.

Carex disperma Dewey (two-seeded). Softleaf sedge. —Plants fine, loosely caespitose or the shoots arising singly from a loose, branching system of slender, scaly, pale brown long rhizomes; rhizomes 0.4–0.6 mm thick. CULMS [6–]15–30[–60] cm tall, very slender, 0.2–0.6 mm wide, weak, arched or nodding, sharply triangular and scabrid, usually exceeding the leaves. LEAVES 0.7–1.8(–2.5) mm wide, flat, thin, soft, green, scabrid; basal sheaths pale brown, thin, hyaline ventrally. INFLORESCENCE 1.3–3.1 cm long, 3[–5] mm wide, elongate, composed of 2–4(–7) sessile, globose, androgynous spikes; spikes 3–5 mm long, 2–4 mm wide, often appearing pistillate as the staminate flowers are hard to see, each with 1–4[–6] perigynia and 1–3 staminate flowers forming an inconspicuous cone at the top of the spike; uppermost spikes more or less contiguous, but the lower ones well-separated; proximal bract 4–11[–20] mm long, sheathless, filiform-foliaceous, shorter than the inflorescence. STAMINATE SCALES narrowly lanceolate. PISTILLATE SCALES narrower and shorter than or as long as the perigynia, ovate to ovate-triangular, hyaline with a green center, the apex obtuse to acute. PERIGYNIA [1.75–]2.4–3.6 long, 1–1.7 mm wide, spreading to ascending, pale green maturing to olive-green, becoming shiny dark brown in age, sometimes spongy at the base, broadly stipitate, leathery, plump, ellipsoid to obovoid, unequally biconvex, with many fine nerves on both sides, with marginal nerves upraised and pushed around to the ventral face, rounded at the apex, abruptly contracted to a short, obliquely cleft beak; beak 0.2–0.5 mm long, entire, or with teeth less than 0.3 mm long. ANTHERS 1.5–2.2 mm long. STIGMAS 2. ACHENES (1–)1.5–1.75(–

2) long, 0.9–1.3 mm wide, oblong-elliptic, lenticular, filling the perigynium, red-brown, rarely yellow-brown, glossy; style short below the branches (scarcely 0.5 mm long), reddish brown and slender, semi-persistent as a slender apiculus on the achene. $2n = 70$. —Swamps, bogs, wet meadows, mossy and shady coniferous woods; Apache Co.; 2650–3200 m (8650–10,500 ft); May–Aug; throughout w and ne N. Amer.; also found in Eurasia. In AZ, only known from the lower slopes of Mt. Baldy, but probably more widespread, at least in the White Mountains. SECTION: *Dispermae*; Group/Key F.

Carex disperma is unlike any other sedge in AZ, with its few-flowered, well-separated, spikes of plump, ovoid (egg-shaped) perigynia. However, it is easy to overlook, as its slight stature makes it very hard to see amongst other herbaceous vegetation.

Carex douglasii Boott (for David Douglas, 1798–1834). Douglas' sedge. —Plants typically forming dioecious colonies; culms arising singly or several from slender creeping rhizomes; the rhizomes 0.8–1.2[–1.9] mm thick, brown. CULMS 4–25[–40] cm tall, slender, stiff, smooth, rounded to trigonous, usually longer than the leaves. LEAVES 0.5–3.0 mm wide, firm, narrow, flat or involute, tapering to a long, slender point; basal sheaths pale to dark brown; with hyaline fronts; old sheaths persistent; ligules [0–]0.4–0.5[–2.8] mm long, the free portion 0.2 mm long. INFLORESCENCE appearing unisexual, but usually having a few nearly undetectable flowers of the opposite gender mixed in the spikes, dense, head-like, often paniculate with at least the lowest branch with multiple spikes; staminate heads 15–40 mm long, 7–20 mm wide, lanceoid; staminate spikes 5–11 mm long by 2–3 mm wide; basal inflorescence bracts 8–10 mm long, broad, hyaline, obtuse to acute to short cuspidate with awns < 5 mm long; pistillate heads 15–33[50] mm long, 8–20[–27] mm wide, suborbicular to ovoid-fusiform; pistillate spikes 6–15 mm long by 1–5 mm wide; basal inflorescence bracts 6–17 mm long, scarious-setaceous, shorter than the inflorescence, larger than, but not much different from the scales, obtuse, acute, or awned; awns up to 10 mm long; stigmas 4–6 mm long, long and tangled, conspicuous at flowering, sometimes persistent. ANTHERS 2.4–4.0 mm long, conspicuous, with a bumpy to shortly bristly apiculus. STAMINATE SCALES elliptic to ovate to triangular, reddish brown with narrow to broad hyaline margins and green- or straw-colored center, acute. PISTILLATE SCALES 4–8 mm long, longer and wider than the perigynia and hiding them, lanceolate to ovoid, similar to the staminate scales, but often cuspidate or shortly awn-tipped. PERIGYNIA (3–)3.5–4.2(–4.8) mm long, 1.2–2.1 mm wide, appressed-ascending, narrowly elliptic, elliptic ovate, obovate, or ovate-lanceolate, straw colored to brown throughout, essentially nerveless, but becoming longitudinally wrinkled, round-tapering to a stipitate base, \pm plano-convex, becoming sharp-edged and entire to finely serrulate distally, firm-walled, dull; beak [0.9–]1.6–1.9 mm long, tapered, slender, serrulate, apex hyaline, friable, obliquely cleft, sometimes also obscurely bidentate. STIGMAS 2. ACHENES (1.4–)1.6–2.0 long, 1–1.5 mm wide, obovate, lenticular, glossy brown, closely enveloped by the perigynia, except around the distal end. —Sagebrush grasslands, forest openings and meadows, from pinyon-juniper woodland to mixed conifer forests, in dry to moist areas, tolerant of alkaline soils; Coconino and Mohave cos.; 1800–2600 m (6000–8500 ft); Jun–Aug; British Columbia

to Saskatchewan, Can.; s through most of the w to Baja C., Mex.; and NM. In AZ, only known n of the Colorado River. SECTION: *Divisae*; Group/Key F.

Carex douglasii is confused with *C. praegracilis* or *C. duriuscula*, other rhizomatous species that tolerate dry, alkaline sites. The heads of *Carex douglasii* are larger and more robust than either of these, and the stigmas on pistillate inflorescences are very long and form a tangled mat that persists through maturity. *Carex praegracilis* is often dioecious, but it has a narrower, more elongate inflorescence, and the rhizomes are stouter, with darker bases. *Carex duriuscula* is usually androgynous, and both the inflorescence and perigynia are smaller and more compact.

Carex duriuscula C.A. Mey. (somewhat hard). Needleleaf sedge. —Plants rhizomatous, the shoots often arising 2 to several per cluster, many nodes without shoots; rhizomes 0.6–1.4[–1.8] mm thick, light to dark brown, covered with sheaths that disarticulate into fibers with age. CULMS 6–30[–40] cm tall, rounded basally, bluntly to sharply trigonous below the inflorescence, usually surpassing the leaves; bases brown, weakly to strongly aphyllopodic; old leaf bases often present and shredding into fibers. LEAVES 0.3–1.5(–2.3)[–2.5] mm wide, flat to mostly involute, tapering to a long slender tip; basal sheaths light to dark brown, overlapping, with hyaline fronts, disarticulating into fibers. INFLORESCENCE [0.5–]0.7–2 cm long, 2–8 mm wide, compact, head-like, half or more as wide as long, composed of 3–8 sessile, androgynous spikes, or the plants rarely unisexual in a clone; spikes 4–9 mm long, 3–5 mm wide, ovoid, usually indistinguishable; inflorescence bracts lance-triangular to broadly ovate, acuminate to awned with awns 1–7 mm long, 4–14 mm long overall, shorter than the inflorescence, similar to the pistillate scales. PISTILLATE SCALES 2.4–4.1 mm long, as long as or slightly longer than the perigynia, broadly ovate, straw colored to dark reddish brown, with hyaline margins and green or straw colored midvein; apex acute to acuminate or awned with a shortly exerted midvein. PERIGYNIA [2.4–]2.8–3.8 mm long, 1.2–1.6[–2.1] mm wide, few, appressed-ascending, greenish to dark reddish brown, blackish at maturity, nerveless or with up to 10 dorsal and ventral nerves, marginally rounded, broadly elliptic ovate to obovate or nearly orbicular, thickly plano-convex, coriaceous, shiny, often broadly short-stipitate, evidently to very obscurely serrulate along the margins distally, often with stiff short hairs on the dorsal face near the tip, abruptly contracted to the serrulate beak; beak 0.3–0.8[–1.2] mm long, bidentate and oblique, hyaline-tipped; inflorescences regularly infected with smut, producing perigynia that are globose, smooth and grey. ANTHERS [1.4–]2.3–2.9 mm long; apiculus smooth to warty, typically short and broad (seen at 30X). STIGMAS 2. ACHENES 1.5–2.1 mm long, 1.25–1.7 mm wide, orbicular-ovate, lenticular, apiculate, jointed at the short style, closely enveloped by the perigynium. [*Carex eleocharis* L. H. Bailey; *C. stenophylla* Wahlberg subsp. *eleocharis* (L. H. Bailey) Hultén; *C. stenophylla* var. *eleocharis* (L. H. Bailey) Breitung]. —Dry prairies, sagebrush grasslands, openings in dry forests; Apache and Coconino cos.; 1850–2650 m (6050–8700 ft); Jun–Aug; AK to Manitoba, Can.; s through the w U.S. to CA, AZ, NM, and e to IL; also in Asia. In AZ, known from the Kaibab Plateau, the s rim of the Grand Canyon to the Flagstaff area, and from the rim of upper Canyon de Chelly into the Chuska and Lukachukai Mountains. SECTION: *Divisae*; Group/Key F.

As far as we know, in AZ, *Carex duriuscula* only occurs in dry locations. Considering that habitat character, the fine rhizomes, the short, thick, bumpy anther apiculus, and consistent simple inflorescence, it should be easily discernible from *Carex praegracilis*, which always grows in moist places (or subalpine meadows), has thick, coarse rhizomes, longer, thinner anther apiculi (often with bristles), and often has a paniculate inflorescence. *Carex duriuscula* has also been confused with *C. siccata*, however, *C. siccata* has a longer and narrower inflorescence, with most perigynia in the upper and lower spikes (male flowers predominantly in the middle), perigynia that are longer than *C. duriuscula* perigynia. *Carex duriuscula* is inconspicuous, therefore probably under-collected and likely more common and widespread than we now know.

Carex ebenea Rydb. (ebony, referring to the dark-brown scales). Ebony sedge. —Plants densely cespitose. CULMS 10–50 cm tall, longer than the leaves, conspicuously striate. LEAVES (1–)2.0–3.5[–4.0] mm wide, green. INFLORESCENCE 1–2[–3] cm long, 10–20 mm wide, compact, dense, usually tapering to a V-shape at the base, or less commonly almost flat-bottomed at the base), composed of 5–12 closely aggregated sessile, gynecandrous spikes, some of the spikes indistinguishable; spikes 9–15 mm long, 4.5–6.5 mm wide, ovoid; proximal internode 1.0–3.0 mm; proximal bract lacking, scale-like, or bristle-like, shorter than the inflorescence, broad at the base, with broad scarious margins. PISTILLATE SCALES narrower and shorter than the perigynia, ovate or ovate-lanceolate, dark brown, sometimes with a green or gold midvein, hyaline margins; apex acute, rarely obtuse. PERIGYNIA (3.5–)5.3–7.1 mm long, 1.1–1.5(–1.7) mm wide, appressed to ascending, green to coppery or golden brown, usually nerved on both sides, sometimes nerveless, plano-convex, narrowly wing-margined or thin-edged to the round base, wing-margined and serrulate distally, long-tapering to the terete beak; beak tip dark brown, entire and smooth for 0.9–1.5 mm, distance from the tip to the top of the achene 2.9–4.0 mm. STIGMAS 2. ACHENES 1.5–1.9 mm long, 0.8–1.1 mm wide, lenticular. $2n = 84$. —Subalpine and alpine meadows, occasionally on talus; Apache, Cochise, Coconino, and Graham cos.; 2650–3650 m (8700–12,000 ft); Jul–Aug; c and s Rockies, from WY through UT and CO to n AZ and NM. In AZ, locally abundant at high elevations on the San Francisco Peaks, with a few records from Mount Baldy, Escudilla Mountain, the Pinaleños, and the Chiricahua Mountains. SECTION: *Ovales*; Group/Key H.

Carex ebenea is distinct from its high elevation relatives in Section *Ovales*. With its shorter, compact stature it is most like *Carex haydeniana*, but its perigynia are narrower, and the base of the inflorescence is cuneate rather than truncate as in *C. haydeniana*. *Carex microptera* has enough variation in its perigynia that the narrow form can resemble *C. ebenea*, but *C. microptera* perigynia are usually shorter and not as dark, with taller culms and lighter colored scales. We have one specimen from the Pinaleño Mountains that has the perigynia of *Carex ebenea*, but the inflorescence of *Carex* sp. nov. B, which is common in the area.

Carex echinata Murray (prickly, referring to the individual spikes with radiating perigynia beaks). Star sedge. —Plants densely cespitose from short, dark, inconspicuous rhizomes. CULMS 15–35[–135] cm tall, slender, wiry, sharply

triangular, equal to or taller than the leaves. LEAVES 0.4–2.5 mm wide, green. INFLORESCENCE [0.7–]1.2–2.1[–7.8] cm long, 5–10 mm wide, open, moderately elongate, composed of 3–5(–7) sessile gynecandrous spikes; spikes easily distinguishable; terminal spike 5–9[–20] mm long with a narrow staminate basal portion less than or equal to half the length of the spike; lateral spikes 3.0–8[–15.5] mm long, sometimes wholly pistillate or with just a few staminate flowers at the base; proximal internode 2–8[–11] mm long; proximal bract scale or awn-like and inconspicuous, usually distinctly shorter than the inflorescence. PISTILLATE SCALES inconspicuous and shorter than the perigynia, ovate/lanceolate, yellow to brown, with a green center and hyaline margins, fading to all hyaline with age; apex acute to obtuse. PERIGYNIA 3.0–3.5[–4.75] mm long, [0.8–]1.1–1.4[–2.1] mm wide, [1.7–]2.5–3[–3.6] times as long as wide, appressed, becoming spreading to reflexed, giving the short lateral spikes a star-like appearance, olive-green to dark brown when mature, nerved or not on either side, broadest at base, plano-convex, plump and somewhat swollen with spongy tissue at the base, with a definite edge, but not wing-margined, scabrous on the upper part of the shoulders upwards through the beak, tapering gradually to the broad beak; beak nearly entire to bidentate to depths of 0–0.3 mm, (0.8–)1.2–1.6 mm long. ANTHERS 1.2 mm long. STIGMAS 2. ACHENES [1.4–]1.6–1.8 mm long, [0.9–]1.0–1.1[–1.3] mm wide, broadly ovate to orbicular, thickly lenticular, elevated on a short stipe. SUBSPECIES 3; AZ plants belong to subsp. *echinata*. —Streamside in wet meadows; Apache, Coconino, and Graham cos.; 2130–3040 m (7000–10,000 ft); Jul–Aug; British Columbia, Can.; through most of the w and e U.S., but absent in many Midwestern states and the Southeast; also known from Eurasia. Uncommon in AZ, known from the Mogollon Rim and the Pinaleño and White Mountains. SECTION: *Stellulatae*: Group/Key G.

Carex echinata is distinctive, recognizable by its star-like spikes separated by obvious internodes, characters it shares with *C. interior*. It is separated from *Carex interior* primarily by the perigynia size characters given in the key. It is probably more widespread in AZ than presently known.

Carex elynoides Holm (similar to the species *Elyna spicata*). Blackroot sedge. —Plants densely caespitose, without creeping rhizomes. CULMS 8–20[–22] cm tall, wiry, filiform, about as long as the leaves, smooth below the inflorescence, bases crowded with old leaf bases. LEAVES 0.2–0.6 mm wide near base, involute-cylindric, stiff, wiry, quill-shaped; basal sheaths straw to light brown, ladder-fibrillose with age. INFLORESCENCE 7–17[–20] mm long, 2–4[–5] mm wide, a single androgynous terminal spike; staminate portion shorter than the pistillate portion; pistillate section 3–10 mm long, with 3–12 perigynia, sometimes apparently lacking; inflorescence bract lacking. STAMINATE SCALES coppery with hyaline margins and pale midstripe; apex obtuse. PISTILLATE SCALES wider than the perigynia and cupping the spike rachis, longer than and concealing the perigynia, broadly lanceolate, light to dark brown with hyaline margins and tip, often with a paler midvein; apex obtuse, the lower apices more pointed, mucronate, or awned to more than 5 mm long. PERIGYNIA 2–3.5[–4.4] mm long, 1.2–1.4[–2.2] mm wide, erect to appressed, with body glabrous or sparsely hirsute and/or ciliate in the upper half, broadly ovoid to obovoid, blunt at the base, straw to yellowish green, sometimes with 2 obscure marginal nerves, either abruptly or

gradually contracted to the cylindric hyaline beak; beak 0.5–1.0 mm long. STIGMAS 3. ACHENES 1.8–2.6[–3.0] mm long, 1.1–1.3[–1.5] mm wide, obovoid to ellipsoid, trigonous; vestigial rachilla present inside perigynium. —Alpine tundra and scree; Coconino Co.; 3600–3800 m (11,900–12,450 ft); Jul–Aug; MT and ID, s through the Rocky Mountains and Basin and Range to NV, n AZ and NM. In AZ, known only from the top of the San Francisco Peaks. SECTION: *Filifoliae*; Group/Key A.

Carex elynoides has been confused with both *C. filifolia* and *C. oreocharis*, its two relatives in Section *Filifoliae*. *Carex oreocharis* is a larger plant, with slightly broader leaves, and prefers mid-elevation meadows in AZ, while *C. eleocharis* has filiform leaves and is restricted to alpine habitats above timberline. *Carex filifolia* shares the narrow involute leaves of *C. elynoides*, but has perigynia more consistently short-pubescent on the distal half, and inflorescences usually taller than the leaves, while the perigynia of *C. elynoides* are almost glabrous, except on the upper portion of the marginal nerves, and usually has inflorescences about as long as the leaves. In AZ, they are also separated by habitat, with *Carex filifolia* found in mid-elevation pinyon-juniper woodland to desert scrub, and *C. elynoides* found above timberline. All three species share the vestigial rachilla inside the perigynium, contrary to the key in Mastrogiuseppe (2002). The low end of the elevation range given there is also incorrect, with this species being restricted to above timberline sites throughout its range (Starr, pers comm.)

Carex emoryi Dewey (for William Hemsley Emory, 1811–1887). Emory's sedge. —Plants loosely cespitose in tufts of several culms, with extensive stout rhizomes; rhizomes 2–3 mm thick; culms arising laterally and not enveloped by the previous year's leaves. CULMS 12–120 cm tall, scabrous, acutely or obtusely angled, shorter to longer than the leaves. LEAVES 2–4[–6] mm wide; basal sheaths straw-colored to red-brown; sheath fronts whitish hyaline and thin, rarely red-spotted, veinless, not ladder-fibrillose. INFLORESCENCE (7–)10–21 cm long, elongate, composed of 2–3 staminate spikes (the lower 1–2 spikes usually shorter than the terminal spike) and 3–5 remote lateral pistillate spikes, these spikes often androgynous; lateral pistillate spikes 2–6 cm long, 3–5 mm wide, often androgynous with a section of staminate flowers at the tip, sessile, or rarely the lower spikes with peduncles up to 1 cm long; proximal bract 1.5–3.5[–5] mm wide, shorter to longer than the inflorescence. PISTILLATE SCALES narrower than and shorter than or equaling the perigynia, oblong, light brown or red-brown with a broad pale green midvein, sometimes the midvein as narrow as in *Carex aquatilis*, especially in the upper portions of the inflorescence; apex blunt to acute, awnless. PERIGYNIA 1.7–3.2 mm long, 1.0–2.1 mm wide, ascending to spreading, green to straw colored, spots absent, lightly 3–5 nerved on each face, somewhat flattened, loosely enclosing achenes, ovate to elliptic, dull, apex acute or obtuse, papillose; beak 0.1–0.4 mm long, entire. ACHENES 1.5 mm long, 1 mm wide, lenticular, dull. $2n = 72$. —River banks and marshes; Coconino Co.; 860–980 m (2800–3200 ft); Apr–May; Manitoba and Ontario, Can.; w to CO and AZ, e to NY, s to TX and Mex. In AZ, known only from Marble Canyon in the upper part of Grand Canyon and the lower part of Glen Canyon below Glen Canyon Dam, previously mistaken for *Carex aquatilis*. SECTION: *Phacocystis*; Group/Key E

Carex emoryi is most likely to be confused with *C. aquatilis* which it resembles in size and habit, along with having similar sheaths and spike dimensions. It can be distinguished by its finely nerved perigynia and its lighter brown pistillate scales with usually a broad pale midvein. In AZ, *Carex emoryi* only occurs in Marble Canyon along the Colorado River at elevations less than 3200 ft, whereas *C. aquatilis* only occurs at elevations greater than 7000 ft.

Carex endlichii Kük. (for Rudolf Endlich, 1872–1915). —Plants cespitose, sometimes appearing rhizomatous. CULMS 20–75 cm tall, longer than the leaves, acutely angled, scabrous. LEAVES 1.2–5.5 mm wide, thick, light green to glaucous; basal sheaths red to orange-brown, strongly ladder-fibrillose; sheath fronts hyaline, often red-brown spotted. INFLORESCENCE (2.8–)4.5–9.5(–11) cm long, elongate, composed of a single terminal gynecandrous (80% of AZ specimens) or staminate spike, with 3–4 lateral pistillate spikes below, each spike 0.8–4 cm long, 4–5 mm wide; proximal bract about as long as the inflorescence, 1–3 mm wide, 0.5–2.0 cm long. PISTILLATE SCALES shorter than perigynia, red-brown with 1–3 nerved lighter center that rarely reaches the apex, with a narrow hyaline border, apex acute to obtuse, awnless to rarely awned with awns up to 0.2 mm long. PERIGYNIA 2.3–3.0 mm long, 1.3–1.75 mm wide, erect, yellow-brown, becoming orange-brown at maturity, with red-brown spots, nerveless or lightly several nerved, puffed out like a pillow, distended by the achenes, obovate, dull; apex acute, glabrous; beak 0.3–0.6[–0.8] mm long, often lighter colored than the body, dark-tipped, with orifice bidentate to 0.1–0.2 mm. STIGMAS 2. ACHENES 1.75 mm long, 1.25 mm wide, lenticular, dull. —Springs and streambanks in the mountains; Cochise and Pima cos.; 1900–2650 m (6300–8700 ft); May–Jul; s into n Mex., where it is considered rare and worthy of conservation. In AZ, known only from the Chiricahua Mountains and Rose Canyon Lake in the Santa Catalina Mountains; of conservation concern, to be looked for in other parts of se AZ. SECTION: *Phacocystis*; Group/Key E.

Hermann (1974) describes a larger range s to c Mex. and Guatemala, but these s plants are now referred to *Carex hermannii* Cochrane (c Mex.) and *C. cuchumatanaensis* Standl. & Steyerl. (Guatemala). While sharing the ladder-fibrillose basal sheaths of *Carex senta*, *C. endlichii* is smaller in stature, and is unique in Section *Phacocystis* in that the perigynium surface becomes orange-brown at maturity due to the dense packing of crystalline epidermal cells. The achenes fill out the small perigynia making them puffy and pillow-like. In AZ, 80% of the specimens have gynecandrous terminal spikes, while *Carex senta* always has a staminate terminal spike (rarely with a few pistillate flowers mixed in). The few Mexican specimens that we observed had a greater percentage of fully staminate terminal spikes.

Carex filifolia Nutt. (refers to the thread-like foliage). Threadleaf sedge. —Plants densely cespitose, without creeping rhizomes. CULMS 9–20[–35] cm tall, wiry, filiform, from shorter to longer than the leaves, smooth and rounded below the inflorescence, bases crowded with old leaf bases. LEAVES 0.3–0.8 mm wide near base, involute-cylindric, stiff and wiry, quill-shaped; basal sheaths straw to light brown, ladder-fibrillose with age. INFLORESCENCE 8–25[–30] mm long, 3–6[–7] mm wide, a single androgynous terminal spike; staminate portion as long as or longer than the

pistillate portion; pistillate section [4–]9–18 mm long, with 2–5[–18] perigynia; inflorescence bract lacking. STAMINATE SCALES red-brown with broad hyaline margins and tip; apex acute, obtuse, sometimes lobed. PISTILLATE SCALES wider than the perigynia, as long as to longer than and concealing the perigynia, broadly obovate, clasping the culm, red-brown or yellowish with wide hyaline margins, with a pale midvein; apex broadly rounded or erose; lower apices more pointed or with a short awn up to 2 mm long. PERIGYNIA [2.8–]3.2–4.0[–4.8] mm long, 1.1–1.5[–2.0] mm wide, appressed to ascending, with body conspicuously hirsute to pubescent on the upper portion, less obviously so below, obovoid to spherical-obovoid or obpyramidal, rounded to tapering at the base, whitish to gold, either abruptly or gradually contracted to the cylindric and hyaline beak; beak [0.2–]0.5–0.8 mm long. ANTHERS 2.8–3.1 mm long. STIGMAS 3. ACHENES 2.2–3.3 mm long, 1.0–1.4[–1.9] mm wide, obovoid to ellipsoid, trigonous; vestigial rachilla present inside perigynium. VARIETIES 2; AZ plants belong to var. *filifolia*. —Dry, open slopes and plains, desert scrub, pinyon-juniper woodland; Apache Co.; 1890–2080 m (6200–6800 ft); May; AK and Northwest Territories, Can.; s to CA and n AZ and NM. SECTION: *Filifoliae*; Group/Key A.

See discussion under *Carex elynoides* for differences with *C. elynoides* and *C. oreocharis*.

Carex geophila Mack. (earth-loving). White Mountain sedge. —Plants densely caespitose, sometimes from short to long, horizontal or ascending rhizomes. CULMS 3–18[–22] cm tall, slender, shorter than the leaves, scabrous distally. LEAVES 0.8–2.9 mm wide, pale to bright green, channeled above; leaf bases tan to brown; old sheaths persistent, forming a dense fibrous base with scabrous fibers, rarely ladder-fibrillose. INFLORESCENCE of two types, basal and terminal; basal inflorescences composed of 1–2 pistillate spikes on a short peduncle, without basal bracts; terminal inflorescence 1–2.5(–6) cm long, composed of one staminate terminal spike, this spike sometime lacking, 5–12[–16] mm long and 1–3 mm wide, on a peduncle 0.9–6.0[–8.8] mm long, subtended by 1–3 lateral, 1–6 flowered, pistillate spikes, each 6–8 mm long, 4–6 mm wide; proximal pistillate bract of the terminal inflorescence 7–20 mm long, leaf-like, shorter, or rarely longer than the inflorescence; sheath negligible to 0.2 mm long. PISTILLATE SCALES shorter than, to as long as the perigynia, ovate, reddish brown with a pale or green center and hyaline margins; apex acute to cuspidate. PERIGYNIA 2.5–4.2 mm long, 1.5–2.0 mm wide, ascending, green to yellowish brown, with two thick marginal nerves and 0–several light nerves on the faces, puberulent, suborbicular in cross section, obovoid, ellipsoid, or suborbicular, contracted to a narrower rounded base, abruptly contracted to the straight, rarely bent, acuminate beak; beak [0.4–]0.6–1.0 mm long, entire or shallowly bidentate to 0.2 mm. ANTHERS 2.0–3.9 mm long. STIGMAS 3. [ACHENES 1.6–2.8 mm long, 1.5–1.9 mm wide, globose to obovoid, round to trigonous with convex sides in cross section.] —Dry and open pine forests, pinyon-juniper and oak woodlands, and chaparral, from the forest floor to rocky slopes; Apache, Cochise, Coconino, Gila, Graham, Greenlee, Mohave, Navajo, Pima, and Yavapai cos.; 1180–2970 m (3900–9750 ft); Mar–Aug; CO, NM, UT and TX; s through Mex. to Guatemala Frequent and wide-ranging in AZ; probably often overlooked due to its inconspicuous inflorescences and early flowering season, and so likely in more locations than now known. SECTION: *Acrocystis*; Group/Key B.

Carex geophila is often confused with *C. rossii*. Typically, *Carex geophila* has inflorescence bracts shorter than the inflorescence, and *C. rossii* has bracts longer than the inflorescence; however, this is not always the case. More reliably, the bases of *Carex geophila* are brown and extremely fibrous, while the bases of *C. rossii* are reddish brown colored, and not so coarsely fibrous. *Carex rossii* prefers slightly moister forest floors with more shade, while *C. geophila* prefers drier, sunnier habitats. In s AZ, *Carex geophila* might be mistaken for the rare *C. lativena*, and without mature inflorescences, the two may be impossible to separate. *Carex lativena* has perigynia with distinct wide nerves, and perigynia beaks that are acute and bent to one side, while in *C. geophila*, the nerves on the body are fine and less apparent than the marginal nerves and the perigynia beaks are acuminate to the narrow, usually straight beak.

Carex geyeri Boott (for Charles A. Geyer, 1809–1853, a German botanist who traveled across North America in 1843 with a group of missionaries). Geyer's sedge, Elk sedge. —Plants rhizomatous, loosely clumping or colonial with short to elongate, thick, brown rhizomes. CULMS [12–]16–30[–50] cm tall, about as long as the leaves, stiffly erect, triangular, scabrous distally. LEAVES 1.5–3.0[–3.5] mm wide, flat, leathery, evergreen, smooth or scabrous-margined; basal sheaths straw to brown, red-spotted. INFLORESCENCE a single androgynous terminal spike, without an inflorescence bract; staminate portion 10–16[–25] mm long, separated from pistillate portion by a 1.5–6.0 mm segment of bare rachis; pistillate portion consisting of 1–2(–3) tightly clustered perigynia. STAMINATE SCALES pale to brownish, apex often ragged to fimbriate-margined. PISTILLATE SCALES longer than the perigynia, narrowly oblong, brown to greenish, hyaline-margined, often with a paler midvein; apex cuspidate on the upper scales, cuspidate to awned on the lowest scale; lowest scale 7–12 mm long, sometimes resembling an inflorescence bract. PERIGYNIA 4.4–5.0[–8.4] mm long, [1.8–]2.2–2.8 mm wide, appressed-ascending, glabrous, obovoid, tapering to the somewhat spongy base, greenish yellow to brown, with 2 (often obscure) marginal nerves, otherwise nerveless; beaks very short or obsolete (in our specimens), entire, apex ciliate. ANTHERS [2.2]4[–6.2] mm long. STIGMAS 3. ACHENES 3.5–4.0[–6.2] mm long, 1.2–2.5[–3.0] mm wide, obpyramidal, apiculate, sharply trigonous, filling the upper part of the perigynium; rachilla lacking to present and equaling the achene. —Dry montane woodlands, open slopes, and meadows; Apache Co.; at 2800 m (9200 ft); May–Jul; British Columbia and Alberta, Can.; s to n CA, CO, and AZ. In AZ, only known from Pastora Peak in the Carrizo Mountains. SECTION: *Firmiculmes*; Group/Key A

Carex geyeri is distinct from all other *Carex* species in AZ, identified by its thick rhizomatous habit and single-spiked inflorescence, with the few perigynia separated from the staminate portion by a bare section of rachis. *Carex obtusata* is also rhizomatous and single-spiked, but is a much smaller plant, with (often) red-purple colored sheaths (vs. brown in *C. geyeri*), and the perigynia are directly subtending the staminate flowers in the small terminal spike.

Carex hassei L. H. Bailey (for Herman Edward Hasse, 1836–1915). False golden sedge. —Plants loosely caespitose or from long, slender rhizomes; rhizomes 0.6–1.6 mm in diameter. CULMS 10–60(–85) cm tall, longer than the leaves. LEAVES

2.0–3.8 mm wide, green; basal sheaths brown. INFLORESCENCE 2–15 cm long, condensed to elongate, composed of a single erect terminal (usually staminate, rarely gynecandrous or pistillate) spike, and 1–4 lateral pistillate spikes, rarely with a separate long-peduncled basal pistillate spike; terminal spike erect, 6–18 mm long, 1.5–3.0 mm wide, up to 4 mm wide if pistillate; lateral spikes (4–)8–20 mm long, 3–5 mm wide, with 7–22[–30] perigynia loosely spaced on the rachis with internodes ranging from 0.5–1.0 mm long; lower lateral spikes long-peduncled; proximal bract leaf-like and longer than the inflorescence, with a sheath 1.5–17 mm long. PISTILLATE SCALES narrower and shorter than, to as long as the perigynia, ovate to orbicular, brownish with pale or green center and narrow to broad hyaline margins, appressed to spreading when mature; tip obtuse to acuminate, often mucronate to aristate. PERIGYNIA 2.0–3.1 mm long, 0.6–1.5[–1.9] mm wide, ascending, green or tan early, then turning pale when mature, lightly or strongly 10–12 nerved when mature, ellipsoid to obovoid, densely papillose, beakless or nearly so; perigynium tip often curved to the back; orifice entire. ANTHERS 1.8–2.0 mm long. STIGMAS 2, or a mix of 2 and 3, with less than 30% of flowers with 3 stigmas on the same spike. ACHENES 1.2–2.0 mm long, 1.1–1.5 mm wide, suborbicular to elliptic, lenticular (trigonous on flowers with three stigmas). — Moist to wet meadows, seepage slopes and springs, streambanks, often on alkaline substrates; Apache, Coconino, Mohave, and Navajo cos.; 1500–2750 m (5000–9000 ft); Apr–Aug; British Columbia, Can.; s to CA, NV, UT, and AZ, one site in Baja C. In AZ, across the s Colorado Plateau to the Canyon de Chelly area. SECTION: *Bicolores*; Group/Keys C, D, E.

See discussion under *Carex aurea*.

Carex haydeniana Olney (for geologist Ferdinand Vandever Hayden, 1829–1887). Cloud sedge. —Plants densely cespitose. CULMS 4–25(–40) cm tall, equal to or longer than the leaves, conspicuously striate. LEAVES 1.0–2.5[–4.0] mm wide, green. INFLORESCENCE 0.8–2.1 cm long, 5–18 mm wide, compact, dense, truncate at the base, composed of 5–7(–9) closely aggregated sessile gynecandrous spikes; spikes 6.5–10 mm long, 4.5–8.0 mm wide, mostly indistinguishable, broadly ovoid; proximal internode 1.0–2.5[–3.4] mm; proximal bract scale-like, shorter than the inflorescence. PISTILLATE SCALES shorter and narrower than the perigynia, narrowly ovate to ovate, reddish to coppery to dark brown, sometimes with a whitish or pale gold midvein, apex acute to obtuse. PERIGYNIA 4.0–5.0[–6.5] mm long, 1.5–2.2[–2.6] mm wide, ascending to spreading-ascending, light brown to coppery or dark brown, often nerved on the dorsal side, sometimes on the ventral side, flat except over the achene, strongly wing-margined to the broadly roundish base, wing-margined and serrulate distally, abruptly acuminate to the terete beak; beak tip dark brown; distance from the beak tip to the top of the achene (2.3–)2.6–3.8 mm. STIGMAS 2. ACHENES (1.2–)1.4–1.8 mm long, 0.8–1.1(–1.3) mm wide, lenticular. $2n = 82$. [*Carex macloviana* D’Urville subsp. *haydeniana* (Olney) Roy L. Taylor]. —Rocky or gravelly alpine slopes and clearings; Coconino Co.; 3450–3650 m (11,400–12,100 ft); Jul–Sep; British Columbia and Alberta, Can.; to CA, n AZ and n NM. In AZ, only found above timberline on the San Francisco Peaks. SECTION: *Ovales*; Group/Key H.

Carex haydeniana is closely related to *C. microptera*. Both share a compact, almost spherical, dark inflorescence head. While most treatments say that it is hard to

distinguish the two in high montane habitats, they seem distinct on the San Francisco Peaks. *Carex microptera* is usually much taller, and its perigynia are shorter and not usually quite as wide, tapering more gradually to the beak.

Carex hystericina Muhl. ex Willd. (like a porcupine, referring to the bristly pistillate spikes). Bottlebrush sedge, Porcupine sedge. —Plants densely clumping from rhizomes with distance between the culms along the rhizome often exceeding 3 cm. CULMS 20–85[–100] cm tall, sharply triangular and scabrous-angled above. LEAVES 2.5–8.5[–10] mm wide, flat, septate nodulose, yellow-green; leaf bases pale to reddish; sheath fronts becoming ladder-fibrillose with age, concave at top. INFLORESCENCE [2.5–]10–30+ cm long, elongate, composed of one terminal staminate spike (rarely absent, androgynous, or with a few pistillate flowers mixed in toward the top of the spike), and [1–]2–6(–8) lateral pistillate spikes; terminal spike [1–]1.5–4[–5] cm long, 2–4 mm wide; pistillate spikes each 1–6 cm long, 8–15 mm wide; lower pistillate spikes slightly spreading on short peduncles; proximal pistillate bract 4–30+ cm long, leaf-like, longer than the inflorescence. PISTILLATE SCALES much narrower and shorter than the perigynia, inconspicuous, ovate to oblanceolate or elliptic; body 1–2 [6 with awn] mm long, with a greenish midvein and broad hyaline margins, abruptly narrowed to a scabrous awn, sometimes with an excurrent midvein, or often emarginate; awn longer than the body. PERIGYNIA 4.0–7.3 mm long, 0.8–2.1 mm wide, widely spreading, densely packed, some reflexed at the base of the spike, light green to straw colored in age, with 13–17[–21] prominent nerves, lanceolate to elliptic, inflated; apex acuminate to a prominent slender beak 1.5–3.5 mm long; beak bidentate with straight teeth, the teeth 0.3–0.9 mm long. STIGMAS 3. ACHENES 1.6[–1.2–2.0] mm long, 1.0[–0.9–1.3] mm wide, obovoid, trigonous and thickened at the blunt angles, pale brown.—Marshes, pond margins and streambanks; Apache, Coconino, Gila, Mohave, Navajo, and Yavapai cos.; 475–2200 m (1550–7200 ft); May–Jul. British Columbia to Newfoundland, Can.; s through the US into n Mex.; absent from the se states. In AZ, found in the Grand Canyon, the Verde Valley and surrounding mountains, along the Mogollon Rim country from Showlow to McNary, and at a few locations on the Navajo Reservation. SECTION: *Vesicariae*; Group/Key C.

Carex hystericina would most likely be confused with *C. thurberi* in AZ. *Carex hystericina* spikes are shorter and stiffer, and the scale awns are longer than the scale bodies, while *C. thurberi* spikes are longer and more flexible, and the scale awns are shorter than the body of the scale. *Carex hystericina* is more strongly cespitose, while *C. thurberi* is usually more loosely clumping to rhizomatous. The original spelling “*hystericina*” has sometimes been “corrected” to the etymologically preferable “*hystricina*” in the past. Its occurrence at Mile 194 along the Colorado River in the Grand Canyon gives it the distinction of being at the lowest elevation (475 m) of any sedge in AZ.

Carex interior L. H. Bailey (inland, referring to range). Inland sedge. —Plants densely cespitose, sometimes with inconspicuous short rhizomes. CULMS 12–38[–95] cm tall, slender, wiry, sharply triangular, equal to or taller than the leaves. LEAVES 0.3–1.6(–2.7) mm wide, green. INFLORESCENCE 1–2.6[–3.7] cm long, 0.4–0.8 cm wide, open, elongate, composed of (2–)3–4(–5) sessile (rarely the lower ones shortly

pedicellate) gynecandrous spikes; spikes easily distinguishable; terminal spike 5–9[–20] mm long, with a narrow staminate basal portion less than or equal to half the length of the spike; lateral spikes 3.0–5[–9.5] mm long, sometimes wholly pistillate or with just a few staminate flowers at the base; lower spikes remote with proximal internode (2–)3–5(–9)[–11] mm long; proximal bract scale or awn-like and inconspicuous, distinctly shorter than the inflorescence. PISTILLATE SCALES inconspicuous and shorter than the perigynia, ovate, yellowish brown center and hyaline margins, all fading to nearly hyaline with age; apex obtuse. PERIGYNIA 1.9–3.0[–3.3] mm long, 1.0–1.5[–1.8] mm wide, about 2 times as long as wide, appressed, becoming spreading to reflexed at maturity, giving the short lateral spikes a star-like appearance, olive-green to dark brown when mature, nerved or unnerved on either side, broadest at the base, plano-convex, plump and somewhat swollen with spongy tissue at the base, with a definite edge, but not wing-margined, scabrous from the shoulders up through the beak, tapering abruptly to the broad beak; beak 0.4–1.0 mm long, nearly entire to shallowly bidentate to a depth of 0.1(0.2) mm. ANTHERS 0.8–1.2 mm long. STIGMAS 2. ACHENES 1.4–1.5[–1.8] mm long, [0.9–]1.0–1.2[–1.3] mm wide, broadly ovate to orbicular, lenticular. —Springs and wet meadows; Apache Co.; 2350–2530 m (7700–8300 ft); May–Jul; AK to Nova Scotia, Can.; s to CA and AZ; two sites in n Mex., in the U.S. absent only from TX and the Southeast. Uncommon in AZ, known from the Lukachukai and White Mountains, also from an 1890, Palmer collection (ARIZ 36211) ‘Willow Springs,’ perhaps in Navajo County along the Mogollon Rim. SECTION: *Stellulatae*: Group/Key G.

Carex interior is distinctive, recognizable by its star-like spikes separated by obvious internodes, characters it shares with *C. echinata*. It is separated from *Carex echinata* primarily by the perigynia size characters given in the key. It is probably more widespread in AZ than presently known.

Carex jonesii L. H. Bailey (for Marcus Eugene Jones, 1852–1934). Jones’ sedge. —Plants loosely caespitose or arising singly on a short, compactly branched rhizome with up to 1 cm between nodes. CULMS 20–40(–60) cm tall, 1[–2] mm wide, slender, sharply triangular, exceeding the leaves, or uncommonly equaling the leaves. LEAVES 1–3.5(–4) mm wide, flat; sheath fronts pale, thin, nerved, truncate or concave at the mouth. INFLORESCENCE 8–15(–20)[–25] mm long, 6–12[–15] mm wide, head-like, ovoid to shortly cylindrical; composed of 4–10 sessile, indistinguishable, androgynous spikes; spikes 4–7 mm long, 1–8 mm wide, few-flowered; proximal internodes not more than 3 mm long, usually not visible; lowest inflorescence bract scale-like, broad-based, wrapping around the culm, inconspicuous, sheathless, often scarcely larger than the pistillate scales, sometimes with an awn 1–4 mm long. PISTILLATE SCALES as long as or slightly shorter than the perigynia, triangular ovate, shiny, coppery or hyaline or dark brown, with acute tips, at maturity, the perigynia are widely spreading so the scales are pushed out of the way making the perigynia easy to see. PERIGYNIA 2.5–2.9(–4.8) mm long, 0.9–1.5 mm wide, green maturing to brown, strongly 7–11 nerved abaxially, 5–9 nerved adaxially, lance-triangular to lance-ovate or broadly lanceolate, widest near the slightly spongy base, or sometimes just above the base, commonly with raised margins proximally; base rounded, truncate, or cordate, with a stipe to 0.1 mm long; tapering above gradually to

the ill-defined, smooth beak, or more abruptly narrowed above the middle; beak nearly entire or slightly obliquely cleft to 0.1 mm. ANTHERS 1.6–1.8 long with an entire apiculus up to 0.1 mm long. STIGMAS 2. ACHENES (1.1–)1.5(–2.0) long, (0.5–)1.0 mm wide, lenticular, elliptic, ovate, sub-stipitate, dark golden brown; persistent style base cylindric. [*Carex nervina* L. H. Bailey var. *jonesii* (L. H. Bailey) Kükenthal]. — Wet subalpine meadows and stream banks; Apache and Coconino cos.; 2000–2900 m (6500–9900 ft); Apr–Aug; WA, ID, and MT, s to CA, AZ, and NM. In AZ, known only from the Mogollon Rim and the White Mountains; should be looked for in Cochise, Graham, Greenlee, and Navajo cos. SECTION: *Vulpinae*; Group/Key F.

Carex jonesii was not recognized within AZ prior to this treatment, and while only recorded from seven AZ localities at this time, it is probably more widespread in AZ than presently known. *Carex jonesii* may be confused with *C. microptera*, due to the small and dense heads of their inflorescences. However, the perigynia are distinct, with those of *Carex microptera* being flat and winged, while those of *C. jonesii* are unwinged and swollen at the base with pithy tissue. *Carex stipata*, a far more common relative in the same section with similar perigynia, has a much larger inflorescence with paniculate branches and many spikes, while *C. jonesii* has few, indistinguishable spikes forming a compact head.

Carex kelloggii W. Boott (for Dr. Albert Kellogg, 1813–1887). Kellogg's sedge. —Plants caespitose, forming clumps or tussocks. CULMS 15–80[–90] cm tall, shorter or longer than the leaves, slender, acutely to obtusely angled. LEAVES green, thin, 1–4 mm wide; basal sheaths straw-colored to light brown; sheath fronts of proximal leaves hyaline, red-spotted or not, not becoming ladder-fibrillose; apex truncate to concave. INFLORESCENCE 5–12(–17) cm long, elongate, composed of 1(–4) terminal staminate spike(s), rarely with a few female flowers at the tip, and 3–4[–7] lateral pistillate spikes (25% of AZ specimens have a few staminate flowers on the top of the upper pistillate spikes); lateral spikes 0.7–4.5 cm long, 2.4–4.0 mm wide, linear cylindric; base cuneate or attenuate; lower spikes sessile, short peduncled, or with peduncles up to 11 cm long; proximal bract most often longer than inflorescence. PISTILLATE SCALES narrower and shorter than to equaling the perigynia, oblong-ovate, reddish brown to black with narrow to broad green midvein not extending to the apex, upper scales often with a narrow hyaline margin; apex obtuse to acute, awnless, or rarely bidentate with a short awn to 0.2 mm long. PERIGYNIA 1.8–3.2[–3.5] mm long, 1–1.8 mm wide, early deciduous, ascending to spreading, whitish to green, sometimes 5–7 nerved on each face but more often nerveless (sometimes with some brown on the faces or maturing to light brown or with well-separated brown spots), loosely enclosing achenes, thin-walled, elliptic or ovate, dull, minutely papillate or glabrous; base truncate, distended, stipitate; apex acute, glabrous; beak 0.1–0.5 mm long, well-defined, slender, with dark tip, entire. STIGMAS 2, rarely 3. ACHENES about 1 mm long, lenticular, suborbicular, stipitate or not, papillate. $2n = 92$. [*Carex lenticularis* var. *lipocarpa* (Holm) L.A. Standley, *Carex lenticularis* Michx. var. *pallida* (W. Boott) Dorn.]. VARIETIES 3; AZ plants belong to var. *kelloggii*. —Wet meadows, springs, banks of sluggish streams, lakeshores, and the margins of seasonal ponds in the mountains; Apache, Cochise, Coconino, Graham, and Navajo cos.; 1700–2300(–2750) m (5600–7500(–9000) ft); May–Jun (Sep); AK and w Can.; s to CA, AZ,

and NM. In AZ, found mostly along the Mogollon Rim, and in the White, Pinaleño, and Chiricahua Mountains. SECTION: *Phacocystis*; Group/Key E.

Recent molecular work by Dragon & Barrington (2009) indicate that the w taxa formerly included in *Carex lenticularis* form a distinct clade separate from the e species, thus our plants are now being called by their original name, *Carex kelloggii*. *Carex kelloggii* is unique in Section *Phacocystis* in the combination of its cespitose habit combined with the inflorescence usually having only one terminal staminate spike, and the pistillate spikes only occasionally having staminate tips. The spikes appear finer textured and greener than in the other *Phacocystis* species, with the broad midvein of the pistillate scales matching the green color of the exposed perigynia. The perigynia are stipitate to a greater degree than in the other *Phacocystis* species. Plants from the Pinaleño and Chiricahua Mountains have long-peduncled lower spikes, perigynia that tend to be more fusiform than the perigynia of n plants, and are more commonly nerved. We do not believe they warrant taxonomic distinction at this time.

Carex lativena S. D. Jones & G. D. Jones. (broad-veined, referring to the perigynia). Broadvein sedge. —Plants densely cespitose from stout, often ascending rhizomes. CULMS 4–15 cm tall, shorter than the leaves, triangular, smooth to scabrous on the angles. LEAVES (0.5–)1.2–2.0(–3.1) mm wide, green, V-shaped to flat, papillose-scabrous; leaf bases brown; sheaths persistent, forming a brown fibrous base; fibers scabrous and slightly ladder-fibrillose. INFLORESCENCE of two types, basal and terminal; basal inflorescences composed of 2–3 pistillate spikes on a slender peduncle; terminal inflorescence 1–2.5 cm long, composed of a single staminate [gynecandrous] terminal spike, 7–9 mm long and 1.2–2.0 mm wide, closely subtended by 1–2 lateral pistillate spikes, each 3–7 mm long and 2–4 mm wide; proximal pistillate bract of the terminal inflorescence leaf-like, [1–]12–16[–18] mm long, shorter to longer than the inflorescence, with a sheath 0–1[–2.5] mm long; basal spikes with or without bracts. PISTILLATE SCALES proximal scales as long as the perigynia, distal scales narrower and shorter than the perigynia, ovate, greenish white to light or reddish brown with a several-veined green center and broad hyaline margins; apices acute to cuspidate. PERIGYNIA 3.0–3.5[–4.0] mm long, 1.1–2.0 mm wide, ascending, pale green to straw-colored, glabrous proximally and hispidulous distally (or nearly glabrous throughout), with 14–18[–27] prominent nerves mostly 0.1 mm or more wide, suborbicular in cross section, obovoid, contracted below to a narrower rounded base, contracted above to the abruptly bent, entire beak; beak 0.1–0.5 mm long. ANTHERS 3.6–3.8 mm long. STIGMAS 3. ACHENES 2.0–2.4 mm long, [1.1–]1.5–1.7[–1.9] mm wide, obovoid, trigonous with 2 faces convex, apex truncate to retuse. —Dry to dry-mesic woodlands, on shaded rocky slopes or canyon bottoms; Cochise Co.; 1680–2560 m (5500–8400 ft); Apr–Jul; se AZ to TX; s into n Mex.; of conservation concern. Rare or overlooked in AZ; found only in the Chiricahua, Dragoon, and Huachuca Mountains. SECTION: *Hallerianae*; Group/Key B.

Carex lativena is easily confused with the far more common *C. geophila*, and cannot reliably be differentiated without mature inflorescences. *Carex lativena* perigynia have wide nerves and short acute beaks often bent to one side, while *C. geophila* perigynia have fine, narrow nerves on the body that are less apparent than the marginal nerves and the acuminate beaks are usually not bent.

Carex leucodonta Holm (white-toothed, referring to the perigynia beaks). Whitetooth sedge. —Plants loosely caespitose, rarely with short to long rhizomes. CULMS 15–50 cm tall, much longer than the leaves, slender, triangular, scabrous distally. LEAVES 2.0–3.5(–4) mm wide, green, herbaceous, papillose-scabrous; leaf bases brown; sheaths persistent and forming brown fibrous bases. INFLORESCENCE 3–5 cm long, composed of a single terminal staminate spike, and 2–4[–5] lateral sessile to short pedunculate pistillate spikes; terminal spike [10–]12–24[–30] mm long, 1.5–3.0 mm wide, on a peduncle 1.1–8[–10] mm long; pistillate spikes 5–10 mm long and 2–7 mm wide, with 1–8[–10] perigynia each; proximal pistillate bract of the inflorescence leaf-like, longer [shorter] than the inflorescence. PISTILLATE SCALES about as long, or slightly longer than the perigynia, ovate, hyaline with a green keeled center, apex acuminate to short-awned. PERIGYNIA 3.4–4.0[–4.2] mm long, [1.5–]1.7–2.2[–2.4] mm wide, ascending, dull green to straw-colored, many-nerved; nerves finer than the marginal keels; perigynia short-pubescent, suborbicular in cross section, obovoid to almost globose, contracted below to a stipitate base, abruptly contracted above to the terete beak; beak 0.5–1.0 mm long, shallowly bidentate to 0.3 mm. ANTHERS [2.2–]2.5–2.9[–3.3] mm long. STIGMAS 3. ACHENES [1.6–]1.8–2.6 mm long, 1.4–2.2[–2.4] mm wide, globose, completely filling the perigynia. — Open pine and oak forests, on dry slopes to canyon bottoms; Cochise, Gila, Pima, and Santa Cruz cos.; 1600–2200 m (5200–7200 ft); Jun–Sep; c AZ; to n Mex. In AZ, s of the Mogollon Rim, and in the Santa Rita, Santa Catalina, Rincon, Patagonia, Huachuca, and Chiricahua Mountains. SECTION: *Acrocystis*; Group/Key B.

Carex leucodonta is unique in Section *Acrocystis* in AZ in that it lacks basal spikes, and its culms significantly surpass the leaves. It flowers later in the season than its relatives. Crins and Rettig (2002) subsume *Carex leucodonta* into *C. turbinata*, a Mexican species from further south. Hermann (1974) separated the two based on how bidentate the beaks are, how acuminate to awned the scales are, and the color of the staminate scales. Reznicek & Gonzalez (pers. comm.) feel that these species will be separated once again when the full variation within this complex is understood better. We have chosen to recognize this taxon based on the above communication, and the separation of populations in Mex.

Carex microdonta Torr. & Hook. (small-toothed, referring to the perigynia beaks). Littletooth sedge. —Plants rhizomatous, culms usually single, or rarely 2–3 culms together from long rhizomes with distance between the culms along the rhizome often exceeding 5 cm. CULMS 7–22[–56] cm tall, stiffly upright. LEAVES 2–6[–8.3] mm wide, flat, but becoming W-shaped at the tips, drab to bright green; basal sheaths brown, the lower sheaths cross-walled; ligule up to about as long as wide, rounded, free portion up to 0.5 mm long. INFLORESCENCE 8–20 cm long, elongate, composed of one erect terminal staminate (rarely androgynous or lacking) spike (occasionally with one to several shorter and immediately subtending staminate or androgynous spikes), and 2–3[–4] erect, short pedunculate, pistillate spikes (the upper rarely with a few staminate flowers at the apex); terminal spike 1.1–2.3[–5.0] cm long, 2–3 mm wide, the lateral spikes 0.7–1.8[–3.7] cm long, 4–7[–8.0] mm wide; lowest spike pedunculate, arising at or below the midpoint of the culm, sometimes almost basal; pistillate bracts leaf-like, shorter to longer than the inflorescence, with sheaths 2–8 mm

long. STAMINATE SCALES green, fading to tan, not brown-spotted, apex acute. PISTILLATE SCALES [1.6–]2.5–6.0 mm long, longer at the base of the spike becoming shorter upwards, lanceolate, triangular to ovate, green with hyaline margins; tips often awl-like and sometimes scabrous. PERIGYNIA 2.6–3.5[–4.2] mm long, 1.4–1.6[–1.8] mm wide, ascending, green to olive-green to light reddish brown, often rust-spotted on the body, with many obscure nerves, narrowly ovoid to oblong-ovoid, contracted to a short, nearly entire beak; beak 0.3–0.7[–0.9] mm long. ANTHERS 2.4–3.1 mm long. STIGMAS 3. ACHENES 1.9–2.7 mm long, 1.2–1.6 mm wide, not including the prominent bent apiculus, obovoid, trigonous. $2n = 64$. —Wet soil at seeps and ponds, often associated with limestone; Cochise Co.; 1850–1875 m (6070–6150 ft); Apr–Jul; AZ to FL, and n into KS and MO. In AZ, known only from one location, the constructed Peterson Ponds in Scotia Canyon, on the w side of the Huachuca Mountains, perhaps introduced there. SECTION: *Granulares*; Group/Key C.

Carex microdonta is most closely related to *C. crawei*, which it resembles greatly, but differs in its larger stature, wider leaves, staminate scales with an acute apex, and perigynia with longer beaks. The inflorescence architecture of both *Carex crawei* and *C. microdonta* resembles that of *C. aurea*, *C. hassei*, and *C. sp. nov. A*, but the culms are more stiffly upright in the *Granulares*, and more flexuous in the latter group. The perigynia characteristics also separate these groups.

Carex microptera Mack. (small-winged, referring to the perigynia wings). Smallwing sedge. —Plants densely cespitose. CULMS 15–80(–110) cm tall, usually longer than the leaves. LEAVES 1–4[–5] mm wide, green. INFLORESCENCE (0.7–)1.1–2.4[–2.6] cm long, 7–18 mm wide, compact, dense, truncate at the base, composed of 4–10(–14) closely aggregated sessile gynecandrous spikes, these spikes mostly indistinguishable; each spike (4–)5.0–9.0(–11.0) mm long, (2–)3–5.0[–7.0] mm wide, broadly ovoid; proximal internode 0.5–3.0(–4.0) mm; proximal bract scale-like, usually shorter than the inflorescence, occasionally leaf-like and longer than the inflorescence. PISTILLATE SCALES shorter and narrower than to as wide as the perigynia, ovate to ovate-lanceolate, brown, usually with a pale (green) midvein and hyaline margin; apex acute to obtuse. PERIGYNIA (2.8–)3.4–4.0(–4.8)[–5.2] mm long, 1.1–1.7[–2.4] mm wide, ascending to spreading, green or tan to brown when mature, nerved on the dorsal side, nerved or not on the ventral side, nerves often extended well above the top of the achene, flat except over the achene, wing-margined to the round-tapering base, serrulate distally, tapering to the long, dark terete beak; beak tip entire, smooth for 0.2–0.4[–0.9] mm, distance from the beak tip to the top of the achene 1.5–2.0(–2.4)[–2.8] mm. ANTHERS 1.3–1.8 mm long. STIGMAS 2. ACHENES 1.0–1.4 mm long, 0.8–1.1 mm wide, lenticular. $2n = 80, 90$. [*Carex festivella* Mackenzie]. —Moist to wet meadows, and along streams; Apache and Coconino cos.; 1900–3300 m (6300–10,800 ft); Jun–Aug; Yukon and Northwest Territories, Can.; throughout the w states; to n Mex. In AZ, moderately abundant in montane areas on the Kaibab Plateau, along the Mogollon Rim to the White Mountains, and in the Chuska and Carrizo Mountains. SECTION: *Ovales*; Group/Key H.

Many AZ specimens were formerly placed as *Carex festivella* Mack., which is no longer considered distinct from *C. microptera*. It was separated by its more oblong-ovoid inflorescence with more distinguishable spikes, and perigynia that were more

abruptly narrowed to the beak. Some of these specimens are now determined as *Carex microptera*; others with elongate inflorescences have been annotated as *C. cf. microptera* “Pinaleño,” but in this treatment are called *C. sp. nov. B. Carex sp. nov. B* spikes are distinct, with the lowest internode 4–5 mm or more long. *Carex microptera* perigynia are widest below the middle, below the top of the achene, while *C. sp. nov. B* perigynia are usually widest near the middle, at or above the top of the achene. *C. sp. nov. B* approaches *C. microptera* in the White Mountains, becoming more distinct and prevalent in the Pinaleño and Chiricahua Mountains. *Carex microptera* perigynia are similar to those of *C. scoparia*, but the pistillate scales are very different, in that they are wider and are darker brown, giving the inflorescences a contrasting coloration between the green perigynia and the dark scales, while in *C. scoparia*, the coloration is more uniform.

We find that all of the plants in the Pinaleño and Chiricahua Mountains fall into the “Pinaleño” group (*Carex sp. nov. B*), as do most of the White Mountain plants. However, in the White Mountains we also find specimens showing the compact heads of classic *C. microptera*, and more variation in the perigynia characters. Part of the problem in working with existing specimens is that many collections have only 1–3 inflorescences, and do not show the whole range of what occurs on a large clump in the field. Some plants in the White Mountains show characters of both inflorescence types on the same clump. We are unsure how this will sort out, but both Andrew Hipp and Peter Zika agree that these plants are morphologically different enough to merit some level of distinction. If we were to conclude that they should remain in *C. microptera*, then we would have to expand the description of *C. microptera*, especially in length of the lower inflorescence internodes. Until we have more definitive information, we have separated the two in our keys, and provided a description for the possible segregate under *C. sp. nov. B*. See also discussion under *Carex haydeniana*.

Carex nebrascensis Dewey (from Nebraska). Nebraska sedge. —Plants rhizomatous, culms arising singly or in small clusters from stout, scaly rhizomes, often forming large, continuous stands. CULMS 12–50(–90) cm tall, shorter to longer than the leaves, acutely angled, scabrous. LEAVES 3–10(–12) mm wide, firm, glaucous or light green; basal sheaths straw-colored to brown, often with crosswalls; sheath fronts hyaline, with or without red spots, veinless, not ladder-fibrillose; apex U-shaped to nearly truncate. INFLORESCENCE (5–)8–17(–19) cm long, elongate, composed of 1–3 erect terminal staminate spikes (the lower often shorter than the upper), and 2–4 erect lateral pistillate spikes, these sometimes androgynous on the upper 2–3; upper pistillate spikes usually sessile, the lower shortly pedunculate, with peduncles 1–2(–4) cm long; proximal pistillate spike 2–5[–5.5] cm long, 5–7[–8] mm wide, base cuneate; proximal bract shorter or longer than spikes, 2–6[–7.5] mm wide. PISTILLATE SCALES equaling to longer than the perigynia, lanceolate, red to dark purplish brown with the greenish midvein often becoming excurrent and awned on the lower scales; scale apices acute to acuminate to awned; awn to 1(–3) mm long, often scabrous. PERIGYNIA 2.6–4 mm long, 1.6–2.5 mm wide, divergent, green to brown, sometimes with red-brown spots on apical half, 3–7 nerved on each face, somewhat inflated, loosely enclosing achenes, elliptic to obovate, leathery, dull, glabrous or minutely papillate; apex rounded or obtuse; beak brown, 0.3–0.6 mm long, entire or bidentate; teeth to 0.2 mm long;

orifice often ciliate. STIGMAS 2. ACHENES 1.3–2.5 mm long, 0.9–1.8 mm wide, lenticular, dull. $2n = 66, 68$. —Springs, wet meadows, lake margins, sides of slow-moving streams, and ditches; Apache, Coconino, Mohave, Navajo, and Yavapai cos.; 1500–2450 m (5000–7600 ft); May–Sep; c Can.; s throughout the w and n midwestern states. In AZ, common from the AZ Strip, Kaibab Plateau, and the Flagstaff area through the Mogollon highlands to the White Mountains, with a few outlying populations in the Prescott area, and in the Chuska and Chiricahua Mountains. SECTION: *Phacocystis*; Group/Key E.

Carex nebrascensis is most readily distinguished from other species in Section *Phacocystis* by its coarse habit, and the combination of its broad, usually glaucous leaves, rhizomatous habit, strongly veined perigynia, and lower pistillate scales with excurrent midvein. We have noticed that achenes rarely develop to full maturity in this species, whereas the other species that it could be confused with in AZ seem to have achenes that most often do develop fully.

Carex obtusata Lilj. (obtuse, perhaps referring to the obtuse angles of the perigynia). Obtuse sedge, Blunt sedge. —Plants rhizomatous, single to several culms from long, tough, but slender, dark brown rhizomes with distance between the culms along the rhizome of 0.5–10 cm; rhizome sheaths not disarticulating into fibers. CULMS [3–]8–25 cm tall, as long as or longer than the leaves, erect, triangular, scabrous. LEAVES 0.5–1.5(–2) mm wide, stiff, flat or channeled; basal sheaths dark reddish brown, not disarticulating into fibers; sheath fronts sometimes red-spotted. INFLORESCENCE 5–15(–20) mm long, 2–5[–6] mm wide, composed of a single androgynous terminal spike; staminate portion as long as the pistillate portion; pistillate portion with [1–]6–14 perigynia; inflorescence bract lacking. STAMINATE SCALES lanceolate, acute to obtuse and fimbriate, light coppery brown with hyaline margins and a pale midvein. PISTILLATE SCALES slightly shorter to longer than, and as wide as, and enclosing the perigynia, ovate to lanceolate, brown, hyaline-margined, often with a pale or green midvein; apex obtuse, cuspidate, sharply acute, or awned; awns 2–10 mm long. PERIGYNIA 2.4–3.8[–4.0] mm long, 1.0–1.5[–2.0] mm wide, ascending, glabrous or slightly pubescent in upper half, broadly ellipsoid to obovoid, round to rounded-triangular in cross section, base rounded to cuneate, light green to dark brown, shiny, finely to coarsely nerved, with grooves between the nerves; tapering to the beak; beak 0.5–1.0 mm long, prominently bidentate, hyaline-tipped, with a dark ring below the tip. ANTHERS 1.8–3.0 mm long. STIGMAS 3. ACHENES 1.8 mm long, [1.0–]1.2 mm wide, oblong-obovoid to orbicular, trigonous; rachilla present, often with a flattened terminal appendage. $2n = 52$. —Dry meadows, grasslands, slopes, and plains; Apache and Coconino cos.; 2600–2800 m (8600–9200 ft); Jun–Aug; AK and Northwest Territories, Can.; s through the Rockies to n AZ and NM. Rare in AZ, known only from the Carrizo and Lukachukai Mountains in ne AZ, and the Kaibab Plateau. SECTION: *Obtusatae*; Group/Key A.

Carex obtusata could be confused with *C. duruiscula* since *C. duruiscula* is also short, grows in dry areas, and has long rhizomes. However, *Carex duruiscula* has multiple spikes, sometimes so congested that they are hard to differentiate, and the rhizome sheaths disarticulate into fibers, whereas the rhizome sheaths of *C. obtusata*

remain entire. *Carex duriuscula* also has brown bases, while those of *C. obtusata* are often red-purple colored.

Carex occidentalis L. H. Bailey (western). Western sedge. —Plants cespitose or densely short rhizomatous, if rhizomatous, culms crowded, with less than 5 mm between culms along a rhizome. CULMS 15–90 cm tall, as long as or longer than the leaves, smooth below, roughened above. LEAVES 1.4–2.8[–3] mm wide, flat, or nearly so, with slightly revolute margins; sheaths thin, brownish or green; sheath fronts hyaline, truncate or shallowly concave at the mouth. INFLORESCENCE 1.5–5.5 cm long, 4–11 mm wide, composed of 4–12 sessile androgynous (staminate flowers often inconspicuous) spikes, loosely aggregated into a slender, usually linear head that may be interrupted especially toward the base, upper spikes often aggregated and indistinguishable; lower spikes readily distinguishable to the naked eye; each spike 4–10 mm long, 3–6 mm wide, with 3–10 perigynia per spike; lowest inflorescence bract absent or setaceous and up to 2[–2.5] cm long, shorter than the inflorescence. PISTILLATE SCALES 3.4–4.0 mm long, about equaling the perigynia, ovate-triangular, brown with hyaline margins and green center; apex acuminate to short-awned; awn less than 1 mm long. PERIGYNIA [2.5–]3–4.8 mm long, 1.4–1.9 mm wide, loosely ascending or somewhat spreading, green maturing to straw, brown or black, smooth and shiny, nerveless, or obscurely nerved on both faces with strong marginal nerves, elliptic to oblong-elliptic, plano-convex, sharp-margined, often doubly serrulate above the middle, narrowly stipitate below, abruptly contracted above to a bidentate beak 0.6–1.3 mm long; beak one third to one half the length of the body, with apical teeth 0.2–0.4 mm long. ANTHERS 1.8–2.6 mm long, with an apiculus to 0.2 mm long, often bumpy or bristly, especially at the apex. STIGMAS 2. ACHENES (1.3–)1.9–2(–2.4) mm long, (0.9–)1.5–1.6 mm wide, lenticular, oblong orbicular, elliptic-circular, light brown at maturity. —Dry grasslands, woodlands, forests, in more mesic habitats at lower elevations; Apache, Cochise, Coconino, Gila, Graham, Greenlee, Mohave, Navajo, Pima, Pinal, Santa Cruz, and Yavapai cos.; (960–)1340–3260 m ([3150–]4400–10,700 ft.); Jun–Aug; MT and ND, s through the Rocky Mountain states to CA, AZ, NM, and TX; n Mex. In AZ, the most widely distributed dryland sedge at mid to upper elevations. SECTION: *Phaestoglochin*; Group/Key F.

Carex occidentalis is one of the most common and widespread sedges in AZ, and is most often confused with the less common *C. vallicola*. Both have moderately elongate inflorescences with androgynous spikes and plano-convex perigynia, and grow in dry forest habitats. *Carex occidentalis* scales are about as long as the perigynia, whereas *C. vallicola* scales are usually shorter. *Carex occidentalis* perigynia are thinner and more serrulate along the upper margins (sometimes doubly so) than *C. vallicola* perigynia, which can be completely glabrous (to very finely and singly serrulate along the upper margins). *Carex occidentalis* perigynia are more regularly arranged in the spikes in an ascending pattern, while those of *C. vallicola* are more randomly spreading, giving the inflorescence a more “irregular” texture. Both species are cespitose, unlike *Carex siccata*, a rhizomatous sedge with a relatively narrow and moderately elongate inflorescence, but with the middle spikes often wholly staminate. All three of these species prefer dry meadows and forests, though they can occasionally be found on the periphery of riparian zones. *Carex praegracilis* often shares the same

inflorescence shape as *C. occidentalis*, but prefers wet habitats, and often has unisexual inflorescences. (*C. occidentalis* can appear all pistillate late in the season when the anthers have fallen, so look carefully for remaining filaments in the upper scales of each spike). When seen in the field, the rhizomatous habit of *Carex praegracilis* is distinct from the cespitose nature of *C. occidentalis*. *Carex occidentalis* perigynia are always toothed, whereas *C. praegracilis* perigynia can be toothed to nearly entire.

Carex oreocharis Holm (mountain beauty). Grassyslope sedge. —Plants densely cespitose, without creeping rhizomes. CULMS 6–50 cm tall, shorter to more often longer than the leaves, erect, scabrous on the angles below the inflorescence. LEAVES (0.3–)1.0–2.0(–2.8) mm wide near base, folded or channeled, not quill-shaped; basal sheaths brown to dark brown and shiny, ladder-fibrillose with age. INFLORESCENCE 13–35[–40] mm long, 3–8 mm wide, composed of a single androgynous terminal spike; staminate portion 10–16(–22) mm long, much longer than the pistillate portion below; pistillate section with (2–)3–15(–20) perigynia; inflorescence bract lacking, but proximal pistillate scale sometimes resembling a bract, with a scabrous awn 0.5–4(–35) mm long, sometimes broken off in old specimens; lowest scales often sterile without perigynia. STAMINATE SCALES dark brown with hyaline margins; apex obtuse to acute. PISTILLATE SCALES shorter than, or as long as, and much wider than the perigynia, broadly orbicular, clasping the perigynia and the inflorescence axis, pale yellow-green, hyaline-margined, often with a pale or green midvein; apex obtuse to mucronate. PERIGYNIA (2.9–)3.5–4.2[–4.5] mm long, [1.4–]1.7–2.0[–2.2] mm wide, erect to appressed, margins often ciliate near the beak and the body sometimes pubescent or hirsute throughout, broadly ovoid to obovoid, rounded to tapering at the base, straw-colored to yellowish green, with 2 obscure marginal nerves, sometimes 3–5 nerved; abruptly contracted to the cylindrical hyaline-tipped beak; beak 0.5–1.0 mm long. ANTHERS 2.3–3.2 mm long. STIGMAS 3. ACHENES 2.2(–3.0) mm long, 1.2–1.9 mm wide, obovoid to ellipsoid, trigonous; vestigial rachilla present inside perigynium. —Mountain meadows, dry slopes and grasslands; Apache, Coconino, Greenlee cos.; 1980–3200 m (7300–10,500 ft); Jun–Aug; WY and CO to n AZ and NM; disjunct in n Mex. Infrequent and often overlooked in AZ, known from the Kaibab Plateau, San Francisco Peaks, Mogollon Rim, and locally abundant in the White Mountains. SECTION: *Filifoliae*; Group/Key A.

Carex oreocharis has most often been confused with *C. filifolia* in AZ, as the wider leaves are not always apparent on dried specimens, often drying inrolled and thus looking filiform. Both plants are more robust than *Carex elynoides*. The three species in Section *Filifoliae* seem to have distinct habitats in AZ, with *Carex elynoides* found in alpine tundra, *C. oreocharis* found in montane meadows above 7000 ft, and *C. filifolia* found in dry plains and deserts below 7000 ft.

Carex pachystachya Cham. ex Steud. (with a thick spike). Chamisso sedge. —Plants densely cespitose. CULMS 15–60[–120] cm tall, longer than the leaves, conspicuously striate. LEAVES 2.2–2.7[–4.2] mm wide, green. INFLORESCENCE 0.6–2.2[–2.6] cm long, 6–15 mm wide, compact and dense, to rarely moderately elongate, composed of 4–10(–14) closely aggregated sessile gynecandrous spikes, the upper spikes indistinguishable; spikes 5.0–9.0(–11.0) mm long, 3–7 mm wide, broadly

ovoid; proximal internode 1–2(–4.0)[–4.5] mm long; proximal bract scale-like, usually shorter than the inflorescence, occasionally leaf-like and up to 2.5 times longer than the inflorescence. PISTILLATE SCALES shorter and narrower than the perigynia, ovate to ovate-lanceolate, brown and shiny, with a pale or green midvein; apex acute to rounded. PERIGYNIA [2.8–]3.6–4.5[–5.2] mm long, 1.1–2.0[–2.4] mm wide, spreading when mature, green or tan to brown, typically (5–)7–9(–11) veined on both sides, sometimes nerveless ventrally, flat except over the achene, wing-margined to the round-tapering base with wings to 0.3–0.4 mm wide, widest below the top of the achene, serrulate to the tip, tapering to the terete beak; beak tip dark brown, [1.5–]1.9–2.7 mm from tip to top of achene. STIGMAS 2. ACHENES 1.2–1.4 mm long, 0.8–1.2 mm wide, lenticular. $2n = 80, 90$. [*Carex macloviana* D'Urville subsp. *pachystachya* (Chamisso ex Steudal) Hulten]. —Montane canyons along streams; Apache and Coconino cos.; 1980–2150 m (6500–7000 ft); Jun–Jul; AK, Yukon, Northwest Territories, Can. and throughout the w states. In AZ, rare in canyons of the Mogollon Rim and Canyon de Chelly; probably under-collected due to its similarity to the more common *Carex microptera*. SECTION: *Ovales*; Group/Key H.

Carex pachystachya is most easily confused with *C. microptera*. Both plants share the same habit and condensed inflorescence, but *Carex pachystachya* perigynia are plano-convex and thicker, causing them to spread more widely at maturity than *C. microptera* perigynia. *Carex pachystachya* perigynia have a more shiny texture than most of the other *Ovales*, and sometimes have a coppery tinge.

Carex pellita Willd. (covered with fur, referring to the hairs covering the perigynia). Woolly sedge. —Plants colonial from long rhizomes, culms arising singly or a few together. CULMS 15–100 cm tall, often shorter than the leaves, erect, sharply triangular, smooth or slightly scabrous on the angles. LEAVES 2.0–4.5(–7.0) mm wide, yellow-green to green, flat- or M-shaped; leaf bases shiny purplish red, ladder-fibrillose. INFLORESCENCE 5–30 cm long, elongate, composed of a terminal staminate spike, often closely subtended by 1–2 shorter sessile staminate spikes, and 2–3[–4] well-separated, erect to ascending pistillate spikes; terminal spike 1.8–5 cm long; pistillate spikes 1–4.2[–5] cm long, 4–7[–8] mm wide, lowest pistillate spike on a slender peduncle up to 8+ cm long, uppermost pistillate spike sessile or on short peduncles, sometimes with a few staminate flowers at the summit; proximal pistillate bract leaf-like, longer than the inflorescence. PISTILLATE SCALES shorter or longer than the perigynia, lanceolate to ovate, ciliate-margined towards the apex, reddish brown or hyaline with a 1–3 nerved pale or greenish midvein, with hyaline margins; apex acute to acuminate-awned. PERIGYNIA 2.5–3.8[–5.2] mm long, 1.4–2.1[–2.8] mm wide, ascending, brown, green or reddish brown, nerved on both sides but nerves hidden by uniform dense, lustrous pubescence throughout, suborbicular in cross section, inflated, rounded and spongy-thickened below, broadly ovoid or ellipsoid, abruptly contracted to the beak; beak [0.5–]0.9–1.2[–1.5] mm long, deeply bidentate with teeth 0.4–0.6 mm long. ANTHERS 2.4–2.8 mm long. STIGMAS 3. Achenes 1.5–2.1 mm long, 0.8–1.3 mm wide, broadly obovoid angles becoming rounded with age. $2n = 78$. [*Carex lanuginosa* Michx. misapplied]. —Common in wetlands, ditches, springs, and along slower moving streams, often in shallow water; Apache, Coconino, Graham, Greenlee, Navajo, Pinal, Santa Cruz, and Yavapai cos.; (750–)1250–2900 m

([2400–]4100–9500 ft); May–Sep; AK and all of Can; most of the U.S. except for the se coastal states; into Mex. Widespread in AZ; found on the Kaibab Plateau, the San Francisco Peaks area, along the Mogollon Rim to the White Mountains, in montane and canyon locations on the Navajo Reservation, and in scattered mountain ranges in se AZ. SECTION: *Paludosae*; Group/Key B.

Carex pellita is distinct in AZ in its combination of widely separated, densely packed spikes and hairy perigynia, combined with its rhizomatous colonial habit. *Carex senta* shares the reddish bases with ladder-fibrillose sheaths, but its rhizomes are shorter, making denser clumps, and its perigynia are glabrous, with two stigmas, versus the three stigmas of *C. pellita*. *Carex pellita* seems to hybridize with *C. utriculata* at Little Park Lake on the Kaibab Plateau.

Carex petasata Dewey (referring to a hat, but no record in the original description as to why). Liddon sedge. —Plants cespitose, forming small clumps from short rhizomes. CULMS 25–85 cm tall, longer than the leaves, smooth or conspicuously striate. LEAVES 0.8–3.0[–5.0] mm wide, green. INFLORESCENCE 1.7–4.3[–6.0] cm long, 3–15 mm wide, open and erect, composed of (2–)3–6[–7] distinct sessile gynecandrous spikes; spikes 8–20[–27] mm long, 3–6[–9] mm wide, fusiform to oblanceolate due to more basal staminate flowers than is typical in Ovales; proximal internode 5–10(–14) mm; second internode often similar; proximal bract lacking, scale-like, or bristle-like, shorter than the inflorescence. PISTILLATE SCALES as long and wide as the perigynia, to much shorter and narrower, ovate or lanceolate, pale green to brownish golden green with a pale or green center, usually with a strong midvein, and broad, hyaline margins, the margins 0.2–0.8 mm wide; apex acute to acuminate. PERIGYNIA (4–)6.0–8.4 mm long, 1.7–2.4 mm wide, appressed to ascending, light green to brown, usually many-nerved on both sides, plano-convex to flat except where distended by the achene, wing-margined to the tapered base, serrulate distally, long-tapering to the flat beak; beak tip green, obliquely cleft, white-hyaline and smooth for 0.3 to 1.0 mm, distance from beak tip to the top of the achene (1.8–)3.2–4.6 mm. ANTHERS 3 mm long. STIGMAS 2. ACHENES 2.2–3.3 mm long, (1.1–)1.3–1.8 mm wide, lenticular. —Dry to wet meadows, grasslands, and open clearings in forests; Apache and Coconino cos.; 2200–2750 m (7200–9000 ft); Jul–Sep; AK, Yukon, and NW Territories, Can.; throughout the w U.S. to CA, n AZ and NM. In AZ, on the Kaibab Plateau, the San Francisco Peaks, and in the White and Chuska Mountains. SECTION: *Ovales*; Group/Key H.

In AZ, *Carex petasata* can be confused with *C. wootonii*, which shares the same inflorescence shape and distinct spikes. The key difference is the veined perigynia of *Carex petasata*, while *C. wootonii* perigynia are nerveless or only finely nerved (sometimes immature or infertile perigynia wrinkle on drying, and appear more veined than they are). *Carex petasata* also has longer scales covering more of the perigynia. The spikes of *Carex petasata* have more staminate flowers at the base than *C. wootonii* spikes, which makes *C. petasata* inflorescences more slender. *Carex wootonii* heads are usually brighter forest green, while *C. petasata* heads are paler. Specimens from the Chuskas have smaller, more golden-green perigynia, and may represent another taxon. They were originally identified as *Carex tahoensis* Smiley by S. Goodrich, but

the habitat, elevation, and habit are not normal for that species. We have also seen this form in se UT.

Carex praegracilis W. Boott (very slender). Blackcreeper sedge, Clustered field sedge. —Plants rhizomatous with coarse, knotty, dark brown or black rhizomes; rhizomes 1.4–3.6 mm thick, typically with long, unbranched segments from which shoots arise singly, or a few together in small clumps every few nodes; nodes up to 2(–4) cm long; plants sometimes forming dense colonies. CULMS 5–65[–100] cm tall, usually exceeding the leaves, sharply triangular, scabrous, less commonly smooth-angled above, brown to black at the base. LEAVES 1–3.5 mm wide, flat, becoming triangular in cross section toward the tip; basal sheaths brown to nearly black, resembling those of the rhizome, the old sheaths persistent, hyaline sheath fronts only rarely with red spots. INFLORESCENCE 1.0–3.0(–5.0) cm long, 5–10(–15) mm wide, moderately elongate, composed of 1–5 multiple-spiked lower branches, and several to many upper spikes sessile on the main rachis in 67% of AZ specimens; or strictly racemose in 33% of AZ specimens, composed of 4–12[–25] sessile, aggregated, androgynous or unisexual (or with just a few opposite gender flowers in a head) spikes, the lower spikes sometimes separate; spikes 4–8(–13) mm long, 3–6 mm wide; staminate flowers in androgynous heads inconspicuous; staminate spikes lanceoloid; pistillate spikes ovoid; lowest inflorescence bract typically 5–15(–30) mm long, lanceolate, with a broad hyaline margin at the base, each bract progressively smaller and less awned upwards in the head, each often encircling the culm with a dark ring at the base, mostly shorter than the inflorescence. STAMINATE SCALES ovate to narrowly lanceolate, acute, or rarely obtuse, colored like the pistillate scales. PISTILLATE SCALES about the same size as the perigynia, sometimes wrapping around the perigynia at the base, ovate, bronze with a green midvein and broad hyaline margins, turning pale in age; apex acute to awned with awns up to 1 mm long. PERIGYNIA 2.0–3.8[–4.0] mm long, 1.0–1.8 mm wide, appressed-ascending, 4–20 per spike, green or pale, turning brown to nearly black at maturity, essentially veinless ventrally, with up to 7 light dorsal nerves, usually with a stipe up to 0.6 mm long, ovate to lanceolate, plano-convex to concavo-convex, usually rounded basally, but sometimes truncate, rarely slightly spongy-based especially toward the edges at the base, usually acuminate, with a definite shoulder forming the beak, but sometimes acute, these variations seen within the same inflorescence, often sharp-margined distally, shiny to dull; apex ± hyaline, tapering into a serrulate, or rarely entire, slightly winged beak; beak 0.7–1.3 mm long, half or more than half the length of the body, entire or obscurely bidentate, or bidentate to 0.2(–0.4) mm on the dorsal side with the ventral side rarely that deeply cut, orifice sometimes with overlapping hyaline edges. ANTHERS 1.4–3.2[–3.9] mm long; apiculus mostly 0.1–0.3(–0.6) mm long, bristly. STIGMAS 2. ACHENES [1.2–]1.5–1.8[2.0–] mm long, [0.75–]1.2[–1.4] mm wide, lenticular, obovoid, tan to dark brown, polished, finely puncticulate, jointed to a short style. —Wet to seasonally dry meadows, wash and stream banks, lakeshores, springs and seeps, cienegas, forest openings, roadside ditches; tolerant of alkaline areas but not restricted to them, more often in open and sunny sites, especially abundant in heavily grazed open areas; Apache, Cochise, Coconino, Gila, Greenlee, Mohave, Navajo, Pima, Pinal, Santa Cruz, and Yavapai cos.; (650–)900–2900 m ([2100–]3000–9500 ft);

Mar–Sep; w N. Amer. from n Can. to c Mex., adventive in the e U.S. In AZ, one of the most widely distributed wetland sedges, found throughout the state except in the low deserts. SECTION: *Divisae*; Group/Key F.

Carex praegracilis is extremely variable in habit and growth pattern, ranging from seemingly depauperate, widely spaced shoots in alkaline hardpan, to dense lush turf in wet riparian areas. In the n part of the state, it could be confused with *Carex simulata*, another rhizomatous, mostly dioecious species. *Carex simulata* likes wetter zones, usually growing in the water, while *C. praegracilis* favors the slightly drier shoreline, or areas that dry out seasonally. *Carex simulata* has lighter rhizomes and culm bases, and shorter perigynia with beaks 0.5 mm long or less. *Carex praegracilis* has also been confused with *C. occidentalis*, which though usually cespitose, also can have short dark brown rhizomes. *Carex occidentalis* grows in dry forests (though it can also grow on the edge of riparian areas), and is always androgynous, while *Carex praegracilis* needs some moisture for a period during the year, and is often unisexual. *Carex occidentalis* is always racemose, while *Carex praegracilis* is often (as many as the four lower branches) paniculate. The perigynia of both are plano-convex, but those of *Carex occidentalis* are usually flatter, while those of *C. praegracilis* are more consistently thicker, sometimes with some spongy tissue marginally at the base. A last character that can be useful is that *Carex praegracilis* perigynia are often only obscurely bidentate, while *C. occidentalis* perigynia are always obviously bidentate. Also, see discussion under *Carex alma*.

Carex rossii Boott (for Sir John Ross, 1777–1856). Ross' sedge. —Plants cespitose, or less commonly from short to long ascending rhizomes. CULMS 7–25[–40] cm tall, slender, sharply triangular, usually shorter, or rarely longer than the leaves, scabrous distally. LEAVES 0.8–3.2[–4.0] mm wide, pale to bright green, herbaceous; leaf bases usually reddish brown, with old sheaths forming a slightly fibrous base that can become ladder-fibrillose with scabrous fibers. INFLORESCENCE of two types, basal and terminal; basal spikes composed of 0(–1) staminate terminal spikes subtended by 1–2 pistillate spikes on a slender, elongate peduncle; basal spike bracts usually longer than the basal inflorescence; terminal inflorescence 1–3.5 cm long, composed of one staminate terminal spike (rarely with the terminal staminate spike lacking), subtended by 2–4 lateral pistillate spikes; terminal spike 4–13 mm long and 1–4 mm wide, on a peduncle 1.1–10.0 mm long; pistillate spikes 4–11 mm long and 3–6 mm wide, with 3–6[–15] flowers each; proximal pistillate bract of the terminal inflorescence leaf-like, 3.0–7.5 cm long, generally longer (rarely shorter) than the inflorescence; sheath 0.2–1.4 mm long. PISTILLATE SCALES shorter than the perigynia, ovate, pale to dark reddish brown with a green center, narrow to broad hyaline margins; apex obtuse to acute or acuminate to awned with awns up to 1 mm long. PERIGYNIA 3.2–4.5 mm long, 1.1–1.5[–1.7] mm wide, ascending, green to pale brown, with two marginal nerves, sometimes with a few faint nerves on the faces, finely puberulent, obovoid to ellipsoid, suborbicular in cross section, contracted below to a narrow stipe-like base, abruptly contracted above to a straight, rarely slightly bent, ciliate-serrulate, acuminate beak; beak 0.9–1.7 mm long, with teeth 0.2–0.4 mm long, obliquely cleft. ANTHERS [1.2–]1.8–2.0 mm long. STIGMAS 3. ACHENES [1.9–]2.0–2.5 mm long, 1.0–1.3[–1.7] mm wide, globose to obovoid or ellipsoid,

obtusely trigonous in cross section, light green. $2n = 36$. —Dry to moist coniferous forests and deciduous woodlands, adjacent meadows and prairies, to above timberline; Apache, Coconino, Cochise, Gila, Graham, Mohave, Navajo, Pima, and Yavapai cos.; 1480–3660 m (4800–12,000 ft); May–Aug; AK to Quebec, Can.; s through the w U.S. to CA, AZ, and NM. Throughout AZ at higher elevations. SECTION: *Acrocystis*; Group/Key B.

Carex rossii is often confused with *C. geophila*. Typically *Carex geophila* has inflorescence bracts shorter than the inflorescence, while *C. rossii* has bracts longer than the inflorescence; however, this character is not always reliable. More reliably, the bases of *Carex geophila* are pale or brown and extremely fibrous, while the bases of *C. rossii* are reddish brown colored, and not so fibrous. *Carex rossii* prefers moister forest floors with more shade, while *C. geophila* prefers drier, sunnier habitats. In n AZ, at high elevations on the San Francisco Peaks, *Carex rossii* might be mistaken for *C. deflexa*, which was formerly included in *C. rossii*. It is similar, with reddish bases and inflorescence bracts usually longer than the inflorescence, but it is smaller and finer, and more mat-like. *Carex rossii* has perigynia longer than 3.2 mm and beaks greater than 0.8 mm long, while *C. deflexa* has perigynia less than 3.3 mm long and beaks less than 1.0 mm long.

Carex scoparia Schkuhr ex Willd. (broom-like). Pointed broom sedge. —Plants densely cespitose, or rarely shortly rhizomatous. CULMS 20–60[–100] cm tall, longer than the leaves. LEAVES 1.5–4.0 mm wide, green. INFLORESCENCE 1.2–4.0[–6.0] cm long, 5–20 mm wide, dense to elongate and open, erect to angled or arching, composed of 3–6(–13) sessile gynecandrous spikes, each distinct even when clustered, but often spread out along the rachis; spikes 6–12[–16] mm long, 3–5(–7)[–13] mm wide, ellipsoid; proximal internode 1–8[–12] mm, second internode often as long; proximal bract scale-like, with a bristle tip sometimes longer than the inflorescence. PISTILLATE SCALES narrower and shorter than the perigynia, lanceolate to ovate, green to light brown with a pale center and hyaline margins; apex acuminate to obtuse. PERIGYNIA 3.5–5.4[–6.8] mm long, 1.2–2.2 mm wide, length at least 2 times width, ascending, green to golden brown, unnerved or nerved, flat except where distended by the achene, strongly wing-margined and tapering to the base, wing-margined and serrulate above mid-length, tapering gradually to the flat or round beak; beak tip pale to golden brown, cleft up to a depth of 1 mm on dorsal side, uncleft on ventral side, 2.2–3.0[–4.8] mm from tip to top of achene. STIGMAS 2. ACHENES 1.0–1.3[–1.7] mm long, 0.7–0.9 mm wide, lenticular. $2n = 56, 58, 60, 68$. —Wet meadows, streamside, and seasonal ponds, generally growing in saturated soils; Apache, Coconino, and Navajo cos.; 1800–2450 m (5900–8000 ft); Jun–Aug (Oct); British Columbia to Newfoundland, Can.; across the n U.S., s to CA & GA. In AZ along the Mogollon Rim to the White Mountains. SECTION: *Ovales*; Group/Key H.

Carex scoparia heads are fine textured due to the thin, narrow scales and perigynia tips, all relatively flat and ascending. The inflorescences are uniformly green to straw colored, without any darker coloration, which helps separate it from *Carex* sp. nov. B, which has perigynia of similar size and shape, but with darker, broader scales. *Carex scoparia* perigynia wings are prominent and often widest near or just below the

middle, whereas *Carex* sp. nov. B perigynia are usually widest at or above the tip of the achene.

Carex senta Boott (rough). Swamp sedge. —Plants loosely to densely cespitose, with stout rhizomes. CULMS 40–80(–100) cm tall, longer than the leaves, acutely angled, scabrous. LEAVES 1–6[–8] mm wide; basal sheaths red-brown to dark red-brown, often shiny; fronts with red-brown spots; older sheaths becoming prominently ladder-fibrillose; apex U-shaped. INFLORESCENCE (5–) 7–15(–19) cm long, elongate, composed of a terminal staminate spike, with 1–2 additional sessile staminate spikes just below, these occasionally with some pistillate flowers at the base, and 2–4 lateral pistillate spikes; each pistillate spike sessile with a peduncle up to 2(–4) cm long, the upper pistillate spikes often staminate at the apex; proximal pistillate spike 2–8 cm long and 3–5(–9) mm wide with a cuneate base; proximal bract shorter to longer than the spikes, 1–4[–5] mm wide. PISTILLATE SCALES narrower and shorter than to equaling the perigynia, oblong to lanceolate, dark red-brown to blackish with a greenish midvein; apex obtuse to acuminate, awnless. PERIGYNIA 3–3.5 mm long, 1.5–2.0[–2.3] mm wide, ascending, pale green with red-brown spots on apical half, or throughout, sometimes with dark apical portions, weakly to strongly 5–7 nerved on each face, or rarely unnerved, flattened, loosely enclosing achenes, thick-walled, broadly ovate to obovate, somewhat leathery, dull, often scabrous on apical margins, the apex obtuse, papillose; beak pale brown or red-brown, 0.2–0.3 mm long, entire. ACHENES 1.5 mm long, 1 mm wide, lenticular, dull. —Along streams, rivers, and lakes; often forming tussocks on midstream rocks, in and at the edge of streams; Apache, Coconino, Gila, Graham, Maricopa, Mohave, Navajo, Pima and Yavapai cos.; 670–2900 m (2200–8300 ft); March–Jun (Jul); CA and AZ; s to Baja, Mex. Found throughout c AZ from Trout Creek in the w to the White Mountains in the e, with outlying populations to the n in the Grand Canyon, and s to the Santa Teresa, Santa Catalina, and Rincon Mountains; one of our most common large riparian sedges. SECTION: *Phacocystis*; Group/Key E.

Carex senta is differentiated from other species in Section *Phacocystis* by the combination of its robust tussock-like habit and the red-brown leaf sheaths becoming ladder-fibrillose. At the higher end of its elevational range on the Mogollon Rim, in gentler streams, it becomes more rhizomatous, but can still be separated there by the ladder-fibrillose bases. *Carex endlichii*, a local species in the Chiricahua Mountains and s into Mex., shares some of these traits, but is smaller in stature, usually has a gynecandrous terminal spike, and has perigynia that are puffy and become orange-tinged at maturity.

Carex serratodens W. Boott (with serrate teeth on the perigynia). Two-tooth sedge. —Plants densely cespitose, with occasional short rhizomes. CULMS [30–]60–110 cm tall, longer than the leaves, scabrous below the inflorescence. LEAVES 1.0–3.2[–4.0] mm wide, green; lower sheaths ladder-fibrillose, with red-spotted sheath fronts. INFLORESCENCE (3.0)3.5–13 cm long, 1–2 cm wide, elongate (rarely condensed), racemose (rarely paniculate), composed of 3–5(–9) distinct spikes; terminal spike 1.1–2.7[–3.0] cm long, 3.0–4.0[–4.5] mm wide, variable in gender arrangement: staminate (60%), gynecandrous (20%), or androgynous (20%); subtended

by 2–4(–8) lateral pistillate spikes, each 0.6–1.5[–2.0] cm long, 4–6[–8] mm wide, sessile or on peduncles up to 6(–10) mm long, short oblong to elongate, often shorter than the terminal spike; proximal internode [0.5–]1.5–4.5(–25) mm; proximal bract shorter than or much longer than the inflorescence. PISTILLATE SCALES shorter and narrower than the perigynia, lanceolate, light to dark brown with a lighter midvein, and narrow hyaline margins. PERIGYNIA (2.0–)2.4–4.0[–5.0] mm long, 1.0–1.6[–2.0] mm wide, ascending to widely spreading, green to light brown, nerved, often red-spotted, broadly ovate, rounded at the base, tapering to a beak 0.3–0.8[–1.0] mm long; beak bidentate to 0.2–0.4 mm, rarely hispidulous. ANTHERS 1.4+ mm long. STIGMAS 3. ACHENES 1.6 mm long, 1.1 mm wide, trigonous, nearly filling the body of the perigynia. —Springs, seeps, and streams, in sun or partial shade; Gila Co.; 850–1200 m (2800–3900 ft.); May–Jul; s OR to CA; disjunct in c AZ. Rare in AZ, only known from several drainages on the e side of Four Peaks at the s end of the Mazatzal Mountains. SECTION: Racemosae; Group/Key D.

Though *Carex serratodens* is highly variable in many regards, it is still morphologically distinctive, with its relatively short, bristly lateral spikes and longer terminal spike with varying gender arrangement. In AZ, it grows with *Carex thurberi*, which also has 3 stigmas. However, *Carex thurberi* has coarser culms, wider leaves, a more rhizomatous habit, longer pistillate spikes, one to several terminal staminate spikes, and is never gynecandrous. We considered that *C. serratodens* may have been introduced to AZ during large scale range conversion projects in central AZ in the mid 1900s. However, Charles Pase, who made the first collections of *Carex serratodens* in AZ on the e side of the s Mazatzal Mts., believes he made those collections prior to the instigation of the range conversion projects, which supports the concept that *C. serratodens* is native to AZ, though disjunct.

Carex siccata Dewey (dried appearing). Dryspike sedge. —Plants rhizomatous with culms arising singly from long, light to medium brown rhizomes; rhizomes 0.6–1.6 mm thick, scaly with a pithy cortex that can be peeled off. CULMS 15–55[–100] cm tall, slender, as long as or longer than the leaves, smooth to scabrous-angled above. LEAVES 1–3.5[–4] mm wide, flat or nearly so, stiff; bases pale to brown; sheath fronts hyaline, truncate or concave at the mouth; ligules 0.6–1.6[–2.5] mm long. INFLORESCENCE 1–3.5[–5] cm long, 0.3–0.9 cm wide, moderately elongate to narrowly head-like, aggregated into a usually more or less cylindric or clavate-cylindric head, composed of [3–]4–9[–12] sessile, ascending to appressed spikes, upper spikes often indistinguishable from each other, lower spikes readily distinguishable, sometimes a little removed from the main cluster; terminal spike androgynous or appearing wholly pistillate, often subtended by one or more very short staminate spikes and thus seemingly but falsely gynecandrous; middle spikes androgynous or more frequently wholly staminate; lower spikes staminate, pistillate, or androgynous; individual spikes 5–10 mm long, 1–8 mm wide; proximal inflorescence bract prolonged to inconspicuous, setaceous, shorter than the inflorescence. PISTILLATE SCALES shorter to as long as the perigynia, narrower or as wide as the perigynia, ovate, largely brownish to reddish brown with a pale or green center and hyaline margins; apex acute to acuminate. PERIGYNIA [3–]3.6–6.0[–6.5] mm long, 1.2–2.0[–2.4] mm wide, ascending to appressed, rarely the top perigynia spreading, green to brown or black,

with green margins that disappear at maturity, thin-margined, wingless to narrowly winged, coarsely nerved (about 10) on the dorsal surface, evidently to obscurely few-nerved ventrally, elliptic to ovate, plano-convex, serrulate to near or below the widest portion, abruptly tapered toward the stipitate base; beak 1.2–2.5[–2.7] mm long, well over half as long as the body, prominent, flat, serrulate-margined, obliquely cleft, bidentate, with teeth 0.2–1.0 mm long. ANTHERS 2.3–3.4 mm long, entire or with a short bristly apiculus. STIGMAS 2. ACHENES [1.7–]2.0[–2.2] mm long, 1.2 mm wide, lenticular, quadrate-orbicular, tan to brown at maturity, filling the perigynium. $2n = 70$. [*Carex foena* Willdenow, misapplied]. —Forest floors, dry prairies, to alpine or subalpine meadows and scree slopes; Apache, Cochise, Coconino, Graham, Greenlee, Navajo, and Pima cos.; 1950–3500 m (6400–11,500 ft); May–Jul; Yukon, all of Can.; WA, through the Rockies to AZ and NM, and in the ne states. In AZ, on the Kaibab Plateau, San Francisco Peaks, the Mogollon Rim to the White Mountains; also in the Chuska, Pinaleño, Santa Catalina, and Chiricahua Mountains. SECTION: *Ammoglochin*; Group/Key F.

Carex siccata is one of the most common woodland sedges in montane AZ, but has often been mistaken for other taxa. The arrangement of staminate and pistillate flowers/spikes in the inflorescence is unique in AZ *Carex*, most notably the tightly overlapping middle spikes often being entirely staminate, with only the upper, or sometimes both upper and lowest spikes being androgynous with a few perigynia each. This often gives the inflorescence a “narrow-waisted” look, which has led some authors to say that the plant appears “falsely gynecandrous,” since the middle spikes look like they are part of the upper spike, and the few staminate flowers on the top of the top spike are early deciduous. This inflorescence architecture is readily discernable at early stages, before mature perigynia are formed, by noting where anthers and stigmas are showing. Infrequently in AZ, *Carex siccata* will demonstrate all androgynous spikes, but can still usually be determined by rhizome characters coupled with habitat, along with perigynia shape. At early stages, the whole inflorescence can appear linear and compact, and may even be mistaken for a single-spiked species until one looks closely. *Carex duriuscula* is a shorter species, with finer rhizomes and smaller perigynia, and does not share the same arrangement of flowers with its multiple overlapping spikes forming a more oval-shaped head. The rhizomes of *Carex siccata* are uniformly light brown to tan, unlike the dark rhizomes of *Carex praegracilis*. *Carex simulata*, which shares the light colored rhizomes, is always found in water, while *C. siccata* never is.

Carex simulata Mack. (resembling *C. gayana* E. Desv.). Shortbeak sedge, Analogue sedge. —Plants commonly forming large dense clonal stands, rhizomatous with thick, long (up to 7 cm between nodes) rhizomes, the rhizomes 1.2–3.0 mm thick, light to medium brown, sometimes with long, unbranched segments from which shoots arise singly every few nodes. CULMS 12–60[–100] cm long, usually longer, rarely shorter than the leaves, sharply trigonous, nearly smooth to scabrous-angled distally. LEAVES 1–3[–6] mm wide, flat, or nearly so; basal sheaths brown, often with red-spotted hyaline fronts; apex truncate or concave at the mouth. INFLORESCENCE condensed into a linear head, racemose (sometimes paniculate with the lowest branch carrying several spikes), unisexual (rarely androgynous); spikes distinguishable (to indistinguishable) to the naked eye; staminate heads 20–30 mm long, 4–12 mm wide,

with 5–8 [more] lanceoloid spikes; staminate spikes 4–9 mm long, 1–3 mm wide; staminate inflorescence bracts similar to the pistillate inflorescence bracts, but generally with shorter awns; pistillate heads 13–28 mm long, 6–13 mm wide, with 7–12[–18] ovoid spikes; pistillate spikes 4–8 mm long, 3–4 mm wide; lowest pistillate inflorescence bract broad-based, 0.2–4.0 cm long, usually shorter than the inflorescence. PISTILLATE SCALES wider and much longer than the subtended perigynia, sometimes wrapping around the perigynia completely concealing them, ovate/triangular, coppery to reddish brown to dark brown, rarely black, with broad hyaline margins, with a firmer pale, or rarely green midvein; apex acute to acuminate-awned. PERIGYNIA 1.7–2.4[–2.8] mm long, [1.1–]1.3–1.5[–1.7] mm wide, ascending, broadly to elliptic ovate or rhombic-orbicular, thickly (0.6–0.7 mm) plano-convex, rarely unequally bi-convex, glossy, chestnut to dark reddish brown, with 2–6 nerves on the dorsal surface (often just 2 nerves near the medial portion or rarely nerveless), ventrally nerveless (or rarely with short nerves at the base only), with stipe to 0.2 mm long, base spongy, especially laterally, abruptly contracted above to the short beak; beak 0.3–0.5[–0.6] mm long, inconspicuously winged and serrulate near the confluence with the body, very short and obliquely cleft, obscurely bidentate the margins of the orifice with a hyaline flap. ANTHERS 2.2–2.8 mm long, apiculus 0.1 mm long, papillate (30X). STIGMAS 2. ACHENE 1.2–1.5[2.3] mm long, 0.7–1.0 wide, lenticular, rhombic-elliptic to obovate, yellow-brown. —Wet meadows, marshes, lakeshores, and slow-moving streams; Apache and Coconino cos.; 1930–2900 m (6300–9500 ft); Jun–Aug; Alberta and Saskatchewan, Can.; s through the w states to CA, AZ, and NM. Uncommon in AZ, from the Mogollon Rim eastward to the White Mountains. SECTION: *Divisae*; Group/Key F.

Carex simulata is often confused with *C. praegracilis*, another rhizomatous, mostly dioecious species. *Carex simulata* likes wetter zones, usually with its feet in the water, while *C. praegracilis* usually favors the slightly drier shoreline, or areas that dry out seasonally. *Carex praegracilis* has darker rhizomes and culm bases, and longer perigynia with beaks 0.7 mm long or longer.

Carex specuicola J. T. Howell (cave-loving, referring to its alcove habitat). Navajo sedge. —Plants loosely caespitose to colonial, with rhizomes 0.7–1.9 mm thick. CULMS 15–50 cm tall, shorter or longer than the leaves, glabrous to glandular, smooth to less frequently slightly scabrous below the inflorescence, and often arching. LEAVES 0.6–3.0[–4.2] mm wide, glabrous or glandular dorsally, green; basal sheaths dark reddish brown, green or brown, distally triangular in cross section. INFLORESCENCE 1.5–8.0 cm long, 0.2–1.0 cm wide, elongate, composed of 2–5 cylindrical to elliptic spikes; terminal spike 8–19 mm long, 3–5 mm wide, gynecandrous, or rarely entirely staminate or entirely pistillate; lateral spikes 3–15[–24] mm long, 2–5 mm wide, entirely pistillate, with the lower spikes increasingly separated and on progressively longer peduncles up to 8 cm long; proximal bract awn-like, shorter than the inflorescence, with a sheath 0–2 mm long, scabrous-margined. PISTILLATE SCALES shorter, rarely slightly longer than and narrower than perigynia, allowing the perigynia edges to be easily visible, ovate to broadly elliptic, blunt to acute to acuminate, rarely short-awned, brown with a lighter tan or bright green midvein, usually with hyaline margins. PERIGYNIA 1.6–2.9[–3.5] mm long, 1.4–2.0 mm wide,

ascending, flat, with a light green margin and white translucent center, sometimes with black mottling, smooth or papillate with papillae to as tall as wide, obovate to almost orbicular, contracted above to a well-defined beak; beak [0.3]0.4 mm long, entire. ANTHERS 1.3–2.4 mm long. STIGMAS 2 (3). ACHENES 0.9–1.5[–2] mm long, 0.7–1.2 mm wide, lenticular (trigonous in flowers with three stigmas), light tan, not filling perigynia, smooth to minutely papillate, rarely bristled. —Hanging gardens and springs; Apache, Coconino, and Navajo cos.; 1490–2300 m (4900–7600 ft.); Jun–Sep; in canyons of the s Colorado Plateau, n AZ and se UT. In AZ, mostly found in the n portion of the Navajo Reservation. SECTION: *Racemosae*; Group/Key D, E.

Carex specuicola usually has a gynecandrous terminal spike, with flat, translucent perigynia. These characters separate it from both *Carex hassei* and *C. aurea*, which have thick, inflated perigynia. Individual inflorescences of *Carex aurea* rarely also have gynecandrous terminal spikes which could cause confusion. *Carex utahensis* Reznicek & D. F. Murray, Utah sedge, a related species segregated from *Carex parryana*, can appear similar to *Carex specuicola*, but has a more stiffly upright habit, and is more often found streamside. *Carex utahensis* has mostly 3 stigmas with up to 40% of the flowers with 2 stigmas, whereas *C. specuicola* has mostly 2 stigmas with up to 5% of the flowers having 3 stigmas. *Carex specuicola* has smaller perigynia that are translucent, whereas *Carex utahensis* perigynia are larger and opaque. *Carex specuicola* was listed Threatened by the U.S. Fish and Wildlife Service in 1985, when it was known from only one location. Many more populations are now known.

Carex stevenii (Holm) Kalela (for Christian von Steven, 1781–1863). Steven's sedge. —Plants loosely to densely caespitose, often from short, slender rhizomes. CULMS 10–60[–80] cm tall, slender, longer than the leaves, with triangular, smooth to slightly scabrous angles above. LEAVES 1.5–4.0 mm wide, pale to bright green; basal sheath fronts hyaline. INFLORESCENCE 9–25 mm long, 5–9 mm wide, a condensed head of overlapping but distinct spikes, composed of a terminal gynecandrous spike, subtended by 1–4 (typically 2) lateral pistillate spikes, the lowermost spike sometimes slightly remote; each spike 4–10[–15] mm long, 3–5 mm wide; terminal spike short oblong with a slender base; lateral spikes short oblong to cylindrical, often with pedicels up to 7 mm long; lowest bract shorter than to longer than the inflorescence. PISTILLATE SCALES shorter than the perigynia and as wide, broadly ovate, black to brownish with an inconspicuous midvein and narrow hyaline margins; tip obtuse to acute to slightly acuminate. STAMINATE SCALES similar to the pistillate scales but narrower. PERIGYNIA 2.0–2.5 mm long, 1.0–1.2[–1.5] mm wide, ascending, fully filled by the achene, green becoming light brown, elliptic, nerveless, smooth to papillate, sometimes slightly scabrous at the base of the beak, tapered at the base, abruptly contracted above to a short beak; beak to 0.3 mm long, entire to shallowly bidentate. ANTHERS 1.4 mm long. STIGMAS 3. ACHENES 1.2–1.4[–1.7] long, 0.7–1.0 mm wide, trigonous, obovoid, pale to brown, filling the perigynia. [*Carex norvegica* Retz. subsp. *stevenii* (Holm) D.F.Murray]. —Moist meadows and forests, stream banks, partially shaded areas; Apache Co.; 2800 m (9200 ft.); Jun–Aug; a Rocky Mountain species, from MT, ID, s to n NM and AZ. In AZ, known only from a single location in the White Mountains, in a high cienega nw of Mt. Baldy. SECTION: *Racemosae*. Group/Key D.

Carex stevenii can be distinguished from other species in Section *Racemosae* by its small distinct spikes that form a compact head, the small perigynia which surpass the scales and are completely filled by the achenes. Our single AZ location is 360 km disjunct from the nearest known population in NM.

Carex stipata Muhl. ex Willd. (crowded). Awl-fruit sedge. —Plants densely caespitose forming large tussocks, with short, stout, dark rhizomes. CULMS 20–75(–120) cm tall, stout, erect, triangular, densely clustered, mostly shorter than, but sometimes exceeding the leaves, sharply and broadly winged, spongy, easily crushed, scabrous, brown at the base. LEAVES 2–8(–11) mm wide, soft, flaccid, flat, yellowish green to green, scabrous along the margins and on the midvein beneath; basal leaf sheaths pale to brown, sheaths of previous year sometimes persistent as fibers; sheath front thin, easily ruptured, cross-rugulose, convex at the mouth. INFLORESCENCE 2–6 cm long, 0.8–2.2 cm wide, densely spicate, bristly due to long perigynia beaks, forming an elongate cylindrical head, with 10–15[–25] distinguishable branches, many branches rebranched, proximal branch internode to 10 mm; lower spikes on a branch distinguishable, upper spikes indistinguishable; spikes 1–3(–7) mm long, 2–8 mm wide, androgynous, rarely pistillate, numerous, sessile, few-flowered with 4–10 flowers per spike; lowest inflorescence bract sheathless, setaceous; upper bracts setaceous and less than 2 cm long, often absent or short. PISTILLATE SCALES shorter than or as long as the body of the perigynia, ovate-triangular, acute or cuspidate to short-awned, awns up to 2 mm long, two-toothed at the apex when cuspidate or short-awned, hyaline to yellow brown, with a green midvein. PERIGYNIA 3.6–4.6 mm long, 1.0–1.6(–2) mm wide, spreading, green becoming yellowish brown to ashy brown at maturity, nerves somewhat darker than the body, prominent on both surfaces, 9–15 reddish brown nerves on the dorsal surface, 5–7 on the ventral surface, plano-convex or bi-convex, lance-triangular, broadest near the base, often basally bulbous in maturity, tapering gradually to the tip, or a little more abruptly narrowed above the middle forming a violin shape; base spongy-distended, truncate or chordate, rarely rounded, with stipe up to 0.4 mm long; beaks 2.0–3.5 mm long, tapered with long, thin, ill-defined, serrulate margins, about the length of the body, slightly bidentate; teeth 0.1–0.3 mm long. ANTHERS 1.4–1.5 mm long with a 0.1–0.2 mm long bristly apiculus. STIGMAS 2. ACHENES (1.3–)2(–2.3) mm long, (1.3–)1.5(–1.8) mm wide, lenticular, ovoid to orbicular, substipitate with a stalk up to 0.3 mm long; apiculate, jointed to the style; style swollen at the base, golden to reddish brown at maturity. VARIETIES 2; AZ plants belong to var. *stipata*. —Seasonally saturated or inundated soils in wet meadows, swamps, and along lakeshores and streambanks; Apache, Coconino, Gila, Graham, Navajo, and Yavapai cos.; 1800–2865 m (6000–9400 ft); Jun–Sep; widely scattered throughout N. Amer.; also known from Asia. In AZ, found along the Mogollon Rim to the White Mountains, in the Pinaleño and the Mazatal Mountains. SECTION: *Vulpinae*; Group/Key F.

Carex stipata is easy to identify when mature; its broad culm wings and its robust, dense, and spiky inflorescences with paniculate lower branches are unlike any other sedge in AZ. *Carex vulpinoidea* shares the dense, paniculate character, and the cross-corrugated sheaths, but its inflorescence is finer textured, with multiple setaceous inflorescence bracts, and it has smaller perigynia without swollen pithy tissue at the

base that are broadest above the base. *Carex alma* and *C. chihuahuensis* are also paniculate, and the former can have quite dense inflorescences, though with a softer feel than those of *C. stipata*, while the latter is less robust and usually more interrupted. The perigynia of these three can appear similar in shape, with the swollen bases, the sometimes violin-like “waist,” and prominent nerves. However, the culms of *Carex stipata* are stouter, with winged margins, and a hollow center, while the culms of *C. alma* and *C. chihuahuensis* are arching at maturity, without wings. Also, neither *Carex alma* nor *C. chihuahuensis* has cross-corrugated sheath fronts.

Carex subfusca W. Boott (brownish) Brown sedge. —Plants densely cespitose. CULMS 10–80[–105] cm tall, longer than the leaves. LEAVES 0.8–2.0(–3.8) mm wide, green. INFLORESCENCE 1.1–3.0 cm long, dense to more open, oblong or ovoid, composed of 4–12(–14) sessile gynecandrous spikes, the lowermost spikes usually distinguishable (rarely with several on a separate branch), uppermost spikes usually tightly clustered and indistinguishable; each spike 4–12 mm long, 1.7–7.0 mm wide, broadly ovoid to narrowly elliptic; proximal internode 1–6[–9.5] mm long; proximal bract scale-like, bristle-like, or leaf-like, generally shorter, rarely longer than the inflorescence. PISTILLATE SCALES shorter and narrower than the perigynia to covering the perigynia, ovate, light green to brown with a pale, straw, or green midvein and hyaline margins; apex obtuse to acuminate. PERIGYNIA 0.9–1.2(–1.5)[–1.9] mm wide, ascending to spreading, green to straw-colored or light brown, coarsely to lightly nerved dorsally, lightly to coarsely nerved or nerveless ventrally, plano-convex, narrowly wing-margined with wings 0.3 mm wide, 2.2–3.8[–4.3] mm long, serrulate to the tip; beak acuminate with a green, gold, or brown tip, the distance from the tip to the top of the achene 1.2–1.8[–2.0] mm. ANTHERS 1.7–2.8 mm long. STIGMAS 2. ACHENES 1.0–1.6 mm long, 0.7–1.2 mm wide, lenticular. $2n = 68$. —Moist to wet meadows, streambanks, forest margins; Apache, Cochise, Coconino, Gila, Graham, Mohave, Navajo, Pima, Pinal, and Yavapai cos.; 1100–2900 m (3600–9500 ft); May–Sep; WA and ID; to n Mex. The most widespread and abundant AZ sedge in Section *Ovales*; around the San Francisco Peaks, through the c AZ highlands to the White Mountains, s to the se mountains. SECTION: *Ovales*; Group/Key H.

In AZ, *Carex subfusca* is confused with *C. athrostachya*, due to the occasional elongated proximal bract on one to a few of its inflorescences. However, it never has elongated bracts on the majority of heads as does *Carex athrostachya*. *Carex microptera* is confused with those specimens of *C. subfusca* that have compact heads, but the perigynia of *C. microptera* are more typically flat, except where distended by the achene, compared to plano-convex in *C. subfusca*. The scales of *Carex subfusca* have a lighter brown color mixed with more green, making the whole inflorescence a more even greenish to straw-brown color, while the scales of *C. microptera* are a more uniform darker brown color, which contrasts with the bright green perigynia margins, for a darker and richer, color contrasting inflorescence. *Carex bebbii* is similar in size of spikes and perigynia, but its spikes are more evenly globose and “beaded” looking, each one distinct, with flat-tipped perigynia. Given all this, we still recognize *Carex subfusca* as a highly variable taxon in AZ, with the possibility of at least two segregates being recognized at some point. Some *Ovales* from the Kaibab Plateau seem to be intermediate between *Carex microptera* and *C. subfusca*.

Carex thurberi Dewey ex Torr. (for Dr. George Thurber, 1821–1890). Thurber's sedge. —Plants densely to loosely cespitose from long stout rhizomes distance between the culms along the rhizome of up to more than 7 cm. CULMS 25–140 cm tall, shorter than to about as long as the leaves, sharply triangular, scabrous-angled above. LEAVES 3.5–9.4 mm wide, thin, stiff, and flat to W-shaped, sometimes with revolute margins, with prominent crosswalls on the lower portions, pale to bright green; bases red, the sheath fronts becoming slightly ladder-fibrillose with age; ligule rounded to acute, about as long as wide. INFLORESCENCE [6–]8–16[–25] cm long, elongate, composed of (0–)1–2 terminal staminate spikes, or these sometimes androgynous or with pistillate flowers mixed in with the staminate flowers, and subtended by 2–6 lateral pistillate spikes; terminal spike 1–6 cm long, 2–5 mm wide; lateral spikes 1.0–7.0 cm long, (5–)7–10 mm wide, with the longer spikes flexuous, lower spikes on thin peduncles shorter than the spikes; proximal pistillate bracts 10–30[–40] cm long, leaf-like, longer than the inflorescence. PISTILLATE SCALE body 1.2–2.3[4.4 with awn] mm long, slightly narrower and much shorter than the perigynia, ovate, inconspicuous, green with broad hyaline margins, abruptly narrowed to a scabrous awn, sometimes emarginate; awn usually shorter than the body. PERIGYNIA 3.1–5.2 mm long, 0.9–1.5(–2) mm wide, ascending to spreading, densely packed, yellowish green, with 10–17 prominent nerves, lanceolate to elliptic, with apex tapered to a prominent slender beak; beak 0.9–1.8 mm long, deeply bidentate with straight teeth, the teeth 0.4–0.8 mm long. STIGMAS 3. ACHENES 1.4–1.8 mm long, [0.75–]0.9–1.0 mm wide, oblong-obovoid, trigonous with blunt angles, yellow to pale brown. —Marshes, springs, seeps and streambanks; Cochise, Coconino, Gila, Maricopa, Pima, Pinal, Santa Cruz, and Yavapai cos.; 600–2500 m (1950–8300 ft); Apr–Jul; in the US, found only in AZ; ranging s as far as Dur., Mex. In AZ, found in the e Grand Canyon, in c AZ from the Weaver Mountains, through the Verde Valley below the Mogollon Rim e to the Sierra Anchas, and in the Chiricahua, Huachuca, Rincon, Pajarito, and Santa Rita Mountains. SECTION: *Vesicariae*; Group/Key C.

Carex thurberi can be distinguished from the closely related *C. hystericina* by its smaller perigynia and pistillate scales with awns shorter than the body, rather than longer than the body as in *C. hystericina*.

Carex ultra L. H. Bailey (more than: a stouter plant than *C. laciniata*). Cochise sedge. —Plants densely clumping to loosely cespitose from very stout, dark rhizomes, the distance between the culms along the rhizome up to 10+ cm. CULMS 50–160 cm tall, longer than the leaves, serrulate and sharply triangular above, smooth with rounded edges below. LEAVES 6–15(–18) mm wide, thick, stiff, glaucous, striate nerved and keeled below, antrorsely roughly scabrous on the margins and keel; leaf bases light to dark brown or sometimes reddish, with sheaths fronts strongly and densely red-spotted, becoming strongly ladder-fibrillose with age, concave or truncate at top; ligules rounded and +/- as long as wide. INFLORESCENCE 18–50[–80] cm long, elongate, composed of 0–3[–4] erect terminal staminate spikes, these often gynacandrous or with pistillate flowers mixed in, and 3–6[–10] erect remote pistillate spikes on long peduncles; terminal spike 2.5–12 cm long, 3–6 mm wide; pistillate spikes, 3–13 cm long, 5–8[–12] mm wide, often flexuous, sometimes with staminate portions at the tips;

proximal pistillate bract leaf-like, scabrous-margined, shorter to longer than the inflorescence. PISTILLATE SCALES [0.5–]1.5–4.8 mm long, narrower and shorter to as long as the perigynia, oblong to lanceolate, acuminate to a ciliate awn, rarely entire, light green with brown, rarely hyaline margins. PERIGYNIA 2–5 mm long, 1.4–2.2[–2.5] mm wide, appressed ascending, pale green to pale reddish brown with red-brown spots, nerveless or several nerved, lance-oblong or obovoid, compressed trigonous and mildly inflated above, with apex obtuse, abruptly short beaked; beak 0.3–0.6 mm long, usually dark-tipped, obliquely emarginate, usually entire, or with stiff, randomly oriented hairs on the faces and margins of the shoulders and beak. STIGMAS 3, the styles contorted with age. ACHENES [2.0–]2.2[–2.5] mm long, 0.8[–1.2] mm wide, ellipsoid, trigonous with blunt angles, dark brown. [*Carex spissa* var. *ultra* L. H. Bailey]. — Springs, seeps, and streambanks; Cochise, Gila, Graham, Maricopa, Pima, Pinal, Santa Cruz, and Yavapai cos.; 550–2000 m (1800–6500 ft); Mar–Jul; from c AZ and sw NM; s into Son. and Coah., Mex. In c AZ as far n as the Verde Valley, s to drainages of the se sky islands. SECTION: *Hispidae*; Group/Key C.

Standley (2002b) subsumes *Carex ultra* into *C. spissa* L. H. Bailey, based on the intergradation of characters between var. *spissa* (CA and Baja C.), var. *ultra* (s AZ and NM, n Mex.), and var. *seatoniana* (c Mex.). Correspondence with Reznicek and Gonzalez indicates that current work on this complex shows that the supposed intergradation of characters was based on previously unrecognized additional taxa in Mex. They intend to reinstate the taxonomic distinctions between taxa in this section in an upcoming paper (Reznicek, in prep) describing these new species. We are choosing to recognize the original species due to their geographic separation, the communication with Reznicek and Gonzalez, and the fact that the USFS currently lists *Carex spissa* var. *ultra* as a sensitive species. Gonzalez reports that *Carex ultra* is known from only a few locations s of the border in Mex., and confirms that it should be of conservation concern. *Carex ultra* is the most robust *Carex* in AZ, with the tallest culms, longest inflorescence and spikes. While the inflorescence shares general morphology with species in Sections *Carex*, *Phacocystis*, and *Vesicariae*, the elongate, oblong perigynia coupled with the thick, roughly scabrous, glaucous leaves and large clumping habit distinguish this taxon from all others.

Carex utahensis Reznicek & D. F. Murray (from Utah). Utah sedge. — PLANTS rhizomatous. CULMS 35–65 cm tall, longer than the leaves, glandular and smooth to scabrous-margined below the inflorescence. LEAVES 1.0–4.2 mm wide, glandular dorsally, green; basal sheaths dark reddish brown. INFLORESCENCE 4.2–5.2 cm long by 0.6–1.5 cm wide, composed of 3–6 cylindric or narrowly elliptic spikes, with the lower ones increasingly separated and on progressively longer peduncles; proximal bract scale-like to leaf-like, , shorter than, or rarely longer than the inflorescence, up to 12 cm long, with a sheath 0–2 mm long, scabrous-margined, originating up to as much as 1.7 cm below lowest spike; terminal spike 12–22 mm long by 5.6 mm wide, usually gynecandrous, usually with some female flowers below the mid-spike male flowers; lateral spikes 8–24 mm long by 4–5 mm wide, entirely pistillate, sessile to pedunculate with peduncles up to 15 cm long, the peduncles progressively longer on lower spikes. PISTILLATE SCALES ovate to narrowly elliptic, blunt to acute to acuminate, to slightly awn-tipped, shorter than (to slightly

longer than) and narrower than perigynia, allowing the perigynia edges to be easily visible, brown with a lighter tan or light green midvein, with midvein often papillate and/or bristly at the distal end, with hyaline margins, sometimes cuspidate. PERIGYNIA 2.7– 3.2 mm long by 1.6–1.9 mm wide, ascending, light green to tan, usually with black mottling, especially below the beak, generally opaque, but sometimes translucent, papillate with some papillae as tall or taller than wide, with papillae especially long near the apex, sometime bristly about the orifice, mostly with 3 stigmas, but sometimes up to 40[–75]% with 2 stigmas, with a well-defined and entire beak to 0.3 mm long. ACHENES trigonous, but sometimes up to 40[–75]% biconvex, light tan, 2.0 X 1.1 mm, not filling perigynia, smooth to minutely papillate. — Streamside and hanging gardens of the central and s Colorado Plateau; Apache Co.; 1935 m (6350 ft); May–Jul; UT and AZ. In AZ found only on the e side of the Carrizo Mountains, but to be expected elsewhere. SECTION: *Racemosae*; Group/Key D.

Carex utahensis was originally considered to be part of *Carex parryana*, until Reznicek and Murray recognized it as one of several new segregate taxa, relegating true *C. parryana* to the n Rockies. *Carex utahensis* occurs in c and s Utah, the s part of its range overlapping with the range of *Carex specuicola*, the species to which it is most closely related in AZ. See discussion under *Carex specuicola*.

Carex utriculata Boott (bladdery, referring to the perigynia). Southern beaked sedge. Northwest Territory sedge. —Plants forming large dense stands, colonial from long rhizomes; distance between the culms along the rhizome of up to 15+ cm. CULMS [15–]22–100 cm tall, shorter than the leaves, sharply triangular, slightly scabrous-angled. LEAVES 3–10[–15] mm wide, flat, spongy-thickened when well-developed, strongly crosswalled with a brick-like pattern, pale to bright green, rarely glandular dorsally or scabrous on the ventral face; leaf bases with crosswalls strongly apparent, brown, to sometimes red, usually in smaller, younger culms, the sheath fronts occasionally ladder-fibrillose with age, concave or truncate at top; ligules of lowest fully developed leaf less than as long as wide, rarely up to 3 times longer than wide, typically rounded to emarginate. INFLORESCENCE 10–30[–50] cm long, elongate, composed of (1–)2–5(–6) terminal staminate spikes (rarely one androgynous spike), and (1–)2–3(–4)[–5] erect to ascending lateral pistillate spikes; terminal spike 0.9–9 cm long, 2–5 mm wide; pistillate spikes 0.9–5[–10] cm long, 6–12[–15] mm wide, sessile above, on short peduncles below, widely separated, with the upper pistillate spikes sometimes having some staminate flowers at the apex; proximal pistillate bract [12–]15–55[–75] cm long, leaf-like, longer than the inflorescence. PISTILLATE SCALES 2.6–6.5[–7.6] mm long, narrower and shorter to almost as long as the perigynia, ovate to lanceolate, light to reddish brown with a 1–3–nerved light green to straw-colored midvein and hyaline margins, or purely hyaline; apex acute to acuminate [rarely short-awned]. PERIGYNIA 3.0–5.8[–8.6] mm long, 1.2–3.0[–3.5] mm wide, ascending to spreading and densely packed, green to straw-colored, 6–10[–15] veined, ovate to elliptic, rarely subglobose, inflated, apex contracted to beak; beak 1.0–1.8[–2.7] mm long, bidentate with straight to curved teeth, the teeth 0.2–0.5[–1.3] mm long. ANTHERS 2.0–3.4 mm long. STIGMAS 3. ACHENES 1.1–2.0 mm long, 0.9–1.3 mm wide, obovoid, trigonous with blunt angles, yellowish brown to brown. [*Carex rostrata* Stokes, misapplied]. —Wet meadows, marshes, pond and lake margins, and along

stream banks, often in shallow water; Apache, Coconino, Gila, and Graham cos.; (1200–)2000–2900 m, ([4000–]6690–9500 ft); Jun–Aug; AK to Greenland, s through all of Can; and the w U.S. to CA, AZ, and NM and in the Northeast; Baja C. and Mex. (rare). In AZ found on the Kaibab Plateau and along the Mogollon Rim to the White Mountains, with outlying populations in the Chuska and Pinaleño Mountains. SECTION: *Vesicariae*; Group/Key C.

Carex utriculata can be separated from the closely related *C. vesicaria* using a gestalt of overlapping characteristics. Basal parts are more diagnostic than inflorescence characters. *Carex utriculata* is strongly rhizomatous, mostly found in the wetter portions of wetlands, while *C. vesicaria* tends to be cespitose and grows in slightly drier sites, though it can have stout rhizomes and can form stands that appear rhizomatous when the old culms have died off leaving widely scattered shoots visible. *Carex utriculata* has larger, pale to brown spongy bases, with very prominent crosswalls in the lower portion of the leaves, while *C. vesicaria* has smaller, often more reddish, firm bases, with few crosswalls in the lower portion of the leaves. Young specimens of *Carex utriculata* can be difficult to tell from *C. vesicaria*, when the bases are narrow and reddish, and the leaf crosswalls not as evident. Lacking these characters, perhaps the best character is the ligule of the lowest mature leaf blade, which in *Carex utriculata* are shorter and rounded on top, while in *C. vesicaria* it is long and V-shaped. *Carex utriculata* sometimes has more (by 1 each on average) staminate and pistillate spikes than *C. vesicaria*, and the perigynia are smaller and more tightly packed and spreading, while those of *C. vesicaria* are larger, with fewer rows and tend to be more ascending. *Carex utriculata* perigynia have shorter teeth. Plants that appear as *Carex utriculata* at Little Park Lake on the Kaibab Plateau, but with hairy perigynia are likely hybrids with *C. pellita*.

Carex vallicola Dewey (dwelling in a valley). Valley sedge. —Plants cespitose, or rarely short rhizomatous, with less than 5 mm between culms, brown. CULMS 12–45[–60] cm tall, longer than the leaves, scabrous below the head, light brown at the base. LEAVES (0.5–)1–3 mm wide, flat or canaliculate, clustered at the base; sheaths light, green, fronts hyaline, thin, truncate or slightly concave at the mouth. INFLORESCENCE [0.5–]1–3.2 cm long, 4–9 mm wide, short to moderately elongate, composed of 5–8[–10] sessile androgynous spikes, the spikes loosely aggregated into an irregular, narrowly cylindrical head; spikes [2–]5–8 mm long, 2–6 mm wide, with staminate flowers often inconspicuous; lowest inflorescence bract short, inconspicuous, and sheathless, or sometimes filiform-elongate to 4 cm long, but usually shorter than the inflorescence. PISTILLATE SCALES 2–5.8 mm long, much shorter, to slightly shorter than the perigynia, ovate, broadly triangular, mostly hyaline with a green (fading to tan) 1–3 veined center, rarely brown marginal to the center; apex acute to short-awned. PERIGYNIA (2.5–)3.1–4.3 mm long, 1.6–2.0[–2.5] mm wide, loose and spreading or spreading-ascending, 2–12 per spike, individual perigynia visually evident in the spike, pale to rich green, 7–17 nerved proximally on the dorsal side, otherwise nerveless or obscurely nerved, nerveless ventrally, plano-convex, lanceolate to ovate, pronounced dorsal bulging of the mature perigynia results in stretching of the perigynium walls displacing the thickened margins so that they are pushed to the ventral surface, tapered or rounded below to a short and thick stipe, smooth-margined above

or with a minute single row of serrulations, glossy at maturity, abruptly contracted to beak; beak 0.5–1 mm long, obliquely cleft, very slightly or not at all bidentate; apical teeth 0.1–0.3 mm long, the dorsal side sometimes split to a depth of 0.8 mm. ANTHERS 1.2–2.4 mm long, sometimes papillate near the tip, apiculus, when present, very short. STIGMAS 2. ACHENES 1.6–2.7 long, (1.4–) 1.5–2 (–2.1) mm wide, orbicular, lenticular, ovate to circular, straw colored or pale, filling the perigynium, substipitate, jointed to the style. [*Carex rusbyi* Mackenzie; *C. vallicola* var. *rusbyi* (Mackenzie) F. J. Hermann]. —Dry to mesic hillsides, grasslands, thickets, open forests; Apache, Coconino, Gila, Mohave, Navajo, and Yavapai cos.; 1400–2550 m (4700–8400 ft.); Apr–Aug; British Columbia, Can.; to MT and SD, s through the w states to CA, AZ, NM. In AZ, widespread in n AZ as far s as the Pinal Mountains. SECTION: *Phaestoglochin*; Group/Key F.

Carex vallicola is confused with its close relative, the more common *C. occidentalis*. Upper perigynia margins of *Carex vallicola* are smooth or with only a single row of minute serrulations, while the upper margins of *C. occidentalis* perigynia have serrations that are more pronounced and usually in two rows. *Carex vallicola* has fewer-flowered spikes, with very exposed perigynia and strongly inflated so that at least one marginal nerve is pushed to the ventral side, and a more random orientation to the perigynia within the spikes. *Carex vallicola* has beaks that are minutely to obliquely bidentate or entire, while *C. occidentalis* has beaks that are distinctly bidentate. See discussion under *Carex occidentalis* for other close species.

Carex vesicaria L. (bladder-like, referring to the perigynia). Blister sedge, Inflated sedge. —Plants usually forming large clumps, but sometimes appearing colonial, cespitose from short, stout rhizomes with distance between the culms along the rhizome up to 1–2(–3) cm. CULMS [15–]30–95[–105] cm tall, shorter than the leaves, triangular and scabrous-angled distally. LEAVES 1.5–6.0[–6.5] mm wide, V- or W-shaped, weakly crosswalled, drab to dark green; leaf bases red to purplish brown, not very spongy-thickened, the sheath fronts ladder-fibrillose with age, often red-spotted; ligules of lowest fully developed leaf usually at least twice as long as wide, rarely only as wide as long, V-shaped. INFLORESCENCE [7.5–]10–22[–45] cm long, elongate, composed of 1–3(–5) terminal staminate spikes, rarely the lower one or two with a few pistillate flowers at the summit, and (1–)2–3 erect to ascending, widely separated lateral pistillate spikes; terminal spike 1.2–6.5[–7] cm long, 2.5–4 mm wide; pistillate spikes 1.4–5(–9) cm long, 5–12[–15] mm wide, sessile above and on short peduncles below, rarely having some staminate flowers at the apex; proximal pistillate bract 10–35[–50] cm long, leaf-like, longer than the inflorescence. PISTILLATE SCALES 2.0–6.5 mm long, narrower and shorter to almost as long as the perigynia, narrowly ovate to lanceolate, purely hyaline or reddish to yellowish brown with a lighter midvein; apex acute to acuminate, awnless. PERIGYNIA [3.6–]3.8–7.5[–8.2] mm long, (1.5–)2.2–3.4[–4.5] mm wide, appressed to ascending, tightly packed, yellowish green to straw-colored or reddish brown, mostly strongly 7–12[–20] nerved, lanceolate to ovoid-lanceolate, inflated, gradually or abruptly tapered to the beak; beak 1.1–2.0[–2.6] mm long, bidentate with straight or curved teeth, the teeth 0.3–1.2[–1.5] mm long. ANTHERS 2.1–3.8 mm long. STIGMAS 3. ACHENES 1.7–3.0 mm long, 1.1–1.8 mm wide, obovoid, trigonous with blunt angles, yellowish brown to brown. —

Wet meadows, marshes, pond and lake margins, and along streambanks, sometimes in shallow water but usually in places that dry out later in the season; Apache, Coconino, Gila, Navajo cos.; (1750–)2300–2900 m ([5800–]7500–9500 ft); Jun–Aug; British Columbia, Can.; to CA and AZ in the West, Manitoba to Newfoundland, Can., and s to MO and NC in the East, absent from the Midwest and Southeast. In AZ on the Kaibab Plateau and along the Mogollon Rim to the White Mountains. SECTION: *Vesicariae*; Group/Key C.

Carex vesicaria is often difficult to tell from *Carex utriculata* without good habitat and habit data. Basal parts are more critical to reliable determinations than inflorescence characters. Without basal parts, ligule shapes may be the best indicator. *Carex vesicaria* is predominantly cespitose, and occurs in slightly drier sites than *C. utriculata*. However, some populations appear more rhizomatous, where old shoots have died, leaving the remaining green ones further apart. See discussion under *Carex utriculata*.

Carex vulpinoidea Michx. (resembling *Carex vulpina*). Fox sedge. —Plants cespitose from short to long stout rhizomes. CULMS (20–)30–100 cm tall, usually shorter than or almost as long as the leaves, stiff, firm, not easily crushed, sharply triangular, scabrous on the angles above, unwinged, dark brown at the base. LEAVES [2–]3.5[–6] mm wide, flat to slightly canaliculate, rough along the margins; sheath fronts membranous, cross-rugose, or sometimes smooth with no dots or sparsely spotted red-brown or pale brown. INFLORESCENCE (1.6–)3–5[–15] cm long, [4–]7–13[–20] mm wide, a spicate, linear to lance-cylindric head, composed of 10–15, sessile, densely aggregated paniculate branches; proximal branch internode to 20(–25) mm; spikes 3–9 mm long, 2–6 mm wide, numerous, small, sessile, few-flowered, androgynous; lowest inflorescence bract sheathless, setaceous-prolonged up to 14 cm long, shorter to longer than the inflorescence, the upper bracts reduced, shorter than the inflorescence, but evident and appearing hair-like throughout most of the head. PISTILLATE SCALES typically shorter than, rarely equaling and narrower than the perigynia, slender, lanceolate, rarely ovate, hyaline to greenish brown, rarely brown and with a green midvein, terminating in a 1–3(–5) mm long, rough, rarely glabrous awn. PERIGYNIA [1.7–]2.2–2.8[–3.5] mm long, [1.0–]1.3[–1.8] mm wide, widely spreading at maturity, with body plano-convex (or flattened), ovoid-lanceoloid to ovoid, ovate or elliptic, nerveless or faintly [2–]3–5 nerved dorsally, dull, green, yellowish green to straw colored, or pale brown, rarely grayish, corky-margined to the rounded base, more or less abruptly contracted above with thin-edged or narrowly winged serrulate upper margins, to a conspicuous, flattened, shortly bidentate beak; beak 0.8–1.2[–1.8] mm long, with teeth 0.2–0.4 mm long and subulate. ANTHERS 1.4–1.5 mm long, with an entire or bristle-tipped apiculus to 0.2 mm long. STIGMAS 2. ACHENES 1.2–1.4(–1.6) mm long, (0.8–)1 mm wide, lenticular, orbicular-ovate, tapering at the base, ovoid, apiculate, jointed to the style; style swollen at the base, red-brown, glossy. $2n = 52$. —In swampy habitats, along streamsides, and lakeshores; Coconino, Navajo, and Yavapai cos.; 1100–2300 m (3550–7400 ft); May–Aug; throughout N.Amer; n Mex.; introduced to Europe and New Zealand. In AZ, infrequent and local along the Mogollon Rim and in upper Verde River drainages below the Mogollon Rim. SECTION: *Multiflorae*; Group/Key F.

Carex vulpinoidea is unique in the closely related Sections *Multiflorae* & *Vulpinae*, in that its long cylindrical, paniculate inflorescences usually have many hair-like long bracts extending from the bases of the tightly packed spikes and branches. Its perigynia are also shorter and flatter than those of the rest of the taxa in these sections.

Carex wootonii Mack. (for Elmer Otis Wooton, 1865–1945). Wooton's sedge. —Plants densely caespitose, forming small clumps from short rhizomes. CULMS (15–)30–75(–100) cm tall, longer than the leaves, smooth. LEAVES 1–4[–4.5] mm wide, green. INFLORESCENCE (1–)2.5–4.0 cm long, 9–18[–20] mm wide, open or dense, composed of 3–7[–8] sessile gynecandrous spikes, the spikes all distinguishable, lowest usually separated by long internodes; spikes 11–21 mm long, 4–7[–9] mm wide, fusiform, broadly ovoid, or obovoid; proximal internode 4.0–17.0 mm long, second internode 2.0–7.5 mm long; proximal bract leaf-like or bristle-like, usually shorter than, but sometimes longer than the inflorescence (particularly with specimens from the Pinaleño Mountains). PISTILLATE SCALES shorter and narrower than the perigynia, broadly ovate or lanceolate, reddish or golden brown with a pale or green midvein and hyaline margins 0–0.4 mm wide; apex acute to acuminate. PERIGYNIA (5.2–)5.5–6.2(–7.2)[–7.5] mm long, 2.0–2.8(–3.0) mm wide, appressed to ascending, forest green when fresh, unnerved on both sides, or rarely slightly nerved dorsally, flat except over the achenes or moderately plano-convex, broadly wing-margined to the rounded base, serrulate distally, tapering to the flat beak; beak tip red-brown, brown, or gold, 2.0–3.6 mm from tip to top of achene. STIGMAS 2. ACHENES 1.6–3.0 mm long, 1.4–2.0 mm wide, lenticular. —Open meadows and slopes, clearings in forests, and rocky areas; Apache, Cochise, Coconino, Graham, and Pima cos.; 1950–3500 m (6500–11,500 ft); Jun–Sep; NM, & sw CO; to n Mex. In AZ, locally frequent on the San Francisco Peaks, the White, Chiricahua, and Pinaleño Mountains, and infrequent on the Kaibab Plateau, Mogollon Rim, and Huachuca Mountains, with one collection from Baboquivari Peak. SECTION: *Ovales*; Group/Key H.

Carex wootonii is similar, and most easily confused with *C. petasata*. See discussion under *Carex petasata*.

***Carex* sp. nov.** A. Arizona sedge. —Plants colonial to loosely clustered, the culms arising singly or a few together from long rhizomes; rhizomes 0.7–2.0 mm in diameter, from pale to light brown, rarely tinted with purple-red. CULMS 10–65 cm tall, longer to shorter than the leaves, thin, stiff, erect to arching, bluntly to sharply triangular, sometimes minutely scabrous on the angles. LEAVES 3.0–6.0(–7.5) mm wide, 3–46 cm long, green, flat or M-shaped; leaf bases whitish or pale to brown. INFLORESCENCE of two forms, both basal and terminal; (30–)50–100% of culms on a sheet have a solitary (rarely several) separate basal or near basal pistillate spike; basal spikes (1.3–)1.8–3.3(–4.5) cm long on a slender peduncle (3.5–)6.0–12.0(–16.5) cm long arising from a leaf axil at the base of the culm; terminal inflorescence 2–32 cm long, elongate and terminating the culm, composed of one terminal staminate spike and 2–4(–5) lateral, well-separated, erect to ascending pistillate spikes; terminal spike 15–23(–28) mm long, 2–3 mm wide, occasionally with both staminate and pistillate flowers in the same spike, or rarely wholly pistillate; lateral pistillate spikes 5–33 mm long, 3.5–6.5 mm wide, short peduncled to sessile; inflorescence branches rarely

rebranched, forming a paniculate inflorescence; proximal pistillate bract of the terminal inflorescence leaf-like, 3–5 mm wide, 1.9–16.4 cm long, usually shorter than the inflorescence, but occasionally as long or a little longer, this bract with a sheath 5.5–30 mm long. PISTILLATE SCALES shorter than to as long as the perigynia and clasping the base, ovate, whitish with brown flecking, or brown, with a pale to bright green 3-nerved midvein, with narrow to broad hyaline margins; apex rounded-obtuse to mucronate to scabrous-awned with awns to 2.5(–3.3) mm long. PERIGYNIA 2.2–3.4 mm long, 0.9–1.8 mm wide, ascending, whitish green, minutely nerved on both sides, with stronger, green, marginal keels, suborbicular in cross section and inflated, obovoid, rounded and spongy-thickened below, abruptly contracted to a short beak, papillose near the beak, rarely lacking a beak; beak truncate with orifice entire and bent to one side. ANTHERS 2.0–2.5 mm long. STIGMAS mostly 3, occasionally 2. ACHENES 1.4–1.8(–2.0) mm long, (0.7–)1.0–1.5 mm wide, obovoid, trigonous with definite angles. [*Carex meadii* Dewey, previously misapplied in AZ to this taxon; not known in AZ]. —Wet meadows, seeps, springs, and along streambanks; Cochise, Coconino, Gila, Graham, Navajo, and Yavapai cos.; 1280–2310 m (4200–7540 ft); Apr–Jun (Sep); endemic to AZ. Found in central AZ, from the Weaver Mountains sw of Prescott, through the Verde Valley and along the Mogollon Rim country to the w edge of White Mountain Apache Tribal lands, with outlying populations to the s in the Huachuca and Pinaleño Mountains, and to the n in Nankoweap Creek in the Grand Canyon and at Moenkopi on the Colorado Plateau. SECTION: *Paniceae*; Group/Key C.

Specimens of this taxon have been annotated to *Carex* sp. nov. A. It appears to be most closely related to *Carex klamathensis* B. L. Wilson & L. P. Janeway, a recently described endemic to the Klamath Mountains in n CA & s OR. AZ specimens were previously determined as *Carex aurea*, *C. hassei*, or *C. meadii*. *Carex* sp. nov. A can be distinguished from the former two by its pistillate flowers with mostly three stigmas, and trigonous achenes. Both *Carex aurea* and *C. hassei* occasionally have a few flowers (up to 20 or 30%) with trigonous flowers and achenes, but this character does not predominate in those two species. At a glance, *Carex* sp. nov. A has broader leaves and a more upright habit than either *C. aurea* or *C. hassei*. *Carex meadii* is an e species, and has not been found in AZ. See discussion under *Carex aurea*.

***Carex* sp. nov. B.** —Plants densely cespitose. CULMS 25–75 cm tall, longer or shorter than the leaves. LEAVES 1.4–4.0 mm wide, green. INFLORESCENCE (1.5–)2.0–3.6 cm long, 7–18 mm wide, open to compact, composed of 5–10(–13) sessile gynecandrous spikes, usually with a tighter cluster of spikes at the top and several more distant below, these lower spikes easily distinguishable, rarely paniculate with several spikes on lower branches; each spike 6–10(–12) mm long, (3–)5–7 mm wide, ovoid; proximal internode (2.0–)3.0–7.0(–8.0) mm; proximal bract scale-like, sometimes with a prolonged awn, shorter than the inflorescence. PISTILLATE SCALES shorter and narrower than, to rarely as wide as the perigynia, ovate to ovate-lanceolate, deep brown, with a pale or green midvein, and hyaline margins; apex acute to obtuse. PERIGYNIA (–3.5)4.0–5.6 mm long, 1.1–1.8 mm wide, ascending, green to golden brown when mature, dorsally nerved, or less commonly unnerved, ventrally nerved less commonly unnerved, flat except over the achene, strongly wing-margined

to the round-tapering base, widest at or near the middle, usually at the top of the achene, wing-margined and serrulate distally, acuminate to the flat beak; beak tip light to dark brown, (2.0–)2.5–3.0 mm from tip to top of achene. ANTHEERS 1.8–2.2 mm long. STIGMAS 2. ACHENES (1.0–)1.2–1.4(–1.6) mm long, 0.7–0.8 mm wide, lenticular. —Moist to wet meadows, slopes, and along streams; Apache, Cochise Graham, and Greenlee cos.; 2450–3150 m (8000–10,300 ft); Jun–Aug; known only from se AZ and sw NM. In AZ, in the Pinaleño, Chiricahua, and White Mountains. SECTION: *Ovales*; Group/Key H. See discussion under *Carex microptera*.

EXCLUDED TAXA:

The following 23 taxa were previously either reported from, or misdetermined from Arizona. We currently do not believe these taxa are present in the state:

- Carex abacta* L. H. Bailey —a synonym for *Carex michauxiana*, a ne taxon of Section *Rostrales*. The one ASU specimen listed in SEINet was not found.
- Carex abrupta* Mack. —an *Ovales* found to the w of AZ in CA and NV. Our specimen was a misdetermination of an immature *Ovales*.
- Carex agrostoides* Mack. —Ball & Reznicek (2002) included this in *Carex alma*, but we feel that it should more correctly be considered a synonym of *Carex chihuahuensis*.
- Carex amplexens* Mack. —an *Ovales* taxon which is now subsumed into *Carex fracta*, a West Coast species of CA, OR and WA. AZ specimens which had been determined as *Carex amplexens* are *C. subfusca* with compact heads.
- Carex bonplandii* Kunth —a South American *Ovales* previously thought to range into n Mex. AZ specimens that had been determined as *Carex bonplandii* are *C. subfusca* and *C. "Pinaleño."*
- Carex egglestonii* Mack. —an *Ovales* found to the n in UT and CO. An AZ specimen previously determined as *Carex egglestonii* is *C. wootonii*.
- Carex epapillosa* Mack. —a *Racemosae* taxon found to the n in UT and CO. AZ specimens which had been determined as this are *Carex chalciolepis*.
- Carex foenea* Willd. —an *Ovales* name that was misapplied to *Carex siccata* for awhile.
- Carex fracta* Mack. —a West Coast *Ovales*. One RM specimen cannot be located. Its duplicate at ASU is *Carex subfusca*.
- Carex heteroneura* W. Boott —a *Racemosae* taxon found to the n in UT, NV, and CA. AZ specimens which had been determined as this were all var. *Carex chalciolepis*, now treated at species level.
- Carex hoodii* Boott —a species from Section *Phaestoglochin* found to the n in UT and CO, related to *Carex occidentalis*. An AZ specimen from the Pinaleños, now curated at RM is *C. sp. nov. B*.
- Carex lasiocarpa* Ehrh. —a far n taxon of Section *Paludosae*. AZ plants are all the closely related *Carex pellita*, which was sometimes called *Carex lasiocarpa* Ehrh. var. *latifolia* (Boeckeler) Gilly in the past.
- Carex lenticularis* Michx. —Current taxonomy puts all AZ plants of this taxon in *Carex kelloggii*, with true *C. lenticularis* as a mostly ne US species.

- Carex leptopoda*** Mack. —a close relative of *Carex bolanderi* in Section *Deweyanae*. In the past, AZ specimens of *Carex bolanderi* were mistaken for this species, which current taxonomy relegates to more n regions.
- Carex mariposana*** L. H. Bailey ex Mack. —an uncommon CA and NV *Ovales* species. AZ specimens that had been determined as *Carex mariposana* are mostly robust *C. subfusca*, with a few *C. sp. nov. B*.
- Carex meadii*** Dewey —an e taxon in Section *Paniceae*. This was previously determined for some of the specimens now treated as the AZ endemic, “*Carex sp. nov. A*,” and one collection of *C. crawei*.
- Carex praeceptorum*** Mack. —a n relative of *Carex canescens*. Two RM specimens cannot be located. Two duplicates of one of these specimens are at ASU and ARIZ, and are now determined as *Carex occidentalis*. The other RM specimen has no duplicate, but the location is one of the few sites in AZ where *Carex canescens* is found, so we suspect it to be a misdetermination.
- Carex schiedeana*** Kunze —a Mexican taxon from Section *Schiedeanae* reported from NM, but not acknowledged in Ball & Reznicek (2002). NM specimens that were originally so determined have now been recognized as *Carex muriculata*. Our few specimens that were previously so determined were annotated to something else, and cannot now be traced.
- Carex spissa*** L. H. Bailey —a coastal CA and Baja C., Mex. species, distinct from AZ plants. All AZ plants will be reinstated at the species level as *Carex ultra* (*C. spissa* var. *ultra*) by Gonzalez and Reznicek.
- Carex tahoensis*** Smiley —an *Ovales* taxon found to the n in UT and CO. An AZ specimen from the Chuska Mountains determined as *Carex tahoensis* is a misdetermination of depauperate *C. petasata*.
- Carex turbinata*** Liebm. —a Mexican species that Ball & Reznicek (2002) equated with *Carex leucodonta*. However, Gonzalez & Reznicek (personal communication) maintain these two taxa as separate species, with all AZ plants in *Carex leucodonta*.
- Carex umbellata*** Schkuhr ex Willd. —an *Acrocystis* taxon from the e U.S. and Canada. Early reports of this species from the San Francisco Peaks cannot be verified, and are most likely a misdetermination of *Carex geophila* or *C. rossii*.
- Carex xerantica*** L. H. Bailey —a far n *Ovales* taxon. This was commonly misdetermined for our area in the past, before the true range of this species was established. AZ specimens are either *Carex petasata* or *C. wootonii*.

METHODS

We borrowed specimens from, or visited and reviewed specimens in these herbaria in AZ: University of Arizona (ARIZ), Arizona State University (ASU), Northern Arizona University (ASC), Cochise County Herbarium (CCH), Desert Botanical Garden (DES), Grand Canyon National Park (GCNP), Navajo Nation Herbarium (NAVA), Museum of Northern Arizona (MNA), Yavapai College (YC), US Forest Service Southwestern Region (TEUI), and several other small Forest Service herbaria. In addition, we borrowed specimens from out-of-state herbaria including Rocky Mountain Herbarium (RM) in WY, New York Botanical Garden (NY) in NY,

Pacific Union College Herbarium (PUA) and the University of California Riverside (UCR) in CA, San Juan College (SJNM), Gila Center for Natural History (SNM), and New Mexico State University Herbarium (NMC) in NM, and Intermountain Herbarium (UTC) in UT. We also borrowed specimens from the private collections of Glenn Clifton (Kingman, AZ) and Arnold Clifford (Beclabito, NM). We reviewed over 4000 specimens. We used the following publications and manuscripts to help us review these materials: Ball and Reznicek 2002, Cronquist 1977, Fritts 1995, Hermann 1970, 1974, Hurd et al. 1998, Kearny and Peebles 1960, McDougall 1973, Norris 2012, Wilson et al. 2008, Zika et al. 2012, Goodrich 2013.

We became aware of recent genetic and nomenclatural work on several taxa during our editing phase, and so have adopted the new nomenclature in this treatment. However, this happened after our annotation work, so many specimens still bear annotations or original labels with the old nomenclature.

- *Carex lenticularis* var. *lipocarpa* is now *Carex kelloggii*
- *Carex spissa* var. *ultra* is now *Carex ultra*
- *Carex turbinata* (plants in AZ) is now *Carex leucodonta*

We were able to locate in the field all but one species (*C. conoidea*). We made new collections and photographs of *Carex* species at each site that we visited. Many of these photos are posted on the SEINet website.

ACKNOWLEDGEMENTS

Taxonomic issues were addressed by facilitating review of specimens in problem groups by *Carex* experts at out-of-state institutions. We could not have completed this project without the invaluable assistance of Peter Zika (WTU), Tony Reznicek (MICH), Andrew Hipp (MOR), Robert Naczi (NY), Barbara Wilson, Dick Brainerd, and Nick Otting (Carex Working Group in Oregon), Julian Starr (CAN), Socorro Gonzalez (CIIDIR), Bill Norris (SNM), Eric-Carl Granfelt of Lakeside, AZ and Glenn Clifton of Kingman, AZ. The Navajo Nation, White Mountain Apache Tribe, and Fort Huachuca Military Reservation facilitated permits for research and collecting on their lands. The University of Arizona gave permission for collecting on the Mingus Springs 4H Camp. This work stands on the shoulders of prior specialists in *Carex* of AZ, including J. H. Lehr (1978) and Miriam Colson Fritts (1995). Tony Reznicek contributed the paragraph describing aphylo-/phyllopodic aspects of *Carex*. Katherine Rink-Callingham helped with illustrations. SEINet was an indispensable resource for completing this work, and we thank Chief Programmer Ed Gilbert for his expertise and assistance. We are also grateful to Glenn Clifton, Les Landrum, and Don Pinkava for reviewing the manuscript.

LITERATURE CITED

Baker, Jr., M.B. compiler. 1999. History of watershed research in the Central Arizona Highlands. Gen. Tech. Rep. RMRS-GTR-29. Fort Collins, CO: US Department of Agriculture, Forest Service, Rocky Mountain Research Station

- Ball, P. W. 2002. 26z. *Carex* Linnaeus sect. *Bicolores* (Tuckerman ex L. H. Bailey) Rouy, Fl. France 13:508. 1912, *In*: Ball, P. W. and A. A. Reznicek. 2002. *Carex*, *In*: Flora of North America, Vol. 23, Oxford University Press, Oxford: 424-426.
- Cochrane, T. S. 1981. *Carex hermannii* (*Cyperaceae*), a new species from Mexico, with comments on related species at high altitudes in Middle America, *Brittonia*, 33(2), 225-232.
- Crins, W. J. and J. H. Rettig. 2002. 26bbb. *Carex* Linnaeus sect. *Acrocystis* Dumortier, Fl. Belg., 147. 1827, *In*: Ball, P. W. and A. A. Reznicek. 2002. *Carex*, *In*: Flora of North America, Vol. 23, Oxford University Press, Oxford: 532-545.
- Cronquist, A., A. H. Holmgren, N. H. Holmgren, J. L. Reveal, and P. K. Homgren. 1977. Intermountain Flora, Vascular Plants of the Intermountain West, U.S.A., Vol. 6, New York Botanical Garden, Columbia University Press, New York.
- Dragon, J. A. and D. S. Barrington. 2008. East vs. West: monophyletic clades within the paraphyletic *Carex acuta* complex, Section *Phacocystis* (*Cyperaceae*). Naczi, Robert F. C. and Bruce A. Ford, *Sedges: Uses, Diversity, and Systematics of the Cyperaceae* (Chapter 10. *In*: *Monographs in Systematic Botany from the Missouri Botanical Garden*). Missouri Botanical Garden Press, St. Louis.
- Dragon, J. A. and D. S. Barrington. 2009. Systematics of the *Carex aquatilis* and *Carex lenticularis* lineages: geographically and ecologically divergent sister clades of *Carex* Section *Phacocystis* (*Cyperaceae*), *American Journal of Botany* 96(10): 1896-1906.
- Facciola, S. 1998. *Cornucopia II, A Source Book of Edible Plants*. Kampong Publications, Vista
- Fritts, M. C. 1995. Arizona: *Cyperaceae: Carex*. Unpublished manuscript prepared for the Vascular Plants of Arizona project.
- Goodrich, S. 2003. *Cyperaceae*. *In*: Welsh, S. L., N. D. Atwood, S. Goodrich, and L. C. Higgins (eds.) *A Utah Flora*, Ed. 3. Brigham Young University, Provo: 687-716.
- Goodrich, S. 2013. *Cyperaceae* *In*: Heil, K. D., S. L. O'Kane, Jr., L. M. Reeves and A. Clifford (eds.). *Flora of the Four Corners Region: Vascular Plants of the San Juan River Drainage: Arizona, Colorado, New Mexico, and Utah*. Missouri Botanical Garden Press, St. Louis: 458-491.
- Hermann, F. J. 1951. *Cyperaceae* *In*: Kearney, T. H., R. H. Peebles, and collaborators. 1960. *Arizona Flora*. University of California Press, Berkeley: 145-164.
- Hermann, F. J. 1970. *Manual of the Carices of the Rocky Mountains and Colorado Basin*; U. S. Department of Agriculture, *Agricultural Handbook* No. 374.

- Hermann, F. J. 1974. Manual of the Genus *Carex* in Mexico and Central America. U. S. Department of Agriculture, Agricultural Handbook No. 467:1- 219.
- Hipp, A. L., A. A. Reznicek, P. E. Rothrock and J. A. Weber. 2006. Phylogeny and classification of *Carex* Section *Ovales* (Cyperaceae), International Journal of Plant Science 167(5): 1029-1048, University of Chicago.
- Hurd, E. G., N. L. Shaw, J. Mastrogioseppe, L. C. Smithman, and S. Goodrich. 1998. Field Guide to Intermountain Sedges, Gen. Tech. Rep. RMRS-GTR-10. Ogden, UT: U. S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
- Lehr, J. H. 1978. A Catalogue of the Flora of Arizona. Desert Botanical Garden, Phoenix.
- Mastrogioseppe, J. 2002. 26nnn. *Carex* Linnaeus sect. *Filifoliae* (Tuckerman) Mackenzie in N. L. Britton et al., N. Amer. Fl. 18: 177. 1935. *In* Ball, P. W. and A. A. Reznicek. 2002. *Carex*, *In*: Flora of North America, Vol. 23, Oxford University Press, Oxford: 566-568.
- McDougall, W. B. 1973. *Cyperaceae*, *In*: Seed Plants of Northern Arizona. Northern Arizona Society of Science and Art, Flagstaff, AZ: 73-88.
- Murray, D. F. 1969. Taxonomy of *Carex* Sect. *Atratae* (Cyperaceae) in the southern Rocky Mountains. *Brittonia* 21: 55-76.
- Naczi, R. F. C. and C. T. Bryson. 2002. 26ee. *Carex* Linnaeus sect. *Griseae* (L. H. Bailey) Kükenthal in H. G. A. Engler, *Pflanzenr.* 20[IV, 38]: 516. 1909, *In* Ball, P. W. and A. A. Reznicek. 2002. *Carex*, *In*: Flora of North America, Vol. 23, Oxford University Press, Oxford: 448-461.
- Norris, W. R. 2012. A dichotomous key to the genus *Carex* in New Mexico. Pp. 579-592 *In*: Allred, K.W. and R.D. DeWitt Ivey. 2012. *Flora Neomexicana III: an illustrated identification manual*. Available at www.lulu.com.
- Reznicek, A. A. 1993. Revision of *Carex* Section *Ovales* (Cyperaceae) in Mexico, *Contributions from the University of Michigan Herbarium*, Vol. 19: 97-136.
- Reznicek, A.A. & D. F. Murray. 2013. A re-evaluation of *Carex specuicola* and the *Carex parryana* complex. *Journal of the Botanical Research Institute of Texas* 7: 37-51.
- Reznicek, A. A. and S. Gonzalez. No Date. Tentative working key to *Carex* section *Hispidae* in North America, unpublished ms.

- SEINet. SOUTHWEST ENVIRONMENTAL INFORMATION NETWORK, SEINet. 2009-2015. <http://swbiodiversity.org/seinet/index.php>. Accessed from October 2010 to January 2015.
- Standley, L. A. 2002a. 26c. *Carex* Linnaeus sect. *Multiflorae* (J. Carey) Kukenthal in H. G. A. Engler, *Pflanzenr.* 3[IV, 20]:142. 1909, *In*: Ball, P. W. and A. A. Reznicek. 2002. *Carex*, *In*: *Flora of North America*, Vol. 23, Oxford University Press, Oxford: 281-285.
- Standley, L. A. 2002b. 26y. *Carex* Linnaeus sect. *Hispidae* Mackenzie ex Reznicek, *Novon* 11: 456. 2001, *In*: Ball, P. W. and A. A. Reznicek. 2002. *Carex*, *In*: *Flora of North America*, Vol. 23, Oxford University Press, Oxford: 423.
- Wilson, B. L., R. Brainerd, D. Lytjen, B. Newhouse, and N. Otting. 2014. *Field Guide to the Sedges of the Pacific Northwest*. Oregon State University Press, Corvallis.
- Wilson, B. L., R. E. Brainerd, L. P. Janeway, K. Kuykendall, D. Lytjen, B. Newhouse, N. Otting, S. Meyers, and P. Zika. 2007. Description of *Carex klamathensis* (Cyperaceae), a rare sedge of the Klamath Region of California, U.S.A. *Journal of the Botanical Research Institute of Texas* 1: 69-77.
- Zika, P. F., A. L. Hipp, and J. Mastrogiuseppe. 2012. *Carex*, *In*: Baldwin, B. G., D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, D. H. Wilken, *The Jepson Manual*, Ed. 2, Second Edition, University of California Press, Berkeley: 1308-1338.

APPENDIX A. CAREX OF ARIZONA WITH SPECIAL ATTRIBUTES.

VERY LIMITED DISTRIBUTION IN ARIZONA (34 of 68 species, exactly half!)

* denotes those known from only one or several localities (16 of 68)

<i>Carex albonigra</i>	San Francisco Peaks*
<i>Carex aquatilis</i>	White Mountains and Kaibab Plateau
<i>Carex atherodes</i>	Mogollon Rim and Flagstaff area lake margins
<i>Carex bebbii</i>	Mogollon Rim
<i>Carex brevior</i>	Mogollon Rim
<i>Carex buxbaumii</i>	Pinaleño Mountains
<i>Carex canescens</i>	lower slopes of Mount Baldy and Chuska Mountains
<i>Carex chalciolepis</i>	San Francisco Peaks*
<i>Carex conoidea</i>	w slope of Mt. Baldy (not seen since 1969) *
<i>Carex crawei</i>	one hanging garden in Canyon de Chelly*
<i>Carex curatorum</i>	streams and hanging gardens of Glen and Grand Canyons
<i>Carex deflexa</i>	San Francisco Peaks*
<i>Carex diandra</i>	White Mountains*
<i>Carex disperma</i>	White Mountains*
<i>Carex douglasii</i>	openings on the Arizona Strip
<i>Carex echinata</i>	White and Pinaleño Mountains, Mogollon Rim
<i>Carex elynoides</i>	San Francisco Peaks*
<i>Carex emoryi</i>	Glen and Marble Canyons from Mile -9 to Mile 39
<i>Carex endlichii</i>	Chiricahua and Santa Catalina Mountains
<i>Carex filifolia</i>	dry desert slopes in Apache County*
<i>Carex geyeri</i>	Pastora Peak, Carrizo Mountains*
<i>Carex haydeniana</i>	San Francisco Peaks*
<i>Carex interior</i>	White Mountains and Chuska Mountains
<i>Carex jonesii</i>	Mogollon Rim and White Mountains
<i>Carex lativena</i> few	SE mountain ranges*
<i>Carex microdonta</i>	Peterson Ponds, Huachuca Mountains*
<i>Carex obtusata</i>	Carrizo and Chuska Mountains and the Kaibab Plateau
<i>Carex pachystachya</i>	Mogollon Rim and Lukachukai Mountains
<i>Carex scoparia</i>	Mogollon Rim
<i>Carex serratodens</i>	e slope of Four Peaks, Mazatzal Mountains*
<i>Carex simulata</i>	White Mountains and Mogollon Rim
<i>Carex specuicola</i>	hanging gardens of the n Navajo Reservation
<i>Carex stevenii</i>	Mount Baldy*
<i>Carex utahensis</i>	streamside in the ne Navajo Reservation*

LONG, THIN, THREADLIKE RHIZOMES

<i>Carex disperma</i>
<i>Carex douglasii</i>
<i>Carex obtusata</i>
<i>Carex duriuscula</i>
<i>Carex obtusata</i>

LADDER-FIBRILLOSE SHEATHS

Carex atherodes
Carex elynoides
Carex endlichii
Carex filifolia
Carex geyeri
Carex obtusata
Carex oreocharis
Carex pellita
Carex senta
Carex spissa
Carex utriculata
Carex vesicaria

PANICULATE HEADS

Carex alma
Carex chihuahuensis
Carex diandra
Carex douglasii
Carex jonesii (possibly, but so compact that this is hard to see)
Carex praegracilis
Carex simulata
Carex stipata
Carex vulpinoidea
Rarely, some *Ovales* (we have seen this in *C. microptera* and *C. subfusca*)

SHEATHS HAIRY

Carex atherodes

PERIGYNIA HAIRY

Carex curatorum
Carex deflexa
Carex geophila
Carex lativena
Carex leucodonta
Carex pellita
Carex rossii

PERIGYNIA YELLOW TO ORANGE AND GLOBOSE AT MATURITY

Carex aurea

GRAZING TOLERANT

Carex nebrascensis
Carex praegracilis

DRY SITES (21 OF 68 SPECIES, NEARLY 1/3)

Carex albonigra
Carex bella (wet sometimes)
Carex chalciolepis
Carex deflexa
Carex douglasii
Carex duriuscula
Carex elynoides
Carex filifolia
Carex geophila
Carex geyeri
Carex haydeniana
Carex lativena
Carex leucodonta
Carex obtusata
Carex occidentalis (wet rarely)
Carex oreocharis
Carex petasata
Carex rossii
Carex siccata
Carex vallicola
Carex wootonii

SPECIES WITH COMPACT HEADS; SPIKES HARD TO DISTINGUISH

Carex athrostachya
Carex douglasii
Carex duriuscula
Carex ebenea
Carex haydeniana
Carex jonesii
Carex microptera
Carex pachystachya (sometimes)
Carex praegracilis (sometimes)
Carex siccata (sometimes)
Carex simulata
Carex subfusca (sometimes)

SINGLE-SPIKED SPECIES

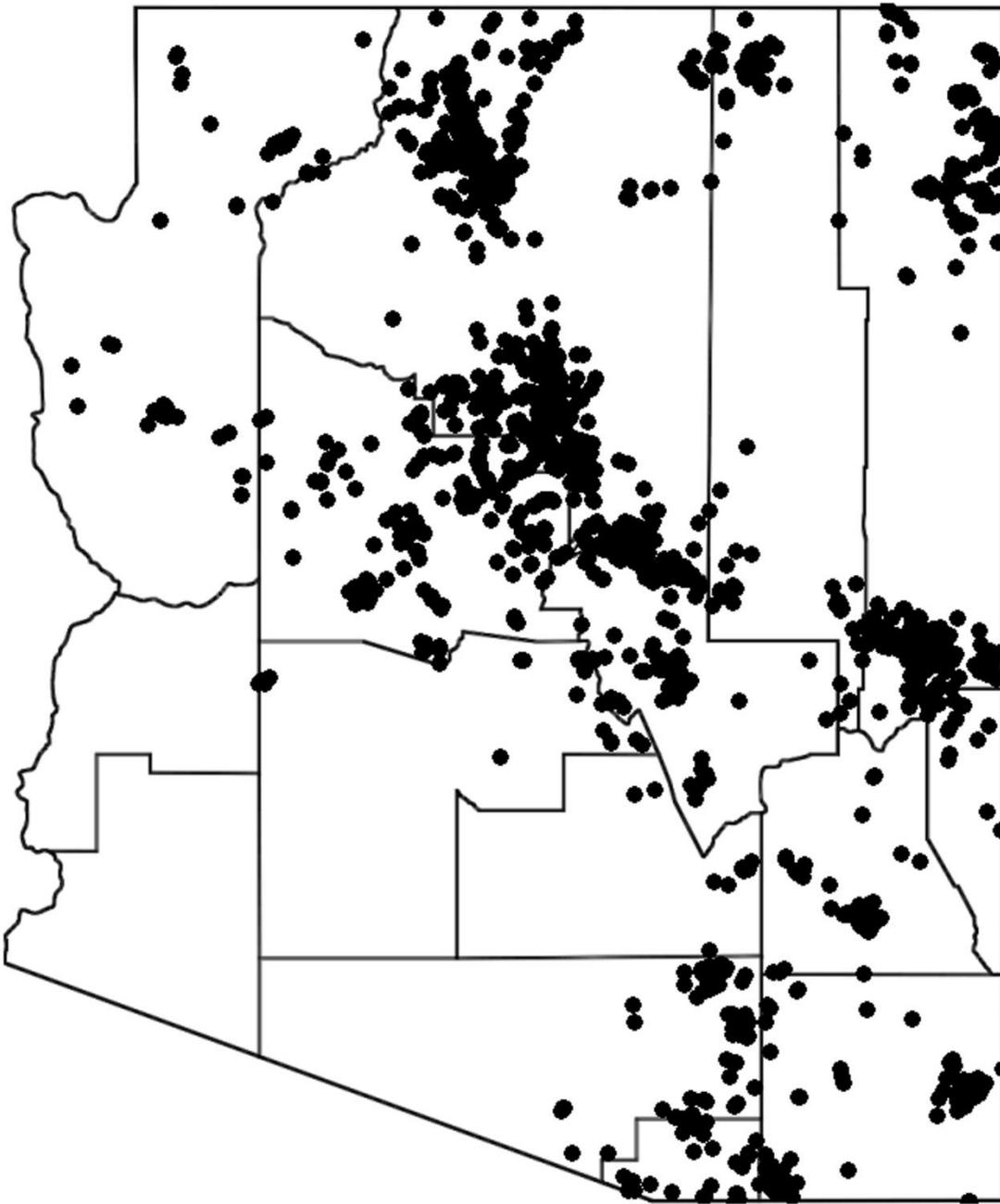
Carex curatorum
Carex elynoides
Carex filifolia
Carex geyeri
Carex obtusata
Carex oreocharis

APPENDIX B. INSTRUCTIONS FOR COLLECTING *CAREX*.

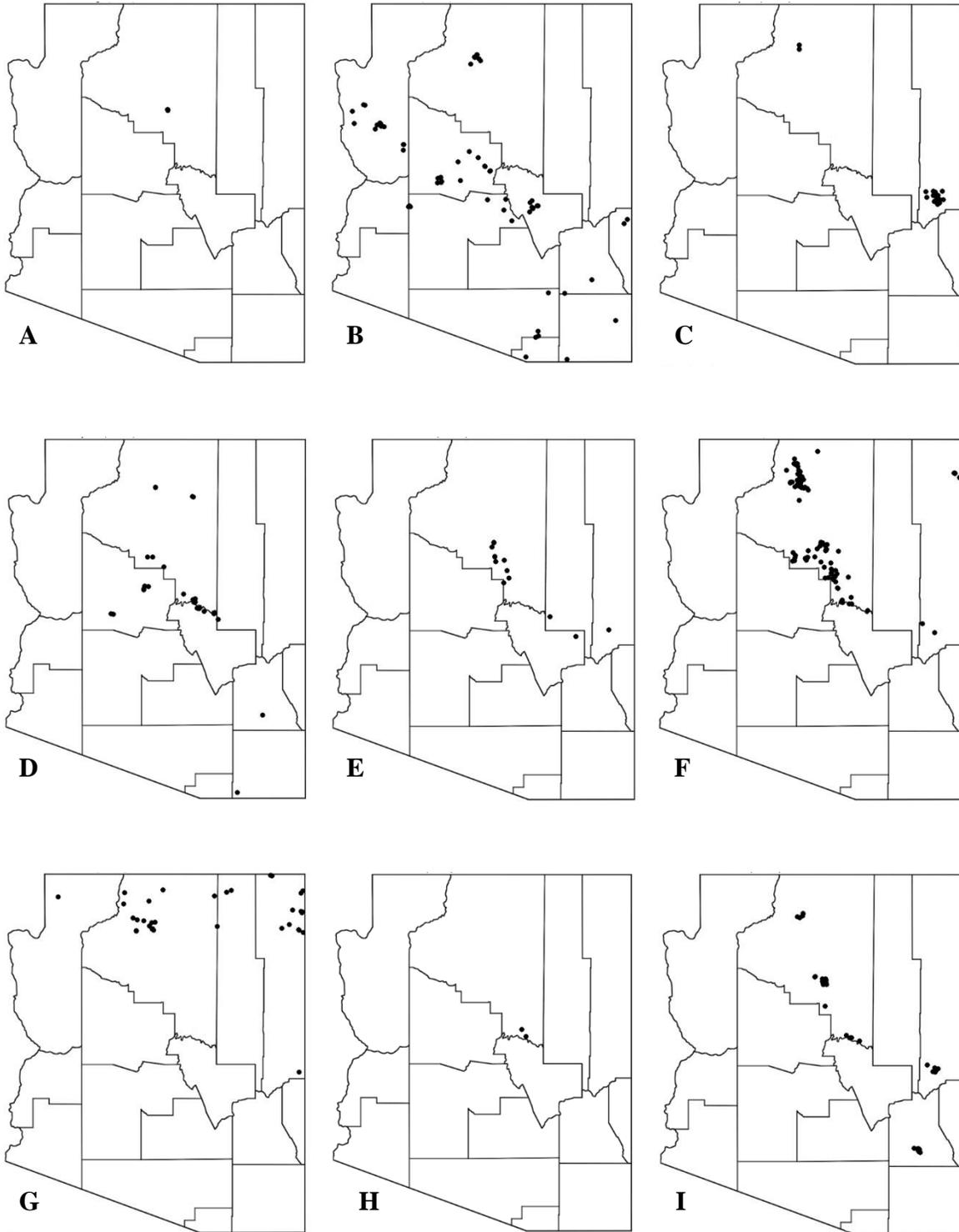
There are certain morphological characters that are frequently required to key out sedges which are often not collected. It is important that new collections be complete, and that sufficient collection data is recorded to aid in describing habitat.

1. Bring your digging tool. Roots and/or rhizome characters will often indicate which group or subgroup the plant is in. If possible, clean the soil from the roots/rhizomes before pressing, so that color, size (diameter, distance between nodes) and other characters can be easily seen, but not so rigorously that the outer layers/sheaths on the rhizomes are lost (as this is often where the color is seen). Thickness, color, and distance between the culms along the rhizome should be observed in the field, and shown in a good collection. Plant habit should be described, as some cespitose species look rhizomatous when the interwoven rhizomes are separated, and only a piece ends up on the herbarium sheet.
2. The basal leaf sheaths are also important in some groups, and whether or not the old ones form a network of fibers (becoming ladder-fibrillose) as they disintegrate. It is easy to destroy these old basal sheaths if you try to pull the clump out of the soil, rather than digging and cutting a section of rhizome.
3. Mature fruiting heads are often needed to make a definitive determination. It is best to collect a large enough sample of the plant to contain at least 6-7 good mature inflorescences. This can be difficult in a few of the larger species, but even in those, more than one culm is recommended. If the whole plant (roots, basal leaves and mature culm) is filling the page, you could cut a few extra inflorescences from the same plant to add to the sheet without crowding it too much (don't take inflorescences from different plants unless you are absolutely sure that they are the same thing). Inflorescence bract length and how the spikes are arranged on the culm can vary within a species, and even on the same plant, so having a good enough numerical sample will tell you what the predominant pattern is. A single inflorescence may or may not be representative of the population. Good written information can help if it is impractical to attach enough inflorescences.
4. Record a good description of the habitat; if it is growing near a stream, are the culms in water, in damp soil on the banks, away from the stream but in a damp meadow, in a meadow but on a drier slope, in the shade or in the sun, etc? Some sedges are very particular in their habitat requirements, and this may be of help in verifying what you found. Others have a broader range of possible habitats. Also record the elevation; this will help establish ranges for elevation in Arizona, which may differ from what the same species may tolerate in another state or region.
5. A final note on the importance of good collections: a collector must learn to recognize when an inflorescence is mature. Flowering culms often look ripe for the picking, but generally when all the anthers and stigmas are exposed, the perigynia are still undeveloped and useless for identification. It is best to wait and return in

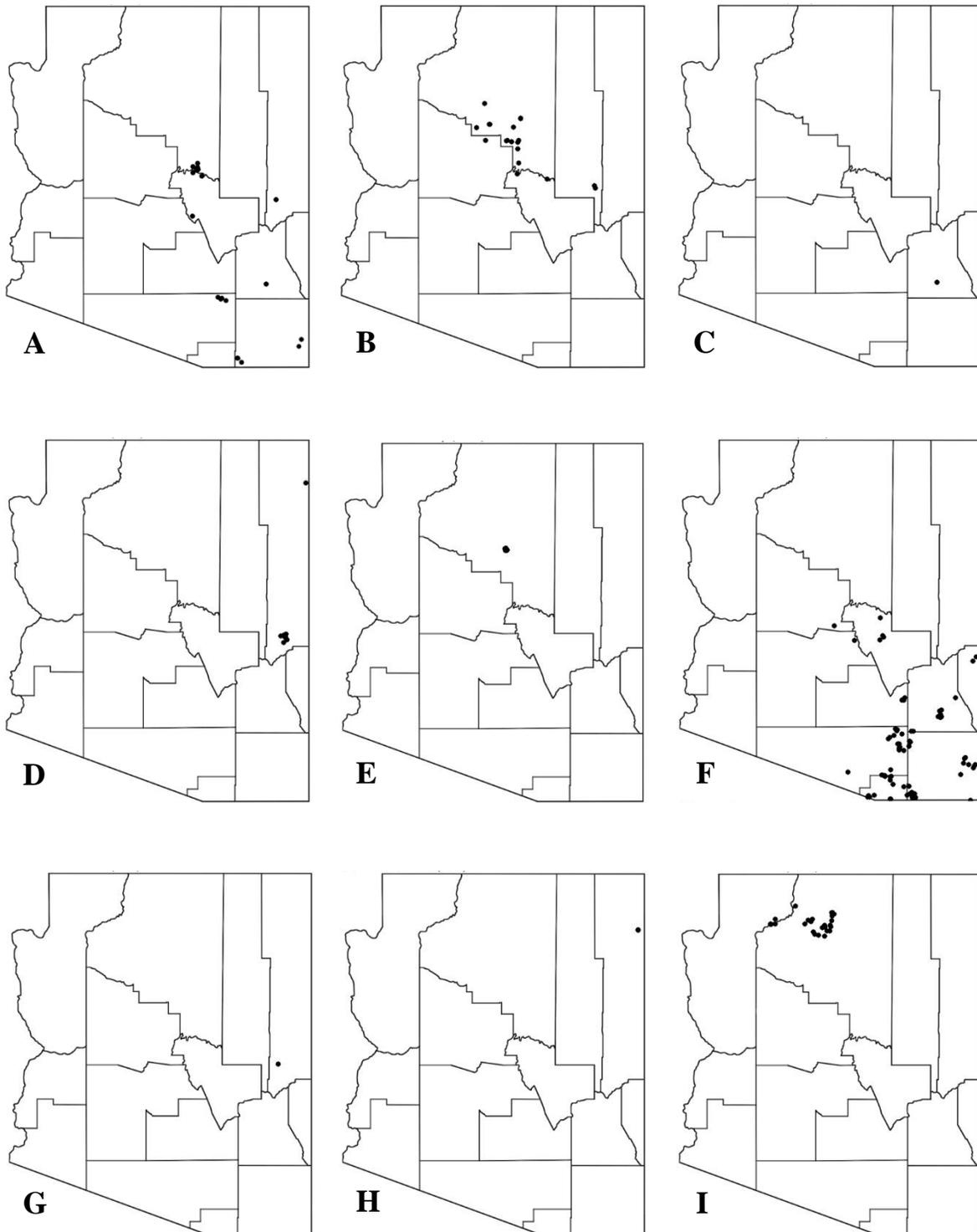
another month, or look around more, for a fully mature specimen, one that is in fruit, but before disarticulation. For most species this leaves a fairly short collection window of a month or two. If you cannot return later, make sure that your collection contains all the basal parts and habit/habitat notes, and you should be able to get to the right section of *Carex* (but maybe not the species). Never take just a “top snatch” (single flowering culm broken off above the base) unless you are doing it for your own practice in looking at perigynia. Top-snatched specimens do not make useful herbarium sheets.



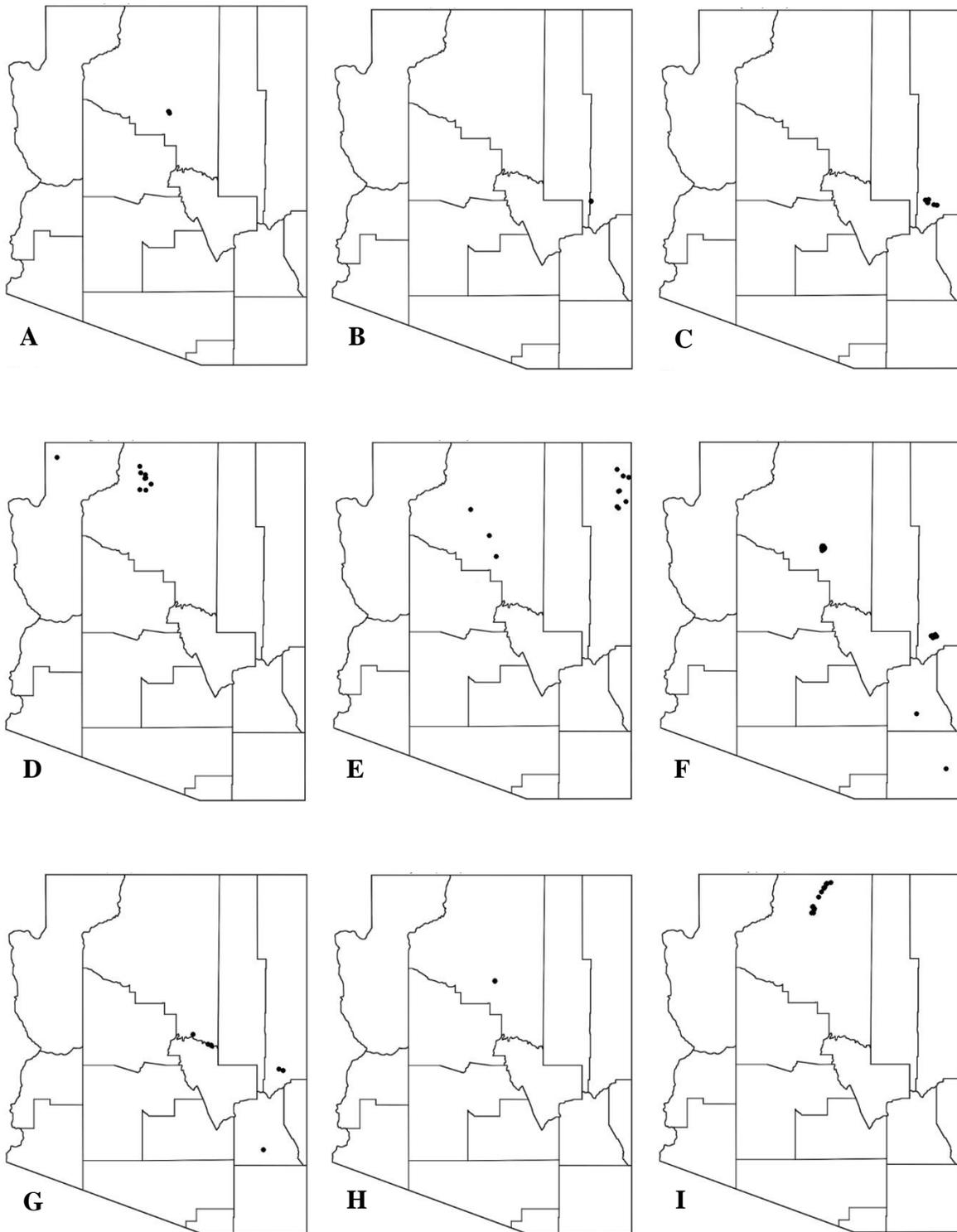
Cyperaceae Figure 10. Distribution of: all *Carex* species in Arizona



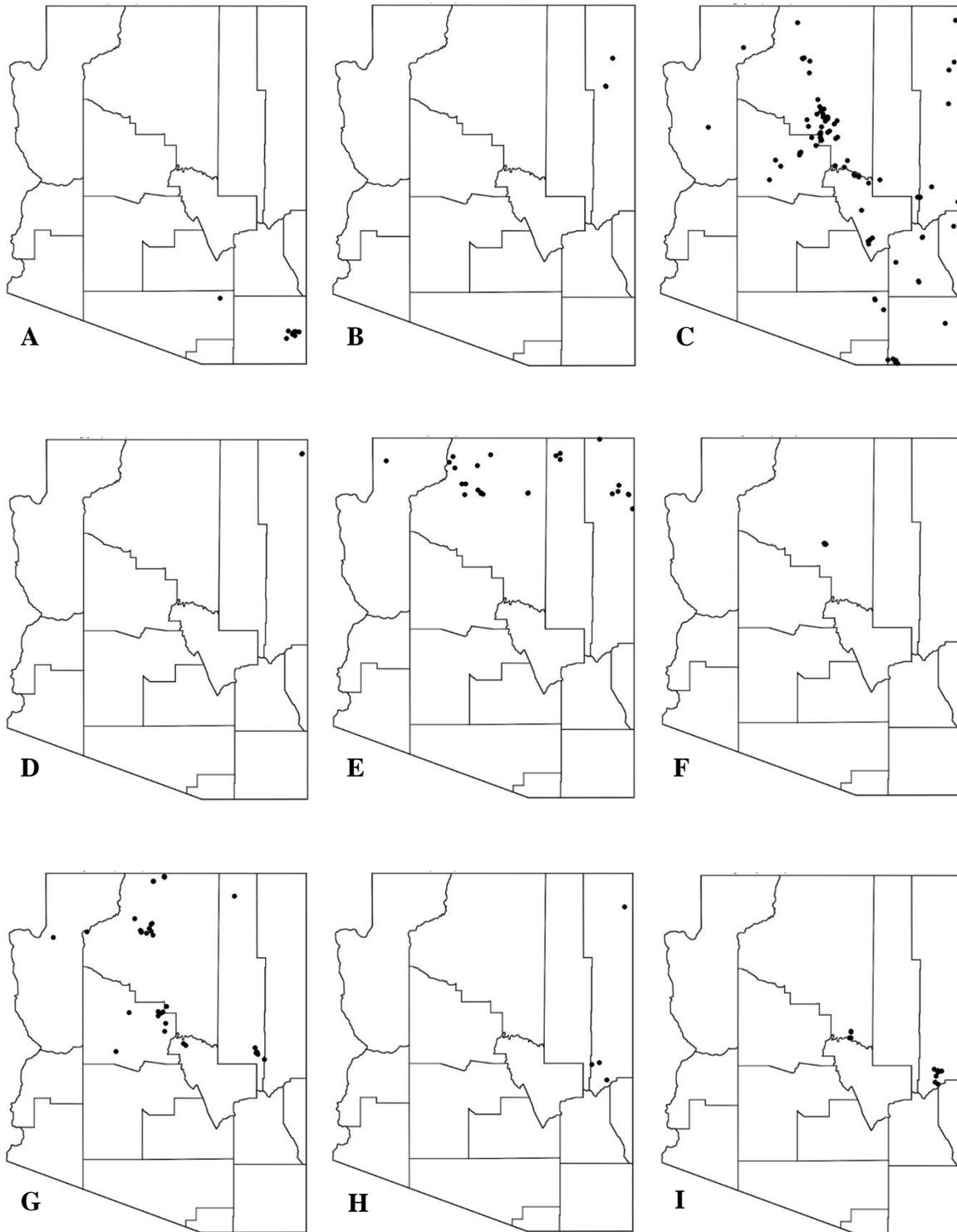
Cyperaceae Figure 11. Distribution of: (A) *Carex albonigra*; (B) *Carex alma*; (C) *Carex aquatilis*; (D) *Carex* sp. nov. A; (E) *Carex atherodes*; (F) *Carex athrostachya*; (G) *Carex aurea*; (H) *Carex bebbii*; (I) *Carex bella*



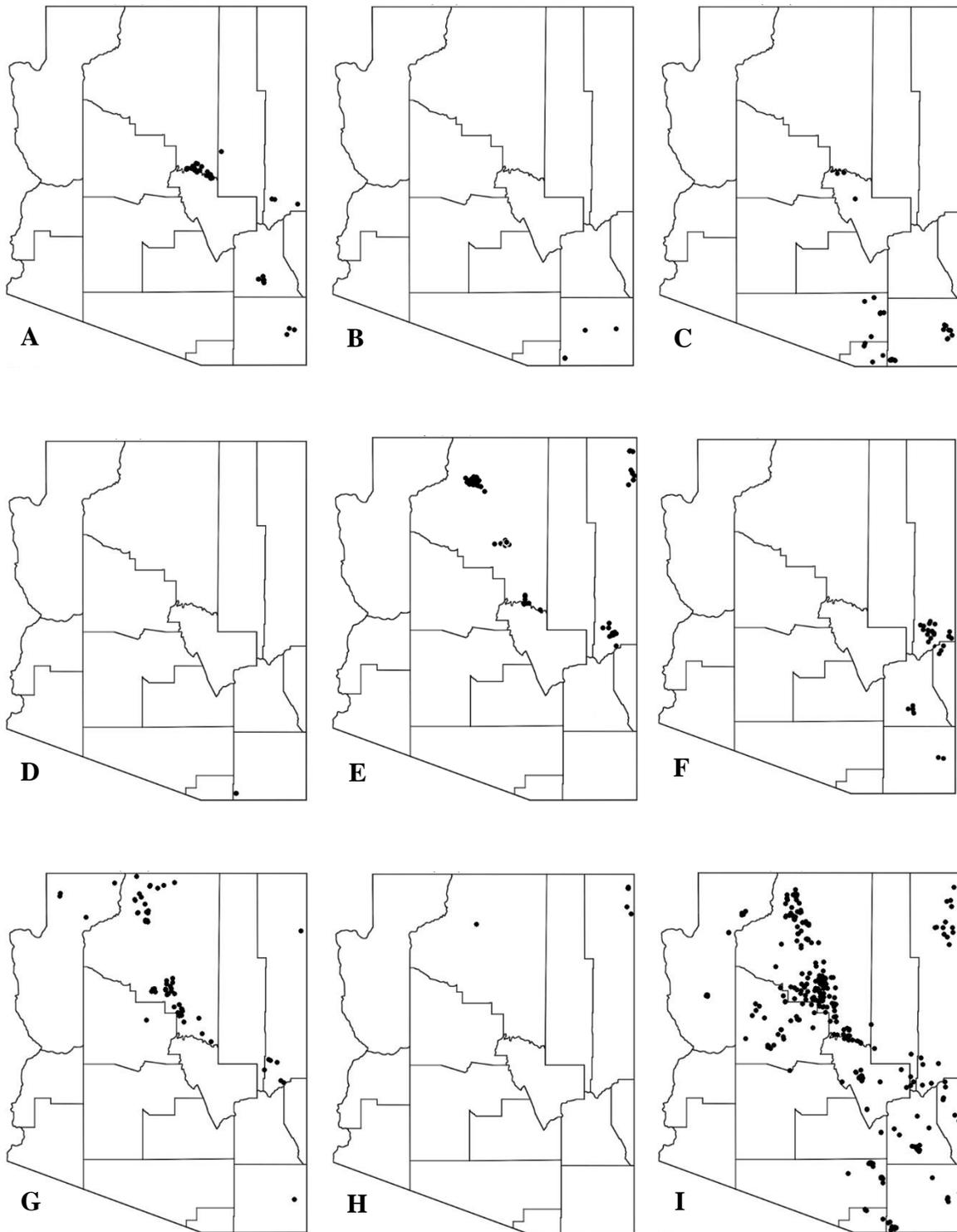
Cyperaceae Figure 12. Distribution of: (A) *Carex bolanderi*; (B) *Carex brevior*; (C) *Carex buxbaumii*; (D) *Carex canescens*; (E) *Carex chalciolepis*; (F) *Carex chihuahuensis*; (G) *Carex conoidea*; (H) *Carex crawei*; (I) *Carex curatorum*



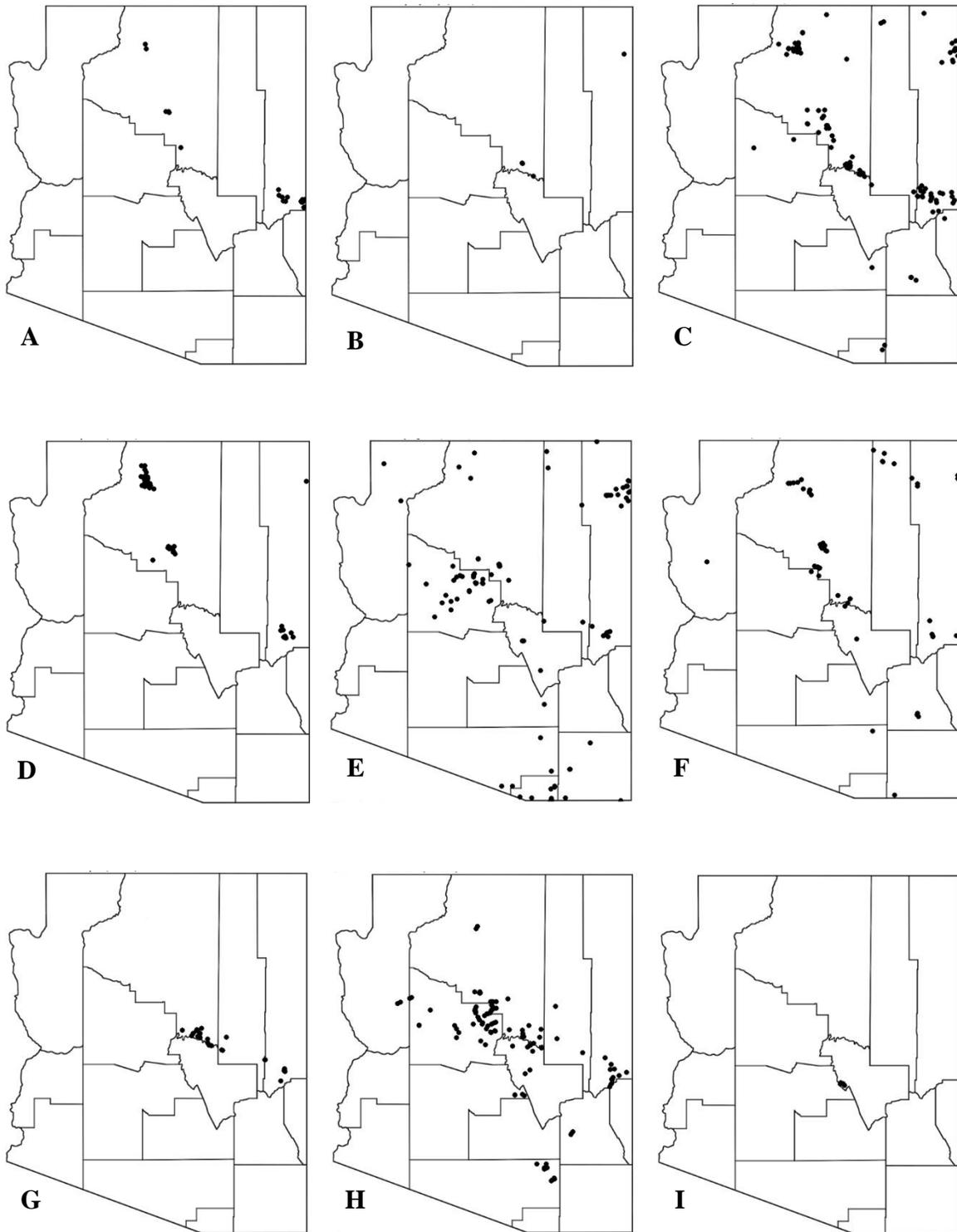
Cyperaceae Figure 13. Distribution of: (A) *Carex deflexa*; (B) *Carex diandra*; (C) *Carex disperma*; (D) *Carex douglasii*; (E) *Carex duriuscula*; (F) *Carex ebenea*; (G) *Carex echinata*; (H) *Carex elynoides*; (I) *Carex emoryi*



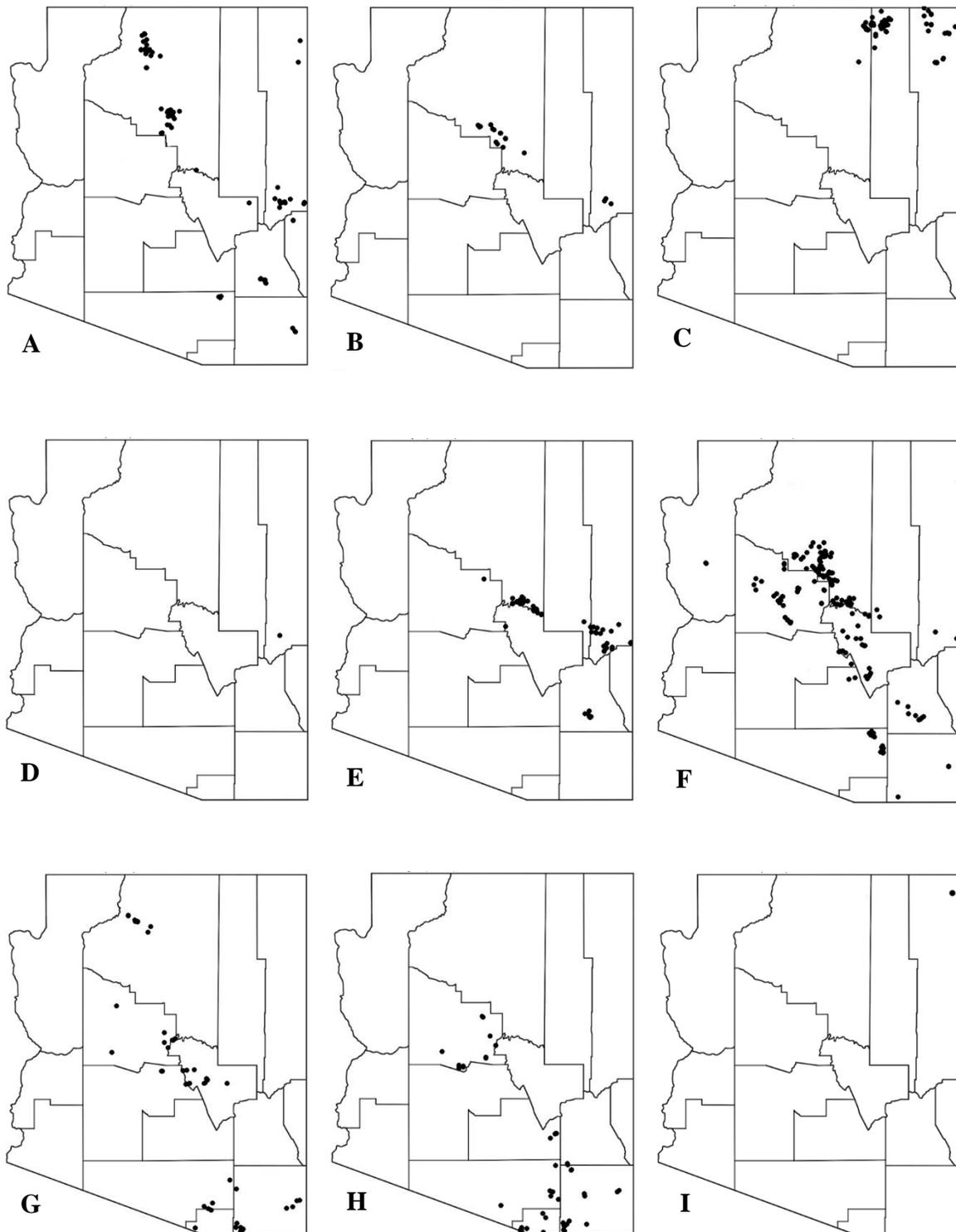
Cyperaceae Figure 14. Distribution of: (A) *Carex endlichii*; (B) *Carex filifolia*; (C) *Carex geophila*; (D) *Carex geyeri*; (E) *Carex hassei*; (F) *Carex haydeniana*; (G) *Carex hystericina*; (H) *Carex interior*; (I) *Carex jonesii*



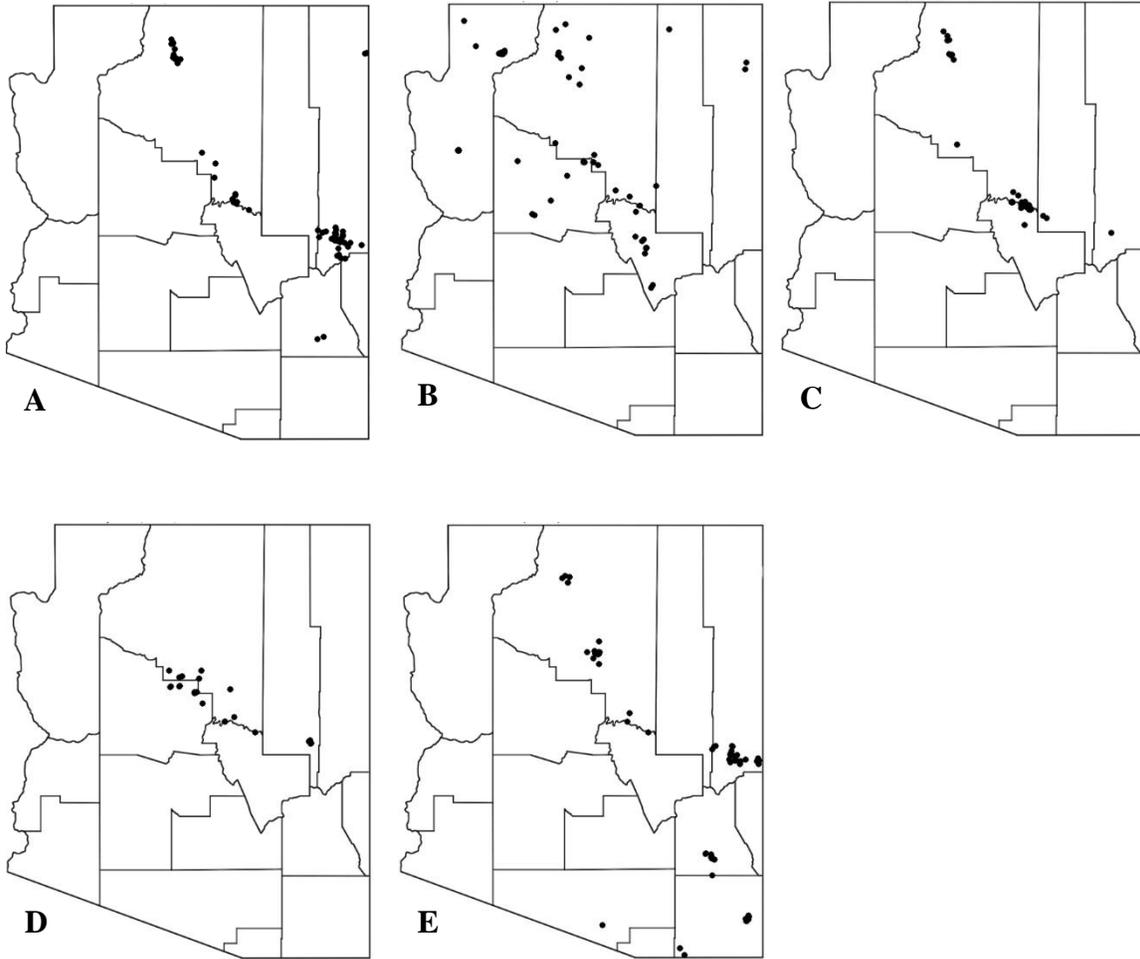
Cyperaceae Figure 15. Distribution of: (A) *Carex kelloggii*; (B) *Carex lativena*; (C) *Carex leucodonta*; (D) *Carex microdonta*; (E) *Carex microptera*; (F) *Carex* sp. nov. B; (G) *Carex nebrascensis*; (H) *Carex obtusata*; (I) *Carex occidentalis*



Cyperaceae Figure 16. Distribution of: (A) *Carex oreocharis*; (B) *Carex pachystachya*; (C) *Carex pellita*; (D) *Carex petasata*; (E) *Carex praegracilis*; (F) *Carex rossii*; (G) *Carex scoparia*; (H) *Carex senta*; (I) *Carex serratodens*



Cyperaceae Figure 17. Distribution of: (A) *Carex siccata*; (B) *Carex simulata*; (C) *Carex specuicola*; (D) *Carex stevenii*; (E) *Carex stipata*; (F) *Carex subfusca*; (G) *Carex thurberi*; (H) *Carex ultra*; (I) *Carex utahensis*



Cyperaceae Figure 18. Distribution of: (A) *Carex utriculata*; (B) *Carex vallicola*; (C) *Carex vesicaria*; (D) *Carex vulpinoidea*; (E) *Carex wootonii*