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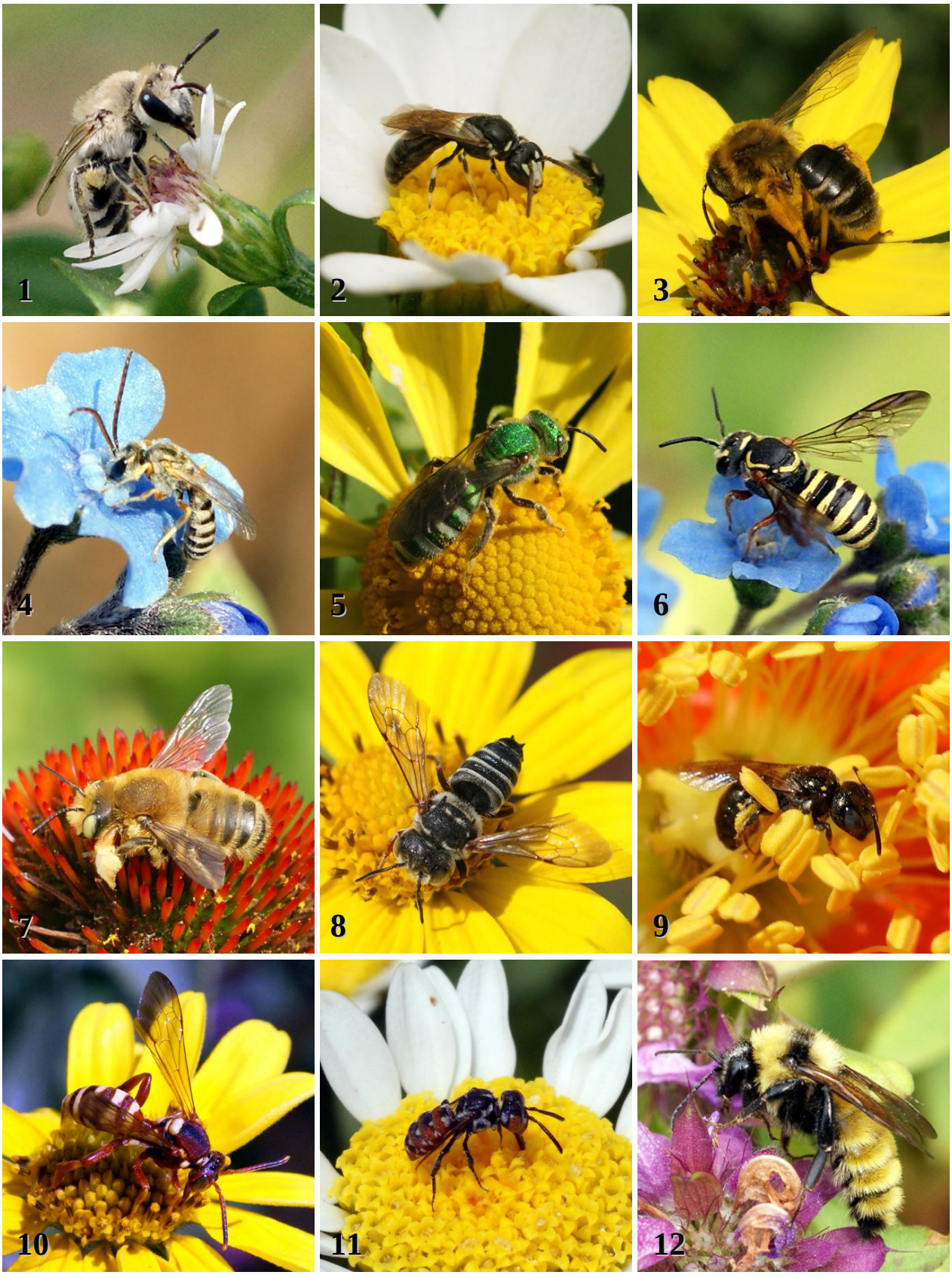
For Url

Plate 1. Colorado Bees

1. *Colletes* sp., ♀.
2. *Hylaeus* (*Hylaeus*) *leptocephalus* (Morawitz), ♂.
3. *Andrena* (*Callandrena*) *helianthi* Robertson, ♀.
4. *Halictus* (*Pachyceble*) *confusus arapahonum* Cockerell, ♂.
5. *Agapostemon* (*Agapostemon*) *femoratus* (Crawford) or *A.* (*A.*) *obliquus* (Provancher), ♀.
6. *Stelis* (*Dolichostelis*) *rudbeckiarum* Cockerell, ♀.
7. *Megachile* (*Xanthosarus*) sp., ♂.
8. *Coelioxys* (*Boreocoelioxys*) sp., ♂.
9. *Ceratina* (*Zadontomerus*) sp., ♀.
10. *Nomada utahensis* Moalif, ♀.
11. *Holcopasites calliopsidis* Linsley, ♀.
12. *Bombus* (*Thoracobombus*) *fervidus* (Fabricius), ♂.

Photographs by Diane M. Wilson.

Plate 1.



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Abstract

The Colorado Bee List contains 946 valid extant bee species in 66 genera. Distributional data are presented at the county level for each bee species found within Colorado. The history of bee research in Colorado is reviewed and important contributors are noted. Gaps in our current understanding of the Colorado bee fauna are discussed. Colorado bee species diversity is assessed in relation to the faunas of other states, including those adjoining Colorado. Life history characteristics, e.g., aspects of sociality, nesting biology, and floral associations, are summarized for Colorado bees at the generic level. The literature on fossil bee species known from Colorado is summarized. *Megachile helianthi* Cockerell is recognized as a junior synonym of *Megachile* (*Megachile*) *montivaga* Cresson, **new synonymy**. The parasitic species *Lasioglossum* (*Dialictus*) *sitocleptum* Gibbs is recorded for the first time from the United States, and 47 species are recorded for the first time from Colorado.

Introduction

Bees are a species-rich group with over 19,500 described species worldwide (Ascher and Pickering 2011; Integrated Taxonomic Information System 2009; Michener 2007). While bees occur throughout the world, they reach their greatest diversity in regions with arid or Mediterranean climates (Michener 1979). In America north of Mexico, there are approximately 3,500 described bee species (Ascher and Pickering 2011; Hurd 1979). The number of described species, however, is only a portion of the actual total, as many additional undescribed species are known to exist. This is even true for relatively well-studied areas such as the United States, including Colorado.

Bees are biologically and ecologically diverse and provide essential pollination services in natural, urban, and agricultural systems (Kearns et al. 1998; Kremen et al. 2002; National Resource Council 2007; Winfree et al. 2008). Changes in bee faunas due to alteration in land use, pesticide application, or reduction in suitable habitat may have profound effects on ecosystem processes (Kearns et al. 1998; Williams et al. 2009; Winfree et al. 2009).

To better understand the biology and roles of bees and to inform guidelines for their conservation, it is essential to have a baseline understanding of bee diversity and distribution. In creating the Colorado Bee List (page 23), we compiled records from natural history collections and published literature that inventory all extant bee species known from Colorado. While previous surveys and regional inventories exist for parts of Colorado (Cockerell 1906c, 1907b, 1910, 1919, 1930) and many Colorado records are listed in numerous taxonomic revisions (including those cited below in the Colorado Bee List) and catalogs (e.g., Hurd 1979; Moure and Hurd 1987), this is the first detailed, comprehensive, statewide listing of Colorado bee species.

The goals for producing the Colorado Bee List are: 1) to provide a taxonomically current inventory of the bee species and subspecies that occur in Colorado, 2) to provide county-level information about each species' distribution within the state, 3) to review the history of bee collecting and research in Colorado, noting important contributors, and 4) to provide a baseline resource for conservation and pollination biologists and other researchers working on a broad range of bee-related studies. To increase the utility of this inventory we also consider the diversity of Colorado bees in a broader context by summarizing some of their important life history traits.

Compiling the Colorado Bee List

The Colorado Bee List (page 23) documents 946 valid living (modern) bee species in 66 genera recorded from the state. A total of 141 subspecies are listed for the 108 Colorado species that have multiple subspecies over their range. Eighty of the 108 polytypic species have one subspecies listed for Colorado, twenty-five species have two subspecies in Colorado, two species have three subspecies in Colorado, and one species has five subspecies in Colorado.

The information in this list reflects over a century of bee research and is based primarily on specimen data from the University of Colorado Museum of Natural History, Boulder, Colorado (UCMC), the C.P. Gillette Museum of Arthropod Diversity, Colorado State University, Fort Collins, Colorado (CSUC), the American Museum of Natural History, New York, New York (AMNH), and the United States Department of Agriculture, Agricultural Research Service, Bee Biology and Systematics Laboratory, Logan, Utah (BBSL). Available georeferenced specimen records used here include 3,691 records from the AMNH Division of Invertebrate Zoology database (Schuh et al. 2010), 5,938 records from the BBSL database, 930 specimens from the University of California Riverside Collection (UCRC) database, and 229 specimen records from the collections of the Rocky Mountain Biological Laboratory (RMBL). A few significant records from the Snow Entomological Collection at the University of Kansas Museum of Natural History (KSEM) were incorporated as well. Records for *Bombus* only have been included from the Los Angeles County Museum (LACM), the Bohart Museum of Entomology at the University of California Davis (BMEC), the C. A. Triplehorn Insect Collection at the Ohio State University (OSUC), the University of Minnesota Insect Collection (UMSP), and the University of Wyoming Insect Museum (ESUW).

In addition to specimen data from these natural history collections, species occurrence information was obtained from numerous taxonomic revisions, regional inventories, and species descriptions. For published records that we considered questionable or problematic based on our current understanding of taxonomy and distribution, we attempted to locate corresponding specimens to confirm or reidentify. If specimens could not be located to document questionable published records, we indicated this on the list.

In a few cases, we obtained significant occurrence data from photographs posted online at BugGuide (www.bugguide.net, accessed 2011). These photos were of sufficient quality and showed diagnostic characters, thus allowing for species identifications by the authors of this paper. While photos of live bees cannot take the place of specimens, they can document species from sites where collecting is restricted, floral associations, nesting sites, and other aspects of bee life history.

The hierarchical classification of family-group names, i.e. families, subfamilies, and, where applicable, tribes and subtribes, follows Engel (2005) with minor modifications: supertribes are not cited; no tribes are recognized in Hylaeinae; subtribe Caenohalictina is included within the tribe Halictini with Agapostemonina treated as a junior synonym; subtribe Sphecodina is treated as a synonym of Halictina; Augochlorini is listed prior to Halictini; Andrenini is recognized as a tribe within Andreninae; Panurginina is recognized as a valid subtribe of Panurgini; Macropidinae is reduced to tribal rank within Melittinae; Hesperapini is treated as a tribe separate from Dasypodaini; Lithurginae is reduced to tribal rank within Megachilinae; Dioxyini is treated as a tribe separate from Anthidiini and is cited prior to it; no subtribes are recognized for Osmiini; and Exomalopsini followed by Emphorini are listed prior to Eucerini.

Generic and subgeneric classification generally follows Michener (2007) with some exceptions. Protandrenine classification follows Ascher (2004), Ascher and Pickering (2011), and Giles and Ascher (2006); see also Mitchell (1960). We prefer to recognize the genus *Protandrena* sensu Timberlake (1976), but also include *Metapsaenythia* (the type species only) as a junior synonym. Genus *Protandrena* sensu lato of Michener (2000, 2007) is heterogeneous and likely paraphyletic, as it includes a variety of South American taxa quite different from *Protandrena* sensu Timberlake but excludes *Pseudopanurgus* sensu Timberlake (1973) which is similar to *Pterosarus* and likely belongs to the same clade (Ascher 2004). In addition to recognizing subgenera, we also recognize formal species groups within many genus-group taxa, most of which have precedents in the literature (e.g., Hurd 1979), although in many cases they have not been widely used. Certain species groups are newly proposed, as in the case of *Sphecodes* where we follow an unpublished infrageneric classification provided by M.S. Arduser (pers. comm.).

Genera and subgenera are listed alphabetically within their family-group taxa. For each genus, we cite revisions and other pertinent literature. Species and subspecies, where applicable, are listed alphabetically within their genus, subgenus, or species group, where applicable, and are cited with author(s) and year of valid publication for nomenclatural purposes, with the imprint date cited in brackets and within quotation marks if this differs.

The nomenclature used in the Colorado Bee List represents the current valid species names (Ascher and Pickering 2011). Junior synonyms are not mentioned in the list, except in a few instances (in brackets following the valid name) where recent synonymies or those made in obscure references are not yet in general use. One **new synonymy** is proposed herein, as the holotype female of *Megachile helianthi* Cockerell in the American Museum of Natural History was studied by JSA and proved to be synonymous with the well-known *Megachile* (*Megachile*) *montivaga* Cresson (see the Colorado Bee List) rather than being a valid species of subgenus *Sayapis*.

For each listed species, we provide information on the Colorado counties (Figure 1) where that species has been collected. In the case of species for which specific locality information is lacking but a valid Colorado record exists (sometimes based on older type material), we note that the species occurs in Colorado. In cases where a locality could not be located with certainty or the locality extends into two or more counties (e.g., Rocky Mountain National Park), the locality name is listed verbatim with no attempt to assign a county.

Field notes, including those of U.N. Lanham (at UCMC) and the C.P. Gillette Accession Volumes (at CSUC), were crucial for determining many county records. Paxson (1906) provides an interesting history of Colorado and its counties from 1861 when Colorado became a territory, through statehood in 1876, and continuing until 1905 when all but three (Broomfield, Jackson, and Moffat) of Colorado's current counties had been defined (although Denver County was enlarged when Denver International Airport was constructed in the early 1990s).

A variety of web-based tools were also used to identify historical localities including:
Colorado Places by County, COGenWeb: http://cogenweb.com/coplaces/
GoogleEarth
Topozone, previously available at http://www.topozone.com/
USGS Board on Geographic Names: http://geonames.usgs.gov/domestic/index.html

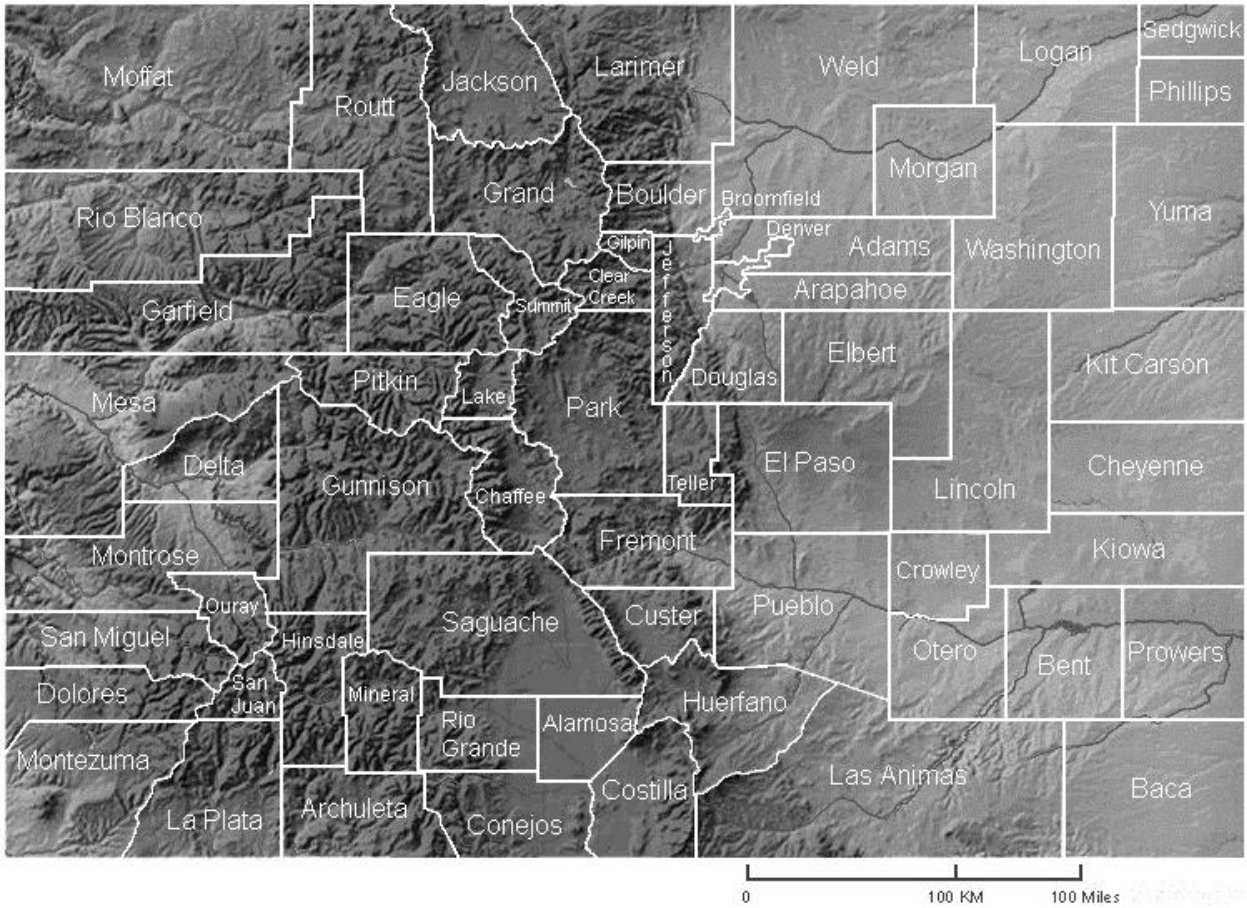

Figure 1. Relief map showing Colorado counties (based on a map from geology.com).

Although the Colorado Bee List reflects an extensive examination of specimens and literature, we recognize that this is a provisional list of the bee fauna of Colorado. As research progresses, we anticipate new synonymies, descriptions of new species, and range extensions or modifications. This current list includes species that will soon be relegated to synonymy as revisions are published, and it does not include undescribed species that are currently known to the authors. The authors are also aware of more than 150 additional described bee species that potentially occur in Colorado. These are species with known distributions that straddle Colorado (e.g., occurring in New Mexico and Wyoming) or documented in a neighboring state within twenty miles of the Colorado state line. These species are not included in the Colorado Bee List since they are not currently documented from the state. After further study, it is quite possible that the number of bee species in Colorado may approach 1,100 species.

Problematic Taxa

Species were considered problematic when their occurrence as established members of the Colorado bee fauna was questionable. Thirty-one species are detailed in the List of Problematic Taxa (page 78) and fall into one of three main categories.

1. *Published records based on misidentifications* – In compiling the Colorado Bee List, we encountered published records of uncertain validity for species otherwise unknown in Colorado.

We attempted to locate the specimens that were the basis of these published records. Some were determined to be misidentifications based on current taxonomic knowledge. Rather than ignore these species, we opted to address them in the List of Problematic Taxa.

2. *Unverifiable identifications* – Some museum specimens seemed out of range even though they were identified by a relevant expert in the past. Further taxonomic study may validate these identifications. Unfortunately, at this time, no one is able to confirm some western U.S. species belonging to taxonomically difficult genera such as *Lasioglossum*, *Sphecodes*, and *Nomada.*

3. *Accidental occurrences* – There are several correctly identified specimens documenting a disjunct occurrence in Colorado of species that are not considered to be established members of the Colorado bee fauna. These are listed with details about their identification, collection, and labeling.

Fossil Bees

While this paper focuses on the extant bees of Colorado, we would be remiss if we did not summarize the literature on fossil bee work in Colorado. Research on Colorado's fossil insects dates back to the early 1870s when Samuel H. Scudder ventured west as part of the Hayden Survey. Scudder collected and described numerous Colorado fossil insects from the Florissant and Green River Formations (see Scudder 1878, 1886, 1890, 1891). In the early 1900s, T.D.A. Cockerell became interested in Colorado fossil insects and collected additional fossil material at Florissant. In 1906 and 1907, S.A. Rohwer joined Cockerell at Florissant. Fossil bee species described by Scudder and Cockerell are catalogued by Zeuner and Manning (1976). F.M. Carpenter includes information on Colorado fossil bees in his *Treatise on Invertebrate Paleontology* (Carpenter 1992). Engel (2001a, 2002) described additional bee species from Florissant. Engel (2001b) and Grimaldi and Engel (2005) commented on Florissant bee fossils and noted the great difficulty of making precise identifications of species preserved in these compression deposits. Meyer (2003) illustrated Florissant fossils and listed 31 described bee species from the Florissant Formation. Various additional fossil bees are known, but have yet to be published (M.S. Engel, pers. comm.).

Fossil insects continue to be collected and studied in Colorado. Current excavations are being undertaken at the Florissant Fossil Beds National Monument (late Eocene), in the Green River Formation of northwestern Colorado (middle Eocene), and at several smaller sites across the state (Eocene and Oligocene) (D. Smith, pers. comm.).

History of Bee Research in Colorado

Research on extant Colorado bees spans more than a century. Early work on Colorado bees focused on taxonomic descriptions of species, species inventories for discrete areas (e.g., Boulder, Florissant, Mesa Verde), and life history studies of particular taxa. The collections associated with these early studies remain important for taxonomists who continue to describe and reevaluate species, for systematists who are interested in the evolutionary relationships within and among bee taxa, and increasingly for ecologists, conservation biologists, and pollination biologists who require baseline data on Colorado bees.

Bee research in Colorado over the last thirty years has included investigations of the ecology of pollinator-plant interactions studied in the context of the conservation of rare plants (Karron 1987; Lewinsohn and Tepedino 2007; Sipes and Tepedino 2006; Tepedino et al. 1999), the effects of pollinators on the genetic structure of communities (Bingham and Orthner 1998; Williams et al. 2001), pollinator efficiency (Catling and Catling 1989; Graham and Jones 1996; Kearns and Inouye 1994), the effects of nitrogen on plant-pollinator networks (Burkle and Irwin 2009, 2010), and the pollination biology of montane and alpine flowers (Burkle et al. 2007; Elliot and Irwin 2009; Galen 1989; Galen and Geib 2007; Jones et al. 1998; Maloof 2001; Newman and Thomson 2005; Suzuki 1994) and other plant communities (Bingham 1999; Eickwort et al. 1996; Graham and Jones 1996; Macior 1970, 1974; Moldenke and Lincoln 1979).

The history of bee research in Colorado has been documented by an impressive number of vouchered specimens that reside in natural history collections within the state. Many of these specimens are housed in the entomology collection at the University of Colorado Museum of Natural History in Boulder (UCMC). Over 70,000 bee specimens at UCMC were collected in Colorado between the early 1900s and the present (an additional ca. 30,000 bee specimens were collected outside Colorado during this time).

Collections at the C.P. Gillette Museum of Arthropod Biodiversity at Colorado State University (CSUC) contain over 65 fully packed drawers of bee specimens, mostly from Colorado. These bees date back to the late 1800s. Since 1986, curator Boris Kondratieff and his associates have continued to build the collections at CSUC by actively collecting bees and other insects throughout Colorado.

Additionally, many thousands of specimens from Colorado reside in the AMNH and in the BBSL. Other collections that have significant Colorado holdings include the National Museum of Natural History, Smithsonian Institution (USNM), Snow Entomological Collection at the University of Kansas Museum of Natural History (KSEM), Cornell University Insect Collection (CUIC), University of California Riverside Collection (UCRC), Rutgers University Arthropod Collection (RUIC), Rocky Mountain Biological Laboratory (RMBL), and the Rebecca Irwin Laboratory at Dartmouth College. Early collections described by E.T. Cresson reside at the Academy of Sciences Philadelphia (ANSP).

Contributors

The following list summarizes significant bee collectors and researchers, arranged more or less in chronological order. Ewan (1950) documents early naturalists, including entomologists, working in the Rocky Mountains. These naturalists included both scholars that lived and worked in the area and adventurers who made one or several significant expeditions into the Rocky Mountain states. The following section draws heavily from this work and also from McClurkin (1935) and Mallis (1971).

Thomas Say (1787-1834) was a taxonomist who described nearly 1,400 insects and was a founding member of the Entomological Society of America. Say is considered to be the first entomologist to venture into the Colorado region, accompanying Major Stephen H. Long on his expedition to the Rocky Mountains in 1819-1820 and collecting insect specimens that he later described (Say 1824, 1837).

James Ridings (1803-1880), a native of England, settled in Philadelphia and helped found the Entomological Society of Philadelphia (American Entomological Society). He made a collecting expedition through Kansas and the eastern portion of the Colorado Territory in 1864. On this trip, it is reported that he traveled to Burlington, Colorado in Boulder County. It should be noted that this Burlington is the city now known as Longmont (Brown 1966) and not the current city of Burlington (Kit Carson County) established in 1887 (and incorporated in 1888). Several dozen bee species collected by Ridings on his Colorado expedition were later described by Cresson (1878a, 1878b, 1879a).

Herbert K. Morrison (1854-1885), originally from Cambridge, Massachusetts, was a renowned insect collector who traveled extensively collecting Lepidoptera and other insects (Mann 1885). His travels took him to the Colorado Territory in 1874 where he collected, among other things, bees that were later described by Cresson (1878a, 1878b, 1879a).

Ezra T. Cresson (1838-1926) was a Philadelphian and one of the founding members of the Entomological Society of Philadelphia (American Entomological Society). He specialized in Hymenoptera taxonomy, including species from the western U.S., and described 196 of the taxa in the Colorado Bee List, including species collected by Ridings and Morrison (Cresson 1872, 1878a, 1878b, 1879a, 1879b). Many of these specimens reside at the Academy of Natural Sciences in Philadelphia (ANSP). Incidentally, Cresson was James Ridings' son-in-law.

Francis H. Snow (1840-1908) was a professor of mathematics and natural science and ultimately a chancellor at the University of Kansas. Between 1876 and 1907, Snow took students on annual summer collecting trips, twenty-six expeditions in all, through various western states, including multiple trips to Colorado. On these trips, he and his students amassed huge numbers of insect specimens that are currently housed at KSEM. Although not a taxonomist, his collections were extensive and have contributed greatly to insect and bee taxonomy.

Clarence P. Gillette (1859-1941) was an entomologist with the Colorado Agriculture College (Colorado State University) and, beginning in 1891, was in charge of the Colorado Experiment Station in Fort Collins. He was an avid collector and founder of their insect collection (CSUC). That collection, which now bears his name, includes some of the oldest Colorado bee specimens housed in Colorado.

Charles F. Baker (1872-1927) was an assistant entomologist who worked with Gillette at the Colorado Experiment Station in Fort Collins from 1892 to 1897. CSUC houses many Baker specimens. It should be noted that in 1899 Baker collected many insect and plant specimens from "Los Pinos", Colorado. Historically, there have been several localities in Colorado that use this same name including a train stop on the Cumbres and Toltec Railroad in Conejos County ca. 9,700 ft., but it is clear that in 1899 Baker was at the Los Pinos (established in 1889) that is the area now known as Bayfield (renamed in 1899) in La Plata County ca. 7,000 ft. (Tiehm 1989).

Theodore Dru Alison (T.D.A.) Cockerell (1866-1948), a native of England, first arrived in Westcliffe, Colorado in 1887 after contracting tuberculosis. After three years living in the Wet Mountain Valley of Colorado, he returned to his birth country. His route back to Colorado included residences in Jamaica and New Mexico. Upon his return in 1903, he worked first as curator of the museum at Colorado College in Colorado Springs, then as a professor at the Boulder Preparatory School and a lecturer at the University of Colorado, and finally as a professor of zoology at the

University of Colorado until his retirement in 1934 (Weber 1965, 2000). His Colorado bee work built upon his previous studies of New Mexico bees begun in the 1890s, where his first encounters with the highly diverse and very poorly known bee fauna of western North America inspired his lifelong interest in describing bees and investigating their biogeography. Professor Cockerell, with the help of his second wife, Wilmatte Porter (W.P.) Cockerell, collected extensively and published prolific works on bees (as well as many other subjects). While he studied bees from around the world, he also published a number of regional Colorado bee studies, including the bees of Florissant, Teller County, Colorado (Cockerell 1906c), which listed 119 species. In the bees of Boulder County, Colorado (Cockerell 1907b), his species list totaled 183 species, including those listed in the postscript, but he estimated the total number of species in Boulder County to exceed 300. Other works, including Cockerell (1905, 1910, 1916, 1919, 1921, 1922b, 1923, 1929b, 1930, 1931, 1933a, 1934), Cockerell and Robbins (1910), and Cockerell and Blair (1930), focused on Colorado bees. Cockerell was an avid taxonomist, describing 6,401 bee species and subspecies worldwide (Zuparko 2008). Of the 946 species (and 57 non-nominate subspecies) listed in the Colorado Bee List, Cockerell described 412 as sole author or coauthor. For a full bibliography of Cockerell's 3,904 publications see Weber (1965). Although many of his specimens and those of his students and close collaborators (see below) reside at UCMC, many other series and type specimens are deposited at the AMNH.

Sievert A. Rohwer (1886-1951) was born in Colorado and attended the University of Colorado where he studied with T.D.A. Cockerell. He spent the summers of 1906 and 1907 collecting living and fossil bees at Florissant, Colorado. Those specimens are housed at UCMC.

Frank E. Lutz (1879-1943) was an entomologist with the American Museum of Natural History in New York who visited much of Colorado on collecting trips made between 1920 and 1922. He and his wife (Martha E.B. Lutz) made pioneering collections from western slope localities such as Ouray (Ouray County) and Mesa Verde (Montezuma County), as well as, from Colorado's eastern plains. His specimens, including holotypes of new species described by Cockerell, reside at the AMNH.

Norma E. LeVeque (1891-1967) moved to Colorado as a child with her mining family in 1898. She studied *Xylocopa* and their mites with T.D.A. Cockerell and became a professor of biology at the University of Colorado in 1924. Bee specimens collected by her are deposited at UCMC and the AMNH.

Marion D. Ellis (1887-1972) was the wife of Dr. Max Ellis, a professor of biology at University of Colorado. She worked with T.D.A. Cockerell and published descriptions of new species of halictid bees (Ellis 1913, 1914a, 1914b, 1914c, 1915).

Beulah Hix Blair (1893-1978) was a student at the University of Colorado, studying bees under T.D.A. Cockerell. She and Cockerell coauthored the first of a series of papers on Rocky Mountain bees (Cockerell and Blair 1930) and also published on the taxonomy of *Dieunomia* (Blair 1935).

Grace A. Sandhouse (1896-1940) was another of T.D.A. Cockerell's students. After finishing her Master's degree at the University of Colorado, she attended Cornell where she obtained her Ph.D. She then took a position at the U.S. Bureau of Entomology in Washington, D.C. She published on Augochlorini (Sandhouse 1937), *Halictus* (Sandhouse 1941), *Lasioglossum* (*Dialictus*) as *Dialictus* (Sandhouse 1923) or *Halictus* (*Chloralictus*) (Sandhouse 1924), and *Osmia* (Sandhouse 1939).

Charles H. Hicks (1899-1941) studied bees with T.D.A. Cockerell in the mid-1920s as a doctoral student at the University of Colorado. He surveyed the bees of Boulder County where, in addition to collecting adult bees, he found nests, recorded nesting behaviors, and reared offspring, thereby obtaining parasites in association with their host bees (Hicks 1926, 1927a, 1927b). These specimens are housed at UCMC.

Clarence P. Custer (1906-1998), while a student at the University of Colorado from 1924 to 1929, and with assistance from Hicks and T.D.A. Cockerell, studied the nesting habits of a variety of bees in the vicinity of Boulder including panurgines (Custer 1927, 1928c, 1929a, 1929b), *Svastra* and its *Triepeolus* cleptoparasite (Custer 1928a, 1929b; citing the *Svastra* as a *Melissodes*), and anthidiines and their wasp and fly parasites (Custer 1928b; Custer and Hicks 1927).

Ruth Sumner (1907-1993) was an instructor of biology at the University of Colorado between 1930 and 1935 and then a professor of physiology at Colorado Agriculture College in Fort Collins. Although she focused many of her studies on insect physiology, she collected bees around Greeley, Colorado (Weld County) and collaborated with T.D.A. Cockerell on a taxonomic study of *Hylaeus* (*Prosopis*) (Cockerell and Sumner 1931).

Hugo G. Rodeck (1902-2004), director of the University of Colorado Museum of Natural History from 1933 to 1971, specialized on *Nomada* and published descriptive and revisionary studies of this genus (Rodeck 1931, 1949). He, along with his first wife Helen E. Rodeck, collected many bees, which are deposited at UCMC, across the Front Range of Colorado and in the previously uncollected area of Dinosaur National Monument (Moffat County). During the 1940s and 1950s, when the Entomology Section had no formal curator, he provided loans of bees to researchers throughout the United States, and thus, these specimens were expertly identified and included in revisions.

Urless (Url) N. Lanham (1918-1999) collected bees in the early 1930s during his undergraduate years at the University of Colorado, mostly in Colorado's Front Range. His wife Caroline C. Lanham (nee C.J. Combs) sometimes collected with him. He returned to the University of Colorado as the curator of the Entomology Section from 1961 to 1989 and remained active through the late 1990s as Curator Emeritus. During his curatorship, he collected throughout Colorado emphasizing previously under-collected parts of the state, as well as the Front Range. He was an avid naturalist who kept detailed field notes and collected approximately one-quarter of all bee specimens at UCMC. Beginning in the 1940s, his research centered on *Andrena* (Lanham 1941, 1949, 1987a, 1993b), the most speciose bee genus in Colorado, with particular emphasis on the complexities of hybridization in the subgenus *Scaphandrena* (Lanham 1987b, 1993a).

Howard E. Evans (1919-2002) was curator of CSUC from 1973 to 1986 and Curator Emeritus until his death. Although his research centered on wasps, he collected bees and worked closely with bee researchers who provided accurate identifications and included CSUC bee specimens in their revisions.

Fredrick (F.) Martin Brown (1903-1993) was a lepidopterist who worked as a high school science teacher at Fountain Valley School in Colorado Springs. He collected a wide variety of insects and donated a portion of his collection to UCMC. These specimens were collected during the 1970s, mostly from El Paso and Elbert Counties, with additional material from Florissant and Great Sand Dunes National Monument and Preserve. He published (Brown 1966) on insect collectors in

Colorado. Although this paper is geared towards lepidopterists, it is still informative from a bee perspective.

George E. Bohart (1916-1998) spent the summer of 1978 working with Lanham, collecting in southeastern Colorado, primarily in Bent County. These specimens reside at UCMC.

Lazarus Walter (Walt) Macior (1926-2007) was a professor of biology at the University of Akron, in Ohio, whose pollination ecology work included studies on Rocky Mountain bumble bees that resulted in many publications (e.g., Macior 1970, 1974). He donated to UCMC just over 14,000 *Bombus* specimens that he collected during the 1960s to the 1990s. Many of these specimens were from Colorado or the Rocky Mountain region. The remainder of his collection was donated to the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM).

Bea Vogel (1930-) collaborated with Lanham while a student studying spiders at the University of Colorado and for many years after, collecting many bees in Colorado (and Montana) from the 1960s to the 1980s. Some of these specimens reside at UCMC, while the rest of her insect (and spider) collection was donated to the Denver Museum of Nature and Science.

Peter Robinson (1932-), Curator Emeritus of the Paleontology Section (curator from 1961 to 1971 and 1982 to 2002) and former director of the University of Colorado Museum of Natural History (from 1971 to 1982), collected bees, particularly *Andrena*, along the northern Front Range and in northwestern Colorado and southwestern Wyoming. These specimens reside at UCMC.

George C. Eickwort (1940-1994) was a professor of entomology at Cornell University, who regularly collected bees while teaching summer courses at the Rocky Mountain Biological Laboratory near Gothic, Colorado. These specimens are deposited in the Cornell University Insect Collection (CUIC). Eickwort determined *Lasioglossum* (*Dialictus*) in many collections, including UCMC, CSUC, AMNH, and BBSL.

Peggy Ann Byron (1954-1981) completed her Ph.D. on Colorado bumble bees at the University of Colorado, Department of Environmental, Population and Organismic Biology in 1980 (Byron 1980). While conducting her research, she collected a wide range of bees across much of the state. Her specimens reside at UCMC.

Virginia L. Scott (1962-), collections manager of the Entomology Section at the University of Colorado Museum of Natural History from 1994 to present, continues to collect bees in Colorado and the surrounding Rocky Mountain states for UCMC. In recent years she has been compiling the Colorado Bee List. Although she collects all bee taxa, she gravitates to colletids and megachilids and has a history of working with trap-nesting species (Scott 1994, 1996; Scott et al. 2000).

A number of individuals have each deposited vouchers at UCMC from their bee ecology and pollination biology studies in Colorado. These include: Robin Bingham (Bingham 1999; Bingham and Orthner 1998), Carol Kearns and Diana Oliveras (Kearns and Oliveras 2009a, 2009b), Sarah Hinners (Hinners 2008; Hinners and Hjelmroos-Koski 2009), Carol English, and David Inouye.

Vince Tepedino and his associates (including TG) have studied pollination of rare plants in western Colorado (Lewinsohn and Tepedino 2007; Sipes and Tepedino 2006; Tepedino et al. 1999). The study plants include: *Astragalus humillimus* Gray and *A. osterhoutii* Jones (Fabaceae), *Eriogonum*

pelinophilum Reveal (Polygonaceae), *Lesquerella congesta* Rollins and *Physaria obcordata* Rollins (Brassicaceae), *Pediocactus knowltonii* Benson, *Sclerocactus glaucus* (Schumann) Benson, and *S. mesae-verde* Boissevain and Davidson (Cactaceae), *Penstemon debilis* O'Kane and Anderson, *P. harringtonii* Pendland, and *P. penlandii* Weber (Plantaginaceae), *Phacelia formosula* Osterhout (Hydrophyllaceae), and *Spiranthes diluvialis* Sheviak (Orchidaceae). The bee specimens associated with these studies are housed at BBSL.

Rebecca Irwin, a professor of biological sciences at Dartmouth College, and her students are currently conducting research on bees and pollination systems at Rocky Mountain Biological Laboratory (RMBL) near Gothic (Gunnison County), Colorado. She has recently initiated databasing of both her vouchers and RMBL bee specimens in collaboration with the AMNH.

Additionally, a significant number of researchers, past and present, have invested vast amounts of time providing expert identifications for specimens that are currently housed at AMNH, BBSL, BMEC, CSUC, KSEM, LACM, UCMC, and UCRC. These include: Alexander, Ascher, Baker, Bohart, Bouseman, Broemeling, Brooks, Byron, Cockerell, Crawford, Daly, Donovan, Eickwort, Franklin, Frison, Gibbs, Gonzalez, Griswold, Hurd, LaBerge, Lanham, Linsley, McGinley, Metz, Michener, Miller, Milliron, Mitchell, Ordway, Ribble, Rightmyer, Roberts, Rodeck, Rozen, Rust, Sandhouse, Schwarz, Shinn, Sipes, Snelling, Stage, Stephen, Thorp, Timberlake, White, and Yanega.

Current and Future Research

Given the number of native bee species and the extent of previous historical surveys, Colorado provides an opportunity to compare past and present bee diversity and to address conservation issues such as pollinator declines, effects of urban fragmentation, changes in land use, and impacts of introduced exotic or invasive species (National Resource Council 2007). Recent studies have used bee communities to explore the effects of urbanization and urban fragmentation on species diversity and on the availability of different floral resources within these fragmented communities (Hinners 2008; Hinners and Hjelmroos-Koski 2009; Kearns and Oliveras 2009a, 2009b).

The range of elevations and climatic zones present in Colorado and the existence of high-quality baseline data from montane sites like the Rocky Mountain Biological Laboratory near Gothic (Gunnison County) and the University of Colorado Mountain Research Station (Boulder County) make Colorado a particularly good place to investigate the impacts of climate and climate change on the phenology and distribution of bees, including elevational shifts of bee species in association with their host plants (Aldridge et al. 2011; Inouye 2008; Miller-Rushing and Inouye 2009).

Additional targeted studies are still needed to fill gaps in our knowledge of Colorado's bee fauna. These should focus on surveying areas, seasons, and plants that have not been well sampled (see below), in addition to longitudinal studies of the relatively few well-sampled areas, including Boulder.

Now that basic qualitative data have been assembled documenting Colorado bee species and their distributions within the state, specimen databasing is needed to serve as the basis for quantitative assessments of the bee fauna. In particular, digitized, georeferenced specimen records can reveal changes in the distribution, abundance, and phenology of bee species in response to climate change,

land development, and other factors. A collaborative bee databasing effort is currently being undertaken at several larger collections which are providing primary data for this study. Additional databasing efforts have recently been initiated at additional collections with significant holdings from sites where extremely valuable historical samples have been obtained, such as RMBL.

Importance of Voucher Specimens

Although generic-level identification of bees in North America is now fairly straightforward (Michener 2007; Michener et al. 1994; Stephen et al. 1969), species-level identifications are frequently difficult. While the eastern U.S. has long benefited from a species-level monograph that included all the regional species known at the time (Mitchell 1960, 1962), no such work has ever been produced for Colorado or elsewhere in the western U.S. Online dynamic identification keys are now being developed (e.g., at www.discoverlife.org), but much revisionary work, including description of numerous undescribed species, is necessary before these can facilitate identification of all Colorado bee species.

In order for taxonomists to make accurate species-level identifications on bees, it is essential to collect specimens. Species-level characters are often obscure or hidden, and genitalic dissections are sometimes necessary for accurate species identifications. Due to the diversity of bees in Colorado and the lack of a single identification guide, one must dig through literature (often quite old) and directly compare specimens to expertly identified material of many candidate species. Study of holotypes may be required.

Well-curated voucher specimens allow for accurate species-level identifications at the time of study and permit future researchers to recheck specimen identifications from earlier published studies. Critical scrutiny of historical material was crucial in compiling the Colorado Bee List, for without reference to specimens, many of Cockerell's early records could not have been verified or corrected. Restudy of voucher specimens is particularly important when resurveying historical sites since there have been extensive changes in taxonomic status, synonymy, and nomenclature over the last century. With this in mind, researchers need to be aware that the names cited in classic publications like Cockerell (1906c, 1907b, 1930) cannot be assumed to be correct. Vouchers also document associations between bees and flowers, accidental occurrences and introductions, and preserve DNA that is useful for discovering and identifying cryptic species (Gibbs 2009a, 2009b, 2010; Goldstein 2004).

We emphasize the need to collect and voucher specimens for *all* studies of Colorado bees, whether they are focused on systematics, diversity, pollination, ecology, or behavior (Goldstein 2004; Krell 2004). When collecting vouchers, it is important that the specimens are accompanied by complete collection data. Ideally, these data should include: country, state, county, a locality name, georeferenced coordinates (e.g., latitude and longitude with documentation of method used to obtain these and an accuracy measurement), elevation, host plant or trap type if relevant, date collected, time of day (especially if notably early or late), and the collector(s) name(s). Specimen preparation techniques should be considered with care (Ebmer 2010) and discussed prior to specimen collection with the staff of the museum where the specimens will be deposited and housed in perpetuity.

Colorado Bee Diversity

The 946 bee species documented in Colorado total more than one-quarter of the approximately 3,500 species found in America north of Mexico (Ascher and Pickering 2011, Hurd 1979). The high species diversity of bees in Colorado is due, at least in part, to the diversity of habitats and regional climes within the state that are associated with changes in elevation, longitude, and latitude. Elevation in Colorado ranges from 1,012 m (3,320 ft.) in Yuma County where the Arikaree River crosses into Kansas to 4,399 m (14,433 ft.) in Lake County at the top of Mount Elbert. This elevational change gives rise to a variety of life zones including prairie, arid steppe, montane, subalpine, and alpine environments. Colorado is positioned on the western edge of the Great Plains where it hosts many species associated with prairies, such as *Bombus fraternus* (Smith). Colorado's northern Front Range supports disjunct populations of bee species and their host plants in relictual habitats typically found in the eastern U.S., such as *Andrena violae* Robertson and, historically at least, *Macropis nuda* (Provancher). The Rocky Mountains, traversing central Colorado, support boreal species, while the Four Corners area of southwestern Colorado supports species characteristic of the arid Southwest. The state's floristic diversity, including approximately 3,000 species of vascular plants (Weber and Wittmann 2000), supports the rich diversity of bees in Colorado.

Colorado's diverse bee fauna is expressed in a rich array of morphologies and behaviors. Colorado bees range in size from the tiny *Perdita salicis* Cockerell (3.5 mm) to the large queens of *Bombus nevadensis* Cresson (26.5 mm). While many bees are hairy, some species, such as those in the genera *Hylaeus* and *Nomada*, are relatively bald and wasp-like. Colorado hosts a colorful bee fauna that includes species that are red, orange, yellow, green, blue, brown, and/or black (Plate 1). Colorado bees also have varied life histories, differing in their levels of sociality, nesting habits, and floral associations (see below and the Table of Natural History Traits, page 78).

Bee Species Diversity in Comparison to Other States

Colorado bee species diversity can be considered very high or only moderately high depending on which states or areas are chosen for comparison. The totals given here for described species recorded from various areas, including states, are derived from source files for Ascher and Pickering (2011), which include unpublished records from BBSL and other specimens identified by TG and recorded in his specimen and state record databases.

Colorado has considerably more documented bee species (946) than the whole eastern U.S. combined as defined by Mitchell (1960, 1962) where only 803 species are known. Of these, at least 279 are shared with Colorado. The species total for Colorado is far higher than the 531 species known for North Carolina, the eastern U.S. state with the greatest known species diversity. Other well-surveyed eastern states have known bee faunas that are less than half as speciose as Colorado's fauna, e.g., 446 species for New York State (updated from Giles and Ascher 2006) and 391 species for Wisconsin (updated from Wolf and Ascher 2009).

On the other hand, the Colorado bee fauna is far less rich than that of California, which has an incredibly diverse bee fauna of 1,651 described species, hundreds more than any other U.S. state (Moldenke and Neff 1974 catalogued the California bee fauna with reference to pollination and ecological research). The only other U.S. states with bee species diversity exceeding that of

Colorado are the remaining Four Corners states. New Mexico, just south of Colorado, has 991 species (including unpublished records from L.L. Larkin and from K.R. Wetherill). Utah, to the west, has at least 979 species (a conservative total based in large part on records from TG). Arizona, located southwest of Colorado, has 1182 species. All four of these western states with species lists exceeding that of Colorado, and two other exceptionally diverse states, Nevada (874 species, including those found in surveys of Clark County by TG and others at BBSL) and Texas (842 species, including records from J.L. Neff), have areas of hot, creosote bush desert teaming with associated desert bee species, whereas these are lacking in Colorado.

Wyoming, Colorado's neighbor to the north, has 552 species (including records from Lavigne and Tepedino 1976). This is far fewer than Colorado and due to genuine factors, such as fewer xeric-associated and eastern relictual species in the fauna, and to less thorough collecting and subsequent taxonomic study. Nebraska (439 species), Colorado's northeastern neighbor, and Kansas (398 species), Colorado's eastern neighbor, have far fewer recorded bee species than Colorado. This is surely the result of their relative lack of topographic and climatic diversity. A paltry 222 species are recorded from Colorado's southeastern neighbor, Oklahoma, due largely to insufficient collecting, particularly in the western panhandle.

Collecting Biases and Areas for Future Study

Although bee research and collecting in Colorado extends over the past 100 years, bees have not been sampled uniformly across the state. As a result, the number of bee species per county (Figure 2) reflects both true bee diversity patterns and collecting effort. Boulder County (552 species in an area of 751 of square miles) has the highest documented bee diversity in Colorado, undoubtedly reflecting both the rich diversity of habitats across the 2,844 m (9,330 ft.) elevational range and the great diversity of flowering plants which number approximately 1600 species in the northern Front Range (Weber 1976). Larimer County (437 species) has the second highest number of recorded bee species. It should be noted, however, that Boulder and Larimer Counties are home to Colorado's two main university insect collections (UCMC and CSUC respectively) and the entomologists who built those collections. Thus, the recorded high species diversity in these two contiguous counties surely results from a combination of genuinely high bee diversity coupled with high sampling effort. El Paso County (251 species) touts the third highest number of recorded bee species, in part because the Cockerells spent much time collecting there and in neighboring Teller County (193 species). As with Boulder and Larimer Counties, El Paso County ranges from lower elevation grasslands at approximately 1,555 m (5,100 ft.) to alpine habitats at the top of Pikes Peak at 4,300 m (14,110 ft.) and therefore would be expected to contain a high diversity of bee species. Mesa County (214 species) in western Colorado and Jefferson County (210 species) located just south of Boulder County have the fourth and fifth highest documented bee faunas, respectively.

While certain areas of the state have been heavily collected, other areas are woefully undersampled such that their inventories do not represent the actual bee diversity. We still have much to learn about the bees in Washington (5 species), Cheyenne (11 species), Phillips (11 species), San Juan (15 species), and Lincoln (22 species) Counties. Broomfield County (0 confirmed species), which consists of only the city of Broomfield, was created in 2001 when it was carved from the four surrounding counties (City and County of Broomfield accessed 2009). Historically, Broomfield has not been well collected and is not well represented in either UCMC or CSUC.

Of the 18 counties documented to have fewer than 50 species, over two-thirds are located on Colorado's Eastern Plains. These heavily agricultural, uninterestingly flat, windswept, and unpopulated counties are an unpredictable and seemingly uninviting place for collecting expeditions. These counties, however, hold great potential for documenting new state records of Great Plains species, particularly along the major riverways (e.g., the South Platte, Republican, Arikaree, and Arkansas Rivers) and in the two National Grasslands (Comanche and Pawnee). These areas should be surveyed to obtain baseline data that do not yet exist in collections.

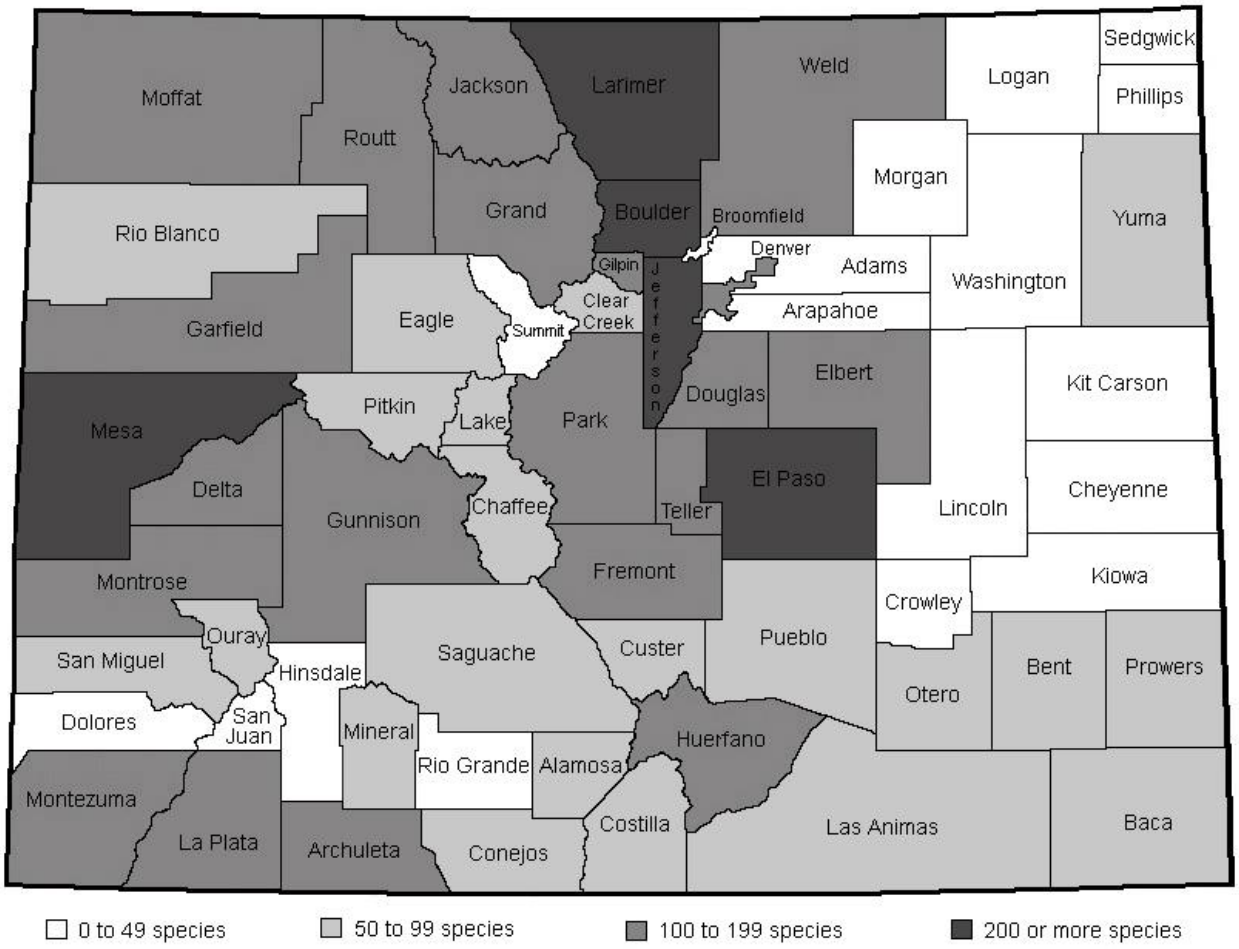

Figure 2. Number of documented bee species per Colorado County.

The Four Corners region of Colorado and, more generally, Colorado's southwestern counties that border on Utah and New Mexico are distant from population centers and relatively understudied. These areas hold particular promise for the discovery of the many desert-associated species that are known from southeastern Utah and northern New Mexico but have not yet been reported from Colorado.

Temporal biases also exist among documented Colorado bee records. Although bees fly in Colorado from late March through mid-October, most of the bee surveys and collecting efforts have occurred from late May through mid-August (based on museum specimens). This temporal collecting bias can be attributed, in part, to the academic schedules of universities. Given this temporal sampling bias, spring and fall species are undersampled and require further study across Colorado, particularly in areas far from the northern Front Range.

Floristic resources play an additional role in the bee collecting equation. Bee species that forage on abundant, showy, and easily accessible flowers (e.g., *Helianthus* in the Asteraceae or *Rosa* and *Prunus* in the Rosaceae) appear to be collected more frequently than bee species that restrict their pollen foraging to plants that are uncommon (e.g., *Lysimachia* in the Myrsinaceae), bear inconspicuous flowers (e.g., *Croton* in the Euphorbiaceae and *Heuchera* in the Saxifragaceae), grow in inaccessible places (e.g., *Fendlera* in the Hydrangeaceae), or are at the edges of their range (e.g., *Prosopis* in the Fabaceae). Bee biologists should seek out these less obvious plants in order to better understand the bee fauna of Colorado.

Native vs. Introduced Species

While the vast majority of Colorado's bee fauna is native to the state, eight species are introductions from other parts of the world. The honey bee, *Apis mellifera* (L.), was intentionally introduced to North America in the 1600s (Strickler and Cane 2003). Six non-native Colorado bee species were accidentally introduced into North America from other parts of the world (Strickler and Cane 2003). In the 1900s, *Hylaeus leptocephalus* (Morawitz), *Megachile rotundata* (Fabricius), and M. *concinna* Smith became established in Colorado. *M. rotundata*, the alfalfa leafcutting bee, has since been managed for alfalfa pollination. Three additional species became established in Colorado during the 2000s. *Anthidium manicatum* (Linnaeus) was reported by Gibbs and Sheffield (2009), and *A. oblongatum* (Illiger) and *Hylaeus punctatus* (Brullé) are reported here. The recent arrival of the large carpenter bee, *Xylocopa virginica* (L.), in Colorado's Front Range is likely due to an accidental importation from the eastern U.S.

Other bee species recently introduced to North America may also be heading to Colorado. One might expect non-native species to appear first in larger cities, college towns with itinerant populations, or near tourist destinations, making Colorado's Front Range a likely place to find these species. There are two cavity nesting species that have the potential to arrive in Colorado in the very near future. The Palearctic *Hylaeus* (*Spatulariella*) *hyalinatus* Smith was first discovered in North America in New York State (Ascher 2001; Matteson et al. 2008) and has recently been found as far west as Illinois (Tonietto and Ascher 2009). The Asian *Megachile* (*Callomegachile*) *sculpturalis* Smith was first reported in North America in North Carolina (Mangum and Brooks 1997) and has spread northwest to Lawrence, Kansas (Mangum and Sumner 2003; Hinojosa-Díaz 2008) and eastern Nebraska (http://bugguide.net/node/view/422451/bgimage).

Bee Biology

To increase the utility of this publication, we place the diversity of Colorado bees into a broader context by summarizing some of their life history traits. This life history information has been compiled from both general references (Hurd 1979; Krombein 1967; Michener 2000, 2007; Stephen et al. 1969) and specific references (see references listed under each genus in the Colorado Bee List). The life history characteristics that we include here are: 1) levels of sociality, 2) nesting biology, and 3) floral associations. These characteristics are discussed below and summarized by genera in the Table of Natural History Traits (page 78).

Life Cycle of a Bee

During their development, bees undergo **complete metamorphosis** (akin to butterflies) comprised of four primary stages: egg, larva, pupa, and adult. While bees are usually collected as adults and identified by this life stage, most species spend the majority of their life cycle as immatures. Many, if not most, species overwinter as post-defecating (mature or last stage) larvae within nest cells, except species that emerge early in spring, which overwinter as adults. Bees that overwinter as mature larvae may persist in this stage for multiple years until favorably timed rainfall triggers emergence (Danforth 1999).

Bees are **haplodiploid**, a characteristic that is shared by all members of the order Hymenoptera (Cook 1993; Michener 2007). Haplodiploidy means that the sex of an individual is determined by the number of different alleles at the sex determining locus that it inherits. A heterozygous diploid offspring that develops from a fertilized egg is female, whereas a hemizygous haploid offspring that develops from an unfertilized egg is male. Since adult female bees store sperm after mating and can control which eggs they fertilize, they can determine the gender of their offspring. Rarely, an offspring will inherit two homologous alleles, resulting in a sterile homozygous diploid male in place of a female offspring. The deleterious implications of haplodiploidy and its potential for increased extinction rates in small or genetically poor populations have been emphasized by Zayed et al. (2004) and Zayed and Packer (2005), but additional studies are required to assess the importance of diploid males to the long-term preservation of small and/or isolated bee populations (Souza et al. 2010). Declining population size is a potentially severe problem for localized bee populations found in Colorado's northern Front Range, as the ever-growing development along the urban corridor north of Denver further isolates these from populations located on the eastern plains. Additionally, alpine species may be vulnerable as climate change shrinks their "island" habitat and the synchrony of life cycles of bees and their flowers is disrupted (Inouye and Barr 2006).

Male bees are often short-lived, being most active prior to and during the period when receptive females emerge from hibernation and initiate nests (Eickwort and Ginsberg 1980). Female bees, on the other hand, live longer and, in the case of non-parasitic species, continue to gather food and nesting material to provision reproductive cells for their young. Given their differing roles, it is not surprising that male and female bees are **sexually dimorphic** (i.e., male and female bees within a species look different from one another). Females have morphological adaptations designed to collect pollen and nesting materials and to carry these resources back to their nests (Wcislo and Cane 1996). Female adaptations include pollen-collecting and grooming structures (e.g., hairs, combs, and pollen baskets) and enlarged or elongated mouthparts (Krenn et al. 2005; Michener 2007; Thorp 1979). Males tend to be smaller than their female counterparts and may have modifications for mate acquisition, such as enlarged forelegs (as in many *Megachile*), enlarged eyes, elongate antennae, and elaborate genitalia and associated apical sternites. Some species have organs associated with pheromone production (Menzel et al. 1991; Minckley 1994). Bees are sexually dimorphic to the extent that identifications for each gender are usually based on different characters and even character states, effectively doubling the 946 bee species in Colorado to 1,892 diagnosable adult forms.

One of the most noteworthy differences between male and female bees is that only females can **sting** because the sting is derived from the ovipositor, an egg laying structure not present in males. Bees sting to deter potential predators, nest intruders, and, particularly in the case of eusocial bees, to protect resources stored in their nests from attack by vertebrates. Most bees, like wasps, can

sting repeatedly. Honey bee workers, however, can only sting once because, unlike other bees, they have barbed stings that are designed to become embedded in their victims. When the stinging honey bee worker is pulled off or wiped away, the venom sac is ripped from the bee's body and continues to pump venom. The worker honey bee is fatally injured, and the honey bee dies within minutes.

The **lifespan** and flight season of an adult bee depends on the species, gender, and, in some instances, caste. Queen honey bees live the longest, sometimes over six years, while honey bee workers may only live for three to six weeks during spring and summer or about four months during the winter (Page and Peng 2001). It is difficult to generalize the flight season of Colorado bee species as these may last anywhere from a few weeks to a couple of months or more (especially in the case of long-lived subsocial Xylocopinae). Some species, especially those occurring at higher elevations where the flowering season is short, have a single flight period (i.e. are **univoltine**). These may be adults for only a few weeks. In warmer areas and at lower elevations, a portion of the native bee fauna may have two successive generations (i.e. are **bivoltine**) or multiple generations (i.e. are **multivoltine**) throughout the favorable nesting season. In some bees, including some species of *Osmia* found at higher elevations in Colorado, a portion of the offspring are univoltine while others emerge after two or more years of development, a condition termed **parsivoltine (**Torchio and Tepedino 1982).

Solitary, Social, and Parasitic Bees

Social behavior of bee species ranges from solitary to highly eusocial (Michener 1974, 2007; Zablotny 2003) with only the minority of species exhibiting eusocial behavior. Despite the misnomer that all bees live in hives, most are solitary and about 15% of bees are parasitic. In fact, the number of species known or inferred to be parasitic, more than 2,600 worldwide (Ascher and Pickering 2011), outnumber the species documented to be eusocial, which include 700 eusocial corbiculates worldwide (Ascher and Pickering 2011), an unknown but potentially large number of primitively eusocial Halictinae, and a smaller number belonging to other groups such as Allodapini.

Solitary bees make up most of the world's bee diversity, and Colorado species are no exception. In solitary bees, interactions between adults are limited to mating and competition for resources such as pollen, nectar, and nesting sites. Female solitary bees individually construct nests, provision cells for their offspring, and lay eggs, but they are not present during the development and emergence of their offspring. Some solitary bees will aggregate by digging burrows in close proximity to each other (sometimes by the thousands), but each female constructs and provisions her own nest. Examples of solitary bees amongst the Colorado bee fauna include, but are not limited to, all Colletidae, most Andrenidae (Custer 1929a; Rozen 1989b), most Megachilidae (Custer and Hicks 1927), some Halictidae, and many Apidae.

Subsocial bees build nests and provision cells for their young, as do solitary bees, but they also provide limited parental care, as the mother bees coexist in nests with their offspring and can therefore offer protection or food. This behavior is best known in Xylocopinae, represented in North America (including Colorado) by the carpenter bees, *Xylocopa* and *Ceratina*.

Parasocial bees live in small colonies or groupings of individual bees that consist of adults of a single generation provisioning cells for offspring. Within parasocial species there are three distinct

categories. Female bees of **communal** species or populations use the same nest, but each bee makes and provisions her own cells and lays her own eggs (Rozen 1973, 1984; Wcislo and Tierney 2009). In **quasi-social** bees, all females occupying the same nest have functioning ovaries, mate, lay eggs, and cooperatively provision the cells. In **semi-social** bees, there is a distinct division of labor in which some female bees make up the working caste that provisions cells for offspring, while others form the reproductive egg-laying caste. Most bee species that display communal, quasi-social and semi-social behavior do so facultatively, and their levels of social organization may change depending on environmental conditions or stages of colony development (Michener 1974, 2007; Soucy and Danforth 2001). Examples of parasocial bees amongst the Colorado fauna include communal halictids such as *Agapostemon*, communal apids such as *Exomalopsis*, and the communal andrenid *Macrotera opuntiae* (Cockerell) (Bennett and Breed 1985; Custer 1928c, 1929b; all as *Perdita opuntiae* Cockerell).

Eusocial bees demonstrate cooperative brood care, have distinct reproductive and worker castes, and produce overlapping generations that maintain and provision the colony. **Primitively eusocial** bees (those with annual colony cycles) that are native to Colorado include many sweat bees such as *Halictus* and metallic *Lasioglossum* (*Dialictus*) and pollen-collecting bumble bees, (*Bombus*, excluding species of the subgenus *Psithyrus*). The eusocial status of certain sweat bees is not entirely clear, as in the case of many non-metallic *Lasioglossum* (*Dialictus*) for which we lack behavioral data. Most metallic species in this subgenus have not been studied but are inferred to be eusocial based on knowledge of related species (Brady et al. 2006; Danforth et al. 2003). Furthermore, certain Colorado species are known to be socially polymorphic. Species such as *Halictus rubicundus* (Christ) may have solitary populations in cold, montane areas, but eusocial populations at warmer, lower elevation sites where more favorable climate permits a longer flight period (Soucy and Danforth 2001), so eusociality cannot always be considered a fixed character of a species (Wcislo 2005). The only **advanced eusocial** bee with perennial colonies found in Colorado is the introduced Western Honey Bee, *Apis mellifera* L.

Cleptoparasitic (cuckoo) bees are species that exploit nests and floral resources gathered by other bee species. Female cleptoparasitic bees spend their time locating nests of host bees rather than constructing their own nests and provisioning their own cells. Host-cleptoparasite relationships are usually very specific since cleptoparasites lay their eggs only in reproductive cells provisioned by particular host bee taxa. The eggs of nomadine species that are layed in cells still being provisioned by the host female often have extraordinary modifications for concealment in the cell wall so as to avoid detection by the returning host bee (Rozen 2003). The young larvae of many cleptoparasitic species are armed with a large, sclerotized head and long, curved mandibles used to destroy the host egg (or larva). Later instars with normal heads and mandibles feed on the provisions originally stored in the cell by the host female for her larva (Baker 1971; Rozen 1989a; Rozen and Favreau 1967, 1968). Cleptoparasitic bees in Colorado include *Sphecodes*, *Stelis* (Hicks 1926, 1927b), *Dioxys*, *Coelioxys* (Baker 1971; Hicks 1926), Nomadinae including *Nomada* and *Triepeolus* (Custer 1928a, 1929b), and Melectini including *Xeromelecta* (Hicks 1926, cited as *Pseudomelecta miranda* Fox).

Socially parasitic bees are also known as inquilines. In these species, a female social parasite enters an established colony of a host bee and lays her own eggs, which are then reared by the host colony's workers. Inquilines have no worker caste. In Colorado, three bumble bee species of the obligately parasitic subgenus *Bombus* (*Psithyrus*) are social parasites in nests of other pollen-collecting *Bombus* species. Additional social parasites in Colorado likely include some species of

Sphecodes and at least two *Lasioglossum* (*Dialictus*) formerly classified in the genus (or subgenus) *Paralictus* (Wcislo 1997). The exact nature of parasitism of Colorado halictine species is not entirely clear due to lack of detailed (or any) life history studies for most species.

Nesting Biology

Adult non-parasitic female bees spend most of their time constructing and provisioning nests to rear offspring. Nesting locations, architecture, and materials are usually species-specific and vary widely across bee taxa (Cane et al. 2007; Michener 2007; O'Toole and Raw 1991; Stephen et al. 1969). Some bees, primarily megachilids, carry building materials to the nest for its construction, including mud, rocks, pebbles, leaves, flower petals, resins, and other plant materials (Custer and Hicks 1927). In addition, honey bees use wax produced by the worker bees to build cells, while some bee species use glandular secretions to build or line their cells. These secretions are thought to prevent desiccation, provide water resistance, and inhibit mold growth (Goettler et al. 2007; Messer 1985). Within a nest, bees usually create separate reproductive cells, each containing enough provisions to produce one offspring from a single egg (Custer 1928a). Rarely, as in *Lithurgus*, multiple eggs are laid within a single provision mass. In some species, after the egg is laid and the provisioned cell is sealed, the female may move to a new location to create her next cell. In other species, females add materials to their nests to create partitions between brood cells in close proximity to each other (O'Toole and Raw 1991; Stephen et al. 1969). Nests can be constructed in a variety of locations, either in pre-existing cavities or areas excavated by the female bee.

Many solitary and social bee species are **ground nesters**. In the majority of ground-nesting species, females dig their own nesting burrows into the soil. In other species, females build nests within preexisting (abandoned) tunnels or cracks. In the case of bumble bees (*Bombus*), new queens often establish colonies in abandoned rodent burrows. Ground-nesting bees in Colorado include all *Colletes*, andrenids and melittids, most halictids and apids, and some megachilids. Many ground-nesting species prefer easily worked soil or sand (with varying amounts of vegetation). One Colorado andrenid is celebrated as "the bee that works in stone" for its ability to excavate communal nests in sandstone (Bennett and Breed 1985; Custer 1928c, 1929b; all as *Perdita opuntiae* Cockerell).

A minority of bee species are **cavity nesters**. These usually nest above ground in places such as the void of a pithy-stemmed twig or in abandoned beetle burrows within a standing tree or fallen log. Some species will even reuse cells in abandoned wasp nests. Many, including the managed blue orchard mason bee, *Osmia lignaria* Say, accept artificial nesting blocks. Other species actively dig their own burrows into a variety of woody substrates. The distinction between cavity-nesting and ground-nesting bees is not always clear, however, as some cavity-nesting species use pre-existing cavities within the ground including abandoned burrows of ground-nesting bees (Barrows 1975; Cane et al. 2007; Scott 1993). Cavity-nesting bees in Colorado include *Hylaeus*, many megachilids (Custer and Hicks 1927), and xylocopines.

A few solitary bees in Colorado, including species of *Dianthidium* and *Anthidiellum*, build **free-standing nests** of mud or resins and pebbles (Custer and Hicks 1927; Grigarick and Stange 1968; Hicks 1926). These are usually attached to a rock or twig.

Floral Associations

Nearly all bees share several derived characteristics that facilitate their life-style as obligate flower visitors. These characteristics include branched or plumose hairs and an expanded hind basitarsus (Michener 2007). In addition, the larvae of all Colorado bee species rely on diets consisting of pollen and nectar (sometimes supplemented with floral oils). While both adult male and female bees forage at flowers for nectar to nourish themselves, females of non-parasitic species also forage at flowers to collect pollen (protein source) and nectar (sugar source) to provision their brood cells. Some bee genera such as *Macropis* also use floral oils as a food source and for lining nests (Cane et al. 1983; Rozen and Jacobson 1980).

Many bee species, including nearly all eusocial species, are **polylectic**; they collect pollen from a wide variety of plant species in many plant families. These polylectic species are not tied directly to the life cycle of a particular plant taxon, so these bees and their colonies tend to be relatively long-lived, active throughout the flowering season, and broadly distributed. Within a polylectic species, individual bees may show flower constancy to some extent by collecting pollen primarily from flowers of a single species. This constancy may be modified over time through experience or changing floral composition, but, across localities, seasons, and individuals, a polylectic species will use a variety of plant species as pollen hosts (Cane and Sipes 2006; Eickwort and Ginsberg 1980; Michener 1974, 2007). Colorado's polylectic bees include most non-parasitic Halictinae, Xylocopinae, *Bombus*, and *Apis*.

Many solitary bee species restrict their pollen collecting in some fashion. Cane and Sipes (2006) coined the term **mesolectic** for bees that restrict pollen collecting to a few plant families (or tribes in the case of larger plant families such as Asteraceae). Some species that fall into this category were previously referred to as "broadly oligolectic" or "narrowly polylectic". Colorado examples include *Caupolicana*, many *Andrena*, many megachilids, and many apids.

Species that collect pollen from a single plant taxon, usually a genus, but not a single species (Cane and Sipes 2006) are termed **oligolectic**. Colorado examples include most Rophitinae, Panurginae, and Emphorini, and many *Andrena* and Osmiini. Specific examples include *Colletes andrewsi* Cockerell on *Heuchera* (Saxifragaceae), *Dufourea maura* (Cresson) on *Campanula* (Campanulaceae), *Dufourea marginata* (Cresson), *Perdita albipennis* Cresson, and *Diadasia enavata* (Cresson) on *Helianthus* (Asteraceae), *Andrena cragini* Robertson on *Amorpha* (Fabaceae), *Andrena violae* Robertson on *Viola* (Violaceae), *Andrena vulpicolor* Cockerell on *Chrysothamnus* (Asteraceae), *Andrena astragali* Cockerell on *Zigadenus* (Liliaceae), *Andrena anograe* Cockerell on *Oenothera* (Onagraceae), *Perdita xanthochroa* Timberlake, *Calliopsis subalpina* Cockerell, and *Diadasia diminuta* (Cresson) on *Sphaeralcea* (Malvaceae), *Andrena andrenoides* (Cresson) and *Perdita salicis* Cockerell on *Salix* (Salicaceae), *Andrena prima* Casad on *Lesquerella* (Brassicaceae), *Perdita mentzeliae* Cockerell on *Mentzelia* (Loasaceae), *Perdita crotonis* Cockerell on *Croton* (Euphorbiaceae), *Macropis nuda* (Provancher) on *Lysimachia* (Myrsinaceae), multiple species of *Atoposmia* (*Atoposmia*) on *Penstemon* (Plantaginaceae), *Osmia pikei* Cockerell on *Ribes* (Grossulariaceae), *Osmia sculleni* Sandhouse on *Hackelia* (Boraginaceae), and *Macrotera opuntiae* (Cockerell), *Lithurgus apicalis* Cresson, *Diadasia australis* (Cresson), *and D. rinconis* Cockerell on *Opuntia* (Cactaceae).

Those species for which all individuals across their range collect pollen from only one species of plant are termed **monolectic**. These bee species are tied to the flowering period of a single host plant species, so they tend to be short lived and restricted in their distribution (Cane and Sipes 2006). There are no monolectic bees documented from Colorado.

The Colorado Bee List

Colletidae

Diphaglossinae

Caupolicanini

***Caupolicana* (References: Michener 1966; Michener and Deyrup 2004; Vergara and Michener 2004)**

(*ocellata* group) [= Subgenus *Caupolicana*, in part]

ocellata Michener, 1966 – Bent County. This is new for Colorado based on two male specimens housed at CSUC.

Colletinae

***Colletes* (References: Stephen 1954; Timberlake 1943b, 1951)**

(*aestivalis* group)

andrewsi Cockerell, 1906 – Boulder and Larimer Counties.

(*americanus* group)

aberrans Cockerell, 1897 – Bent and Weld Counties.

albescens Cresson, 1868 – Alamosa and Costilla Counties plus Great Sand Dunes National Monument and Preserve.

aff. *annae* Cockerell, 1897 – Alamosa County. This is new for Colorado based on one male and one female specimen housed at CSUC collected from the Alamosa County portion of Great Sand Dunes National Monument on September 1-2, 1978 and determined by TG.

gypsicolens Cockerell, 1897 – Alamosa, Huerfano, and Mesa Counties plus Great Sand Dunes National Monument and Preserve.

laticinctus Timberlake, 1951 – Boulder County.

mandibularis Smith, 1853 – Boulder, Otero, Prowers, and Weld Counties.

susannae Swenk, 1925 – El Paso and Larimer Counties.

(*ciliatus* group)

ciliatus Patton, 1879 – Yuma County.

(*compactus* group)

compactus Cresson, 1868 – See subspecies.

compactus hesperius Swenk, 1906 – Costilla, Douglas, Jefferson, Larimer, and San Miguel Counties.

(*consors* group)

consors Cresson, 1868 – See subspecies.

consors consors Cresson, 1868 – Boulder, Custer, Gilpin, Gunnison, Huerfano, Jefferson, and Larimer Counties.

nigrifrons Titus, 1900 – Boulder, Chaffee, Gilpin, Gunnison, Jefferson, Lake, Larimer, Mineral, Ouray, Park, Routt, and Teller Counties.

paniscus Viereck, 1903 [“1902”] – See subspecies.

paniscus paniscus Viereck, 1903 [“1902”] – Boulder, Clear Creek, El Paso, Elbert, Garfield, Gilpin, Grand, Gunnison, Huerfano, Jackson, La Plata, Lake, Larimer, Montezuma, Park, Rio Grande, and Teller Counties.

scopiventer Swenk, 1908 – Colorado.

wickhami Timberlake, 1943 – El Paso County.

(*daleae* group)

petalostemonis Swenk, 1906 – Bent, Boulder, El Paso, and Larimer Counties.

(*hyalinus* group)

hyalinus Provancher, 1888 – See subspecies.

hyalinus hyalinus Provancher, 1888 – Adams, Boulder, Eagle, Gilpin, Lake, Larimer, Mineral, Pitkin, and Weld Counties.

lutzi Timberlake, 1943 – See subspecies.

lutzi lutzi Timberlake, 1943 – Alamosa, Conejos, Costilla, Delta, Garfield, Jackson, Lake, Larimer, Mesa, Mineral, Moffat, Ouray, Pitkin, Pueblo, Teller, and Weld Counties plus Great Sand Dunes National Monument and Preserve.

phaceliae Cockerell, 1906 – Adams, Alamosa, Archuleta, Boulder, Delta, Denver, Gilpin, Grand, Gunnison, Jackson, Jefferson, Lake, Larimer, Logan, Mesa, Moffat, Montezuma, Montrose, Park, Pitkin, Routt, Teller, Weld, and Yuma Counties.

(*intermixtus* group)

intermixtus Swenk, 1905 – Mesa County.

(*latitarsis* group)

latitarsis Robertson, 1891 – Boulder, El Paso, Kiowa, Las Animas, and Yuma Counties.

(*nudus* group)

nudus Robertson, 1898 – Boulder and Denver Counties.

(*productus* group)

gilensis Cockerell, 1897 – Baca, Boulder, El Paso, Mesa, Otero, Park, Pueblo, and Weld Counties.

(*robertsonii* group)

metzi Timberlake, 1951 – Boulder County. This species is known only from Colorado. Timberlake (1951: 192) records the male AMNH holotype from the city of Boulder collected by Metz. He also lists a male paratype from Boulder collected on August 14, 1935 by C.D. Michener.

robertsonii Dalla Torre, 1896 – Boulder County.

timberlakei Stephen, 1954 – Boulder County.

(*simulans* group)

eulophi Robertson, 1891 – Boulder County.

fulgidus Swenk, 1904 – See subspecies.

fulgidus fulgidus Swenk, 1904 – Boulder, Garfield, Las Animas, Moffat, Ouray, Pitkin, Rio Blanco, and Routt Counties.

kincaidii Cockerell, 1898 – Archuleta, Boulder, Chaffee, Costilla, Denver, Elbert, Garfield, Gilpin, Huerfano, Jackson, Jefferson, La Plata, Lake, Larimer, Mesa, Mineral, Moffat, Ouray, Park, Pitkin, Routt, San Miguel, and Teller Counties plus Rocky Mountain National Park.

rufocinctus Cockerell, 1929 – Jefferson and Larimer Counties.

simulans Cresson, 1868 – See subspecies. The species is also known from Alamosa, Costilla, and Denver Counties.

simulans nevadensis Swenk, 1908 – Garfield and Mesa Counties. This is new for Colorado based on a female specimen housed at UCMC collected at Colorado National Monument [lv or lw] Gl[ade] P[ar]k Jct. on August 29, 1962 from flowers of *Chrysothamnus* by McCoy and Miller and determined by TG.

simulans simulans Cresson, 1868 – Boulder, Chaffee, Garfield, Jefferson, Larimer, Mesa, Mineral, Moffat, San Miguel, Weld, and Yuma Counties plus the San Luis Valley.

slevini Cockerell, 1925 – Mesa County.

trigonatus Cockerell, 1933 – Larimer County. This species is poorly known and only from Colorado. Cockerell (1933a: 42-43) records the female type from Pingree Park on August 15, 1932 by H. James. Stephen (1954: 275-276) notes that the species is known only from the type.

aff. *wootoni* Cockerell, 1897 – Gunnison County. This is new for Colorado based on a female specimen housed at UCMC collected 7 miles southwest of Redstone, 7,200 ft. on August 1, 1982 from flowers of yellow *Melilotus* by U.N. Lanham and determined by TG.

(*willistoni* group)
brevicornis Robertson, 1897 – Boulder, El Paso, Fremont, and Larimer Counties.
willistoni Robertson, 1891 – Boulder, Delta, and Weld Counties.

Hylaeinae

Hylaeus **(References: Ascher 2001; Ascher et al. 2006; Cockerell and Sumner 1931; Dathe 1994; Matteson et al. 2008; Metz 1911; Roig-Alsina 2006; Scott 1994, 1996; Snelling 1966a, 1966b, 1966c, 1968, 1970, 1975, 1983b; Torchio 1984)**

(*Cephalylaeus*)
basalis (Smith, 1853) – Boulder, Conejos, Dolores, Garfield, Gilpin, Gunnison, Jackson, Jefferson, La Plata, Lake, Larimer, Ouray, Park, Pitkin, Routt, and Teller Counties.

(*Hylaeus*)
annulatus (Linnaeus, 1758) [= senior synonym of *Prosopis elliptica* Kirby; see Dathe (1994)] – Boulder, Chaffee, Delta, Dolores, Garfield, Gilpin, Gunnison, Jackson, Jefferson, La Plata, Lake, Larimer, Mesa, Moffat, Ouray, Park, Pitkin, Rio Grande, Routt, and Teller Counties.
conspicuus (Metz, 1911) – Garfield, Gunnison, Larimer, and Montrose Counties. Although the Larimer County record is quite far east for this species, the male CSUC specimen collected from Ft. Collins on July 4,1900 was confirmed by VLS and appears to be a valid record.
leptocephalus (Morawitz, 1871[“1870”]) [= senior synonym of *Hylaeus bisinuatus* Förster; see Westrich (1990: 662) and *Prosopis stevensi* Crawford; see Snelling (1975: 8)] – Adams, Boulder, Delta, Denver, El Paso, Garfield, Jefferson, Larimer, Phillips, Prowers, Pueblo, Weld, and Yuma Counties. This is an introduced species, having arrived in North America in the early 1900s (Snelling 1975: 8-9). Colorado specimens at UCMC and AMNH date back to specimens collected in Denver in 1915.
mesillae (Cockerell, 1896) – Alamosa, Boulder, Delta, Eagle, El Paso, Fremont, Garfield, Jefferson, Lake, Mesa, Rio Grande, Routt, Teller, and Yuma Counties. The following two subspecies both occur in Colorado (Hurd 1979: 1767; Snelling 1970: 14). Snelling (1970) refers to “intergrades” and “intermediate forms” of the subspecies with regards to Colorado specimens and VLS concurs. For this reason, county information is not provided here for the documented Colorado subspecies.
mesillae cressoni (Cockerell, 1907) – Colorado.
mesillae mesillae (Cockerell, 1896) – Colorado.
rudbeckiae (Cockerell and Casad, 1895) – Boulder, Delta, and Routt Counties.
verticalis (Cresson, 1869) – Boulder, Custer, Douglas, Jefferson, Larimer, Las Animas, Ouray, San Miguel, and Teller Counties.

(*Paraprosopis*)
(*megalotis* group)
megalotis (Swenk and Cockerell, 1910) – Alamosa and Moffat Counties.
(*wootoni* group)
coloradensis (Cockerell, 1896) – Boulder, Chaffee, Delta, Douglas, Elbert, Garfield, Gunnison, Jefferson, La Plata, Lake, Larimer, Montrose, Ouray, and Teller Counties.
personatellus (Cockerell, 1915) – Boulder, Grand, Gunnison, Larimer, Mesa, and Ouray Counties.
wootoni (Cockerell, 1896) – Alamosa, Boulder, Delta, Fremont, Jefferson, Larimer, Mesa, Montezuma, Ouray, Routt, and Teller Counties.
(unplaced to group)
seclusus Cockerell and Sumner, 1931 – Ouray County. This species is known only from Colorado. Cockerell and Sumner (1931: 12-13) list the male type from Ouray about 8,500 ft. on July 11-14, 1919 by F.E. Lutz. While Snelling (1966: 171) lists this species as a member of the subgenus *Paraprosopis*, it is not included in Snelling (1970).

(*Prosopis*)

affinis (Smith, 1853) – Adams, Bent, Boulder, Larimer, Weld, and Yuma Counties.

episcopalis (Cockerell, 1896) – See subspecies. This species also occurs in Douglas, Jefferson, Mesa, Pitkin, Routt, and Teller Counties.

episcopalis coquilletti (Cockerell, 1896) – Montrose County. This is new for Colorado based on two BBSL specimens: one collected 6 km north of Montrose and the other collected 7 km northeast of Montrose.

episcopalis episcopalis (Cockerell, 1896) – Archuleta, Boulder, Delta, Eagle, Fremont, Garfield, Gunnison, Hinsdale, La Plata, Larimer, Mineral, Montrose, and Park Counties.

modestus Say, 1837 – See subspecies.

modestus citrinifrons (Cockerell, 1896) – Archuleta, Boulder, Delta, Fremont, Gilpin, Jefferson, La Plata, Larimer, Moffat, Montrose, Pitkin, and Rio Grande Counties.

(*Spatulariella*)

punctatus (Brullé, 1832) – Boulder and Denver Counties. This is new for Colorado. This introduced Palearctic species was first documented in North America in 1981 in Los Angeles County, California (Snelling 1983b). It has subsequently been found further north in California (Ascher 2001), in the District of Columbia (Ascher et al. 2006), New York City (Matteson et al. 2008), and is widely established in Chile and Argentina (Matteson et al. 2008; Roig-Alsina 2006). It is now found in Colorado. The earliest known Colorado specimens (a series of males and females) were collected by C.Y. Scott from *Aegopodium podagraria 'variegatum'* in VLS's back yard in Longmont (Boulder County) in 2008 and again in 2009 and 2010 (both males and females as late as October 3rd). Additionally, a short series of photographs by Diane Wilson, best depicted by http://bugguide.net/node/view/337636, shows a mating pair of this species in Denver (Denver County) on September 25, 2009 on broccoli flowers. It would appear this species has become established in Colorado's Front Range in recent years and is either bivoltine or multivoltine.

Halictidae

Rophitinae

Rophitini

***Dufourea* (References: Bohart 1947, 1948, 1949)**

fimbriata (Cresson, 1878) – Boulder, Clear Creek, Conejos, Eagle, Grand, Gunnison, Lake, Larimer, Mesa, Ouray, Park, Rio Blanco, Rio Grande, Summit, and Teller Counties.

marginata (Cresson, 1878) – Boulder, Chaffee, Cheyenne, Conejos, Custer, Denver, El Paso, Fremont, Larimer, Las Animas, Lincoln, Logan, Morgan, Pueblo, Washington, Weld, and Yuma Counties.

maura (Cresson, 1878) – Boulder, Clear Creek, Conejos, Costilla, Custer, Eagle, El Paso, Gilpin, Gunnison, Jefferson, Larimer, Mineral, Montrose, Park, Rio Blanco, Routt, Summit, and Teller Counties.

oryx (Viereck, 1903["1902"]) – Costilla, Fremont, Las Animas, Pitkin, and Saguache Counties.

Nomiinae

***Dieunomia* (References: Blair 1935; Cross 1958)**

(*Dieunomia*)

apacha (Cresson, 1868) – Boulder and Weld Counties.

heteropoda (Say, 1824) – See subspecies.

heteropoda kirbii (Smith, 1865) – Alamosa, Baca, Bent, Crowley, El Paso, Kiowa, Larimer, Mesa, Morgan, Otero, Prowers, Saguache, Weld, and Yuma Counties plus Great Sand Dunes National Monument and Preserve.

mesillae Cockerell, 1899 – Baca, Bent, Boulder, Kiowa, Las Animas, Otero, and Prowers Counties.
xerophila Cockerell, 1899 – Crowley, Kiowa, Logan, Mesa, and Weld Counties.
(*Epinomia*)
nevadensis (Cresson, 1874) – See subspecies.
nevadensis bakeri (Cockerell, 1898) – Alamosa, Bent, Boulder, Clear Creek, Conejos, Crowley, Denver, El Paso, Fremont, Huerfano, Jefferson, Kit Carson, Larimer, Lincoln, Morgan, Otero, Prowers, Weld, and Yuma Counties.
triangulifera (Vachal, 1897) – Alamosa, Baca, Bent, Crowley, El Paso, Lincoln, Prowers, Saguache, and Weld Counties.
***Nomia* (References: Ribble 1965)**
(*Acunomia*)
foxii Dalla Torre, 1896 – Archuleta and Montezuma Counties.
melanderi Cockerell, 1906 – Delta, Eagle, Garfield, Mesa, Montezuma, Montrose, and Rio Blanco Counties.
nortoni Cresson, 1868 – Clear Creek, Custer, and Larimer Counties.
nortoni nortoni Cresson, 1868 – This is the expected subspecies for Colorado.
universitatis Cockerell, 1908 – Baca, Bent, Boulder, Denver, El Paso, Huerfano, Larimer, Las Animas, and Weld Counties.

Halictinae

Augochlorini

***Augochlorella* (References: Coelho 2004; Ordway 1966; Sandhouse 1937)**
(*aurata* group)
aurata (Smith, 1853) [= senior synonym of *Augochlora striata* Provancher; see Coelho (2004)] – Adams, Arapahoe, Archuleta, Baca, Bent, Boulder, Crowley, Denver, Douglas, El Paso, Elbert, Gunnison, Huerfano, Jefferson, La Plata, Larimer, Las Animas, Prowers, Pueblo, Summit, and Weld Counties.
***Augochloropsis* (References: Mitchell 1960; Moure and Hurd 1987; Sandhouse 1937)**
(*Paraugochloropsis*)
metallica (Fabricius, 1793) – Baca, Bent, Boulder, El Paso, Huerfano, Jefferson, Larimer, Mesa, Otero, Phillips, Weld, and Yuma Counties.
sumptuosa (Smith, 1853) – Bent, Boulder, Cheyenne, El Paso, Kiowa, Larimer, Morgan, Otero, Sedgwick, Weld, and Yuma Counties.

Halictini

Caenohalictina

***Agapostemon* (References: Janjic and Packer 2003; Roberts 1972)**
(*Agapostemon*)
(*splendens* group)
angelicus Cockerell, 1924 – Alamosa, Arapahoe, Archuleta, Baca, Bent, Boulder, Chaffee, Costilla, Crowley, Custer, Delta, Denver, Douglas, Eagle, El Paso, Elbert, Fremont, Gilpin, Grand, Gunnison, Huerfano, Kiowa, Kit Carson, La Plata, Larimer, Las Animas, Logan, Mesa, Mineral, Moffat, Montezuma, Otero, Ouray, Park, Prowers, Pueblo, Routt, Saguache, Sedgwick, Teller, Weld, and Yuma Counties.
femoratus Crawford, 1901 – Boulder, Conejos, Delta, Douglas, Eagle, El Paso, Elbert, Garfield, Larimer, Mesa, Moffat, Montrose, Rio Blanco, and Saguache Counties.
splendens (Lepeletier, 1841) – Alamosa, Boulder, El Paso, Larimer, Saguache, Weld, and Yuma Counties.
texanus Cresson, 1872 – Boulder, Chaffee, Conejos, El Paso, Elbert, Garfield, Gilpin, Gunnison, Jefferson, Larimer, Montezuma, Rio Blanco, Routt, Teller, and Weld Counties.
(*sericeus* group)
melliventris Cresson, 1874 – Bent, Boulder, Crowley, Delta, Mesa, and Otero Counties.

obliquus (Provancher, 1888) [= senior synonym of *Agapostemon cockerelli* Crawford; see Janjic and Packer (2003)] – Boulder, Elbert, Garfield, Grand, Huerfano, Kit Carson, Larimer, Mesa, Montrose, Otero, and Weld Counties.

sericeus (Forster, 1771) – Denver County. This is based on a single male specimen housed at UCMC identified by R. Roberts, but not mapped or noted in Roberts (1972).

(*tyleri* group)

coloradinus (Vachal, 1903) – Boulder, Crowley, Denver, El Paso, Elbert, Huerfano, Larimer, Las Animas, Logan, Mesa, Morgan, Saguache, Weld, Teller, and Yuma Counties.

(*virescens* group)

virescens (Fabricius, 1775) – Archuleta, Baca, Bent, Boulder, Crowley, Denver, Douglas, Eagle, El Paso, Elbert, Gunnison, Jackson, Jefferson, Larimer, Las Animas, Moffat, Montrose, Montezuma, Morgan, Otero, Prowers, Pueblo, Rio Blanco, Weld, and Yuma Counties.

Halictina

***Sphecodes* (References: Moure and Hurd 1987)** These are provisionally assigned to species groups corresponding to traditional subgeneric names as indicated, based on an infrageneric classification by M.S. Arduser (pers. comm.).

(*confertus* group) [= Subgenus *Drepanium*]

confertus Say, 1837 – Colorado.

(*dichrous* group: *dichrous* Subgroup) [= Subgenus *Austrosphecodes*, in part]

arvensiformis Cockerell, 1904 – Boulder and Montrose Counties plus the South Fork of the Rio Grande River.

dichrous Smith, 1853 – Boulder County.

(*dichrous* group: *prosphorus* Subgroup) [= Subgenus *Austrosphecodes*, in part]

millsi Cockerell, 1919 – Larimer County. This species is known only from Colorado. Cockerell (1919: 288) records the male type from the Longs Peak Inn on July 21 from an umbelliferous flower by Cockerell and notes that it is named after Enos Mills, the famous Rocky Mountain naturalist who owned the Longs Peak Inn.

pulsatillae Cockerell, 1906 – Boulder, Larimer, and Weld Counties.

sophiae Cockerell, 1898 – Teller County. Cockerell (1907b: 241) records this species from the city of Boulder. The only specimen at UCMC is from Florissant in Teller County. No Boulder or Boulder County specimens have been located as of this writing.

sulcatulus Cockerell, 1906 – Grand and Teller Counties.

(*mandibularis* group) [= Subgenus *Sphecodium*]

arroyanus Cockerell, 1904 – Colorado.

eustictus Cockerell, 1906 – Boulder, Larimer, Park, and Teller Counties.

fragariae Cockerell, 1903 – Teller County.

lautipennis Cockerell, 1908 – Colorado. This poorly known species belongs to the *davisii* subgroup along with *S. davisii* Robertson and *S. johnsonii* Lovell from eastern North America, and multiple western species. The remaining Colorado members of the *mandibularis* group belong to the *mandibularis* subgroup.

mandibularis Cresson, 1872 – Boulder, El Paso, and Saguache Counties.

nitidissimus Cockerell, 1910 – Routt County. This species is known only from Colorado. Cockerell (1910: 367) records the female type from Steamboat Springs on May 27.

pycnanthemi Robertson, 1897 – Colorado.

rohweri Cockerell, 1907 – Teller County.

(*ranunculi* group) [= Subgenus *Proteraner*]

pecosensis Cockerell, 1904 – See subspecies. This species also occurs in Boulder, Custer, and Fremont Counties.

pecosensis pecosensis Cockerell, 1904 – El Paso and Teller Counties.

rhois (Cockerell, 1904) – El Paso County.

***Halictus* (References: Pesenko 2004; Sandhouse 1941)**

(*Nealictus*)

farinosus Smith, 1853 – Conejos, Delta, Dolores, Eagle, Fremont, Huerfano, Mesa, Montezuma, and Montrose Counties.

parallelus Say, 1837 – Baca, Bent, Boulder, El Paso, Weld, and Yuma Counties.

(*Odontalictus*)

ligatus Say, 1837 – Adams, Arapahoe, Baca, Bent, Boulder, Chaffee, Crowley, Custer, Delta, Denver, Dolores, Douglas, El Paso, Elbert, Fremont, Garfield, Gilpin, Gunnison, Huerfano, Jackson, Jefferson, Kiowa, Larimer, Las Animas, Logan, Mesa, Montezuma, Montrose, Morgan, Otero, Ouray, Pitkin, Prowers, Pueblo, Rio Blanco, Routt, Sedgwick, Teller, Weld, and Yuma Counties.

(*Pachyceble*) See Michener (2007: 369) discussion under *Halictus* (*Seladonia*).

confusus Smith, 1853 – See subspecies. This species occurs in Adams, Alamosa, Arapahoe, Bent, Boulder, Conejos, Custer, Delta, Douglas, El Paso, Elbert, Fremont, Garfield, Grand, Gunnison, Huerfano, Jackson, Jefferson, Kit Carson, La Plata, Larimer, Logan, Mesa, Moffat, Montezuma, Montrose, Morgan, Otero, Ouray, Pitkin, Prowers, Pueblo, Rio Blanco, Rio Grande, Routt, Saguache, San Miguel, Teller, Weld, and Yuma Counties.

confusus arapahonum Cockerell, 1906 – eastern plains of Colorado.

confusus confusus Smith, 1853 – mountainous areas of Colorado.

tripartitus Cockerell, 1895 – Adams, Archuleta, Baca, Bent, Boulder, Custer, Delta, Denver, Dolores, Douglas, Eagle, El Paso, Elbert, Fremont, Garfield, Grand, Gunnison, Huerfano, Jefferson, Kiowa, La Plata, Larimer, Las Animas, Logan, Mesa, Montezuma, Montrose, Otero, Prowers, Pueblo, Rio Blanco, Routt, San Miguel, Weld, and Yuma Counties.

virgatellus Cockerell, 1901 – Boulder, Conejos, Delta, Eagle, Garfield, Grand, Gunnison, Jackson, Lake, Larimer, Mesa, Montrose, Pitkin, Rio Blanco, and San Juan Counties plus the Camp Creek Ranger Station.

(*Protohalictus*)

rubicundus (Christ, 1791) – Archuleta, Bent, Boulder, Chaffee, Conejos, Costilla, Custer, Delta, Denver, Douglas, Eagle, El Paso, Elbert, Garfield, Gilpin, Grand, Gunnison, Huerfano, Jackson, Jefferson, La Plata, Lake, Larimer, Mesa, Mineral, Moffat, Montezuma, Montrose, Ouray, Pitkin, Prowers, Rio Blanco, Rio Grande, Routt, San Juan, San Miguel, Summit, Teller, Weld, and Yuma Counties plus the south fork of the Rio Grande River.

***Lasioglossum* (References: Gibbs 2009a, 2009b, 2010; McGinley 1986, 2003; Sandhouse 1923, 1924)**

(*Dialictus*) Certain acarinate species that have traditionally been included in the genus (or subgenus) *Evylaeus* are reported here as non-metallic *Lasioglossum* (*Dialictus*) sensu Michener (2000, 2007) based on the study of their morphology by JSA and/or J. Gibbs (unpublished), and reported online by Ascher and Pickering (2011).

absimile (Sandhouse, 1924) – Logan County. This species is known only from Colorado. Sandhouse (1924: 21-22) lists the female USNM holotype No. 26416 as being collected from Sterling on July 10, 1920 at dandelion (*Taraxacum*) by Sandhouse.

albipenne (Robertson, 1890) [= senior synonym of *Halictus* (*Chloralictus*) *lactineus* Sandhouse; see Gibbs (2010)] – Boulder, Elbert, and Sedgwick Counties.

anomalum (Robertson, 1892) – Boulder, Custer, and Larimer Counties.

caducum (Sandhouse, 1924) – Las Animas and Montrose Counties.

callidum (Sandhouse, 1924) – Boulder County.

clematisellum (Cockerell, 1904) – Las Animas and Mesa Counties.

coactum (Cresson, 1897) – Baca and Las Animas Counties.

cressonii (Robertson, 1890) – Boulder, Jefferson, Larimer, and Routt Counties.

diatretum (Vachal, 1904) – Colorado.

ephialtum Gibbs, 2010 – Larimer County.

glabriventre (Crawford, 1907) – Rio Blanco and Rio Grande Counties.

aff. *griswoldi* Gibbs, 2009 – Boulder County. (J. Gibbs, pers. comm.)
hemimelas (Cockerell, 1901) – Boulder County plus the south fork of the Rio Grande River.
hudsoniellum (Cockerell, 1919) – Boulder, El Paso, Larimer, and Las Animas Counties.
hyalinum (Crawford, 1907) – Montrose and Rio Blanco Counties.
illinoense (Robertson, 1892) – Colorado.
imitatum (Smith, 1853) – Larimer County.
incompletum (Crawford, 1907) – Routt County. This is new for Colorado based on two female AMNH specimens collected 22 miles west of Steamboat Springs on July 15, 1963 by N. and B. Marston and determined by J. Gibbs. It represents a range extension beyond that which was published in Gibbs (2010: 161-166).
inconditum (Cockerell, 1916) – Boulder, Gunnison, Hinsdale, Montrose, Rio Grande, and San Miguel Counties plus Camp Creek Ranger Station.
knereri Gibbs, 2010 – Jackson and Larimer Counties.
laevissimum (Smith, 1853) [= senior synonym of *Halictus* (*Chloralictus*) *jameseae* Cockerell, *H.* (*C.*) *phaceliarum* Cockerell, and *H.* (*C.*) *praepes* Sandhouse; see Gibbs (2010)] – Archuleta, Boulder, Larimer, Ouray, and Park Counties.
lazulis (Ellis, 1913) – Larimer and Teller Counties.
lilliputense Gibbs, 2010 – Boulder, Elbert, Garfield, and Routt Counties plus the Camp Creek Ranger Station. This represents a range extension beyond what is published in Gibbs (2010) and is based on AMNH specimens identified by Gibbs subsequent to that work.
lineatulum (Crawford, 1906) [= senior synonym of *Halictus* (*Chloralictus*) *latus* Sandhouse; see Gibbs (2010)] – Denver, El Paso, and Elbert Counties.
lionotum (Sandhouse, 1923) – Colorado. This species is known only from Colorado. Sandhouse (1923: 194) records the male type from "Colorado, (Baker No. 1596)."
mactum (Sandhouse, 1924) – Larimer? and Teller Counties. This species is known only from Colorado. Sandhouse (1924: 37-38) records the male USNM type No. 26400 from Longs Peak Trail on July 18 at flowers of *Senecio* by W.P. Cockerell. This is probably from Larimer County, although this trail extends into Boulder County.
molle (Sandhouse, 1924) – Teller County. This species is known only from Colorado. Sandhouse (1924: 39-40) records the male USNM type No. 26443 as being collected from Florissant on July 16 from flowers of *Dasiphora fruticosa* by Cockerell.
obnubilum (Sandhouse, 1924) – Boulder, Elbert, Garfield, and Larimer Counties. This species is known only from Colorado. Sandhouse (1924: 28-29) records the male USNM type No. 26427 from the city of Boulder on July 18, 1908 by S.A. Rohwer.
occidentale (Crawford, 1902) – Boulder, El Paso, Elbert, Fremont, and Larimer Counties.
oceanicum (Cockerell, 1916) – El Paso County. Three specimens from El Paso County identified as *Dialictus nymphaearum* (Robertson) by Eickwort are housed at UCMC. The name *D. nymphaearum*, as used by Eickwort, refers to *L. oceanicum*; see Gibbs (2010: 223). This represents a range extension beyond what was published in Gibbs (2010).
ovaliceps (Cockerell, 1898) – Boulder, Elbert, Larimer, and Ouray Counties.
pacatum (Sandhouse, 1924) – Boulder, Gilpin, and Larimer Counties.
packeri Gibbs, 2010 – Baca, Fremont, Las Animas, Logan, and Sedgwick Counties.
pallidellum (Ellis, 1914) – Pueblo and Sedgwick Counties.
paululum (Sandhouse, 1924) – Logan County. This species is known only from Colorado. Sandhouse (1924: 23-24) records the male USNM type No. 26419 from Crook on August 29, 1920 by Sandhouse.
pavoninum (Ellis, 1913) [= senior synonym of *Halictus* (*Chloralictus*) *abietum* Michener, *H.* (*C.*) *evestigatus* Sandhouse, and *H.* (*C.*) *pikei* Sandhouse; see Gibbs (2010)] – Boulder, Gilpin, Larimer, and Park Counties plus Pikes Peak, Printing Office.
pectorale (Smith, 1853) – Boulder, Elbert, and Sedgwick Counties.
pectoraloides (Cockerell, 1895) – Baca, Boulder, El Paso, Fremont, Otero, and Ouray Counties.

pensitum (Sandhouse, 1924) – Boulder County. This species is known only from Colorado. Sandhouse (1924: 38) described this species based on four males including USNM type No. 26441 from the city of Boulder, July 20 to August 1, 1908 by S.A. Rohwer.

perdifficile (Cockerell, 1895) – Delta, Denver, Grand, and Rio Blanco Counties.

perpunctatum (Ellis, 1913) – Boulder, Denver, Elbert, and Larimer Counties.

pictum (Crawford, 1902) – Alamosa, El Paso, and Weld Counties.

prasinogaster Gibbs, 2010 – Boulder, Garfield, Jackson, Ouray, and Teller Counties plus the Camp Creek Ranger Station.

pruinosum (Robertson, 1892) – Boulder, El Paso, Elbert, La Plata, Larimer, Las Animas, Moffat, Rio Blanco, and Sedgwick Counties.

pudicum (Sandhouse, 1924) – Larimer? County. This species is known only from Colorado. Sandhouse (1924: 33) records the male USNM type No. 26434 from Longs Peak in August at flowers of gentian by Cockerell. Although Longs Peak is actually in Boulder County, the majority of Longs Peak Trail is in Larimer County.

pulveris (Cockerell, 1930) – Boulder, El Paso, Grand, Montezuma, and Rio Blanco Counties.

ruidosense (Cockerell, 1897) – Boulder, El Paso, Elbert, Grand, Gunnison, Jackson, Larimer, Park, and Teller Counties.

sagax (Sandhouse, 1924) [= senior synonym of *Halictus* (*Chloralictus*) *accentus* Sandhouse; see Gibbs (2010)] – Boulder County.

sandhouseae Michener, 1951 – Teller County.

scrophulariae (Cockerell, 1906) – Alamosa and Teller Counties.

sedi (Sandhouse, 1924) – Boulder, Conejos, Grand, Gunnison, Hinsdale, Jackson, Larimer, Mineral, Park, and Rio Blanco Counties.

semibrunneum (Cockerell, 1895) [= senior synonym of *Halictus oleosus* Cockerell; see Gibbs (2010)] – El Paso, Fremont, and Las Animas Counties.

semicaeruleum (Cockerell, 1895) [= senior synonym of *Halictus* (*Chloralictus*) *actuarius* Sandhouse and *Halictus pruinosiformis* Crawford; see Gibbs (2010)] – Alamosa, Arapahoe, Boulder, Chaffee, El Paso, Elbert, Huerfano, Jefferson, Larimer, Las Animas, Montezuma, Otero, Prowers, Pueblo, Sedgwick, Teller, Weld, and Yuma Counties.

sitocleptum Gibbs, 2010 – Garfield County. This is new for Colorado based on a female parasitic *L.* (*Dialictus*) in the AMNH collected from Glenwood Springs on August 5, 1920 and initially determined by P.H. Timberlake as *Paralictus simplex* Robertson, a species known with certainty only from the eastern U.S. (Mitchell 1960: 449-450; Moure and Hurd 1987: 143; J. Gibbs pers. comm.). This specimen was reidentified by J. Gibbs as *L. sitocleptum*, a species he described in 2010 from Alberta and Saskatchewan. This is the first record of this species for the United States.

succinipenne (Ellis, 1913) – Alamosa, Boulder, El Paso, Elbert, Grand, Jefferson, Larimer, and Teller Counties.

synthyridis (Crawford, 1906) – Boulder, El Paso, Elbert, and Teller Counties. Future studies are needed to clarify the taxonomy and geographic ranges of this and related species; some Colorado specimens may prove to be the similar eastern species *Lasioglossum foxii* (Robertson).

aff. *tegulariforme* (Crawford, 1907) – Boulder, El Paso, Larimer, and Weld Counties. Gibbs (2010) notes that many specimens from the western U.S. identified as *tegulariforme* likely pertain to *Lasioglossum imbrex* Gibbs.

tenax (Sandhouse, 1924) [= senior synonym of *Halictus* (*Chloralictus*) *meritus* Sandhouse; see Gibbs (2010)] – Boulder, Larimer, Gunnison, and Teller Counties.

tenue (Ellis, 1913) – Boulder County. This species is known only from Colorado. Ellis (1913: 208) records the female type from "Sugar Loaf Mountain, Colorado, altitude 8,500 ft. one (= type) 5 mm. long, May 18, 1907 (S.A. Rohwer)."

vaporellum (Cockerell, 1910) – Routt County. This species is known only from Colorado. Cockerell (1910: 366) records two females from Steamboat Springs on May 27.

versans (Lovell, 1905) – Custer and Jefferson Counties.

viridatulum (Cockerell, 1919) – Larimer County.
zephyrum (Smith, 1853) [= senior synonym of *Halictus* (*Chloralictus*) *academicus* Sandhouse; see Gibbs (2010)] – Boulder, Denver, El Paso, and Larimer Counties.
zophops (Ellis, 1914) – Boulder, Larimer, and Teller Counties.

(*Evylaeus*) See note under *Lasioglossum* (*Dialictus*); also see taxonomic notes in Ebmer (1995).

cinctipes (Provancher, 1888) – Archuleta, Boulder, Denver, El Paso, and Ouray Counties.
cooleyi (Crawford, 1906) – Alamosa, Archuleta, Boulder, El Paso, Elbert, Fremont, Garfield, Gunnison, La Plata, Larimer, Montezuma, Ouray, Pitkin, Rio Blanco, Routt, and Teller Counties.
granosum (Vachal, 1904) – Colorado. This species is known only from Colorado. Vachal (1904: 477-478) records the type locality as Colorado and the collector as Morrison.
nigricalle (Vachal, 1904) – Boulder County. This is based on a single UCMC specimen determined by T.D.A. Cockerell. Moure and Hurd (1987: 77) list the distribution of this very poorly known species as "Colorado and ?Nevada" and note, "The holotype is labeled: Nevada, Morrison, January, 1880, even though Vachal records it from Colorado."
nigrum (Viereck, 1903 ["1902"]) – Colorado. The true status of this species is problematic; see Ebmer (1995). [Putative AMNH *L. nigrum* are from Boulder, Lake, La Plata, Montezuma, Ouray, and Rio Grande Counties plus Camp Creek Ranger Station.]
peralpinum (Cockerell, 1919) – Gunnison and Larimer? Counties. This species is known only from Colorado. Cockerell (1919: 289) records the female type from Longs Peak trail, above timberline on July 20, 1919 by Wilmatte P. Cockerell. Although Longs Peak Trail extends into Boulder County, most of the trail occurs in Larimer County, including the area at timberline.
peraltum (Cockerell, 1901) – Colorado. The true status of this species is problematic; see Ebmer (1995). [Putative AMNH *L. peraltum* are from Lake, Ouray, and Pitkin Counties plus Lawn Lake.]
regis (Cockerell, 1916) – Larimer County. This species is known only from Colorado. Cockerell (1916: 102) records the female type from Kingston, just above timber-line, in July 1915 at flowers of *Frasera* by L.A. Kenoyer.
supranitens (Cockerell, 1919) – Larimer? County. This species is known only from Colorado. Cockerell (1919: 289) records the female type from Longs Peak trail, above timberline, on July 20, 1919 by Cockerell. Although Longs Peak Trail extends into Boulder County, most of the trail occurs in Larimer County, including the area at timberline.
testaceum (Robertson, 1897) – Alamosa, Ouray, and Teller Counties.

(*Lasioglossum*)

athabascense (Sandhouse, 1933) – Delta, Garfield, and Routt Counties.
colatum (Vachal, 1904) – Alamosa, Archuleta, Boulder, Jefferson Moffat, Ouray, Routt, Teller, and Yuma Counties.
desertum (Smith, 1879) – Boulder, Douglas, El Paso, Elbert, and Fremont Counties.
egregium (Vachal, 1904) – Archuleta, Boulder, Chaffee, Clear Creek, Costilla, Delta, Denver, Douglas, Eagle, El Paso, Fremont, Garfield, Gilpin, Grand, Gunnison, Huerfano, Jefferson, La Plata, Larimer, Las Animas, Mesa, Mineral, Moffat, Montezuma, Montrose, Rio Blanco, Rio Grande, Routt, Saguache, and Teller Counties.
heterorhinum (Cockerell, 1930) – Boulder, El Paso, Fremont, La Plata, Las Animas, Mesa, Moffat, Montezuma, and Montrose Counties.
manitouellum (Cockerell, 1908) – Boulder, El Paso, Fremont, Larimer, and Teller Counties.
paraforbesii McGinley, 1986 – Boulder, Custer, Delta, Denver, El Paso, Elbert, Garfield, Grand, La Plata, Larimer, Lincoln, Mesa, Prowers, Pueblo, and Yuma Counties.
rupticristum McGinley, 1986 – Custer County.
sisymbrii (Cockerell, 1895) – Adams, Alamosa, Boulder, Chaffee, Costilla, Delta, Denver, Douglas, Eagle, El Paso, Fremont, Garfield, Grand, Gunnison, Hinsdale, Huerfano,

Jefferson, Larimer, Las Animas, Mesa, Moffat, Montezuma, Montrose, Ouray, Park, Pueblo, Rio Blanco, Routt, Saguache, Teller, and Weld Counties.

titusi (Crawford, 1902) – Delta and Routt Counties.

trizonatum (Cresson, 1874) – Alamosa, Boulder, Chaffee, Clear Creek, Costilla, Douglas, El Paso, Elbert, Garfield, Grand, Gunnison, Hinsdale, Jackson, Jefferson, La Plata, Larimer, Las Animas, Mesa, Mineral, Moffat, Montezuma, Montrose, Park, Rio Grande, Summit, and Teller Counties.

(*Sphecodogastra*)

aberrans (Crawford, 1903) – Archuleta, Boulder, Clear Creek, Denver, El Paso, Elbert, Gunnison, Huerfano, Jackson, Jefferson, Larimer, Montrose, Park, Routt, and Teller Counties.

lusorium (Cresson, 1872) – Adams, Boulder, Clear Creek, Custer, Denver, El Paso, Gilpin, Gunnison, Huerfano, Jefferson, Larimer, Las Animas, Moffat, Montrose, Otero, Park, Sedgwick, Teller, and Weld Counties.

noctivaga Linsley and MacSwain, 1962 – Baca, Bent, and Weld Counties.

texanum (Cresson, 1872) – Boulder, Denver, El Paso, Huerfano, Kiowa, Larimer, Morgan, Park, and Weld Counties.

Andrenidae

Andreninae

Andrenini

***Andrena* (References: Bouseman and LaBerge 1979; Cockerell 1931; Donovan 1977; Gusenleitner and Schwarz 2002; Gusenleitner et al. 2005; LaBerge 1967, 1969, 1971a, 1971b, 1973, 1977, 1978, 1980, 1986, 1987, 1989; LaBerge and Bouseman 1970; LaBerge and Ribble 1972, 1975; LaBerge and Thorp 2005; Lanham 1941, 1949, 1982, 1987a, 1987b, 1993a, 1993b; Larkin et al. 2006; Michener 1937a; Ribble 1967, 1968a, 1968b, 1973, 1974; Thorp 1969; Thorp and LaBerge 2005; Viereck and Cockerell 1914)**

(*Andrena*)

birtwelli Cockerell, 1901 – Archuleta, Boulder, Chaffee, Clear Creek, Conejos, Costilla, Douglas, Eagle, El Paso, Gilpin, Grand, Gunnison, Hinsdale, Lake, Larimer, Mesa, Mineral, Park, Routt, San Miguel, and Teller Counties.

buckelli Viereck, 1924 – Boulder, Chaffee, Clear Creek, Costilla, Custer, Fremont, Grand, Gunnison, Hinsdale, Jackson, Jefferson, Larimer, Mesa, Routt, and Saguache Counties.

ceanothifloris Linsley, 1938 – See subspecies.

ceanothifloris cretata LaBerge, 1980 – Boulder and Moffat Counties.

clarkella (Kirby, 1802) – Boulder, Clear Creek, Grand, Larimer, Routt, and Summit Counties.

durangoensis Viereck and Cockerell, 1914 – La Plata and Montezuma Counties. LaBerge (1980: 495) cites two Colorado localities: Durango (holotype male, May 19, 1899 by Oslar) and Los Pinos (1 female, May 19, 1899 by C.F. Baker; 1 female and 1 male, May 22, 1899 by C.F. Baker). On the map in LaBerge (1980: 442, fig. 9) there is a dot at what appears to be the Los Pinos train stop on the Cumbres and Toltec Railroad in Conejos County. VLS thinks this is the wrong Los Pinos. See section on C.F. Baker for further information. JSA also notes that the male *A. durangoensis* sensu Mitchell (1960: 229-230, listed in the subgenus *Conandrena*) is a misidentification of *Andrena thaspii* Graenicher. The true *A. durangoensis* is recorded reliably from Colorado and New Mexico only (LaBerge 1980).

frigida Smith, 1853 – Boulder, Conejos, Costilla, Douglas, El Paso, Elbert, Fremont, Gilpin, Grand, Jackson, Jefferson, Larimer, Routt, Summit, and Teller Counties.

laminibucca Viereck and Cockerell, 1914 – Boulder, Clear Creek, El Paso, Fremont, Larimer, Rio Blanco, Teller, and Weld Counties.

lanhami LaBerge, 1980 – Boulder, Chaffee, Conejos, Costilla, Elbert, Gilpin, Grand, Jackson, Larimer, Saguache, and Teller Counties.

macoupinensis Robertson, 1900 – Boulder, Delta, Larimer, Prowers, Pueblo, and Sedgwick Counties.

mandibularis Robertson, 1892 – Boulder, Denver, El Paso, Larimer, Pueblo, and Routt Counties plus Pikes Peak.

milwaukeensis Graenicher, 1903 – Archuleta, Boulder, Chaffee, Clear Creek, Eagle, El Paso, Garfield, Gunnison, Hinsdale, Jefferson, Larimer, Mesa, Mineral, Montezuma, Montrose, Pueblo, Routt, Saguache, and San Miguel Counties plus the South Fork of the Rio Grande River.

perarmata Cockerell, 1898 – Boulder, Conejos, Costilla, Delta, Denver, Douglas, Gilpin, Grand, Jackson, Jefferson, Larimer, Mesa, and Routt Counties.

rufosignata Cockerell, 1902 – Clear Creek, Custer, Delta, Elbert, Grand, Jackson, Larimer, and Mesa Counties.

thaspii Graenicher, 1903 – Archuleta, Boulder, Clear Creek, Costilla, Delta, Denver, El Paso, Elbert, Fremont, Garfield, Gilpin, Grand, Gunnison, Huerfano, Jackson, Jefferson, La Plata, Larimer, Mesa, Mineral, Montrose, Park, Routt, San Juan, and Teller Counties.

topazana Cockerell, 1906 – Boulder, Clear Creek, Custer, Delta, El Paso, Fremont, Garfield, Gilpin, Grand, Gunnison, Hinsdale, Huerfano, Jackson, Jefferson, Larimer, Las Animas, Mesa, Moffat, Park, Pitkin, Pueblo, Routt, San Miguel, and Teller Counties.

vicinoides Viereck, 1904 – Archuleta, Boulder, Chaffee, Clear Creek, Costilla, El Paso, Garfield, Gilpin, Grand, Huerfano, Jefferson, La Plata, Larimer, Mesa, Park, Routt, and Teller Counties.

(*Belandrena*)

sphaeralceae Linsley, 1939 – Delta and Mesa Counties. This is new for Colorado based on a female specimen housed at UCMC collected in "Escalante Cyn. 4mi", on May 21, 1963 by C.J. McCoy and B. Vogel and determined by U.N. Lanham and confirmed by TG.

(*Callandrena* sensu stricto of Larkin et al. (2006))

(*accepta* group)

accepta Viereck, 1916 – Alamosa, Arapahoe, Baca, Bent, Boulder, Denver, Douglas, El Paso, Elbert, Fremont, Gilpin, Jefferson, Kit Carson, Larimer, Lincoln, Montezuma, Morgan, Otero, Pueblo, Weld, and Yuma Counties.

(*aureocincta* group)

simulata Smith, 1879 – Montrose County.

(*Callandrena* sensu lato of LaBerge (1967), in addition to species listed above)

(*gardineri* group)

ardis LaBerge, 1967 – Lincoln and Weld Counties. Note: the specific epithet "ardis" was misspelled as "*aridis*" in Hurd (1979: 1779).

berkeleyi Viereck and Cockerell, 1914 – Denver County.

biscutellata Viereck, 1917 – Baca County.

gardineri Cockerell, 1906 – Baca, Boulder, Denver, Douglas, El Paso, Elbert, Fremont, Huerfano, Jefferson, Larimer, Lincoln, Mesa, Pueblo, and Weld Counties plus Los Pinos.

utahensis LaBerge, 1967 – Delta and La Plata Counties.

(*helianthi* group)

haynesi Viereck and Cockerell, 1914 – Baca, Cheyenne, Logan, Washington, and Weld Counties.

helianthi Robertson, 1891 – Adams, Arapahoe, Boulder, Denver, Dolores, Douglas, Eagle, El Paso, Elbert, Fremont, Garfield, Huerfano, Jefferson, Larimer, Las Animas, Lincoln, Logan, Montezuma, Morgan, Otero, Prowers, Pueblo, Routt, Saguache, Weld, and Yuma Counties.

pecosana Cockerell, 1913 – Boulder, Douglas, El Paso, Elbert, Gilpin, Larimer, and Weld Counties.

vulpicolor Cockerell, 1897 – Costilla, Huerfano, Larimer, Rio Blanco, and San Miguel Counties plus Great Sand Dunes National Monument and Preserve.

(*krigiana* group)

tonkaworum Viereck, 1917 – Baca County.

(*melliventris* group)

rudbeckiae Robertson, 1891 – Phillips County.

(*Cnemidandrena*)

(*apacheorum* group)

apacheorum Cockerell, 1897 – Boulder, Custer, Eagle, Garfield, Grand, Gunnison, Jackson, Lake, Larimer, Mineral, Montezuma, Montrose, Park, Routt, and Teller Counties.

(*chromotricha* group)

chromotricha Cockerell, 1899 – Chaffee, El Paso, Jefferson, Larimer, and Las Animas Counties.

(*costillensis* group)

columbiana Viereck, 1917 – Boulder, Clear Creek, Costilla, Eagle, El Paso, Gilpin, Gunnison, Huerfano, Jackson, Jefferson, Lake, Larimer, Mineral, Montrose, Pitkin, Routt, and Teller Counties.

costillensis Viereck and Cockerell, 1914 – Boulder, Chaffee, Clear Creek, Costilla, Dolores, Eagle, Garfield, Gilpin, Grand, Gunnison, Huerfano, Jackson, La Plata, Lake, Larimer, Mineral, Park, San Miguel, and Teller Counties.

(*hirticincta* group)

colletina Cockerell, 1906 – Alamosa, Costilla, Dolores, Garfield, Huerfano, Jackson, Larimer, Mesa, Mineral, Moffat, Rio Blanco, Rio Grande, Saguache, and Teller Counties.

hirticincta Provancher, 1888 – Boulder, Delta, Douglas, El Paso, Elbert, Grand, Jackson, Jefferson, Larimer, Montrose, and Teller Counties.

surda Cockerell, 1910 – Boulder, Chaffee, Costilla, Delta, Fremont, Garfield, Huerfano, La Plata, Larimer, Mesa, Moffat, Montezuma, Montrose, Pitkin, Rio Blanco, Saguache, and San Miguel Counties.

(*mentzeliae* group)

mentzeliae Cockerell, 1897 – Alamosa, Baca, Boulder, Conejos, Denver, El Paso, Jefferson, Larimer, Mesa, and Pueblo Counties.

(*nubecula* group)

canadensis Dalla Torre, 1896 – Boulder, Clear Creek, Denver, Grand, Jackson, Jefferson, Larimer, Saguache, and Teller Counties.

nubecula Smith, 1853 – Boulder, Denver, Douglas, Eagle, Elbert, Fremont, Garfield, Jefferson, Larimer, Pueblo, Weld, and Yuma Counties.

xanthigera Cockerell, 1900 – Costilla, Eagle, and Saguache Counties.

(*sulcata* group)

ramaleyi Cockerell, 1931 – Alamosa, Costilla, and Montezuma Counties plus the San Luis Valley.

(*scutellinitens* group)

runcinatae Cockerell, 1906 [= senior synonym of *Andrena robervalensis* Mitchell; see Gusenleitner et al. (2005)] – Fremont, Larimer, Saguache, and Teller Counties.

(*Conandrena*)

bradleyi Viereck, 1907 – Boulder County.

cheyennorum Viereck and Cockerell, 1914 – Colorado.

(*Dactylandrena*)

berberidis Cockerell, 1905 – Boulder, Jefferson, and Routt Counties.

porterae Cockerell, 1900 – Boulder, Clear Creek, Conejos, Douglas, El Paso, Elbert, Huerfano, Jefferson, Larimer, Pueblo, and Teller Counties.

(*Dasyandrena*)

cristata Viereck, 1917 – Montrose County.

(*Diandrena*)

(*chalybioides* group)

ablegata (Cockerell, 1922) – Routt County. This species is newly confirmed for Colorado. Thorp (1969: 94-95) notes "Michener (1937[a]) records this species from Hayden, Routt County, Colorado, but since I have not seen this specimen, it has not been included on the map or in the discussion of distribution." A specimen bearing "Hayden Col. 6-14-[19]07", "Collected S.A. Johnson" and "*Diandrena ablegata* Ckll. Det. Michener" labels was located at CSUC and sent to R.W. Thorp who confirmed the *D. ablegata* identification.

(*nothocalaidis* group)

nothocalaidis (Cockerell, 1905) – Boulder, Grand, Larimer, Mesa, Rio Blanco, and Routt Counties.

(*Euandrena*)

algida Smith, 1853 – Boulder, Costilla, Elbert, Fremont, Grand, Gunnison, Huerfano, Jackson, Jefferson, La Plata, Larimer, Mesa, Montrose, Park, Routt, Summit, and Teller Counties.

antonitonis Viereck and Cockerell, 1914 – Conejos County. This species is known only from Colorado. Viereck and Cockerell (1914: 56) list the female USNM type No. 18164 as being collected from Antonito on August 5, 1899 by Gillette.

astragali Viereck and Cockerell, 1914 – Boulder, Jefferson, and Larimer Counties.

auricoma Smith, 1879 – Boulder, Jefferson, and Larimer Counties.

geranii Robertson, 1891 – Archuleta, Boulder, Custer, El Paso, Elbert, Jefferson, Larimer, and Weld Counties.

nigrihirta (Ashmead, 1890) – Boulder, Chaffee, Clear Creek, Custer, Douglas, El Paso, Gilpin, Gunnison, Jackson, Larimer, Pitkin, Rio Grande, Routt, and Teller Counties.

nigrocaerulea Cockerell, 1897 – Delta, Grand, and Mesa Counties.

padoucorum Viereck and Cockerell, 1914 – Jefferson County. This species is known only from Colorado. Viereck and Cockerell (1914: 38) list the male type as being collected from Evergreen on July 16, 1897 from *Sedum stenopetalum* by Dunning (1308).

segregans Cockerell, 1900 – Boulder, Costilla, Custer, El Paso, Gunnison, Huerfano, Moffat, Montezuma, and Teller Counties.

(*Gonandrena*)

persimulata Viereck, 1917 – Boulder, Eagle, and Jefferson Counties.

(*Holandrena*)

cressonii Robertson, 1891 – See subspecies. The species also occurs in Alamosa, Baca, Dolores, Huerfano, Mesa, Moffat, Montezuma, Pueblo, San Miguel, Weld, and Yuma Counties.

cressonii infasciata Lanham, 1949 – Archuleta, Boulder, Delta, Denver, Douglas, El Paso, Garfield, Jefferson, La Plata, Larimer, Montrose, and Routt Counties.

cressonii kansensis Cockerell, 1899 – El Paso and Elbert Counties.

moquiorum Viereck and Cockerell, 1914 – Fremont County.

(*Iomelissa*)

violae Robertson, 1891 – Boulder and Larimer Counties.

(*Larandrena*)

miserabilis Cresson, 1872 – Archuleta, Boulder, Douglas, Elbert, Garfield, Jefferson, Larimer, Mesa, Moffat, Montezuma, Montrose, Pueblo, and Routt Counties.

(*Leucandrena*)

barbilabris (Kirby, 1802) – Archuleta, Boulder, Clear Creek, Costilla, Denver, Douglas, El Paso, Elbert, Fremont, Grand, Gunnison, Jefferson, La Plata, Larimer, Mesa, Montrose, Park, Routt, San Miguel, and Teller Counties plus Great Sand Dunes National Monument and Preserve and the South Fork of the Rio Grande River.

monilicornis Cockerell, 1896 – El Paso County.

(*Melandrena*)

carlini Cockerell, 1901 – Boulder, Custer, Denver, Douglas, El Paso, Elbert, Gilpin, Grand, Gunnison, Huerfano, Jefferson, Larimer, and Routt Counties.

cerasifolii Cockerell, 1896 – Archuleta, Delta, Garfield, Mesa, and Montrose Counties.

commoda Smith, 1879 – Boulder, Denver, Douglas, El Paso, Elbert, Jefferson, Larimer, and Pueblo Counties.

lupinorum Cockerell, 1906 – Alamosa, Boulder, Chaffee, Clear Creek, Conejos, Costilla, Custer, Eagle, El Paso, Elbert, Fremont, Garfield, Gilpin, Grand, Gunnison, Jefferson, Larimer, Mesa, Moffat, Montezuma, Montrose, Park, Rio Blanco, Rio Grande, Saguache, San Miguel, Teller, and Weld Counties.

nivalis Smith, 1853 – Archuleta, Boulder, Clear Creek, Conejos, Costilla, Custer, El Paso, Fremont, Garfield, Gilpin, Grand, Gunnison, Hinsdale, Huerfano, Jefferson, Larimer, Las Animas, Mesa, Montrose, Rio Blanco, Rio Grande, Routt, San Miguel, and Teller Counties.

pertristis Cockerell, 1905 – See subspecies.

pertristis carliniformis Viereck and Cockerell, 1914 – Boulder, Conejos, Elbert, Jefferson, Lake, Moffat, and Routt Counties.

platyrhina Cockerell, 1930 – Archuleta, Boulder, La Plata, and Montezuma Counties.

transnigra Viereck, 1904 – Archuleta, Boulder, Chaffee, Conejos, Costilla, Custer, Denver, Dolores, Eagle, El Paso, Elbert, Fremont, Garfield, Grand, Gunnison, Hinsdale, Huerfano, Jackson, Jefferson, Lake, Larimer, Mesa, Montezuma, Montrose, Rio Blanco, Routt, and San Miguel Counties plus the South Fork of the Rio Grande River.

vicina Smith, 1853 – Boulder, Douglas, El Paso, Elbert, Gilpin, Gunnison, Jefferson, Larimer, Mesa, Routt, San Miguel, and Teller Counties.

(*Micrandrena*)

(*illinoiensis* group)

illinoiensis Robertson, 1891 – Alamosa, Arapahoe, Bent, Boulder, Denver, Douglas, El Paso, Elbert, Jefferson, Kit Carson, Larimer, Mesa, Park, Pueblo, Sedgwick, Teller, and Weld Counties.

nigrae Robertson, 1905 – Bent, Boulder, Costilla, Elbert, Jefferson, Kit Carson, Larimer, Pueblo, Sedgwick, and Weld Counties.

salictaria Robertson, 1905 – Boulder, Costilla, Douglas, El Paso, Elbert, Hinsdale, Jefferson, Larimer, and Pueblo Counties.

(*piperi* group)

candidiformis Viereck and Cockerell, 1914 – Boulder, Jefferson, and Larimer Counties.

kristina Lanham, 1983 ["1982"] – Boulder, Delta, Fremont, Larimer, Mesa, Rio Blanco, and San Miguel Counties. This species is known only from Colorado. Lanham (1982: 309-311) records the female holotype from 4 miles north of Boulder, 5,500 ft. on May 23, 1980 at flowers *Physaria beffii* by U.N. Lanham. Paratypes are from locals in Boulder and Larimer Counties. Additional county records noted here are based on UCMC specimens determined by U.N. Lanham.

melanochroa Cockerell, 1898 – Boulder, Delta, Denver, Grand, Jefferson, Larimer, and Rio Blanco Counties.

microchlora Cockerell, 1922 – Boulder, Delta, Denver, and Larimer Counties.

piperi Viereck, 1904 – Delta, Garfield, La Plata, Mesa, Montrose, and Rio Blanco Counties.

ziziae Robertson, 1891 – Denver County.

(*primulifrons* group)

robinsoni Lanham, 1987 – Baca, Huerfano, Larimer, and Weld Counties. This species is known only from Colorado. Lanham (1987a: 325-327) records the female holotype from 10 miles southwest of Loveland, 5,500 ft. on May 26, 1980 at flowers of *Physaria belli* by P. Robinson, paratypes from Weld County, and one additional record from Baca County. The Huerfano County record is based on a female UCMC specimen determined by VLS.

(*Notandrena*)
nothoscordi Robertson, 1897 – Elbert County.
(*Onagrandrena*)
anograe Cockerell, 1901 – Chaffee, El Paso, Gunnison, Huerfano, Mesa, Park, and Teller Counties.
anograe anograe Cockerell, 1901 – The expected subspecies for Colorado.
(*Parandrena*)
andrenoides (Cresson, 1878) – Alamosa, Archuleta, Boulder, Costilla, Custer, Douglas, El Paso, Elbert, Garfield, Grand, Hinsdale, Kit Carson, Larimer, Pueblo, and Sedgwick Counties.
wellesleyana Robertson, 1897 – Douglas and Jackson Counties. This is new for Colorado based on two UCMC specimens. The Jackson County specimen is a male collected 7 miles east of Cowdry on May 17, 1967 from *Salix* by U.N. Lanham. The Douglas County specimen is a female collected from Walden, 8,300 ft. on May 16, 1978 from *Salix* by U. Lanham. Both specimens were determined by U.N. Lanham and confirmed by TG.
(*Plastandrena*)
(*crataegi* group)
argemonis Cockerell, 1896 – Archuleta, Boulder, El Paso, Fremont, Huerfano, Jefferson, Larimer, and Las Animas Counties.
crataegi Robertson, 1893 – Archuleta, Boulder, Chaffee, Custer, Douglas, Eagle, El Paso, Elbert, Fremont, Garfield, Gunnison, Huerfano, Jefferson, Larimer, Las Animas, Mesa, Moffat, Montezuma, Montrose, Pueblo, Routt, and San Miguel Counties.
(*prunorum* group)
casadae Cockerell, 1896 – Colorado. Hurd (1979: 1844) records this poorly known species from New Mexico and Colorado. LaBerge (1969) did not treat this species, which is, perhaps, a synonym of *A. prunorum* (JSA unpublished, based on brief examination of the holotype at USNM).
prunorum Cockerell, 1896 – See subspecies.
prunorum prunorum Cockerell, 1896 – Alamosa, Archuleta, Baca, Bent, Boulder, Chaffee, Crowley, Custer, Delta, Denver, Dolores, Douglas, Eagle, El Paso, Fremont, Garfield, Gilpin, Grand, Gunnison, Huerfano, Jefferson, La Plata, Lake, Larimer, Mesa, Moffat, Montezuma, Montrose, Park, Rio Blanco, Rio Grande, Routt, San Miguel, Sedgwick, Teller, and Weld Counties.
(*Ptilandrena*)
distans Provancher, 1888 – Park County.
pallidiscopa (Viereck, 1904) – Boulder, Denver, and Larimer Counties.
(*Rhacandrena*)
brevipalpis Cockerell, 1930 – Boulder and Denver Counties.
coruscata LaBerge, 1977 – Boulder County.
cragini Cockerell, 1899 – Boulder County.
robertsonii Dalla Torre, 1896 – Boulder, Douglas, Huerfano, and San Miguel Counties.
(*Rhaphandrena*)
prima Casad, 1896 – Huerfano County. This is new for Colorado based on one female CSUC specimen collected from Mt. Shadow Falls Ranch, end of 312 Rd., on April 15, 2006 by B. Kondratieff and W. Cranshaw and determined by TG.
(*Scaphandrena*)
(*merriami* group)
bruneri Viereck and Cockerell, 1914 – Mesa and Montezuma Counties.
hicksi Cockerell, 1925 – Boulder, Costilla, Larimer, Mesa, Rio Blanco, and Routt Counties.
merriami Cockerell, 1901 – Denver, Douglas, El Paso, Garfield, Grand, Gunnison, Jefferson, Larimer, Mesa, Montrose, Rio Blanco, Routt, Teller, and Weld Counties.
nigerrima Casad, 1896 – Boulder, Jefferson, Larimer, and Weld Counties.

shoshoni Ribble, 1974 – Gunnison County. This is new for Colorado based on a specimen collected as part of R. Irwin's research at the Rocky Mountain Biological Laboratory and determined by TG.

sladeni Viereck, 1924 – Rio Blanco County. This is new for Colorado based on a female UCMC specimen collected 6 miles northeast of Meeker on May 31, 1989 between 14:30-16:00 hrs. from flowers of *Sisymbrium loeseli* by P. Robinson, determined by U.N. Lanham, and confirmed by TG.

vestali Cockerell, 1913 – Boulder County.

walleyi Cockerell, 1932 – Garfield, Mesa, Moffat, and Rio Blanco Counties.

(*scurra* group)

ellisiae Cockerell, 1914 – Boulder, El Paso, Fremont, Huerfano, Jefferson, Larimer, and Weld Counties. The status of this species is problematic; see Gusenleitner and Schwarz (2002).

montrosensis Viereck and Cockerell, 1914 – Colorado. The status of this species is problematic; see Lanham (1993a) and Gusenleitner and Schwarz (2002).

scurra Viereck, 1904 – Adams, Boulder, Chaffee, Eagle, El Paso, Garfield, Grand, Huerfano, Larimer, Mesa, Mineral, Moffat, Montrose, Park, Pueblo, Rio Blanco, San Miguel, Teller, and Weld Counties.

sieverti Cockerell, 1906 – Colorado. The status of this species is problematic; see Lanham (1993a) and Gusenleitner and Schwarz (2002).

(*Scrapteropsis*)

(*alleghaniensis* group)

alleghaniensis Viereck, 1907 – Gunnison County.

(*imitatrix* group)

imitatrix Cresson, 1872 – Bent, Boulder, Denver, Douglas, Gunnison, Jefferson, Kit Carson, Larimer, Mesa, Pueblo, and Weld Counties.

(*Simandrena*)

angustitarsata Viereck, 1904 – Boulder, Garfield, Jefferson, Larimer, and Routt Counties.

nasonii Robertson, 1895 – Boulder, Douglas, El Paso, Jefferson, Larimer, Pueblo, and Routt Counties.

pallidifovea (Viereck, 1904) – Delta, Larimer, Mesa, Moffat, Montrose, Rio Blanco, and Routt Counties.

wheeleri Graenicher, 1904 – Boulder, Custer, El Paso, Garfield, Grand, Larimer, Mesa, Moffat, Rio Blanco, Routt, and San Miguel Counties.

(*Thysandrena*)

candida Smith, 1879 – Boulder, Clear Creek, Denver, Douglas, Garfield, Gilpin, Jefferson, and Larimer Counties.

livida LaBerge, 1977 – Los Pinos, Colorado; see LaBerge (1977: 48).

medionitens Cockerell, 1902 – Alamosa, Boulder, Costilla, Delta, Douglas, El Paso, Elbert, Gilpin, Grand, Gunnison, Hinsdale, Jefferson, La Plata, Larimer, Park, Routt, Teller, and Weld Counties.

trizonata (Ashmead, 1890) – Boulder, Costilla, Custer, Denver, Grand, Jackson, La Plata, Larimer, Mesa, Summit, and Teller Counties.

vierecki Cockerell, 1904 – Archuleta, Boulder, Costilla, Custer, Delta, Denver, Dolores, Douglas, El Paso, Elbert, Fremont, Grand, Gunnison, Hinsdale, Huerfano, Jefferson, Larimer, Mesa, Moffat, Montrose, Rio Blanco, Routt, San Miguel, and Weld Counties.

w-scripta Viereck, 1904 – Boulder, Custer, Dolores, Douglas, El Paso, Elbert, Fremont, Gilpin, Grand, Gunnison, Hinsdale, Jackson, Jefferson, Kit Carson, Larimer, Mesa, Montrose, Park, Rio Blanco, Routt, San Juan, San Miguel, and Weld Counties plus the South Fork of the Rio Grande River.

(*Trachandrena*)

amphibola (Viereck, 1904) – Boulder, Delta, Douglas, Eagle, Elbert, Garfield, Grand, Gunnison, Hinsdale, Huerfano, Jackson, Larimer, Mesa, Moffat, Montrose, and Routt Counties.

ceanothi Viereck, 1917 – Douglas and Larimer Counties.

cleodora (Viereck, 1904) – See subspecies.

cleodora cleodora (Viereck, 1904) – Boulder County.

cupreotincta Cockerell, 1901 – Archuleta, Boulder, Dolores, Garfield, Grand, La Plata, Larimer, Mesa, Moffat, Montezuma, Montrose, Rio Blanco, and Routt Counties plus Great Sand Dunes National Monument and Preserve.

cyanophila Cockerell, 1906 – Archuleta, Boulder, Chaffee, Clear Creek, Conejos, Costilla, Delta, Dolores, Douglas, Eagle, El Paso, Elbert, Gilpin, Grand, Gunnison, Hinsdale, Huerfano, Jackson, Jefferson, La Plata, Lake, Larimer, Mesa, Park, Pitkin, Routt, San Miguel, and Teller Counties.

forbesii Robertson, 1891 – Archuleta, Boulder, Dolores, Douglas, Elbert, Fremont, Grand, Jackson, Larimer, Mesa, Moffat, Montrose, and Park Counties.

hippotes Robertson, 1895 – Archuleta, Boulder, Hinsdale, Kit Carson, and Larimer Counties plus Los Pinos.

mariae Robertson, 1891 – Archuleta, Boulder, Costilla, Delta, Douglas, El Paso, Elbert, Huerfano, Jefferson, Kit Carson, Larimer, Sedgwick, and Weld Counties.

miranda Smith, 1879 – Boulder, Clear Creek, Costilla, Custer, Douglas, El Paso, Fremont, Gilpin, Hinsdale, Jefferson, Larimer, Pueblo, Routt, and Teller Counties.

nuda Robertson, 1891 – Archuleta, Boulder, Douglas, El Paso, Elbert, Jefferson, Larimer, Montezuma, Montrose, Park, and Pueblo Counties.

quintilis Robertson, 1898 – Boulder, Larimer, Mesa, and Routt Counties

salicifloris Cockerell, 1897 – Boulder, Delta, El Paso, Gilpin, Grand, Jackson, Jefferson, Larimer, Mesa, Routt, and Summit Counties.

sigmundi Cockerell, 1902 – Boulder, Costilla, Custer, Dolores, Douglas, Elbert, Hinsdale, Huerfano, Jackson, Jefferson, and Larimer Counties.

striatifrons Cockerell, 1897 – Grand and Jackson Counties. This is new for Colorado based on UCMC specimens. Two Grand County records are as follows: one male specimen from 4 miles west of Tabernash, 8,000 ft. on May 23, 1964 at *Salix* by U.N. Lanham and one female collected 2 miles South of Kremmling, 7,500 ft. on May 20, 1964 at *Salix* by U.N. Lanham. The Jackson County record is based on a female collected 23 miles south of Walden, 8,500 ft. on May 22, 1964 at *Salix* by U.N. Lanham. All specimens were determined by U.N. Lanham.

(*Tylandrena*)

erythrogaster (Ashmead, 1890) – Archuleta, Bent, Boulder, Costilla, Custer, Delta, Douglas, El Paso, Elbert, Huerfano, Kit Carson, Larimer, Pueblo, Sedgwick, Weld, and Yuma Counties.

hallii Dunning, 1898 – Boulder, Dolores, Douglas, Eagle, El Paso, Fremont, Gunnison, Jefferson, Larimer, Mesa, Moffat, Montezuma, Montrose, Rio Blanco, Routt, San Miguel, and Weld Counties.

perplexa Smith, 1853 – Archuleta, Boulder, Douglas, El Paso, Elbert, Jefferson, Larimer, and Routt Counties.

subaustralis Cockerell, 1898 – Archuleta County. This is new for Colorado based on two female UCMC specimens collected 9 miles north of Arboles on May 27, 1977 from flowers of *Salix* by U. Lanham and P. Byron and determined by U.N. Lanham and confirmed by JSA.

subtilis Smith, 1879 – Archuleta, Delta, Garfield, Gunnison, Mesa, Moffat, Montezuma, Montrose, Routt, and San Miguel Counties.

wilmattae Cockerell, 1906 – Boulder, Douglas, Jefferson, Larimer, and Mesa Counties.

Panurginae

Calliopsini

***Calliopsis* (References: Danforth 1994; Rozen 1958; Shinn 1967)**

(*Calliopsima*)

(*crypta* group)

chlorops Cockerell, 1899 – Boulder, Chaffee, Conejos, Costilla, Custer, El Paso, Fremont, Jackson, La Plata, Larimer, Las Animas, Mesa, Montezuma, Pitkin, Rio Blanco, Teller, and Weld Counties.

(*coloratipes* group)

coloradensis Cresson, 1878 – Boulder, Denver, Jefferson, Larimer, Las Animas, Lincoln, Saguache, Teller, Weld, and Yuma Counties.

(*pectidis* group)

philiphunteri Shinn and Engel, 2003 [= replacement name for *Calliopsis* (*Calliopsima*) *timberlakei* Shinn, 1967; see Shinn and Engel (2003)] – Montezuma County. This is new for Colorado based on three UCRC specimens collected 11.1 miles south of Cortez on August 27, 1967, two from *Chrysothamnus* and one from *Gutierrezia* and confirmed by D. Yanega.

(*Calliopsis*)

(*andreniformis* group)

andreniformis Smith, 1853 – Alamosa, Boulder, Costilla, Jefferson, Larimer, and Weld Counties.

teucrii Cockerell, 1899 – Alamosa, Archuleta, Douglas, Fremont, La Plata, Larimer, Mineral, Montrose, Ouray, Park, Saguache, and Teller Counties.

(*Hypomacrotera*)

callops (Cockerell and Porter, 1899) – Baca, Larimer, Prowers, and Pueblo Counties.

subalpina Cockerell, 1894 – Bent, Mesa, Moffat, and Pueblo Counties. This is new for Colorado based, in part, on UCMC specimens. The Pueblo County specimens (male and female) were taken 2 miles south of Cedarwood on June 8, 1965 from *Sphaeralcea* by U.N. Lanham and determined by U.N. Lanham and confirmed by TG.

(*Nomadopsis*) We prefer to place all species of *Nomadopsis* sensu lato of Rozen (1958) in a single subgenus, i.e. to regard *Micronomadopsis* in addition to *Macronomadopsis* as a synonym of *Nomadopsis* and to treat all infrageneric groupings of Rozen, including the *boharti* group, as formal species groups.

(*scutellaris* group)

australior Cockerell, 1897 – Boulder, Conejos, Delta, Lincoln, Otero, and Pueblo Counties.

scitula Cresson, 1878 – See subspecies. This species also occurs in Larimer, Ouray, and Routt Counties.

scitula scitula Cresson, 1878 – Alamosa, Boulder, Denver, Fremont, Garfield, Gilpin, Lake, Moffat, Park, Rio Grande, San Miguel, and Teller Counties.

(*zebrata* group)

zebrata Cresson, 1878 – See subspecies. This species also occurs in Elbert, Gunnison, and Larimer Counties.

zebrata zebrata Cresson, 1878 – Alamosa, Boulder, Chaffee, Costilla, Gilpin, Grand, Ouray, and Teller Counties.

(*Verbenapis*)

nebraskensis Crawford, 1902 – Yuma County.

Protandrenini

***Protandrena* (References: Ascher and Pickering 2011; Timberlake 1976)**

bancrofti Dunning, 1897 – Baca, Boulder, Larimer, and Sedgwick Counties.

cockerelli Dunning, 1897 – Boulder, Crowley, Larimer, and Las Animas Counties.

***Pseudopanurgus* [sensu lato] (References: Ascher 2004; Ascher and Pickering 2011; Cockerell 1922b; Giles and Ascher 2006; Hurd 1979; Timberlake 1964b, 1967, 1973, 1975)**

(*aethiops* group) [= *Pseudopanurgus* sensu Timberlake (1973)]

aethiops (Cresson, 1872) – Baca, Boulder, Fremont, Garfield, Jefferson, Larimer, Morgan, Otero, Pueblo, Weld, and Yuma Counties.

fraterculus (Cockerell, 1896) – See subspecies.

fraterculus timberlakei Cockerell, 1931 – Larimer County.

(*bakeri* group) [= *Heterosarus* sensu Timberlake (1975), in part]

bakeri (Cockerell, 1896) – Alamosa, Boulder, Eagle, Fremont, Grand, Lake, Larimer, Las Animas, Mineral, Ouray, and Teller Counties.

(*rudbeckiae* group) [= *Pterosarus*]

albitarsis (Cresson, 1872) – El Paso, Larimer, and Logan Counties.

altissimus (Cockerell, 1922) – Ouray County. This species is known only from Colorado. Cockerell (1922b: 3) records the male type and two female specimens from Ouray about 8,000 ft. on July 11[-14], 1919 by H.F. Schwarz and an additional female specimen from Ouray obtained on the same date but from about 8,500 ft. by sweeping grass among Douglas fir, aspen, scrub oak, etc.

atricornis (Cresson, 1878) – Boulder, Chaffee, Fremont, Larimer, and Montezuma Counties.

boylei (Cockerell, 1896) – Colorado.

citripes (Ashmead, 1890) – Colorado.

didirupa (Cockerell, 1908) – Boulder, Chaffee, El Paso, Fremont, La Plata, Larimer, Mesa, Mineral, Montezuma, and Ouray Counties.

innuptus (Cockerell, 1896) – Arapahoe, Boulder, Fremont, Gilpin, Larimer, Otero, and Pueblo Counties.

irregularis (Cockerell, 1922) – Boulder County.

leucopterus (Cockerell, 1923) – Morgan and Washington Counties.

lutzae (Cockerell, 1922) – Otero County. This species is known only from Colorado. Cockerell (1922b: 7-8) records the female AMNH type from La Junta, along the road between irrigated fields, near town about 4,100 ft. on August 12, 1920 by Mrs. F.E. Lutz. The name is miscited as "lutzi" on the determination label of the type specimen.

nebrascensis (Crawford, 1903) – Boulder, Denver, La Plata, and Yuma Counties.

ornatipes (Cresson, 1872) – Colorado.

perlaevis (Cockerell, 1896) – Boulder and Yuma Counties.

piercei (Crawford, 1903) – Boulder, El Paso, and Teller Counties.

porterae (Cockerell, 1900) – Boulder, Fremont, and Larimer Counties.

pulchricornis (Cockerell, 1922) – Eagle County. This species is known only from Colorado. Cockerell (1922b: 10) records the female AMNH type from Tennessee Pass, about 10,500 ft. on August 6-8, 1920 by F.E. Lutz.

renimaculatus (Cockerell, 1896) – Boulder, Eagle, and Grand Counties.

(unplaced to group) [= *Heterosarus* sensu Timberlake (1975), in part]

dawsoni Timberlake, 1964 – Colorado.

flavotinctus (Cockerell, 1898) – Fremont and Teller Counties.

parvus (Robertson, 1892) – El Paso County.

Panurgini

Panurginina

***Panurginus* (References: Crawford 1926)**

beardsleyi (Cockerell, 1904) – Baca, Bent, Boulder, Kiowa, and Weld Counties. Cockerell (1907b: 247) records this species (cited as a *Greeleyella*) from the city of Boulder, collected in June at *Malvastum* by W.P. Cockerell. While UCMC houses no specimens that document this published record, UCRC houses a specimen collected in Boulder on June 17, 1903 and determined by T.D.A. Cockerell.

cressoniellus Cockerell, 1898 – Boulder, Conejos, Dolores, Eagle, Gunnison, Lake, La Plata, Larimer, Mesa, Ouray, San Miguel, and Teller Counties.
ineptus Cockerell, 1922 – Boulder, Conejos, Eagle, Gunnison, Jackson, Mesa, Mineral, Moffat, and Park Counties.

Perditina

***Macrotera* (References: Bennett and Breed 1985; Custer 1928c, 1929b; Danforth 1996; Snelling and Danforth 1992; Timberlake 1954, 1960, 1968)**

(*Cockerellula*)

opuntiae (Cockerell, 1922) – Boulder, El Paso, and Jefferson Counties.

***Perdita* (References: Cockerell 1922a; Griswold and Miller 2010; Griswold and Parker 1988; Timberlake 1954, 1956, 1958, 1960, 1962, 1964a, 1968, 1971, 1980a)**

(*Cockerellia*)

albipennis Cresson, 1868 – See subspecies. This species also occurs in El Paso, Huerfano, La Plata, Larimer, Las Animas, and Weld Counties.
albipennis albipennis Cresson, 1868 – Alamosa, Arapahoe, Baca, Bent, Boulder, Fremont, Kiowa, Mesa, Moffat, Montezuma, Otero, Prowers, Washington, and Yuma Counties.
heliophila Cockerell, 1916 – Montezuma and Otero Counties.
lepachidis Cockerell, 1896 – See subspecies.
lepachidis lepachidis Cockerell, 1896 – Logan County.
lingualis Cockerell, 1896 – Bent, Fremont, Kiowa, Larimer, Mesa, and Otero Counties.

(*Hexaperdita*)

ignota Cockerell, 1896 – See subspecies. This species also occurs in Garfield and La Plata Counties.
ignota crawfordi Cockerell, 1901 – Boulder, Jefferson, and Larimer Counties.
ignota ignota Cockerell, 1896 – Boulder and Douglas Counties.

(*Perdita*)

(*halictoides* group)

halictoides Smith, 1853 – Boulder and Larimer Counties.
levigata Timberlake, 1968 – Fremont County. This species is known only from Colorado. Timberlake (1968:60-61) records the male holotype from Coaldale, 7,800 ft. on August 4, 1957 at *Physalis* by C.D. Michener.
sexmaculata Cockerell, 1895 – Fremont, Larimer, Las Animas, and Prowers Counties.
sexmaculata sexmaculata Cockerell, 1895 – The expected subspecies for Colorado.

(*octomaculata* group)

affinis Cresson, 1878 – Boulder, Fremont, Gilpin, Huerfano, Larimer, Las Animas, Moffat, Pitkin, and Rio Blanco Counties.
bigeloviae Cockerell, 1896 – Logan and Otero Counties.
bruneri Cockerell, 1897 – Boulder, Costilla, Denver, Larimer, Las Animas, Moffat, and Weld Counties.
crotonis Cockerell, 1896 – Weld County.
dolichocephala Swenk and Cockerell, 1907 – Weld and Yuma Counties.
fallax Cockerell, 1896 – Alamosa, Boulder, Garfield, La Plata, Larimer, Moffat, Rio Blanco, and Weld Counties.
gutierreziae Cockerell, 1896 – Costilla County.
lasiogastra Timberlake, 1929 – Moffat County.
laticincta Swenk and Cockerell, 1907 – Boulder, Chaffee, Larimer, Washington, and Weld Counties.
luteiceps Cockerell, 1896 – Alamosa and Routt Counties.
luteola Cockerell, 1894 – Costilla and Moffat Counties.
maculigera Cockerell, 1896 – See subspecies.
maculigera bilineata Timberlake, 1929 – Weld County.
melanostoma Swenk and Cockerell, 1907 – See subspecies.

melanostoma melanostoma Swenk and Cockerell, 1907 – Costilla County.
nuda Cockerell, 1896 – Moffat County.
phymatae Cockerell, 1895 – Moffat County. This is new for Colorado based on two KSEM specimens collected 8 miles east of Maybell on August 17, 1959 by E. Ordway and determined by P.H. Timberlake.
rectangulata Cockerell, 1896 – Larimer County.
reperta Timberlake, 1968 – Alamosa County plus Great Sand Dunes National Monument and Preserve.
snowii Cockerell, 1896 – Boulder, Costilla, Larimer, and Moffat Counties plus Ute Creek.
solidaginis Cockerell, 1922 – Boulder County. This species is known only from Colorado. Cockerell (1922a: 12) records the male type series from White Rocks, near Boulder, on August 13, 1919 at flowers of *Solidago* by. W.P. Cockerell.
swenki Crawford, 1915 – Larimer County.
tridentata Stevens, 1919 – Weld County.
xanthochroa Timberlake, 1960 – Moffat County.
(*sphaeralceae* group)
calloleuca Cockerell, 1922 – See subspecies. This species also occurs in Montrose County. This is the type and only species of the *calloleuca* species subgroup.
calloleuca calloleuca Cockerell, 1922 – Delta, Dolores, and Mesa Counties.
florissantella Cockerell, 1906 – Alamosa, Costilla, Park, and Teller Counties plus Great Sand Dunes National Monument and Preserve. This is the type species of the *florissantella* species subgroup.
mimosae Timberlake, 1964 – See subspecies.
mimosae efferta Timberlake, 1980 – Pueblo County.
nigroclypeata Timberlake, 1964 – Alamosa and Rio Grande Counties. This species is known only from Colorado. Timberlake (1964a: 314-316) records the female holotype from Monte Vista on July 2, 1933 by K. Moehler and a female paratype from Great Sand Dunes National Monument in Alamosa County on June 21, 1955 by Hugo G. Rodeck. Species subgroup is uncertain.
salicis Cockerell, 1896 – See the five subspecies that have been reported for Colorado. This species is a member of the *exclamans* species subgroup.
salicis coloradana Timberlake, 1929 – Delta and Garfield Counties.
salicis imperialis Cockerell, 1925 – Archuleta and Fremont Counties.
salicis salicis Cockerell, 1896 – Colorado.
salicis subtristis Cockerell, 1933 – Archuleta, Chaffee, and Fremont Counties.
salicis tristis Timberlake, 1964 – Delta County.
tortifoliae Cockerell, 1906 – See subspecies. This is the type species of the *tortifoliae* species subgroup.
tortifoliae tortifoliae Cockerell, 1906 – Park and Teller Counties.
wilmattae Cockerell, 1906 – See subspecies. This is a member of the *tortifoliae* species subgroup.
wilmattae miricornis Cockerell, 1922 – Mesa and Moffat Counties.
wilmattae wilmattae Cockerell, 1906 – Chaffee, Moffat, and Teller Counties.
zebrata Cresson, 1878 – See subspecies. This species also occurs in Bent, Boulder, Chaffee, Denver, Garfield, Las Animas, Otero, Ouray, Pueblo, Teller, and Weld Counties. This is the type species of the *zebrata* species subgroup.
zebrata flavens Timberlake, 1958 – Dolores and Moffat Counties.
zebrata zebrata Cresson, 1878 – Alamosa, Delta, Fremont, Larimer, and Moffat Counties.
(*ventralis* group)
kiowi Griswold, 1988 – Bent, Denver, El Paso, Otero, Pueblo, Weld, and Yuma Counties.
mentzeliae Cockerell, 1896 – Conejos and Las Animas Counties.
wootonae Cockerell, 1898 – Bent, Boulder, Denver, Pueblo, and Weld Counties.

(*zonalis* group)
dubia Cockerell, 1896 – See subspecies. The species also occurs in Garfield County.
dubia dubia Cockerell, 1896 – Pitkin County.
similis Timberlake, 1958 – See subspecies.
similis similis Timberlake, 1958 – Eagle and Moffat Counties.
stottleri Cockerell, 1896 – Eagle, Chaffee, Garfield, Grand, Gunnison, Jackson, Larimer, Mesa, Pitkin, and Rio Blanco Counties.
(*Pygoperdita*)
(*eriogoni* group)
eriogoni Cockerell, 1925 – Delta, Dolores, Elbert, Larimer, and Montrose Counties. This species is known only from Colorado. Cockerell (1925: 621-622) records the female type and an additional male from Ute, Montrose County on July 7, 1924 from flowers of *Eriogonum umbellatum* by Edwin Payson.
(*Xerophasma*)
bequaertiana Cockerell, 1951 – Bent and Las Animas Counties.

Melittidae

Melittinae

Macropidini

***Macropis* (References: Michener 1981; Snelling and Stage 1995)**
(*Macropis*)
nuda (Provancher, 1882) – Boulder County. The only UCMC specimen is a female from Boulder on July 13, 1922 at flowers of *Steironema ciliatum* [now *Lysimachia ciliata*].

Dasypodainae

Hesperapini

***Hesperapis* (References: Michener 1981; Michez et al. 2009; Stage 1966)**
(*Carinapis*)
carinata Stevens, 1919 – Alamosa County.
rodecki Cockerell, 1934 – Crowley, Morgan, Phillips, and Weld Counties.

Megachilidae

Megachilinae

Lithurgini

***Lithurgus* (References: Snelling 1983a)**
(*Lithurgopsis*)
apicalis Cresson, 1875 – Alamosa, Archuleta, Baca, Boulder, Chaffee, Conejos, Costilla, Crowley, Delta, Denver, Eagle, El Paso, Elbert, Fremont, Garfield, Gilpin, Huerfano, La Plata, Larimer, Las Animas, Logan, Mesa, Moffat, Montezuma, Montrose, Otero, Ouray, Pueblo, Saguache, Teller, and Weld Counties.

Dioxyini

***Dioxys* (References: Hurd 1958)**
aurifusca (Titus, 1901) – Costilla, Jefferson, La Plata, and Larimer Counties.
pomonae Cockerell, 1910 – See subspecies. This species is also known from Denver County.
pomonae pomonae Cockerell, 1910 – Delta and Rio Blanco Counties.
rohweri Cockerell, 1908 – Grand County. This species is known only from Colorado. Cockerell (1908b: 329-330) records the male type from Troublesome, 7,345 ft. on June 9, 1908 by S.A. Rohwer.

Anthidiini

***Anthidiellum* (References: Schwarz 1926b; Urban 2001)**

(*Loyolanthidium*)

notatum (Latreille, 1809) – See subspecies. This species is also known from Bent, Boulder, Jefferson, Moffat, and Montrose Counties.

notatum gilense (Cockerell, 1897) – El Paso County.

notatum robertsoni (Cockerell, 1904) – Garfield and Mesa Counties.

***Anthidium* (References: Gibbs and Sheffield 2009; Grigarick and Stange 1968; Hoebeke and Wheeler 1999; Schwarz 1927a, 1927b)**

(*Anthidium*)

atripes Cresson, 1879 – Mesa County.

clypeodentatum Swenk, 1914 – Boulder, Jefferson, Larimer, and Teller Counties.

emarginatum (Say, 1824) – Boulder, Douglas, Fremont, Gunnison, Larimer, and Weld Counties.

jocosum Cresson, 1878 – Colorado. Although "Colorado" is the reported type locality for this species (Cresson 1878a: 111), no subsequent records corroborate its occurrence in the state or from biogeographically similar areas of adjacent states. Confirmed records of this species, as presently understood, place this species only as far north as southwestern Utah and southern Nevada (Gonzalez and Griswold, in prep.) The type specimen was examined by V.H. Gonzalez in 2010 and found to match the current concept of this species, so the identity of the species is not in question, but the possibility of an erroneous type locality due to mislabeling or some other cause must be considered.

maculosum Cresson, 1878 – Fremont and Huerfano Counties.

manicatum (Linnaeus, 1758) – Boulder, Jefferson, and El Paso Counties. This is a non-native species in North America (Gibbs and Sheffield 2009). The earliest documented Colorado record we have located for this species is a male UCMC specimen collected in the city of Boulder on September 29, 2000.

montivagum Cresson, 1878 – Colorado.

mormonum Cresson, 1878 – Alamosa, Archuleta, Boulder, Costilla, Garfield, Jefferson, Larimer, Mesa, Montezuma, Montrose, and Teller Counties.

placitum Cresson, 1879 – Bent, Crowley, Delta, Larimer, Moffat, Montezuma, and Saguache Counties.

porterae Cockerell, 1900 – Arapahoe, Archuleta, Baca, Bent, Boulder, Chaffee, Crowley, Custer, Denver, El Paso, Elbert, Fremont, Huerfano, Jefferson, Kiowa, Kit Carson, Larimer, Las Animas, Montezuma, Morgan, Otero, Prowers, Pueblo, Teller, Weld, and Yuma Counties.

rodecki Schwarz, 1934 – Alamosa, Saguache, and Weld Counties.

tenuiflorae Cockerell, 1907 – Boulder, Chaffee, Conejos, Costilla, Custer, Denver, Dolores, Elbert, Gilpin, Gunnison, Huerfano, Jackson, Jefferson, Larimer, Mesa, Mineral, Moffat, Montezuma, Montrose, Park, Routt, San Miguel, and Teller Counties.

(*Callanthidium*)

formosum Cresson, 1878 – Boulder, Denver, Eagle, Huerfano, Jackson, Jefferson, Larimer, Mesa, Rio Blanco, and Saguache Counties.

(*Proanthidium*)

oblongatum (Illiger, 1806) – Boulder, Denver, and Jefferson Counties. This is new for Colorado. The first Colorado records for this non-native species were posted on Bugguide at http://bugguide.net/node/view/334074 and http://bugguide.net/node/view/334073, photographed in Arvada on June 23, 2009 by Diane Wilson. Since then a few UCMC specimens have been collected in Colorado's Front Range. These include a female taken in Denver on June 19, 2010 at *Sedum* by D.M. Wilson determined by VLS and a short series of males and females from Longmont on June 16, 2011 at *Melilotus officinalis* collected and determined by VLS.

***Dianthidium* (References: Grigarick and Stange 1968; Griswold and Michener 1988; Schwarz 1926b; Timberlake 1943a)**

(*Adanthidium*)

arizonicum Rohwer, 1916 – Montezuma County.

(*Dianthidium*)

concinnum (Cresson, 1872) – Boulder and Larimer Counties.

cressonii (Dalla Torre, 1896) – Boulder, Elbert, Pitkin, Summit, Teller, and Weld Counties.

curvatum (Smith, 1854) – See subspecies.

curvatum sayi Cockerell, 1907 – Baca, Bent, Boulder, Cheyenne, Crowley, Denver, El Paso, Elbert, Huerfano, Kit Carson, Larimer, Las Animas, Otero, Prowers, Sedgwick, and Weld Counties.

heterulkei Schwarz, 1940 – See subspecies.

heterulkei fraternum Timberlake, 1943 – Ouray County. This is new for Colorado based a UCRC specimen collected from Ouray on August 27, 1963 and confirmed by D. Yanega.

parvum (Cresson, 1878) – See subspecies.

parvum parvum (Cresson, 1878) – Boulder, Denver, Elbert, Garfield, Larimer, Mesa, Montezuma, Pitkin, Rio Blanco, and Teller Counties.

pudicum (Cresson, 1879) – See subspecies.

pudicum pudicum (Cresson, 1879) – Archuleta, Boulder, Chaffee, Douglas, Elbert, Gilpin, Gunnison, and Larimer Counties.

subparvum Swenk, 1914 – Boulder, Jefferson, and Rio Blanco Counties.

ulkei (Cresson, 1878) – See subspecies.

ulkei ulkei (Cresson, 1878) – Boulder, Elbert, Garfield, Larimer, Mesa, Montezuma, Pitkin, Rio Blanco, Saguache, and Teller Counties.

***Paranthidium* (References: Schwarz 1926b)**

(*Paranthidium*)

jugatorium (Say, 1824) – See subspecies.

jugatorium perpictum (Cockerell, 1898) – Boulder, Costilla, Douglas, Elbert, Fremont, Jefferson, La Plata, Larimer, Pitkin, and Rio Blanco Counties.

***Stelis* (References: Parker and Bohart 1979; Thorp 1966)**

(*Dolichostelis*)

rudbeckiarum Cockerell, 1904 – Boulder, El Paso, and Jefferson Counties. This is new for Colorado. The Jefferson County record is based on a photograph by Diane Wilson taken in Arvada on August 4, 2009 and posted at http://bugguide.net/node/view/325313/bgimage.

(*Stelis*)

callura Cockerell, 1925 – Boulder, Larimer, and Montrose Counties.

carnifex Cockerell, 1911 – Conejos County.

coarctatus Crawford, 1916 – Boulder County.

crassiceps Cockerell, 1926 – Colorado.

cusackae (Cockerell, 1910) – Colorado plus the Wet Mountain Valley.

elegans Cresson, 1864 – Boulder, Chaffee, Elbert, Gilpin, Gunnison, Jackson, Larimer, Mineral, Routt, and Teller Counties.

foederalis Smith, 1854 – Boulder, Clear Creek, Fremont, Gunnison, Jackson, Larimer, Moffat, Routt, and Teller Counties.

lateralis Cresson, 1864 – Boulder, Elbert, Fremont, and Huerfano Counties.

melanotricha (Cockerell, 1925) – Boulder County. This species is known only from Colorado. Cockerell (1925: 626) records the female type from the city of Boulder on May 17, 1925 by C.H. Hicks.

montana Cresson, 1864 – Archuleta, Boulder, Clear Creek, Conejos, Costilla, Eagle, El Paso, Gilpin, Gunnison, Hinsdale, Jackson, La Plata, Lake, Larimer, Mesa, Park, and Teller Counties.

monticola Cresson, 1878 – Colorado. Cresson records the type locality as Colorado and the collector as Ridings. Because Ridings collecting trip took him to Boulder County, that is likely where this specimen was collected; see section on James Ridings. Cockerell (1906c; 445) records this species, as *Chelynia monticola*, from Florissant (Teller County), however we were unable to locate any specimens that confirms this locality.

nitida Cresson, 1878 – Clear Creek, Grand, and Gunnison Counties.

pavonina (Cockerell, 1908) – Archuleta, Boulder, Clear Creek, Delta, Gilpin, Gunnison, Jackson, Mesa, and Rio Blanco Counties.

permaculata Cockerell, 1898 – Boulder County.

pulchra Crawford, 1902 – Gilpin County. Cockerell (1907b: 249) records this species, in the genus *Chelynia* and noted its variety as occurring in the city of Boulder. At the time of this writing, no Boulder or Boulder County specimens of this species have been located.

rubi Cockerell, 1898 – Larimer? County. There is an AMNH specimen from Longs Peak collected by F.E. Lutz and determined by H.F. Schwarz and confirmed by F.D. Parker. Although Longs Peak is actually in Boulder County, the majority of Longs Peak Trail is in Larimer County.

seneciophila Cockerell, 1908 – Teller County.

subcaerulea Cresson, 1878 – Boulder, Denver, El Paso, Gunnison, Mineral, Moffat, and Rio Blanco Counties.

subemarginata Cresson, 1878 – Boulder, Gunnison, Jackson, Larimer, and San Miguel Counties.

***Trachusa* (References: Brooks and Griswold 1988; Schwarz 1926a)**

(*Heteranthidium*)

(*occidentalis* group)

occidentalis (Cresson, 1868) – Boulder, Custer, Elbert, Gilpin, Larimer, and Montezuma Counties.

(*zebrata* group)

zebrata (Cresson, 1872) – Baca, Boulder, Crowley, Larimer, Otero, Prowers, Weld, and Yuma Counties.

Osmiini

***Ashmeadiella* (References: Hurd et al. 1980, Hurd and Michener 1955; Michener 1939a)**

(*Arogochila*)

lutzi (Cockerell, 1930) – Mesa and Montezuma Counties.

(*Ashmeadiella*)

aridula Cockerell, 1910 – See subspecies.

aridula aridula Cockerell, 1910 – Garfield, Montrose, and Routt Counties.

bucconis (Say, 1837) – See subspecies. This species also occurs in Douglas, Jefferson, Mesa, Montezuma, and Montrose Counties.

bucconis bucconis (Say, 1837) – Moffat County.

bucconis denticulata Cresson, 1878 – Boulder, Costilla, Delta, Dolores, El Paso, Fremont, Garfield, Larimer, Las Animas, Moffat, Pueblo, and Rio Blanco Counties.

cactorum (Cockerell, 1897) – See subspecies.

cactorum cactorum (Cockerell, 1897) – Boulder, Delta, Larimer, Mesa, Saguache, and Teller Counties.

californica (Ashmead, 1897) – See subspecies.

californica florissantensis Michener, 1936 – Alamosa, Boulder, Custer, El Paso, Garfield, Grand, Huerfano, Larimer, Mesa, Ouray, Rio Blanco, Routt, and Teller Counties.

gillettei Titus, 1904 – See subspecies.

gillettei gillettei Titus, 1904 – Boulder, Costilla, Delta, Jackson, Larimer, Logan, Mesa, Moffat, Montrose, Morgan, Phillips, Saguache, and Weld Counties.

opuntiae (Cockerell, 1897) – Boulder, Delta, Fremont, Huerfano, Mesa, and Saguache Counties.
pronitens (Cockerell, 1906) – Boulder, Costilla, Custer, Gilpin, Gunnison, Jackson, Larimer, and Teller Counties.
prosopidis (Cockerell, 1897) – Colorado.

***Atoposmia* (References: Hurd and Michener 1955; Michener 1943)**

(*Atoposmia*)
abjecta (Cresson, 1878) – See subspecies.
abjecta abjecta (Cresson, 1878) – Boulder, Chaffee, Eagle, Garfield, Grand, Gunnison, Huerfano, Larimer, Moffat, Montezuma, Park, Routt, and Teller Counties.
anthodyta (Michener, 1943) – See subspecies.
anthodyta anthodyta (Michener, 1943) – Colorado.
elongata (Michener, 1936) – Boulder, El Paso, Fremont, Garfield, Grand, and Park Counties.
aff. *triodonta* (Cockerell, 1935) – Eagle County.

(*Hexosmia*)
copelandica (Cockerell, 1908) – See subspecies.
copelandica copelandica (Cockerell, 1908) – Boulder, Delta, Gilpin, and Larimer Counties.

***Chelostoma* (References: Michener 1938b, 1938c)**

(*Prochelostoma*)
philadelphi (Robertson, 1891) – Boulder County. This is new for Colorado. Neither the identity, determined by VLS and confirmed by JSA, nor the provenance of the single male specimen collected on the University of Colorado campus on 13 June 2002 at flowers of *Philadelphus* by VLS are in doubt, however, the establishment of this bee in Colorado remains to be demonstrated. Additional collecting on horticultural plantings of *Philadelphus* in the Front Range should be undertaken, as well as collecting at populations of the native *Philadelphus microphyllus* Gray in Colorado.

***Heriades* (References: Hurd and Michener 1955; Michener 1938a)**

(*Neotrypetes*)
carinatus Cresson, 1864 – Boulder, Denver, Eagle, Garfield, Jefferson, La Plata, Larimer, Mesa, Moffat, Montezuma, Prowers, Routt, Saguache, and Weld Counties.
cressoni Michener, 1938 – Boulder, Chaffee, El Paso, Garfield, La Plata, Larimer, Ouray, and Pitkin Counties.
gracilior Cockerell, 1897 – Archuleta and Montezuma Counties. Cockerell (1907b: 253) records this species from the city of Boulder, however no specimens have been located from anywhere in Boulder County at the time of this writing.
timberlakei Michener, 1938 – Fremont, Garfield, Mesa, and Montezuma Counties.
variolosus (Cresson, 1872) – See subspecies.
variolosus variolosus (Cresson, 1872) – Bent, Boulder, Jefferson, Larimer, Mesa, Pitkin, Pueblo, Saguache, Weld, and Yuma Counties.

***Hoplitis* (References: Hurd and Michener 1955; Michener 1938c, 1947)**

(*Alcidamea*)
(*producta* group)
pilosifrons (Cresson, 1864) – Boulder, El Paso, Huerfano, Logan, Sedgwick, Weld, and Yuma Counties.
producta (Cresson, 1864) – See subspecies. This species also occurs in Clear Creek, Delta, Eagle, El Paso, Elbert, Fremont, Grand, Mesa, Montrose, Teller, and Weld Counties. Michener (1947: 289) concluded that *H. p. producta* "ranges westward to the foot of the Rocky Mountains, but is replaced in the mountains by the subspecies *interior*." Specimens from Florissant and Eldora were considered intermediate between *H. p. producta* and *H. p. interior*.
producta interior Michener, 1947 – Boulder, Chaffee, Dolores, Garfield, Gunnison, Huerfano, Lake, Larimer, Moffat, Ouray, Park, and Saguache Counties.

producta producta (Cresson, 1864) – Boulder County.

(*truncata* group)

truncata (Cresson, 1878) – See subspecies. This species also occurs in Boulder County.

truncata mescalerium Cockerell, 1910 – Elbert and Fremont Counties.

truncata truncata (Cresson, 1878) – Larimer County.

(*Cyrtosmia*)

hypocrita (Cockerell, 1906) – Boulder, Gilpin, La Plata, and Larimer Counties.

(*Formicapis*)

robusta (Nylander, 1848) – Boulder, Chaffee, Delta, Eagle, El Paso, Gunnison, Jackson, La Plata, Lake, Larimer, Mesa, Montezuma, Ouray, Pitkin, Rio Grande, San Miguel, and Summit Counties.

(*Monumetha*)

albifrons (Kirby, 1837) – See subspecies.

albifrons argentifrons (Cresson, 1864) – Alamosa, Archuleta, Boulder, Chaffee, Conejos, Costilla, Custer, Delta, Douglas, Eagle, El Paso, Elbert, Fremont, Garfield, Gilpin, Grand, Gunnison, Huerfano, Jackson, Jefferson, Larimer, Mesa, Mineral, Moffat, Montrose, Ouray, Park, Pitkin, Rio Blanco, Routt, Saguache, San Miguel, and Teller Counties.

fulgida (Cresson, 1864) – See subspecies.

fulgida fulgida (Cresson, 1864) – Archuleta, Boulder, Clear Creek, Conejos, Custer, Delta, Dolores, Douglas, Eagle, El Paso, Elbert, Fremont, Garfield, Gilpin, Grand, Gunnison, Hinsdale, Huerfano, Jackson, Jefferson, La Plata, Lake, Larimer, Las Animas, Mesa, Mineral, Montezuma, Ouray, Park, Pitkin, Routt, San Juan, San Miguel, Summit, and Teller Counties plus the South Fork of the Rio Grande River.

spoliata (Provancher, 1888) [= replacement name for *Hoplitis cylindrica* (Cresson); as cited in Michener (2000)] – Boulder County.

Osmia **(References: Cane et al. 2007; Cooper 1993; Cripps and Rust 1985; Michener 1949, 1957; Rightmyer et al. 2010; Rust 1974; Rust and Bohart 1986; Sandhouse 1939; Sinha and Michener 1958; Snelling 1967; White 1952)** Note: information on species listed as new for Colorado, not given in full here, is based on specimens identified by TG or M. Rightmyer in preparation of a revision of North American *Osmia*.

(*Acanthosmioides*)

calcarata White, 1952 – Colorado.

dakotensis Michener, 1937 – Boulder, El Paso, Larimer, Ouray, and Pueblo Counties.

giffardi Sandhouse, 1939 – Colorado.

giliarum Cockerell, 1906 – Boulder, Chaffee, Costilla, Douglas, Eagle, Elbert, Gilpin, Grand, Hinsdale, Huerfano, Jackson, La Plata, Larimer, Mesa, Park, Pitkin, Teller, and Weld Counties.

integra Cresson, 1878 – Archuleta, Bent, Custer, El Paso, Gilpin, Larimer, Las Animas, Moffat, Montezuma, Montrose, Park, Prowers, Teller, and Weld Counties. Cockerell (1907b: 251) records *Osmia novomexicana* Cockerell, a junior synonym of *O. integra*, as occurring in the city of Boulder. Although this species is documented from much of Colorado including the northern Front Range, no Boulder County specimens have been located as of this writing.

kenoyeri Cockerell, 1915 – Boulder and Gilpin Counties.

longula Cresson, 1864 – Boulder, Custer, Delta, Douglas, Eagle, Elbert, Gilpin, Grand, Jackson, Jefferson, Larimer, Mesa, Montezuma, Montrose, Park, Routt, and Teller Counties.

nifoata Cockerell, 1909 – Archuleta, Boulder, Douglas, Garfield, Grand, Gunnison, Jackson, La Plata, Larimer, Mesa, Montezuma, Rio Blanco, Routt, and San Miguel Counties.

nigrifrons Cresson, 1878 – Archuleta, Boulder, Chaffee, Delta, El Paso, Garfield, Gilpin, Grand, Jefferson, Larimer, Las Animas, Mesa, Moffat, Montrose, Park, San Miguel, and Teller Counties.

nigrobarbata Cockerell, 1916 – Colorado.

physariae Cockerell, 1907 – Archuleta, Boulder, Delta, Douglas, Grand, Gunnison, Huerfano, Jackson, Larimer, and Teller Counties.

sladeni Sandhouse, 1925 – Chaffee, Jackson, and Routt Counties. This is new for Colorado. The Chaffee county record is based on a KSEM specimen determined by J.R. White.

unca Michener, 1937 – Boulder, Conejos, El Paso, Huerfano, Jefferson, Larimer, Montezuma, and Weld Counties.

(*Cephalosmia*)

californica Cresson, 1864 – Archuleta, Boulder, Elbert, Garfield, Grand, Hinsdale, Larimer, Mesa, Moffat, and Routt Counties.

grinnelli Cockerell, 1910 – Boulder, Garfield, and Mesa Counties.

marginipennis Cresson, 1878 – Boulder, El Paso, and Larimer Counties.

montana Cresson, 1864 – See subspecies.

montana montana Cresson, 1864 – Boulder, Chaffee, El Paso, Garfield, Gilpin, Grand, Gunnison, Huerfano, Jackson, Larimer, Mesa, Mineral, Montezuma, Park, Routt, Saguache, San Miguel, Teller, Weld, and Yuma Counties.

subaustralis Cockerell, 1900 – Boulder, Chaffee, Clear Creek, Conejos, Delta, Eagle, El Paso, Fremont, Garfield, Gilpin, Grand, Gunnison, Jackson, Jefferson, La Plata, Larimer, Mesa, Montrose, Park, Saguache, San Juan, and Teller Counties.

(*Diceratosmia*)

subfasciata Cresson, 1872 – Baca County. This is new for Colorado. Although the range map in Hurd and Michener (1955: map 112) shows this species as potentially occurring in extreme southeastern Colorado, they cite no specific Colorado localities. Specimens have now been located by TG that document this species in Colorado.

(*Helicosmia*)

coloradensis Cresson, 1878 – Alamosa, Archuleta, Baca, Boulder, Chaffee, Custer, El Paso, Garfield, Gilpin, Grand, Gunnison, Jackson, La Plata, Larimer, Mesa, Montezuma, Rio Blanco, Saguache, San Juan, and Teller Counties.

texana Cresson, 1872 – Adams, Boulder, Dolores, El Paso, Garfield, Gunnison, Jefferson, Larimer, Mesa, Moffat, and Teller Counties.

(*Melanosmia*)

albolateralis Cockerell, 1906 – Boulder, Delta, Eagle, Fremont, Gilpin, Grand, Gunnison, Huerfano, Jackson, La Plata, Lake, Larimer, Mesa, Mineral, Moffat, Routt, Saguache, San Miguel, and Teller Counties.

albolateralis albolateralis Cockerell, 1906 – The expected subspecies for Colorado.

atrocyanea Cockerell, 1897 – See subspecies.

atrocyanea atrocyanea Cockerell, 1897 – Archuleta, Boulder, Garfield, Grand, Gunnison, Huerfano, Larimer, Mesa, Montrose, Routt, and San Miguel Counties.

austromaritima Michener, 1936 – Boulder, La Plata, and Mesa Counties.

bella Cresson, 1878 – Alamosa, Boulder, Eagle, El Paso, Garfield, Gunnison, Larimer, Mesa, Montrose, and Teller Counties.

brevis Cresson, 1864 – Alamosa, Archuleta, Boulder, Douglas, Eagle, El Paso, Elbert, Fremont, Garfield, Gilpin, Grand, Gunnison, Huerfano, Jackson, Jefferson, Larimer, Mesa, Moffat, Montezuma, Routt, Teller, and Weld Counties.

bruneri Cockerell, 1897 – Alamosa, Archuleta, Boulder, Chaffee, Conejos, Delta, Douglas, Eagle, El Paso, Elbert, Fremont, Garfield, Grand, Gunnison, Jefferson, Larimer, Mesa, Montezuma, Teller, and Weld Counties.

bucephala Cresson, 1864 – Boulder, Conejos, Costilla, Custer, Delta, Fremont, Garfield, Gilpin, Grand, Gunnison, Huerfano, Jackson, Jefferson, Larimer, Mesa, Mineral, Moffat, Montezuma, Montrose, Park, Rio Grande, Routt, Saguache, and San Juan Counties.

cahuilla Cooper, 1993 – Colorado.

calla Cockerell, 1897 – Boulder, Eagle, Garfield, Grand, Mesa, Montrose, and Rio Blanco Counties.

caulicola Cockerell, 1934 – Boulder, Douglas, Elbert, and Routt Counties.
cobaltina Cresson, 1878 – Baca, Douglas, El Paso, Garfield, Grand, Hinsdale, Jefferson, Larimer, Mesa, Mineral, and Ouray Counties.
cockerelli Sandhouse, 1939 – Alamosa, Boulder, El Paso, Larimer, Las Animas, Mesa, Pueblo, and Weld Counties.
cordata Robertson, 1902 – Boulder, El Paso, Garfield, Jefferson, Kiowa, Larimer, Mesa, and Pueblo Counties.
crassa Rust and Bohart, 1986 – Garfield County.
cyanella Cockerell, 1897 – Archuleta, Boulder, Douglas, Larimer, Mesa, Montezuma, Montrose, and Routt Counties.
cyaneonitens Cockerell, 1906 – Boulder, Douglas, El Paso, Garfield, Grand, Gunnison, Jefferson, Phillips, Teller, and Weld Counties.
cyanopoda Cockerell, 1916 – La Plata County. This is new for Colorado.
densa Cresson, 1864 – Boulder, Fremont, Larimer, Montrose, and Teller Counties plus Pikes Peak.
distincta Cresson, 1864 – Colorado.
ednae Cockerell, 1907 – Archuleta, Boulder, Costilla, Delta, Eagle, Garfield, Grand, Gunnison, Jefferson, Larimer, Mesa, Moffat, Pitkin, Routt, San Miguel, and Teller Counties.
enixa Sandhouse, 1924 – Colorado.
gaudiosa Cockerell, 1907 – Archuleta, Boulder, Douglas, El Paso, Fremont, Garfield, Huerfano, Las Animas, Mesa, Moffat, and Montrose Counties.
grindeliae Cockerell, 1910 – Boulder, Garfield, Grand, Gunnison, Larimer, Routt, and Weld Counties.
hendersoni Cockerell, 1907 – Arapahoe, Boulder, Elbert, Gilpin, and Mineral Counties.
inermis (Zetterstedt, 1838) – Boulder, Grand, Gunnison, Lake, Larimer, Mesa, Mineral, Routt, and Summit Counties.
inurbana Cresson, 1878 – Boulder and Routt Counties.
iridis Cockerell and Titus, 1902 – Archuleta, Boulder, Garfield, Gunnison, and Jackson Counties.
juxta Cresson, 1864 – See subspecies. The species also occurs in Alamosa, Conejos, Douglas, Fremont, Gilpin, La Plata, and Teller Counties.
juxta juxta Cresson, 1864 – Boulder, Elbert, and Larimer Counties.
kincaidii Cockerell, 1897 – Archuleta, Boulder, Garfield, Grand, and Moffat Counties.
malina Cockerell, 1909 – Boulder, El Paso, and Jefferson Counties.
mertensiae Cockerell, 1907 – Boulder, El Paso, Jackson, Larimer, and Teller Counties.
nanula Cockerell, 1897 – Boulder, Delta, Douglas, Fremont, Gilpin, Gunnison, La Plata, Larimer, and Las Animas Counties.
pagosa Sandhouse, 1939 – Archuleta, Douglas, and Jefferson Counties.
paradisica Sandhouse, 1924 – Boulder, Delta, Fremont, Gunnison, Jackson, and Routt Counties. This is new for Colorado based, in part, on UCMC specimens determined by TG.
pentstemonis Cockerell, 1906 – Boulder, Delta, Douglas, Fremont, Garfield, Gilpin, Gunnison, Huerfano, Jackson, Larimer, Mesa, Mineral, Routt, and Teller Counties.
pikei Cockerell, 1907 – Boulder, Gunnison, Huerfano, Jackson, Jefferson, Mesa, and Teller Counties.
pingreeana Michener, 1937 – Baca, Costilla, Jackson, Larimer, Mesa, Montrose, and Teller Counties. This species is known only from Colorado. Michener (1937b: 408-409) records the holotype female from Pingree Park on August 22, 1935 by C.D. Michener.
proxima Cresson, 1864 – Boulder, Douglas, Eagle, Fremont, Grand, Gunnison, La Plata, Larimer, and Mesa Counties.
pulsatillae Cockerell, 1907 – Boulder and Moffat Counties.
pusilla Cresson, 1864 – Boulder, El Paso, Grand, Mesa, Mineral, and Rio Grande Counties.
raritatis Michener, 1957 – Jackson and Mesa Counties.

rawlinsi Sandhouse, 1939 – Eagle, Garfield, Moffat, Montezuma, and Rio Blanco Counties. This is new for Colorado. The Moffat County record is based on one female specimen housed at CSUC from Juniper Hot Springs, Co. Rts. 53 and 77 on June 21, 1992 by Kondratieff and Kippenhan and determined by TG.

sanrafaelae Parker, 1985 – Eagle, Garfield, and Montezuma Counties. This is new for Colorado.

sculleni Sandhouse, 1939 – Boulder, Chaffee, Gunnison, Jackson, Jefferson, La Plata, Larimer, Park, Routt, San Miguel, and Teller Counties plus Pikes Peak.

simillima Smith, 1853 – Archuleta, Boulder, Chaffee, Conejos, Delta, Eagle, Garfield, Gunnison, Jackson, Jefferson, La Plata, Lake, Larimer, Mesa, Montrose, Pitkin, Routt, Rio Grande, Summit, and Teller Counties.

tanneri Sandhouse, 1939 – Park County. This is new for Colorado.

tersula Cockerell, 1912 – Boulder, Gunnison, and La Plata Counties.

trevoris Cockerell, 1897 – Boulder, Douglas, Elbert, Garfield, Grand, Gunnison, Jackson, Jefferson, Larimer, Mesa, Moffat, Montezuma, Montrose, Park, San Miguel, and Teller Counties.

tristella Cockerell, 1897 – See subspecies. The species also occurs in Gunnison, Jackson, La Plata, Larimer, and Mineral Counties.

tristella tristella Cockerell, 1897 – Colorado.

tristella cyanosoma Cockerell, 1916 – Boulder County.

universitatis Cockerell, 1907 – Boulder County.

(*Mystacosmia*)

nemoris Sandhouse, 1924 – Boulder, El Paso, Garfield, Mesa, and Pueblo Counties. This is new for Colorado.

(*Osmia*)

lignaria Say, 1837 – See subspecies.

lignaria propinqua Say, 1837 – Alamosa, Archuleta, Baca, Boulder, Clear Creek, Conejos, Costilla, Custer, Delta, Denver, Dolores, Douglas, El Paso, Elbert, Fremont, Garfield, Gilpin, Grand, Gunnison, Jackson, Jefferson, La Plata, Larimer, Mesa, Moffat, Montrose, Ouray, Park, Routt, and Teller Counties.

ribifloris Cockerell, 1900 – See subspecies.

ribifloris ribifloris Cockerell, 1900 – Archuleta, Baca, Boulder, Conejos, Delta, Jefferson, and Larimer Counties.

(*Trichinosmia*)

latisulcata Michener, 1936 – Garfield and Mesa Counties.

(unassigned)

angustipes Cockerell, 1933 – Boulder County. This species is known only from Colorado. Cockerell (1933b: 158) records the male type from "Boulder, April 21, 1833 (H.W. Campbell)." Surely, this should read 1933 as other specimens cited in this same publication were collected by H.W. Campbell in 1933.

Megachilini

Coelioxys (References: Baker 1971, 1975; Mitchell 1973)

(*Boreocoelioxys*)

banksi Crawford, 1914 – Boulder, Elbert, and Fremont Counties.

funeraria Smith, 1854 – Boulder, Gunnison, and San Miguel Counties.

insita Cresson, 1872 – Boulder County.

moesta Cresson, 1864 – Boulder, Fremont, Gunnison, and Larimer Counties.

octodentata Say, 1824 – Boulder, Delta, El Paso, Elbert, La Plata, Montrose, Prowers, and Yuma Counties.

porterae Cockerell, 1900 – Boulder, Fremont, Garfield, Jefferson, Larimer, Montrose, and Pitkin Counties.

rufitarsis Smith, 1854 – Boulder, Delta, Denver, Mesa, Moffat, Montrose, Pueblo, and Weld Counties.
sayi Robertson, 1897 – Boulder County.

(*Coelioxys*)

sodalis Cresson, 1878 – Boulder, Chaffee, Custer, Delta, Douglas, Fremont, Gilpin, Grand, Gunnison, Jackson, Jefferson, Lake, Larimer, Mesa, Montrose, Ouray, and Park Counties.

(*Cyrtocoelioxys*)

deani Cockerell, 1909 – Boulder County.
gilensis Cockerell, 1896 – Delta County.

(*Synocoelioxys*)

alternata Say, 1837 – Boulder and Larimer Counties.
apacheorum Cockerell, 1900 – Boulder, Delta, Fremont, and Rio Blanco Counties.
erysimi Cockerell, 1912 – northern Front Range and western Colorado.
hunteri Crawford, 1914 – northern Front Range of Colorado.

(*Xerocoelioxys*)

edita Cresson, 1872 – Boulder, Clear Creek, Crowley, El Paso, Elbert, Fremont, Huerfano, Mesa, Otero, Prowers, Pueblo, Rio Blanco, and Yuma Counties.
grindeliae Cockerell, 1900 – Boulder, Fremont, Pitkin, and Rio Blanco Counties.
mesae Cockerell, 1921 – Boulder County.

Megachile **(References: Gonzalez and Griswold 2007; Mitchell 1934, 1935a, 1935b, 1936, 1937a, 1937b, 1937c, 1937d, 1980; Sheffield and Westby 2007; Snelling 1990)**

(*Argyropile*)

parallela Smith, 1853 – Adams, Baca, Bent, Boulder, Cheyenne, Clear Creek, Crowley, Delta, Denver, El Paso, Elbert, Fremont, Garfield, Jefferson, Kit Carson, La Plata, Larimer, Las Animas, Lincoln, Logan, Mesa, Moffat, Montezuma, Montrose, Otero, Phillips, Prowers, Pueblo, Rio Blanco, Sedgwick, Weld, and Yuma Counties.
townsendiana Cockerell, 1898 – Otero and Weld Counties.

(*Chelostomoides*)

(*exilis* group)

campanulae (Robertson, 1903) – El Paso and Fremont Counties.
exilis Cresson, 1872 – Crowley County.
exilis exilis Cresson, 1872 – The expected subspecies for Colorado.
subexilis Cockerell, 1908 – Boulder, Costilla, Denver, El Paso, Garfield, La Plata, Larimer, Mesa, and Moffat Counties.

(*rugifrons* group)

chilopsidis Cockerell, 1900 – Colorado.
odontostoma Cockerell, 1924 – Colorado.

(*occidentalis* group)

prosopidis Cockerell, 1900 – Mesa County. This is new for Colorado based on a single female UCMC specimen originally identified as *M. occidentalis* by T.B. Mitchell, however based on Snelling (1990) VLS has determined it to be *M. prosopidis*. A series of seven males accompany this female that was collected from Colorado National Monument, 4,660 ft. on June 14, 1963 at flowers of *Tamarix* by C.J. McCoy.

(*Eutricharaea*)

concinna Smith, 1879 – Otero and Yuma Counties. This is a non-native species accidentally introduced to the United States from the Old World. The Otero County record is from 1957 and based on a KSEM specimen determined by M.B. Mitchell. AMNH specimens from Yuma County date back to 1964.
rotundata (Fabricius, 1793) – Bent, Boulder, Denver, El Paso, Garfield, Larimer, Montrose, Morgan, Phillips, Pitkin, Weld, and Yuma Counties. This non-native (Old World) species was introduced into North America around World War II (Mitchell 1962: 122-123). The earliest records at UCMC for its occurrence in Colorado are from 1962 in the cities of

Boulder and Denver. This is the type species of subgenus *Neoeutricharaea* Rebmann, which is recognized as valid by certain Palearctic specialists.

(*Litomegachile*)

brevis Say, 1837 – See subspecies. The species also occurs in Adams, Bent, Cheyenne, Clear Creek, El Paso, Fremont, Jefferson, Las Animas, Logan, Mesa, Phillips, and Yuma Counties.

brevis brevis Say, 1837 – Baca, Boulder, Elbert, Kit Carson, Montezuma, and Prowers Counties.

brevis onobrychidis Cockerell, 1908 – Alamosa, Boulder, Delta, Elbert, Larimer, Moffat, Otero, and Weld Counties.

lippiae Cockerell, 1900 – Baca, Bent, Boulder, Delta, Denver, Eagle, El Paso, Fremont, La Plata, Larimer, Mesa, Moffat, Montrose, Prowers, and Rio Blanco Counties.

mendica Cresson, 1878 – See subspecies. The species also occurs in El Paso County.

mendica mendica Cresson, 1878 – Boulder and Denver Counties.

mendica snowi Mitchell, 1927 – Alamosa, Boulder, Delta, Elbert, Larimer, Otero, and Weld Counties.

texana Cresson, 1878 – Archuleta, Bent, Boulder, Delta, Denver, Eagle, Elbert, Garfield, Jackson, La Plata, Larimer, Mesa, Moffat, Montrose, Otero, Prowers, Pueblo, and Weld Counties.

(*Megachile*)

centuncularis (Linnaeus, 1758) – Boulder, Denver, Douglas, Jefferson, Larimer, and Routt Counties.

inermis Provancher, 1888 – Boulder, Costilla, Delta, El Paso, Gunnison, Larimer, Mesa, Mineral, Pitkin, Routt, San Juan, and San Miguel Counties.

montivaga Cresson, 1878 – Arapahoe, Archuleta, Boulder, Costilla, Custer, Denver, Douglas, El Paso, Elbert, Gilpin, Grand, Gunnison, Huerfano, Jefferson, Larimer, Las Animas, Logan, Montezuma, Park, Phillips, Pitkin, Prowers, Rio Grande, Teller, Weld, and Yuma Counties. **Note:** *Megachile helianthi* Cockerell, 1908, described from Boulder County, has been treated as a poorly known species in the subgenus *Sayapis* (Mitchell 1937c: 200; Hurd 1979: 2070), but the holotype female in the AMNH, studied by JSA, proved to be a junior synonym of *Megachile montivaga*, **new synonymy.**

nivalis Friese, 1903 – Boulder and El Paso Counties plus Rocky Mountain National Park.

relativa Cresson, 1878 – Boulder, Chaffee, Clear Creek, Costilla, Delta, Eagle, El Paso, Elbert, Gilpin, Grand, Huerfano, Jackson, Jefferson, La Plata, Lake, Larimer, Mesa, Mineral, Moffat, Montezuma, Montrose, Ouray, Park, Pitkin, Rio Grande, Routt, San Miguel, Summit, and Teller Counties.

(*Megachiloides*)

alamosana Mitchell, 1934 – Alamosa, Boulder, El Paso, and Larimer Counties.

anograe Cockerell, 1908 – Boulder, El Paso, Larimer, Park, and Teller Counties.

bruneri Mitchell, 1934 – Costilla, Larimer, and Ouray Counties.

casadae Cockerell, 1898 – Boulder, El Paso, Huerfano, Larimer, Las Animas, and Mesa Counties.

coloradensis Mitchell, 1936 – Boulder County.

fucata Mitchell, 1934 – Colorado.

hilata Mitchell, 1934 – Boulder, Fremont, Larimer, and Rio Blanco Counties.

hookeri Cockerell, 1915 – Colorado.

impartita Mitchell, 1934 – Colorado. (Type locality.)

latita Mitchell, 1934 – Moffat County.

legalis Cresson, 1879 – Gilpin and Saguache Counties.

manifesta Cresson, 1878 – Boulder, Chaffee, Denver, Douglas, El Paso, Jefferson, La Plata, Larimer, Las Animas, Montezuma, Routt, Teller, and Weld Counties.

micheneri Mitchell, 1936 – Larimer County.

mucorosa Cockerell, 1908 – Baca, Boulder, Clear Creek, Denver, and Larimer Counties.

nelsoni Mitchell, 1936 – Boulder County.
nevadensis Cresson, 1879 – Alamosa and Costilla Counties.
oslari Mitchell, 1934 – Denver County.
pagosiana Mitchell, 1934 – Archuleta County. This species is known only from Colorado. Mitchell (1934: 334) records the type female from Pagosa Springs, about 7,200 ft. during June 22-24, 1919.
subanograe Mitchell, 1934 – Mesa County. This is new for Colorado based on UCMC specimens. There is a series of seven males collected from Whitewater on May 18, 1963 at flowers of *Sphaeralcea coccinea* by C.J. McCoy and B. Vogel. On that same date and locality there were also one male and one female collected from *Astragalus*. One additional male was collected at Colorado National Monument, 4,500 ft. on May 16, 1963 from *Sphaeralcea parvifolia* by C.J. McCoy. All of these specimens were determined by T.B. Mitchell.
subnigra Cresson, 1879 – See subspecies and List of Problematic Taxa.
subnigra subnigra Cresson, 1879 – Archuleta County.
toscata Mitchell, 1934 – Boulder and Larimer Counties. This species is known only from Colorado. Mitchell (1934: 341-342) records the type female from Ft. Collins on September 7, 1903.
umatillensis (Mitchell, 1927) – Weld County.
wheeleri Mitchell, 1927 – Eagle, Lake, Mesa, Mineral, Pitkin, Rio Blanco, Routt, and Saguache Counties.

(*Sayapis*)
fidelis Cresson, 1878 – Boulder, Costilla, El Paso, Fremont, Garfield, Larimer, Las Animas, Montezuma, Pitkin, and Teller Counties.
inimica Cresson, 1872 – See subspecies.
inimica sayi Cresson, 1878 – Boulder, Elbert, Jefferson, Mesa, Montezuma, Otero, and Pueblo Counties.
mellitarsis Cresson, 1878 – Boulder, Delta, Jefferson, Larimer, and Mesa Counties.
newberryae Cockerell, 1900 – Colorado.
policaris Say, 1831 – Baca County.
pugnata Say, 1837 – See subspecies and List of Problematic Taxa. This species also occurs in Delta, Gunnison, La Plata, Park, Routt, Saguache, and San Miguel Counties.
pugnata pugnata Say, 1837 – Boulder, Clear Creek, Costilla, Eagle, El Paso, Elbert, Garfield, Gilpin, Jefferson, Lake, Larimer, Mineral, Ouray, Pitkin, and Teller Counties.

(*Xanthosarus*)
agustini Cockerell, 1905 – Archuleta, Boulder, Costilla, Douglas, Fremont, Huerfano, Jefferson, La Plata, Larimer, Las Animas, Mesa, Montezuma, and Otero Counties.
comata Cresson, 1872 – Boulder, El Paso, Elbert, Larimer, and Teller Counties.
dentitarsus Sladen, 1919 – Boulder, Denver, Elbert, Larimer, Pueblo, Sedgwick, Teller, and Weld Counties.
fortis Cresson, 1872 – Boulder, Douglas, Jefferson, Las Animas, Logan, Weld, and Yuma Counties.
frigida Smith, 1853 – See subspecies.
frigida frigida Smith, 1853 – Bent, Boulder, Chaffee, Conejos, Costilla, Delta, Denver, Eagle, Fremont, Garfield, Gilpin, Grand, Gunnison, Jackson, La Plata, Lake, Larimer, Mesa, Mineral, Montezuma, Ouray, Park, Pitkin, Rio Blanco, Rio Grande, Summit, and Teller Counties.
gemula Cresson, 1878 – See subspecies. This species also occurs in Delta, Gilpin, Larimer, Montezuma, and Park Counties. Note: Specimens from Conejos, Custer, and Park Counties and from Seattle, Washington in the AMNH determined as *Megachile gemula fulvogemula* Mitchell by T.B. Mitchell are regarded by JSA as conspecific with *M. melanophaea* Smith

based on both mandibular morphology and hair color. Thus, we question the validity of this taxon pending study of the holotype.

gemula gemula Cresson, 1878 – Boulder, Custer, Jefferson, Montrose, and Pitkin Counties.

giliae Cockerell, 1906 – Boulder, Chaffee, Fremont, Gilpin, Larimer, Park, and Teller Counties.

innupta Cockerell, 1915 – Boulder and Pueblo Counties. This species is known only from Colorado. Cockerell (1915: 534) records the female type from Pueblo on August 10, 1907 by G.M. Hite.

latimanus Say, 1823 – Alamosa, Boulder, Clear Creek, Costilla, Denver, Douglas, Eagle, El Paso, Elbert, Garfield, Jefferson, La Plata, Lake, Larimer, Mineral, Montezuma, Ouray, Park, Pitkin, Rio Blanco, Rio Grande, Routt, and Teller Counties.

melanophaea Smith, 1853 – See subspecies. This species also occurs in Conejos, Custer, Eagle, Garfield, Gilpin, Gunnison, Huerfano, Jefferson, La Plata, Montrose, Ouray, Pitkin, Saguache, and San Miguel Counties. Three subspecies, listed here, have been reliably reported in Colorado, more or less sympatrically. One additional subspecies has been reported in Colorado, however we question its status as a true member of the Colorado bee fauna; see List of Problematic Taxa. It is clear the taxonomy of this variable species requires further study. Also, see note above listed under *M. gemula fulvogemula*.

melanophaea melanophaea Smith, 1853 – Boulder, El Paso, Elbert, Lake, Larimer, Park, Routt, and Teller Counties.

melanophaea rohweri Cockerell, 1906 – Boulder, Chaffee, Larimer, and Teller Counties.

melanophaea wootoni Cockerell, 1898 – Clear Creek, Costilla, El Paso, Larimer, Las Animas, and Mineral Counties.

perihirta Cockerell, 1898 – Adams, Alamosa, Arapahoe, Archuleta, Boulder, Chaffee, Custer, Delta, Denver, Eagle, El Paso, Garfield, Gilpin, Grand, Gunnison, Jackson, La Plata, Lake, Larimer, Las Animas, Mesa, Mineral, Moffat, Montezuma, Montrose, Ouray, Pitkin, Pueblo, Rio Grande, Saguache, Teller, and Weld Counties.

Apidae

Xylocopinae

Xylocopini

***Xylocopa* (References: Hurd 1955, 1978; Hurd and Moure 1963; O'Brien and Hurd 1965)**

(*Notoxylocopa*)

tabaniformis Smith, 1854 – See subspecies.

tabaniformis androleuca Michener, 1940 – Mesa and Montrose Counties. This is new for Colorado based on specimens housed at CSUC as follows: one male from San Miguel R[iver] Pres[erve], SR 141, Mp 71 in Montrose County on July 14, 1994 by D. Leatherman and determined by Parks; one female from Colorado National Monument, Rimrock Road 0.7 miles south of Headquarters on May 23, 1997; one female from WCRC@FR [Western Colorado Research Center at Fruita] in Mesa County on July 13, 2001 from [yellow] J[apanese] B[eetle] trap by R.W. Hammon; and two females from Palisade on June 18, 2004 from JB trap by M. Camper.

(*Xylocopoides*)

virginica (Linnaeus, 1771) – See subspecies.

virginica virginica (Linnaeus, 1771) – Boulder? and Jefferson Counties. This is new for Colorado. This bee was first documented for Colorado by a single female CSUC specimen collected in Longmont (Boulder County) on August 23, 1999 from a "picnic table from NJ". Although it had appeared as though this conspicuous eastern U.S. species had not become established in Colorado from that accidental introduction, a new record has been documented at http://bugguide.net/node/view/546075/bgimage photographed by

Diane Wilson in Arvada (Jefferson County) on July 15, 2011 at *Monarda fistulosa* and this female specimen subsequently added to UCMC. It is unclear whether this is a separate introduction into Colorado's Front Range and also unclear whether a viable population has become established here or anywhere in the state.

Ceratinini

Ceratina **(References: Daly 1973)**

(*Zadontomerus*)

(*dupla* group)

calcarata Robertson, 1900 – Arapahoe, Boulder, Larimer, and Sedgwick Counties plus southeastern Colorado.

(*nanula* group)

nanula Cockerell, 1897 – Archuleta, Boulder, Delta, Douglas, Eagle, El Paso, Garfield, Grand, Jackson, Jefferson, La Plata, Larimer, Mesa, Moffat, Montezuma, Montrose, Rio Blanco, and Weld Counties.

(*pacifica* group)

pacifica H.S. Smith, 1907 – Delta, Garfield, Mesa, and Moffat Counties.

(unplaced to group)

neomexicana Cockerell, 1901 – Adams, Alamosa, Archuleta, Boulder, Conejos, Delta, Douglas, Eagle, El Paso, Elbert, Fremont, Grand, Gunnison, Jackson, La Plata, Logan, Mesa, Moffat, Montezuma, Pueblo, Routt, Saguache, Teller, and Weld Counties.

Nomadinae

Neolarrini

Neolarra **(References: Linsley and Michener 1939; Michener 1939b; Shanks 1977)**

pruinosa Ashmead, 1890 – Boulder and Denver Counties.

verbesinae (Cockerell, 1895) – Colorado.

vigilans (Cockerell, 1895) – Larimer and Weld Counties.

Ammobatini

Oreopasites **(References: Linsley 1941; Linsley and Michener 1939; Rozen 1992)**

(*Oreopasites*)

scituli Cockerell, 1906 – Chaffee and Park Counties.

Nomadini

Nomada **(References: Alexander 1994; Alexander and Schwarz 1994; Broemeling 1988; Broemeling and Moalif 1988; Cockerell 1903, 1905; Droege et al. 2010; Evans 1972; Linsley and Michener 1939; Rodeck 1931, 1949; Snelling 1986)**

(*adducta* group) [= Subgenus *Pachynomada*, in part (atypical)]

adducta Cresson, 1878 – Colorado. (Type locality.)

(*erigeronis* group) [= Subgenera *Centrias* and *Nomadula*]

articulata Smith, 1854 – Boulder, Larimer, Morgan, and Weld Counties.

frieseana Cockerell, 1904 – Arapahoe, Boulder, Denver, El Paso, Elbert, Huerfano, and Larimer Counties. This species is known only from Colorado. Cockerell (1904: 28-29) records the female type from Prospect Lake, in Colorado Springs on May 22 by T. and W. Cockerell.

martinella Cockerell, 1903 – Larimer County. Cockerell (1907b: 248) records this species as occurring in the city of Boulder, however, at the time of this writing, no specimens of this species were located from anywhere in Boulder County.

rohweri Cockerell, 1906 – See subspecies. This species also occurs in Chaffee County. This species is known only from Colorado. Cockerell (1906c: 348-349) records the female types from east of Lake George on June 18 at flowers of *Senecio* by S.A. Rohwer

rohweri aureopilosa Swenk, 1913 – Colorado.

rohweri rohweri Cockerell, 1906 – Park and Teller Counties.

scita Cresson, 1878 – Alamosa, Arapahoe, Bent, Boulder, Delta, Denver, Elbert, Grand, Huerfano, Larimer, Las Animas, Mesa, Montezuma, Sedgwick, Teller, and Weld Counties.

semiscita Cockerell, 1904 – Boulder, Denver, El Paso, Elbert, Huerfano, and Jefferson Counties. This species is known only from Colorado. Cockerell (1904: 29) records the male type from Prospect Lake, Colorado Springs on May 22, 1904 at flowers of *Senecio* by T. and W. Cockerell.

(*roberjeotiana* group) [= Subgenus *Callinomada*]

snowii Cresson, 1878 – Boulder, Fremont, Larimer, Moffat, and Montezuma Counties.

(*ruficornis* group) [= Subgenera *Gnathias*, *Heminomada*, *Nomada*, and *Phor*]

accepta Cresson, 1878 – Boulder, El Paso, and Larimer Counties.

agynia Cockerell, 1905 – Jefferson County. This species is known only from Colorado. Cockerell (1905: 81) records the male type from Golden in July by C.P. Gillette and "marked Colorado 2196".

alpha Cockerell, 1905 – See subspecies. This species also occurs in Jefferson County. This species is known only from Colorado.

alpha alpha Cockerell, 1905 – Larimer County. Cockerell (1905: 84) records the female type from Ft. Collins on May 20, 1903 from flowers of *Capsella bursa-pastoris* by F.C. Bishopp.

alpha dialpha Cockerell, 1921 – Jackson County. Cockerell (1921b: 3) records two AMNH females, including the type, from Walden, about 8,300 ft. on the more mesophytic riverbottom among willows, cottonwood, *Iris*, etc. on June 17, 1920 by F.E. Lutz.

alpha paralpha Cockerell, 1921 – Jackson County. Cockerell (1921b: 3) records the female AMNH type from Walden, about 8,400 ft. among sagebrush on hillside on June 17, 1920 by F.E. Lutz.

bella Cresson, 1863 – See subspecies. Cockerell (1907b: 259) records a varity of this species from the city of Boulder, but we were unable to locate any specimens from Boulder County.

bella callura Cockerell, 1911 – Custer County

carinicauda Cockerell, 1921 – Mineral County. This species is known only from Colorado. Cockerell (1921b: 7) records the female AMNH type from the South Fork of the Rio Grande at about 37°36'N, 106°43'W, about 5,800 ft. among *Pinus scopulorum, Pseudotsuga mucronata, Picea pungens*, etc. on June 17, 1919 by F.E. Lutz.

aff. *citrina* Cresson, 1878 – Larimer County.

civilis Cresson, 1878 – Boulder, Grand, and Teller Counties.

civilis civilis Cresson, 1878 – The expected subspecies for Colorado.

clarescens Cockerell, 1921 – Jackson County. This species is known only from Colorado. Cockerell (1921b: 10) records the female AMNH type from Walden, about 8,300 ft. on the sagebrush hills near town on June 17, 1920 by F.E. Lutz.

collinsiana Cockerell, 1905 – Boulder, Larimer, and Routt Counties.

coloradella Cockerell, 1905 – Dolores and Larimer Counties. This species is known only from Colorado. Cockerell (1905: 83) records the male type from Ft. Collins on June 18, 1900 and a female "Colorado 633" from Dolores on June 18, 1892 by C.P. Gillette.

coloradensis Cockerell, 1903 – Boulder and Montrose Counties. This species is known only from Colorado. Cockerell (1903:603-604) lists the female type from "Colorado, bearing numbers 566 and 34; no further particulars known to me. One in Coll. of Acad. Nat. Sci. Phila. I suspect that it came from Prof. Gillette."

concinnula Cockerell, 1921 – Archuleta and La Plata Counties. This species is known only from Colorado. Cockerell (1921b: 6) records two females, including the AMNH type, from Electra Lake near Durango, about 8,400 ft. on June 29, 1919 by F.E. Lutz and two females from Pagosa Springs, about 7,400 ft. in U.S. forest reservation, San Juan valley on June 23, 1919 by F.E. Lutz.

crawfordi Cockerell, 1905 – See subspecies. This species also occurs in Boulder, Jefferson, Park, and Teller Counties.

crawfordi crawfordi Cockerell, 1905 – Larimer County.

cressonii Robertson, 1893 – El Paso County.

cressonii cressonii Robertson, 1893 – The expected subspecies for Colorado.

custeriana Cockerell, 1911 – Custer County. This species is known only from Colorado. Cockerell (1911a: 241-242) records the male USNM type No. 14023 from "West Cliff" by Cockerell.

cymbalariae Cockerell, 1906 – Park and Teller Counties. This species is known only from Colorado. Cockerell (1906c: 349) records the female AMNH type series from east of Lake George in June at flowers of *Halerpestes cymbalaria* by S.A. Rohwer.

depressa Cresson, 1863 – Boulder County.

dilucida Cresson, 1878 – Colorado. This species is known only from Colorado. Cresson (1878a: 80) records the female type from Colorado collected by H.K. Morrison.

ednae Cockerell, 1907 – Boulder County. This species is known only from Colorado. Cockerell (1907b: 537) records the male type from Boulder on the campus of the University of Colorado on April 10, 1907 at flowers of *Taraxacum taraxa*cum by E. Baker.

elrodi Cockerell, 1903 – Boulder County.

erythraea Dalla Torre, 1896 – Colorado.

fontis Cockerell, 1910 – Larimer and Routt Counties.

fragilis Cresson, 1878 – See subspecies. This species occurs in Boulder and Larimer Counties.

fragilis fragilis Cresson, 1878 – Colorado. (Type locality.)

frankei Cockerell, 1929 – Montezuma County. This species is known only from Colorado. Cockerell (1929b: 443) records the male type from Mesa Verde National Park on June 22, 1929 by P.R. Franke.

gillettei Cockerell, 1905 – Jefferson County. This species is known only from Colorado. Cockerell (1905: 81) records the male type "marked Colorado 2198" from Golden on July 3 by C.P. Gillette.

leucozona Rodeck, 1931 – Boulder County. This species is known only from Colorado. Rodeck (1931: 4) records the male type from Boulder on April 14, 1931 at *Salix* by Pauline Lundy.

libata Cresson, 1878 – Boulder? and Denver Counties. This species is known only from Colorado. In his description of this species, Cresson (1878a: 80) records four specimens from Colorado collected by J. Ridings. These were most likely taken in Boulder County; see section on James Ridings.

luteoloides Robertson, 1895 – Boulder County. This is new for Colorado based on a UCMC specimen collected in the city of Boulder on April 22, 1930 by E.C. Nelson and determined by JSA.

luteopicta Cockerell, 1905 – Mesa County. This species is known only from Colorado. Cockerell (1905: 83) records two males and a female from Palisade on May 7, 1901 at apple blossoms by C.P Gillette.

maculiventer Swenk, 1915 – Larimer County. This is new for Colorado based on a male UCMC specimen collected from Masonville on September 18, 1937 by M.T. James and determined by H.G. Rodeck.

morrisoni Cresson, 1878 – See subspecies. This species also occurs in Custer and Denver Counties.

morrisoni flagellaris Cockerell, 1903 – Rio Grande County.

morrisoni morrisoni Cresson, 1878 – Colorado.

munda Cresson, 1878 – Boulder County.

obliterata Cresson, 1863 – Colorado.

ornithica Cockerell, 1906 – Boulder and Teller Counties.

orophila Cockerell, 1921 – Jackson County.

aff. *ovata* (Robertson, 1903) – Boulder County.

packardiella Cockerell, 1906 – Boulder, Chaffee, and Park Counties.
pallidella Cockerell, 1905 – Montrose County. This species is known only from Colorado. Cockerell (1905: 82) records the male type "marked Colorado 566" from Montrose on June 24, 1902 by C.P. Gillette.
parata Cresson, 1878 – Colorado. (Type locality.)
perivincta Cockerell, 1905 – See subspecies. This species is known only from Colorado.
perivincta perivincta Cockerell, 1905 – Colorado. Cockerell (1905: 80) records the female type from "Colorado, without definite locality."
perivincta semirufula Cockerell, 1905 – Colorado.
pulsatillae Cockerell, 1906 – Boulder County.
rhodosoma Cockerell, 1903 – See subspecies.
rhodosoma rhodosomella Cockerell, 1903 – Colorado.
rhodoxantha Cockerell, 1905 – Boulder, Douglas, and Moffat Counties. This species is known only from Colorado. Cockerell (1905: 78) records the female type series from "Colorado, without other locality label."
rubrella Cockerell, 1905 – Larimer County. This species is known only from Colorado. Cockerell (1905: 75) records the type from Ft. Collins, near foothills, on May 18, 1901 at plum blossoms by Mrs. Laura Titus.
ruidosensis Cockerell, 1903 – Park and Teller Counties.
schwarzi Cockerell, 1903 – See subspecies.
schwarzi schwarzi Cockerell, 1903 – Boulder, Costilla, and Huerfano Counties.
sedi Cockerell, 1919 – Larimer County.
semirugosa Cockerell, 1929 – Boulder County. This species is known only from Colorado. Cockerell (1929a: 297) records the female type from the city of Boulder in 1925 by N. LeVeque.
siccorum Cockerell, 1919 – Larimer County. This species is known only from Colorado. Cockerell (1919: 291-292) records the male type from the Longs Peak Inn in a dry sandy spot on July 21 by Cockerell.
subaccepta Cockerell, 1907 – Teller County. This species is known only from Colorado. Cockerell (1907c: 267-268) records two males from Florissant on June 13 and 15, 1907 by S.A. Rohwer and notes one was at flowers of *Antennaria microphylla*.
taraxacella Cockerell, 1903 – Denver, Larimer, Routt, and Teller Counties
undulaticornis Cockerell, 1906 – Boulder County. This species is known only from Colorado. Cockerell (1906b: 70-71) records the male type from the city of Boulder on April 20, 1905 at flowers of *Pulsatilla hirsutissima* by W.P. Cockerell.
utensis Swenk, 1913 – Costilla County.
valida Smith, 1854 – Colorado.
vallesina Cockerell, 1906 – See subspecies.
vallesina honorata Cockerell, 1922 – Boulder County.
vallesina vallesina Cockerell, 1906 – Colorado. (Type locality.)
vexator Cockerell, 1909 – Boulder, Grand, and Larimer Counties. This species is known only from Colorado. Cockerell (1909: 92-93) described this species from a series of five females and one male all collected from Troublesome, 7,345 ft. on June 9, 1908 by S.A. Rohwer.
vicinalis Cresson, 1878 – See subspecies. This species also occurs in Boulder County.
vicinalis infrarubens Cockerell, 1905 – La Plata, Mineral, and San Miguel Counties.
vicinalis vicinalis Cresson, 1878 – Colorado.
xantholepis Cockerell, 1911 – La Plata County. This species is known only from Colorado. Cockerell (1911a: 239-240) records the male USNM type No. 14022 from Los Pinos on May 22, 1899 from flowers of *Erigeron* by C.F. Baker.

(*superba* group) [= Subgenus *Holonomada*]

edwardsii Cresson, 1878 – Boulder, Delta, Huerfano, Jefferson, Larimer, Mesa, and Yuma Counties.

edwardsii edwardsii Cresson, 1878 – The expected subspecies for Colorado.

grandis Cresson, 1875 – Colorado. (Type locality.)

hemphilli Cockerell, 1903 – Arapahoe County. This is new for Colorado based on a CSUC specimen collected in Englewood on June 14, 1978 by D.A and J.T. Polhemus and determined by D.K. Broemeling.

pecosensis Cockerell, 1903 – Archuleta, Gunnison, Huerfano, Park, and Pueblo Counties.

superba Cresson, 1863 – See subspecies.

superba malvastri Swenk, 1913 – Boulder County.

superba superba Cresson, 1863 – Pikes Peak.

(*vegana* group) [= Subgenera *Hypochrotaenia* and *Micronomada*]

amorphae Swenk, 1913 – Weld County.

arenicola Swenk, 1913 – Bent and Weld Counties.

crucis Cockerell, 1903 – Colorado.

garciana Cockerell, 1907 – Bent and Weld Counties.

gutierreziae Cockerell, 1896 – Colorado.

lamarensis Cockerell, 1905 – Prowers County.

melanoptera Cockerell, 1921 – Sedgwick, Weld, and Yuma Counties.

putnami Cresson, 1876 – Boulder, Denver, El Paso, and Larimer Counties.

ridingsii Cresson, 1878 – Boulder? County. This species is known only from Colorado. Cresson (1878a: 74) records the female type from Colorado collected by James Ridings, which likely places the collection locality in Boulder County; see section on James Ridings.

suavis Cresson, 1878 – Alamosa County.

texana Cresson, 1872 – Mesa and Prowers Counties.

uhleri Cockerell, 1905 – Larimer County. This species is known only from Colorado. Cockerell (1905: 77) records the male type from Ft. Collins on August 18, 1900 by E.S.G. Titus.

vegana Cockerell, 1903 – Bent, Boulder, Costilla, Crowley, Denver, El Paso, Fremont, Larimer, Moffat, Montezuma, Otero, Prowers, Saguache, and Weld Counties.

vierecki Cockerell, 1903 – Bent and El Paso Counties.

(*vincta* group) [= Subgenus *Pachynomada*, in part, including the type]

utahensis Moalif, 1988 – Bent, Boulder, Denver, El Paso, Fremont, Jefferson, Larimer, Las Animas, Montezuma, Pueblo, Weld, and Yuma Counties.

vincta Say, 1837 – Alamosa, Boulder, Larimer, Las Animas, and Yuma Counties.

zebrata Cresson, 1878 – Boulder, Denver, Dolores, El Paso, Fremont, Las Animas, and Yuma Counties.

Ammobatoidini

Holcopasites (References: Hurd and Linsley 1972; Linsley and Michener 1939)

(*arizonicus* group)

arizonicus (Linsley, 1942) – Fremont and Rio Blanco Counties.

(*heliopsis* group)

calliopsidis (Linsley, 1943) – See subspecies. Additionally, a photograph by Diane Wilson posted at http://bugguide.net/node/view/318795 places this species in Jefferson County.

calliopsidis calliopsidis (Linsley, 1943) – Arapahoe, Boulder, Denver, Huerfano, and Larimer Counties.

heliopsis (Robertson, 1897) – Boulder, Larimer, and Yuma Counties.

pulchellus (Cresson, 1878) – Boulder, Larimer, Montezuma, and Rio Blanco Counties.

(*illinoiensis* group)

haematurus Cockerell and Hicks, 1926 – Boulder County.

Brachynomadini

Brachynomada **(References: Snelling and Rozen 1987)**

(*Melanomada*)

grindeliae (Cockerell, 1903) – Crowley and Pueblo Counties.

Epeolini

Epeolus **(References: Brumley 1965; Linsley and Michener 1939)**

americanus (Cresson, 1878) – Custer, El Paso, Elbert, Gilpin, La Plata, Larimer, Mineral, Ouray, Park, and Teller Counties.

beulahensis Cockerell, 1904 – Boulder and Park Counties.

bifasciatus Cresson, 1864 – See subspecies.

bifasciatus bifasciatus Cresson, 1864 – Boulder County.

compactus Cresson, 1878 – Colorado.

crucis Cockerell, 1904 – Colorado.

hitei Cockerell, 1908 – Boulder County. This species is known only from Colorado. Cockerell (1908a: 60) records the female type from Copeland Park in Boulder County on September 6, 1907 by G.M. Hite.

interruptus Robertson, 1900 – Boulder County.

lutzi Cockerell, 1921 – Boulder County.

minimus (Robertson, 1902) – El Paso and Huerfano Counties.

pusillus Cresson, 1864 – Alamosa County.

rufomaculatus Cockerell and Sandhouse, 1924 – Boulder County.

rufulus Cockerell, 1941 – Crowley County. This species is known only from Colorado. Cockerell (1941: 36) records the female type from Crowley on September 1, 1932 by M.T. James.

Triepeolus **(References: Linsley and Michener 1939; Rightmyer 2006, 2008)**

(*paenepectoralis* group)

eldoradensis (Cockerell, 1910) – Boulder and Eagle Counties.

paenepectoralis Viereck, 1905 – Boulder, Dolores, Gunnison, Lake, Rio Blanco, and Routt Counties.

(*simplex* group)

lectiformis (Cockerell, 1925) – Logan County. This species is poorly known and only from Colorado. Cockerell (1925: 623) records two females from Logan County on August 23, 1923 by Grace Sandhouse.

rhododontus Cockerell, 1921 – Yuma County.

(*verbesinae* group)

custeri Cockerell, 1926 – Boulder County. This species is known only from Colorado. Cockerell (1926: 306-307) records the male type from White Rocks near Boulder on September 18, 1925 by Clarence Custer.

cyclurus Cockerell, 1923 – Morgan County. This species is known only from Colorado. Cockerell (1923: 49-50) records the female type from 6 miles east of Wiggins on August 15 at flowers of *Helianthus petiolaris.*

grindeliae Cockerell, 1907 – Boulder County.

(unplaced to group)

argus Rightmyer, 2008 – Boulder, El Paso, and Weld Counties.

balteatus Cockerell, 1921 – Boulder, Denver, El Paso, Larimer, and Summit Counties.

circumculus Rightmyer, 2008 – Boulder County.

concavus (Cresson, 1878) – Baca, Bent, Boulder, Cheyenne, Crowley, Denver, Elbert, Gilpin, Kit Carson, Larimer, Las Animas, Otero, Prowers, Pueblo, and Yuma Counties.

dacotensis Stevens, 1919 – Montrose County. This is new for Colorado based on a BBSL specimen determined by M. Rightmyer.

denverensis Cockerell, 1910 – Boulder and Denver Counties.

diffusus Rightmyer, 2008 – Delta, Moffat, and Montrose Counties.

distinctus (Cresson, 1878) – Baca County.
diversipes Cockerell, 1924 – Denver County.
fraserae Cockerell, 1904 – Boulder, Denver, and Logan Counties. Rightmyer (2006) elevated this taxon to species level. Prior to this, it was treated as a subspecies of *Triepeolus cressonii* (Robertson) (Hurd 1979: 2092).
helianthi (Robertson, 1897) – Boulder, Crowley, Douglas, El Paso, Fremont, Garfield, Jefferson, Larimer, Las Animas, Mesa, Montezuma, Otero, Pueblo, Weld, and Yuma Counties.
laticaudus Cockerell, 1921 – Denver, El Paso, and Yuma Counties.
lunatus (Say, 1824) – Baca, Bent, Cheyenne, Kiowa, Otero, Prowers, and Yuma Counties.
lusor Cockerell, 1925 – Logan County. This species is known only from Colorado. Cockerell (1925: 625-626) records the male type from Crook on August 24, 1920 by Grace Sandhouse.
martini (Cockerell, 1900) – Boulder, Crowley, Denver, El Paso, Larimer, Otero, Pueblo, Weld, and Yuma Counties.
micropygius Robertson, 1903 – Boulder and Denver Counties.
occidentalis (Cresson, 1878) – Boulder County.
parvus Rightmyer, 2008 – Boulder and Jefferson Counties.
pectoralis (Robertson, 1897) – Eagle, Fremont, and Mesa Counties.
penicilliferus (Brues, 1903) – Baca County.
perpictus Rightmyer, 2008 – Moffat County.
remigatus (Fabricius, 1804) – Bent, Boulder, Cheyenne, Jefferson, Larimer Counties.
rohweri Cockerell, 1911 – Boulder County. This species is known only from Colorado. Cockerell (1911b: 668-9) records the male type from North Boulder Creek, Boulder County, in the Canadian Zone on August 22, 1907 by S. N. [sic] Rohwer. Rightmyer (2008: 112) cites the male USNM holotype No. 100035 from this same locality, but lists the date as August 23, 1907.
schwarzi Cockerell, 1921 – Rio Blanco County.
sequior Cockerell, 1921 – Ouray County. This species is known only from Colorado. Cockerell (1921a: 8-9) records the male type from Ridgeway, about 7,000ft. on July 15, 1919 in sagebrush country by H.F. Schwarz. Rightmyer (2008: 132) cites the male AMNH holotype as No. 25040.
subalpinus Cockerell, 1910 – Boulder, Costilla, Elbert, Garfield, La Plata, Montezuma, Montrose, and Routt Counties.
tanneri Cockerell, 1928 – Colorado.
texanus (Cresson, 1878) – Garfield, Gunnison, Larimer, and Teller Counties.
townsendi Cockerell, 1907 – El Paso, Larimer, and Teller Counties.

Apinae

Exomalopsini

***Anthophorula* (References: Hurd 1979; Timberlake 1980b)**

(*Anthophorisca*)

pygmaea (Cresson, 1872) – Boulder and Logan Counties.

(*Anthophorula*)

albata (Timberlake, 1947) – Delta County. This is new for Colorado based on three female UCMC specimens collected 4 miles west of Delta on July 1, 1938 by R. Bauer and determined by TG.

***Exomalopsis* (References: Timberlake 1947, 1980b)**

(*Stilbomalopsis*)

solani Cockerell, 1896 – Baca, Bent, Fremont, and Pueblo Counties.

Emphorini

***Ancyloscelis* (References: Michener 1942)**

sejunctus Cockerell, 1933 – Baca County.

***Diadasia* (References: Adlakha 1969; Sipes and Wolf 2001; Snelling 1994; Timberlake 1941)** Although Michener (2000, 2007) no longer recognizes the subgenera listed here, we find them useful.

(*Coquillettapis*)

(*australis* group)

australis (Cresson, 1878) – Arapahoe, Boulder, Denver, Jefferson, Larimer, Las Animas, Morgan, and Pueblo Counties. Hurd (1979: 2121) lists the following two subspecies for Colorado.

australis australis (Cresson, 1878) – Colorado.

australis californica Timberlake, 1940 – Colorado.

rinconis Cockerell, 1897 – Arapahoe, Boulder, Fremont, Huerfano, Jefferson, and Weld Counties.

rinconis rinconis Cockerell, 1897 – The currently recognized subspecies in Colorado.

(*nigrifrons* group)

diminuta (Cresson, 1878) – Arapahoe, Bent, Boulder, Chaffee, Denver, El Paso, Fremont, Garfield, Huerfano, Jefferson, Kit Carson, La Plata, Larimer, Las Animas, Moffat, Montezuma, Otero, Pueblo, and Saguache Counties.

lutzi Cockerell, 1924 – El Paso and Gunnison Counties. This is new for Colorado. The El Paso County record is based on three female UCMC specimens collected at Foster Ranch, 5,700 ft., T15S R65W Sec14 S1/2 on July 10, 1976 by F.M. Brown and determined by R.W. Thorp. Two were collected on chicory and one on *Heterotheca villosa.* The Gunnison County record is based on a BBSL specimen determined by S. Sipes and confirmed by TG.

lutzi lutzi Cockerell, 1924 – The currently recognized subspecies in Colorado.

nigrifrons Cresson, 1878 – Moffat County.

(*Dasiapis*)

ochracea (Cockerell, 1903) – Bent, La Plata, and Otero Counties.

(*Diadasia*)

enavata (Cresson, 1872) – Bent, Kiowa, Kit Carson, Las Animas, Mesa, Otero, Prowers, and Sedgwick Counties.

***Melitoma* (References: Hurd 1979)**

grisella (Cockerell and Porter, 1899) – Bent, Boulder, Crowley, Denver, Douglas, El Paso, Otero, and Weld Counties.

Eucerini

Eucerina

***Eucera* (References: Timberlake 1969)**

(*Synhalonia*)

actuosa (Cresson, 1878) – Delta, Mesa, and Montezuma Counties.

aragalli (Cockerell, 1904) – El Paso County.

chrysobotryae (Cockerell, 1908) – Boulder, Denver, and Weld Counties.

chrysophila (Cockerell, 1914) – Larimer County.

cordleyi (Viereck, 1905) – Boulder and Montezuma Counties.

edwardsii (Cresson, 1878) – Boulder and Eagle Counties.

frater (Cresson, 1878) – See subspecies.

frater frater (Cresson, 1878) – Boulder, Grand, La Plata, and Larimer Counties.

fulvitarsis (Cresson, 1878) – See subspecies. This species also occurs in Eagle, Grand, Larimer, and Montrose Counties.

fulvitarsis annae (Cockerell, 1937) – Archuleta County.

fulvitarsis fulvitarsis (Cresson, 1878) – Moffat County.

hamata (Bradley, 1942) – Weld County.

lepida (Cresson, 1878) – Colorado.

lutziana (Cockerell, 1933) – Boulder and El Paso Counties.

pagosana (Cockerell, 1925) – Archuleta County.
pallidihirta (Timberlake, 1969) – Weld County. This is new for Colorado based on a BBSL specimens determined by TG.
phaceliae (Cockerell, 1911) – Delta County. This is new for Colorado based on BBSL specimens determined by TG.
speciosa (Cresson, 1878) – Boulder, El Paso, and Larimer Counties.
suavis (Cresson, 1878) – Boulder County. This species is known only from Colorado. Cresson (1878b: 210) records the female type from Colorado collected by H.K. Morrison.

***Florilegus* (References: Urban 1970)**

(*Florilegus*)

condignus (Cresson, 1878) – Montezuma, Otero, and Yuma Counties.

***Melissodes* (References: LaBerge 1956a, 1956b, 1961)**

(*Callimelissodes*)

coloradensis Cresson, 1878 – Boulder County.
composita Tucker, 1909 – Denver, El Paso, and Montezuma Counties.
glenwoodensis Cockerell, 1905 – Boulder, Denver, El Paso, Garfield, Jefferson, Larimer, Lincoln, Moffat, Montezuma, and Otero Counties.
lupina Cresson, 1878 – Moffat and Rio Blanco Counties.

(*Eumelissodes*)

agilis Cresson, 1878 – Adams, Alamosa, Arapahoe, Baca, Bent, Boulder, Cheyenne, Clear Creek, Conejos, Costilla, Crowley, Denver, El Paso, Garfield, Gilpin, Huerfano, Jefferson, Kiowa, Kit Carson, La Plata, Lake, Larimer, Las Animas, Logan, Mesa, Moffat, Montezuma, Montrose, Morgan, Otero, Prowers, Pueblo, Rio Blanco, Saguache, Sedgwick, and Yuma Counties.
bicolorata LaBerge, 1961 – Moffat County. This is new for Colorado based on a BBSL specimen determined by JSA.
bimatris LaBerge, 1961 – Denver and Montezuma Counties.
confusa Cresson, 1878 – Archuleta, Boulder, Chaffee, Costilla, Custer, Dolores, El Paso, Fremont, Gilpin, Grand, Jefferson, Lake, Larimer, Mineral, Montezuma, Montrose, Ouray, Pitkin, Rio Blanco, Saguache, San Miguel, and Teller Counties plus the San Luis Valley.
coreopsis Robertson, 1905 – Adams, Boulder, Clear Creek, Conejos, Crowley, Delta, Denver, El Paso, Elbert, Fremont, Jackson, Jefferson, Kiowa, Kit Carson, Larimer, Lincoln, Logan, Montezuma, Otero, Prowers, Sedgwick, Teller, and Weld Counties.
druriella (Kirby, 1802) – Archuleta, Elbert, Fremont, Jefferson, Larimer, Las Animas, Montezuma, and Park Counties.
gelida LaBerge, 1961 – Adams, Arapahoe, Boulder, and Denver Counties
grindeliae Cockerell, 1898 – Arapahoe, Archuleta, Boulder, Chaffee, Douglas, El Paso, Fremont, Garfield, Jefferson, La Plata, Lake, Larimer, Montezuma, Park, Pitkin, Pueblo, Rio Blanco, and Teller Counties.
hymenoxidis Cockerell, 1906 – Boulder, Chaffee, Eagle, Gilpin, Jackson, Lake, Larimer, Mineral, Montrose, Ouray, Rio Blanco, San Miguel, and Teller Counties.
lutulenta LaBerge, 1961 – Costilla, Eagle, Fremont, Jackson, Larimer, Moffat, Montezuma, Rio Blanco, and Saguache Counties.
menuachus Cresson, 1868 – Adams, Alamosa, Boulder, Custer, Denver, Eagle, El Paso, Elbert, Fremont, Jefferson, La Plata, Larimer, Las Animas, Lincoln, Montezuma, Otero, Prowers, Pueblo, Teller, Weld, and Yuma Counties.
microsticta Cockerell, 1905 – Boulder, Chaffee, Delta, Fremont, Garfield, Gilpin, Grand, Larimer, Mesa, Ouray, Pitkin, Rio Blanco, and Yuma Counties.
montana Cresson, 1878 – Boulder, El Paso, Jefferson, and Teller Counties.
pallidisignata Cockerell, 1905 – Adams, Arapahoe, Boulder, Denver, El Paso, Fremont, Jackson, Jefferson, Larimer, Las Animas, Moffat, Pueblo, Rio Blanco, and Weld Counties.

perlusa Cockerell, 1925 – Boulder, Clear Creek, Denver, Jefferson, Larimer, Las Animas, Logan, Montezuma, and Saguache Counties plus the San Luis Valley
perpolita LaBerge, 1961 – Montezuma County.
saponellus Cockerell, 1908 – Delta County.
semilupina Cockerell, 1905 – Alamosa and Jefferson Counties plus Great Sand Dunes National Monument and Preserve.
snowii Cresson, 1878 – Adams, Arapahoe, Denver, and Weld Counties.
subagilis Cockerell, 1905 – Adams, Boulder, Denver, Larimer, Las Animas, Lincoln, Logan, Moffat, Montezuma, Ouray, Rio Blanco, Routt, Saguache, and Yuma Counties plus the San Luis Valley. Also, see *Tetraloniella excurrens* in List of Problematic Taxa.
submenuacha Cockerell, 1897 – Fremont County.
tristis Cockerell, 1894 – Archuleta, Bent, Boulder, Chaffee, Conejos, Crowley, Custer, Denver, El Paso, Fremont, Gunnison, Larimer, Las Animas, Logan, Montezuma, Montrose, Otero, Park, Prowers, Pueblo, Routt, Saguache, Sedgwick, Teller, and Weld Counties.
vernoniae Robertson, 1902 – Denver, Larimer, and Yuma Counties.

(*Heliomelissodes*)
rivalis Cresson, 1872 – Boulder, Custer, El Paso, Garfield, Gunnison, Jefferson, Larimer, and Moffat Counties.

(*Melissodes*)
bimaculata (Lepeletier, 1825) – See subspecies.
bimaculata bimaculata (Lepeletier, 1825) – Adams, Boulder, Costilla, Denver, Larimer, Otero, and Prowers Counties.
communis Cresson, 1878 – See subspecies. The species also occurs in San Miguel County.
communis alopex Cresson, 1878 – Intergrades in Delta and San Miguel Counties.
communis communis Cresson, 1878 – Baca, Bent, Boulder, Crowley, Denver, El Paso, Jefferson, Kiowa, Larimer, Lincoln, Morgan, Otero, Prowers, Teller, and Weld Counties.
comptoides Robertson, 1898 – Adams, Baca, Bent, Boulder, Cheyenne, Crowley, Kiowa, Kit Carson, Larimer, Las Animas, Otero, Prowers, Weld, and Yuma Counties.
gilensis Cockerell, 1896 – See subspecies.
gilensis gilensis Cockerell, 1896 – Boulder County.

(*Psilomelissodes*)
intorta Cresson, 1872 – Yuma County. This is new for Colorado based on a male UCMC specimen that was collected at Beecher Island on June 21, 1979 from *Melilotus* by U.N. Lanham and determined by K. Wetherill.

(*Tachymelissodes*)
dagosa Cockerell, 1909 – Alamosa, Boulder, Delta, Dolores, Montezuma, Montrose, Rio Grande, and Saguache Counties.

***Peponapis* (References: Hurd and Linsley 1964, 1970)**

(*Peponapis*)
(*pruinosa* group)
pruinosa (Say, 1837) – Boulder, Denver, Fremont, La Plata, Larimer, Las Animas, Mesa, Otero, Pueblo, and Yuma Counties.

***Svastra* (References: LaBerge 1955, 1956a, 1958)**

(*Anthedonia*)
compta (Cresson, 1878) – El Paso County.

(*Brachymelissodes*)
cressonii (Dalla Torre, 1896) – Baca, Kiowa, Otero, Prowers, and Yuma Counties.

(*Epimelissodes*)
(*atripes* group)
atripes (Cresson, 1872) – See subspecies.
atripes atripes (Cresson, 1872) – Otero and Prowers Counties.

(*obliqua* group)
comanche (Cresson, 1872) – Colorado.
obliqua (Say, 1837) – See subspecies. This species also occurs in Archuleta, Delta, Douglas, and Weld Counties.
obliqua expurgata (Cockerell, 1925) – Mesa and Montezuma Counties.
obliqua obliqua (Say, 1837) – Adams, Arapahoe, Baca, Bent, Boulder, Clear Creek, Crowley, Denver, El Paso, Elbert, Fremont, Huerfano, Jefferson, Kiowa, Kit Carson, Larimer, Las Animas, Lincoln, Logan, Otero, Prowers, Pueblo, and Yuma Counties.
texana (Cresson, 1872) – See subspecies. This species also occurs in Bent County.
texana texana (Cresson, 1872) – El Paso County.
(*petulca* group)
petulca (Cresson, 1878) – See subspecies.
petulca suffusa (Cresson, 1878) – Baca, Kit Carson, and Otero Counties.

***Tetraloniella* (References: LaBerge 2001)**

(*Tetraloniella*)
albata (Cresson, 1872) – Larimer County.
cressoniana (Cockerell, 1905) – Saguache County.
eriocarpi (Cockerell, 1898) – La Plata and Montezuma Counties.
paenalbata LaBerge, 2001 – Bent County.
spissa (Cresson, 1872) – Crowley, Jefferson, and Otero Counties.

***Xenoglossa* (References: Hurd and Linsley 1964, 1967, 1970)**

(*Eoxenoglossa*)
kansensis Cockerell, 1905 – Baca, Boulder, Crowley, El Paso, Otero, Prowers, and Pueblo Counties.
strenua (Cresson, 1878) – Bent, Boulder, Denver, Fremont, Logan, and Pueblo Counties.

Anthophorini

***Anthophora* (References: Brooks 1983, 1988)**

(*Anthophoroides*)
californica Cresson, 1869 – Bent, Denver, Larimer, Las Animas, and Weld Counties.
(*Clisodon*)
terminalis Cresson, 1869 – Boulder, Chaffee, Conejos, Custer, Delta, Eagle, El Paso, Fremont, Garfield, Grand, Gunnison, Huerfano, La Plata, Lake, Larimer, Mineral, Montezuma, Ouray, Pitkin, Routt, San Miguel, and Teller Counties.
(*Heliophila*)
(*estebana* group)
albata Cresson, 1876 – Colorado.
arthuri Cockerell, 1906 – Moffat County. This species is known only from Colorado. Cockerell (1906a: 72) records the type female from Maybell on August 1, 1904 on yellow flowers of the family Compositae by S.A. Johnson.
exigua Cresson, 1879 – Colorado.
flexipes Cresson, 1879 – Jackson and Teller Counties.
maculifrons Cresson, 1879 – Moffat County.
peritomae Cockerell, 1905 – Alamosa, Garfield, Montezuma, and Rio Blanco Counties.
petrophila Cockerell, 1905 – Montezuma County. This is new for Colorado based on two male AMNH specimens collected in Mesa Verde National Park on August 23, 1934. One was collected by F.E. Lutz while the other was collected by D. Rockefeller. Both were determined by R.W. Brooks.
squammulosa Dours, 1869 – Alamosa, Chaffee, Conejos, Denver, and Montezuma Counties.

(*Lophanthophora*)
(*porterae* group)
affabilis Cresson, 1878 – Baca, Bent, Boulder, Denver, El Paso, Elbert, Gunnison, Huerfano, Larimer, Las Animas, Montezuma, Pueblo, and Weld Counties.
dammersi Timberlake, 1937 – Delta County.
neglecta Timberlake and Cockerell, 1936 – Montezuma County.
pacifica Cresson, 1878 – Colorado.
porterae Cockerell, 1900 – Boulder, Delta, Fremont, Huerfano, Jefferson, Larimer, Mesa, and Moffat Counties.
ursina Cresson, 1869 – Archuleta, Boulder, Denver, Douglas, Eagle, El Paso, Elbert, Fremont, Garfield, Grand, Jefferson, Larimer, Mesa, Moffat, Montezuma, and Teller Counties.
(*Melea*)
(*bomboides* group)
bomboides Kirby, 1837 – Alamosa, Boulder, Delta, Denver, Douglas, Eagle, El Paso, Garfield, Grand, Gunnison, Huerfano, Jackson, Jefferson, Larimer, Las Animas, Mesa, Moffat, Montezuma, Rio Grande, Routt, San Miguel, and Teller Counties.
occidentalis Cresson, 1869 – Baca, Bent, Boulder, Conejos, Costilla, Delta, Denver, Douglas, Eagle, El Paso, Garfield, Gunnison, Huerfano, Kit Carson, Larimer, Las Animas, Mesa, Moffat, Montezuma, Morgan, Otero, Rio Blanco, and Weld Counties plus the San Luis Valley.
(*Mystacanthophora*)
(*montana* group)
montana Cresson, 1869 – Adams, Alamosa, Arapahoe, Archuleta, Baca, Bent, Boulder, Crowley, Custer, Denver, Douglas, El Paso, Fremont, Gilpin, Gunnison, Huerfano, Jefferson, Kiowa, Kit Carson, Larimer, Las Animas, Lincoln, Montezuma, Morgan, Otero, Pueblo, Saguache, Teller, Weld, and Yuma Counties plus the San Luis Valley.
walshii Cresson, 1869 – Boulder, Jefferson, Kit Carson, Larimer, Las Animas, Montezuma, Otero, Prowers, Weld, and Yuma Counties.
(*urbana* group)
urbana Cresson, 1878 – Chaffee, Custer, Delta, Dolores, Fremont, Gilpin, Gunnison, Jefferson, Larimer, Mesa, Moffat, Montezuma, Montrose, Pueblo, and Rio Blanco Counties.
(*Pyganthophora*)
(*crotchii* group)
lesquerellae (Cockerell, 1896) – Delta County.
(*retusa* group)
edwardsii Cresson, 1878 – Boulder, Denver, Huerfano, Larimer, Montrose, and Routt Counties.

***Habropoda* (References: Hurd 1979)**

cineraria (Smith, 1879) – Alamosa, Boulder, Conejos, Costilla, Douglas, Eagle, Garfield, Gilpin, Grand, Jefferson, Larimer, Moffat, Montrose, and Park Counties.
citula (Cockerell, 1929) – Archuleta and Montezuma Counties. This species is poorly known and only from Colorado. Cockerell (1929b: 442) records the type male from Mesa Verde National Park on July 12, 1929 by P.R. Franke.
cressonii (Dalla Torre, 1896) – Boulder, Chaffee, Saguache, and Teller Counties.
morrisoni (Cresson, 1878) – Boulder, Eagle, Larimer, Moffat, and Weld Counties.
vierecki (Cockerell, 1909) – Colorado. This poorly known species was described by Cockerell (1909: 414) where he writes "EMPHOROPSIS VIERECKI, new species. *Emphoropsis*, new species, Cockerell, Canadian Entomologist, July, 1905, p. 265. Allied to *E. pascoensis* Cockerell, but hair of face and vertex without black intermixed. Colorado and New Mexico. I supposed in 1905 that Mr. Viereck was about to describe it, but as he did not do so, I provide a name. The type is in the collection of the American Entomological Society."

Melectini

***Melecta* (References: Hurd and Linsley 1951; Linsley 1939)**

(*Melecta*)

pacifica Cresson, 1878 – See subspecies and List of Problematic Taxa.

pacifica fulvida Cresson, 1879 – Baca, Boulder, Douglas, Eagle, El Paso, Elbert, Fremont, Garfield, Gilpin, Jackson, Jefferson, Larimer, Las Animas, Mesa, Montezuma, Montrose, Rio Blanco, Rio Grande, Routt, Sedgwick, and Teller Counties.

separata Cresson, 1879 – See subspecies.

separata johnsoni (Cockerell, 1905) – Boulder and Larimer Counties.

thoracica Cresson, 1875 – Larimer County.

***Xeromelecta* (References: Hurd and Linsley 1951; Linsley 1939)**

(*Melectomorpha*)

californica (Cresson, 1878) – Alamosa, Baca, Boulder, Crowley, Denver, Douglas, El Paso, Larimer, Moffat, Montezuma, Otero, and Weld Counties.

interrupta (Cresson, 1872) – Alamosa, Bent, Boulder, El Paso, Huerfano, Jefferson, Larimer, Lincoln, Teller, and Yuma Counties.

***Zacosmia* (References: Hurd and Linsley 1951; Linsley 1939)**

maculata (Cresson, 1879) – Colorado. See subspecies.

maculata maculata (Cresson, 1879) – The expected subspecies for western Colorado. Hurd (1979: 2172) records this subspecies from Alberta, Washington, California, Idaho, Utah, Wyoming, and Colorado, although Hurd and Linsley (1951: 123 and map 1) show this subspecies as occurring only in Washington, Oregon, and California.

Centridini

***Centris* (References: Snelling 1966d, 1974, 1984)**

(*Paracentris*)

caesalpiniae Cockerell, 1897 – Bent and Otero Counties. This is new for Colorado based on a female CSUC specimen collected in Higbee Canyon off Hwy 109 in Otero County on June 12, 2007 by B. Kondratieff and W. Cranshaw and a female UCMC specimen collected 2 miles south of Hasty in Bent County on June 25, 1975 from flowers of tamarisk by U.N. Lanham. Both specimens were determined by JSA.

Bombini

***Bombus* (References: Byron 1980; Franklin 1913; Kearns and Thomson 2001; LaBerge and Webb 1962; Milliron 1971, 1973a, 1973b; Stephen 1957; Thorp et al. 1983; Williams 1998; Williams et al. 2008)**

(*Alpinobombus*)

balteatus Dahlbom, 1832 – Boulder, Clear Creek, Gilpin, Grand, Gunnison, Hinsdale, Larimer, Mesa, Mineral, Park, Pitkin, San Miguel, and Summit Counties.

(*Bombias*)

(*nevadensis* group)

auricomus (Robertson, 1903) – Boulder, Larimer, and Yuma Counties. One additional record from El Paso County was located at the University of Minnesota Insect Collection (UMSP) and a Weld County record was located at the University of Wyoming Entomological Museum (ESUW) by C. Boyd (pers. comm.).

nevadensis Cresson, 1874 – Adams, Alamosa, Archuleta, Bent, Boulder, Chaffee, Conejos, Denver, Dolores, Douglas, El Paso, Elbert, Fremont, Garfield, Gilpin, Grand, Gunnison, Huerfano, Jefferson, La Plata, Larimer, Mesa, Moffat, Montrose, Park, Pueblo, Routt, Saguache, Teller, and Weld Counties.

(*Bombus*)

occidentalis Greene, 1858 – Boulder, Chaffee, Clear Creek, Conejos, Costilla, Delta, Denver, Dolores, Douglas, Eagle, El Paso, Fremont, Garfield, Gilpin, Grand, Gunnison, Hinsdale, Huerfano, Jackson, Jefferson, La Plata, Lake, Larimer, Mesa, Mineral, Moffat, Montezuma,

Montrose, Ouray, Park, Pitkin, Rio Grande, Routt, Saguache, San Miguel, Summit, and Teller Counties. Although this species used to be common in Colorado, it has become undetectable across much of its former range. It was documented in Boulder, Chaffee, Gunnison, Larimer, Mesa, Montrose, and Summit Counties in 2008 and/or 2009 (UCMC and BBSL specimens) and by a Diane Wilson photograph of a very yellow individual for Colorado, http://bugguide.net/node/view/358442 from Jefferson County on July 27, 2009. It continues to be seen on rare occasion including a recently collected worker UCMC specimen from Arvada on July 20, 2011 by D.M. Wilson.

(*Cullumanobombus*)

(*griseocollis* group)

griseocollis (DeGeer, 1773) – Adams, Baca, Bent, Boulder, Delta, Douglas, El Paso, Fremont, Jefferson, Larimer, Moffat, Morgan, Otero, Prowers, Pueblo, Saguache, Weld, and Yuma Counties.

morrisoni Cresson, 1878 – Adams, Alamosa, Archuleta, Baca, Bent, Boulder, Chaffee, Conejos, Costilla, Delta, Denver, Dolores, Douglas, El Paso, Fremont, Garfield, Huerfano, Jefferson, La Plata, Larimer, Las Animas, Lincoln, Mesa, Mineral, Moffat, Montezuma, Montrose, Morgan, Otero, Ouray, Prowers, Pueblo, Saguache, San Juan, Teller, and Weld Counties.

(*robustus* group)

fraternus (Smith, 1854) – Adams, Arapahoe, Baca, Bent, Boulder, Denver, Douglas, El Paso, Elbert, Fremont, Huerfano, Jefferson, Kit Carson, Larimer, Morgan, Otero, Prowers, Sedgwick, Teller, Weld, and Yuma Counties.

(*rufocinctus* group)

rufocinctus Cresson, 1863 – Archuleta, Boulder, Chaffee, Clear Creek, Conejos, Costilla, Custer, Delta, Denver, Dolores, Douglas, El Paso, Elbert, Fremont, Garfield, Gilpin, Grand, Gunnison, Huerfano, Jackson, Jefferson, La Plata, Lake, Larimer, Las Animas, Logan, Mesa, Mineral, Moffat, Montrose, Ouray, Park, Pitkin, Rio Blanco, Routt, Saguache, San Miguel, Summit, Teller, and Weld Counties.

(*Psithyrus*)

(*bohemicus* group)

suckleyi Greene, 1860 – Boulder, Chaffee, Clear Creek, Conejos, Eagle, Gilpin, Grand, Gunnison, Jackson, La Plata, Larimer, Mesa, Pitkin, Routt, and San Miguel Counties.

(*citrinus* group)

insularis (Smith, 1861) – Adams, Alamosa, Boulder, Chaffee, Conejos, Custer, El Paso, Elbert, Fremont, Garfield, Gilpin, Grand, Gunnison, Huerfano, Jackson, Jefferson, La Plata, Larimer, Mesa, Moffat, Montezuma, Montrose, Ouray, Park, Pitkin, Routt, San Juan, San Miguel, Summit, and Teller Counties.

(*sylvestris* group)

fernaldae (Franklin, 1911) – Archuleta, Boulder, Conejos, Gilpin, Grand, Gunnison, Jackson, Larimer, Montrose, Ouray, San Juan, San Miguel, and Teller Counties.

(*Pyrobombus*)

(*lapponicus* group)

bifarius Cresson, 1878 – Alamosa, Archuleta, Boulder, Chaffee, Clear Creek, Conejos, Costilla, Custer, Delta, Dolores, Douglas, Eagle, El Paso, Elbert, Fremont, Garfield, Gilpin, Grand, Gunnison, Hinsdale, Huerfano, Jackson, Jefferson, La Plata, Lake, Larimer, Las Animas, Logan, Mesa, Mineral, Moffat, Montezuma, Montrose, Ouray, Park, Pitkin, Rio Blanco, Rio Grande, Routt, Saguache, San Juan, San Miguel, Summit, and Teller Counties.

huntii Greene, 1860 – Adams, Alamosa, Archuleta, Boulder, Chaffee, Clear Creek, Conejos, Costilla, Delta, Denver, Dolores, Douglas, Eagle, El Paso, Elbert, Fremont, Garfield, Gilpin, Grand, Gunnison, Hinsdale, Huerfano, Jackson, Jefferson, La Plata, Larimer, Logan, Mesa, Mineral, Moffat, Montezuma, Montrose, Morgan, Otero, Ouray, Park, Pitkin, Pueblo, Rio Blanco, Rio Grande, Routt, Saguache, Teller, and Weld Counties plus the San Luis Valley.

melanopygus Nylander, 1848 – Boulder, Clear Creek, Conejos, El Paso, Gilpin, Grand, Gunnison, Hinsdale, Huerfano, Jackson, Larimer, Mineral, Park, Pitkin, Summit, and Teller Counties.

sylvicola Kirby, 1837 – Boulder, Chaffee, Clear Creek, Conejos, Custer, Delta, Dolores, Eagle, El Paso, Garfield, Gilpin, Grand, Gunnison, Hinsdale, Huerfano, Jackson, Lake, Larimer, Mesa, Mineral, Montezuma, Park, Pitkin, Routt, Saguache, San Miguel, and Summit Counties.

(*vagans* group)

centralis Cresson, 1864 – Alamosa, Archuleta, Boulder, Chaffee, Clear Creek, Conejos, Costilla, Custer, Dolores, Douglas, El Paso, Elbert, Fremont, Garfield, Gilpin, Grand, Gunnison, Huerfano, Jackson, Jefferson, La Plata, Larimer, Las Animas, Mesa, Mineral, Montrose, Ouray, Park, Pitkin, Rio Blanco, Routt, Saguache, San Miguel, Summit, and Teller Counties.

flavifrons Cresson, 1863 – Alamosa, Boulder, Chaffee, Clear Creek, Conejos, Custer, Delta, Dolores, Douglas, El Paso, Elbert, Garfield, Gilpin, Grand, Gunnison, Huerfano, Jackson, La Plata, Lake, Larimer, Mesa, Mineral, Montezuma, Montrose, Ouray, Park, Pitkin, Routt, Saguache, San Juan, San Miguel, Summit, and Teller Counties.

(*pratorum* group)

frigidus Smith, 1854 – Boulder, Clear Creek, Eagle, Grand, Gunnison, Hinsdale, Jackson, Lake, Larimer, Park, Routt, Saguache, and Summit Counties.

mixtus Cresson, 1878 – Alamosa, Boulder, Chaffee, Clear Creek, Conejos, Eagle, Garfield, Gilpin, Grand, Gunnison, Jackson, Lake, La Plata, Larimer, Mesa, Mineral, Montrose, Ouray, Park, Pitkin, Routt, San Juan, and San Miguel Counties.

(*Subterraneobombus*)

appositus Cresson, 1878 – Alamosa, Archuleta, Boulder, Chaffee, Clear Creek, Conejos, Delta, Denver, Douglas, Eagle, El Paso, Elbert, Fremont, Garfield, Gilpin, Grand, Gunnison, Huerfano, Jackson, Jefferson, Larimer, Mesa, Montezuma, Montrose, Ouray, Park, Pitkin, Rio Blanco, Rio Grande, Routt, Saguache, San Miguel, and Teller Counties.

(*Thoracobombus*)

(*pensylvanicus* group)

californicus Smith, 1854 – Boulder, Chaffee, Dolores, Garfield, Gilpin, Grand, Gunnison, Jefferson, Larimer, Mesa, Moffat, Montrose, Ouray, Park, Routt, Summit, and Teller Counties.

fervidus (Fabricius, 1798) – Alamosa, Arapahoe, Boulder, Conejos, Delta, Denver, Dolores, Douglas, El Paso, Elbert, Fremont, Garfield, Gilpin, Huerfano, Jefferson, La Plata, Larimer, Las Animas, Lincoln, Mesa, Moffat, Montezuma, Montrose, Morgan, Otero, Ouray, Pueblo, Rio Blanco, Saguache, Teller, Weld, and Yuma Counties.

pensylvanicus (DeGeer, 1773) – Adams, Alamosa, Baca, Bent, Boulder, Crowley, Delta, Denver, Douglas, El Paso, Elbert, Fremont, Huerfano, Jefferson, Kiowa, Kit Carson, Larimer, Las Animas, Lincoln, Logan, Mesa, Moffat, Morgan, Otero, Phillips, Prowers, Pueblo, Sedgwick, Weld, and Yuma Counties.

Apini

Apis **(References: Hurd 1979)**

(*Apis*)

mellifera Linnaeus, 1758 – Documented from Adams, Alamosa, Arapahoe, Bent, Boulder, Chaffee, Conejos, Costilla, Crowley, Delta, Denver, Dolores, Douglas, Eagle, El Paso, Elbert, Fremont, Gilpin, Gunnison, Huerfano, Jefferson, La Plata, Larimer, Las Animas, Mesa, Moffat, Montezuma, Montrose, Ouray, Prowers, Pueblo, Rio Blanco, Rio Grande, Saguache, Teller, and Weld Counties. This non-native species, intentionally introduced long ago to North America, is surely found throughout Colorado except at higher elevations.

List of Problematic Taxa

The species listed below could not be confirmed as part of the Colorado bee fauna. These include: 1) published records based on misidentifications, 2) unverifiable identifications, and 3) accidental occurrences.

Colletidae

Hylaeus (*Hylaeus*) *granulatus* (Metz, 1911) – Metz (1911: 114) described this taxon as a variety of *Prosopis rudbeckiae* Cockerell and Casad, but did not list any locality information. According to Snelling (1970: 24) the type locality is in Nevada. Cockerell and Sumner (1931) did not address this species. Snelling (1970: 23-24) states he had "a few males from Colorado which seem referable to this form; these differ slightly, however, in the shape of the ninth ventrite which is very similar to that of *H. cressoni*." Hurd (1979: 1767) records this species from "Nev., Calif., ?Colo". Not long before R. Snelling died, VLS contacted him, asking specifically about this species. He said that it is a "good species" and mentioned that he had seen series from trap-nests in Utah. He did not explicitly confirm this species as occurring in Colorado, nor did he say that it should be excluded from a list of Colorado bees.

Hylaeus (*Paraprosopis*) *tuertonis* (Cockerell, 1906) – This poorly understood species was described in Cockerell (1906c: 424) as *Prosopis tuertonis*, with the female type specimen being "from Tuerto Mountain, near Santa Fé, New Mexico". Cockerell goes on to say that this species is "Also from Florissant" (Teller County). Cockerell (1907b: 240) records this species (as a *Prosopis*) from Boulder County. Metz (1911: 141) synonymized *P. tuertonis* with *P. coloradensis* Cockerell, but Cockerell and Sumner (1931: 6) resurrected *H. tuertonis.* Snelling (1970: 58) wrote, "I have not seen these specimens, and the original description offers little information of use in identifying the species. It is probably correctly assigned to *Paraprosopis* and seems nearest to *H. wootoni*, of which it may be a synonym. The description applies equally well, however, to *H. cookii*. Until the types can be studied, the status of this name must remain uncertain." *H. wootoni* (Cockerell) is a Colorado species, while *H. cookii* (Metz) is not, although it is known from New Mexico. Cockerell's material needs to be examined to understand both the identity of *H. tuertonis* (through study of the holotype) and to clarify the identity of the Boulder County specimens reported under this name (Cockerell 1907b). No specimens identified as this species by Cockerell were located at UCMC or the AMNH.

Halictidae

Agapostemon (*Agapostemon*) *viridulus* (Fabricius, 1793) – Cockerell (1907b: 243) records this species from Boulder County but it is actually restricted to Cuba (Ascher and Pickering 2011; Moure and Hurd 1987: 204). Specimens from the early 1900s identified by T.D.A. Cockerell as *A. viridulus* located at UCMC have been reidentified as *A. virescens*. One specimen bears a determination label in Cockerell's handwriting that reads "*Agapostemon virescens* Fab. (*viridulus* Fab.) ♀". This evidence and specimens in the AMNH demonstrates that Cockerell regularly used the name of the Cuban species *A. viridulus* for the North American species *A. virescens*.

Lasioglossum (*Dialictus*) *albohirtum* (Crawford, 1907) – CSUC has specimens from Alamosa and Larimer Counties identified as *Dialictus albohirtus* by G.C. Eickwort. Although Eickwort's identifications may well be correct, these specimens fall outside the currently understood range of this species, known from northwestern U.S. and southwestern Canada (Gibbs 2010). According to J. Gibbs (pers. comm.) there is a cryptic species allied to *L. albohirtum* in the vicinity of Colorado. More study is needed of metallic *Lasioglossum* (*Dialictus*) from the western U.S. before this species can be confirmed in Colorado.

Lasioglossum (*Dialictus*) *divergens* (Lovell, 1905) – There are two UCMC specimens from El Paso County identified as *Evylaeus divergens* by G.C. Eickwort and two female specimens in the AMNH from Boulder and Archuleta Counties determined as "#23 *divergens*?" by R. J. McGinley (unpublished). Moure and Hurd (1987: 73) list this species distribution as Nova Scotia to Minnesota and south to Georgia. AMNH records extend the range to North Dakota, but Colorado records are still well outside the published range for the species. This is considered a hypothetical Colorado species pending further study of the non-metallic species of *Lasioglossum* (*Dialictus*) sensu lato (see Michener 2000, 2007), i.e. the acarinate *Evylaeus*.

Lasioglossum (*Dialictus*) *oblongum* (Lovell, 1905) – Sandhouse (1924: 43) records this species from two different locations in Boulder County. UCMC also houses one specimen from Florissant (Teller County) collected on June 22, 1908. Taxonomic problems abound among the western U.S. members of *Lasioglossum* (*Dialictus*) and, at this time, *L. oblongum* cannot be confirmed for Colorado since historical identifications are considered untrustworthy (Gibbs 2010, pers. comm.).

Lasioglossum (*Dialictus*) *pilosum* (Smith, 1853) – Cockerell (1907b: 242) recorded *Halictus pilosus* Smith, var. from the city of Boulder, but no specimens of this species were located at UCMC. J. Gibbs (pers. comm.) noted that true *L. pilosum* is unlikely to occur in Colorado and that this record likely pertains to the similar *L.* (*Dialictus*) *succinipenne* (Ellis), as do many specimens from Wisconsin and elsewhere that had been identified as *L. pilosum* prior to study by Gibbs (Gibbs 2010; Wolf and Ascher 2009).

Lasioglossum (*Dialictus*) *tegulare* (Robertson, 1890) – Moure and Hurd (1987: 134) list *Dialictus tegularis* as having a distribution of Minnesota to New Hampshire and south to Texas and Florida, and note that it is probably erroneously recorded from Montana, Colorado, California, and Mexico. Gibbs (2009a) records this species from Ontario, Vermont, South Carolina, Kentucky, and Tennessee. According to J. Gibbs (pers. comm.), Colorado records of *L. tegulare* likely pertain to other members of the *tegulare* species group.

Lasioglossum (*Dialictus*) *veganum* (Cockerell, 1901) – Cockerell (1906c: 429) reported *Halictus veganus* from Florissant (Teller County), but Hurd (1979: 1972) and Moure and Hurd (1987: 137) list the distribution of this species as New Mexico and California. While no Colorado specimens were located at UCMC, a female specimen from Florissant was located at the AMNH. It was determined by Cockerell as *Halictus veganus* and is very similar to Colorado specimens of *L. sedi* (Sandhouse), a species closely resembling *L. veganum.* Thus, the published Teller County record may be referable to *L. sedi* rather than *L. veganum.*

Lasioglossum (*Evylaeus*) *dasiphorae* (Cockerell, 1901) – Seven acarinate *Evylaeus* (i.e. *Dialictus*) females in the AMNH identified as *Halictus dasiphorae* by P.H. Timberlake, from Boulder, La Plata, and Rio Grande Counties, are not *H. dasiphorae*, since true *L. dasiphorae* is a carinate *Evylaeus* and a potential senior synonym of *L.* (*Evylaeus*) *boreale* Svensson, Ebmer, and Sakagami, 1977 (Packer and Taylor 1997). Timberlake's misidentification was the result of Cockerell's type series being composite, i.e. including both carinate species (the type) and acarinate species (*L. dasiphorae* sensu Timberlake as determined in the AMNH). True carinate *L. dasiphorae* (? = *Lasioglossum boreale*) is a species or species complex that occurs at high latitudes and also at high elevations south to New Mexico (type locality of *L. dasiphorae*) and southeastern Arizona, and is known from Utah (Packer and Taylor 2002). It should occur in Colorado, but we do not know of any confirmed records. There has been considerable confusion with respect to synonymies and identifications in carinate *Evylaeus* (Ebmer 1995), so further study is necessary to clarify the occurrence and distribution of these in Colorado.

Andrenidae

Andrena (*Melandrena*) *barbara* Bouseman and LaBerge, 1979 – Bouseman and LaBerge (1979: 300) records this species from Larimer County. Lanham (1993b) reidentified the specimen as the aptly named *Andrena perplexa* Smith. We concur with Lanham and have excluded this eastern species from the Colorado Bee List.

Andrena (*Scaphandrena*) *capricornis* Casad and Cockerell, 1896 – RMBL houses a specimen from Cocheton Pass Rd (Gunnison County), 8000 ft. on July 8, 1974 by P. Lincoln and A.R. Moldenke and determined by U.N. Lanham. Ribble (1973, 1974) list this species as occurring in the southwestern U.S., but not reaching Colorado. This species and two others (see below) are notorious for hybridization. While Lanham knew this group very well, particularly with regards to Colorado specimens (Lanham 1987a, 1987b, 1993a), this specimen would represent a large range extension, both geographically and ecologically. Since hybridization is known in this group, we are choosing to list this as a problematic species in need of further study.

Andrena (*Scaphandrena*) *scurra* x *arabis* x *capricornis* Putative hybrids – Hurd (1979: 1825) records this hybrid complex as occurring in Colorado, as well as other western states. The taxonomy of this hybrid complex is in flux (Gusenleitner and Schwarz 2002; Gusenleitner et al. 2005; Lanham 1993a). We opted not to include this unresolved complex, as such, in the Colorado Bee List.

Calliopsis (*Calliopsis*) *rhodophila* Cockerell, 1897 – Cockerell (1906c: 440) records *Calliopsis rhodophilus* from Florissant (Teller County) and Colorado Springs (El Paso County). In his revision, Shinn (1967: 796) records this species from New Mexico, Arizona, Utah, California, and Mexico. Colorado specimens in the AMNH bearing Cockerell's identification labels reading "*Calliopsis rhodophilus*", from Florissant, Ridgeway Park, Ouray, and Pagosa Springs (collections from the last three sites are from 1919), and "*Calliopsis rhodophilus* var. appr. [approaching] *teucrii*", collected from Estes Park in 1919, were reidentified by A. Shinn as *Calliopsis teucrii*, so Cockerell's (1906c) report likely pertains to *Calliopsis teucrii* Cockerell. There is also a female UCRC specimen collected in La Plata County bearing Timberlake's *C. rhodophila* determination label, but since we are unable to confirm this identification at this time, we cannot reliably report *C. rhodophila* as a true member of the Colorado bee fauna.

Megachilidae

Hoplitis (*Robertsonella*) *simplex* (Cresson, 1864) – Cockerell (1906c: 445; 1907b: 253) reported this species as *Alcidamea simplex* Cresson from Florissant (Teller County) and the city of Boulder (Boulder County). Two specimens at UCMC collected from Florissant and bearing Cockerell's *A. simplex* determination labels appear to be the specimens mentioned in Cockerell (1906c: 445). They have, however, been reidentified as *Hoplitis* (*Alcidamea*) *producta* (Cresson) by JSA. The distribution of *H. simplex* is currently considered to extend from Connecticut to South Carolina, southern Illinois, Kansas, Oklahoma, and Texas (Neff 2009).

Osmia (*Melanosmia*) *nigriventris* (Zetterstedt, 1838) – Hurd (1979: 2036) records this species from Colorado, but Rightmyer et al. (2010) did not locate any Colorado specimens of this species in their review of North American non-metallic *Osmia*. As such, we have chosen not to place it on the Colorado Bee List at this time. Future high elevation collecting in north central Colorado might produce this species as well as another "dark" *Osmia*, *O.* (*Melanosmia*) *aquilonaria* Rightmyer, Griswold, and Arduser, 2010, as both are documented from high elevations as close as Fremont County, Wyoming.

Megachile (*Megachiloides*) *subnigra angelica* Mitchell (1934) – Mitchell (1934: 318) records two male paratypes from Pagosa Springs (Archuleta County), but Hurd (1979: 2065) records this subspecies only from Oregon, California, and Arizona. We concur with Hurd's more restricted subspecific distribution.

Megachile (*Sayapis*) *pugnata pomonae* Cockerell, 1916 – Mitchell (1937c: 206) cites numerous "definite records" for this subspecies from Colorado including seven females with no specific locality data beyond "Colorado", two females from Boulder County, one female from Denver (Denver County), three females from Leadville (Lake County), and one female from Tennessee Pass (Lake County near boarder with Eagle County). Neither UCMC nor AMNH have specimens identified as this subspecies among their holdings of Colorado *M. pugnata* Say. Hurd (1979: 2072) records *M. pugnata pomonae* from California, Nevada, and Arizona, and we concur with this more restricted subspecific distribution.

Megachile (*Xanthosarus*) *melanophaea calogaster* Cockerell 1898 – Although Cockerell (1907b: 253) records this taxon from Ward (Boulder County), Hurd (1979) cited only records from west of Colorado. We concur with Hurd's judgment given the great difficulty of reliably separating putative subspecies of *M. melanophaea.*

Megachile (unassigned) *coloradensis* Uhler, 1877 – According to Hurd (1979: 2072), this species is known only from Colorado and is an *"invalid nomen dubium".*

Apidae

Xylocopa (*Xylocopoides*) *californica arizonensis* Cresson, 1879 – This taxon is documented from Boulder County by a single female specimen deposited at UCMC, collected by "Chas. H. Hicks, III-28-1926". We consider this to be either an accidental occurrence or a mislabeled specimen. Although some bees fly in Boulder at the end of March, this record seems oddly early. The identification of this specimen was confirmed by JSA.

Nomada (*ruficornis* group) *cuneata* (Robertson, 1903) – Cockerell (1907b: 259) records this species from "University Campus" (Boulder County). One specimen identified by T.D.A. Cockerell and two specimens identified by H.G. Rodeck as *N. cuneata* in the collections of UCMC were examined by JSA and determined to have been misidentified. At present, no specimens can be confirmed documenting the occurrence of this species in Colorado.

Nomada (*ruficornis* group) *lepida* Cresson, 1863 – Cockerell (1907b: 248) records this species from Boulder County. One specimen from Boulder collected on *Drymocallis* bearing T.D.A. Cockerell's determination resides at UCMC. Due to taxonomic difficulties in this genus, we are not able to confirm this identification, which JSA believes to be incorrect.

Nomada (*ruficornis* group) *subrutila* Lovell and Cockerell, 1905 – Cockerell (1907b: 248) records this species from the city of Boulder (Boulder County). This is a nominally valid species known from New England (Hurd 1979: 2108). One UCMC specimen with label data matching that in Cockerell (1907b) and bearing T.D.A. Cockerell's *N. subrutila* determination has been identified as *N. luteoloides* Robertson by JSA. *N. subrutila* may prove to be a junior synonym of that species or another similar species in the *luteola* species group (Schwarz and Gusenleitner 2004) such as *N. imbricata* Smith. At this time, no specimens can be confirmed that document the obscure *N. subrutila* as having ever occurred in Colorado.

Nomada (*roberjeotiana* group) *elegantula* Cockerell, 1903 – UCMC has one La Plata County specimen determined by H.G. Rodeck. This record may well prove to be correct, but we are not able to confirm it at this time. The known distribution of this western species includes California, Oregon, Idaho and Utah.

Eucera (*Synhalonia*) *acerba* (Cresson, 1879) – Cockerell (1907b: 255-256) records this species, (as a *Tetralonia*) from the city of Boulder (Boulder County) with the following note: "The female of *acerba* has not been taken in our region. It seems possible that the male assigned to *acerba* is after all a variety of *T. edwardsii*." *E. acerba* is a valid species (type specimen is a female) with a known distribution from California to Oregon, Montana, Utah, and Nevada (Timberlake 1969: 11-12). A male specimen collected in 1922 bearing a *Tetralonia acerba* determination label in T.D.A. Cockerell's handwriting has been located at UCMC and determined to be *E. edwardsii* (Cresson) by TG. Since this specimen was collected fifteen years after Cockerell (1907b), this is obviously not the male specimen that Cockerell used as the basis of his Boulder County observation; it does, however, suggest that what Cockerell was calling the male *T. acerba* in his 1907 publication was most likely *E. edwardsii.*

Tetraloniella (*Tetraloniella*) *crenulaticornis* (Cockerell, 1898) – This species is a senior synonym of *Tetraloniella* (*Tetraloniella*) *fuscotincta* Cockerell, 1905 (LaBerge 2001: 114), a species recorded from Teller County by Timberlake (1969: 41). This Teller County record is not listed in LaBerge (2001: 114), who records *T. crenulaticornis* north only to New Mexico and Arizona. The Teller County specimen was not located for confirmation.

Tetraloniella excurrens (Cockerell, 1903) – This species is documented from Boulder, Denver, and Otero Counties by AMNH specimens determined by T.D.A. Cockerell as *Xenoglossodes excurrens*. This is a nominally valid name that was not treated by LaBerge (2001). The AMNH specimens are curated as *Melissodes* (*Eumelissodes*) *subagilis* Cockerell, presumably by LaBerge, and all appear to be *M. subagilis* according to JSA. Future studies of relevant holotypes are required to verify the status of *T. excurrens* (Cockerell), but JSA suspects it may prove to be a senior synonym of *M. subagilis*.

Melecta (*Melecta*) *pacifica pacifica* Cresson, 1879 – Linsley (1939: 440) reported this subspecies, based on color pattern, from Sedgwick and Teller Counties, but subsequent publications (Hurd 1979: 2171; Hurd and Linsley 1951: 127 and map 4) restrict this subspecies to California. UCMC does house some pale specimens from Teller County that are likely faded specimens of *Melecta pacifica fulvida* Cresson.

Bombus (*Pyrobombus*) *impatiens* Cresson, 1863 – CSUC houses a series of specimens from Fort Collins (Larimer County) collected in September 1931. These are correctly identified per JSA, but must have been an accidental or introduced occurrence since this species, clearly, has not been an established member of the Colorado bee fauna based on specimens at UCMC, CSUC, and AMNH; and Byron (1980). Future movement of *B. impatiens* as a managed greenhouse pollinator makes it possible that this species may be field collected again in Colorado.

Bombus (*Pyrobombus*) *vagans vagans* Smith, 1854 – AMNH houses a series of four workers labeled "Boulder, Colo. // 1922." determined by JSA. Their color pattern is entirely typical, i.e. unlike the poorly known *Bombus cockerelli* Franklin, 1913 from Cloudcroft and vicinity in the White Mountains (Sierra Blanca) of south-central New Mexico, which resembles *Bombus vagans bolsteri* Franklin, 1913 of Newfoundland. The status of *B. cockerelli* is uncertain but it may prove to be a color variety of *B. vagans* as suggested by its describer (Franklin, 1913). We are reluctant to add *B. vagans vagans* to the Colorado bee list based on single series with poor labels lacking a collector, precise locality, or a month and day of collection.

Table of Natural History Traits for Colorado Bee Genera

Family	Subfamily	Tribe	Genus	Common name:	Number of Colorado species:	Sociality:	Nesting habits:	Floral associations for Colorado species:
Colletidae	Diphaglossinae	Caupolicanini	*Caupolicana*		1	Solitary	Ground nesters	Mesolectic on *Dalea* (early and late day)
Colletidae	Colletinae		*Colletes*	Plasterer bees	36	Solitary	Ground nesters	Polylectic, Mesolectic, Oligolectic
Colletidae	Hylaeinae		*Hylaeus*	Yellow-faced bees	16	Solitary	Cavity nesters including twigs and pre-existing tunnels in soil	Polylectic, Mesolectic
Halictidae	Rophitinae	Rophitini	*Dufourea*		4	Solitary	Ground nesters	Oligolectic on Asteraceae
Halictidae	Nomiinae		*Dieunomia*		6	Solitary and/or Communal	Ground nesters	Mesolectic, Oligolectic
Halictidae	Nomiinae		*Nomia*	(includes the Alkali bee)	4	Solitary and/or Communal	Ground nesters	Polylectic, Mesolectic
Halictidae	Halictinae	Augochlorini	*Augochlorella*	Green sweat bees	1	Primitively eusocial	Clusters of cells in rotting wood	Polylectic
Halictidae	Halictinae	Augochlorini	*Augochloropsis*	Green sweat bees	2	Solitary	Cluster of cells adjoining hollow "burrow"	Polylectic
Halictidae	Halictinae	Halictini	*Agapostemon*	Green sweat bees	9	Solitary and/or Communal	Ground nesters	Polylectic
Halictidae	Halictinae	Halictini	*Sphecodes*		17	Cleptoparasitic, Social parasites	In nests of other Halictinae	n/a
Halictidae	Halictinae	Halictini	*Halictus*	Sweat bees	7	Solitary, Primitively eusocial	Ground nesters	Polylectic
Halictidae	Halictinae	Halictini	*Lasioglossum*	Sweat bees	89	Solitary, Communal, Primitively eusocial, Social parasites	Mostly ground nesters, some nest in wood, a few are social parasites in nests of other *Lasioglossum*	Mostly Polylectic; some Oligolectic
Andrenidae	Andreninae	Andrenini	*Andrena*	Mining bees	144	Solitary and/or Communal	Ground nesters	Polylectic, Mesolectic, Oligolectic
Andrenidae	Panurginae	Calliopsini	*Calliopsis*		11	Solitary	Ground nesters	Mesolectic, Oligolectic
Andrenidae	Panurginae	Protandrenini	*Protandrena*		2	Solitary	Ground nesters	Polylectic
Andrenidae	Panurginae	Protandrenini	*Pseudopanurgus*		23	Solitary	Ground nesters	Oligolectic on Asteraceae

Andrenidae	Panurginae	Panurgini	*Panurginus*		3	Solitary to Facultatively communal	Ground nesters	Polylectic, Mesolectic, Oligolectic
Andrenidae	Panurginae	Panurgini	*Macrotera*		1	Solitary, Communal	Ground nesters, in cracks in limestone	Oligolectic on *Opuntia*
Andrenidae	Panurginae	Panurgini	*Perdita*		46	Solitary, Communal	Ground nesters	Polylectic, Mesolectic, Oligolectic
Melittidae	Melittinae	Macropidini	*Macropis*	Oil bee	1	Solitary	Ground nesters	Oligolectic for pollen and plant oils on *Lysimachia*
Melittidae	Dasypodainae	Hesperapini	*Hesperapis*		2	Solitary	Ground nesters	Oligolectic on Asteraceae
Megachilidae	Megachilinae	Lithurgini	*Lithurgus*		1	Solitary, Communal	Burrow into wood	Oligolectic on *Opuntia*
Megachilidae	Megachilinae	Dioxyini	*Dioxys*		3	Cleptoparasitic	In nests of Megachilinae	n/a
Megachilidae	Megachilinae	Anthidiini	*Anthidiellum*		1	Solitary	Freestanding cells of resin on twigs or rocks	Polylectic
Megachilidae	Megachilinae	Anthidiini	*Anthidium*	Wool-carder bees	14	Solitary	Cavity nesters	Polylectic, Mesolectic
Megachilidae	Megachilinae	Anthidiini	*Dianthidium*		9	Solitary (may aggregate)	Cells of resin and pebbles on rocks, twigs, cavities or soil	Mesolectic, Oligolectic
Megachilidae	Megachilinae	Anthidiini	*Paranthidium*		1	Solitary	Ground nesters in sandy soil, cells lined with resin	Oligolectic on Asteraceae
Megachilidae	Megachilinae	Anthidiini	*Stelis*		20	Cleptoparasitic	In nests of Megachilidae	n/a
Megachilidae	Megachilinae	Anthidiini	*Trachusa*		2	Solitary	Ground nesters	Mesolectic
Megachilidae	Megachilinae	Osmiini	*Ashmeadiella*		9	Solitary	Twig/cavity and/or Ground nesters	Polylectic, Mesolectic
Megachilidae	Megachilinae	Osmiini	*Atoposmia*		5	Solitary	Under rocks or in pithy stems	Oligolectic on *Penstemon*
Megachilidae	Megachilinae	Osmiini	*Chelostoma*		1	Solitary	Twig nesters	Oligolectic on *Philadelphus*
Megachilidae	Megachilinae	Osmiini	*Heriades*		5	Solitary	Cavity nesters	Polylectic
Megachilidae	Megachilinae	Osmiini	*Hoplitis*		8	Solitary	Cavity nesters or in pithy stems	Polylectic
Megachilidae	Megachilinae	Osmiini	*Osmia*	Mason bees	76	Solitary	Cavity nesters	Polylectic, Mesolectic, Oligolectic

Megachilidae	Megachilinae	Megachilini	*Coelioxys*		18	Cleptoparasitic	Mostly in nests of *Megachile*	n/a
Megachilidae	Megachilinae	Megachilini	*Megachile*	Leaf-cutting (Leafcutter) and resin bees	59	Solitary	Cavity nesters	Polylectic, Mesolectic, Oligolectic
Apidae	Xylocopinae	Xylocopini	*Xylocopa*	Large carpenter bees	2	Subsocial	Burrow into wood	Polylectic
Apidae	Xylocopinae	Ceratinini	*Ceratina*	Small carpenter bees	4	Subsocial	In pithy stems	Polylectic
Apidae	Nomadinae	Neolarrini	*Neolarra*		3	Cleptoparasitic	In nests of Perditina	n/a
Apidae	Nomadinae	Ammobatini	*Oreopasites*		1	Cleptoparasitic	In nests of *Calliopsis* (*Nomadopsis*)	n/a
Apidae	Nomadinae	Nomadini	*Nomada*	Cuckoo bees	88	Cleptoparasitic	Mostly in nests of *Andrena* (also *Eucera* and *Agapostemon*)	n/a
Apidae	Nomadinae	Ammobatoidini	*Holcopasites*		5	Cleptoparasitic	In nests of Panurginae	n/a
Apidae	Nomadinae	Brachynomadini	*Brachynomada*		1	Cleptoparasitic	In nests of *Anthophorula*	n/a
Apidae	Nomadinae	Epeolini	*Epeolus*		12	Cleptoparasitic	In nests of *Colletes*	n/a
Apidae	Nomadinae	Epeolini	*Triepeolus*		36	Cleptoparasitic	Mostly in nests of Eucerini (also *Dieunomia*)	n/a
Apidae	Apinae	Exomalopsini	*Anthophorula*		2	Solitary (Communal)	Ground nesters	Polylectic
Apidae	Apinae	Exomalopsini	*Exomalopsis*		1	Communal	Ground nesters	Polylectic
Apidae	Apinae	Emphorini	*Ancyloscelis*		1	Solitary (may aggregate)	Ground nesters	Oligolectic on *Ipomoea*
Apidae	Apinae	Emphorini	*Diadasia*		7	Solitary (may aggregate)	Ground nesters, often with turrets at the nest entrance	Oligolectic
Apidae	Apinae	Emphorini	*Melitoma*		1	Solitary (may aggregate)	Ground nesters	Oligolectic
Apidae	Apinae	Eucerini	*Eucera*	Long-horned bees	16	Solitary	Ground nesters	Polylectic, Mesolectic, Oligolectic
Apidae	Apinae	Eucerini	*Florilegus*	Long-horned bees	1	Solitary (may aggregate)	Ground nesters	Mesolectic on Fabaceae
Apidae	Apinae	Eucerini	*Melissodes*	Long-horned bees	34	Solitary	Ground nesters	Mesolectic, Oligolectic
Apidae	Apinae	Eucerini	*Peponapis*	Squash or Gourd bee	1	Solitary	Ground nesters	Oligolectic on Cucurbitaceae
Apidae	Apinae	Eucerini	*Svastra*	Long-horned bees	7	Solitary	Ground nesters	Oligolectic

Apidae	Apinae	Eucerini	*Tetraloniella*	Long-horned bees	5	Solitary	Ground nesters	Oligolectic
Apidae	Apinae	Eucerini	*Xenoglossa*	Squash or Gourd bees	2	Solitary	Ground nesters	Oligolectic on Cucurbitaceae
Apidae	Apinae	Anthophorini	*Anthophora*	Digger bees	23	Solitary, Communal	Ground nesters (mostly) or in rotting wood and pithy stems (*A. terminalis*)	Polylectic
Apidae	Apinae	Anthophorini	*Habropoda*		5	Solitary	Ground nesters	Polylectic
Apidae	Apinae	Melectini	*Melecta*		3	Cleptoparasitic	In nests of *Anthophora*	n/a
Apidae	Apinae	Melectini	*Xeromelecta*		2	Cleptoparasitic	In nests of *Anthophora*	n/a
Apidae	Apinae	Melectini	*Zacosmia*		1	Cleptoparasitic	In nests of *Anthophora*	n/a
Apidae	Apinae	Centridini	*Centris*		1	Solitary	Ground nesters	Polylectic
Apidae	Apinae	Bombini	*Bombus*	Bumble bees	23	Primitively eusocial or Social parasites (*Psithyrus*)	Mostly ground nesters, often in abandoned rodent burrows	Polylectic, but well known to exhibit floral constancy
Apidae	Apinae	Apini	*Apis*	Western Honey bee	1	Highly eusocial	Perennial hives either in man-made boxes or cavities in trees, buildings, or rocks	Highly polylectic

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