

**The adaptive significance of inflorescence pigmentation
and its potential influence on the diversification dynamics
of North American sedges (*Carex*, Cyperaceae)**

By: Dylan Longert B. Sc. (Hons)

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Department of Biology
Faculty of Science
University of Ottawa

Abstract

Although pollinator-driven selection is known to generate pigmentation variation in plants, the contribution of abiotic factors in the evolution of pigmentation is still poorly understood. This is largely due to a lack of research on pigmentation variation in wind-pollinated (anemophilous) plants, where the confounding effect of pollinators can be excluded. Here, I study pigmentation variation in *Carex*, the world's largest anemophilous genus. Using 456 North American species, I use phylogenetic comparative methods to test (1) whether darker inflorescence parts are correlated with short growing seasons and (2) whether inflorescence pigmentation has affected the diversification dynamics of *Carex* throughout time. I also examine UV irradiance and precipitation at both the interspecific and intraspecific (four wide-ranging species, >100 accessions each) levels, factors previously associated with floral darkness at high altitude and latitude. At the inter- and intraspecific level, darker inflorescence parts are associated with short growing seasons, as seen in arctic and alpine regions. Additionally, dark pigmentation is associated with stronger UV irradiance and higher precipitation in the intraspecific dataset. Finally, despite the adaptive importance of pigmentation in arctic and alpine regions, it has not contributed to the diversification dynamics of *Carex*. The results suggest that climatic conditions can promote pigmentation variation in anemophilous plants, and are most consistent with the hypothesis that dark inflorescence parts accelerate reproductive development by absorbing solar energy. Finally, despite the adaptive importance of pigmentation in arctic and alpine regions, it has not contributed to the diversification dynamics of *Carex*.

Résumé

Bien que la sélection induite par les pollinisateurs soit connue pour générer des variations de pigmentation chez les plantes, la contribution des facteurs abiotiques dans l'évolution de la pigmentation est encore mal comprise. Cela est dû en grande partie à un manque de recherche sur la variation de la pigmentation chez les plantes pollinisées par le vent (anémophiles), où l'effet de confusion des pollinisateurs peut être exclu. Ici, j'étudie la variation de pigmentation chez *Carex*, le plus grand genre anémophile au monde. En utilisant 456 espèces nord-américaines, j'utilise des méthodes comparatives phylogénétiques pour tester (1) si les parties d'inflorescence plus sombres sont corrélées avec des saisons de croissance courtes et (2) si la pigmentation de l'inflorescence a affecté la dynamique de diversification de *Carex* au fil du temps. J'examine également l'irradiance UV et les précipitations aux niveaux interspécifique et intraspécifique (quatre espèces à large distribution, > 100 accessions chacune), facteurs précédemment associés à l'obscurité florale à haute altitude et latitude. Au niveau inter- et intraspécifique, les parties d'inflorescence plus sombres sont associées à des saisons de croissance courtes, comme on le voit dans les régions arctiques et alpines. De plus, la pigmentation foncée est associée à un rayonnement UV plus fort et à des précipitations plus élevées dans l'ensemble de données intraspécifiques. Enfin, malgré l'importance adaptative de la pigmentation dans les régions arctiques et alpines, celle-ci n'a pas contribué à la dynamique de diversification du *Carex*. Les résultats suggèrent que les conditions climatiques peuvent favoriser la variation de la pigmentation chez les plantes anémophiles et sont plus compatibles avec l'hypothèse selon laquelle les parties sombres de l'inflorescence accélèrent le développement reproducteur en absorbant l'énergie solaire. Enfin, malgré l'importance adaptative de la pigmentation dans les régions arctiques et alpines, celle-ci n'a pas contribué à la dynamique de diversification du *Carex*.

Statement of Contributions

Dylan Longert, Étienne Léveillé-Bourret, and Julian R. Starr conceived and designed this study.

D. Longert, Khaled Himmat, Audrey N. Paquette, Erin Johnson, Xiaohao Wu, and Simon Piché-Mongeon, collected the data. The data in this study were analysed, visualized, and presented by

D. Longert and É. Léveillé-Bourret.

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List of abbreviations

Aq: *Carex aquatilis*
 β (SE): slope and standard error
BIO16: precipitation
BM: Brownian motion
Br: *Carex brunnescens*
Bx: *Carex buxbaumii*
DF: degrees of freedom
GBIF: global biodiversity information facility
GSL: growing season length
Lp: *Carex leptalea*
N: total sample size
OU: Ornstein-Uhlenbeck
Partial adj R^2 : partial adjusted R^2
PGLS: phylogenetic generalized least squares regression
 $R^2_{(pred)}$: predicted (phylogenetic) R^2
RGB: red, green, blue
sd: standard deviation
UV3: UV irradiance

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Chapter 1: Introduction

One of the most striking features in the natural world is the astonishingly diverse array of pigmentation patterns found across all organisms. This variation can clearly be seen in the brightly coloured fish and birds that inhabit tropical regions, bacteria which range in colour between purple, red, brown, and orange, flamingos which possess a vibrant pink plumage, and cavefish which completely lack colour pigments. Pigmentation serves a wide variety of important functions in both animals and plants. In animals, within species interactions like mate choice (Rowland *et al.*, 1995; Loyau *et al.*, 2007; Gomez *et al.*, 2010; Couchard *et al.*, 2017), and between species interactions like species recognition and discrimination (Llaurens *et al.*, 2014; Robertson & Green, 2017; Tamura *et al.*, 2017; Rodríguez-Rodríguez & Negro, 2021), mimicry (Clark & Shepard, 1972; Ritland & Bower, 1991; De Bona *et al.*, 2015; Fujisawa *et al.*, 2020), and aposematism (Dumbaucher *et al.*, 1992; Caro, 2005; Kikuchi & Fannig, 2010; Saporito *et al.*, 2012) function with pigmentation patterns.

In flowering plants, pigmentation patterns in reproductive parts (e.g. flowers and bracts) are thought to be primarily involved in pollinator attraction and discrimination (Rebelo & Siegfried, 1985; Meléndez-Ackerman *et al.*, 1997; Pickering & Stock, 2004; Newman *et al.*, 2010; Shrestha *et al.*, 2012; Papiorek *et al.*, 2016; Shrestha *et al.*, 2019). The evolution of pigmentation in flowers and associated organs has been extensively studied in the context of biotic interactions, with many studies showing how changes in pigmentation mediate switches to different pollinator species or guilds (Weiss & Lamont, 1997; Rosas-Guerrero *et al.*, 2014). However, comparatively little research has investigated the influence of abiotic factors in the

evolution of pigmentation, despite mounting evidence that pigments play many roles in plants besides pollinator attraction.

Anemophilous pollination

Seed plants are ancestrally anemophilous (wind pollinated), but in angiosperms, anemophily is uncommon. It is found in approximately 18% of angiosperm families (Ackerman, 2000) including the Betulaceae, Salicaceae, Juglandaceae, and Poaceae. This pollination mode is believed to have independently evolved at least 65 times, during periods or in areas where biotic pollination was unfavourable, or alternatively, where wind was more reliable (Whitehead, 1969; Linder, 1998). For example, a shift to anemophily has been proposed for species within the genus *Schiedea* when they invaded windy and dry habitats, due to the reduction in biotic pollinators in those habitats (Weller *et al.*, 1990, 1998).

In comparison to biotic pollination, anemophily is a passive process, heavily reliant on climatic variables like humidity, temperature, and precipitation for the release, transport, and deposition of pollen (Culley *et al.*, 2002). Therefore, in dry and open environments where pollen movement via wind is maximized, anemophily tends to be common (Regal, 1982; Whitehead, 1983). Anemophilous plants are characterized by a suite of traits which are thought to enhance reproductive output in these types of environments. These traits, as well as their biotic analogs are summarized in Table 1.1.

The flowers of anemophilous plants, which are often drab and lacking of any bright colour pigments, typically range in colour from white to green (Linder, 1998; Friedman & Barrett, 2009). However, certain anemophilous lineages are surprisingly colourful. For example, species in the rush family (Juncaceae) possess flowers that range from green to purplish-black

(Brooks & Clements, 2000) and the seed cones of *Pinus* range between tan and lavender (Kral, 1993).

This raises the question as to why pigmentation variation exists in anemophilous lineages. One explanation is that variation in pigmentation is related to heating up structures of interest. This phenomenon occurs in animals where, for example, the more heavily melanized morphs of *Colias* butterflies and *Drosophila melanogaster* tend to be found in cooler regions because they absorb and retain heat more efficiently than the less melanized morphs (Watts, 1968; Pool & Aquadro, 2007; Telonis-Scott *et al.*, 2011). For plants residing in cold environments such as montane or arctic tundra, dark pigmented inflorescences could similarly enable accelerated floral development, thereby conferring an adaptive advantage in those regions.

Taxonomy of the family Cyperaceae

Cyperaceae is itself the third largest monocot family (>5600 spp.; Govaerts *et al.*, 2020). This monophyletic family is placed within the order Poales and is the closest living relative, the sister group, to the rush family (Juncaceae; Simpson *et al.*, 2007; Muasya *et al.*, 2009a; Givnish *et al.*, 2010; Escudero & Hipp, 2013; Jung & Choi, 2013; Bouchenack-Khelladi *et al.*, 2014; Ruhfel *et al.*, 2014; Spalink *et al.*, 2016b; Semmouri *et al.*, 2019). In all recent phylogenetic analyses conducted on Cyperaceae, two clades have been recovered: the subfamily Mapanioideae - which mainly includes broad-leaf tropical forest understory herbs, and the much larger Cyperoideae - which contains the majority of the morphological, ecological, and species diversity of Cyperaceae.

Taxonomy and distribution of the sedge genus (*Carex*)

The genus *Carex* (>2100 spp., Govaerts *et al.*, 2020) encompasses nearly 40% of the species diversity within Cyperaceae (Roalson *et al.*, 2021). It is mostly anemophilous and is split into 5 major clades: Core *Carex*, *Vignea*, Core Unispicate, *Schoenoxiphium*, and *Siderostictae* (Global *Carex* Group, 2015). Within North America, 3 of the 5 major clades are represented (Core *Carex*, *Vignea*, and Core Unispicate; Starr *et al.*, 2015) while the *Schoenoxiphium* and *Siderostictae* clades are found exclusively outside North America (Starr *et al.*, 2015). Common to habitats as different as deserts and prairies to temperate and tropical forests, the genus is also remarkable because most of its diversity lies in the temperate and cold regions of the earth, with significant hot spots of diversity in the North America (North of Mexico; >483 spp.) and Eastern Asia (>500 spp.; Ball & Reznicek, 2002; Starr *et al.*, 2009; Dai *et al.*, 2010; Escudero *et al.*, 2012; Tang *et al.*, 2014; Kerkoff *et al.*, 2014; Spalink *et al.*, 2018; Martín-Bravo *et al.*, 2019). It also possesses many species with extraordinary biogeographical (e.g., bipolar, amphiatlantic; Ball, 1990), latitudinal (e.g., *Carex arctogena*; Moore and Chater, 1971; Villaverde *et al.*, 2015) and elevational (e.g., *Carex montis-everestii* Kük., up to 5500 m) distributions.

***Carex* inflorescence structure and diversity**

One of the defining characteristics of *Carex* is its distinctive reproductive morphology. Each female flower is encased in a modified prophyll (first leaf of a branch) called a perigynium which in turn is subtended by a modified bract known as a female scale. Similarly, each male flower is directly subtended by a modified leaf known as a male scale. An aggregation of male flowers, or of female flowers, are respectively called a male spike and a female spike (Figure 1.1).

Although the overall inflorescence pigmentation diversity of *Carex* favours dull colours of yellow and brown, including all shades of green as might be expected of a predominantly anemophilous lineage (Friedman & Barrett, 2009), a rich range of colours exist amongst its taxa. Exceptional examples include the colourful diaspores of species like *Carex aurea* (orange) or *Carex baccans* (red), which are thought to attract birds (Hipp 2008; Kern 1974) or the vividly coloured inflorescences of *Carex fraserianus* (white) or *Carex scaposa* (red), which are known to be insect pollinated (Thomas, 1984; Yano *et al.*, 2015), but such species represent just a fraction of the enormous diversity of *Carex*.

***Carex* inflorescence development**

When looking for correlations between climate and plant development, it is important to be able to differentiate between floral and seed development. *Carex* presents a unique opportunity to investigate this relationship because each flower is either male or female (unisexuality). This trait makes it possible to discern whether darker pigmentation is an adaptation for accelerated seed development, or floral development. In *Carex*, mature perigynia are covered to varying extents by a female scale but developing perigynia are completely covered by a scale. Hence, male and female scales are expected to exhibit the greatest degree of pigmentation variation since they are the structures directly exposed to the effects of solar radiation. Therefore, if both male and female scales possess darker pigments in arctic and alpine regions, this could suggest an adaptation for accelerated floral development because both the male and female flowers could accelerate development. On the contrary, if female scales possess darker pigments than male scales, this could suggest an adaptation for accelerated seed

development because only the female flower, which houses the developing seed, could accelerate development.

***Carex* biogeographic and diversification patterns**

Over the past 10 years, many studies have been conducted to determine the biogeographic history of *Carex*, when it diversified, and whether any key innovations enabled diversification rate increases in *Carex*. Current research supports an East Asian origin for *Carex* during the late Eocene (c. 37 MYA; Spalink *et al.*, 2016; Léveillé-Bourret *et al.*, 2018; Martín-Bravo *et al.*, 2019). Beginning in the late Oligocene to early Miocene, multiple reciprocal dispersal events between East Asia and the other biogeographic realms occurred, with 25% of these reciprocal events involving North America (Martín-Bravo *et al.*, 2019).

It is believed that as many as 13 shifts towards higher diversification rates occurred during the late Miocene to early Pliocene; five of these shifts occurred within North America (c. 2.6-2.0 MYA; Martín-Bravo *et al.*, 2019). These bursts of diversification in temperate areas partly explain the very high species diversity of *Carex* in cooler regions (Ball, 1990; Spalink *et al.*, 2016b; Martín-Bravo *et al.*, 2019). Many hypotheses have been proposed to explain the circumstances surrounding the diversification events leading to the high diversity seen in present day. For example, the holocentric chromosomes found in *Carex* possess diffuse centromeres, which in turn lead to increased variations in chromosomal structure among individuals (Escudero *et al.*, 2012; Márquez-Corro *et al.*, 2019; Márquez-Corro *et al.*, 2021). Furthermore, the simplification of the perigynium has been hypothesized to enable the proliferation of novel morphological forms, thereby allowing *Carex* to occupy new ecological niches (Léveillé-Bourret *et al.*, 2018). While both traits have been proposed contributing factors to the high species

diversity seen in *Carex*, inflorescence pigmentation has never been considered. If dark pigmented individuals can more easily migrate into sparsely populated cold regions than light pigmented individuals, the geographic separation can facilitate reproductive isolation between individuals and speciation.

Rational for this study

The study of pigmentation variation in *Carex* and other anemophilous lineages is lacking. Qualitative observations suggest that inflorescence pigmentation variation exists in *Carex* such that darker pigments occur in colder regions and lighter pigments occur in warmer regions (Holm, 1896). Yet, no study has investigated the links between climatic factors and inflorescence pigmentation, and the relative importance of inflorescence pigmentation in the diversification dynamics of *Carex*.

In this thesis, I investigate the impact inflorescence pigmentation has on climatic niche adaptation and the diversification dynamics in North American *Carex*. In chapter 2, I examine (1) whether darker pigmented inflorescences are found in individuals and species that inhabit arctic and alpine regions, and (2) whether diversification events are linked with transitions to darker pigmented inflorescences. In chapter 3, the conclusions from chapter 2 are discussed, as well as their implications for future research into pigmentation variation within *Carex* and other anemophilous lineages.

1.1 TABLES AND FIGURES

Table 1.1 Some of the morphological characters commonly associated with biotic and anemophilous pollination syndromes

Biotic	Anemophily	References
Flowers usually bisexual Perianth showy Low pollen:ovule ratio Few pollen grains produced Pollen diameter often $>60 \mu\text{m}$ Stigmas simple	Flowers usually unisexual Perianth reduced or absent High pollen:ovule ratio Many pollen grains produced Pollen diameter $10\text{-}50 \mu\text{m}$ Stigmas feathery	Whitehead, 1969; Linder, 1998; Culley et al., 2002; Friedman & Barrett, 2008; Friedman & Barrett, 2009; Wragg, 2011

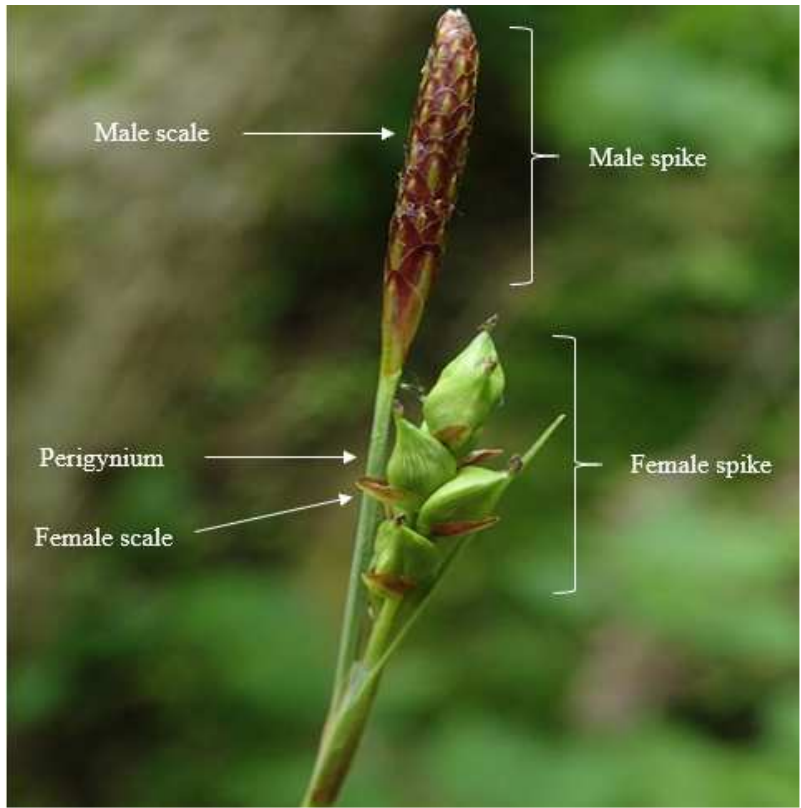


Figure 1.1 The floral morphology of *Carex*. Photo by Peter Dziuk.

Chapter 2: How does regional climatic variation shape inflorescence pigmentation within the anemophilous *Carex*?

2.1 INTRODUCTION

Research into the forces that influence floral pigmentation patterns has heavily focused on biotic pollination rather than abiotic pollination, despite current evidence that the abiotic environment has a major effect on floral pigmentation patterns. Previous research has shown that low temperatures (Dick *et al.*, 2011; Koski & Galloway, 2018), water stress (Warren & MacKenzie, 2001), and short day length (Dalrymple *et al.*, 2020) correlate with increased pigmentation in inflorescences. Several mechanisms have been proposed to explain how abiotic factors shape floral pigmentation. One important class of mechanisms involves the pleiotropic action of genes that produce pigments, but that are also involved in stress resistance. For instance, the flavonoid biosynthetic pathway produces pigments that offer protection from the harmful mutagenic effects of UV-B radiation. Furthermore, they simultaneously absorb light in the human-visible spectrum (Wessinger and Rausher, 2012; Tripp, 2018; Vaidya *et al.*, 2018) and produces compounds involved in resistance to salinity, temperature, and drought stress (Robberecht *et al.*, 1980; Warren *et al.*, 2003; Flenley 2011; Comont *et al.*, 2013; Shaukat *et al.*, 2013). Changes in pigmentation can therefore be mediated by selection on genes that confer resistance to UV-B and other stressors. A second class of mechanisms involves selection on inflorescence pigmentation itself, either to protect reproductive organs from abiotic stressors (Koski and Ashman 2016; Koski and Galloway 2018), or to convert more sunlight into heat, thus accelerating the development of reproductive organs (Dick *et al.*, 2011) or providing a “heat reward” that attracts pollinators (Harrap *et al.*, 2017).

Although the influence of abiotic factors on floral pigmentation is now well established, previous studies have focused on animal-pollinated systems where variation in climate also affects pollinator abundance and diversity (e.g. Ogutson *et al.*, 2012; Koski & Ashman 2016). In consequence, it has been difficult to disentangle the effect of abiotic factors on pigmentation from collinear effects of pollinator communities. The few studies that have involved anemophilous lineages also found correlations between climate and pigmentation, but they examined only variation in pigmentation among populations of individual species (e.g., Lacey & Herr 2005; Stiles *et al.*, 2007; Lacey *et al.*, 2010, 2012), limiting the scope of their conclusions. To better quantify the direct effect of climate on the evolution of plant pigmentation, there is a need for studies on anemophilous lineages integrating population-level and multi-species data. By utilizing these two types of data, it becomes possible to not only investigate the climatic variables that shape floral pigmentation patterns, but also compare the strength of these forces across species and ask questions such as whether these climatic forces have been acting on species through evolutionary time.

The genus *Carex* L. (Cyperaceae) is the largest (ca. 2000 species) cosmopolitan genus of anemophilous plants. It occupies a diverse suite of habitats ranging from tropical rainforests to prairie grassland to arctic and alpine tundra (Ball & Reznicek, 2002; Starr & Ford 2009), although most species inhabit temperate regions (Reznicek, 1990; Martín-Bravo *et al.*, 2019). Although *Carex* inflorescences are often dull shades of greens and browns, they also exhibit a rich range of pigmentation brightness ranging from pure white (*Carex fraserianus*) to charcoal black (*Carex atrofusca*; Ball and Reznicek 2002). This combination of characteristics makes *Carex* an ideal model group to study the effect of abiotic factors on pigmentation, both at inter-specific and intra-specific levels.

A recent thermal imaging study demonstrated that the flowers and inflorescences of a broad phylogenetic sample of species in the Alps rapidly accumulate heat when exposed to sunlight (Dietrich & Körner, 2015). Higher floral temperatures were suggested to benefit plants growing in cool environments by accelerating floral development (oogenesis, sporogenesis), pollen tube growth (Galen & Stanton 2003; Song *et al.*, 2012; Steinacher & Wagner 2012), and the maturation and viability of fruits and seeds (embryogenesis, seed weight, Kjellberg *et al.*, 1982; Stanton & Galen 1989). The most important biological factor that determined heat accumulation was flowering unit size, yet a few species of *Carex* and other anemophilous genera warmed up substantially in sunlight (up to 12°C) despite small flower diameters, probably due to their dark brown to black inflorescences (Dietrich & Körner, 2015). The aforementioned authors suggested that anemophilous species could take thermal advantage of their dark pigmentation without incurring the costs associated with insect pollination, specifically the cost of pollinator visibility. This hypothesis would be consistent with the century-old observations of Holm (1896), who noted that northern and alpine species of *Carex* were often “bright coloured, purplish or deep brown”, whereas southern and sylvan species were “pale, hyaline or light green”. Recently, Small and Cayouette (2016) also noted that the reproductive parts in arctic *Carex* species were darker than in most temperate taxa, and they hypothesised that this was an adaptation for absorbing sunlight to promote seed development in a cold climate. However, this proposed correlation between geography and pigmentation has not yet been demonstrated quantitatively, despite its potential to shed light on the role of abiotic factors in the evolution of plant pigmentation.

Using *Carex* as a model group, I investigate the hypothesis that in regions where the growing season is short, dark pigmented reproductive structures heat flowers and fruits through

solar radiation absorption, accelerating their development. I propose that most *Carex* with darker reproductive structures will be found in regions where the length of the growing season is short. I also examine whether pigmentation could play a role in protection from UV radiation or water stress resilience. To test these alternative hypotheses, I assessed the relationship between inflorescence pigmentation (darkness), growing season length, UV radiation intensity, and precipitation across nearly all ca. 483 species of North American *Carex*, north of Mexico (Ball & Reznicek, 2002; Waterway *et al.*, 2015), and at the intraspecific level in four geographically widespread species. Should any of these abiotic factors affect the evolution of pigmentation, I would expect them to be correlated with pigmentation at both the intraspecific and interspecific levels on a continental scale. Following this, I utilize phylogenetic comparative methods to investigate whether the inflorescence pigmentation has affected the diversification dynamics of *Carex*. Lastly, I discuss potential mechanistic explanations for the observed results, in light of my results.

2.2 MATERIALS AND METHODS

2.2.1 Specimen image collection

This study focuses exclusively on the Flora of North America region (FNA; www.eflora.org), which encompasses the North America continent north of Mexico. Within the FNA, extensive and precise climate and locality data are readily available, North American *Carex* are taxonomically well known, thoroughly collected, and precisely geolocated (Ball & Reznicek, 2002). Moreover, the genus is extremely diverse in the area, with ca. 483 species representing three of the approximately six major *Carex* lineages known within the genus (Core *Carex*, Unispicate, Vignea; Starr *et al.*, 2015).

I gathered specimen images distributed online by North American herbaria using multiple data sharing platforms (e.g. Consortium of Midwest Herbaria, Intermountain Regional Herbarium Network, SeiNet). Images were selected for analysis only when: (1) they were high resolution, (2) there was no specimen discolouration due to immaturity, late collection, or poor preservation, and (3) there was a colour control reference patch on the image, including the ColorGauge Nano Target 30 (Image Science Associates, LLC), ColorChecker Chart (X-Rite), or Kodak Color Control Patches. When images for species did not satisfy the above three requirements, or were unavailable online, physical specimens were consulted at the herbaria of the Canadian Museum of Nature (CAN), Canadian National Collection of Vascular Plant (DAO) and Marie-Victorin Herbarium (MT). If no specimen could be found, the species was excluded, as were recently introduced taxa, and species missing from a phylogeny of North American *Carex* (see below). This left a total of 450 species for analyses.

2.2.2 Image pigmentation measurement and standardization

Pigmentation data in the form of RGB values were measured from each specimen using ImageJ (ver. 1.50i; Schindelin *et al.*, 2012) in the standard RGB (sRGB) colour space. RGB is an additive colour model that adds red, blue, and green in different combinations to produce a diverse array of colours (Pascale, 2003). RGB values averaged over several pixels were collected from each specimen's colour reference patch, a photosynthetic leaf, and inflorescence organs directly linked to male and female flowers using the "RGB measure" plugin for ImageJ (Rasbund, 2004; Figure 2.1). The inflorescence organs measured consisted of: (1) the perigynium (2) the female scale and (3) a male scale (Figure 1.1). Only the apical portion of the perigynium was measured, as the basal portion is partially to completely hidden by the female scale. The use of specimen images makes measurement of the pigmentation of such small structures possible.

Raw RGB values can be influenced by camera model and lens, lighting, and post-processing. Consequently, to make all images comparable, RGB values were calibrated by 3D Thin-Plate Spline warping with the colour control patches set as a reference (Menesatti *et al.*, 2012). Then, the sum of these calibrated RGB values were used as an indication of pigmentation darkness, where a maximum of 765 corresponded to pure white and a minimum of 0 corresponded to pure black. I calculated percent pigmentation darkness (D) as $D = \frac{765 - \sum RGB}{765} \times 100\%$. All subsequent statistical analyses were completed using R v4.0.0 (R Core Team, 2020).

2.2.3 Interspecific variation in inflorescence pigmentation

I measured photosynthetic leaf and inflorescence pigmentation from 1-4 images per species, depending on the availability of specimen images, and selected specimens that were geographically disparate whenever possible. For this analysis, pigmentation was measured in two

specimens for the vast majority of species (98%), a single specimen for 5 species, 3 specimens for 1 species, and 4 specimens for 1 species. Additionally, male scale pigmentation data for *Carex chihuahuensis* was excluded from the analysis since they could not be found in the selected images.

Estimating and extracting the climatic data that characterizes the habitats species live requires all locality records for each species. These were extracted from The Global Biodiversity Information Facility (GBIF; www.gbif.org) using the *gbif* function in the R package *dismo* v1.1-4 (Hijman *et al.*, 2017). Non-North American and duplicate localities were removed using the *countrycode* function in the R package *countrycode* (Arel-Bundock *et al.*, 2018) and the *clean_coordinates* function in the R package *CoordinateCleaner* (Zizka *et al.*, 2019). A total of 156 719 georeferenced localities across all taxa within North America were collected, with a range of 1-3432 georeferenced localities per species, and an average of 346 georeferenced localities per species. Seven species in this analysis had less than four georeferenced localities.

Growing season length was extracted from each geographic coordinate as follows: (1) monthly average temperature data was extracted from the WorldClim Global Climate Datasets (Hijman *et al.*, 2005); (2) the monthly average values were taken as the average daily value for the middle day of each month; (3) a curve was fit to the data using linear interpolation to estimate the remaining days of the year, and (4) growing season length was calculated as the total number of days in a year where temperatures were greater than or equal to 5°C, which is within the 0-5°C base temperature range required for temperate plants to germinate (Moot *et al.*, 2000; Larsen & Bibby, 2005; Lonati *et al.*, 2009).

Regional precipitation and UV irradiance data were extracted at each geographic coordinate from the WorldClim Global Climate (Hijman *et al.*, 2005) and the gIUV datasets

(Beckmann *et al.*, 2014) respectively. For the purposes of these analyses, the mean UV-B irradiance of the highest month (UVB3 in gIUV dataset – referred to as “UV irradiance” throughout the rest of the paper) and precipitation of the wettest season (BIO16 in WorldClim dataset – referred to as “precipitation” throughout the rest of the paper) were selected for this analysis. Each of the predictor variables was standardized using a z-transformation to enable comparisons among variables.

A North American *Carex* phylogeny containing 477 species (Pender, 2021) was used in this analysis to account for species relatedness. This phylogeny was reconstructed using the chloroplast markers *matK* and *rps16* and the nuclear ribosomal markers ITS and ETS. I performed a multivariate ancestral character state estimation analysis of the red, green, and blue component of the RGB colour space model using the R package *mvMORPH* (Clavel *et al.*, 2015) to visualize the evolution of pigmentation throughout *Carex*. These ancestral character state estimations were performed for photosynthetic leaf, perigynium, male scale, and female scale using a multivariate Brownian Motion (BM) model of trait evolution (see below for an explanation of BM evolution).

Using the *gls* function in the R package *nlme* v3.1-147 (Pinheiro *et al.*, 2020), I performed multiple phylogenetic generalized least squares (PGLS) regression (Grafen, 1989) using growing season length, UV irradiance, and precipitation as predictor variables. I used AIC scores to assess whether a BM or Ornstein-Uhlenbeck (OU) error structure best fit each regression model. BM models evolution as a random walk process with the variance of traits proportional to the rate of evolution and time (Felsenstein, 1985), while OU is an extension of BM where trait variances are further constrained to an adaptive optimum (Hansen, 1997; Butler & King, 2004). I found that the model of trait evolution with the lowest AIC across all plant

structures was the OU model (AIC scores: photosynthetic leaf OU = 3396, BM = 3779; perigynium OU = 3665, BM = 4061; male scale OU = 3783, BM = 4018; female scale OU = 3856, BM = 4103).

To reduce bias in the PGLS model, among site variance in the predictor variables and measurement error in the response variables need to be accounted for. To account for among-site variation of the predictor variables for each species, I used the *weights* argument within the *gls* wrapper function. The weights were implemented by calculating the squared standard deviation of each predictor variable using the climatic data extracted from all GBIF coordinates. Furthermore, multiple approaches are available for accounting for measurement error in the response variable (see Hansen & Bartoszek, 2012; Kopperud *et al.*, 2020). However, the current approaches available either require a BM error structure or cannot account for more than a single predictor variable. Given that an OU error structure best fits my data and I needed to include multiple predictor variables, I opted not to incorporate measurement error in the response variable (pigmentation). Despite the possibility of my regression models being biased by neglecting to incorporate measurement, I felt not incorporating measurement error in the response variables was the better option than either removing predictor variables from the PGLS model or specifying a poor-fitting model of trait evolution.

When performing a regression analysis, one would report an R^2 value to express how well a model explains the data. However, when performing PGLS regression complications arise because of the need to account for correlations between species. To alleviate this problem, I utilized a modification of R^2 , also known as predicted R^2 (R^2_{pred}). Using R^2_{pred} , the predicted data for a given species j are calculated by removing the observed species j from the dataset, and then predicting the value for the observed species, \hat{j} from the remaining species and predictor

variables (Ives, 2018). R^2_{pred} was calculated as the variance in the difference between the observed and predicted pigmentation data using the *R2.pred* function in the R package *rr2* (Ives & Li, 2018)

2.2.4 Intraspecific variation in inflorescence pigmentation

In addition to assessing how pigmentation varies across species, I also assessed how pigmentation varies within individual species. For this second analysis, I quantified the degree of intraspecific pigmentation variation for four widespread sedge species representing the three major *Carex* clades found within the FNA: *Carex aquatilis* and *C. buxbaumii* (Core *Carex*), *C. brunnescens* (*Vignea*), and *C. leptalea* (Unispicate; Figure 2.2). A total of 468 images were collected (more than 100 images per species), and the pigmentation of their photosynthetic leaf and inflorescence organs were measured. Due to the structures not being found in the images, there was no pigmentation data from 1 photosynthetic leaf specimen, 13 perigynium specimens, 14 male scale specimens, and 12 female scale specimens. Furthermore, the pigmentation data from an additional 4 images were removed from these set of analyses because there was no provided collection year.

Similar to the interspecific analysis, locality data are required to estimate and extract the climatic data that characterize the environments individuals live in. Geographic coordinates of each specimen were extracted either directly from the herbarium label, or they were estimated with Google Maps using the locality description provided on the herbarium labels. After extracting growing season length, UV irradiance, and precipitation from each specimen's locality and standardizing those variables, all intraspecific specimen data was pooled and regression analyses were run using the pigmentation of photosynthetic leaf, perigynium, male scale, and female scale as response variables and species identity, specimen collection year, growing season

length, UV irradiance, and precipitation as predictor variables. Species identity was included as a covariate to enable comparisons among the species selected in this analysis. I additionally included the covariate specimen collection year to account for the effects of specimen discolouration, which would expect to be seen in older specimens. Specimen collection year was not included as a covariate in the interspecies analysis because only 1-4 specimens per species were analysed. Although it would have been preferable to utilize model II regression for the intraspecific analyses, there are no available R packages which compute model II regression parameters in a multiple regression framework.

2.2.5 Pigmentation diversification dynamics

In addition to investigating the adaptive significance of inflorescence pigmentation, I also examined the possibility that inflorescence pigmentation is a trait that has contributed to the high species richness of *Carex*. To assess whether pigmentation has influenced the diversification dynamics of *Carex*, I utilized a statistic from the tip-rate correlation (TRC) statistical methods called ES-sim (Harvey & Rabosky, 2018). ES-sim is a correlation coefficient between the trait values and speciation rates for a given species. Speciation rates are calculated by summing the branch lengths separating a species from its root node, with each consecutive root-ward branch weighted by a factor of 0.5 (See Figure A4.1 for a worked-out example). I calculated four ES-sim correlation coefficients using the pigmentation of photosynthetic leaf, perigynium, male scale, and female scale as traits. The significance of the ES-sim correlation coefficients were assessed by comparing them to a null distribution of 1000 simulated trait values along the phylogeny, evolving according to an OU model of trait evolution. The OU model of trait evolution was utilized because it had the highest AIC support (see “interspecific variation in inflorescence pigmentation”). The interpretation of the ES-sim statistic is identical to that of a

normal correlation statistic: the closer ES-sim is to 1, the stronger the correlation is between the trait of interest and diversification rate and the closer ES-sim is to 0, the weaker the correlation is between the trait of interest and diversification rate.

While multiple other TRC methods have also been proposed (e.g. ND-sim, TD-sim), ES-sim has the highest statistical power (Harvey & Rabosky, 2018) and therefore was selected for this analysis. Furthermore, three alternative methods were also considered for the diversification dynamics analysis. The first method, sister clade contrasts, estimates diversification dynamics across phylogenies by comparing rates of diversification between sister clades (Barracough & Nee, 2001). However, this method was ruled out because the sample size is limited by the total number of sister species whereas ES-sim utilizes all taxa. The second suite of methods - State Speciation Extinction (SSE) models (incl. BiSSE, QuaSSE, MuSSE, HiSSE, and MuHiSSE; Beaulieu & O'Meara, 2016; Maddison *et al.*, 2007; Fitzjohn *et al.*, 2009; Fitzjohn, 2010) - jointly estimates speciation rates, extinction rates, and trait transition rates from phylogenetic trees and trait data. However, apart from QuaSSE, traits are required to be discrete rather than continuous. QuaSSE, while utilizing continuous characters, cannot discern the degree of independence between the diversification process and the trait of interest (Rabosky & Goldberg, 2015). The final method considered was Bayesian Analysis of Macroevolutionary Mixtures (BAMM), which uses the reversible jump Markov chain Monte Carlo (rjMCMC) algorithm to calculate the number of rate shifts in a species diversification process or in a character trait (Rabosky, 2013; Shi & Rabosky, 2015). However, BAMM was ultimately rejected because it cannot explicitly test whether traits are correlated with diversification rate shifts.

2.3 RESULTS

Growing season length at the locations from which specimens were collected varied widely among (range: 55-365 days, average = 225 days) and within species (range: 0-365 days, average: 176 days), as did UV irradiance (between species range: 2720-7182 J/m²/day, average = 4824 J/m²/day; within species range: 2474-7339 J/m²/day, average = 4204 J/m²/day) and precipitation (between species range: 92.3-869.1 mm, average = 331.9 mm; within species range: 41-1417 mm, average = 291 mm; Table 2.1).

Most climatic variables are correlated with each other to a certain degree. Growing season length was positively correlated between and within species with UV irradiance (between species: N = 450, r = 0.44, P < 0.0001; within species: N = 467, r = 0.38, P < 0.0001) and precipitation (between species: N = 450, r = 0.52, P < 0.0001; within species: N = 468, r = 0.50, P < 0.0001). UV irradiance was positively correlated with precipitation between species (N = 449, r = 0.15, P = 0.0001), but not within species (N = 466, r = 0.06, P = 0.18). Specimen collection year was positively correlated with UV irradiance within species (N = 468, r = 0.25, P < 0.0001).

2.3.1 Is pigmentation correlated with climate between species?

Perigynia tend to be lighter pigmented in comparison to photosynthetic leaves, male scales, and female scales (photosynthetic leaves: range = 22.67-83.03, average = 51.14; perigynia: range = 25.96-90.08, average = 50.03; male scales: range = 21.53-93.30, average = 52.20, female scales: range = 24.38-95.31, average = 54.42; Table 2.2). However, ancestral character state reconstruction analyses demonstrate that, in comparison to photosynthetic leaf and perigynium that have not experienced large shifts in pigmentation over evolutionary time,

male and female scale have both experienced large shifts in pigmentation in recent evolutionary time both within and across major lineages (Figure 2.3). Furthermore, some clades have evolved darker pigmented male and female scales and have mostly retained this through evolutionary time (Figure 2.3).

Photosynthetic leaves tended to possess darker pigments only in regions with high UV irradiance ($N = 450$, $R^2_{\text{pred}} = 0.006$, $F_{1,444} = 12.2$, $P < 0.0005$) but perigynium pigmentation was not correlated with any climatic variable (Table 2.3, Figure A4.1-A4.5). The pigmentation of male and female scales tend to be darker in regions with a short growing season (male scale: $N = 449$, $R^2_{\text{pred}} = 0.17$, $F_{1,444} = 27.1$, $P < 0.0001$; female scale: $N = 450$, $R^2_{\text{pred}} = 0.15$, $F_{1,445} = 92.8$, $P < 0.0001$; Table 2.3, Figure 2.4) and for female scales, high UV irradiance ($R^2_{\text{pred}} = 0.0009$; $F_{1,445} = 8.73$, $P = 0.003$; Table 2.3, Figure A4.2). No correlation was observed between the pigmentation of photosynthetic leaf or any inflorescence structure and precipitation (Figure A4.1-A4.5).

2.3.2 Is pigmentation correlated with climate and specimen age within species?

Pigmentation varied greatly within and between the four species selected for this analysis. While the pigmentation of leaves and perigynia were comparable across each species, *Carex aquatilis* and *Carex buxbaumii* possess much darker pigmented male and female scales than *Carex brunnescens* and *Carex leptalea* (Table 2.4).

Individuals found in regions with a short growing season, high UV irradiance, and low precipitation tended to possess darker pigmented inflorescences. The years specimens were collected in range from 1866 to 2017 (average = 1969). No relationship was found between either photosynthetic leaf and inflorescence pigmentation and specimen collection year (Table 2.5). Photosynthetic leaves tended to be slightly darker in higher UV irradiance regions ($N =$

461, Partial $R^2 = 0.04$, $F_{1,444} = 19.4$, $P < 0.0001$, Figure A4.4). Perigynia similarly tended to be slightly darker pigmented in regions with higher UV irradiation ($N = 455$, Partial $R^2 = 0.04$; $F_{1,448} = 19.2$, $P < 0.0001$) and shorter growing seasons (Partial $R^2 = 0.01$; $F_{1,448} = 4.1$, $P = 0.04$, Figure 2.5, A4.4). Male and female scale pigmentation both tended to be darker in regions with a short growing season (male scale: $N = 454$, Partial $R^2 = 0.11$; $F_{1,447} = 50.9$, $P < 0.0001$; female scale: $N = 456$, Partial $R^2 = 0.14$; $F_{1,449} = 69.6$, $P < 0.0001$; Figure 2.5), high UV irradiance (male scale: Partial $R^2 = 0.015$; $F_{1,447} = 6.12$, $P = 0.01$; female scale: Partial $R^2 = 0.015$; $F_{1,449} = 7.30$, $P = 0.0007$; Figure A4.4), and low precipitation (male scale: Partial $R^2 = 0.03$; $F_{1,447} = 14.02$, $P = 0.0002$; female scale: $P = 0.013$; $F_{1,449} = 6.03$, $P = 0.01$, Figure A4.5). However, male and female scale pigmentation were by far most strongly correlated with GSL (Table 2.5).

2.3.3 How has photosynthetic leaf and inflorescence pigmentation impacted the diversification dynamics of *Carex*?

Results from ES-sim indicate no correlation exists between the diversification rate of *Carex* and the pigmentation of photosynthetic leaves ($\rho = 0.076$, $P = 0.67$), perigynia ($\rho = -0.0061$, $P = 0.92$), male scales ($\rho = 0.028$, $P = 0.74$), or female scales ($\rho = 0.0049$, $P = 0.95$).

2.4 DISCUSSION

This is the largest study to date to investigate the effects of abiotic factors on inflorescence pigmentation variation, and the only study to focus on a predominantly anemophilous lineage. My results suggest that climatic factors may play a role in shaping floral pigmentation in plants at both macroevolutionary and microevolutionary levels, such that pigmentation is not a character influenced solely by ancestral inheritance. They also suggest that floral pigmentation may hold adaptive potential even in anemophilous lineages.

This study exclusively relied on preserved specimen images. Preserved specimens housed in herbaria offer a wealth of information on organisms (Funk, 2003), and they enable many types of studies ranging from paleogenomics to long term phenological studies (Brunson & Reich, 2019; Heberling *et al.*, 2019). I utilized herbarium specimens because of the accessibility of not only the extensive species collections, but also collections of individuals ranging from all over North America. However, a potential limitation of herbarium specimens concerns specimen age. Some of the specimens in our dataset were collected as early as 1866, which could be problematic because specimens have the tendency to degrade in quality over time (Staats *et al.*, 2010). However, our results were robust to the inclusion of specimen age as a covariate. Specimen age was not a significant predictor of pigmentation for any of the measured organs. Therefore, I conclude that specimen age is not an extraneous variable affecting this analysis.

The results indicate that inter- and intraspecific variation in inflorescence pigmentation are plastic traits that are most strongly correlated with the length of the growing season. Specifically, species and populations with darker pigmented inflorescences tend to be found in high latitude and altitude regions, where the length of the growing season is short. This finding is

corroborated with studies that found darker pigmented flowers in northerly and high elevation populations of anemophilous *Plantago lanceolata* (Stiles *et al.*, 2007; Lacey *et al.*, 2010).

Plants that inhabit high elevation and latitude regions need to be able to cope with the challenges of long periods of freezing temperatures and short period of temperatures optimal for growth and development. *Carex* and up to 70% of other perennial, herbaceous species exhibit floral preformation (Smith, 1966; Bliss, 1971; Heide, 1997; Klimešová *et al.*, 2017; Schnablová *et al.*, 2021). Species exhibiting inflorescence preformation form primordial floral buds either above or below ground prior to winter that can withstand harsh winter conditions. When the spring thaw occurs, floral bud development resumes and since these floral buds have already begun developing, they develop quicker than non-preformed flowers. In regions like arctic and alpine zones, the ability to develop earlier and quicker can be seen as advantageous (Geber *et al.*, 1997b; Whigham, 2004).

Furthermore, the dark pigmented inflorescences found in many arctic and alpine Carices could serve as an adaptation to further accelerate inflorescence development, since darker pigments absorb solar radiation more readily than lighter pigments (Watt, 1968; De Jong *et al.*, 1996; Gilbert *et al.*, 1998). Small and Cayouette (2016) hypothesized that arctic sedges evolved darker inflorescences to accelerate seed development. However, my results indicate that pigmentation variation may affect both male and female inflorescence components. This suggests that darker pigmentation may have evolved as an adaptation to accelerate reproductive development, as opposed to solely seed development. Similar phenomena have also been observed in yeast, which tend to possess darker pigments at high latitudes (Cordero *et al.*, 2018), birds that lay darker pigmented eggs at higher latitudes (Wisocki *et al.*, 2019), desert grasshoppers with black pigmentation hypothesized to accelerate development (Whitman, 1988),

and bearded dragons that can alter their skin pigmentation in response to temperature fluctuations (Smith *et al.*, 2016).

Results indicate that significant inter- and intraspecific pigmentation variation exists among the vegetative and floral structures (i.e. photosynthetic leaf, perigynium, male scale, female scale) of *Carex*. Firstly, some floral organs appeared more strongly affected by climate than others. *Carex* perigynia were less strongly correlated with growing season length than male or female scales, suggesting that stronger selective pressures could be acting on the pigmentation of scales. This is possibly explained by the fact that scales are directly exposed to the abiotic environment. In response to this, the scales become darker over evolutionary time. The perigynium in contrast is covered to varying degrees by a female scale and as a result does not darken to the same degree as the scale. However, caution should still be used when interpreting perigynium pigmentation patterns. For certain species like *Carex brunnescens* and *Carex leptalea*, perigynia were difficult to measure because they were almost completely covered by a female scale.

Secondly, at the interspecific level, only female scales tend to be slightly darker in regions with high UV irradiance, and precipitation did not affect any structure of interest (photosynthetic leaf, perigynium, male scale, female scale). However, at the population level, all structures of interest were slightly darker in regions of higher UV irradiance and male and female scales were slightly darker in regions with increased precipitation. A minimum of 100 specimens per species were utilized in the intraspecific analysis and the whole geographic range of the four target species was well represented (Figure 2.1). Because only 1-4 specimens were utilized for the interspecific analysis, spatial variation within species could not be detected. This difference

in sampling effort between the inter- and intraspecific analyses could explain the discrepancies in the results.

Caution should be applied when interpreting pigmentation patterns with respect to UV irradiance. In this study, I quantified the pigmentation of *Carex* in the visible range but not the UV range. Hence, the darker pigmented inflorescences observed may not necessarily have high UV absorbance. The secondary compounds responsible for pigmentation in *Carex* are still poorly known, although phenolic compounds such as flavones, tannins, and 3-desoxyanthocyanidins are present and possess similar UV-absorbing properties to anthocyanidins (Harborne, 1971, 1985; Xiong *et al.*, 2019). Studies quantifying spectral reflectance of *Carex* in the full visible + UV spectrum would be needed to assess whether the correlations I found here could reflect adaptations for UV absorption. In particular, UV-B protection is essential because prolonged exposure to high concentrations of UV-B radiation can alter the structure of DNA, thereby preventing cells from operating normally and increasing the chance of unfit mutant gametes (Robberecht *et al.*, 1980; Epel *et al.*, 1999; Flenley, 2011; Shaukat *et al.*, 2013; Comont *et al.*, 2013).

2.4.1 Diversification dynamics of *Carex*

There is no relationship between the diversification rate of *Carex* and the pigmentation of photosynthetic leaves or inflorescences. This indicates that the diversification dynamics of *Carex* are impacted by other traits like the architecture of the perigynium or holocentric chromosomes. Lèveillé-Bourret *et al.* (2018) hypothesized that the reduction and truncation of the perigynium rachilla led to the release of mechanical constraints on the perigynium shape. This could have enabled the proliferation of novel perigynium morphological forms, which could have enabled species to take advantage of novel ecological niches, thereby promoting ecological speciation.

Holocentric chromosomes have also been proposed as a trait affecting the diversification dynamics of *Carex* (Escudero *et al.*, 2012; Márquez-Corro *et al.*, 2019; Márquez-Corro *et al.*, 2021). In holocentric chromosomes, the centromere is diffuse, such that kinetochore activity occurs across the entire chromosome. This in turn has led to the high chromosomal diversity seen in *Carex* ($2n = 10-132$; Roalsen, 2008; Hipp *et al.*, 2009). Differences in chromosomal number between species could have contributed to reproductive isolation between populations, thereby facilitating speciation.

2.4.2 Alternative correlates of *Carex* pigmentation variation

2.4.2.1 Herbivory

This study has solely considered the influence of abiotic variables on inflorescence pigmentation. However, biotic factors may also play an important role in the pigmentation of inflorescences. In addition to UV-B protection and drought resistance, anthocyanins have been proposed to discourage herbivory (Strauss *et al.*, 2004). Owing to the greater number of species interactions and higher competition at lower latitudes (Anstett *et al.*, 2018 and references therein), it was previously hypothesized that plants found at lower latitudes should produce more secondary chemical compounds (e.g. Coley & Aide, 1991; Coley & Barone, 1996; Dyer & Coley, 2002). However, an increasing number of studies have found the opposite pattern, where chemical defense mechanisms are more commonly found in species and populations inhabiting higher latitudes (Stevens *et al.*, 2016; Moreira *et al.*, 2017; Anstett *et al.*, 2018). This indicates that abiotic factors could also play a role in plant defense mechanisms.

Various studies have demonstrated that in response to herbivory, plants increase anthocyanin production, which can lead to darker pigmentation (Simms & Butcher, 1996; Irwin,

2003). In the arctic, *Carex* are often the most dominant and abundant species present (Small & Cayouette, 2016; Hoffman *et al.*, 2017). As a result, they are vulnerable to heavy grazing pressures by animals including mammals, birds, and insects (Blumer & Diemer, 1996; Sedinger 1997; Tolvanen & Henry, 2000; Smith *et al.*, 2001; Zacheis *et al.*, 2001; Bråthen & Junttila, 2006). Arctic sedges such as *Carex aquatilis* and *Carex bigelowii* are known to produce compounds inhibiting digestion in response to lemming grazing (Seldal *et al.*, 1994; Bråthen *et al.*, 2004). Colorful flavonoids and tannins are known to be involved in defense against herbivores, notably as inhibitors of digestion (Treutter, 2006). However, the accumulation of plant secondary compounds does not necessarily correlate with pigmentation. For example, *Carex brevicollis*, which possesses dark pigmented male and female scales, produces the colourless chemical brevicarine, which induces abortions in grazing cattle (Busque *et al.*, 2010). The chemical pathways underlying pigmentation in *Carex* are not well known. As such, future studies of *Carex* should investigate which secondary compounds are responsible for the pigments produced in *Carex*.

2.4.2.2 Pollinator attraction

Darker pigmented inflorescences could also be an adaptation to more effectively attract pollinators in otherwise pollinator-scarce habitats. If darker pigmented flowers are warmer than lighter pigmented flowers, darker inflorescences can provide temperature incentives for visiting pollinators inhabiting cold environments. Pollinators generally prefer to visit warmer flowers (Kevan, 1975; Sapir *et al.*, 2006; Dyer *et al.*, 2006; Rands & Whitney, 2008); however, there is no consensus concerning the direct impact of pollinators on floral pigmentation darkness (Lavi & Sapir, 2015). While *Carex* is assumed to be an obligately anemophilous lineage, insect visitation

has been observed in some species and closely allied genera (Thomas, 1984; Proctor *et al.*, 1996; Zettler *et al.*, 1996; Wragg & Johnson, 2011; Yano *et al.*, 2015). However, these observations are only known in few species, and those species frequently possess white inflorescences (e.g. Ball *et al.*, 2002). I therefore do not believe that insect pollination is an important factor shaping inflorescence pigmentation patterns in *Carex*.

2.4.2.3 *Correlated evolution between plant structures*

Darker pigmented inflorescences may also be a consequence of correlated evolution, where increased accumulation of flavonoids in vegetative tissues also indirectly cause floral structures to be darker (Strauss & Whittall, 2006). For example, a plant may produce higher quantities of flavonoids to discourage herbivory or protect against UV radiation, and thereby indirectly produce higher concentrations of flavonoids in floral organs. In certain species of Solanaceae, vegetative and floral flavonoid production occur independently (Berardi *et al.*, 2016), while in some Caryophyllaceae, vegetative and floral anthocyanin production are positively correlated (Bowman, 1987; Armbruster, 2002; Pan *et al.*, 2013; Narbona *et al.*, 2018). Quantitative studies on flavonoid production in vegetative and reproductive tissues of *Carex* would be needed to determine whether such correlations play a role in the patterns I have discovered here.

2.5 FIGURES AND TABLES

Table 2.1 Summary statistics for the climatic variables used in the among species and within species analyses.

Climatic variable	Among species	Within species
Growing season length (days)	range: 55-365 average: 225	range: 0-365 average: 176
UV irradiance (J/m ² /day)	range: 2720-7181 average: 4824	range: 2474-7338 average: 4204
Precipitation of the wettest season (mm)	range: 92.3-869.1 average: 331.9	range: 41-1417 average: 290.8

Table 2.2 The range and average pigmentation of all structures of interest (photosynthetic leaf, perigynium, male scale, female scale) of all species included in the inter-specific analysis.

Structure	Among species
Photosynthetic leaf	range: 22.67-83.03 average: 51.14
Perigynium	range: 25.96-90.08 average: 50.03
Male scale	range: 21.53-93.30 average: 52.20
Female scale	range: 24.38-95.31 average: 54.42

Table 2.3: The relationship between pigmentation and growing season length (gsl), UV irradiance (uv3), and precipitation (bio16) across all species. N: Sample size, Residual DF: Residual degrees of freedom, β (SE): slope and standard error, R^2_{pred} : Predicted R^2 for the entire model. R^2_{pred} was calculated without incorporating measurement error.

Structure	N	Residual DF	Parameter	β (SE)	R^2_{pred}	F	P
Photosynthetic leaf	450	445	gsl	1.24 (0.65)	0.03	3.65	0.06
			uv3	-1.28 (0.43)		8.84	0.003
			bio16	-0.52 (0.76)		0.48	0.49
Perigynium	450	445	gsl	-0.89 (0.89)	0.02	1.0	0.32
			uv3	-0.54 (0.59)		0.84	0.36
			bio16	-1.36 (1.04)		1.70	0.19
Male Scale	449	444	gsl	-5.46 (1.03)	0.27	30.2	< 0.0001
			uv3	-0.21 (0.68)		0.006	0.94
			bio16	0.97 (1.18)		0.73	0.39
Female Scale	450	445	gsl	-10.7 (1.10)	0.47	95.3	< 0.0001
			uv3	1.48 (0.72)		4.19	0.04
			bio16	1.52 (1.27)		1.43	0.23

Table 2.4 The range and average pigmentation of the four species used in the intra-specific analyses. The averaged pigmentation for each species displayed was calculated independently from the other predictor variables.

Structure	<i>Carex aquatilis</i>	<i>Carex brunnescens</i>	<i>Carex buxbaumii</i>	<i>Carex leptalea</i>
Photosynthetic leaf	range = 30.2-75.9 average = 47.8	range = 29.7-79.5 average = 45.7	range = 33.1-78.8 average = 46.4	range = 32.1-74.6 average = 49.4
Perigynium	range = 28.6-79.0 average = 47.2	range = 26.2-74.2 average = 43.7	range = 19.9-68.6 average = 38.3	range = 32.2-66.7 average = 45.3
Male Scale	range = 29.3-99.0 average = 62.0	range = 6.37-70.7 average = 38.3	range = 45.8-89.3 average = 65.1	range = 23.0-64.0 average = 43.8
Female Scale	range = 40.1-100 average = 67.7	range = 21.5-78.9 average = 40.1	range = 49.1-91.1 average = 65.5	range = 23.0-64.0 average = 48.9

Table 2.5 The relationship between pigmentation and growing season length (gsl), UV irradiance (uv3), and precipitation (bio16) within *Carex aquatilis* (Aq), *Carex brunnescens* (Br), *Carex buxbaumii* (Bx), and *Carex leptalea* (Lp). Intercepts are provided for each species instead of differences from a reference species. N: Sample size, Residual DF: Residual degrees of freedom, β (SE): Slope and standard error, Partial Adj R²: Partial adjusted R².

Structure	N	Residual DF	Parameter	β (SE)	Partial Adj R ²	F	P
Photosynthetic leaf	461	454	Species	Aq: 47.1 (0.75) Br: 46.0 (1.03) Bx: 46.3 (1.05) Lp: 49.5 (1.10)	0.02	4.30	0.005
			Collection year	0.66 (0.38)	0.005	3.08	0.08
			gsl	-0.99 (0.48)	0.007	4.32	0.04
			uv3	1.94 (0.41)	0.04	21.8	<0.0001
			bio16	-0.02 (0.43)	-0.002	0.001	0.97
			Perigynium	455	448	Species	Aq: 46.5 (0.76) Br: 44.1 (1.05) Bx: 38.2 (1.06) Lp: 45.7 (1.06)
			Collection year	0.63 (0.38)	0.002	2.71	0.10
			gsl	-1.14 (0.48)	0.01	5.58	0.01
			uv3	1.86 (0.43)	0.04	19.6	<0.0001
			bio16	-0.39 (0.43)	-0.0004	0.81	0.37
Male Scale	454	447	Species	Aq: 60.9 (0.97) Br: 37.9 (1.33) Bx: 64.7 (1.35) Lp: 45.5 (1.42)	0.54	178.0	<0.0001
			Collection year	0.62 (0.49)	0.001	1.61	0.21
			gsl	-4.69 (0.62)	0.11	50.9	<0.0001
			uv3	1.51 (0.53)	0.015	8.01	0.005
			bio16	2.12 (0.55)	0.03	15.04	0.0001
			Female Scale	456	449	Species	Aq: 66.6 (0.87) Br: 39.6 (1.20) Bx: 65.3 (1.21) Lp: 50.9 (1.28)
Collection year	0.38 (0.43)	-0.003				0.76	0.38
gsl	-4.79 (0.56)	0.14				73.1	<0.0001
uv3	1.35 (0.49)	0.015				7.65	0.006
bio16	1.29 (0.49)	0.013				6.87	0.009

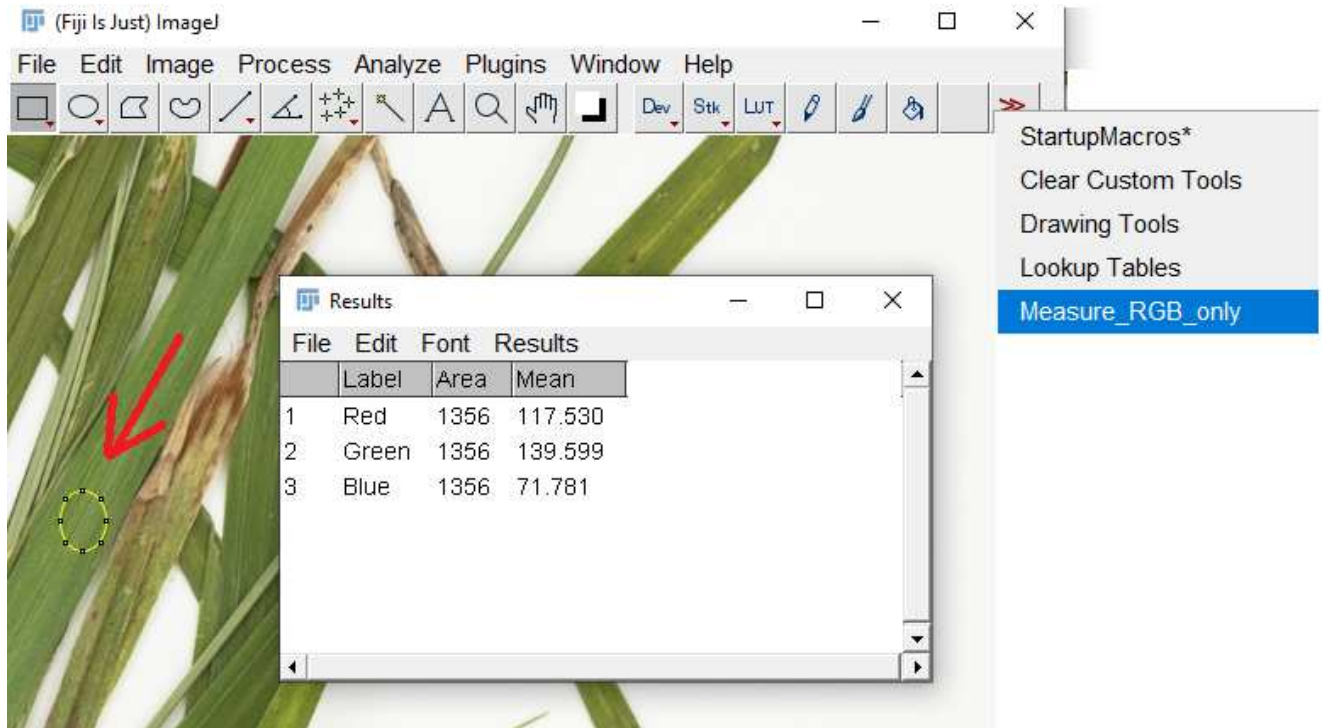


Figure 2.1 Measuring the RGB colour from a given specimen. First, I select the “Measure RGB” plugin, then I select an area (yellow circle) where the average RGB within the selected area is measured.

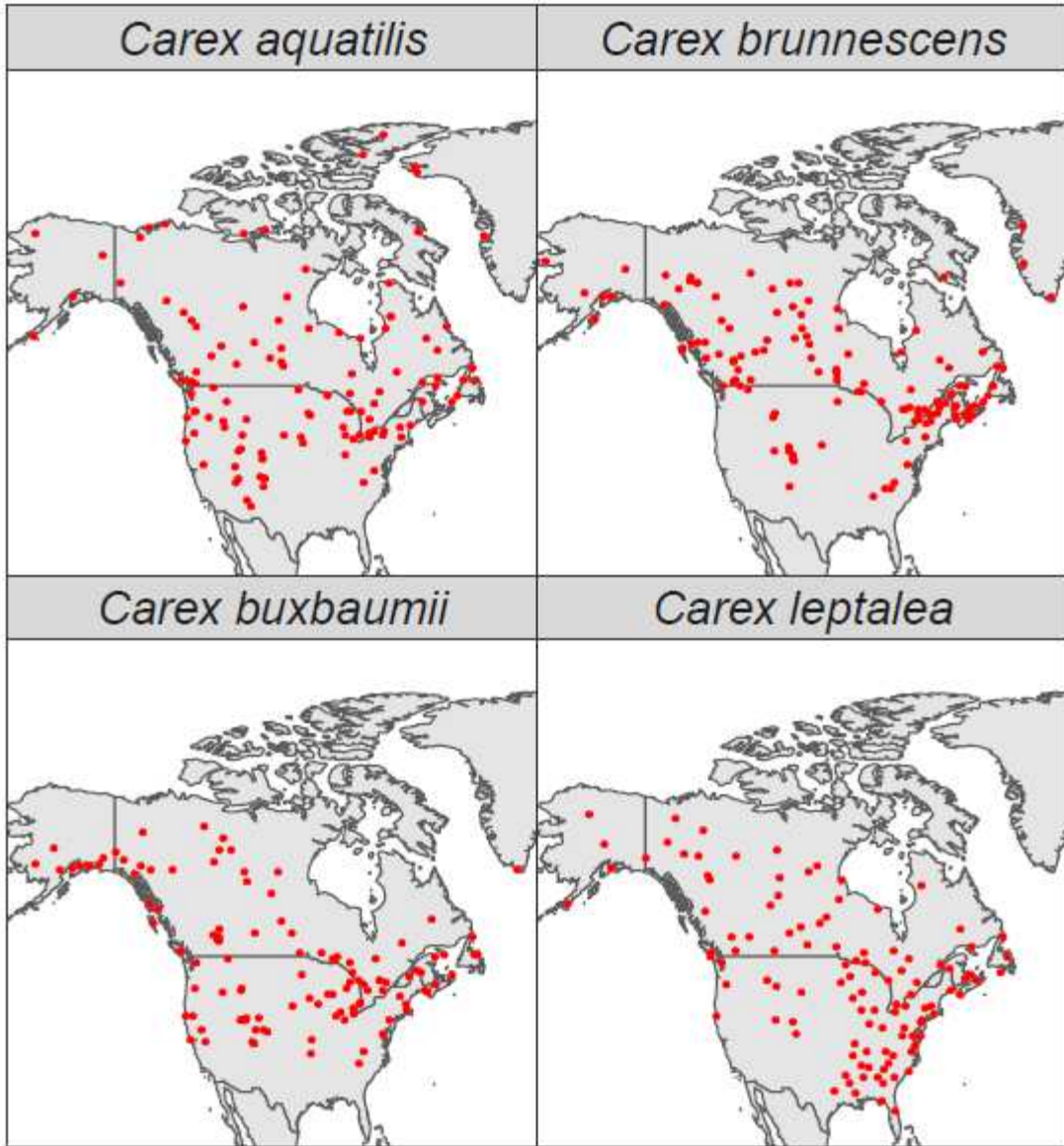


Figure 2.2 Geographic distribution of sampled specimens for *Carex aquatilis*, *Carex brunnescens*, *Carex buxbaumii*, and *Carex leptalea* (species names above maps). Each red point indicates the geographic locality of a specimen image. Sampling covers nearly the entire range of all four species in the Flora of North America region (Ball & Reznicek, 2002)

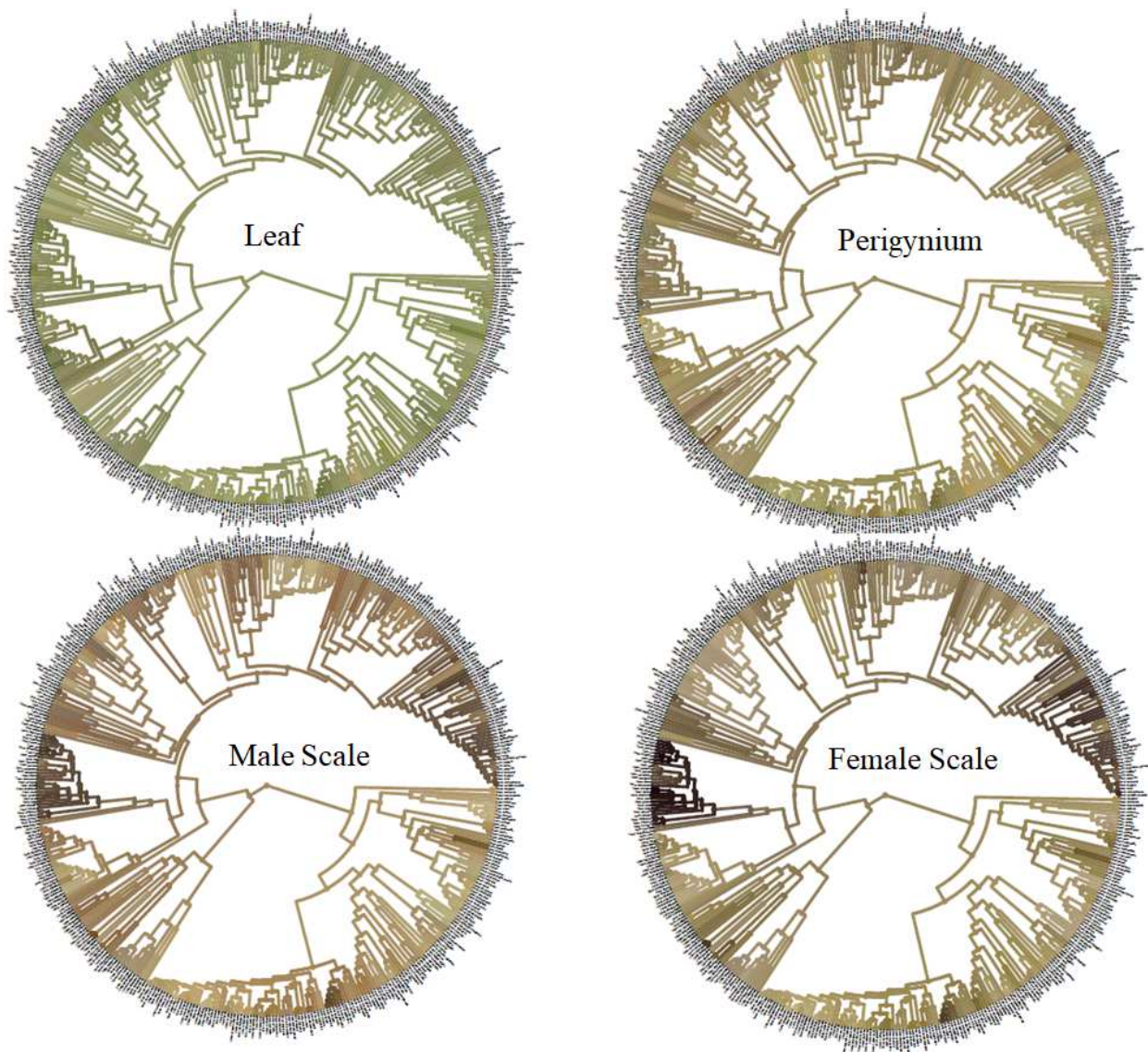


Figure 2.3. Ancestral character state reconstruction for photosynthetic leaf, perigynium, male scale and female scale pigmentation. The colour of each phylogenetic edge represents the colour of each structure reconstructed through evolutionary time using multivariate ancestral character state estimation from the RGB colour data.

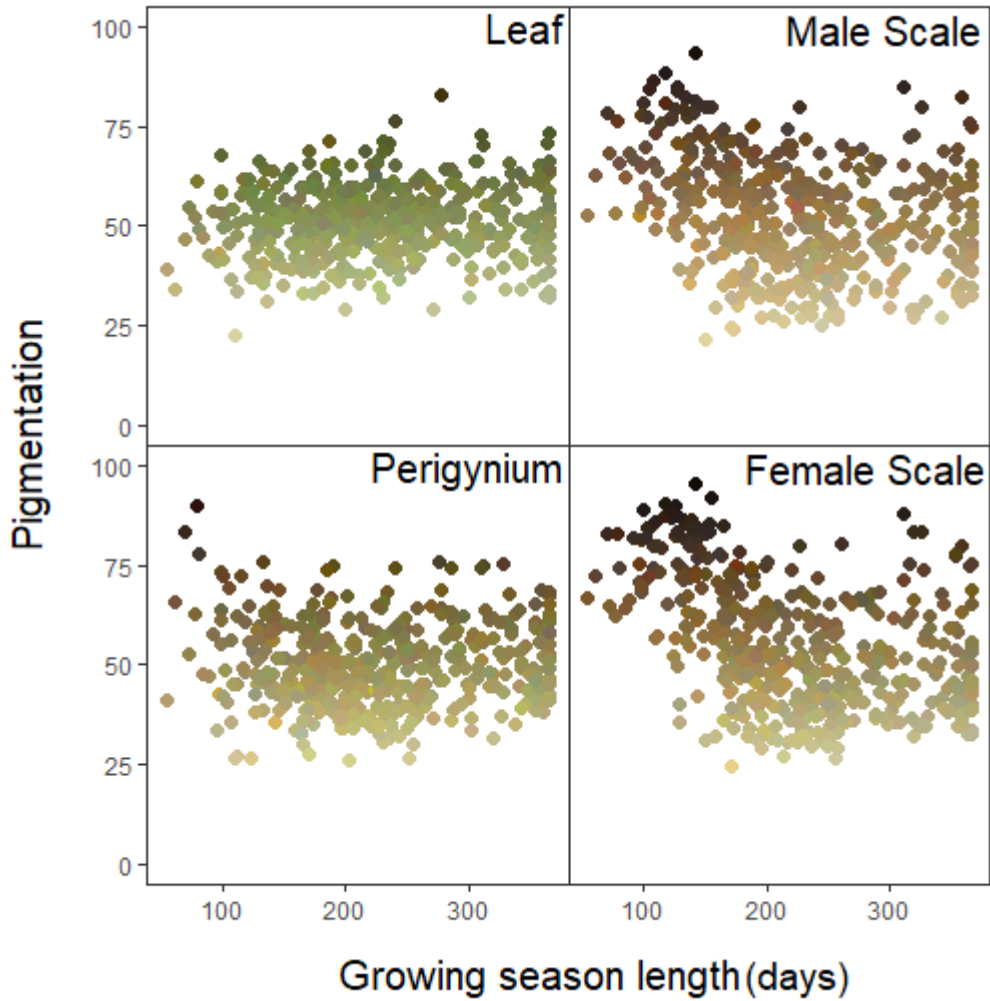


Figure 2.4 The relationship between growing season length and pigmentation across species. Each data point represents the averaged pigmentation (degree of darkness) for a given species. The RGB measured colour for each structure of interest (photosynthetic leaf, perigynium, male scale, female scale) was averaged among each image and is represented by the colour of each data point.

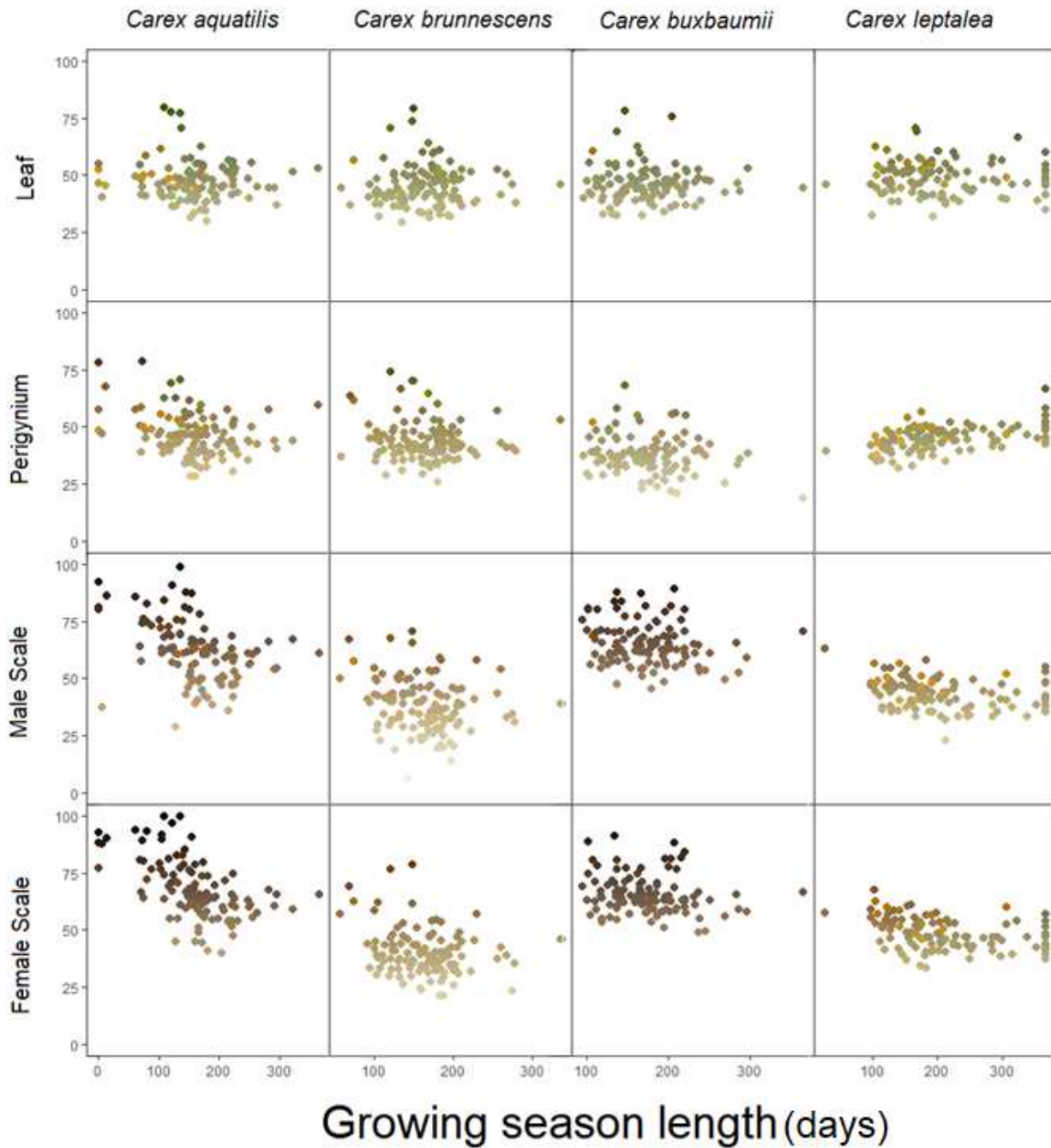


Figure 2.5 Relationship between growing season length and pigmentation within species. Each point represents the pigmentation (degree of darkness) for each specimen. The RGB measured colour for each structure of interest (photosynthetic leaf, perigynium, male scale, female scale) is represented by the colour of each point.

Chapter 3: Conclusions

In this thesis, I used the largest anemophilous angiosperm lineage to investigate the relationship linking inflorescence pigmentation with (1) adaptation and (2) diversification dynamics. My results suggest that while climatic niche could be a major component driving pigmentation variation, this variation is not an important driver influencing the diversification of *Carex* within North America.

Two major conclusions can be made from this study. Firstly, species and individuals tend to have darker pigmented inflorescences in northern and montane regions. By far, the climatic variable with highest predictive power was growing season length, followed by UV irradiance, and precipitation. The female scale exhibited the highest variation in pigmentation, followed by male scale, perigynium, and photosynthetic leaf.

Secondly, the pigmentation of inflorescences does not play an important role in the diversification dynamics of *Carex*. That is, arctic and alpine lineages which tend to possess darker pigmented inflorescences do not exhibit faster diversification rates than lineages with lighter pigmented inflorescences. Specifically, no correlation was found between the diversification rate of *Carex* and the pigmentation of either photosynthetic leaf or any inflorescence structure.

This study lays the groundwork for future studies in the inflorescence pigmentation patterns of anemophilous lineages. Despite the large dataset used in this analysis, only one genus was used in this study. As such, the first step would be to establish whether this phenomenon is also found in other anemophilous lineages. This can be achieved by extending this study to include other anemophilous lineages like *Pinus*, *Betula*, and *Quercus* to test whether plants found

at higher latitudes and altitudes possess darker pigmented inflorescences and reproductive structures.

Since this study is purely correlative in nature, genetic and mechanistic studies should be conducted to (1) understand the genetic basis for inflorescence pigmentation in anemophilous lineages and (2) assess how the pigmentation of anemophilous inflorescences responds to environmental stimuli. To assess the genetic basis for inflorescence pigmentation, a genome wide association study analysis can be conducted to determine which single nucleotide polymorphisms might be associated with changes in inflorescence pigmentation.

Furthermore, to determine how variation in inflorescence pigmentation responds to environmental variation, transplant and common garden experiments can be conducted. A transplant experiment would require selecting a widely distributed taxon like *Carex aquatilis*, transplanting it from either a low latitude or altitude location to a high latitude location, and assessing how the pigmentation of inflorescences responds to such a climatic change. In a common garden experiment, a taxon can be exposed to multiple different environmental conditions to assess whether inflorescence pigmentation changes. Both experiments can elucidate whether inflorescence pigmentation variation is shaped by inheritance or is a plastic trait, which responds to environmental stimuli.

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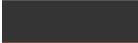


















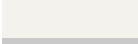


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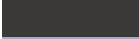



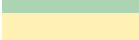
















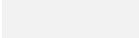

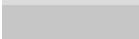

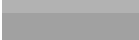





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Appendix 1: RGB calibration targets utilized in this study.

Table A1.1 RGB values for each reference patch of the RGB calibration targets utilized in this study

Calibration Target	Type	R	G	B	Colour
ColorChecker_Chart12	1	56	61	150	
ColorChecker_Chart12	2	70	148	73	
ColorChecker_Chart12	3	175	54	60	
ColorChecker_Chart12	4	231	199	31	
ColorChecker_Chart12	5	187	86	149	
ColorChecker_Chart12	6	8	133	161	
ColorChecker_Chart12	7	243	243	242	
ColorChecker_Chart12	8	200	200	200	
ColorChecker_Chart12	9	160	160	160	
ColorChecker_Chart12	10	122	122	121	
ColorChecker_Chart12	11	85	85	85	
ColorChecker_Chart12	12	52	52	52	
ColorChecker_Chart24	1	115	80	64	
ColorChecker_Chart24	2	195	151	130	
ColorChecker_Chart24	3	94	123	156	
ColorChecker_Chart24	4	88	108	65	
ColorChecker_Chart24	5	130	129	177	
ColorChecker_Chart24	6	100	190	171	
ColorChecker_Chart24	7	217	122	37	
ColorChecker_Chart24	8	72	91	165	
ColorChecker_Chart24	9	194	84	98	
ColorChecker_Chart24	10	91	59	107	
ColorChecker_Chart24	11	160	188	60	
ColorChecker_Chart24	12	230	163	42	
ColorChecker_Chart24	13	46	60	153	
ColorChecker_Chart24	14	71	150	69	
ColorChecker_Chart24	15	177	44	56	
ColorChecker_Chart24	16	238	200	27	
ColorChecker_Chart24	17	187	82	148	
ColorChecker_Chart24	18	-49	135	166	
ColorChecker_Chart24	19	243	242	237	
ColorChecker_Chart24	20	201	201	201	
ColorChecker_Chart24	21	161	161	161	

ColorChecker_Chart24	22	122	122	121	
ColorChecker_Chart24	23	83	83	83	
ColorChecker_Chart24	24	50	49	50	
ColorGauge_NanoTarget30	1	111	84	71	
ColorGauge_NanoTarget30	2	186	145	126	
ColorGauge_NanoTarget30	3	96	122	153	
ColorGauge_NanoTarget30	4	100	110	70	
ColorGauge_NanoTarget30	5	127	128	172	
ColorGauge_NanoTarget30	6	128	188	172	
ColorGauge_NanoTarget30	7	48	135	168	
ColorGauge_NanoTarget30	8	246	246	244	
ColorGauge_NanoTarget30	9	231	232	231	
ColorGauge_NanoTarget30	10	217	218	217	
ColorGauge_NanoTarget30	11	202	204	202	
ColorGauge_NanoTarget30	12	206	126	53	
ColorGauge_NanoTarget30	13	175	85	146	
ColorGauge_NanoTarget30	14	174	176	175	
ColorGauge_NanoTarget30	15	148	149	148	
ColorGauge_NanoTarget30	16	116	116	116	
ColorGauge_NanoTarget30	17	91	91	91	
ColorGauge_NanoTarget30	18	81	87	166	
ColorGauge_NanoTarget30	19	228	203	53	
ColorGauge_NanoTarget30	20	71	70	69	
ColorGauge_NanoTarget30	21	45	45	44	
ColorGauge_NanoTarget30	22	30	31	30	
ColorGauge_NanoTarget30	23	20	20	19	
ColorGauge_NanoTarget30	24	180	86	95	
ColorGauge_NanoTarget30	25	162	60	60	
ColorGauge_NanoTarget30	26	101	146	81	
ColorGauge_NanoTarget30	27	31	69	143	
ColorGauge_NanoTarget30	28	219	164	57	
ColorGauge_NanoTarget30	29	171	186	79	
ColorGauge_NanoTarget30	30	86	65	103	
Kodak_ColorControlPatches	1	170.363	168.371	203.222	
Kodak_ColorControlPatches	2	160.584	217.972	235.176	
Kodak_ColorControlPatches	3	172.791	212.053	177.656	
Kodak_ColorControlPatches	4	255	241.291	179.512	
Kodak_ColorControlPatches	5	246.519	176.399	158.156	
Kodak_ColorControlPatches	6	241.952	181.813	205.063	
Kodak_ColorControlPatches	7	249.229	247.694	245.779	
Kodak_ColorControlPatches	8	177.511	167.183	166.286	

Kodak_ColorControlPatches	9	171.322	168.932	165.309	
Kodak_ColorControlPatches	10	41.1876	64.362	137.361	
Kodak_ColorControlPatches	11	0	167.165	222.284	
Kodak_ColorControlPatches	12	0	150.282	78.0963	
Kodak_ColorControlPatches	13	255	228.48	13.8363	
Kodak_ColorControlPatches	14	224.196	36.9138	56.0261	
Kodak_ColorControlPatches	15	224.403	40.6062	129.257	
Kodak_ColorControlPatches	16	249.229	247.694	245.779	
Kodak_ColorControlPatches	17	58.3211	67.2537	80.4627	
Kodak_ColorControlPatches	18	58.089	56.8395	55.205	
Kodak_ColorControlPatches_GreyScale	1	170.363	168.371	203.222	
Kodak_ColorControlPatches_GreyScale	2	160.584	217.972	235.176	
Kodak_ColorControlPatches_GreyScale	3	172.791	212.053	177.656	
Kodak_ColorControlPatches_GreyScale	4	255	241.291	179.512	
Kodak_ColorControlPatches_GreyScale	5	246.519	176.399	158.156	
Kodak_ColorControlPatches_GreyScale	6	241.952	181.813	205.063	
Kodak_ColorControlPatches_GreyScale	7	249.229	247.694	245.779	
Kodak_ColorControlPatches_GreyScale	8	177.511	167.183	166.286	
Kodak_ColorControlPatches_GreyScale	9	171.322	168.932	165.309	
Kodak_ColorControlPatches_GreyScale	10	41.1876	64.362	137.361	
Kodak_ColorControlPatches_GreyScale	11	0	167.165	222.284	
Kodak_ColorControlPatches_GreyScale	12	0	150.282	78.0963	
Kodak_ColorControlPatches_GreyScale	13	255	228.48	13.8363	
Kodak_ColorControlPatches_GreyScale	14	224.196	36.9138	56.0261	
Kodak_ColorControlPatches_GreyScale	15	224.403	40.6062	129.257	
Kodak_ColorControlPatches_GreyScale	16	249.229	247.694	245.779	
Kodak_ColorControlPatches_GreyScale	17	58.3211	67.2537	80.4627	
Kodak_ColorControlPatches_GreyScale	18	58.089	56.8395	55.205	
Kodak_ColorControlPatches_GreyScale	19	242.393	242.393	242.393	
Kodak_ColorControlPatches_GreyScale	20	218.956	218.956	218.956	
Kodak_ColorControlPatches_GreyScale	21	197.638	197.638	197.638	
Kodak_ColorControlPatches_GreyScale	22	178.286	178.286	178.286	
Kodak_ColorControlPatches_GreyScale	23	160.67	160.67	160.67	
Kodak_ColorControlPatches_GreyScale	24	144.707	144.707	144.707	
Kodak_ColorControlPatches_GreyScale	25	130.466	130.466	130.466	
Kodak_ColorControlPatches_GreyScale	26	117.002	117.002	117.002	
Kodak_ColorControlPatches_GreyScale	27	104.573	104.573	104.573	
Kodak_ColorControlPatches_GreyScale	28	94.1103	94.1103	94.1103	
Kodak_ColorControlPatches_GreyScale	29	84.2265	84.2265	84.2265	
Kodak_ColorControlPatches_GreyScale	30	75.2352	75.2352	75.2352	
Kodak_ColorControlPatches_GreyScale	31	59.6496	59.6496	59.6496	

Kodak_ColorControlPatches_GreyScale	32	52.9125	52.9125	52.9125
Kodak_ColorControlPatches_GreyScale	33	67.0829	67.0829	67.0829
Kodak_ColorControlPatches_GreyScale	34	46.8027	46.8027	46.8027
Kodak_ColorControlPatches_GreyScale	35	41.2335	41.2335	41.2335
Kodak_ColorControlPatches_GreyScale	36	36.1718	36.1718	36.1718
Kodak_ColorControlPatches_GreyScale	37	31.5716	31.5716	31.5716
Kodak_ColorControlPatches_GreyScale	38	27.4049	27.4049	27.4049

Appendix 2: *Carex* specimen voucher data

Table A2.1 All *Carex* specimen images selected for use in the interspecific analysis. The herbarium labels of each image follow Thiers (continuously updated).

Species	Herbarium	Calibration Target	Accession Number	Collection Number	Collection Date
<i>Carex aboriginum</i>	MICH	ColorGauge_NanoTarget30	MICH1359664	4263	28 May, 1999
<i>Carex aboriginum</i>	MU	ColorGauge_NanoTarget30	MU-V-000167861	4263	28 May, 1999
<i>Carex abrupta</i>	MOR	ColorGauge_NanoTarget30	0063634MOR	7228	24 June, 2001
<i>Carex abrupta</i>	MOR	ColorGauge_NanoTarget30	0061559MOR	9475	24 June, 2008
<i>Carex abscondita</i>	MIN	ColorGauge_NanoTarget30	MIN1280411	4158	15 April, 1986
<i>Carex abscondita</i>	MOAR	ColorGauge_NanoTarget30	MOAR0020578	Not provided	22 May, 2009
<i>Carex acidicola</i>	GA	Kodak_ColorControlPatches	GA011426	2506	14 May, 1996
<i>Carex acidicola</i>	GA	Kodak_ColorControlPatches	GA082982	4741	20 May, 1995
<i>Carex acutiformis</i>	MICH	ColorGauge_NanoTarget30	MICH1319205	3694	10 June, 1998
<i>Carex acutiformis</i>	MICH	ColorGauge_NanoTarget30	MICH1359844	9200	10 June, 2007
<i>Carex adelostoma</i>	MICH	ColorGauge_NanoTarget30	MICH1359851	2224	20 July, 1951
<i>Carex adelostoma</i>	MICH	ColorGauge_NanoTarget30	MICH1428353	J82-230	30 July, 1982
<i>Carex adusta</i>	MIN	ColorGauge_NanoTarget30	WIN71648	12650	24 June, 1951
<i>Carex adusta</i>	WIN	ColorChecker_Chart24	MIN1006545	524	24 June, 2005
<i>Carex aestivalis</i>	MOAR	ColorGauge_NanoTarget30	TENN-V-0046199	Not provided	24 May, 2004
<i>Carex aestivalis</i>	TENN	ColorGauge_NanoTarget30	MOAR0020585	76127	6 May, 1989
<i>Carex aggregata</i>	GMUF	ColorGauge_NanoTarget30	ILLS00068589	10478	2 June, 1995
<i>Carex aggregata</i>	ILLS	ColorGauge_NanoTarget30	GMUF-0012344	4281	11 May, 2011
<i>Carex alata</i>	URV	ColorGauge_NanoTarget30	URV019746	54	4 June, 1974
<i>Carex alata</i>	USFWS:PRR	ColorGauge_NanoTarget30	PRR004576	9258	11 June, 2016
<i>Carex albicans emmonsii</i>	MICH	ColorGauge_NanoTarget30	MICH1360539	117676	19 June, 2005
<i>Carex albicans emmonsii</i>	MICH	ColorGauge_NanoTarget30	MICH1221375	10791	30 April, 2005
<i>Carex albida</i>	DAO	ColorGauge_NanoTarget30	01-01001119673	140	7 June, 1951
<i>Carex albolutescens</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0015677	86-290	20 May, 1986
<i>Carex albolutescens</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0046246	159; 370; 307	10 May, 1999
<i>Carex albonigra</i>	KHD	Kodak_ColorControlPatches	KHD00026608	537	26 July, 1971
<i>Carex albonigra</i>	KHD	Kodak_ColorControlPatches	KHD00019445	27	14 July, 2009
<i>Carex albursina</i>	ILLS	ColorGauge_NanoTarget30	TENN-V-0051713	4707	5 April, 2012
<i>Carex albursina</i>	TENN	ColorGauge_NanoTarget30	ILLS00068650	2836	25 May, 1978
<i>Carex alma</i>	DES	ColorChecker_Chart24	DES00062615	11247	29 May, 2012
<i>Carex alma</i>	DES	ColorChecker_Chart24	DES00072393	7284	14 June, 2008
<i>Carex alopecoidea</i>	MIN	ColorGauge_NanoTarget30	MIN1006698	2598	13 June, 1978
<i>Carex alopecoidea</i>	MIN	ColorGauge_NanoTarget30	MIN1006651	4562	31 July, 1979
<i>Carex amphibola</i>	PRR	ColorGauge_NanoTarget30	TENN-V-0046367	7259	18 April, 2012
<i>Carex amphibola</i>	TENN	ColorGauge_NanoTarget30	PRR000926	2093	12 May, 2012
<i>Carex amplifolia</i>	IBE	Kodak_ColorControlPatches	IBE026965	4163	16 May, 1981
<i>Carex amplifolia</i>	MU	ColorGauge_NanoTarget30	MU-V-000082873	7567	19 July, 2008
<i>Carex angustata</i>	COLO	ColorGauge_NanoTarget30	MICH1450902	35873	22 July, 1960

<i>Carex angustata</i>	MICH	ColorGauge_NanoTarget30	COLO01030782	14387	21 July, 2007
<i>Carex annectens</i>	GMUF	ColorGauge_NanoTarget30	GMUF-0012497	1606	30 May, 1998
<i>Carex annectens</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0051805	159234	10 May, 1999
<i>Carex anthoxanthea</i>	MICH	ColorGauge_NanoTarget30	MICH1282827	11532	3 August, 2003
<i>Carex anthoxanthea</i>	MICH	ColorGauge_NanoTarget30	MICH1361395	Not provided	4 July, 1923
<i>Carex aperta</i>	MOR	ColorGauge_NanoTarget30	0066979MOR	7968	24 August, 2008
<i>Carex aperta</i>	MU	ColorGauge_NanoTarget30	MU-V-000114779	9989	14 August, 2011
<i>Carex appalachica</i>	GA	Kodak_ColorControlPatches	GA011506	222	29 May, 2000
<i>Carex appalachica</i>	VPI	ColorChecker_Chart24	VPI-V-0002359	6110	21 June, 1986
<i>Carex aquatilis aquatilis</i>	MICH	ColorGauge_NanoTarget30	MICH1459155	9604	12 August, 2012
<i>Carex aquatilis aquatilis</i>	MOR	ColorGauge_NanoTarget30	0076373MOR	30367	19 July, 1995
<i>Carex arapahoensis</i>	DBG:KHD	Kodak_ColorControlPatches	KHD00002282	2870	10 August, 1995
<i>Carex arapahoensis</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0051965	17377	20 July, 1984
<i>Carex arcta</i>	MIN	ColorGauge_NanoTarget30	MIN1106937	6004	14 June, 2010
<i>Carex arcta</i>	MOR	ColorGauge_NanoTarget30	0072264MOR	86225	21 July, 2007
<i>Carex arctata</i>	MIN	ColorGauge_NanoTarget30	MIN1006931	29624	30 June, 2006
<i>Carex arctata</i>	MOAR	ColorGauge_NanoTarget30	MOAR0020699	Not provided	19 May, 2005
<i>Carex arctiformis</i>	MICH	ColorGauge_NanoTarget30	MICH1361964	5425	17 July, 1998
<i>Carex arctiformis</i>	MICH	ColorGauge_NanoTarget30	MICH1361966	11565	21 May, 1992
<i>Carex argyrantha</i>	FARM	ColorGauge_NanoTarget30	FARM-0000889	10700	15 June, 1975
<i>Carex argyrantha</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0052013	91-622	30 June, 1991
<i>Carex arkansana</i>	NCU	ColorChecker_Chart24	TEX00292561	15-0200	11 June, 2015
<i>Carex arkansana</i>	TEX	ColorGauge_NanoTarget30	NCU00291059	10382	3 May, 1997
<i>Carex assiniboinensis</i>	MIN	ColorGauge_NanoTarget30	MIN1277705	Not provided	July, 1968
<i>Carex assiniboinensis</i>	MIN	ColorGauge_NanoTarget30	MIN1006954	MDL3358	30 May, 2003
<i>Carex atherodes</i>	MICH	ColorGauge_NanoTarget30	MICH1362096	3954	16 June, 2001
<i>Carex atherodes</i>	MT	ColorGauge_NanoTarget30	MT00209407	95-3	15 July, 1995
<i>Carex athrostachya</i>	MIN	ColorGauge_NanoTarget30	NAVA00011557	3311	22 July, 1941
<i>Carex athrostachya</i>	NAVA	ColorGauge_NanoTarget30	MIN1280832	1494	28 June, 2012
<i>Carex atlantica capillacea</i>	MICH	ColorGauge_NanoTarget30	MICH1319758	476	3 July, 1979
<i>Carex atlantica capillacea</i>	MICH	ColorGauge_NanoTarget30	MICH1362389	12868	22 June, 2002
<i>Carex atrata</i>	COLO	ColorGauge_NanoTarget30	MICH1362455	67-1331	20 July, 1967
<i>Carex atrata</i>	MICH	ColorGauge_NanoTarget30	COLO01019397	12142	25 August, 1993
<i>Carex atratiformis</i>	MICH	ColorGauge_NanoTarget30	MICH1362493	18982	17 July, 1996
<i>Carex atratiformis</i>	MICH	ColorGauge_NanoTarget30	MICH1450432	04-0154	22 July, 2004
<i>Carex atrofusca</i>	MIN	ColorGauge_NanoTarget30	MIN1280956	12439	13 July, 1944
<i>Carex atrofusca</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0052115	Not provided	12 July, 1958
<i>Carex atosquama</i>	COLO	ColorGauge_NanoTarget30	MSC0150405	2919	11 August, 1995
<i>Carex atosquama</i>	MSC	ColorGauge_NanoTarget30	COLO00260828	1890	10 July, 1927
<i>Carex aurea</i>	KHD	Kodak_ColorControlPatches	MICH1319860	6009	16 July, 1996
<i>Carex aurea</i>	MICH	ColorGauge_NanoTarget30	KHD00002325	277	19 July, 1962
<i>Carex aureolensis</i>	CLEMS	ColorGauge_NanoTarget30	TENN-V-0052192	17384	27 June, 1996
<i>Carex aureolensis</i>	TENN	ColorGauge_NanoTarget30	CLEMS0006393	390	29 May, 2003
<i>Carex austrina</i>	KHD	Kodak_ColorControlPatches	MICH1450256	14721	19 May, 2000

<i>Carex australina</i>	MICH	ColorGauge_NanoTarget30	KHD00006623	2236	30 May, 2006
<i>Carex austrocaroliniana</i>	TENN	ColorGauge_NanoTarget30	WCUH0009319	41182	28 May, 1966
<i>Carex austrocaroliniana</i>	WCUH	Kodak_ColorControlPatches	TENN-V-0046656	60	28 April, 1974
<i>Carex backii</i>	MICH	ColorGauge_NanoTarget30	MICH1362908	8121	55 May, 1998
<i>Carex backii</i>	MOR	ColorGauge_NanoTarget30	0076102MOR	8553	19 July, 1985
<i>Carex baileyi</i>	Harvard	ColorGauge_NanoTarget30	1030265	13912	16 August, 1935
<i>Carex baileyi</i>	Harvard	ColorGauge_NanoTarget30	217253	4098	26 July, 1995
<i>Carex baltzellii</i>	GA	Kodak_ColorControlPatches	GA110663	8668	25 March, 1967
<i>Carex baltzellii</i>	GA	Kodak_ColorControlPatches	GA110669	16120	13 March, 1991
<i>Carex barbarae</i>	MICH	ColorGauge_NanoTarget30	MICH1363008	24798	3 May, 2010
<i>Carex barbarae</i>	MICH	ColorGauge_NanoTarget30	MICH1428471	7766	23 April, 2003
<i>Carex barrattii</i>	GMUF	ColorGauge_NanoTarget30	KHD00003006	12812	2 May, 1997
<i>Carex barrattii</i>	KHD	Kodak_ColorControlPatches	GMUF-0012619	7690	27 April, 1936
<i>Carex basiantha</i>	MICH	ColorGauge_NanoTarget30	MICH1363152	9448	25 May, 1993
<i>Carex basiantha</i>	MICH	ColorGauge_NanoTarget30	MICH1363097	3359	21 April, 2004
<i>Carex bebbii</i>	MIN	ColorGauge_NanoTarget30	MIN1007306	4332	21-Jun-81
<i>Carex bebbii</i>	MT	ColorGauge_NanoTarget30	MT00208936	7431	1 July, 2008
<i>Carex bella</i>	KHD	Kodak_ColorControlPatches	KHD00002353	73-44	27 July, 1973
<i>Carex bella</i>	KHD	Kodak_ColorControlPatches	KHD00002351	6231	1 July, 1998
<i>Carex bicknellii</i>	MICH	ColorGauge_NanoTarget30	MICH1363364	13827	13 June, 1999
<i>Carex bicknellii</i>	MICH	ColorGauge_NanoTarget30	MICH1363329	10190	8 June, 1996
<i>Carex bicolor</i>	MICH	ColorGauge_NanoTarget30	MICH1398771	4224	28 July, 2004
<i>Carex bicolor</i>	MICH	ColorGauge_NanoTarget30	MICH1459206	26441	13 July, 2001
<i>Carex bigelowii lugens</i>	CAN	Kodak_ColorControlPatches	MICH1450194	9249	24 July, 2009
<i>Carex bigelowii lugens</i>	MICH	ColorGauge_NanoTarget30	CAN595601	4793	12 July, 1963
<i>Carex biltmoreana</i>	TENN	ColorGauge_NanoTarget30	WCUH0009331	61881	24 May, 1978
<i>Carex biltmoreana</i>	WCUH	Kodak_ColorControlPatches	TENN-V-0052375	12123	12 May, 1998
<i>Carex blanda</i>	MICH	ColorGauge_NanoTarget30	MICH1364071	2416	12 March, 2003
<i>Carex blanda</i>	USFWS:PRR	ColorGauge_NanoTarget30	PRR000927	7260	18 April, 2012
<i>Carex bolanderi</i>	MICH	ColorGauge_NanoTarget30	MICH1364094	10285	28 June, 1989
<i>Carex bolanderi</i>	VSC	Kodak_ColorControlPatches	VSC0043931	10553	26 July, 2004
<i>Carex bonanzensis</i>	ILL	ColorGauge_NanoTarget30	ILL00113233	12553	3 July, 1963
<i>Carex bonanzensis</i>	ILL	ColorGauge_NanoTarget30	ILL00113233	12553	3 July, 1963
<i>Carex brainderdii</i>	MICH	ColorGauge_NanoTarget30	MICH1364155	8129	30 May, 2004
<i>Carex brainderdii</i>	MICH	ColorGauge_NanoTarget30	MICH1364156	8406	29 May, 2005
<i>Carex brevicaulis</i>	MICH	ColorGauge_NanoTarget30	MICH1364166	13766	12 April, 1938
<i>Carex brevicaulis</i>	MICH	ColorGauge_NanoTarget30	MICH1364170	30258A	12 June, 1955
<i>Carex brevior</i>	MIN	ColorGauge_NanoTarget30	MIN1109169	18711	23 May, 1998
<i>Carex brevior</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0052625	88315	21 June, 1980
<i>Carex breweri</i>	KHD	Kodak_ColorControlPatches	MICH1364455	5226	27 July, 2005
<i>Carex breweri</i>	MICH	ColorGauge_NanoTarget30	KHD00013599	818	26 July, 1987
<i>Carex bromoides bromoides</i>	MIN	ColorGauge_NanoTarget30	MIN1007982	3951	18 June, 1979
<i>Carex bromoides bromoides</i>	MT	ColorGauge_NanoTarget30	MT00176611	63-387	17 June, 1963
<i>Carex brunnescens brunnescens</i>	MICH	ColorGauge_NanoTarget30	MICH1459230	2936	22 July, 2005

<i>Carex brunnescens brunnescens</i>	MICH	ColorGauge_NanoTarget30	MICH1450770	2407	13 July, 2012
<i>Carex brysonii</i>	IBE	Kodak_ColorControlPatches	IBE020209	11610	15 May, 1992
<i>Carex brysonii</i>	MSC	ColorGauge_NanoTarget30	MSC0150690	12372	25 May, 1993
<i>Carex bulbostylis</i>	MU	ColorGauge_NanoTarget30	MU-V-000073111	11715	21 April, 2007
<i>Carex bulbostylis</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0052577	JK0741.2	1 April, 2007
<i>Carex bullata</i>	AUA	Kodak_ColorControlPatches_GreyScale	AUA000020136	825	17 June, 1982
<i>Carex bullata</i>	IBE	Kodak_ColorControlPatches_GreyScale	IBE021806	4341	6 May, 1967
<i>Carex bushii</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0052609	8275	18 April, 1992
<i>Carex bushii</i>	UARK	ColorGauge_NanoTarget30	UARK 063172	12325	17 May, 1993
<i>Carex buxbaumii</i>	DAO	ColorGauge_NanoTarget30	ILLS00018951	05-0180	7 July, 2005
<i>Carex buxbaumii</i>	ILLS	ColorGauge_NanoTarget30	01-01000527363	37589	2 June, 2005
<i>Carex calcifugen</i>	NCU	ColorChecker_Chart24	NCU00015174	1461	11 May, 1996
<i>Carex calcifugen</i>	NCU	ColorChecker_Chart24	NCU00015173	2203	12 April, 1996
<i>Carex californica</i>	IND	ColorGauge_NanoTarget30	IND-0018152	11873	5 July, 1935
<i>Carex californica</i>	MIN	ColorGauge_NanoTarget30	MIN1281818	Not provided	20 June, 1976
<i>Carex canescens disjuncta</i>	MIN	ColorGauge_NanoTarget30	0020233MOR	MDL3703	2 July, 2004
<i>Carex canescens disjuncta</i>	MOR	ColorGauge_NanoTarget30	MIN1008451	329	10 May, 1998
<i>Carex capillaris</i>	MICH	ColorGauge_NanoTarget30	MIN1008472	4459	27 June, 1963
<i>Carex capillaris</i>	MIN	ColorGauge_NanoTarget30	MICH1450206	115	25 June, 2004
<i>Carex capitata</i>	KHD	Kodak_ColorControlPatches	KHD00060633	2692	18 August, 2015
<i>Carex capitata</i>	MICH	ColorGauge_NanoTarget30	MICH1431262	4829	27 July, 1988
<i>Carex caroliniana</i>	CLEMS	ColorGauge_NanoTarget30	3 1234 10004769 3	23205	14 May, 1990
<i>Carex caroliniana</i>	EKY	ColorGauge_NanoTarget30	CLEMS0007329	11046	1 May, 2010
<i>Carex caryana</i>	MICH	ColorGauge_NanoTarget30	MICH1484660	890	25 May, 2013
<i>Carex caryana</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0046954	91-122	17 April, 1991
<i>Carex castanea</i>	MIN	ColorGauge_NanoTarget30	v 0185937 WIS	3844	13 June, 1979
<i>Carex castanea</i>	WIS	ColorGauge_NanoTarget30	MIN1008551	1763	4 June, 1981
<i>Carex cephaloidea</i>	MIN	ColorGauge_NanoTarget30	MIN1008556	3592	1 June, 1979
<i>Carex cephaloidea</i>	MIN	ColorGauge_NanoTarget30	MIN1008585	1441	21 June, 1994
<i>Carex cephalophora</i>	MIN	ColorGauge_NanoTarget30	MU-V-000169914	19241	16 June, 1998
<i>Carex cephalophora</i>	MU	ColorGauge_NanoTarget30	MIN1008609	6557	23 May, 1985
<i>Carex chalciolepis</i>	MICH	ColorGauge_NanoTarget30	MICH1365729	17731	4 August, 1962
<i>Carex chalciolepis</i>	MICH	ColorGauge_NanoTarget30	MICH1365727	523	10 August, 1995
<i>Carex chapmanii</i>	GA	Kodak_ColorControlPatches	GA111241	13247	28 April, 1990
<i>Carex chapmanii</i>	VSC	Kodak_ColorControlPatches	VSC0065125	16796	9 June, 2006
<i>Carex cherokeeensis</i>	GA	Kodak_ColorControlPatches	UCHT004197	10170	28 April, 2001
<i>Carex cherokeeensis</i>	UCHT	ColorGauge_NanoTarget30	GA011712	216	28 April, 2009
<i>Carex chihuahuensis</i>	ARIZ	ColorChecker_Chart12	ARIZ433776	2338	12 April, 2017
<i>Carex chihuahuensis</i>	UNM	ColorGauge_NanoTarget30	UNM0134268	4878	16 May, 2015
<i>Carex chordorrhiza</i>	MIN	ColorGauge_NanoTarget30	MIN1009393	3199	13 July, 1978
<i>Carex chordorrhiza</i>	MIN	ColorGauge_NanoTarget30	MIN1282251	8796	19 July, 1961
<i>Carex circinata</i>	ILL	ColorGauge_NanoTarget30	ILL00112618	7410	25 August, 1949
<i>Carex circinata</i>	MICH	ColorGauge_NanoTarget30	MICH1449759	BG07-109	7 August, 2007
<i>Carex collinsii</i>	KNK	ColorGauge_NanoTarget30	v 0276048 WIS	10327	18 August, 1999

<i>Carex collinsii</i>	WIS	ColorGauge_NanoTarget30	3 1973 000009884	6596	21 June, 1935
<i>Carex communis amplisquama</i>	MICH	ColorGauge_NanoTarget30	TTRS_000000078	7330	14 May, 1984
<i>Carex communis amplisquama</i>	TTRS	Kodak_ColorControlPatches	MICH1365994	1288	5 May, 1985
<i>Carex comosa</i>	NCSC	Kodak_ColorControlPatches_GreyScale	NCSC00044143	1059	9 June, 2004
<i>Carex comosa</i>	WIS	ColorGauge_NanoTarget30	v 0186605 WIS	12776	24 July, 1992
<i>Carex complanata</i>	IBE	Kodak_ColorControlPatches	IBE020646	685	28 April, 1989
<i>Carex complanata</i>	UCHT	ColorGauge_NanoTarget30	UCHT004545	921	1 June, 2007
<i>Carex concinna</i>	NCSC	Kodak_ColorControlPatches	NCSC00049191	102305	28 June, 1951
<i>Carex concinna</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0053199	Not provided	27 June, 1984
<i>Carex concinnoides</i>	IND	ColorGauge_NanoTarget30	IND-0124529	130616a11	16 June, 2013
<i>Carex concinnoides</i>	IND	ColorGauge_NanoTarget30	IND-0124528	120816a12	16 August, 2012
<i>Carex congdonii</i>	MICH	ColorGauge_NanoTarget30	MICH1428567	25322	11 August, 2010
<i>Carex conjuncta</i>	TENN	ColorGauge_NanoTarget30	UWSP-V-0004473	Not provided	22 May, 2008
<i>Carex conjuncta</i>	UWSP	ColorGauge_NanoTarget30	TENN-V-0047301	4752	30 May, 2000
<i>Carex conoidea</i>	MIN	ColorGauge_NanoTarget30	MIN1008778	10597	2 June, 1988
<i>Carex conoidea</i>	MIN	ColorGauge_NanoTarget30	MIN1008785	5668	20 August, 2008
<i>Carex cordillerana</i>	MICH	ColorGauge_NanoTarget30	UTC00275193	19536	10 May, 2004
<i>Carex cordillerana</i>	UTC	ColorChecker_Chart24	MICH1399097	442	16 May, 2014
<i>Carex corrugata</i>	MICH	ColorGauge_NanoTarget30	TENN-V-0053165	30257	19 May, 1998
<i>Carex corrugata</i>	TENN	ColorGauge_NanoTarget30	MICH1366778	21439	9 May, 2006
<i>Carex crawei</i>	MIN	ColorGauge_NanoTarget30	MIN1109500	1530	23 June, 1995
<i>Carex crawei</i>	WIS	ColorGauge_NanoTarget30	v 0229669 WIS	14366	4 June, 2005
<i>Carex crawfordii</i>	MICH	ColorGauge_NanoTarget30	MIN1008977	04-0849	17 July, 2004
<i>Carex crawfordii</i>	MIN	ColorGauge_NanoTarget30	MICH1366998	4391	12 July, 2001
<i>Carex crebriflora</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0053254	6961	18 April, 1996
<i>Carex crebriflora</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0053260	00-324	30 April, 2000
<i>Carex crinita crinita</i>	F	ColorGauge_NanoTarget30	1904713	4642	4 June, 1982
<i>Carex crinita crinita</i>	MOAR	ColorGauge_NanoTarget30	MOAR0020034	Not provided	27 May, 2010
<i>Carex cristatella</i>	MIN	ColorGauge_NanoTarget30	MIN1009141	24449	21 June, 1994
<i>Carex cristatella</i>	MSC	ColorGauge_NanoTarget30	MSC0200414	94-622	17 June, 1994
<i>Carex crus-corvi</i>	TENN	ColorGauge_NanoTarget30	TEX00431163	156629	20 May, 1998
<i>Carex crus-corvi</i>	TEX	ColorGauge_NanoTarget30	TENN-V-0053361	4699	9 April, 2007
<i>Carex cryptotolepis</i>	MIN	ColorGauge_NanoTarget30	MIN1109573	6056	28 June, 2010
<i>Carex cryptotolepis</i>	MU	ColorGauge_NanoTarget30	MU-V-000055104	21289	17-Jun-99
<i>Carex cumberlandensis</i>	NCU	ColorChecker_Chart24	NCU00098586	5910	29 April, 2004
<i>Carex cumberlandensis</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0047555	00-469	22 May, 2000
<i>Carex cumulata</i>	MCA	ColorGauge_NanoTarget30	TENN-V-0053418	90153	5 July, 1954
<i>Carex cumulata</i>	TENN	ColorGauge_NanoTarget30	MCA0048059	3768	18 July, 1997
<i>Carex curatorum</i>	DES	ColorChecker_Chart24	DES00059026	4852	6 June, 2006
<i>Carex curatorum</i>	DES	ColorChecker_Chart24	DES00065150	7051	18 May, 2008
<i>Carex cusickii</i>	MIN	ColorGauge_NanoTarget30	TENN-V-0053423	5382	2 July, 1998
<i>Carex cusickii</i>	TENN	ColorGauge_NanoTarget30	MIN1282721	330	17 June, 1991
<i>Carex dasycarpa</i>	FLAS	Kodak_ColorControlPatches	GA011919	5386	10 April, 1965
<i>Carex dasycarpa</i>	GA	Kodak_ColorControlPatches	FLAS92378	777	26 April, 2004

<i>Carex davisii</i>	IND	ColorGauge_NanoTarget30	0020218MOR	04051ad	12 May, 2004
<i>Carex davisii</i>	MOR	ColorGauge_NanoTarget30	IND-0018725	Not provided	2 June, 1979
<i>Carex davyi</i>	MICH	ColorGauge_NanoTarget30	MICH1367816	11531	6 August, 2006
<i>Carex davyi</i>	MOR	ColorGauge_NanoTarget30	0063400MOR	901a	17 July, 1999
<i>Carex debilis debilis</i>	PH	ColorGauge_NanoTarget30	PH00208109	40152	30 May, 1933
<i>Carex debilis debilis</i>	UOS	ColorGauge_NanoTarget30	UOS06716	Not provided	10 May, 2007
<i>Carex decomposita</i>	LSU	Kodak_ColorControlPatches	TENN-V-0053565	6063	3 May, 2007
<i>Carex decomposita</i>	TENN	ColorGauge_NanoTarget30	LSU00114393	2853	5 June, 1980
<i>Carex deflexa deflexa</i>	MICH	ColorGauge_NanoTarget30	MICH1368151	19962	1 June, 1981
<i>Carex deflexa deflexa</i>	MICH	ColorGauge_NanoTarget30	MICH1368134	22762	11 July, 1981
<i>Carex densa</i>	MICH	ColorGauge_NanoTarget30	MSC0157179	7760	22 April, 2003
<i>Carex densa</i>	MSC	ColorGauge_NanoTarget30	MICH1368224	2496	20 June, 1982
<i>Carex deweyana deweyana</i>	MIN	ColorGauge_NanoTarget30	MIN1009564	147	6 June, 1999
<i>Carex deweyana deweyana</i>	MOAR	ColorGauge_NanoTarget30	MOAR0020117	Not provided	29 May, 2001
<i>Carex diandra</i>	MICH	ColorGauge_NanoTarget30	MIN1009716	04-0299	28 June, 2004
<i>Carex diandra</i>	MIN	ColorGauge_NanoTarget30	MICH1368404	527	4 July, 1979
<i>Carex disperma</i>	FLD	ColorChecker_Chart24	FLD0004760	88	12 July, 1994
<i>Carex disperma</i>	FLD	ColorChecker_Chart24	FLD0004762	111	11 June, 1996
<i>Carex douglasii</i>	CAN	Kodak_ColorControlPatches	RENO39710	Not provided	27 May, 1936
<i>Carex douglasii</i>	RENO	ColorChecker_Chart12	CAN17558	220	1 June, 2013
<i>Carex duriuscula</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0057554	99-339	30 May, 1999
<i>Carex duriuscula</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0057552	94-476	13 June, 1994
<i>Carex ebenea</i>	KHD	Kodak_ColorControlPatches	KHD00001339	4977	30 July, 1987
<i>Carex ebenea</i>	KHD	Kodak_ColorControlPatches	KHD00024706	106	29 June, 1997
<i>Carex eburnea</i>	MIN	ColorGauge_NanoTarget30	MIN1010107	7224	27 May, 1983
<i>Carex eburnea</i>	MIN	ColorGauge_NanoTarget30	MIN1010046	92121	22 August, 1992
<i>Carex echinata echinata</i>	KHD	Kodak_ColorControlPatches	KHD00002283	1976	28 July, 1998
<i>Carex echinata echinata</i>	MICH	ColorGauge_NanoTarget30	MICH1369246	7294	18 July, 1996
<i>Carex edwardsiana</i>	TEX	ColorGauge_NanoTarget30	TEX00198880	18841	17 April, 2000
<i>Carex edwardsiana</i>	TEX	ColorGauge_NanoTarget30	TEX00197016	18845	18 April, 2000
<i>Carex egglestonii</i>	KHD	Kodak_ColorControlPatches	KHD00029590	10365	27 June, 2015
<i>Carex egglestonii</i>	KHD	Kodak_ColorControlPatches	KHD00061273	9095	17 July, 2011
<i>Carex eleusinoides</i>	ALA	ColorChecker_Chart24	H1125991	12025	17 August, 1988
<i>Carex eleusinoides</i>	MICH	ColorGauge_NanoTarget30	MICH1450326	02-242	3 July, 2002
<i>Carex elliottii</i>	DUKE	ColorGauge_NanoTarget30	DUKE10037642	3953	15 May, 2001
<i>Carex elliottii</i>	MICH	ColorGauge_NanoTarget30	MICH1369598	8820	25 May, 1992
<i>Carex elynoides</i>	MOR	ColorGauge_NanoTarget30	0077029MOR	15005	27 June, 1988
<i>Carex elynoides</i>	MOR	ColorGauge_NanoTarget30	0076201MOR	22486	7 August, 1991
<i>Carex emoryi</i>	MIN	ColorGauge_NanoTarget30	0020511MOR	3935	18 June, 1979
<i>Carex emoryi</i>	MOR	ColorGauge_NanoTarget30	MIN1010371	429	28 May, 1994
<i>Carex endlichii</i>	ARIZ	ColorChecker_Chart12	ARIZ430523	13933	6 June, 2016
<i>Carex endlichii</i>	DES	ColorChecker_Chart24	DES00082438	13933	6 June, 2016
<i>Carex engelmannii</i>	MOR	ColorGauge_NanoTarget30	0076637MOR	6019	13 August, 1983
<i>Carex engelmannii</i>	MOR	ColorGauge_NanoTarget30	0076818MOR	28484	30 July, 1994

<i>Carex epapillosa</i>	UTC	ColorChecker_Chart24	UTC00148692	21730	16 July, 1985
<i>Carex epapillosa</i>	UTC	ColorChecker_Chart24	UTC00196483	77	27 July, 1976
<i>Carex exilis</i>	IBE	Kodak_ColorControlPatches	IBE020985	4162	15 April, 1986
<i>Carex exilis</i>	MICH	ColorGauge_NanoTarget30	MICH1369787	18296	5 July, 1978
<i>Carex exsiccata</i>	MICH	ColorGauge_NanoTarget30	MICH1369835	7941	30 July, 2003
<i>Carex exsiccata</i>	UBC	ColorChecker_Chart24	V42571	Not provided	15 June, 2012
<i>Carex festucacea</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0053902	95-	26 May, 1995
<i>Carex festucacea</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0047917	92-368	23 May, 1992
<i>Carex feta</i>	MOR	ColorGauge_NanoTarget30	0084673MOR	24978	22 June, 2010
<i>Carex feta</i>	MOR	ColorGauge_NanoTarget30	0066319MOR	25561	9 July, 2011
<i>Carex filifolia</i>	MOR	ColorGauge_NanoTarget30	0077094MOR	16563	9 June, 1989
<i>Carex filifolia</i>	MOR	ColorGauge_NanoTarget30	0077083MOR	3898	17 June, 1982
<i>Carex fissa fissa</i>	MMNS	Kodak_ColorControlPatches	MMNS 041131	8279	18 April, 1992
<i>Carex fissa fissa</i>	MMNS	Kodak_ColorControlPatches	MMNS 041140	8418	30 April, 1992
<i>Carex fissuricola</i>	MICH	ColorGauge_NanoTarget30	MICH1429379	25208	22 July, 2010
<i>Carex fissuricola</i>	MICH	ColorGauge_NanoTarget30	MICH1249378	25368	18 August, 2010
<i>Carex flaccosperma</i>	TENN	ColorGauge_NanoTarget30	VSC0042742	98-	24 May, 1998
<i>Carex flaccosperma</i>	VSC	Kodak_ColorControlPatches	TENN-V-0047966	19216	6 May, 2002
<i>Carex flava</i>	GMUF	ColorGauge_NanoTarget30	GMUF-0013250	10618	21 June, 1995
<i>Carex flava</i>	UWSP	ColorGauge_NanoTarget30	UWSP-V-0005124	26270A	1 July, 1992
<i>Carex floridana</i>	MICH	ColorGauge_NanoTarget30	MICH1370531	6207	28 March, 1995
<i>Carex floridana</i>	MICH	ColorGauge_NanoTarget30	MICH1370574	6216	12 March, 1991
<i>Carex foenea</i>	MIN	ColorGauge_NanoTarget30	MIN1010534	2751	18 June, 1998
<i>Carex foenea</i>	MIN	ColorGauge_NanoTarget30	MIN1010540	2601	4 June, 1998
<i>Carex folliculata</i>	BRU	ColorGauge_NanoTarget30	P BRU 00028158	1026	29 July, 2014
<i>Carex folliculata</i>	VSC	Kodak_ColorControlPatches	VSC0042760	19385	10 June, 2002
<i>Carex formosa</i>	IND	ColorGauge_NanoTarget30	IND-0125012	8204	11 June, 1988
<i>Carex formosa</i>	MT	ColorGauge_NanoTarget30	MT00010048	94-10	21 June, 1994
<i>Carex fracta</i>	MOR	ColorGauge_NanoTarget30	0063621MOR	25298	6 August, 2010
<i>Carex fracta</i>	MOR	ColorGauge_NanoTarget30	0084082MOR	8224	30 June, 2004
<i>Carex frankii</i>	TENN	ColorGauge_NanoTarget30	UCHT004610	Not provided	14 July, 1976
<i>Carex frankii</i>	UCHT	ColorGauge_NanoTarget30	TENN-V-0048075	1938	15 June, 1983
<i>Carex fraserianus</i>	GMUF	ColorGauge_NanoTarget30	GMUF-0014432	8149	17 June, 1993
<i>Carex fraserianus</i>	SALK	ColorGauge_NanoTarget30	SALK0000422	Not provided	11 May, 2004
<i>Carex fuliginosa</i>	MIN	ColorGauge_NanoTarget30	MIN1010639	Not provided	16 July, 1949
<i>Carex fuliginosa</i>	MIN	ColorGauge_NanoTarget30	MIN1010649	Not provided	13 August, 1948
<i>Carex garberi</i>	MICH	ColorGauge_NanoTarget30	MICH1322539	28507	21 June, 2003
<i>Carex garberi</i>	MICH	ColorGauge_NanoTarget30	MICH1282641	13287	24 June, 1970
<i>Carex geophila</i>	DES	ColorChecker_Chart24	DES00076193	927	17 April, 2004
<i>Carex geophila</i>	MICH	ColorGauge_NanoTarget30	MICH1371010	30-62	11 June, 1962
<i>Carex geyeri</i>	KHD	Kodak_ColorControlPatches	KHD00054088	9621	18 June, 2013
<i>Carex geyeri</i>	KHD	Kodak_ColorControlPatches	KHD00056235	10063	8 July, 2014
<i>Carex gholsonii</i>	FLAS	Kodak_ColorControlPatches	FLAS235242	3712	Not provided
<i>Carex gholsonii</i>	MICH	ColorGauge_NanoTarget30	MICH1450463	Not provided	23 March, 2009

<i>Carex gigantea</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0048199	99-556	15 July, 1999
<i>Carex gigantea</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0048135	4991b	1 July, 1987
<i>Carex glacialis</i>	CAN	Kodak_ColorControlPatches	MICH1459416	05-101	4 August, 2005
<i>Carex glacialis</i>	MICH	ColorGauge_NanoTarget30	CAN586970	25984	5 July, 2001
<i>Carex glareosa glareosa</i>	CAN	Kodak_ColorControlPatches	CAN274438	Not provided	23 June, 1928
<i>Carex glareosa glareosa</i>	CAN	Kodak_ColorControlPatches	CAN18526	12028	11 July, 1961
<i>Carex glaucescens</i>	FLAS	Kodak_ColorControlPatches	GA112378	23345	11 July, 1979
<i>Carex glaucescens</i>	GA	Kodak_ColorControlPatches	FLAS216451	1516	30 June, 2005
<i>Carex glaucodea</i>	MICH	ColorGauge_NanoTarget30	MICH1459423	3795	25 April, 2010
<i>Carex glaucodea</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0054225	166034A	27 May, 2000
<i>Carex globosa</i>	MICH	ColorGauge_NanoTarget30	MICH1371398	7749	29 March, 2003
<i>Carex globosa</i>	MICH	ColorGauge_NanoTarget30	MICH1371398	18093	4 June, 2002
<i>Carex gmelinii</i>	MICH	ColorGauge_NanoTarget30	MICH1459424	BG07-051	3 August, 2007
<i>Carex gmelinii</i>	MICH	ColorGauge_NanoTarget30	MICH1449743	92-6	11 July, 2009
<i>Carex godfreyi</i>	CLEMS	ColorGauge_NanoTarget30	CLEMS0006448	1494	15 May, 1997
<i>Carex godfreyi</i>	MU	ColorGauge_NanoTarget30	MU-V-000141973	16826	16 April, 2012
<i>Carex gracilescens</i>	MICH	ColorGauge_NanoTarget30	MICH1371538	84678	19 May, 1995
<i>Carex gracilescens</i>	MOAR	ColorGauge_NanoTarget30	MOAR0019440	Not provided	6 May, 2011
<i>Carex gracilior</i>	MOR	ColorGauge_NanoTarget30	0061670MOR	15710	15 May, 2009
<i>Carex gracilior</i>	MOR	ColorGauge_NanoTarget30	0061671MOR	Not provided	10 May, 2007
<i>Carex gracillima</i>	MIN	ColorGauge_NanoTarget30	MIN1010790	2741	29 June, 1959
<i>Carex gracillima</i>	MOAR	ColorGauge_NanoTarget30	MOAR0019448	Not provided	3 June, 2003
<i>Carex granularis</i>	MIN	ColorGauge_NanoTarget30	MIN1010913	6410	15 June, 1982
<i>Carex granularis</i>	MOAR	ColorGauge_NanoTarget30	MOAR0019478	Not provided	1 June, 2010
<i>Carex gravida</i>	CALVIN	ColorGauge_NanoTarget30	MIN1011048	Not provided	13 May, 1966
<i>Carex gravida</i>	MIN	ColorGauge_NanoTarget30	CALVIN004122	2601	13 June, 1978
<i>Carex grayi</i>	ILLS	ColorGauge_NanoTarget30	TENN-V-0048404	43186	28 June, 2012
<i>Carex grayi</i>	TENN	ColorGauge_NanoTarget30	ILLS00021073	6332	11 August, 2004
<i>Carex grisea</i>	MIN	ColorGauge_NanoTarget30	MIN1011158	4078	27 June, 1979
<i>Carex grisea</i>	MIN	ColorGauge_NanoTarget30	MIN1011201	8350	19 June, 1984
<i>Carex gynandra</i>	MICH	ColorGauge_NanoTarget30	MIN1011257	9576	3 July, 1993
<i>Carex gynandra</i>	MIN	ColorGauge_NanoTarget30	MICH1372648	173	5 July, 1956
<i>Carex gynocrates</i>	MICH	ColorGauge_NanoTarget30	MICH1323051	1180	10 July, 1985
<i>Carex gynocrates</i>	MICH	ColorGauge_NanoTarget30	MICH1323048	2703	4 August, 1923
<i>Carex gynodynama</i>	MICH	ColorGauge_NanoTarget30	MICH1372716	9849	1 June, 1999
<i>Carex gynodynama</i>	MSC	ColorGauge_NanoTarget30	MSC0157821	7443081	30 April, 1974
<i>Carex halliana</i>	DES	ColorChecker_Chart24	DES00010368	616	12 August, 1976
<i>Carex halliana</i>	GA	Kodak_ColorControlPatches	GA112689	4240	23 July, 1991
<i>Carex hallii</i>	MICH	ColorGauge_NanoTarget30	MIN1011341	12147	18 August, 2012
<i>Carex hallii</i>	MIN	ColorGauge_NanoTarget30	MICH1459707	6852	22 July, 1982
<i>Carex harfordii</i>	DAO	ColorGauge_NanoTarget30	0063397MOR	Not provided	19 May, 1958
<i>Carex harfordii</i>	MOR	ColorGauge_NanoTarget30	01-01001119731	320	25 May, 1999
<i>Carex hassei</i>	DES	ColorChecker_Chart24	DES00058708	4824	5 June, 2006
<i>Carex hassei</i>	MICH	ColorGauge_NanoTarget30	MICH1429447	24535	18 June, 2009

<i>Carex haydeniana</i>	KHD	Kodak_ColorControlPatches	KHD00024340	6065	11 July, 2012
<i>Carex haydeniana</i>	MOR	ColorGauge_NanoTarget30	0061685MOR	38917	9 July, 2001
<i>Carex haydenii</i>	IND	ColorGauge_NanoTarget30	IND-0124568	9036	24 June, 1992
<i>Carex haydenii</i>	WIS	ColorGauge_NanoTarget30	v 0200904 WIS	94-004	30 May, 1994
<i>Carex heleonastes</i>	MICH	ColorGauge_NanoTarget30	MICH1459717	10-182	9 July, 2010
<i>Carex heleonastes</i>	MICH	ColorGauge_NanoTarget30	MICH1459718	10-259	11 July, 2010
<i>Carex helleri</i>	MICH	ColorGauge_NanoTarget30	MICH1372887	776	19 July, 1987
<i>Carex helleri</i>	MICH	ColorGauge_NanoTarget30	MICH1372895	849	2 August, 1987
<i>Carex hendersonii</i>	MOR	ColorGauge_NanoTarget30	TENN-V-0054568	24453	30 May, 2009
<i>Carex hendersonii</i>	TENN	ColorGauge_NanoTarget30	0075642MOR	349	5 June, 1991
<i>Carex heteroneura</i>	MICH	ColorGauge_NanoTarget30	MICH1398989	7915A	24 July, 2003
<i>Carex heteroneura</i>	MICH	ColorGauge_NanoTarget30	MICH1398983	10651	31 July, 2004
<i>Carex hirsutella</i>	GMUF	ColorGauge_NanoTarget30	GMUF-0013393	10359	21 May, 1976
<i>Carex hirsutella</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0048553	99-179	10 May, 1999
<i>Carex hirtifolia</i>	MDKY	ColorGauge_NanoTarget30	MDKY00002744	1133	30 May, 2000
<i>Carex hirtifolia</i>	WIS	ColorGauge_NanoTarget30	v 0188885 WIS	13334	24 June, 1977
<i>Carex hirtissima</i>	MICH	ColorGauge_NanoTarget30	MICH1373055	3068C	24 April, 1984
<i>Carex hirtissima</i>	MICH	ColorGauge_NanoTarget30	MICH1373057	7758	15 April, 2003
<i>Carex hitchcockiana</i>	MIN	ColorGauge_NanoTarget30	0020824MOR	16052	9 June, 1997
<i>Carex hitchcockiana</i>	MOR	ColorGauge_NanoTarget30	MIN1011501	188	28 May, 1992
<i>Carex holostoma</i>	MICH	ColorGauge_NanoTarget30	MICH1429462	J81-718	3 August, 1981
<i>Carex holostoma</i>	MICH	ColorGauge_NanoTarget30	MICH1450450	J81-718	3 August, 1981
<i>Carex hoodii</i>	MU	ColorGauge_NanoTarget30	UT0016313	11113	30 June, 2013
<i>Carex hoodii</i>	UT	ColorChecker_Chart24	MU-V-000200419	5038	11 July, 1976
<i>Carex hookerana</i>	DAO	ColorGauge_NanoTarget30	01-01356727	4993	23 July, 1947
<i>Carex hookerana</i>	DAO	ColorGauge_NanoTarget30	01-01356725	8029	13 July, 1983
<i>Carex hormathodes</i>	GMUF	ColorGauge_NanoTarget30	GMUF-0013429	10384	23 May, 1995
<i>Carex hormathodes</i>	MOR	ColorGauge_NanoTarget30	0063049MOR	Not provided	17 July, 2009
<i>Carex hostiana</i>	MSC	ColorGauge_NanoTarget30	568620	95-235	28 July, 1995
<i>Carex hostiana</i>	F	ColorGauge_NanoTarget30	MSC0157925	20043	6 August, 1925
<i>Carex hostiana</i>	MSC	ColorGauge_NanoTarget30	MSC0157925	95-235	28 July, 1995
<i>Carex houghtoniana</i>	MICH	ColorGauge_NanoTarget30	MICH1373368	18732	21 June, 1979
<i>Carex houghtoniana</i>	WIN	ColorChecker_Chart24	WIN43078	24299	8 July, 1979
<i>Carex hyalina</i>	LSU	Kodak_ColorControlPatches	LSU00027637	7380	25 April, 1997
<i>Carex hyalina</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0054716	7925	27 April, 1998
<i>Carex hyalinolepis</i>	MICH	ColorGauge_NanoTarget30	MICH1373493	7299	5 April, 1997
<i>Carex hyalinolepis</i>	MICH	ColorGauge_NanoTarget30	MICH1373607	312	25 May, 2003
<i>Carex hystericina</i>	WIN	ColorChecker_Chart24	WIN43237	70-2	4 July, 1970
<i>Carex hystericina</i>	WIN	ColorChecker_Chart24	WIN24045	586	19 July, 1979
<i>Carex idahoa</i>	MICH	ColorGauge_NanoTarget30	RENO100046	5208	31 July, 1990
<i>Carex idahoa</i>	RENO	ColorChecker_Chart24	MICH1373779	778	1 July, 2016
<i>Carex illota</i>	CAN	Kodak_ColorControlPatches	CAN343311	12321	4 July, 1969
<i>Carex illota</i>	CAN	Kodak_ColorControlPatches	CAN411731	17377	23 July, 1977
<i>Carex impressinervia</i>	LSU	Kodak_ColorControlPatches	LSU00069375	5605	1 May, 1987

<i>Carex impressinervia</i>	LSU	Kodak_ColorControlPatches	LSU00069376	8510	3 May, 1988
<i>Carex infirminervia</i>	MICH	ColorGauge_NanoTarget30	MICH1450863	25481	29 June, 2011
<i>Carex infirminervia</i>	MOR	ColorGauge_NanoTarget30	0057282MOR	3193A	18 July, 2008
<i>Carex inops inops</i>	MICH	ColorGauge_NanoTarget30	MICH1429474	25119	9 July, 2010
<i>Carex inops inops</i>	MICH	ColorGauge_NanoTarget30	MICH1429472	24849	21 May, 2010
<i>Carex integra</i>	MICH	ColorGauge_NanoTarget30	MICH1373947	3608	10 September, 1969
<i>Carex integra</i>	MOR	ColorGauge_NanoTarget30	0084347MOR	25271	5 August, 2010
<i>Carex interior</i>	MIN	ColorGauge_NanoTarget30	MIN1011904	92048	5 July, 1992
<i>Carex interior</i>	MIN	ColorGauge_NanoTarget30	MIN1011879	10546	31 May, 1988
<i>Carex interrupta</i>	MICH	ColorGauge_NanoTarget30	MICH1459752	24871	24 May, 2010
<i>Carex interrupta</i>	UWSP	ColorGauge_NanoTarget30	UWSP-V-0005564	Not provided	23-Jul-97
<i>Carex intumescens</i>	WIN	ColorChecker_Chart24	WIN53403	24	11 August, 1992
<i>Carex intumescens</i>	WIN	ColorChecker_Chart24	WIN55024	Not provided	11 July, 1993
<i>Carex jamesii</i>	MICH	ColorGauge_NanoTarget30	MICH1374617	7881	22 May, 1987
<i>Carex jamesii</i>	MICH	ColorGauge_NanoTarget30	MICH1374442	3917	19 May, 1994
<i>Carex jonesii</i>	KHD	Kodak_ColorControlPatches	KHD00024011	9116	18 July, 2011
<i>Carex jonesii</i>	KHD	Kodak_ColorControlPatches	KHD00024710	8899	20 July, 2007
<i>Carex joorii</i>	GMUF	ColorGauge_NanoTarget30	TENN-V-0048957	29156	28 July, 1997
<i>Carex joorii</i>	TENN	ColorGauge_NanoTarget30	GMUF-0013498	199	2 August, 1992
<i>Carex juniperorum</i>	MICH	ColorGauge_NanoTarget30	MICH1374763	20285	13 June, 1994
<i>Carex juniperorum</i>	MICH	ColorGauge_NanoTarget30	MICH1374747	8748	6 May, 1991
<i>Carex klamathensis</i>	MICH	ColorGauge_NanoTarget30	MICH1374769	5714	3 July, 1998
<i>Carex klamathensis</i>	MOR	ColorGauge_NanoTarget30	0075746MOR	24537	19 June, 2009
<i>Carex kraliana</i>	MICH	ColorGauge_NanoTarget30	MICH1374802	7596	22 May, 1997
<i>Carex kraliana</i>	MICH	ColorGauge_NanoTarget30	MICH1374786	21289	22 April, 2006
<i>Carex krausei</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0055066	Not provided	22 June, 1958
<i>Carex krausei</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0055063	24274	31 July, 1958
<i>Carex lachenalii</i>	MOR	ColorGauge_NanoTarget30	MT00209271	17840	14 July, 2009
<i>Carex lachenalii</i>	MT	ColorGauge_NanoTarget30	0057137MOR	8411	26 July, 2008
<i>Carex lacustris</i>	MICH	ColorGauge_NanoTarget30	MICH1375006	18570	16 June, 2014
<i>Carex lacustris</i>	MICH	ColorGauge_NanoTarget30	MICH1452169	3689	4 June, 1998
<i>Carex laeviculmis</i>	MICH	ColorGauge_NanoTarget30	MICH1375076	10082	13 July, 1999
<i>Carex laeviculmis</i>	MT	ColorGauge_NanoTarget30	MT00175148	8186a	30 June, 1919
<i>Carex laevivaginata</i>	GA	Kodak_ColorControlPatches	TENN-V-0055113	23268	21 May, 1990
<i>Carex laevivaginata</i>	TENN	ColorGauge_NanoTarget30	GA113117	213	12 May, 2002
<i>Carex laevivonica</i>	MICH	ColorGauge_NanoTarget30	WIN67309	93-192	3 June, 1993
<i>Carex laevivonica</i>	WIN	ColorChecker_Chart24	MICH1375031	94109	11 June, 1994
<i>Carex lapponica</i>	MSC	ColorGauge_NanoTarget30	MSC0200323	18334	13 June, 1978
<i>Carex lapponica</i>	WIS	ColorGauge_NanoTarget30	v 0275453 WIS	Not provided	20 June, 1961
<i>Carex lasiocarpa</i>	MICH	ColorGauge_NanoTarget30	MICH1323889	5245	26 June, 1933
<i>Carex lasiocarpa</i>	MICH	ColorGauge_NanoTarget30	MICH1323885	2921	10 July, 1936
<i>Carex latebracteata</i>	WIS	ColorGauge_NanoTarget30	v 0280693 WIS	97-276	17 May, 1997
<i>Carex lativena</i>	MICH	ColorGauge_NanoTarget30	MICH1375294	8289	4 October, 1998
<i>Carex lativena</i>	MICH	ColorGauge_NanoTarget30	MICH1375298	8194	28 March, 1992

<i>Carex laxa</i>	MICH	ColorGauge_NanoTarget30	MICH1375299	03-042	3 August, 2008
<i>Carex laxa</i>	MICH	ColorGauge_NanoTarget30	MICH1375300	96.71	10 July, 1996
<i>Carex laxiculmus laxiculmis</i>	MOAR	ColorGauge_NanoTarget30	MOAR0019660	Not provided	7 June, 2011
<i>Carex laxiculmus laxiculmis</i>	MOAR	ColorGauge_NanoTarget30	MOAR0019663	Not provided	13 June, 2006
<i>Carex laxiflora</i>	GA	Kodak_ColorControlPatches	GA012344	1591	2 May, 2007
<i>Carex laxiflora</i>	IBE	Kodak_ColorControlPatches	IBE022944	1936	8 May, 1978
<i>Carex leavenworthii</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0049292	13747	2 May, 1999
<i>Carex leavenworthii</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0055353	14806	21 April, 1995
<i>Carex lemmonii</i>	MICH	ColorGauge_NanoTarget30	MICH1429532	7876	July, 2003
<i>Carex lemmonii</i>	MOR	ColorGauge_NanoTarget30	0075751MOR	25920	5 August, 2010
<i>Carex lenticularis impressa</i>	ILL	ColorGauge_NanoTarget30	ILL00117202	7483	14 July, 1953
<i>Carex lenticularis impressa</i>	MICH	ColorGauge_NanoTarget30	MICH1450895	15204	14 August, 2008
<i>Carex leporinella</i>	MOR	ColorGauge_NanoTarget30	MU-V-000082876	40548	24 July, 2003
<i>Carex leporinella</i>	MU	ColorGauge_NanoTarget30	0061700MOR	7487	9 July, 2008
<i>Carex leptalea</i>	DAO	ColorGauge_NanoTarget30	3 1234 10005620 7	NPE-LDS-49	17 July, 2005
<i>Carex leptalea</i>	EKU	ColorGauge_NanoTarget30	01-01000525695	11077	3 May, 2010
<i>Carex leptonervia</i>	MIN	ColorGauge_NanoTarget30	MIN1110772	2439	21 May, 1998
<i>Carex leptonervia</i>	MIN	ColorGauge_NanoTarget30	MIN1013021	90-268	6 June, 1990
<i>Carex leptopoda</i>	MICH	ColorGauge_NanoTarget30	v 0161043 WIS	7929	27 July, 2003
<i>Carex leptopoda</i>	WIS	ColorGauge_NanoTarget30	MICH1376645	25	30 June, 2002
<i>Carex limosa</i>	MICH	ColorGauge_NanoTarget30	MICH1376695	25315	10 August, 2010
<i>Carex limosa</i>	MICH	ColorGauge_NanoTarget30	MICH1429615	530	2 July, 1996
<i>Carex livida</i>	ALA	ColorChecker_Chart24	H1138176	27613	29 July, 1960
<i>Carex livida</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0055528	88-579	27 June, 1988
<i>Carex loliacea</i>	MICH	ColorGauge_NanoTarget30	MICH1452192	2010-104	7 July, 2010
<i>Carex loliacea</i>	MICH	ColorGauge_NanoTarget30	MICH1459810	09-001	21 June, 2009
<i>Carex lonchocarpa</i>	TEX	ColorGauge_NanoTarget30	TEX00443188	3671	14 April, 2006
<i>Carex lonchocarpa</i>	VSC	Kodak_ColorControlPatches	VSC0065088	16711	20 May, 2006
<i>Carex longii</i>	CLEMS	ColorGauge_NanoTarget30	CLEMS0007652	2928	6 May, 1998
<i>Carex longii</i>	VSC	Kodak_ColorControlPatches	VSC0058827	19824	18 June, 2010
<i>Carex louisianica</i>	CLEMS	ColorGauge_NanoTarget30	CLEMS0007656	3932	21 May, 1985
<i>Carex louisianica</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0055601	165; 424; 879	9 June, 2000
<i>Carex lucorum lucorum</i>	MICH	ColorGauge_NanoTarget30	MICH1359036	9602	4 July, 1993
<i>Carex lucorum lucorum</i>	MICH	ColorGauge_NanoTarget30	MICH1459818	25377	11 June, 2001
<i>Carex lupuliformis</i>	MICH	ColorGauge_NanoTarget30	MICH1377183	JKB:1998:175	17 September, 1988
<i>Carex lupuliformis</i>	MICH	ColorGauge_NanoTarget30	MICH1377213	7308	10 July, 1991
<i>Carex lupulina</i>	MT	ColorGauge_NanoTarget30	MT00188056	3423	17 September, 2012
<i>Carex lupulina</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0055710	35187	7 June, 1973
<i>Carex lurida</i>	Harvard	ColorGauge_NanoTarget30	TENN-V-0049756	Not provided	15 August, 1892
<i>Carex lurida</i>	TENN	ColorGauge_NanoTarget30	810301	FCF-888	19 June, 2001
<i>Carex luzulifolia</i>	MICH	ColorGauge_NanoTarget30	MICH1377908	826	26 July, 1987
<i>Carex luzulifolia</i>	MICH	ColorGauge_NanoTarget30	MICH1377912	869	5 August, 1987
<i>Carex luzulina luzulina</i>	MICH	ColorGauge_NanoTarget30	MICH1449802	10423	6 July, 1991
<i>Carex lyngbyei</i>	MICH	ColorGauge_NanoTarget30	MICH1201308	11513	27 July, 2003

<i>Carex lyngbyei</i>	UWSP	ColorGauge_NanoTarget30	UWSP-V-0006117	24454	30 May, 2009
<i>Carex mackenziei</i>	TENN	ColorGauge_NanoTarget30	WIN57785	91-415	3 July, 1991
<i>Carex mackenziei</i>	WIN	ColorChecker_Chart24	TENN-V-0055918	83-214	4 August, 1983
<i>Carex macloviana</i>	CAN	Kodak_ColorControlPatches	CAN19627	Not provided	26 July, 1966
<i>Carex macloviana</i>	CAN	Kodak_ColorControlPatches	CAN409290	97993	24 July, 1918
<i>Carex macrocephala</i>	MIN	ColorGauge_NanoTarget30	MIN1280119	15459	11 July, 1964
<i>Carex macrocephala</i>	MOR	ColorGauge_NanoTarget30	0084330MOR	24563	23 June, 2009
<i>Carex macrochaeta</i>	COLO	ColorGauge_NanoTarget30	COLO00842666	7478	12 August, 1966
<i>Carex macrochaeta</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0055932	Not provided	11 July, 1968
<i>Carex magellanica irrigua</i>	MICH	ColorGauge_NanoTarget30	v 0208078 WIS	2010-81	6 July, 2010
<i>Carex magellanica irrigua</i>	WIS	ColorGauge_NanoTarget30	MICH1459839	13084	2 June, 1998
<i>Carex manhartii</i>	GA	Kodak_ColorControlPatches	GA113854	Not provided	May, 1999
<i>Carex manhartii</i>	GA	Kodak_ColorControlPatches	GA012691	45630	30 April, 1967
<i>Carex marina</i>	MICH	ColorGauge_NanoTarget30	MT00209079	37869	7 July, 2010
<i>Carex marina</i>	MT	ColorGauge_NanoTarget30	MICH1459843	7914	13 July, 2008
<i>Carex mariposana</i>	MICH	ColorGauge_NanoTarget30	MICH1431281	7883	7 July, 2003
<i>Carex mariposana</i>	MICH	ColorGauge_NanoTarget30	MICH1378268	675	10 July, 1999
<i>Carex meadii</i>	MOR	ColorGauge_NanoTarget30	0021852MOR	6633	22 May, 1979
<i>Carex meadii</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0055968	165,339	12 May, 2000
<i>Carex media</i>	MICH	ColorGauge_NanoTarget30	0081049MOR	9730	11 July, 1989
<i>Carex media</i>	MOR	ColorGauge_NanoTarget30	MICH1398893	7470	26 May, 1975
<i>Carex membranacea</i>	UBC	ColorChecker_Chart24	V202676	6219	29 July, 1990
<i>Carex membranacea</i>	UBC	ColorChecker_Chart24	V115612	7725	12 July, 1957
<i>Carex mendocinensis</i>	MICH	ColorGauge_NanoTarget30	MICH1459854	25946	3 July, 2011
<i>Carex mendocinensis</i>	MICH	ColorGauge_NanoTarget30	MICH1459853	26186	9 June, 2013
<i>Carex merritt-fernaldii</i>	MIN	ColorGauge_NanoTarget30	MIN1013519	5483	12 July, 2007
<i>Carex merritt-fernaldii</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0056024	99-397	26 May, 1999
<i>Carex mertensii</i>	MICH	ColorGauge_NanoTarget30	MICH1378640	405	21 June, 1987
<i>Carex mertensii</i>	MICH	ColorGauge_NanoTarget30	MICH1378655	6096	1 August, 2001
<i>Carex mesochorea</i>	AVCH	ColorGauge_NanoTarget30	AVCH-0000299	3385	25 April, 2012
<i>Carex mesochorea</i>	VPI	ColorChecker_Chart24	VPI-V-0008129	12867	23 May, 2013
<i>Carex michauxiana</i>	MIN	ColorGauge_NanoTarget30	MIN1110908	172	22 June, 2012
<i>Carex michauxiana</i>	MIN	ColorGauge_NanoTarget30	MIN1013587	5832	26 July, 2009
<i>Carex microchaeta microchaeta</i>	ALA	ColorChecker_Chart24	H1118620	358.2	27 July, 1976
<i>Carex microchaeta microchaeta</i>	BOON	Kodak_ColorControlPatches	BOON006603	03-0590	17 June, 2003
<i>Carex microdonta</i>	TEX	ColorGauge_NanoTarget30	TEX00433242	13678	20 May, 1990
<i>Carex microdonta</i>	TEX	ColorGauge_NanoTarget30	TEX00293170	2717	9 May, 2002
<i>Carex microglochin</i>	WIS	ColorGauge_NanoTarget30	v 0282162 WIS	88-606	2 July, 1988
<i>Carex microglochin</i>	WIS	ColorGauge_NanoTarget30	v 0282163 WIS	91-585	2 July, 1991
<i>Carex micropoda</i>	KHD	Kodak_ColorControlPatches	KHD00017165	2686	18 August, 2015
<i>Carex micropoda</i>	KHD	Kodak_ColorControlPatches	MICH1378907	6198/2469	16 August, 1984
<i>Carex micropoda</i>	MICH	ColorGauge_NanoTarget30	KHD00060224	Not provided	10 August, 1980
<i>Carex micropoda</i>	MICH	ColorGauge_NanoTarget30	MICH1378916	2756	4 September, 1935
<i>Carex microptera</i>	MICH	ColorGauge_NanoTarget30	MICH1379231	3430	21 July, 2003

<i>Carex microptera</i>	MICH	ColorGauge_NanoTarget30	MICH1379004	18964	20 July, 1963
<i>Carex misera</i>	CLEMS	ColorGauge_NanoTarget30	CLEMS0017143	172	25 June, 1981
<i>Carex misera</i>	IND	ColorGauge_NanoTarget30	IND-0020667	43981	24 June, 1961
<i>Carex missouriensis</i>	ILLS	ColorGauge_NanoTarget30	IND-0020670	43375	20 June, 2013
<i>Carex missouriensis</i>	IND	ColorGauge_NanoTarget30	ILLS00070699	24	6 May, 1994
<i>Carex mitchelliana</i>	MICH	ColorGauge_NanoTarget30	MICH1199419	5868	18 April, 1994
<i>Carex mitchelliana</i>	MICH	ColorGauge_NanoTarget30	MICH1379344	9523	8 May, 1989
<i>Carex molesta</i>	ILLS	ColorGauge_NanoTarget30	TENN-V-0056149	19170	29 April, 2002
<i>Carex molesta</i>	TENN	ColorGauge_NanoTarget30	ILLS00069982	3130	14 June, 1942
<i>Carex molestiformis</i>	GA	Kodak_ColorControlPatches	GA113962	5482	22 May, 1993
<i>Carex molestiformis</i>	VPI	ColorChecker_Chart24	VPI-V-0008130	12869	23 May, 2013
<i>Carex muehlenbergii enervis</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0049902	123	12 May, 2007
<i>Carex muehlenbergii enervis</i>	UCHT	ColorGauge_NanoTarget30	UCHT004489	864	20 May, 2007
<i>Carex multicaulis</i>	MICH	ColorGauge_NanoTarget30	MICH1430177	25966	15 May, 2012
<i>Carex multicaulis</i>	MICH	ColorGauge_NanoTarget30	MICH1459913	11417	19 July, 2005
<i>Carex multicosata</i>	MICH	ColorGauge_NanoTarget30	MICH1459915	26106	11 August, 2012
<i>Carex multicosata</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0056214	89-640	15 July, 1989
<i>Carex muriculata</i>	TEX	ColorGauge_NanoTarget30	TEX00343921	2480	16 August, 1974
<i>Carex muriculata</i>	TEX	ColorGauge_NanoTarget30	TEX00343920	2571	6 September, 1974
<i>Carex muskingumensis</i>	MICH	ColorGauge_NanoTarget30	MICH1380073	6292	16 June, 1994
<i>Carex muskingumensis</i>	MOR	ColorGauge_NanoTarget30	0021285MOR	Not provided	20 June, 1995
<i>Carex nardina</i>	MIN	ColorGauge_NanoTarget30	MIN1013735	2732	31 July, 1978
<i>Carex nardina</i>	MOR	ColorGauge_NanoTarget30	0072933MOR	22245	30 July, 1991
<i>Carex nebrascensis</i>	DES	ColorChecker_Chart24	DES00070428	9958	30 July, 2010
<i>Carex nebrascensis</i>	KHD	Kodak_ColorControlPatches	KHD00012518	Not provided	3 June, 2002
<i>Carex nelsonii</i>	COLO	ColorGauge_NanoTarget30	KHD00019323	8445	12 August, 1995
<i>Carex nelsonii</i>	KHD	Kodak_ColorControlPatches	COLO00308361	5395	19 July, 1983
<i>Carex nervina</i>	MICH	ColorGauge_NanoTarget30	176491MOR	10565	26 July, 2004
<i>Carex nervina</i>	MOR	ColorGauge_NanoTarget30	MICH1380269	3195	18 July, 2008
<i>Carex neurophora</i>	KHD	Kodak_ColorControlPatches	KHD00056200	10123	19 July, 2014
<i>Carex neurophora</i>	MICH	ColorGauge_NanoTarget30	MICH1459919	26367	29 July, 2013
<i>Carex nigra</i>	ILLS	ColorGauge_NanoTarget30	ILLS00070023	Not provided	24 July, 2007
<i>Carex nigra</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0056275	00-055-1	30 July, 2000
<i>Carex nigricans</i>	KHD	Kodak_ColorControlPatches	MIN1013743	9224	10 August, 2011
<i>Carex nigricans</i>	MIN	ColorGauge_NanoTarget30	KHD00059704	7932	23 August, 1952
<i>Carex nigromarginata</i>	GA	Kodak_ColorControlPatches	MICH1450241	9068	9 April, 2000
<i>Carex nigromarginata</i>	MICH	ColorGauge_NanoTarget30	GA012752	2114	4 May, 2004
<i>Carex normalis</i>	MIN	ColorGauge_NanoTarget30	MIN1013753	8372	19 June, 1984
<i>Carex normalis</i>	MOR	ColorGauge_NanoTarget30	0021256MOR	18268	14 June, 1990
<i>Carex norvegica</i>	MICH	ColorGauge_NanoTarget30	WIN71118	Not provided	July, 1934
<i>Carex norvegica</i>	WIN	ColorChecker_Chart24	MICH1380842	4120	14 July, 2004
<i>Carex nova</i>	KHD	Kodak_ColorControlPatches	KHD00002757	841	1 September, 1944
<i>Carex nova</i>	KHD	Kodak_ColorControlPatches	KHD00002767	5828	30 August, 1995
<i>Carex novae-angliae</i>	MICH	ColorGauge_NanoTarget30	MICH1201274	11350	29 June, 2002

<i>Carex novae-angliae</i>	MICH	ColorGauge_NanoTarget30	MICH1459937	31000	25 May, 2005
<i>Carex nudata</i>	IBE	Kodak_ColorControlPatches	IBE026850	4906	3 June, 1985
<i>Carex nudata</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0056315	8057	28 May, 1984
<i>Carex obispoensis</i>	COLO:V	ColorGauge_NanoTarget30	MICH1005727A	Not provided	29 May, 1979
<i>Carex obispoensis</i>	MICH	ColorGauge_NanoTarget30	COLO01050244	3076	28 April, 1984
<i>Carex obnupta</i>	MSC	ColorGauge_NanoTarget30	MSC0196893	Not provided	11 May, 1939
<i>Carex obnupta</i>	MSC	ColorGauge_NanoTarget30	MSC0196889	7442721	27 April, 1974
<i>Carex obtusata</i>	MICH	ColorGauge_NanoTarget30	0072736MOR	13161	23 June, 1948
<i>Carex obtusata</i>	MOR	ColorGauge_NanoTarget30	MICH1381002	6188	21 August, 1983
<i>Carex occidentalis</i>	ILL	ColorGauge_NanoTarget30	KHD00055581	74871	1 June, 2002
<i>Carex occidentalis</i>	KHD	Kodak_ColorControlPatches	ILL00116943	8922	3 August, 2008
<i>Carex oklahomensis</i>	IBE	Kodak_ColorControlPatches	IBE023616	9400	14 May, 1996
<i>Carex oklahomensis</i>	MU	ColorGauge_NanoTarget30	MU-V-000113803	13600	11 June, 2010
<i>Carex oligocarpa</i>	TENN	ColorGauge_NanoTarget30	UOS06838	97-130	24 April, 1997
<i>Carex oligocarpa</i>	UOS	ColorGauge_NanoTarget30	TENN-V-0049963	8645	25 April, 2013
<i>Carex oligosperma</i>	MICH	ColorGauge_NanoTarget30	MICH1459940	11693	2 August, 2005
<i>Carex oligosperma</i>	MICH	ColorGauge_NanoTarget30	MICH1221378	7072	26 June, 2014
<i>Carex opaca</i>	IND	ColorGauge_NanoTarget30	IND-0123908	9803	27 May, 1994
<i>Carex opaca</i>	IND	ColorGauge_NanoTarget30	IND-0150771	9761	25 May, 1994
<i>Carex oreocharis</i>	DES	ColorChecker_Chart24	DES00070410	2572	12 September, 2009
<i>Carex oreocharis</i>	KHD	Kodak_ColorControlPatches	KHD00002475	4400	14 June, 2000
<i>Carex ormostachya</i>	WIS	ColorGauge_NanoTarget30	v 0039966 WIS	13267	22 June, 1994
<i>Carex ormostachya</i>	WIS	ColorGauge_NanoTarget30	v 0254902 WIS	14813	14 June, 2008
<i>Carex oronensis</i>	MICH	ColorGauge_NanoTarget30	MICH1201263	11343	29 June, 2002
<i>Carex oronensis</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0056430	88-540	18 June, 1988
<i>Carex ouachitana</i>	MICH	ColorGauge_NanoTarget30	MICH1381544	25559	11 May, 1991
<i>Carex ouachitana</i>	MICH	ColorGauge_NanoTarget30	MICH1381550	30112	24 April, 1998
<i>Carex ovalis</i>	MICH	ColorGauge_NanoTarget30	MICH1372758	310	25 May, 1999
<i>Carex ovalis</i>	MIN	ColorGauge_NanoTarget30	MIN1277210	Not provided	30 June, 1976
<i>Carex oxylepis</i>	FARM	ColorGauge_NanoTarget30	TENN-V-0056464	8496	4 May, 1994
<i>Carex oxylepis</i>	TENN	ColorGauge_NanoTarget30	FARM-0002565	7369	29 April, 1988
<i>Carex ozarkana</i>	EKY	ColorGauge_NanoTarget30	IND-0123914	9514	19 May, 1994
<i>Carex ozarkana</i>	IND	ColorGauge_NanoTarget30	3 1234 10006737 8	2889	17 May, 1993
<i>Carex pachystachya</i>	MOR	ColorGauge_NanoTarget30	0065823MOR	8717	1 July, 2006
<i>Carex pachystachya</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0056485	89-682	11 July, 1989
<i>Carex paeninsulae</i>	GA	Kodak_ColorControlPatches	NY00622235	19167	15 March, 1992
<i>Carex paeninsulae</i>	NY	ColorChecker_Chart24	GA259452	2770	20 April, 1991
<i>Carex paleacea</i>	IBE	Kodak_ColorControlPatches	IBE027255	2948	9 June, 1987
<i>Carex paleacea</i>	MU	ColorGauge_NanoTarget30	MU-V-000172820	J78-18	4 July, 1978
<i>Carex pallescens</i>	MIN	ColorGauge_NanoTarget30	MIN1277234	519	19 June, 1941
<i>Carex pallescens</i>	MOR	ColorGauge_NanoTarget30	0072674MOR	1551	14 June, 1952
<i>Carex pansa</i>	DAO	ColorGauge_NanoTarget30	MICH1430238	31193	3 July, 1961
<i>Carex pansa</i>	DAO	ColorGauge_NanoTarget30	01-01001119748	31193	2 July, 1961
<i>Carex pansa</i>	MICH	ColorGauge_NanoTarget30	01-01001119747	23280	26 July, 2007

<i>Carex parryana</i>	KHD	Kodak_ColorControlPatches	MU-V-000031722	5913	5 May, 2010
<i>Carex parryana</i>	MU	ColorGauge_NanoTarget30	KHD00043004	4737	12 July, 2003
<i>Carex pauciflora</i>	MIN	ColorGauge_NanoTarget30	MIN1013976	4424	29 June, 1941
<i>Carex pauciflora</i>	MIN	ColorGauge_NanoTarget30	MIN1013988	2223	22 June, 1995
<i>Carex paupercula</i>	NCSC	Kodak_ColorControlPatches	ND119023	Not provided	8 June, 1905
<i>Carex paupercula</i>	ND	ColorGauge_NanoTarget30	NCSC00048677	4229	14 June, 1954
<i>Carex peckii</i>	IBE	Kodak_ColorControlPatches	MIN1014191	5845	13 June, 1978
<i>Carex peckii</i>	MIN	ColorGauge_NanoTarget30	IBE027262	5695	13 June, 1982
<i>Carex pedunculata</i>	TENN	ColorGauge_NanoTarget30	v0194043 WIS	Not provided	28 April, 1987
<i>Carex pedunculata</i>	WIS	ColorGauge_NanoTarget30	TENN-V-0050098	17295	19 May, 1961
<i>Carex pellita</i>	WIN	ColorChecker_Chart24	WIN73601	6	11 June, 2000
<i>Carex pellita</i>	WIN	ColorChecker_Chart24	WIN75011	06-107	7 June, 2006
<i>Carex pelocarpa</i>	MICH	ColorGauge_NanoTarget30	MICH1398807	609	14 August, 1986
<i>Carex pelocarpa</i>	MICH	ColorGauge_NanoTarget30	MICH1398817	10660	31 July, 2004
<i>Carex pennsylvanica</i>	IBE	Kodak_ColorControlPatches	IBE023477	1889	5 May, 1978
<i>Carex pennsylvanica</i>	NCSC	Kodak_ColorControlPatches	NCSC00048672	Not provided	25 May, 1952
<i>Carex perdentata</i>	MU	ColorGauge_NanoTarget30	MU-V-000048081	10100	1 May, 2004
<i>Carex perdentata</i>	TEX	ColorGauge_NanoTarget30	TEX00166301	11770	23 April, 2007
<i>Carex petasata</i>	KHD	Kodak_ColorControlPatches	KHD00022254	536; 312	25 July, 2010
<i>Carex petasata</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0056556	91-835	10 July, 1991
<i>Carex petricosa misandroides</i>	CAN	Kodak_ColorControlPatches	MICH1382871	11556	17 August, 1943
<i>Carex petricosa misandroides</i>	MICH	ColorGauge_NanoTarget30	CAN23147	2965	8 July, 1952
<i>Carex phaeocephala</i>	CAN	Kodak_ColorControlPatches	CAN17958	990	9 July, 1925
<i>Carex phaeocephala</i>	MICH	ColorGauge_NanoTarget30	MICH1430253	24658b	3 September, 2009
<i>Carex picta</i>	KNK	ColorGauge_NanoTarget30	MICH1382984	2990	20 March, 1993
<i>Carex picta</i>	MICH	ColorGauge_NanoTarget30	3 1973 000010612	36273	10 April, 2004
<i>Carex picta</i>	MICH	ColorGauge_NanoTarget30	MICH1382978	1815	30 April, 1988
<i>Carex picta</i>	MU	ColorGauge_NanoTarget30	MU-V-000046635	36273	10 April, 2004
<i>Carex pigra</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0050141	7633	25 May, 2005
<i>Carex pigra</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0050144	97-249	20 May, 1997
<i>Carex pityophila</i>	KHD	Kodak_ColorControlPatches	MICH1383035	6404	2 June, 2016
<i>Carex pityophila</i>	MICH	ColorGauge_NanoTarget30	KHD00062165	627	6 June, 1968
<i>Carex planispicata</i>	KNK	ColorGauge_NanoTarget30	3 1973 000010650	2869	4 May, 1991
<i>Carex planispicata</i>	UARK	ColorGauge_NanoTarget30	UARK 064754	5426	18 May, 1993
<i>Carex planostachys</i>	TENN	ColorGauge_NanoTarget30	TEX00293291	10825	21 April, 2002
<i>Carex planostachys</i>	TEX	ColorGauge_NanoTarget30	TENN-V-0056614	10305	10 March, 1990
<i>Carex plantaginea</i>	KNK	ColorGauge_NanoTarget30	UWSP-V-0006804	Not provided	20 April, 1975
<i>Carex plantaginea</i>	UWSP	ColorGauge_NanoTarget30	3 1973 000010617	17133	10 April, 1981
<i>Carex platyphylla</i>	GA	Kodak_ColorControlPatches	TENN-V-0056647	94-171	10 May, 1994
<i>Carex platyphylla</i>	TENN	ColorGauge_NanoTarget30	GA114498	11486	16 May, 1978
<i>Carex pluriflora</i>	COLO	ColorGauge_NanoTarget30	COLO01052869	6003	17 July, 1951
<i>Carex pluriflora</i>	F	ColorGauge_NanoTarget30	1906278	Not provided	26 June, 1962
<i>Carex podocarpa</i>	COLO	ColorGauge_NanoTarget30	COLO01053354	1761	9 August, 1956
<i>Carex podocarpa</i>	COLO	ColorGauge_NanoTarget30	COLO01053271	82-8	6 July, 1982

<i>Carex polymorpha</i>	LYN	ColorGauge_NanoTarget30	LYN-0011837	8039	31 May, 1993
<i>Carex polymorpha</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0056672	Not provided	9 July, 1909
<i>Carex praeceptorum</i>	KHD	Kodak_ColorControlPatches	KHD00003095	5329	25 August, 1988
<i>Carex praeceptorum</i>	UTC	ColorChecker_Chart24	UTC00216233	24552	22 July, 1994
<i>Carex praegracilis</i>	MIN	ColorGauge_NanoTarget30	MIN1014880	1294	23 June, 1982
<i>Carex praegracilis</i>	WIS	ColorGauge_NanoTarget30	v 0214155 WIS	679b	5 August, 2002
<i>Carex prairea</i>	MIN	ColorGauge_NanoTarget30	MIN1014999	4910	7 June, 1994
<i>Carex prairea</i>	MIN	ColorGauge_NanoTarget30	MIN1015027	469	12 June, 1978
<i>Carex prasina</i>	BEREA	ColorGauge_NanoTarget30	TENN-V-0050277	88-427	20 May, 1988
<i>Carex prasina</i>	TENN	ColorGauge_NanoTarget30	BEREA003740	Not provided	27 May, 1983
<i>Carex praticola</i>	IND	ColorGauge_NanoTarget30	IND-0136830	160627f3	27 June, 2016
<i>Carex praticola</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0056694	94-610	22 June, 1994
<i>Carex preslii</i>	MICH	ColorGauge_NanoTarget30	0061822MOR	26372A	29 July, 2013
<i>Carex preslii</i>	MOR	ColorGauge_NanoTarget30	MICH1264012	24657A	3 September, 2009
<i>Carex projecta</i>	CAN	Kodak_ColorControlPatches	MDKY00003045	10412	13 July, 1965
<i>Carex projecta</i>	MDKY	ColorGauge_NanoTarget30	CAN302351	5430	14 June, 1991
<i>Carex proposita</i>	DAO	ColorGauge_NanoTarget30	MICH1384205	27928	18 July, 1951
<i>Carex proposita</i>	MICH	ColorGauge_NanoTarget30	01-01001119736	13996	28 July, 1937
<i>Carex pseudocyperus</i>	MT	ColorGauge_NanoTarget30	MT00187960	3325	25 July, 2012
<i>Carex pseudocyperus</i>	WIN	ColorChecker_Chart24	WIN75083	Not provided	17 July, 2009
<i>Carex purpurifera</i>	BEREA	ColorGauge_NanoTarget30	BEREA003761	AF-38	3 June, 1997
<i>Carex purpurifera</i>	BEREA	ColorGauge_NanoTarget30	BEREA003764	275	2 May, 1995
<i>Carex pyrenaica</i>	ASC	ColorChecker_Chart24	0072755MOR	27289A	31 July, 2007
<i>Carex pyrenaica</i>	MOR	ColorGauge_NanoTarget30	ASC00089780	11114	16 August, 1986
<i>Carex radiata</i>	MIN	ColorGauge_NanoTarget30	MIN1015279	2033	1 June, 1991
<i>Carex radiata</i>	MOAR	ColorGauge_NanoTarget30	MOAR0019178	Not provided	21 May, 2004
<i>Carex ramenskii</i>	ALA	ColorChecker_Chart24	H1137103	12554	20 July, 1997
<i>Carex ramenskii</i>	ALA	ColorChecker_Chart24	H1137088	10882	31 July, 2001
<i>Carex rariflora</i>	MICH	ColorGauge_NanoTarget30	MICH1564023	05-0944	25 July, 2005
<i>Carex rariflora</i>	MICH	ColorGauge_NanoTarget30	MICH1450437	26455	s.n.
<i>Carex raynoldsii</i>	KHD	ColorGauge_NanoTarget30	KHD00029598	9100	17 July, 2011
<i>Carex raynoldsii</i>	MOR	ColorGauge_NanoTarget30	0073754MOR	20690	11 June, 1991
<i>Carex recta</i>	MICH	ColorGauge_NanoTarget30	MICH1384652	J76-14-1	12 August, 1976
<i>Carex recta</i>	MICH	ColorGauge_NanoTarget30	MICH1384668	J79-168	14 July, 1979
<i>Carex reniformis</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0050412	2490	8 May, 1987
<i>Carex reniformis</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0056875	159,138	25 April, 1999
<i>Carex retroflexa</i>	TENN	ColorGauge_NanoTarget30	TEX00442210	99-133	11 May, 1999
<i>Carex retroflexa</i>	TEX	ColorGauge_NanoTarget30	TENN-V-0050442	3644	28 March, 2006
<i>Carex retrorsa</i>	WIN	ColorChecker_Chart24	WIN33446	260	10 June, 1977
<i>Carex retrorsa</i>	WIN	ColorChecker_Chart24	WIN30194	3613	31 July, 1973
<i>Carex reznicekii</i>	EKY	ColorGauge_NanoTarget30	3 1234 10006472 2	3749	11 April, 2010
<i>Carex reznicekii</i>	VPI	ColorChecker_Chart24	VPI-V-0008135	12525	23 March, 2012
<i>Carex richardsonii</i>	MIN	ColorGauge_NanoTarget30	MIN1015527	18700	22 May, 1998
<i>Carex richardsonii</i>	MIN	ColorGauge_NanoTarget30	MIN1015531	89001	23 May, 1989

<i>Carex roanensis</i>	DAO	ColorGauge_NanoTarget30	01-01001119727	3796	21 July, 2011
<i>Carex roanensis</i>	MICH	ColorGauge_NanoTarget30	MICH1385092	Not provided	26 May, 1996
<i>Carex rosea</i>	ILLS	ColorGauge_NanoTarget30	v 0186837 WIS	5649	17 June, 2015
<i>Carex rosea</i>	WIS	ColorGauge_NanoTarget30	ILLS00088915	38	30 May, 1986
<i>Carex rossii</i>	MOR	ColorGauge_NanoTarget30	0086410MOR	3707B	17 July, 1977
<i>Carex rossii</i>	MOR	ColorGauge_NanoTarget30	0073861MOR	1772	16 July, 1998
<i>Carex rostrata</i>	WIN	ColorChecker_Chart24	WIN39677	83-480	24 July, 1983
<i>Carex rostrata</i>	WIN	ColorChecker_Chart24	WIN64097	Not provided	August, 1961
<i>Carex rotundata</i>	MIN	ColorGauge_NanoTarget30	MIN1015831	Not provided	June-June, 1995
<i>Carex rotundata</i>	WIN	ColorChecker_Chart24	WIN77128	07-724	26 July, 2007
<i>Carex rupestris</i>	MICH	ColorGauge_NanoTarget30	MICH1385541	Not provided	24 July, 1921
<i>Carex rupestris</i>	WIS	ColorGauge_NanoTarget30	v 0284916 WIS	Not provided	1 July, 1984
<i>Carex ruthii</i>	GA	Kodak_ColorControlPatches	MICH1385587	Not provided	June, 1999
<i>Carex ruthii</i>	MICH	ColorGauge_NanoTarget30	GA12956	1635	26 May, 1987
<i>Carex sabulosa</i>	CAN	Kodak_ColorControlPatches	COLO01062793	67-129(B)	21 June, 1967
<i>Carex sabulosa</i>	COLO	ColorGauge_NanoTarget30	CAN316743	7713	2 July, 1968
<i>Carex salina</i>	MICH	ColorGauge_NanoTarget30	MU-V-000173489	J79-71-3	30 June, 1979
<i>Carex salina</i>	MU	ColorGauge_NanoTarget30	MICH1385611	17816	10 July, 1974
<i>Carex sartwelliana</i>	MICH	ColorGauge_NanoTarget30	MICH1385630	7879	6 July, 2003
<i>Carex sartwelliana</i>	MICH	ColorGauge_NanoTarget30	MICH1430603	25299	6 August, 2010
<i>Carex sartwellii</i>	MOR	ColorGauge_NanoTarget30	0074287MOR	214	18 June, 1989
<i>Carex sartwellii</i>	MOR	ColorGauge_NanoTarget30	0021657MOR	22539	9 June, 1995
<i>Carex saxatilis</i>	MICH	ColorGauge_NanoTarget30	MICH1385785	Not provided	21 August, 1998
<i>Carex saxatilis</i>	WIN	ColorChecker_Chart24	WIN77127	08-574	4 August, 2008
<i>Carex saximontana</i>	MIN	ColorGauge_NanoTarget30	MIN1016002	4073	27 June, 1979
<i>Carex saximontana</i>	MIN	ColorGauge_NanoTarget30	MIN1016006	4383	17 July, 1979
<i>Carex scabrata</i>	MUHW	ColorGauge_NanoTarget30	MUHW028888	707	27 June, 1903
<i>Carex scabrata</i>	WIS	ColorGauge_NanoTarget30	v 0212824 WIS	9362	7 July, 1980
<i>Carex scabriuscula</i>	MICH	ColorGauge_NanoTarget30	MICH1005730A	24536	18 June, 2009
<i>Carex scabriuscula</i>	MICH	ColorGauge_NanoTarget30	MICH1835961	925	14 August, 1987
<i>Carex scabriuscula</i>	MICH	ColorGauge_NanoTarget30	MICH1430626	8789	4 July, 2006
<i>Carex schottii</i>	MICH	ColorGauge_NanoTarget30	MICH1385970	38346	2 July, 1969
<i>Carex schottii</i>	MSC	ColorGauge_NanoTarget30	MSC0197548	7691558	15 September, 1976
<i>Carex schweinitzii</i>	Harvard	ColorGauge_NanoTarget30	MICH1327618	2022	23 June, 1983
<i>Carex schweinitzii</i>	MICH	ColorGauge_NanoTarget30	717271	1876	4 June, 1987
<i>Carex scirpoidea scirpoidea</i>	MICH	ColorGauge_NanoTarget30	MICH1386093	2924	12 July, 1948
<i>Carex scirpoidea scirpoidea</i>	MICH	ColorGauge_NanoTarget30	MICH1386150	6316	13 July, 1980
<i>Carex scoparia scoparia</i>	MIN	ColorGauge_NanoTarget30	MIN1016163	3997	4 July, 2000
<i>Carex scoparia scoparia</i>	MOR	ColorGauge_NanoTarget30	0084097MOR	24543	21 June, 2009
<i>Carex scopulorum scopulorum</i>	MOR	ColorGauge_NanoTarget30	0074200MOR	30538	7 August, 1995
<i>Carex scopulorum scopulorum</i>	MOR	ColorGauge_NanoTarget30	0073306MOR	41429	22 July, 2005
<i>Carex senta</i>	DES	ColorChecker_Chart24	DES00050030	8963	2 May, 1992
<i>Carex senta</i>	UT	ColorChecker_Chart24	UT0018360	Not provided	8 May, 1969
<i>Carex seorsa</i>	MICH	ColorGauge_NanoTarget30	VSC0044042	JKB:1999:029	20 May, 1999

<i>Carex seorsa</i>	VSC	Kodak_ColorControlPatches	MICH1386657	10831	1 May, 2005
<i>Carex serpenticola</i>	MICH	ColorGauge_NanoTarget30	MICH1386701	608	26 June, 1993
<i>Carex serpenticola</i>	MICH	ColorGauge_NanoTarget30	MICH1386702	11975	21 April, 1993
<i>Carex serratodens</i>	MICH	ColorGauge_NanoTarget30	MICH1564085	8499	22 June, 1964
<i>Carex serratodens</i>	MICH	ColorGauge_NanoTarget30	MICH1386709	3189	2 August, 2011
<i>Carex sheldonii</i>	MICH	ColorGauge_NanoTarget30	MICH1386723	6261	29 July, 1993
<i>Carex sheldonii</i>	MICH	ColorGauge_NanoTarget30	MICH1386730	3117	5 June, 2003
<i>Carex shinersii</i>	MOR	ColorGauge_NanoTarget30	0057390MOR	4882	31 May, 2009
<i>Carex shinersii</i>	TEX	ColorGauge_NanoTarget30	TEX00339083	10373	3 May, 1997
<i>Carex shortiana</i>	IND	ColorGauge_NanoTarget30	IND-0221566	31050	8 June, 1920
<i>Carex shortiana</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0057384	89814	5 July, 1989
<i>Carex siccata</i>	DBG:KHD	Kodak_ColorControlPatches	MIN1016257	9018	17 July, 2009
<i>Carex siccata</i>	MIN	ColorGauge_NanoTarget30	KHD00026573	3459	2 July, 1978
<i>Carex silicea</i>	KHD	Kodak_ColorControlPatches	KHD00003131	7816	10 June, 1936
<i>Carex silicea</i>	MICH	ColorGauge_NanoTarget30	MICH1450088	12217	30 June, 2013
<i>Carex simulata</i>	CAN	Kodak_ColorControlPatches	v 0214183 WIS	14964	6 September, 1945
<i>Carex simulata</i>	WIS	ColorGauge_NanoTarget30	CAN296870	709	9 August, 2002
<i>Carex socialis</i>	MISS	Kodak_ColorControlPatches	TENN-V-0050690	1488-1-1025	18 April, 2010
<i>Carex socialis</i>	TENN	ColorGauge_NanoTarget30	MISS 0072346	80394	10 May, 1992
<i>Carex sparganioides</i>	BHO	ColorGauge_NanoTarget30	BHO0004435	616	24 May, 2001
<i>Carex sparganioides</i>	MOR	ColorGauge_NanoTarget30	0021841MOR	9911	12 June, 1990
<i>Carex specifica</i>	MOR	ColorGauge_NanoTarget30	0062884MOR	9875	26 July, 2009
<i>Carex specifica</i>	MOR	ColorGauge_NanoTarget30	0061842MOR	8223	30 July, 2004
<i>Carex spectabilis</i>	IND	ColorGauge_NanoTarget30	IND-0021665	1031	14 August, 1973
<i>Carex spectabilis</i>	UT	ColorChecker_Chart24	UT0017940	12429	22 July, 1948
<i>Carex specuicola</i>	NAVA	ColorGauge_NanoTarget30	NAVA00012030	01-455	24 May, 2001
<i>Carex specuicola</i>	NAVA	ColorGauge_NanoTarget30	NAVA00007873	13242	12 June, 2015
<i>Carex spissa</i>	ARIZ	ColorChecker_Chart12	ARIZ431974	887	8 April, 2017
<i>Carex spissa</i>	DES	ColorChecker_Chart24	DES00049845	8395	25 May, 1991
<i>Carex sprengelii</i>	MIN	ColorGauge_NanoTarget30	MIN1016481	5451	28 June, 2007
<i>Carex sprengelii</i>	WIS	ColorGauge_NanoTarget30	v 0229668 WIS	14568	12 May, 2007
<i>Carex squarrosa</i>	ILLS	ColorGauge_NanoTarget30	NY01095344	330001	16 May, 2001
<i>Carex squarrosa</i>	NY	ColorChecker_Chart24	ILLS00070513	27439	25 May, 2010
<i>Carex stenoptila</i>	IND	ColorGauge_NanoTarget30	IND-0124978	597	14 August, 1986
<i>Carex stenoptila</i>	KHD	Kodak_ColorControlPatches	KHD00059515	9748	17 July, 2013
<i>Carex sterilis</i>	MU	ColorGauge_NanoTarget30	MU-V-000173822	1994:36:00	27 May, 1994
<i>Carex sterilis</i>	MU	ColorGauge_NanoTarget30	MU-V-000173821	1994:28:00	27 May, 1994
<i>Carex stevenii</i>	MICH	ColorGauge_NanoTarget30	MICH1398863	712	5 July, 1987
<i>Carex stevenii</i>	MICH	ColorGauge_NanoTarget30	MICH1564103	9302	26 June, 2012
<i>Carex stipata stipata</i>	MIN	ColorGauge_NanoTarget30	MIN1016714	24450	21 June, 1994
<i>Carex stipata stipata</i>	MOAR	ColorGauge_NanoTarget30	MOAR0019323	Not provided	12 June, 2015
<i>Carex straminea</i>	IND	ColorGauge_NanoTarget30	IND-0123939	10837	6 June, 1999
<i>Carex straminea</i>	IND	ColorGauge_NanoTarget30	IND-0150584	3038	23 June, 1993
<i>Carex straminiformis</i>	MOR	ColorGauge_NanoTarget30	0062879MOR	20754	11 August, 2009

<i>Carex stramineiformis</i>	MOR	ColorGauge_NanoTarget30	0056553MOR	9140	29 July, 2007
<i>Carex striata</i>	MICH	ColorGauge_NanoTarget30	MICH1387969	84530	21 April, 1993
<i>Carex striatula</i>	MICH	ColorGauge_NanoTarget30	VPI-V-0025826	7950	8 April, 1998
<i>Carex striatula</i>	VPI	ColorChecker_Chart12	MICH1387989	3598	21 June, 2006
<i>Carex stricta</i>	MIN	ColorGauge_NanoTarget30	MIN1017013	Not provided	9 June, 1973
<i>Carex stricta</i>	MOAR	ColorGauge_NanoTarget30	MOAR0019347	Not provided	25 June, 2010
<i>Carex styloflexa</i>	GA	Kodak_ColorControlPatches	GA115188	57323	17 March, 1976
<i>Carex styloflexa</i>	MOAR	ColorGauge_NanoTarget30	MOAR0019372	Not provided	21 May, 2010
<i>Carex stylosa</i>	MICH	ColorGauge_NanoTarget30	MICH1388535	18963	17 July, 1996
<i>Carex stylosa</i>	MICH	ColorGauge_NanoTarget30	MICH1388536	LKI011-15	12 August, 2006
<i>Carex subbracteata</i>	MOR	ColorGauge_NanoTarget30	0062890MOR	358	28 May, 1999
<i>Carex subbracteata</i>	MOR	ColorGauge_NanoTarget30	0061848MOR	24500	16 June, 2009
<i>Carex suberecta</i>	MICH	ColorGauge_NanoTarget30	MICH1388583	10188	20 May, 1999
<i>Carex suberecta</i>	MICH	ColorGauge_NanoTarget30	MICH1388615	22 and 659	30 June, 1983
<i>Carex subfusca</i>	MICH	ColorGauge_NanoTarget30	0063836MOR	10486	22 July, 2004
<i>Carex subfusca</i>	MOR	ColorGauge_NanoTarget30	MICH1388713	7145	10 June, 2001
<i>Carex subnigricans</i>	KHD	Kodak_ColorControlPatches	KHD00023025	4308	5 August, 2008
<i>Carex subnigricans</i>	MICH	ColorGauge_NanoTarget30	MICH1450877	26051	8 August, 2012
<i>Carex subspathacea</i>	MICH	ColorGauge_NanoTarget30	MICH1201211	11519	30 July, 2003
<i>Carex subspathacea</i>	MICH	ColorGauge_NanoTarget30	MICH1564116	10-252	11 July, 2010
<i>Carex superata</i>	MICH	ColorGauge_NanoTarget30	MICH1388831	8413	25 April, 2000
<i>Carex superata</i>	MICH	ColorGauge_NanoTarget30	MICH1388843	11617	15 May, 1992
<i>Carex supina spaniocarpa</i>	BOON	Kodak_ColorControlPatches	BOON006744	10-062	14 June, 2010
<i>Carex supina spaniocarpa</i>	MICH	ColorGauge_NanoTarget30	MICH1449708	G.B.U. 78-7	14 July, 1978
<i>Carex swanii</i>	PRR	ColorGauge_NanoTarget30	PRR000948	7308	10 May, 2012
<i>Carex swanii</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0057819	7786	31 May, 2005
<i>Carex synchnocephala</i>	CAN	Kodak_ColorControlPatches	CAN437472	11277	18 July, 1967
<i>Carex synchnocephala</i>	CAN	Kodak_ColorControlPatches	CAN245105	13424	23 August, 1956
<i>Carex tahoensis</i>	KHD	Kodak_ColorControlPatches	KHD00024371	70-32	8 July, 1970
<i>Carex tahoensis</i>	KHD	Kodak_ColorControlPatches	KHD00002987	9554	25 July, 2012
<i>Carex tenax</i>	IBE	Kodak_ColorControlPatches	IBE000444	3044	20 April, 1962
<i>Carex tenax</i>	VSC	Kodak_ColorControlPatches	VSC0043741	55816	24 May, 1975
<i>Carex tenera tenera</i>	MOR	ColorGauge_NanoTarget30	WIN69130	3179	9 July, 2008
<i>Carex tenera tenera</i>	WIN	ColorChecker_Chart24	0057213MOR	258	20 June, 2002
<i>Carex tenuiflora</i>	MIN	ColorGauge_NanoTarget30	MIN1017288	2249	10 June, 1997
<i>Carex tenuiflora</i>	MIN	ColorGauge_NanoTarget30	MIN1017334	4539	25 June, 2002
<i>Carex tetanica</i>	MICH	ColorGauge_NanoTarget30	MICH1450836	50	6 June, 2002
<i>Carex tetanica</i>	MIN	ColorGauge_NanoTarget30	MIN1017366	15265	3 June, 1989
<i>Carex tetrastachya</i>	TEX	ColorGauge_NanoTarget30	TEX00453736	5881	7 May, 2008
<i>Carex tetrastachya</i>	TEX	ColorGauge_NanoTarget30	TEX00453892	27880	19 May, 2009
<i>Carex texensis</i>	LSU	Kodak_ColorControlPatches	LSU00124438	7335	13 April, 2010
<i>Carex texensis</i>	MU	ColorGauge_NanoTarget30	MU-V-000095206	14631	10 May, 2010
<i>Carex thornei</i>	EKY	ColorGauge_NanoTarget30	NY00622234	93693	23 Mar, 2003
<i>Carex thornei</i>	NY	ColorChecker_Chart24	3 1234 10006769 1	5214	3 May, 1996

<i>Carex thurberi</i>	MICH	ColorGauge_NanoTarget30	MICH1564145	3105	18 June, 2011
<i>Carex timida</i>	MICH	ColorGauge_NanoTarget30	MICH1389612	7232	23 May, 1998
<i>Carex timida</i>	MICH	ColorGauge_NanoTarget30	MICH1389629	7343	19 April, 1997
<i>Carex tinctoria</i>	IND	ColorGauge_NanoTarget30	IND-0150757	Not provided	25 June, 1905
<i>Carex tinctoria</i>	IND	ColorGauge_NanoTarget30	IND-0022078	9639	11 July, 1993
<i>Carex tompkinsii</i>	MICH	ColorGauge_NanoTarget30	MICH1389656	7874	6 July, 2003
<i>Carex tompkinsii</i>	MICH	ColorGauge_NanoTarget30	MICH1389659	48696	24 April, 1972
<i>Carex tonsa</i>	MICH	ColorGauge_NanoTarget30	MICH1450052	5118	24 May, 2006
<i>Carex tonsa</i>	MICH	ColorGauge_NanoTarget30	MICH1564150	7022	11 June, 2014
<i>Carex torreyi</i>	MIN	ColorGauge_NanoTarget30	MIN1118426	2695	29 May, 1964
<i>Carex torreyi</i>	MIN	ColorGauge_NanoTarget30	MIN1118427	32442	5 June, 2011
<i>Carex torta</i>	IND	ColorGauge_NanoTarget30	IND-0049686	4994	23 May, 2016
<i>Carex torta</i>	MARY	ColorGauge_NanoTarget30	MARY1015401	7723	8 June, 1997
<i>Carex triangularis</i>	IBE	Kodak_ColorControlPatches	UARK 065076	8421	17 April, 1995
<i>Carex triangularis</i>	UARK	ColorGauge_NanoTarget30	IBE000471	7468	18 May, 1997
<i>Carex tribuloides tribuloides</i>	MICH	ColorGauge_NanoTarget30	PRR000954	30405	30 June, 1992
<i>Carex tribuloides tribuloides</i>	USFWS:PRR	ColorGauge_NanoTarget30	MICH1390133	7349	23 May, 2012
<i>Carex trichocarpa</i>	ILLS	ColorGauge_NanoTarget30	ILLS00026442	18888	23 May, 1991
<i>Carex trichocarpa</i>	ILLS	ColorGauge_NanoTarget30	ILLS00026445	3276	9 June, 2005
<i>Carex triquetra</i>	MICH	ColorGauge_NanoTarget30	MICH1390312	8060	8 May, 2004
<i>Carex triquetra</i>	MICH	ColorGauge_NanoTarget30	MICH1390316	7311	12 May, 1993
<i>Carex trisperma</i>	MICH	ColorGauge_NanoTarget30	MIN1017538	8220	4 June, 1999
<i>Carex trisperma</i>	MIN	ColorGauge_NanoTarget30	MICH1390323	5667	26 July, 1983
<i>Carex tuckermanii</i>	Harvard	ColorGauge_NanoTarget30	1060465	2460	4 August, 1989
<i>Carex tuckermanii</i>	Harvard	ColorGauge_NanoTarget30	1060488	1183	18 July, 1939
<i>Carex tumulicola</i>	MICH	ColorGauge_NanoTarget30	MICH1430742	24506	17 June, 2009
<i>Carex tumulicola</i>	MU	ColorGauge_NanoTarget30	MU-V-000132857	11.249E	13 May, 2011
<i>Carex turbinata</i>	ARIZ	ColorChecker_Chart24	ARIZ427037	13	7 August, 2012
<i>Carex turbinata</i>	MICH	ColorGauge_NanoTarget30	MICH1564184	3167	1 August, 2011
<i>Carex turgescens</i>	FLAS	ColorGauge_NanoTarget30	TENN-V-0058153	21374	3 April, 1993
<i>Carex turgescens</i>	TENN	ColorGauge_NanoTarget30	FLAS195402	19963	14 April, 2004
<i>Carex typhina</i>	PRR	ColorGauge_NanoTarget30	WINU0001398	6546	24 May, 2011
<i>Carex typhina</i>	WINU	ColorGauge_NanoTarget30	PRR000867	1627	28 June, 2001
<i>Carex umbellata</i>	MISSA	Kodak_ColorControlPatches	MISSA009704	29	19 March, 2004
<i>Carex umbellata</i>	MU	ColorGauge_NanoTarget30	MU-V-000048000	10790	30 April, 2005
<i>Carex unilateralis</i>	MICH	ColorGauge_NanoTarget30	MICH1390845	6060	2 July, 1993
<i>Carex unilateralis</i>	MICH	ColorGauge_NanoTarget30	MICH1390840	2236	15 June, 1980
<i>Carex ursina</i>	MICH	ColorGauge_NanoTarget30	MICH1390864	1327	15 July, 1948
<i>Carex ursina</i>	MICH	ColorGauge_NanoTarget30	MICH1390865	423	25-27 July, 1947
<i>Carex utriculata</i>	WIN	ColorChecker_Chart24	WIN77172	08-572	4 August, 2008
<i>Carex utriculata</i>	WIN	ColorChecker_Chart24	WIN42509	85-716	22 July, 1985
<i>Carex vacillans</i>	ILLS	ColorGauge_NanoTarget30	ILLS00070774	30487	18 June, 1998
<i>Carex vacillans</i>	MU	ColorGauge_NanoTarget30	MU-V-000174456	30487	18 June, 1998
<i>Carex vaginata</i>	MICH	ColorGauge_NanoTarget30	MICH1484665	919	18 June, 2013

<i>Carex vaginata</i>	MIN	ColorGauge_NanoTarget30	MIN1018050	3965	12 June, 2000
<i>Carex vallicola</i>	MICH	ColorGauge_NanoTarget30	0066982MOR	3562	23 July, 2011
<i>Carex vallicola</i>	MOR	ColorGauge_NanoTarget30	MICH1450759	218	21 May, 2007
<i>Carex venusta</i>	DOV	ColorGauge_NanoTarget30	DOV0044408	1422	1 July, 2005
<i>Carex venusta</i>	MICH	ColorGauge_NanoTarget30	MICH1391327	20097	30 April, 2004
<i>Carex verrucosa</i>	FLAS	Kodak_ColorControlPatches	FLAS223956	3092	24 April, 2008
<i>Carex verrucosa</i>	VSC	Kodak_ColorControlPatches	VSC0043837	16445	7 April, 2006
<i>Carex vesicaria</i>	WIN	ColorChecker_Chart24	WIN54943	93/235	22 June, 1993
<i>Carex vesicaria</i>	WIN	ColorChecker_Chart24	WIN55016	93/401	11 July, 1993
<i>Carex vestita</i>	KHD	Kodak_ColorControlPatches	KHD00009824	7173	23 June, 1963
<i>Carex vestita</i>	MICH	ColorGauge_NanoTarget30	MICH1283328	11680	29 June, 2005
<i>Carex vexans</i>	FLAS	Kodak_ColorControlPatches	FLAS107276	10642	1 March, 1969
<i>Carex vexans</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0058281	90-137	6 April, 1990
<i>Carex virescens</i>	MOAR	ColorGauge_NanoTarget30	PRR000947	Not provided	19 May, 2000
<i>Carex virescens</i>	PRR	ColorGauge_NanoTarget30	MOAR0018501	7309	10 May, 2012
<i>Carex viridistellata</i>	MICH	ColorGauge_NanoTarget30	MICH1332776	11357	9 July, 2002
<i>Carex viridistellata</i>	MICH	ColorGauge_NanoTarget30	MICH1216003	1097	10 August, 2009
<i>Carex viridula oedocarpa</i>	MT	ColorGauge_NanoTarget30	MT00241549	Not provided	1-Jul
<i>Carex viridula oedocarpa</i>	MT	ColorGauge_NanoTarget30	MT00241553	4306	30 July, 1957
<i>Carex vulpinoidea</i>	KHD	Kodak_ColorControlPatches	KHD00027187	3176	11 June, 2010
<i>Carex vulpinoidea</i>	PRR	ColorGauge_NanoTarget30	PRR003745	7986	28 June, 2013
<i>Carex whitneyi</i>	IND	ColorGauge_NanoTarget30	IND-0022544	12227	21 July, 1935
<i>Carex whitneyi</i>	IND	ColorGauge_NanoTarget30	IND-0022545	11715	26 July, 1935
<i>Carex wiegandii</i>	MU	ColorGauge_NanoTarget30	MU-V-000174705	74-264	18 July, 1974
<i>Carex wiegandii</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0058466	88-388	28 June, 1988
<i>Carex willdenowii</i>	MICH	ColorGauge_NanoTarget30	MICH1392130	3153	29 May, 1993
<i>Carex willdenowii</i>	MICH	ColorGauge_NanoTarget30	MICH1392124	2608	15 June, 1990
<i>Carex williamsii</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0058474	Not provided	26 June, 1959
<i>Carex williamsii</i>	TENN	ColorGauge_NanoTarget30	TENN-V-0058472	Not provided	12 July, 1959
<i>Carex woodii</i>	MIN	ColorGauge_NanoTarget30	v 0254724 WIS	MDL914	22 May, 1995
<i>Carex woodii</i>	WIS	ColorGauge_NanoTarget30	MIN1018500	14623	2 June, 2007
<i>Carex wootonii</i>	MOR	ColorGauge_NanoTarget30	0085866MOR	2156	20 July, 2002
<i>Carex wootonii</i>	MOR	ColorGauge_NanoTarget30	0077839MOR	4084	3 August, 2013
<i>Carex xerantica</i>	MOR	ColorGauge_NanoTarget30	UT0017650	8427	8 July, 1978
<i>Carex xerantica</i>	UT:Botany	ColorChecker_Chart24	0066980MOR	5374	17 August, 1982

Table A2.2 All *Carex* specimen images selected for use in the intraspecific analysis. The herbarium labels follow Thiers (continuously updated).

Image	Latitude	Longitude	Herbarium	Calibration Target	Accession Number	Collection Number	Collection Date
Carex_aquaticus_1	43.558334	-86.500653	ALBC	Kodak_ColorControlPatches	ALBC009584	91-100	31 May, 1991
Carex_aquaticus_2	39.860333	-86.023222	BUT	ColorGauge_NanoTarget30	BUT0000851	2127	16 May, 2006
Carex_aquaticus_3	56.53144	-61.70791	BUT	ColorGauge_NanoTarget30	BUT0004335	7465	16 August, 1937
Carex_aquaticus_4	45.505409	-84.760037	CALVIN	Kodak_ColorControlPatches	CALVIN004056	381	Not provided
Carex_aquaticus_5	79.033333	-81.833333	CAN	Kodak_ColorControlPatches	CAN10021972	24	17 July, 1987
Carex_aquaticus_6	60.6	-99.803056	CAN	Kodak_ColorControlPatches	CAN10020312	2316	16 July, 1947
Carex_aquaticus_7	68.25	-135	CAN	Kodak_ColorControlPatches	CAN10020328	626	10 August, 1951
Carex_aquaticus_8	69.433333	-132.933333	CAN	Kodak_ColorControlPatches	CAN10020399	Not provided	5 August, 1971
Carex_aquaticus_9	62.248049	-139.803538	CAN	Kodak_ColorControlPatches	CAN10020422	109	13 June, 1962
Carex_aquaticus_10	57.38333333	-101.9666667	CAN	Kodak_ColorControlPatches	CAN10020537	2390	9 August, 1981
Carex_aquaticus_11	48.83585	-64.504828	CAN	Kodak_ColorControlPatches	CAN10020497	20386	1 August, 1882
Carex_aquaticus_12	60.08333333	-128.7166667	CAN	Kodak_ColorControlPatches	CAN10020456	10935	1 August, 1943
Carex_aquaticus_13	68.59277778	-110.3066667	CAN	Kodak_ColorControlPatches	CAN10000428	8190	21 July, 2008
Carex_aquaticus_14	69.13333333	-105.1666667	CAN	Kodak_ColorControlPatches	CAN10000423	1108	22 July, 1997
Carex_aquaticus_15	81.416667	-76.916667	CAN	Kodak_ColorControlPatches	CAN10022061	10354	31 July, 1990
Carex_aquaticus_16	70	-129	CAN	Kodak_ColorControlPatches	CAN10022252	2844; 2718	7-15 August, 1927
Carex_aquaticus_17	68.833333	-68.5	CAN	Kodak_ColorControlPatches	CAN10021921	1213	21 July, 1967
Carex_aquaticus_18	55.15	-82.33333333	CAN	Kodak_ColorControlPatches	CAN10020509	Not provided	16 July, 1970
Carex_aquaticus_19	45.720809	-85.541932	CMC	ColorGauge_NanoTarget30	CMC00004992	Not provided	19 June, 1972
Carex_aquaticus_20	42.1247	-84.1668	CMC	Kodak_ColorControlPatches	CMC0019449	119	29 May, 2012
Carex_aquaticus_21	46.773889	-114.3775	DES	Kodak_ColorControlPatches	DES00058527	245	31 July, 2002
Carex_aquaticus_22	65.8	-168	DES	Kodak_ColorControlPatches	DES00022601	299	4 June, 2017
Carex_aquaticus_23	33.9995	-109.4959	DES	Kodak_ColorControlPatches	DES00018955	F15	5 August, 1979
Carex_aquaticus_24	36.370706	-112.146533	DES	ColorChecker_Chart24	DES00070420	9974	31 July, 2010
Carex_aquaticus_25	43.61777778	-114.8647222	ETSU	ColorGauge_NanoTarget30	ETSU001586	5048	18 July, 2002
Carex_aquaticus_26	37.93234	-79.032364	GMUF	ColorGauge_NanoTarget30	GMUF-0012548	11777	18 June, 1996
Carex_aquaticus_27	42.594672	-86.060942	HCHM	Kodak_ColorControlPatches	HCHM00505	12	5 June, 1974
Carex_aquaticus_28	65.81666667	-144.0333333	IBE	Kodak_ColorControlPatches	IBE027360	21814	17 July, 1978
Carex_aquaticus_29	50.41666667	-84.38333333	ILL	ColorGauge_NanoTarget30	ILL00111434	6495	22 July, 1956
Carex_aquaticus_30	40.28	-106.09	ILL	ColorGauge_NanoTarget30	ILL00111402	11289	9 August, 2004
Carex_aquaticus_31	44.95	-123.8166667	ILLS	ColorGauge_NanoTarget30	ILLS00068724	32807	3 August, 2000
Carex_aquaticus_32	45.489349	-121.821695	IND	ColorGauge_NanoTarget30	IND-0017807	11199	31 July, 1934
Carex_aquaticus_33	48.098624	-77.797066	IND	ColorGauge_NanoTarget30	IND-0017810	8046	25 June, 1918
Carex_aquaticus_34	46.720904	-79.098954	IND	ColorGauge_NanoTarget30	IND-0017809	8045	25 June, 1918
Carex_aquaticus_35	39.510442	-105.711451	KHD	Kodak_ColorControlPatches	KHD00024769	9055	24 June, 2011
Carex_aquaticus_36	39.430364	-105.846345	KHD	Kodak_ColorControlPatches	KHD00024723	9062	8 July, 2011
Carex_aquaticus_37	37.065831	-106.395518	KHD	Kodak_ColorControlPatches	KHD00029612	9347	16 July, 2012
Carex_aquaticus_38	36.91341667	-105.2611389	KHD	Kodak_ColorControlPatches	KHD00046049	6598	27 July, 2007
Carex_aquaticus_39	42.524177	-76.976656	LSU	Kodak_ColorControlPatches	LSU00068544	Not provided	Not provided
Carex_aquaticus_40	53.531341	-64.006524	LSU	Kodak_ColorControlPatches	LSU00068546	524	31 July, 1972
Carex_aquaticus_41	38.314475	-112.405896	MESA	ColorGauge_NanoTarget30	MESA05476	2433	28 June, 1984

Carex_aquaticus_42	55.3375	-160.5	MICH	ColorGauge_NanoTarget30	MICH1459160	SP05-107	10 July, 2005
Carex_aquaticus_43	60.5430414	-151.1518436	MICH	ColorGauge_NanoTarget30	MICH1450307	5945	8 July, 1951
Carex_aquaticus_44	41.74222222	-124.1619444	MICH	ColorGauge_NanoTarget30	MICH1361824	7935	29 July, 2003
Carex_aquaticus_45	38.6025	-119.8822222	MICH	ColorGauge_NanoTarget30	MICH1361565	8251	19 August, 2004
Carex_aquaticus_46	54.633333	-107.783333	MICH	ColorGauge_NanoTarget30	MICH1361786	11183	8 July, 1967
Carex_aquaticus_47	46.815645	-67.635994	MICH	ColorGauge_NanoTarget30	MICH1361740	2389	12 June, 1979
Carex_aquaticus_48	49.333333	-122.85	MICH	ColorGauge_NanoTarget30	MICH1361826	7383	23 May, 1987
Carex_aquaticus_49	57.383333	-122.8	MICH	ColorGauge_NanoTarget30	MICH1361647	11602	31 August, 1943
Carex_aquaticus_50	50.813244	-121.563139	MICH	ColorGauge_NanoTarget30	MICH1361799	341	12 July, 1938
Carex_aquaticus_51	58.516667	-124.566667	MICH	ColorGauge_NanoTarget30	MICH1361646	10645	18 July, 1943
Carex_aquaticus_52	49.717241	-57.860971	MICH	ColorGauge_NanoTarget30	MICH1361579	1499	18 August, 1985
Carex_aquaticus_53	47.628515	-59.266787	MICH	ColorGauge_NanoTarget30	MICH1361584	1456	12 August, 1985
Carex_aquaticus_54	42.866659	-122.158239	MICH	ColorGauge_NanoTarget30	MICH1361513	4124	3 August, 1990
Carex_aquaticus_55	43.05	-79.016667	MICH	ColorGauge_NanoTarget30	MICH1361525	Not provided	11-15 June, 1981
Carex_aquaticus_56	42.503228	-82.522393	MICH	ColorGauge_NanoTarget30	MICH1361526	6160	24 May, 1986
Carex_aquaticus_57	45.716667	-82.166667	MICH	ColorGauge_NanoTarget30	MICH1361719	9375	13 July, 1993
Carex_aquaticus_58	42.680953	-80.332141	MICH	ColorGauge_NanoTarget30	MICH1361729	BL2398	30 May, 1992
Carex_aquaticus_59	44.509176	-80.236225	MICH	ColorGauge_NanoTarget30	MICH1285425	1669	20 June, 1972
Carex_aquaticus_60	58.05	-75.066667	MICH	ColorGauge_NanoTarget30	MICH1361501	J82-301	5 August, 1982
Carex_aquaticus_61	49.484722	-67.509722	MICH	ColorGauge_NanoTarget30	MICH1361509	J79-213	26 July, 1979
Carex_aquaticus_62	49.859032	-63.968098	MICH	ColorGauge_NanoTarget30	MICH1361528	13133	18 August, 1991
Carex_aquaticus_63	50.616667	-73.733333	MICH	ColorGauge_NanoTarget30	MICH1361798	72	12 July, 1944
Carex_aquaticus_64	57.98333333	-75.08333333	MICH	ColorGauge_NanoTarget30	MICH1428396	J82-33	20 July, 1982
Carex_aquaticus_65	68.45	-52.95	MICH	ColorGauge_NanoTarget30	MICH1361841	Not provided	13 August, 1987
Carex_aquaticus_66	45.376922	-94.835116	MIN	ColorGauge_NanoTarget30	MIN1006742	68	15 July, 1982
Carex_aquaticus_67	56.342207	-76.44663	MIN	ColorGauge_NanoTarget30	MIN1276208	3706	5 August, 1909
Carex_aquaticus_68	68.78333333	-160	MIN	ColorGauge_NanoTarget30	MIN1276278	3965	12 July, 1950
Carex_aquaticus_69	62.215368	-75.682085	MIN	ColorGauge_NanoTarget30	MIN1276313	150b	26 July, 1939
Carex_aquaticus_70	47.754721	-90.330669	MIN	ColorGauge_NanoTarget30	MIN1006780	Not provided	29 June, 1891
Carex_aquaticus_71	45.1344444	-94.2919444	MIN	ColorGauge_NanoTarget30	MIN1006770	23018	21 July, 1993
Carex_aquaticus_72	55.908851	-87.366667	MIN	ColorGauge_NanoTarget30	MIN1276197	1548	20 August, 1952
Carex_aquaticus_73	51.370556	-55.598462	MIN	ColorGauge_NanoTarget30	MIN1276198	2743	7 August, 1951
Carex_aquaticus_74	49.6291144	-54.7610865	MIN	ColorGauge_NanoTarget30	MIN1276203	36	10 August, 1892
Carex_aquaticus_75	43.6086181	-73.0134749	MIN	ColorGauge_NanoTarget30	MIN1276219	Not provided	24 June, 1927
Carex_aquaticus_76	48.385724	-97.261159	MIN	ColorGauge_NanoTarget30	MIN1276227	1721	13 June, 1958
Carex_aquaticus_77	76.545655	-68.823282	MIN	ColorGauge_NanoTarget30	MIN1276235	Not provided	29 June, 1953
Carex_aquaticus_78	48.725344	-117.561651	MIN	ColorGauge_NanoTarget30	MIN1276240	426	6 August, 1902
Carex_aquaticus_79	59.138024	-110.420484	MIN	ColorGauge_NanoTarget30	MIN1276250	2606	5 September, 1932
Carex_aquaticus_80	77.4687117	-69.2606031	MIN	ColorGauge_NanoTarget30	MIN1276275	Not provided	31 July, 1953
Carex_aquaticus_81	52.611426	-103.934081	MIN	ColorGauge_NanoTarget30	MIN1276413	Not provided	20 July, 1928
Carex_aquaticus_82	49.833997	-125.059589	MIN	ColorGauge_NanoTarget30	MIN1276335	889	7 August, 1903
Carex_aquaticus_83	56.63333333	-121.55	MIN	ColorGauge_NanoTarget30	MIN1276234	27072	16 July, 1960
Carex_aquaticus_84	54.98333333	-66.68333333	MIN	ColorGauge_NanoTarget30	MIN1276321	3637	20 July, 1953
Carex_aquaticus_85	46.996816	-60.46423	MIN	ColorGauge_NanoTarget30	MIN1276202	Not provided	12 August, 1904

Carex_aquaticus_86	45.61713	-122.048859	MIN	ColorGauge_NanoTarget30	MIN1276333	Not provided	13 August, 1905
Carex_aquaticus_87	47.962071	-84.899587	MIN	ColorGauge_NanoTarget30	MIN1276310	693	20 July, 1938
Carex_aquaticus_88	44.462548	-109.597636	MOR	ColorGauge_NanoTarget30	0076438MOR	Not provided	5 July, 1983
Carex_aquaticus_89	33.399576	-108.58186	MOR	ColorGauge_NanoTarget30	0076479MOR	3980	11 July, 1977
Carex_aquaticus_90	48.016666	-122.816666	MOR	ColorGauge_NanoTarget30	0084096MOR	24547	22 June, 2009
Carex_aquaticus_91	44.4072	-115.2241	MOR	ColorGauge_NanoTarget30	0076361MOR	42061	25 July, 2007
Carex_aquaticus_92	36.86574	-111.586738	NO	Kodak_ColorControlPatches	NO0037273	77-4-3	22 May, 1977
Carex_aquaticus_93	49.083	-121.708	NYBG	ColorChecker_Chart24	NY00011076	33753	25 July, 1901
Carex_aquaticus_94	43.128291	-76.668071	PH	ColorGauge_NanoTarget30	PH00648200	7713	24 June, 1917
Carex_aquaticus_95	42.163596	-80.110245	PH	ColorGauge_NanoTarget30	PH00648201	Not provided	7 June, 1925
Carex_aquaticus_96	56.358935	-94.694453	TENN	ColorGauge_NanoTarget30	TENN-V-0051858	Not provided	10 August, 1984
Carex_aquaticus_97	42.350692	-72.590894	TENN	ColorGauge_NanoTarget30	TENN-V-0051906	85803	25 July, 1978
Carex_aquaticus_98	54.143254	-115.69359	TENN	ColorGauge_NanoTarget30	TENN-V-0051881	91-851	6 July, 1991
Carex_aquaticus_99	51.642675	-111.990821	TENN	ColorGauge_NanoTarget30	TENN-V-0051902	89-557	22 July, 1989
Carex_aquaticus_100	52.120426	-101.251347	TENN	ColorGauge_NanoTarget30	TENN-V-0051905	89-600	23 July, 1989
Carex_aquaticus_101	52.904449	-118.044054	TENN	ColorGauge_NanoTarget30	TENN-V-0051955	7811	26 July, 1941
Carex_aquaticus_102	43.8467135	-70.3938713	TENN	ColorGauge_NanoTarget30	TENN-V-0051904	94-	1 August, 1996
Carex_aquaticus_103	53.838078	-101.262213	TENN	ColorGauge_NanoTarget30	TENN-V-0051883	91-639	29 June, 1991
Carex_aquaticus_104	36.382132	-81.564988	TENN	ColorGauge_NanoTarget30	TENN-V-0051913	44055	24 June, 1961
Carex_aquaticus_105	35.91990777	-105.5783034	UNM	ColorGauge_NanoTarget30	UNM0088478	C2 206	July, 1982
Carex_aquaticus_106	36.80303699	-105.2177444	UNM	ColorGauge_NanoTarget30	UNM0088464	433	3 August, 2003
Carex_aquaticus_107	44.7281	-118.6225	UNM	ColorGauge_NanoTarget30	UNM0088482	10208	1 August, 2002
Carex_aquaticus_108	42.5995	-110.5795	UT	ColorChecker_Chart24	UT0000601	81-174	23 July, 1981
Carex_aquaticus_109	40.6764794	-110.9433302	UT	ColorChecker_Chart24	UT0016003	3871	17 August, 1928
Carex_aquaticus_110	40.591139	-111.605708	UT	Kodak_ColorControlPatches	UT0015989	15454	29 August, 1958
Carex_aquaticus_111	41.540013	-96.030994	UT	ColorChecker_Chart24	UT0017707	4555	11 May, 1968
Carex_aquaticus_112	64.16666667	-95.5	UWSP	Kodak_ColorControlPatches	UWSP-V-0003561	9232	9 August, 1973
Carex_aquaticus_113	51.6	-100.8	WIN	ColorChecker_Chart24	WIN47004	86241	19 June, 1986
Carex_aquaticus_114	49.33333333	-122.85	WIS	ColorGauge_NanoTarget30	v 0285484 WIS	7383	23 May, 1987
Carex_aquaticus_115	42.322699	-96.491706	WIS	ColorGauge_NanoTarget30	v 0286178 WIS	28344	10 June, 1952
Carex_aquaticus_116	42.54844	-100.623238	WIS	ColorGauge_NanoTarget30	v 0286179 WIS	481	15 July, 1936
Carex_brunnescens_1	44.5798095	-66.7620082	ALBC	Kodak_ColorControlPatches	ALBC002569	68-54	20 June, 1963
Carex_brunnescens_2	36.403056	-81.463333	BOON	Kodak_ColorControlPatches	BOON006318	05-653	11 June, 2005
Carex_brunnescens_3	34.4533879	-86.6401311	BRIT	ColorChecker_Chart24	BRIT161419	9727; 7315	13 April, 1997
Carex_brunnescens_4	63.155	-69.6975	CAN	Kodak_ColorControlPatches	CAN10000455	2232	8 July, 2012
Carex_brunnescens_5	35.568611	-83.706389	CONV	ColorGauge_NanoTarget30	CONV2005577	2417	3 June, 1936
Carex_brunnescens_6	54.218285	-129.903191	DAO	ColorGauge_NanoTarget30	01-01356927	13107	17 July, 1954
Carex_brunnescens_7	49.694835	-119.528359	DAO	ColorGauge_NanoTarget30	01-01356928	10247	9 July, 1953
Carex_brunnescens_8	57.36666667	-122.8166667	DAO	ColorGauge_NanoTarget30	01-01356929	27114	17 July, 1960
Carex_brunnescens_9	54.491906	-126.739981	DAO	ColorGauge_NanoTarget30	01-01356930	12567	12 July, 1954
Carex_brunnescens_10	49.357757	-119.907894	DAO	ColorGauge_NanoTarget30	01-01356931	11785	11 August, 1953
Carex_brunnescens_11	53.718081	-132.126177	DAO	ColorGauge_NanoTarget30	01-01356926	143	15 June, 1957
Carex_brunnescens_12	62.36666667	-128.7	DAO	ColorGauge_NanoTarget30	01-01356924	17863	9 August, 1967
Carex_brunnescens_13	64.13333333	-145.85	DAO	ColorGauge_NanoTarget30	01-01356918	5078	10 June, 1951

Carex_brunnescens_14	60.43333333	-149.3666667	DAO	ColorGauge_NanoTarget30	01-01356922	6079	19 July, 1951
Carex_brunnescens_15	60.48333333	-151.2	DAO	ColorGauge_NanoTarget30	01-01356923	6739	14 August, 1951
Carex_brunnescens_16	52.940039	-123.416168	DAO	ColorGauge_NanoTarget30	01-01356933	16204	1 July, 1956
Carex_brunnescens_17	50.890896	-118.832746	DAO	ColorGauge_NanoTarget30	01-01356934	8769	6 June, 1953
Carex_brunnescens_18	49.02423	-122.512234	DAO	ColorGauge_NanoTarget30	01-01356936	20818	18 May, 1957
Carex_brunnescens_19	49.638432	-115.961589	DAO	ColorGauge_NanoTarget30	01-01356938	9185	14 June, 1953
Carex_brunnescens_20	53.6567	-132.204665	DAO	ColorGauge_NanoTarget30	01-01356932	21563	10 June, 1957
Carex_brunnescens_21	54.83305	-111.976215	DAO	ColorGauge_NanoTarget30	01-01356967	7053	28 June, 1953
Carex_brunnescens_22	51.940161	-120.025485	DAO	ColorGauge_NanoTarget30	01-01356968	7084	18 June, 1961
Carex_brunnescens_23	59.048721	-95.034836	DAO	ColorGauge_NanoTarget30	01-01356959	2046	23 July, 1956
Carex_brunnescens_24	50.487373	-95.237852	DAO	ColorGauge_NanoTarget30	01-01356960	189	18 June, 1955
Carex_brunnescens_25	46.488922	-66.699165	DAO	ColorGauge_NanoTarget30	01-01356949	63-228	25 June, 1963
Carex_brunnescens_26	47.75013889	-68.15	DAO	ColorGauge_NanoTarget30	01-01356950	Not provided	24 July, 1958
Carex_brunnescens_27	47.86305	-67.696458	DAO	ColorGauge_NanoTarget30	01-01356951	16271	11 July, 1957
Carex_brunnescens_28	48.8167	-57.9651	DAO	ColorGauge_NanoTarget30	01-01356941	1204	3 August, 1955
Carex_brunnescens_29	51.368972	-55.595561	DAO	ColorGauge_NanoTarget30	01-01356942	2389	19 July, 1951
Carex_brunnescens_30	44.524915	-63.86332	DAO	ColorGauge_NanoTarget30	01-01356943	41125	3 July, 1941
Carex_brunnescens_31	45.088552	-64.458862	DAO	ColorGauge_NanoTarget30	01-01356944	1513	19 June, 1942
Carex_brunnescens_32	44.992533	-62.730709	DAO	ColorGauge_NanoTarget30	01-01356946	2514	24 June, 1949
Carex_brunnescens_33	49.28333333	-88.85	DAO	ColorGauge_NanoTarget30	01-01356958	11880	1 July, 1969
Carex_brunnescens_34	45.294643	-75.835064	DAO	ColorGauge_NanoTarget30	01-01356956	2634	15 June, 1987
Carex_brunnescens_35	46.19918	-63.353581	DAO	ColorGauge_NanoTarget30	01-01356947	1106	1 July, 1952
Carex_brunnescens_36	46.351398	-62.235364	DAO	ColorGauge_NanoTarget30	01-01356948	1167	3 July, 1952
Carex_brunnescens_37	46.782462	-71.286069	DAO	ColorGauge_NanoTarget30	01-01356953	2999	5 June, 1962
Carex_brunnescens_38	46.217944	-70.781211	DAO	ColorGauge_NanoTarget30	01-01356954	19	18 June, 1939
Carex_brunnescens_39	45.96657	-74.330944	DAO	ColorGauge_NanoTarget30	01-01356955	307	22 July, 1945
Carex_brunnescens_40	59.258751	-105.832963	DAO	ColorGauge_NanoTarget30	01-01356961	63C	2 July, 1960
Carex_brunnescens_41	59.91666667	-102.0833333	DAO	ColorGauge_NanoTarget30	01-01356964	108-63	9 July, 1963
Carex_brunnescens_42	44.143794	-73.986563	DAO	ColorGauge_NanoTarget30	01-01356969	7499	17 June, 1953
Carex_brunnescens_43	46.548299	-69.405249	DAO	ColorGauge_NanoTarget30	01-01356970	2569	3 July, 1946
Carex_brunnescens_44	35.704129	-82.376925	DAO	ColorGauge_NanoTarget30	01-01356971	4755	25 June, 1958
Carex_brunnescens_45	53.20222222	-114.7575	DAO	ColorGauge_NanoTarget30	01-01356903	9180	3 July, 2000
Carex_brunnescens_46	52.725	-118.3166667	DAO	ColorGauge_NanoTarget30	01-01356905	17131	12 August, 1971
Carex_brunnescens_47	53.65	-112.7666667	DAO	ColorGauge_NanoTarget30	01-01356908	9941	1 July, 1994
Carex_brunnescens_48	59.5	-136.5	DAO	ColorGauge_NanoTarget30	01-01356909	1370	13 July, 1956
Carex_brunnescens_49	52.18333333	-119.93	DAO	ColorGauge_NanoTarget30	01-01356910	81-625	10 July, 1980
Carex_brunnescens_50	52.41666667	-126.4166667	DAO	ColorGauge_NanoTarget30	01-01356911	18424	6 July, 1956
Carex_brunnescens_51	56.33333333	-120.93	DAO	ColorGauge_NanoTarget30	01-01356914	9972	5 July, 1994
Carex_brunnescens_52	69.78333333	-50.86666667	DAO	ColorGauge_NanoTarget30	01-01356800	482	3 August, 1981
Carex_brunnescens_53	64.8	-50.58333333	DAO	ColorGauge_NanoTarget30	01-01356801	478	4 August, 1976
Carex_brunnescens_54	60.36666667	-44.06666667	DAO	ColorGauge_NanoTarget30	01-01356802	67-1407	21 July, 1967
Carex_brunnescens_55	50.71677778	-99.66666667	DAO	ColorGauge_NanoTarget30	01-01356873	24568	13 July, 1979
Carex_brunnescens_56	51.03333333	-95.33333333	DAO	ColorGauge_NanoTarget30	01-01356874	8722	5 July, 1979
Carex_brunnescens_57	52.584028	-101.434833	DAO	ColorGauge_NanoTarget30	01-01356875	74-131	30 June, 1974

Carex_brunnescens_58	56.343015	-94.750345	DAO	ColorGauge_NanoTarget30	01-01356876	G-125	28 June, 1955
Carex_brunnescens_59	49.717953	-95.210921	DAO	ColorGauge_NanoTarget30	01-01356877	13061	24 June, 1959
Carex_brunnescens_60	46.11945	-67.110134	DAO	ColorGauge_NanoTarget30	01-01356839	64-1093	22 June, 1964
Carex_brunnescens_61	45.076779	-67.038851	DAO	ColorGauge_NanoTarget30	01-01356840	184415	1 July, 1984
Carex_brunnescens_62	53.336006	-60.384416	DAO	ColorGauge_NanoTarget30	01-01356831	8598	19 July, 1954
Carex_brunnescens_63	51.479804	-56.951954	DAO	ColorGauge_NanoTarget30	01-01356832	Not provided	20 August, 1964
Carex_brunnescens_64	45.256912	-64.351584	DAO	ColorGauge_NanoTarget30	01-01356835	38018	1 July, 1938
Carex_brunnescens_65	46.838861	-60.338643	DAO	ColorGauge_NanoTarget30	01-01356836	3476	28 July, 1950
Carex_brunnescens_66	45.81666667	-63.55	DAO	ColorGauge_NanoTarget30	01-01356837	15	8 June, 1989
Carex_brunnescens_67	62.36666667	-128.7	DAO	ColorGauge_NanoTarget30	01-01356806	17834	9 August, 1967
Carex_brunnescens_68	61.58333333	-110.75	DAO	ColorGauge_NanoTarget30	01-01356807	3006	1 July, 1962
Carex_brunnescens_69	62.33333333	-106.4166667	DAO	ColorGauge_NanoTarget30	01-01356809	15334	23 July, 1966
Carex_brunnescens_70	62.3	-104.4166667	DAO	ColorGauge_NanoTarget30	01-01356810	15465	26 July, 1966
Carex_brunnescens_71	63.55	-115.9166667	DAO	ColorGauge_NanoTarget30	01-01356811	2618	14 July, 1949
Carex_brunnescens_72	53.3	-80	DAO	ColorGauge_NanoTarget30	01-01356804	Not provided	28 July, 1973
Carex_brunnescens_73	45.917384	-79.07104	DAO	ColorGauge_NanoTarget30	01-01356864	910	23 June, 1977
Carex_brunnescens_74	44.558996	-75.714637	DAO	ColorGauge_NanoTarget30	01-01356865	21841	14 June, 1975
Carex_brunnescens_75	46.211276	-77.886538	DAO	ColorGauge_NanoTarget30	01-01356866	3491	25 June, 1967
Carex_brunnescens_76	48.218841	-90.153117	DAO	ColorGauge_NanoTarget30	01-01356867	1432	17 July, 1951
Carex_brunnescens_77	44.401822	-76.690604	DAO	ColorGauge_NanoTarget30	01-01356870	4285	25 June, 1967
Carex_brunnescens_78	45.81666667	-79.5	DAO	ColorGauge_NanoTarget30	01-01356871	814	1 June, 1977
Carex_brunnescens_79	45.046683	-72.738499	DAO	ColorGauge_NanoTarget30	01-01356841	19010	18 June, 1961
Carex_brunnescens_80	45.93333333	-75.85	DAO	ColorGauge_NanoTarget30	01-01356842	22006	14 June, 1966
Carex_brunnescens_81	51.229069	-68.483547	DAO	ColorGauge_NanoTarget30	01-01356844	3536	23 July, 1962
Carex_brunnescens_82	48.838875	-64.484473	DAO	ColorGauge_NanoTarget30	01-01356845	57042	27 July, 1957
Carex_brunnescens_83	48.416431	-77.545979	DAO	ColorGauge_NanoTarget30	01-01356846	51-107	10 July, 1951
Carex_brunnescens_84	52.33333333	-70.58333333	DAO	ColorGauge_NanoTarget30	01-01356848	237	5 August, 1949
Carex_brunnescens_85	49.01666667	-66	DAO	ColorGauge_NanoTarget30	01-01356849	Not provided	31 July, 1968
Carex_brunnescens_86	45.437277	-73.052472	DAO	ColorGauge_NanoTarget30	01-01356851	Not provided	10 June, 1939
Carex_brunnescens_87	58.21666667	-103.7166667	DAO	ColorGauge_NanoTarget30	01-01356878	22056	27 July, 1975
Carex_brunnescens_88	55.48333333	-102.4833333	DAO	ColorGauge_NanoTarget30	01-01356888	20019	11 July, 1973
Carex_brunnescens_89	55.18333333	-105.2833333	DAO	ColorGauge_NanoTarget30	01-01356889	21092	30 June, 1975
Carex_brunnescens_90	58.35013889	-109.55	DAO	ColorGauge_NanoTarget30	01-01356890	24057	14 June, 1977
Carex_brunnescens_91	54.302627	-101.825888	DAO	ColorGauge_NanoTarget30	01-01356901	33935-B	26 June, 1985
Carex_brunnescens_92	56.38347222	-103.5666667	DAO	ColorGauge_NanoTarget30	01-01356902	4354	19 July, 1983
Carex_brunnescens_93	61.11666667	-155.6	DAO	ColorGauge_NanoTarget30	01-01356827	8666	27 June, 1999
Carex_brunnescens_94	62.95	-130.15	DAO	ColorGauge_NanoTarget30	01-01356815	27736	2 August, 1960
Carex_brunnescens_95	63.3	-136.25	DAO	ColorGauge_NanoTarget30	01-01356817	1930	14 July, 1987
Carex_brunnescens_96	61.5	-133.05	DAO	ColorGauge_NanoTarget30	01-01356819	35840	6 July, 1999
Carex_brunnescens_97	60.44653871	-124.2056292	DAO	ColorGauge_NanoTarget30	01-01356822	04-0595	13 July, 2004
Carex_brunnescens_98	48.8720599	-118.3722984	DES	Kodak_ColorControlPatches	DES00010377	380	4 August, 1973
Carex_brunnescens_99	46.955833	-84.680556	DES	Kodak_ColorControlPatches	DES00010942	3229-2	23 June, 1973
Carex_brunnescens_100	39.947146	-105.816219	DES	Kodak_ColorControlPatches	DES00017296	68-84	31 July, 1968
Carex_brunnescens_101	51.033333	-95.333333	DES	Kodak_ColorControlPatches	DES00023232	722	5 July, 1979

Carex_brunnescens_102	38.5550687	-78.3957526	GMUF	ColorGauge_NanoTarget30	GMUF-0012679	4902	15 June, 1990
Carex_brunnescens_103	65.1	-164.91	ALA	ColorChecker_Chart24	H1124328	84194	19 July, 1982
Carex_brunnescens_104	57.66777778	-153.257778	ALA	ColorChecker_Chart24	H1124310	06-182	22 July, 2006
Carex_brunnescens_105	39.556163	-105.839421	KHD	Kodak_ColorControlPatches	KHD00002641	6040	23 July, 1996
Carex_brunnescens_106	40.371467	-106.723833	KHD	Kodak_ColorControlPatches	KHD00002370	78-57	3 August, 1978
Carex_brunnescens_107	39.26888	-105.4816	KHD	Kodak_ColorControlPatches	KHD00024917	6084	18 August, 2012
Carex_brunnescens_108	54.512222	-128.538333	MIN	ColorGauge_NanoTarget30	MIN1281628	14892	21 August, 1954
Carex_brunnescens_109	47.729195	-59.139205	MIN	ColorGauge_NanoTarget30	MIN1281603	88-581	22 June, 1988
Carex_brunnescens_110	53.039113	-92.620036	MIN	ColorGauge_NanoTarget30	MIN1281617	4339	25 July, 1957
Carex_brunnescens_111	48.076222	-89.351701	MIN	ColorGauge_NanoTarget30	MIN1281639	5140	22 June, 1951
Carex_brunnescens_112	56.125105	-76.272191	MIN	ColorGauge_NanoTarget30	MIN1281612	3122	3 July, 1939
Carex_brunnescens_113	40.9103258	-106.7020231	MIN	ColorGauge_NanoTarget30	MIN1281608	472	8 July, 1901
Carex_brunnescens_114	48.310556	-116.515833	MIN	ColorGauge_NanoTarget30	MIN1281633	231	July, 1889
Carex_brunnescens_115	41.2198575	-98.7980407	MIN	ColorGauge_NanoTarget30	MIN1281629	5729	24 May, 1913
Carex_brunnescens_116	62.483333	-130.4	MIN	ColorGauge_NanoTarget30	MIN1281672	27777	2 August, 1960
Carex_brunnescens_117	44.613306	-63.696444	MIN	ColorGauge_NanoTarget30	MIN1281699	1403	25 June, 1940
Carex_brunnescens_118	44.3027756	-72.8984623	MIN	ColorGauge_NanoTarget30	MIN1281701	Not provided	4 July, 1929
Carex_brunnescens_119	45.421	-110.0863	MOR	ColorGauge_NanoTarget30	0066921MOR	73672	1 August, 2007
Carex_brunnescens_120	44.74667	-110.583676	MOR	ColorGauge_NanoTarget30	0076463MOR	38675	25 June, 2001
Carex_brunnescens_121	41.8581186	-78.6294696	PH	ColorGauge_NanoTarget30	PH00610641	8961	20 June, 1950
Carex_brunnescens_122	42.314805	-74.1609814	PH	ColorGauge_NanoTarget30	PH00610634	7865	12 June, 1936
Carex_brunnescens_123	48.88215	-58.062947	TENN	ColorGauge_NanoTarget30	TENN-V-0052533	88-501	4 July, 1988
Carex_brunnescens_124	35.91482	-106.58648	UNM	ColorGauge_NanoTarget30	UNM0088558	78071a	19 July, 2002
Carex_brunnescens_125	45.2262674	-71.2934128	UT	ColorChecker_Chart24	UT0017786	14466A	1 July, 1980
Carex_brunnescens_126	46.9660904	-95.0650029	UT	ColorChecker_Chart24	UT0017785	6995	30 June, 1971
Carex_brunnescens_127	40.4888889	-110.1525	UTC	ColorChecker_Chart24	UTC00206503	22910	11 June, 1989
Carex_buxbaumii_1	45.3957684	-84.9016189	ALBC	Kodak_ColorControlPatches	ALBC002573	Not provided	22 July, 1897
Carex_buxbaumii_2	36.35674	-94.14434	ANHC	ColorGauge_NanoTarget30	ANHC007872	09-0178	9 May, 2009
Carex_buxbaumii_3	38.056159	-93.994158	ANHC	ColorGauge_NanoTarget30	ANHC005363	2091	7 June, 2003
Carex_buxbaumii_4	38.747794	-77.104526	AVCH	ColorGauge_NanoTarget30	AVCH0001117	3932	21 May, 2015
Carex_buxbaumii_5	43.394408	-94.482993	BUT	ColorGauge_NanoTarget30	BUT0001001	Not provided	June, 1883
Carex_buxbaumii_6	40.752244	-86.149114	BUT	ColorGauge_NanoTarget30	BUT0006329	Not provided	5 June, 1940
Carex_buxbaumii_7	65.73333333	-119.6666667	CAN	Kodak_ColorControlPatches	CAN10036386	3566	22 August, 1928
Carex_buxbaumii_8	35.053937	-82.698248	CLEMS	ColorGauge_NanoTarget30	CLEMS0006111	23391	15 June, 1992
Carex_buxbaumii_9	42.09	-84.11	CMC	Kodak_ColorControlPatches	CMC00018517	255	6 June, 2012
Carex_buxbaumii_10	39.016291	-104.537892	COCO	ColorGauge_NanoTarget30	COCO-V-0007800	14-10	9 June, 2014
Carex_buxbaumii_11	51.2	-116.5666667	DAO	ColorGauge_NanoTarget30	01-01356790	1931	22 June, 1958
Carex_buxbaumii_12	59.5	-136.5	DAO	ColorGauge_NanoTarget30	01-01356792	1460	15 July, 1956
Carex_buxbaumii_13	53.106337	-131.867892	DAO	ColorGauge_NanoTarget30	01-01356782	35278	20 June, 1964
Carex_buxbaumii_14	51.65	-117.4666667	DAO	ColorGauge_NanoTarget30	01-01356788	3658	8 August, 1958
Carex_buxbaumii_15	50.81666667	-116.2666667	DAO	ColorGauge_NanoTarget30	01-01356785	721	22 May, 1958
Carex_buxbaumii_16	49.68333333	-125.4	DAO	ColorGauge_NanoTarget30	01-01356789	32264	7 August, 1961
Carex_buxbaumii_17	60.193986	-44.8181	DAO	ColorGauge_NanoTarget30	01-01356730	1926	29 July, 1937
Carex_buxbaumii_18	49.245191	-96.826492	DAO	ColorGauge_NanoTarget30	01-01356768	7899	13 June, 1963

Carex_buxbaumii_19	53.417344	-101.332539	DAO	ColorGauge_NanoTarget30	01-01356770	10116	7 August, 1958
Carex_buxbaumii_20	44.60091	-66.899692	DAO	ColorGauge_NanoTarget30	01-01356744	7296	23 July, 1944
Carex_buxbaumii_21	53.78333333	-65.4	DAO	ColorGauge_NanoTarget30	01-01356737	41127	29 July, 1963
Carex_buxbaumii_22	49.128485	-54.555474	DAO	ColorGauge_NanoTarget30	01-01356738	5508	8 July, 1960
Carex_buxbaumii_23	51.366381	-55.593296	DAO	ColorGauge_NanoTarget30	01-01356739	2258	12 July, 1951
Carex_buxbaumii_24	46.474074	-60.450786	DAO	ColorGauge_NanoTarget30	01-01356742	8072	16 July, 1953
Carex_buxbaumii_25	45.132755	-64.435848	DAO	ColorGauge_NanoTarget30	01-01000685649	1562	26 June, 1942
Carex_buxbaumii_26	64.28333333	-115.2	DAO	ColorGauge_NanoTarget30	01-01356732	3409	11 August, 1949
Carex_buxbaumii_27	61.043089	-117.39085	DAO	ColorGauge_NanoTarget30	01-01356733	5293	14 July, 1959
Carex_buxbaumii_28	62.7	-113.25	DAO	ColorGauge_NanoTarget30	01-01356734	1312	18 August, 1961
Carex_buxbaumii_29	44.42881	-77.103232	DAO	ColorGauge_NanoTarget30	01-01356751	17149	3 June, 1958
Carex_buxbaumii_30	45.814504	-77.818213	DAO	ColorGauge_NanoTarget30	01-01356752	318	9 June, 1976
Carex_buxbaumii_31	48.537635	-88.964808	DAO	ColorGauge_NanoTarget30	01-01356753	1176	9 July, 1950
Carex_buxbaumii_32	48.350647	-88.635751	DAO	ColorGauge_NanoTarget30	01-01356754	3682e	23 July, 1913
Carex_buxbaumii_33	45.1901	-81.590194	DAO	ColorGauge_NanoTarget30	01-01356755	16479	27 July, 1956
Carex_buxbaumii_34	42.570193	-82.507728	DAO	ColorGauge_NanoTarget30	01-01356756	3644	11 June, 1964
Carex_buxbaumii_35	44.359226	-80.734512	DAO	ColorGauge_NanoTarget30	01-01356759	437	18 June, 1990
Carex_buxbaumii_36	45.45	-76.28333333	DAO	ColorGauge_NanoTarget30	01-01356760	16258	4 June, 2005
Carex_buxbaumii_37	45.792947	-82.667356	DAO	ColorGauge_NanoTarget30	01-01356761	6046	17 July, 1952
Carex_buxbaumii_38	47.959296	-84.902186	DAO	ColorGauge_NanoTarget30	01-01356762	864	29 July, 1938
Carex_buxbaumii_39	45.884263	-77.636394	DAO	ColorGauge_NanoTarget30	01-01356763	2238	24 June, 1962
Carex_buxbaumii_40	48.753307	-87.913793	DAO	ColorGauge_NanoTarget30	01-01356765	6736	7 August, 1950
Carex_buxbaumii_41	50.61666667	-72.45	DAO	ColorGauge_NanoTarget30	01-01356747	14522	13 August, 1968
Carex_buxbaumii_42	48.46683611	-78.81666667	DAO	ColorGauge_NanoTarget30	01-01356748	Not provided	14 June, 2005
Carex_buxbaumii_43	48.827526	-64.574641	DAO	ColorGauge_NanoTarget30	01-01356750	J85-138	23 July, 1985
Carex_buxbaumii_44	46.217944	-70.786312	DAO	ColorGauge_NanoTarget30	01-01356746	38	21 July, 1939
Carex_buxbaumii_45	59.91666667	-102.0833333	DAO	ColorGauge_NanoTarget30	01-01356772	176-63	13 July, 1963
Carex_buxbaumii_46	58.58333333	-109.4166667	DAO	ColorGauge_NanoTarget30	01-01356773	559-62	13 July, 1962
Carex_buxbaumii_47	52.03581	-107.597742	DAO	ColorGauge_NanoTarget30	01-01356774	3780	29 June, 1979
Carex_buxbaumii_48	57	-103.6	DAO	ColorGauge_NanoTarget30	01-01356776	1743	3 July, 1973
Carex_buxbaumii_49	38.015694	-122.999902	DAO	ColorGauge_NanoTarget30	01-01356794	23212	4 June, 1947
Carex_buxbaumii_50	37.878812	-119.365435	DAO	ColorGauge_NanoTarget30	01-01356795	4008	15 September, 1958
Carex_buxbaumii_51	36.398629	-81.575697	DAO	ColorGauge_NanoTarget30	01-01356796	44049	24 June, 1961
Carex_buxbaumii_52	41.165715	-124.129626	DAO	ColorGauge_NanoTarget30	01-01356797	35293	9 August, 1965
Carex_buxbaumii_53	60.61666667	-149.55	DAO	ColorGauge_NanoTarget30	01-01356736	6815	18 August, 1951
Carex_buxbaumii_54	62.34305556	-140.8344444	DAO	ColorGauge_NanoTarget30	01-01000527359	03-047	08 August, 2003
Carex_buxbaumii_55	65.12061	-134.43163	DAO	ColorGauge_NanoTarget30	01-01000527363	05-0180	7 July, 2005
Carex_buxbaumii_56	60.11805556	-127.3513889	DAO	ColorGauge_NanoTarget30	01-01000527366	32384	7 July, 1983
Carex_buxbaumii_57	60.23666667	-132.5547222	DAO	ColorGauge_NanoTarget30	01-01000527367	98-182	29 July, 1998
Carex_buxbaumii_58	60.58333333	-134.9166667	DAO	ColorGauge_NanoTarget30	01-01000527369	35649	27 June, 1999
Carex_buxbaumii_59	43.888391	-90.073382	EKU	ColorGauge_NanoTarget30	3 1234 10004738 8	87-614	1 June, 1987
Carex_buxbaumii_60	41.649134	-87.068877	EMC	ColorGauge_NanoTarget30	EMC003226	7298	3 June, 1961
Carex_buxbaumii_61	39.323239	-120.379925	F	ColorGauge_NanoTarget30	F308991	5056	1866
Carex_buxbaumii_62	37.64472222	-107.7486111	FLD	ColorChecker_Chart24	FLD0004644	Not provided	27 June, 2006

Carex_buxbaumii_63	44.690139	-85.70881	GA	Kodak_ColorControlPatches	GA111050	2650	30 July, 1928
Carex_buxbaumii_64	62.95	-155.6	ALA	ColorChecker_Chart24	H1124422	4697	29 August, 1950
Carex_buxbaumii_65	54.92972222	-130.7636111	ALA	ColorChecker_Chart24	H1124409	93-330	8 July, 1993
Carex_buxbaumii_66	61.36666667	-138.98333333	ALA	ColorChecker_Chart24	H1124415	13932	3 August, 1948
Carex_buxbaumii_67	60.43333333	-151.25	ALA	ColorChecker_Chart24	H1124454	124	28 July, 1980
Carex_buxbaumii_68	61.55611111	-143.8744444	ALA	ColorChecker_Chart24	H1124406	5120	9 August, 2003
Carex_buxbaumii_69	61.01972222	-144.7397222	ALA	ColorChecker_Chart24	H1124411	11093	15 July, 1996
Carex_buxbaumii_70	60.2	-154.2666667	ALA	ColorChecker_Chart24	H1124434	96-209	1 July, 1996
Carex_buxbaumii_71	60.98333333	-160.0666667	ALA	ColorChecker_Chart24	H1124427	90	24 July, 1980
Carex_buxbaumii_72	49.176901	-55.058924	IBE	Kodak_ColorControlPatches	IBE026940	88-112	28 June, 1988
Carex_buxbaumii_73	55.762896	-132.839013	IBE	Kodak_ColorControlPatches	IBE027024	1462b	4 August, 1981
Carex_buxbaumii_74	41.24668	-88.201	ILLS	ColorGauge_NanoTarget30	ILLS00018951	37589	2 June, 2005
Carex_buxbaumii_75	40.92292	-106.60979	KHD	Kodak_ColorControlPatches	KHD00002373	6496	10 July, 1999
Carex_buxbaumii_76	39.26966	-105.48941	KHD	Kodak_ColorControlPatches	KHD00024447	882	23 July, 2012
Carex_buxbaumii_77	39.36082	-107.45146	KHD	Kodak_ColorControlPatches	KHD00056244	10049	8 July, 2014
Carex_buxbaumii_78	46.706335	-84.345269	MICH	ColorGauge_NanoTarget30	MICH1364859	5185	4 August, 1979
Carex_buxbaumii_79	40.57805556	-111.03333333	MICH	ColorGauge_NanoTarget30	MICH1364921	10697	5 August, 2004
Carex_buxbaumii_80	44.26666667	-66.33333333	MICH	ColorGauge_NanoTarget30	MICH1364946	15090	1 July, 1993
Carex_buxbaumii_81	41.1571	-122.4561	MICH	ColorGauge_NanoTarget30	MICH1428527	10556	11 July, 2001
Carex_buxbaumii_82	46.521816	-96.414416	MIN	ColorGauge_NanoTarget30	MIN1008257	26	6 June, 1980
Carex_buxbaumii_83	44.302199	-115.257458	MIN	ColorGauge_NanoTarget30	MIN1281777	3650	5 August, 1941
Carex_buxbaumii_84	41.826229	-71.412492	MIN	ColorGauge_NanoTarget30	MIN1281784	Not provided	Not provided
Carex_buxbaumii_85	62.753032	-116.059582	MIN	ColorGauge_NanoTarget30	MIN1281790	8133	26 July, 1961
Carex_buxbaumii_86	49.475385	-91.749864	MIN	ColorGauge_NanoTarget30	MIN1281791	9356	5 August, 1961
Carex_buxbaumii_87	60.700859	-147.348602	MIN	ColorGauge_NanoTarget30	MIN1281805	339	5 September, 1935
Carex_buxbaumii_88	50.81666667	-116.2666667	MIN	ColorGauge_NanoTarget30	MIN1281808	721	22 May, 1958
Carex_buxbaumii_89	52.467345	-116.101582	MIN	ColorGauge_NanoTarget30	MIN1281811	1595	28 July, 1925
Carex_buxbaumii_90	51.96666667	-98.83333333	MIN	ColorGauge_NanoTarget30	MIN1281812	4511	7 August, 1982
Carex_buxbaumii_91	44.642374	-121.997172	MIN	ColorGauge_NanoTarget30	MIN1281815	5370	2 July, 1998
Carex_buxbaumii_92	46.778182	-67.854232	MIN	ColorGauge_NanoTarget30	MIN1282072	134	5 July, 1893
Carex_buxbaumii_93	43.628784	-72.89502	MIN	ColorGauge_NanoTarget30	MIN1282073	2119	2 July, 1900
Carex_buxbaumii_94	44.728615	-110.696754	MOR	ColorGauge_NanoTarget30	0076467MOR	39209	28 June, 2002
Carex_buxbaumii_95	44.460289	-110.853571	MOR	ColorGauge_NanoTarget30	0076622MOR	9121	4 August, 1985
Carex_buxbaumii_96	51.461631	-116.225954	MSC	ColorGauge_NanoTarget30	MSC0150708	89-608	20 July, 1989
Carex_buxbaumii_97	43.0189	-82.342322	MSC	ColorGauge_NanoTarget30	MSC0150744	Not provided	8 June, 1892
Carex_buxbaumii_98	42.330792	-98.652006	MSC	ColorGauge_NanoTarget30	MSC0150750	94512	9 June, 1994
Carex_buxbaumii_99	41.464503	-83.951643	MU	ColorGauge_NanoTarget30	MU000169784	26,442	21 May, 1997
Carex_buxbaumii_100	49.03333333	-62.43333333	MU	ColorGauge_NanoTarget30	MU000169788	17830	7 May, 1974
Carex_buxbaumii_101	42.670159	-71.503968	MUHV	ColorGauge_NanoTarget30	MUHV028159	978	17 June, 1928
Carex_buxbaumii_102	40.576664	-75.400417	PH	ColorGauge_NanoTarget30	PH00608840	17743	8 June, 1942
Carex_buxbaumii_103	51.461085	-116.22372	TENN	ColorGauge_NanoTarget30	TENN-V-0052697	89-608	20 June, 1989
Carex_buxbaumii_104	40.849486	-109.636348	TENN	ColorGauge_NanoTarget30	TENN-V-0052735	Not provided	3 July, 1986
Carex_buxbaumii_105	48.024035	-121.687795	TENN	ColorGauge_NanoTarget30	TENN-V-0052737	248	19 July, 1990
Carex_buxbaumii_106	40.622378	-109.94215	UT	ColorChecker_Chart24	UT0016092	21254	1 August, 1984

Carex_buxbaumii_107	40.637121	-110.81633	UT	ColorChecker_Chart24	UT0016093	22104	5 August, 1986
Carex_buxbaumii_108	48.602638	-114.034377	UT	ColorChecker_Chart24	UT0017793	17365	10 July, 1962
Carex_buxbaumii_109	40.7444444	-109.7380556	UTC	ColorChecker_Chart24	UTC00196303	22104	5 August, 1986
Carex_buxbaumii_110	44.034168	-88.936849	UWL	ColorGauge_NanoTarget30	UWL0006549	26786	6 June, 1973
Carex_buxbaumii_111	42.595713	-92.54897	UWL	ColorGauge_NanoTarget30	UWL0006556	70	20 May, 1970
Carex_buxbaumii_112	37.7014246	-108.2846955	UWSP	ColorGauge_NanoTarget30	UWSP-V-0004194	85	1 August, 1995
Carex_buxbaumii_113	47.118634	-69.03042	WIS	ColorGauge_NanoTarget30	v 0275377 WIS	265	12 July, 1983
Carex_buxbaumii_114	60	-110.2	WIS	ColorGauge_NanoTarget30	v 0275383 WIS	Not provided	30 June, 1962
Carex_leptalea_1	33.34986	-93.17677	ANHC	ColorGauge_NanoTarget30	ANHC005515	13-0050	16 May, 2013
Carex_leptalea_2	36.09586	-91.50768	ANHC	ColorGauge_NanoTarget30	ANHC005522	10-0107	5 June, 2010
Carex_leptalea_3	34.34833333	-87.65305556	AUA	Kodak_ColorControlPatches	AUA000020261	12102	9 May, 2004
Carex_leptalea_4	42.40023	-72.677363	AUA	Kodak_ColorControlPatches	AUA000020694	86633	28 May, 1979
Carex_leptalea_5	37.247306	-76.714516	AUA	Kodak_ColorControlPatches	AUA000020696	223	22 May, 1989
Carex_leptalea_6	44.1617	-103.8237	BHSC	ColorChecker_Chart24	BHSC0024973	04H039A	10 July, 2004
Carex_leptalea_7	47.4	-68.333333	CAN	Kodak_ColorControlPatches	CAN439417	199	15 June, 1978
Carex_leptalea_8	46.423461	-63.251654	CAN	Kodak_ColorControlPatches	CAN20550	31321	2 July, 1888
Carex_leptalea_9	44.056579	-66.005398	CAN	Kodak_ColorControlPatches	CAN20556	82481	6 June, 1910
Carex_leptalea_10	59.4	-126.067	CAN	Kodak_ColorControlPatches	CAN20629	9857	21 June, 1946
Carex_leptalea_11	52.616944	-103.928912	CAN	Kodak_ColorControlPatches	CAN20620	308	19 July, 1939
Carex_leptalea_12	51.410486	-116.223894	CAN	Kodak_ColorControlPatches	CAN20619	1030	9 July, 1925
Carex_leptalea_13	48.941203	-125.545603	CAN	Kodak_ColorControlPatches	CAN20631	78708	8 June, 1909
Carex_leptalea_14	53.982812	-97.834413	CAN	Kodak_ColorControlPatches	CAN113434	2890	25 June, 1948
Carex_leptalea_15	50.153267	-95.388061	CAN	Kodak_ColorControlPatches	CAN209232	8859	27 June, 1951
Carex_leptalea_16	58.76666667	-94.16666667	CAN	Kodak_ColorControlPatches	CAN247328	7113	1 August, 1956
Carex_leptalea_17	59.01666667	-109	CAN	Kodak_ColorControlPatches	CAN281148	390-62	4 July, 1962
Carex_leptalea_18	52.41666667	-65.81666667	CAN	Kodak_ColorControlPatches	CAN484906	401-2	14 August, 1980
Carex_leptalea_19	50.434156	-102.259579	CAN	Kodak_ColorControlPatches	CAN489294	7961	20 June, 1983
Carex_leptalea_20	60.607898	-99.921778	CAN	Kodak_ColorControlPatches	CAN20626	2383	5 August, 1947
Carex_leptalea_21	38.88559	-105.00897	COCO	ColorGauge_NanoTarget30	COCO-V-0007938	6.205	20 June, 2006
Carex_leptalea_22	61.56694444	-141.0188889	DAO	ColorGauge_NanoTarget30	01-0100525691	04-0962	22 July, 2004
Carex_leptalea_23	66.67755556	-133.9080556	DAO	ColorGauge_NanoTarget30	01-01000525695	NPE-LDS-49	17 July, 2005
Carex_leptalea_24	49.661071	-110.292898	DAO	ColorGauge_NanoTarget30	01-01395879	289-63	9 July, 1963
Carex_leptalea_25	49.26666667	-125.3666667	DAO	ColorGauge_NanoTarget30	01-01395886	30673	18 June, 1961
Carex_leptalea_26	49.698997	-119.530254	DAO	ColorGauge_NanoTarget30	01-01395896	10248	8 July, 1953
Carex_leptalea_27	58.85	-125.73	DAO	ColorGauge_NanoTarget30	01-01395923	28355	18 August, 1960
Carex_leptalea_28	46.782054	-56.182685	DAO	ColorGauge_NanoTarget30	01-01395647	Not provided	5 August, 1940
Carex_leptalea_29	56.341867	-94.700293	DAO	ColorGauge_NanoTarget30	01-01395841	1357	5 August, 1950
Carex_leptalea_30	53.18333333	-99.35	DAO	ColorGauge_NanoTarget30	01-01001010576	J77-41	22 June, 1977
Carex_leptalea_31	48.953773	-54.617241	DAO	ColorGauge_NanoTarget30	01-01395640	1017	12 July, 1949
Carex_leptalea_32	51.371284	-55.595835	DAO	ColorGauge_NanoTarget30	01-01395641	2016	3 July, 1951
Carex_leptalea_33	65.206335	-127.182417	DAO	ColorGauge_NanoTarget30	01-01395623	2306	2 July, 1972
Carex_leptalea_34	51.971163	-106.668026	DAO	ColorGauge_NanoTarget30	01-01395849	Not provided	23 June, 1934
Carex_leptalea_35	59.91666667	-102.0833333	DAO	ColorGauge_NanoTarget30	01-01395856	357-63	18 July, 1963
Carex_leptalea_36	56.78333333	-109.2669444	DAO	ColorGauge_NanoTarget30	01-01395871	266025	27 July, 1979

Carex_leptalea_37	63.8	-135.8	DAO	ColorGauge_NanoTarget30	01-01000525706	4236	3 August, 1949
Carex_leptalea_38	45.63695	-82.94957	DES	Kodak_ColorControlPatches	DES00015649	9511	5 August, 1976
Carex_leptalea_39	34.234785	-84.008162	DUKE	ColorGauge_NanoTarget30	DUKE10039598	18880	17 June, 1955
Carex_leptalea_40	31.15013889	-90.83	DUKE	ColorGauge_NanoTarget30	DUKE10039606	902	23 May, 1998
Carex_leptalea_41	33.162747	-85.459483	EKU	ColorGauge_NanoTarget30	3 1234 10005620 7	11077	3 May, 2010
Carex_leptalea_42	32.310983	-92.226872	EKU	ColorGauge_NanoTarget30	3 1234 10005624 9	49053	27 April, 1976
Carex_leptalea_43	36.53773	-88.21644	EKU	ColorGauge_NanoTarget30	3 1234 10005616 5	Not provided	12 June, 2008
Carex_leptalea_44	33.220914	-88.981097	EKU	ColorGauge_NanoTarget30	3 1234 10072788 0	3327	22 May, 1982
Carex_leptalea_45	49.316667	-88.766667	EMC	ColorGauge_NanoTarget30	EMC003332	12042	14 July, 1969
Carex_leptalea_46	29.98111111	-84.57583333	FLAS	ColorGauge_NanoTarget30	FLAS195374	21363	3 April, 1993
Carex_leptalea_47	28.72222222	-81.30222222	FLAS	ColorGauge_NanoTarget30	FLAS195372	19180	18 March, 1992
Carex_leptalea_48	38.694984	-77.165435	GMUF	ColorGauge_NanoTarget30	GMUF-0013588	10331	15 May, 1995
Carex_leptalea_49	36.55279	-77.377207	GMUF	ColorGauge_NanoTarget30	GMUF-0013586	9175	3 June, 1994
Carex_leptalea_50	38.582836	-79.643652	GMUF	ColorGauge_NanoTarget30	GMUF-0013594	9121	27 May, 1994
Carex_leptalea_51	32.469592	-84.265854	HEND	ColorGauge_NanoTarget30	HEND001084	6591	14 May, 1988
Carex_leptalea_52	40.02679	-87.5593	ILLS	ColorGauge_NanoTarget30	ILLS00022545	43103	9 May, 2012
Carex_leptalea_53	55.626782	-111.126891	IND	ColorGauge_NanoTarget30	IND-0136827	160627d4	27 June, 2016
Carex_leptalea_54	50.212822	-63.149844	IND	ColorGauge_NanoTarget30	IND-0020330	18169	26 July, 1924
Carex_leptalea_55	48.572144	-78.119036	IND	ColorGauge_NanoTarget30	IND-0020333	8047	11 July, 1918
Carex_leptalea_56	40.39363	-105.856624	KHD	Kodak_ColorControlPatches	KHD00032712	4031	11 August, 1997
Carex_leptalea_57	44.175977	-89.252064	MICH	ColorGauge_NanoTarget30	MICH1376374	17741	30 June, 1935
Carex_leptalea_58	41.609618	-81.29998	MICH	ColorGauge_NanoTarget30	MICH1376379	21684	10 June, 1982
Carex_leptalea_59	57.991667	-75.033333	MICH	ColorGauge_NanoTarget30	MICH1429607	J82-114	23 July, 1982
Carex_leptalea_60	45.256667	-121.711667	MICH	ColorGauge_NanoTarget30	MICH1429609	25152	16 July, 2010
Carex_leptalea_61	48.146629	-88.48418	MICH	ColorGauge_NanoTarget30	MICH1324279	3081	1 July, 1930
Carex_leptalea_62	46.668665	-86.147345	MICH	ColorGauge_NanoTarget30	MICH1324311	179	5 July, 1973
Carex_leptalea_63	49.60852861	-81.76532873	MICH	ColorGauge_NanoTarget30	MICH1282621	28482	21 June, 2003
Carex_leptalea_64	55.05746305	-85.39948591	MICH	ColorGauge_NanoTarget30	MICH1282661	28963	11 July, 2003
Carex_leptalea_65	31.306111	-95.8025	MICH	ColorGauge_NanoTarget30	MICH1376300	6519	3 May, 1988
Carex_leptalea_66	33.181944	-81.568056	MICH	ColorGauge_NanoTarget30	MICH1376311	5866	18 April, 1994
Carex_leptalea_67	35.019219	-82.901519	MICH	ColorGauge_NanoTarget30	MICH1376340	W-328	28 May, 1998
Carex_leptalea_68	37.424167	-91.055556	MICH	ColorGauge_NanoTarget30	MICH1376367	4093	11 May, 2005
Carex_leptalea_69	45.520131	-76.235856	MICH	ColorGauge_NanoTarget30	MICH1376395	173	13 June, 1922
Carex_leptalea_70	34.063811	-78.145705	MICH	ColorGauge_NanoTarget30	MICH1376287	31314	18 April, 1999
Carex_leptalea_71	47.893056	-70.477778	MICH	ColorGauge_NanoTarget30	MICH1376399	J77-20	23 July, 1977
Carex_leptalea_72	36.487804	-83.625498	MICH	ColorGauge_NanoTarget30	MICH1376406	8084	2 June, 1992
Carex_leptalea_73	48.4	-90.733333	MICH	ColorGauge_NanoTarget30	MICH1376415	20056	15 June, 1981
Carex_leptalea_74	62.15	-131.833333	MICH	ColorGauge_NanoTarget30	MICH1376421	26266	25 June, 1980
Carex_leptalea_75	61.833333	-128.3	MICH	ColorGauge_NanoTarget30	MICH1376422	70-950	2 August, 1970
Carex_leptalea_76	45.633333	-61.783333	MICH	ColorGauge_NanoTarget30	MICH1376427	14694	20 June, 1993
Carex_leptalea_77	42.675217	-81.033547	MICH	ColorGauge_NanoTarget30	MICH1376428	14849	4 June, 1993
Carex_leptalea_78	44.076898	-77.523275	MICH	ColorGauge_NanoTarget30	MICH1376429	20641	3 June, 1998
Carex_leptalea_79	62.58333333	-109.63	MICH	ColorGauge_NanoTarget30	MICH1376447	15775	2 August, 1966
Carex_leptalea_80	54.771764	-126.825968	MICH	ColorGauge_NanoTarget30	MICH1376442	12992	14 July, 1954

Carex_leptalea_81	61.983333	-119.366667	MICH	ColorGauge_NanoTarget30	MICH1376446	18656	4 July, 1970
Carex_leptalea_82	55.875917	-159.472867	MICH	ColorGauge_NanoTarget30	MICH1376468	042-X-1	12 July, 1999
Carex_leptalea_83	42.180833	-74.206111	MICH	ColorGauge_NanoTarget30	MICH1376470	8574	3 July, 2000
Carex_leptalea_84	60.283333	-149.366667	MICH	ColorGauge_NanoTarget30	MICH1376474	6555	7 August, 1951
Carex_leptalea_85	36.118148	-81.838226	MICH	ColorGauge_NanoTarget30	MICH1376480	1659	28 May, 1987
Carex_leptalea_86	44.573426	-67.970272	MICH	ColorGauge_NanoTarget30	MICH1376488	9593	4 July, 1993
Carex_leptalea_87	63.476049	-150.865537	MICH	ColorGauge_NanoTarget30	MICH1376497	2248	16 August, 1928
Carex_leptalea_88	41.15	-124.133333	MICH	ColorGauge_NanoTarget30	MICH1376499	1895	24 June, 1987
Carex_leptalea_89	67.21666667	-154.53	MICH	ColorGauge_NanoTarget30	MICH1450187	5074	26 July, 1963
Carex_leptalea_90	51.473611	-120.484167	MICH	ColorGauge_NanoTarget30	MICH1400429	144	30 June, 2000
Carex_leptalea_91	47.083333	-79.733333	MICH	ColorGauge_NanoTarget30	MICH1376420	9410	14 July, 1993
Carex_leptalea_92	43.55136	-91.481406	MIN	ColorGauge_NanoTarget30	MIN1012782	930609-9	9 June, 1993
Carex_leptalea_93	47.9169444	-93.2736111	MIN	ColorGauge_NanoTarget30	MIN1110741	32600	15 June, 2011
Carex_leptalea_94	45.543642	-94.322053	MIN	ColorGauge_NanoTarget30	MIN1110725	801	10 June, 1976
Carex_leptalea_95	41.86622	-86.339963	MOR	ColorGauge_NanoTarget30	0021074MOR	Not provided	15 June, 1974
Carex_leptalea_96	47.973333	-122.813333	MOR	ColorGauge_NanoTarget30	0057506MOR	24550	22 June, 2009
Carex_leptalea_97	45.695011	-112.023446	MOR	ColorGauge_NanoTarget30	0070400MOR	40412	16 July, 2003
Carex_leptalea_98	41.966556	-89.362426	MOR	ColorGauge_NanoTarget30	0070410MOR	404	23 June, 1994
Carex_leptalea_99	44.884431	-109.676135	MOR	ColorGauge_NanoTarget30	0070413MOR	40916	11 July, 2004
Carex_leptalea_100	39.637128	-84.398791	MU	ColorGauge_NanoTarget30	MU-V-000172088	6533	13 May, 1998
Carex_leptalea_101	40.290724	-75.245394	PH	ColorGauge_NanoTarget30	PH00629040	147	28 June, 1932
Carex_leptalea_102	39.646767	-79.182568	PH	ColorGauge_NanoTarget30	PH00633151	Not provided	26 June, 1907
Carex_leptalea_103	38.645217	-75.191544	PH	ColorGauge_NanoTarget30	PH00633176	3709	17 May, 1938
Carex_leptalea_104	40.646281	-74.974805	PH	ColorGauge_NanoTarget30	PH00633136	46290	28 June, 1935
Carex_leptalea_105	34.663986	-89.465775	PIHG	ColorGauge_NanoTarget30	PIHG007291	10003	18 May, 1990
Carex_leptalea_106	46.083303	-64.68317	TENN	ColorGauge_NanoTarget30	TENN-V-0055367	88-498	6 July, 1988
Carex_leptalea_107	40.615191	-109.937715	UT	ColorChecker_Chart24	UT0016739	4200-1	24 July, 1972
Carex_leptalea_108	41.346923	-72.104858	UT	ColorChecker_Chart24	UT0018524	Not provided	8 June, 1929
Carex_leptalea_109	46.310499	-92.155004	UT	ColorChecker_Chart24	UT0018525	6716	20 June, 1970
Carex_leptalea_110	42.49513	-78.862062	UT	ColorChecker_Chart24	UT0018528	548	7 June, 1928

Appendix 3: Pigmentation and climatic data

Table A3.1 The measured pigmentation data and extracted climatic data utilized in the interspecific analysis. The pigmentation and climatic data for each species was averaged using each individual specimen, while the standard deviation for the climatic data was calculated using all GBIF coordinates for each species. GSL: growing season length, UV3: UV irradiance, BIO16: precipitation, sd: standard deviation.

Species	Photosynthetic				GSL	GSL.sd	UV3 (J/m ² /day)	UV3.sd	BIO16 (mm)	BIO16.sd
	leaf	Perigynium	Male Scale	Female Scale						
<i>Carex aboriginum</i>	45.66366013	53.05947713	71.49575164	78.44751634	177.5	61.51828996	5952.819581	148.0688023	165	30.14041808
<i>Carex abrupta</i>	33.31	42.54464053	35.33810458	52.06320262	165.3814433	53.33901857	6280.828815	604.9546286	370.2371134	192.6302467
<i>Carex abscondita</i>	66.20418301	46.80156863	58.44928105	35.57673203	307.1350211	49.03611948	4996.323409	401.3262506	364.7257384	62.99001713
<i>Carex acidicola</i>	73.16901961	67.41366013	50.74575164	54.19437909	365	14.37586276	5358.065124	148.0688023	412.5	30.14041808
<i>Carex acutiformis</i>	39.02895425	40.36718955	68.1679085	61.41254902	242.5555556	24.82441484	4525.833071	449.982212	307	30.14041808
<i>Carex adelostoma</i>	36.81398693	35.71477124	65.56183007	74.33777778	107.4761905	17.45743122	3187.152739	230.5044181	152.9047619	52.07965511
<i>Carex adusta</i>	45.57738562	40.01444445	36.3106536	38.37947713	172.3166667	19.43057402	3916.873081	374.9712722	277.8111111	45.24023879
<i>Carex aestivalis</i>	65.12248366	58.06470588	41.34575163	56.31150327	239.5229358	32.85901318	4651.272725	327.9609983	343.4770642	59.39581547
<i>Carex aggregata</i>	48.01620915	36.48398693	37.47078432	34.17503268	254.0114286	20.26462536	4982.01762	269.3563895	329.7085714	30.14041808
<i>Carex alata</i>	41.75777778	38.51679739	33.70718954	36.53222222	287.6363636	59.4806887	4914.680697	420.0243071	359.3090909	91.17730102
<i>Carex albicans emmonsii</i>	51.49411765	40.63941177	57.72823529	47.6927451	263.3151618	38.7974761	4817.44653	399.6604602	326.193356	43.53273463
<i>Carex albolutescens</i>	58.97836601	62.42150327	46.99673203	51.75509804	295.4	47.40166291	4960.776622	392.1136666	352.4439024	60.25463146
<i>Carex albonigra</i>	56.32699347	53.38980393	79.48745099	89.6324183	125.7180451	36.84797188	4318.322768	1325.450461	250.6052632	192.120457
<i>Carex albursina</i>	50.75908497	48.10339869	37.70843138	37.7824183	232.6029412	27.95010799	4627.770474	364.691303	298.0183824	34.74404744
<i>Carex alma</i>	56.20137255	56.89869281	49.8385621	66.06398693	319.1372549	60.01782561	6365.092218	209.6934512	213.3333333	86.59183111
<i>Carex alopecoidea</i>	50.56901961	25.96346405	33.58071896	31.85529412	202.86875	21.05073891	4282.244797	308.494314	265.65	40.17261497
<i>Carex amphibola</i>	60.65679739	51.5479085	40.82679739	42.33843137	267.1163895	39.66008239	4830.259121	386.5901893	329.6579572	43.6263012
<i>Carex amplifolia</i>	65.85745098	58.17503268	63.09104576	62.49424837	225.3142857	56.36996603	5276.690561	674.6816708	463.4857143	289.8384183
<i>Carex angustata</i>	51.36816994	54.06640523	68.46078432	64.62418301	207.8555556	48.98097799	5644.403293	583.2776468	423.8666667	202.0023473
<i>Carex annectens</i>	46.56379085	44.42620915	41.82568628	48.32830066	259.1902017	31.92932521	4866.634072	396.3786629	327.0317003	34.41557633
<i>Carex anthoxanthea</i>	35.03176471	41.64379085	49.16189543	52.4733987	149.3181818	42.03639248	2998.056079	420.2942928	522.6590909	312.1934913
<i>Carex aperta</i>	48.1033987	53.1520915	79.90699347	79.57699347	226.3482143	59.8237215	4720.895331	571.5220977	443.7678571	263.2268909
<i>Carex appalachica</i>	55.4996732	57.62320261	29.85130719	40.05058824	235.8888889	30.54701592	4525.794873	337.4542041	314.9494949	40.9634914
<i>Carex aquatilis aquatilis</i>	52.75660131	44.38228759	81.26947712	80.90248366	142.2855478	63.03085753	3968.600457	1077.423664	253.8519814	202.3795148
<i>Carex arapahoensis</i>	57.59535948	72.33169935	75.70379085	79.33915033	114.9642857	14.37586276	7181.803031	148.0688023	200.6785714	32.62702081
<i>Carex arcta</i>	65.36836602	55.06594771	50.87071895	53.23104576	204.98125	64.28887313	4192.044199	670.5721643	437.05625	264.8788508
<i>Carex arctata</i>	48.88575164	48.92039216	38.07882353	34.12333333	185.0823529	19.37028983	4024.195958	297.228096	290.9156863	35.84870001
<i>Carex arctiformis</i>	38.34986928	36.90882353	35.06633987	36.25862745	219	35.39067674	3850.013699	467.4633356	776.6666667	262.6708968
<i>Carex argyrantha</i>	55.53294118	56.14424837	46.01437909	46.67496732	206.0909091	16.36949075	4329.475719	176.7577898	305.4545455	66.2830535
<i>Carex arkansana</i>	54.88601307	52.13313726	46.31594771	47.44568628	285.7868852	35.30114009	5322.532211	212.1155016	344.9836066	30.14041808
<i>Carex assiniboinensis</i>	50.70797386	42.05588236	34.96875817	34.12	185.8166667	27.11400393	4414.199239	309.1600834	233.1666667	39.22648995
<i>Carex atherodes</i>	53.01385621	46.23111111	48.65333333	47.16633987	181.9108911	27.95231637	4351.310417	798.9786142	217.4678218	79.34622098
<i>Carex athrostachya</i>	39.14392157	34.28830066	44.91620915	43.77503268	197.1375465	47.72898002	5411.638682	996.8824419	247.5687732	180.2328618
<i>Carex atlantica capillacea</i>	58.81169935	53.3233987	33.65712419	41.29026144	272.4555556	53.17667535	4735.054176	443.850004	350.1041667	67.09927865
<i>Carex atrata</i>	37.68372549	55.97143791	82.11464052	81.55411765	134.75	37.2418776	4887.490667	1368.913912	193.6666667	69.68510734

<i>Carex atratiformis</i>	48.7733987	42.66973856	63.49104576	76.58215686	144.1099291	25.54554876	3783.642851	849.3831279	254.1595745	76.74888153
<i>Carex atrofusca</i>	46.44921569	83.37784314	78.31908497	83.02562092	70.03384615	32.35731393	3300.962891	435.996973	116.8584615	47.58551397
<i>Carex atosquama</i>	50.92725491	45.13235294	63.51215686	79.69810458	112.0323887	24.11808188	3721.005321	762.5209442	215.8906883	66.84042545
<i>Carex aurea</i>	57.74281046	47.78464053	50.29248366	53.54810458	181.2222222	40.46396196	4538.290408	1024.279854	247.6659498	112.3144295
<i>Carex aureolensis</i>	59.95196079	57.70013072	55.80104575	40.45470589	333.984	38.51434253	5422.075488	253.9296433	386.344	58.20598905
<i>Carex austrina</i>	54.16248366	41.94816994	45.12562092	44.29084968	268.5288889	35.53720775	5291.539692	311.9850416	328.3244444	43.9915432
<i>Carex austrocaroliniana</i>	66.20418301	46.80156863	58.44928105	35.57673203	304.1176471	26.04514112	5148.912081	166.1728692	440.3235294	49.81038019
<i>Carex backii</i>	45.71725491	40.86222222	38.33928105	32.3103268	183.8681319	16.83341113	4109.411141	325.6318089	256.4230769	35.03072235
<i>Carex baileyi</i>	60.13712419	47.1554902	40.30202615	30.50254902	216.7575758	29.00777197	4357.389641	314.4771013	328.5252525	32.23996235
<i>Carex baltzellii</i>	66.20222222	57.61464053	74.80633987	75.19346405	365	14.37586276	5256.936646	148.0688023	506.5	30.14041808
<i>Carex barbarae</i>	46.66856209	38.60130719	66.65124183	77.08875817	353.1829268	29.88584373	5756.975339	538.6992682	398.0731707	167.274505
<i>Carex barrattii</i>	53.83490197	49.10633987	70.4730719	80.29901961	260.4461538	22.55273734	4585.967488	217.5041034	314.0769231	30.14041808
<i>Carex basiantha</i>	32.42202614	42.20666667	39.27464053	32.76470588	361.7191011	14.37586276	5382.069742	180.4109976	452.5393258	69.89489775
<i>Carex bebbii</i>	49.85875817	52.44084968	44.8703268	53.00418301	188.0275862	26.32603707	4217.612845	550.7560317	260.6643678	87.15356865
<i>Carex bella</i>	53.22058824	46.24039216	68.74490196	85.09947712	153.375	44.34283217	6798.262504	505.5863082	207.55	45.44640393
<i>Carex bicknellii</i>	36.81954249	32.28398693	52.22104575	37.55084967	243.2811502	23.136389	4826.72594	369.3883309	322.5303514	31.59722286
<i>Carex bicolor</i>	41.17980392	33.66411765	66.00091503	70.68562092	96.71223022	36.08489278	3128.985847	391.7067346	180.7482014	121.7771839
<i>Carex bigelowii lugens</i>	67.76398693	63.61287582	80.94568628	88.98326797	99.71722718	38.68793769	3276.939867	560.2520735	190.4465021	105.3498741
<i>Carex biltmoreana</i>	52.44575164	61.18437909	54.97058824	46.63385621	286.6	14.37586276	5034.806543	148.0688023	432.4	93.25663515
<i>Carex blanda</i>	48.07627451	42.30503268	27.97372549	33.32888889	256.6574519	42.13799701	4890.638602	417.7382435	317.1923077	45.99104766
<i>Carex bolanderi</i>	52.22169935	44.57503268	24.84882353	31.34954249	244.8571429	75.8601207	5430.459644	821.704258	508.4464286	294.8795097
<i>Carex bonanzensis</i>	37.23130719	26.75248366	49.37542484	52.12052288	123.5306122	14.37586276	2973.845534	197.8595529	124.2653061	30.14041808
<i>Carex brainerdii</i>	39.14464052	36.24117647	45.50267974	46.30470589	234.4242424	54.45355263	5931.123047	176.2389404	509.2727273	131.3835684
<i>Carex brevicaulis</i>	29.11372549	36.86771242	45.6327451	40.81333334	270.4444444	61.16394181	4350.193088	936.1118116	558.7777778	238.049773
<i>Carex brevior</i>	50.95816994	50.0151634	45.17294118	48.01294118	239.2315191	36.96716866	5005.1216	485.9852854	288.3679935	65.05772483
<i>Carex breweri</i>	41.18437909	68.94130719	60.81372549	69.13137255	146.1953125	31.18753501	6056.920868	742.370258	488.640625	257.707022
<i>Carex bromoides</i>	61.32084968	51.50764706	45.22124183	43.66522876	238.4988864	51.44796803	4557.723016	462.1891793	319.5389755	66.37894406
<i>Carex brunnescens</i>	51.86424837	49.96326798	46.2272549	48.60588236	166.9348086	35.61234778	3844.652628	617.8250006	293.7320574	99.2412024
<i>Carex brysonii</i>	56.65078432	62.72869281	57.45006536	47.91045752	337	14.37586276	5581.755371	148.0688023	437	30.14041808
<i>Carex bulbostylis</i>	65.1309804	55.71320262	46.07777778	44.22130719	357.4285714	22.71211871	5743.399623	173.402848	334.6571429	55.29915586
<i>Carex bullata</i>	69.42071896	68.08620915	56.52875817	62.47640523	233.3169014	30.40771872	4348.928482	307.4937752	362.2746479	53.65930671
<i>Carex bushii</i>	58.62359477	76.01300654	64.42601308	66.90202615	275.0817308	35.07036717	5192.743566	329.6501442	340.1370192	30.8168781
<i>Carex buxbaumii</i>	43.15862745	38.60751634	53.64509804	48.99019608	192.0237826	43.96035759	4320.861266	765.610557	304.3816535	151.3867132
<i>Carex calcifugens</i>	63.59764706	61.25967321	60.1706536	49.98143791	365	14.37586276	5245.151856	148.0688023	438.6666667	69.97142274
<i>Carex californica</i>	47.59947713	51.27372549	65.43372549	71.10130719	309.8918919	58.14435283	5025.830764	402.738975	869.1081081	308.4640069
<i>Carex canescens disjuncta</i>	47.24117647	39.1882353	29.88980393	37.76071896	175.5779596	45.29174071	4058.017324	933.7012203	305.3051011	156.161581
<i>Carex capillaris</i>	44.6596732	45.08718955	47.76150327	49.48163399	128.1551724	46.20784273	3808.418787	1013.947063	204.7403651	90.79654018
<i>Carex capitata</i>	47.63431373	62.15941177	55.655817	73.41777778	112.8072289	33.67327153	3356.125538	1086.581163	169.3012048	92.61192766
<i>Carex caroliniana</i>	47.34287582	56.27372549	33.7772549	38.80947713	301.3668639	43.68660403	5154.999554	365.125672	351.6390533	46.31138026
<i>Carex castanea</i>	46.53366013	43.41013072	46.86797386	37.35281046	180.4836957	24.16913057	4046.3427	361.9507742	279.9103261	34.60379249
<i>Carex cephaloidea</i>	48.03692811	36.00803922	25.95640523	26.99006536	213.3958333	22.60459338	4458.508387	251.1905559	273.4583333	36.3071755
<i>Carex cephalophora</i>	49.47712419	34.02189543	27.50718954	34.62849674	249.9537223	35.73388088	4739.707969	375.3273866	311.4758551	41.5659478
<i>Carex chalciolepis</i>	35.75816994	38.76215686	55.28947713	73.61745098	132.5121951	32.8197676	6940.045946	471.4041271	211.9837398	43.27248468
<i>Carex chapmanii</i>	70.52954249	58.35444445	60.36346405	41.26732027	363.8292683	14.37586276	5326.308653	148.0688023	523.9268293	48.50380925

<i>Carex cherokeensis</i>	48.21457517	38.63104575	40.75235294	35.07588235	358.0898345	18.97270341	5553.551884	214.2751945	376.3758865	61.82288634
<i>Carex chihuahuensis</i>	33.90830066	49.16647059	NA	55.31143791	342.8333333	51.78598149	6526.769857	171.1097748	212.0833333	46.50602763
<i>Carex chordorrhiza</i>	40.89300654	35.5875817	44.98810458	61.34026144	143	44.34196362	3511.32801	544.4932527	218.9457944	87.6051474
<i>Carex circinata</i>	38.63104576	52.00830066	57.97444445	59.43601307	165.4069767	36.26191582	2931.954364	456.112204	663.5930233	298.4785095
<i>Carex collinsii</i>	46.04183007	49.16980392	31.70013072	36.1403268	270.6725664	30.79582604	4660.380224	210.2409413	319.8584071	30.14041808
<i>Carex communis amplisquama</i>	51.82660131	45.12607844	43.18869281	39.42967321	211.9732072	31.77544795	4282.88239	353.6940561	304.892041	49.58628691
<i>Carex comosa</i>	48.63418301	31.50862745	49.50869281	47.51522876	235.0708763	41.82589261	4574.794513	385.2102119	309.8621134	73.02671404
<i>Carex complanata</i>	70.51248366	74.83111111	57.84450981	60.82444444	311.648855	50.73580033	5084.381287	427.8446822	363.8129771	62.42886637
<i>Carex concinna</i>	55.11810458	62.44117647	71.75588236	71.89261438	137.7861386	34.61869686	3592.767119	656.2562946	199.5128713	59.18125518
<i>Carex concinnoides</i>	29.22065359	40.26869281	58.73477124	74.94555556	199.5364238	73.24113369	4851.974037	566.3176317	340.0728477	245.9772645
<i>Carex congdonii</i>	51.45738562	60.77647059	60.67986928	65.46235294	119.2	19.72838288	6878.452213	205.1387697	311.8888889	30.14041808
<i>Carex conjuncta</i>	47.92379085	37.11111112	40.9451634	33.65718955	257.2833333	18.91978805	5024.55233	255.2284873	330.7888889	30.14041808
<i>Carex conoidea</i>	53.89477125	35.3224183	35.92163399	30.78189543	225.1225166	24.61115991	4424.975395	328.5035787	310.3509934	43.54891071
<i>Carex cordillerana</i>	49.14248366	42.03934641	32.02209151	39.00215687	177.5641026	27.35323985	4489.762226	647.9154722	190.6410256	81.14363067
<i>Carex corrugata</i>	63.30150327	59.35562092	46.75019608	48.9154902	334.5826087	39.71432695	5434.516589	235.093204	391.9217391	59.50912474
<i>Carex crawei</i>	44.55111111	44.95575163	39.59104576	45.86294118	208.3956835	24.30381932	4522.248735	334.4416162	268.7985612	42.03900533
<i>Carex crawfordii</i>	43.97784314	39.07228758	31.99084968	46.49287582	177.1064593	24.60907591	3902.220941	405.1294896	282.8696172	77.48170182
<i>Carex crebriflora</i>	61.19156863	51.95575164	43.66986928	52.43045752	360.0961538	14.37586276	5403.710656	148.0688023	436.8076923	40.57336056
<i>Carex crinita crinita</i>	50.46254902	47.73764706	51.81202615	49.67895425	233.5004625	48.32346882	4461.607348	449.6475474	313.6984274	50.15521914
<i>Carex cristatella</i>	49.91960785	39.76509804	35.60104575	35.9385621	224.7931548	22.5684007	4589.603327	330.6697726	287.3497024	36.60358431
<i>Carex crus corvi</i>	52.34359477	54.66091503	49.46326798	45.43633987	305.1489362	54.8574567	5328.756563	367.0408889	340.5683891	52.93019768
<i>Carex cryptolepis</i>	50.54156863	34.34477124	45.72777778	33.82143791	197.4760148	20.80042682	4248.444895	292.4994429	283.0590406	42.0397984
<i>Carex cumberlandensis</i>	58.80830066	55.77568628	37.52640523	45.86372549	306.0877193	37.30342798	5158.868815	212.8097538	386.6491228	47.0157615
<i>Carex cumulata</i>	50.32196079	49.78745098	46.63620915	45.83287582	205.7365269	14.37586276	4189.873575	262.0136502	314.0179641	63.47416447
<i>Carex curatorum</i>	44.96071896	49.83222222	57.11869281	65.33477124	251	38.05182225	6178.600349	148.0688023	101.7428571	30.14041808
<i>Carex cusickii</i>	47.17294118	44.60352941	48.8751634	56.64359478	240.75	71.80568687	5013.930279	848.4522139	494.3289474	274.4133324
<i>Carex dasycarpa</i>	63.25418301	48.95294118	34.65620915	40.38836602	365	14.37586276	5306.766896	148.0688023	504.0754717	46.73486964
<i>Carex davisii</i>	52.65039216	54.06111112	30.49039216	35.62575163	251.9594883	21.71917849	4961.624103	329.5372658	324.4776119	31.09253541
<i>Carex davyi</i>	46.29614379	38.55679739	60.52222222	62.27686275	167	14.37586276	6685.015625	351.33481	443	30.14041808
<i>Carex debilis</i>	53.42490196	55.15045752	37.66359477	44.23045752	246.9676071	63.98682523	4525.520843	540.3065447	343.6980146	63.71151087
<i>Carex decomposita</i>	48.05823529	61.03294118	45.10457516	62.57666667	316.7111111	51.73511716	5244.188135	423.4746752	364.2888889	64.54494897
<i>Carex deflexa deflexa</i>	38.98039216	42.78875817	42.15385621	57.48686275	156.4717286	31.99080206	3929.255909	880.1462564	285.0016155	118.5299315
<i>Carex densa</i>	42.80986929	35.35143791	48.91542484	49.43849673	337.5547445	43.6659983	5495.970977	478.9854791	527.4306569	136.1890876
<i>Carex deweyana deweyana</i>	51.36026144	37.08379085	32.26150327	31.29542484	193.0023866	28.79577487	4174.180763	463.1890367	302.4836913	133.5214561
<i>Carex diandra</i>	33.14980392	44.4048366	37.80640523	63.82294118	173.5842167	35.00296868	3945.475591	696.3441558	247.639576	77.89626107
<i>Carex disperma</i>	48.65718955	38.40281046	32.01071896	38.95084968	171.2219959	30.60917301	4224.627574	981.6933149	262.5064494	95.06194415
<i>Carex douglasii</i>	36.13640523	48.47928105	33.03287582	51.6933987	195.1468354	41.21417021	5651.629238	869.9666673	168.2632911	111.0311227
<i>Carex duriuscula</i>	54.6024183	55.92928105	60.48222222	59.87464053	186.2517815	36.91010028	5276.862022	1112.935347	194.2541568	45.73786087
<i>Carex ebenea</i>	57.65784314	58.8706536	67.90418301	86.20862745	138.6824324	35.4506531	6842.467731	475.8388968	203.4864865	46.12663529
<i>Carex eburnea</i>	49.58542484	47.96124183	26.9651634	29.27627451	195.4355017	44.410251	4205.214768	598.0725625	265.4696803	54.96824205
<i>Carex echinata echinata</i>	52.93248366	46.45366013	36.41450981	44.84143791	199.6923913	48.21277774	4162.151207	679.4826977	405.8592391	230.6141298
<i>Carex edwardsiana</i>	55.28045752	52.78052288	55.92392157	39.85529412	365	14.37586276	5881.782511	148.0688023	276.3333333	30.14041808
<i>Carex egglestonii</i>	62.10424837	60.39830066	71.73647059	72.65980392	150.7761194	30.97008375	6667.193192	576.7470634	168.4029851	36.37517456
<i>Carex eleusinoides</i>	54.14294118	56.34222223	86.25228758	79.92601308	107.8837209	16.38700022	2971.996207	492.7864346	163.3953488	47.02741831

<i>Carex elliotii</i>	38.58588236	46.69647059	42.36150327	46.3109804	364.4693878	14.37586276	5288.281669	148.0688023	501.4897959	56.5881033
<i>Carex elynoides</i>	50.23535948	57.41908497	69.82222222	63.18915033	135.8	26.43416541	6608.54694	726.9596414	189.72	42.20915006
<i>Carex emoryi</i>	55.52111111	34.92653595	59.80712419	65.68333334	236.9310345	43.61107684	4955.659419	686.0058688	289.8068966	71.64969536
<i>Carex endlichii</i>	60.5561438	61.63601308	72.72836601	83.21542484	319	24.64751509	6517.608887	148.0688023	272.8	30.14041808
<i>Carex engelmannii</i>	40.76078432	75.58535948	63.62078432	72.77856209	132.3777778	29.26857521	5266.189762	1206.148941	436.8888889	373.6054812
<i>Carex epapillosa</i>	59.60712419	51.67450981	73.80045752	78.19437909	145.2282609	32.56037613	6185.824925	784.6836996	191.8152174	65.10497514
<i>Carex exilis</i>	58.57875817	66.85751634	58.00973856	60.10130719	187.9359606	51.28415959	3950.892918	521.4439493	313.864532	58.12922066
<i>Carex exsiccata</i>	51.99496732	53.69379085	47.29686275	54.01581699	247.28125	73.4698401	4537.234928	606.1822646	642.0357143	302.1171759
<i>Carex festucacea</i>	49.9175817	48.10718955	40.85725491	43.30732026	271.7058824	44.10486723	4942.789748	441.2566671	342.2167183	47.37431327
<i>Carex feta</i>	63.92575164	74.1096732	66.77522876	67.71437908	284.875	58.8689991	5293.530224	675.2358966	522.046875	142.1329011
<i>Carex filifolia</i>	40.68784314	62.16797386	68.74320262	62.78222222	181.7893701	38.14465518	4994.471881	1024.9436	183.6240157	68.24993497
<i>Carex fissa fissa</i>	61.43875817	54.48052288	37.42183007	44.19986929	346.1403509	35.07233415	5301.656601	163.7374496	469.245614	90.2221017
<i>Carex fissuricola</i>	48.65653595	59.94130719	61.78843138	66.2609804	130.0714286	32.65184309	6805.473371	362.1787099	302.1785714	44.7470699
<i>Carex flaccosperma</i>	65.56718954	67.60686275	61.83967321	55.87960785	332.52657	48.72000466	5313.131164	427.516543	382.7874396	48.72902324
<i>Carex flava</i>	55.13163399	48.22130719	45.2803268	45.74235294	190.0391156	27.76022259	4078.181592	392.8910346	304.7619048	97.35557698
<i>Carex floridana</i>	37.57156863	38.15006536	41.33973856	41.05640523	360.4342105	20.04816569	5352.667178	175.0026052	468.4473684	87.6849504
<i>Carex foenea</i>	41.64254902	55.51431373	37.1033987	43.43411765	170.7845868	33.78804512	4089.144551	936.6561175	259.5803157	72.31831679
<i>Carex folliculata</i>	71.25797386	65.63620915	44.01189543	51.94568628	229.9858491	35.54384833	4395.823676	346.4073404	329.6320755	56.63197819
<i>Carex formosa</i>	55.59352941	61.69888889	45.31633987	53.67418301	212	14.37586276	4355.832539	289.1184822	269.6902655	30.14041808
<i>Carex fracta</i>	55.80143791	64.3527451	56.03457516	52.54503268	228.7067669	71.6836254	6128.693466	512.144933	491.1879699	180.0700684
<i>Carex frankii</i>	51.83692811	64.44464053	61.31588235	54.6761438	277.8473054	36.86061971	5056.666383	344.6412138	334.2844311	52.29655316
<i>Carex fraserianus</i>	54.29934641	39.42620915	45.90653595	35.80620915	264	63.63961031	4930.0542	421.1297352	399.5	30.14041808
<i>Carex fuliginosa</i>	34.03640523	65.58490196	62.97418301	72.15084967	61.64033613	37.91331225	3497.757822	864.7323546	121.9865546	63.33237496
<i>Carex garberi</i>	51.91686275	33.07267974	43.85189543	46.62143791	164.5519802	49.76998977	3864.470286	684.5743369	242.5371287	108.8539491
<i>Carex geophila</i>	45.50045752	49.67888889	44.34901961	50.50281046	205.3888889	56.76431363	6306.681085	520.7257166	189.2222222	43.07343305
<i>Carex geyeri</i>	38.57300654	35.21124183	24.30470588	33.96372549	173.3880126	41.80482357	5685.123874	843.4430654	252.5804416	172.9055973
<i>Carex gholsonii</i>	53.67477124	60.97921569	52.9403268	53.23745098	365	14.37586276	5372.410566	148.0688023	520.3548387	56.29753999
<i>Carex gigantea</i>	59.31401961	60.50542484	62.60575164	59.15601308	330.9666667	42.27400284	5226.974255	306.6339103	424.05	97.95161299
<i>Carex glacialis</i>	58.36895425	55.40228758	64.84202615	68.29849673	98.4929078	32.31630186	3184.430609	377.1740653	170.7375887	94.85869959
<i>Carex glareosa</i>	43.0951634	42.76647059	52.85084968	75.08104576	97.10734463	43.43889128	3184.377348	481.9608382	225.8426966	157.3750351
<i>Carex glaucescens</i>	60.27640523	68.98692811	82.38679739	79.91816994	358.122449	34.77302095	5414.261965	192.182436	450.755102	81.65577531
<i>Carex glaucodea</i>	64.18816994	56.4754902	55.05392157	47.39843137	281.1666667	34.63564638	5066.822107	312.5727906	329.4920635	37.14291233
<i>Carex globosa</i>	41.66732026	38.49254902	55.20666667	58.18614379	355.0273973	40.67041397	5557.95978	485.7939042	486.0410959	184.5208087
<i>Carex gmelinii</i>	52.83803922	62.12562092	80.2030719	84.27189543	143.62	28.83017835	2753.790882	213.6077863	415.46	262.5984138
<i>Carex godfreyi</i>	50.10751634	47.59882353	33.99052288	34.695817	353.5714286	48.47411948	5232.754299	501.7881971	521.8571429	59.73530358
<i>Carex gracilescens</i>	52.89261438	42.56503268	45.15562092	26.40405229	254.6735537	38.14251561	4741.137947	343.855923	323.6446281	48.06234877
<i>Carex gracilior</i>	58.96248367	62.57934641	55.26058824	69.00202615	365	14.37586276	5671.295391	310.9221822	549.24	114.1243036
<i>Carex gracillima</i>	57.23124183	61.83483661	33.81986928	38.68522876	213.2433962	27.07868442	4346.9676	307.3412043	291.6226415	38.32477701
<i>Carex granularis</i>	45.44816993	47.75039216	56.73405229	42.72888889	234.7194005	35.91077413	4640.0629	405.8320058	299.7601998	45.94470352
<i>Carex gravida</i>	51.91026144	26.6382353	36.09993464	31.82163399	250.8035714	24.22891547	5278.960138	339.9700135	301.8407738	51.15194575
<i>Carex grayi</i>	57.39732027	55.59287582	44.2972549	48.64986928	247.1118012	34.37689729	4752.810759	361.4651451	309.1254658	40.05550142
<i>Carex grisea</i>	59.1569281	51.07751634	33.32620915	31.71830066	247.6410596	30.90019287	4875.525327	415.5497887	312.0980132	36.98785999
<i>Carex gynandra</i>	45.1530719	34.95359478	41.83124183	51.88986928	204.5777778	34.07875956	4196.234434	357.2871383	317.7555556	53.85434364
<i>Carex gynocrates</i>	42.45934641	59.33921569	40.86816994	42.04718954	143.9502262	34.82700444	3663.364922	737.8349231	247.5701357	64.44307435

<i>Carex gynodynamis</i>	36.32522876	49.18895425	55.235817	59.31732026	352.625	43.53474697	5509.564056	314.2606398	613.78125	253.3654424
<i>Carex halliana</i>	48.75222222	46.82196079	59.28052288	61.6133987	170.0588235	23.16367895	5508.012273	378.6166515	728.1294118	224.7797752
<i>Carex hallii</i>	39.98594771	54.98555556	58.55326798	69.70496732	175.8095238	45.42119313	5767.190162	1057.194412	205.9761905	61.99586457
<i>Carex harfordii</i>	46.82849673	41.04653595	59.65490197	63.25640523	357.7758621	35.32110502	5422.243745	289.2411002	553.7758621	147.2031706
<i>Carex hassei</i>	45.03300654	45.42287582	65.49882353	66.60660131	263.7241379	72.02255617	5682.566555	726.0005792	400.2068966	244.4974028
<i>Carex haydeniana</i>	64.34699347	63.03261438	77.32522876	85.38921569	135.0064516	34.72405072	5845.856524	1119.117204	210.0516129	54.55972464
<i>Carex haydenii</i>	53.05895425	47.20692811	53.85542484	60.69993464	196.0275229	37.92302626	4176.174361	560.1952405	316.7844037	75.50777013
<i>Carex heleonastes</i>	56.9175817	45.08431373	58.8227451	59.03045752	136.2117647	23.86923409	3453.398662	459.5379328	218.3764706	50.89718312
<i>Carex helleri</i>	36.33294118	52.05150327	62.3554902	71.04111111	132.2268041	24.29570656	6792.232019	380.2547264	271.3402062	81.01901611
<i>Carex hendersonii</i>	64.32058824	63.49006536	64.10084968	52.16895425	286.0218978	51.5665571	4733.330999	496.4343927	686.6423358	247.0910387
<i>Carex heteroneura</i>	52.63960784	40.17777778	65.76633987	76.7054902	151.4868421	39.28533536	6301.448496	773.2632229	247.4473684	108.7964738
<i>Carex hirsutella</i>	48.60947713	58.50594772	40.46810458	47.19869281	258.1392962	28.93203761	4829.266718	368.0438576	321.5307918	37.39505832
<i>Carex hirtifolia</i>	59.09601307	43.63777778	34.44830066	32.93947713	233.630713	23.52916529	4606.186327	337.231465	303.1224863	31.7657634
<i>Carex hirtissima</i>	44.22941177	46.33869281	32.48058824	38.36666667	353.9333333	42.8610157	5890.595312	527.5400526	623.8	130.9041089
<i>Carex hitchcockiana</i>	56.14738563	47.62607843	26.94771242	41.05732026	227.9861878	26.37072849	4550.081811	390.3472254	295.1823204	40.10318985
<i>Carex holostoma</i>	49.21477125	77.58248366	65.82457516	74.03980393	81.17391304	14.37586276	3159.48769	410.414284	115.826087	30.34214528
<i>Carex hoodii</i>	52.47692811	58.52764706	63.51686275	57.81437909	173.7881679	40.37447764	5426.396232	850.3458456	289.4484733	218.0943259
<i>Carex hormathodes</i>	48.04039216	45.14418301	52.92235295	51.66627451	227.0199005	35.00142286	4263.211446	384.9708974	338.5920398	50.23716489
<i>Carex hostiana</i>	45.72555556	46.18091504	49.83091503	56.92699347	156.475	16.011194	3654.941772	148.5058292	313.175	30.14041808
<i>Carex houghtoniana</i>	49.84784314	50.67313726	46.65751634	53.26509804	172.2357143	18.98194496	3870.292983	321.0529203	276.8142857	53.58101208
<i>Carex hyalina</i>	48.75026144	41.25777778	47.60379085	41.3596732	352.5454545	16.75233395	5584.202482	148.0688023	383.5909091	39.96743805
<i>Carex hyalinolepis</i>	46.64921569	36.09535948	50.72006536	50.53013072	285.2877698	48.34700751	5220.983254	317.5156445	350.0863309	63.18387378
<i>Carex hystericina</i>	48.65071896	47.14869281	56.13941177	36.30058824	219.3494424	28.61059504	4642.066105	520.1204616	271.2490706	57.32134834
<i>Carex idahoensis</i>	39.3048366	35.98738562	56.05830065	65.53888889	168.1111111	35.6806826	6246.392198	234.5270183	127.2222222	48.46075159
<i>Carex illota</i>	53.36986928	56.13261438	58.51712419	73.51202615	141.6898148	28.76482167	5612.85108	1292.218667	400.2638889	288.2474709
<i>Carex impressinervis</i>	53.32934641	55.48320262	41.62901961	40.15222223	357.75	14.5	5374.536255	180.5712689	411	44.17389878
<i>Carex infirmis</i>	59.13830066	57.09849673	44.7054902	50.74967321	175.025	43.91687223	5614.236407	780.7972714	392.775	204.5123641
<i>Carex inops inops</i>	54.06477124	47.73019608	64.92300654	62.94124183	214.5045732	45.41086372	5004.660355	758.467949	379.9603659	236.5721069
<i>Carex integra</i>	60.91751634	53.51091503	54.55856209	63.37405229	191.5490196	37.07846476	6189.680999	522.6473543	456.3921569	179.3216193
<i>Carex interior</i>	44.365817	36.175817	31.88431373	40.68254902	193.9932603	35.30438524	4336.939921	701.3080858	273.0042123	82.48174707
<i>Carex interrupta</i>	53.68777778	46.35176471	69.42026144	66.33326798	275.775	52.99366454	4655.869302	497.9313366	698.175	240.2569181
<i>Carex intumescens</i>	60.36444445	57.40601308	49.6727451	49.11699346	230.6629464	59.08391216	4428.504805	494.74519	320.0075893	63.21092982
<i>Carex jamesii</i>	46.53	37.87026144	36.58810458	40.03346405	256.0607211	27.53483991	4948.211817	295.5380274	319.8766603	39.93637961
<i>Carex jonesii</i>	59.61019608	59.42300654	71.06575164	71.0327451	171.6350365	38.89292918	6038.482842	661.2040228	364.6642336	236.2625744
<i>Carex jorii</i>	48.03431373	65.07797386	58.90346405	53.60052288	353.4137931	24.45693278	5435.402588	173.6164104	412.4310345	50.70766303
<i>Carex juniperorum</i>	32.14039216	30.63771242	38.70189543	36.58653595	230.6428571	27.58718743	4437.323277	266.9812019	286.3214286	36.03707306
<i>Carex klamathensis</i>	51.5882353	37.16614379	64.25398693	56.12993464	326.3684211	29.37494893	5781.969174	148.0688023	626.3421053	129.57629
<i>Carex kraliana</i>	51.38503268	40.04784314	37.39594771	38.00496732	345.8222222	29.37166916	5348.292177	231.7836056	399.3333333	46.03210342
<i>Carex krausei</i>	52.01019608	62.81588235	52.98045752	62.14124183	77.65693431	33.68505471	3141.28966	361.3351387	133.4306569	95.26478545
<i>Carex lachenalii</i>	58.63254902	73.37797386	77.95411765	81.40607844	99.01689189	26.74071248	3333.122317	824.4824497	203.9442568	92.78416962
<i>Carex lacustris</i>	47.38313726	45.99	64.09692811	56.80281046	209.3174387	27.52151674	4363.124664	347.3957493	277.8051771	42.45959704
<i>Carex laeviconica</i>	41.07366013	32.73209151	40.60300654	33.58045752	227.7929293	30.57756303	4933.687766	422.0714486	290.020202	59.4422434
<i>Carex laeviculmis</i>	56.3972549	51.03470589	46.15372549	52.40640523	202.4312268	53.02611219	4496.752967	1060.896143	658.5873606	304.792119
<i>Carex laevivaginata</i>	61.13254902	52.56836601	52.16901961	53.79941177	256.9813433	39.68437776	4712.845219	296.8353158	312.4738806	41.84682328

<i>Carex lapponica</i>	42.37581699	33.80522876	29.83071896	32.1279085	158.4320988	45.6363173	3594.248415	801.6254489	242.6790123	86.90293826
<i>Carex lasiocarpa</i>	38.31816994	38.36869281	50.03712418	59.85437909	198.3166575	33.99596822	4344.426806	687.5730157	268.8455195	107.0077354
<i>Carex latebracteata</i>	33.96901961	47.83372549	44.62248366	37.1503268	329.8461538	14.37586276	5361.199669	148.0688023	429.6153846	30.14041808
<i>Carex lativena</i>	43.54104575	31.43607843	27.04679739	32.12339869	319	14.37586276	6378.890137	148.0688023	121	30.14041808
<i>Carex laxa</i>	33.59418301	27.21176471	53.00986928	57.09843137	111.6	14.37586276	3012.820996	148.0688023	197.4	30.14041808
<i>Carex laxiculmis laxiculmis</i>	56.19568628	55.87614379	42.80973857	44.78509804	244.9578059	27.36284869	4636.047687	315.6831168	312.6793249	35.28049061
<i>Carex laxiflora</i>	76.26379085	74.3303268	50.03535948	56.60058824	240.1138015	32.70802634	4559.947629	328.6071817	309.0702179	42.73819397
<i>Carex leavenworthii</i>	62.87830065	48.73575164	45.27771242	50.79542484	288.8461538	42.95527227	5220.093965	270.6569769	352.7352941	45.15722168
<i>Carex lemmonii</i>	60.92464052	58.23411765	54.95934641	64.33163399	284.7608696	75.1765876	6068.203645	522.052456	513.0652174	149.3899301
<i>Carex lenticularis impressa</i>	42.00372549	42.99385621	67.13875817	62.22673203	170.2579505	30.78651409	3983.603404	702.9631421	330.4028269	166.3253032
<i>Carex leporinella</i>	44.56764706	50.54111111	72.7930719	70.86019608	159.4246575	42.00890045	5847.407367	816.5829651	386.1643836	244.9658714
<i>Carex leptalea</i>	43.50326798	34.20490196	27.38176471	39.48895425	205.6907858	61.76719657	4218.213288	675.2420291	320.6399096	158.0517085
<i>Carex leptoneura</i>	58.23183007	46.34954249	34.05287582	41.47745099	190.0775194	23.23376091	4060.26074	322.3120784	303.379845	46.704834
<i>Carex leptopoda</i>	50.9803268	44.01973856	36.95117648	36.4585621	260.8826291	70.15992734	4807.033836	695.2400797	613.8873239	279.7263597
<i>Carex limosa</i>	47.76117647	42.74058824	71.18346406	68.61888889	162.9945005	33.64417104	3839.299586	804.5889171	282.1063245	130.0581933
<i>Carex livida</i>	53.50738562	44.83150327	62.44607844	66.23052288	168.8382749	47.95674562	3711.834975	820.9900155	392.4447439	303.1713529
<i>Carex loliacea</i>	54.82993464	51.2851634	39.16169935	40.07313726	129.0144928	23.8176237	3100.639815	374.687529	210.3188406	60.94874721
<i>Carex lonchocarpa</i>	62.76261438	59.45019608	35.87862746	37.43575164	357.4634146	20.92976058	5297.275641	207.8975437	434.3414634	69.61379524
<i>Carex longii</i>	49.32169935	74.41084968	39.03294118	46.34424837	309.7685775	54.5292382	5036.259807	467.4099599	396.0509554	119.3463294
<i>Carex louisianica</i>	53.71607843	51.68346406	51.92444445	49.99620915	326.893617	40.94991752	5271.460172	317.6947865	385.8723404	53.2126262
<i>Carex lucorum lucorum</i>	40.01490196	45.74601307	61.11418301	59.97333334	198.4067797	20.88071098	4170.240814	250.7485801	287.1355932	58.54808152
<i>Carex lupuliformis</i>	43.56366013	45.34281046	43.80666667	37.51843138	299.1414634	65.71204629	4968.88691	509.5479475	404.0146341	121.4104398
<i>Carex lupulina</i>	58.5775817	61.66509804	63.48725491	58.41522876	247.5898277	47.5460965	4677.034719	465.5413274	314.8096801	56.47082341
<i>Carex lurida</i>	56.61450981	53.49418301	54.26941176	38.00640523	251.740678	51.85926934	4607.176513	474.9403459	329.9502825	50.54804019
<i>Carex luzulifolia</i>	44.55228759	68.99228759	71.83888889	74.19248366	177.6315789	47.57474882	6119.486559	565.4224699	488.8947368	228.4595502
<i>Carex lyngbyei</i>	48.5075817	49.97398693	68.17431373	73.93947713	220.58	93.70517131	3465.948952	850.7869202	563.1266667	296.5211627
<i>Carex mackenziei</i>	48.35732027	43.25437909	56.82620915	62.49947713	139.8652482	40.37789704	3414.866533	621.0088598	275.4893617	110.8375012
<i>Carex macloviana</i>	51.19215686	56.32281046	51.32124183	72.47784314	141.6746988	58.75374559	4233.447478	1325.327753	271.5572289	189.7791204
<i>Carex macrocephala</i>	59.95143791	64.58947713	68.50614379	65.09058824	268.53	72.33933155	3746.357263	683.3463712	721.14	340.1077375
<i>Carex macrochaeta</i>	54.23490196	47.49013072	78.47921569	83.18444445	141.126183	37.5212578	3077.932268	561.6440381	438.4731861	271.7673697
<i>Carex magellanica</i>	59.6806536	32.49359477	59.20450981	61.66366013	164.1283784	30.79271395	3824.305797	648.7861939	277.7625483	83.83196666
<i>Carex manhartii</i>	83.03895425	68.93895425	55.80300654	52.19156863	277.6111111	14.37586276	5016.099637	148.0688023	467.5	35.92025481
<i>Carex marina</i>	54.59633987	52.86215686	68.265817	64.69189543	72.46706587	37.44759944	3317.867624	593.8939455	115.9761905	60.95339855
<i>Carex mariposana</i>	49.96973856	48.97888889	45.43666667	52.52915033	176.1818182	50.3664413	6740.148793	265.2508429	414.9393939	112.6817807
<i>Carex meadii</i>	56.95542484	53.03895425	59.05810458	43.31431373	260.919403	32.30722764	5147.10665	318.8641679	336.6955224	34.31628789
<i>Carex media</i>	60.7927451	57.09346405	79.55542484	86.14228758	132.6691729	26.30710409	3411.450803	606.7951254	212.6240602	84.81937314
<i>Carex membranacea</i>	61.3079085	90.08078432	76.05882353	82.7424183	79.07549858	34.73632077	3217.51547	415.46915	133.5242165	64.97221055
<i>Carex mendocinensis</i>	47.47254902	60.58954249	55.43215687	57.60111111	328.8181818	44.80916473	5550.49941	312.1824107	667.9220779	156.9433996
<i>Carex merritt fernaldii</i>	48.40908497	55.69679739	44.70339869	50.98457517	186	15.48448355	4083.270164	196.5057855	271.2622951	30.14041808
<i>Carex mertensii</i>	49.28862745	38.54039216	66.03156863	72.17163399	188.8877551	62.02133553	4160.203704	951.7302008	636.7346939	347.1210179
<i>Carex mesochorea</i>	55.07346405	35.50712418	36.38326798	41.9451634	253.462585	39.20691023	4862.98481	468.0199581	333.2176871	31.60143854
<i>Carex michauxiana</i>	53.29705883	44.23196079	42.97411765	36.11503268	164.1174603	23.04928629	3757.509247	396.5807653	306.9555556	66.42047536
<i>Carex microchaeta microchaeta</i>	50.34993464	40.83869281	84.39222223	84.14692811	104.6374696	24.22259492	3011.144143	348.3131986	190.3649635	61.01745563

<i>Carex microdonta</i>	44.14803922	47.70359477	59.33418301	45.40647059	319.0769231	45.92235027	5530.325954	243.5371695	340	43.09391223
<i>Carex microglochin</i>	22.66143791	26.49620915	49.40418301	56.77444445	110.2014388	32.90922514	3745.608685	1142.288598	186.3309353	87.97474839
<i>Carex micropoda</i>	58.77620915	55.85300654	61.95503268	82.18130719	125.5514403	37.1868249	3681.91436	1583.87227	391.1316872	268.2213052
<i>Carex microptera</i>	45.87627451	29.94607843	63.69450981	57.58535948	165.1815068	33.64726447	5700.709146	1097.918548	226.2936644	159.7652902
<i>Carex misera</i>	39.50431373	52.58888889	51.33366014	60.24980392	255.3	19.69016415	4974.774561	148.0688023	404.05	57.81355976
<i>Carex missouriensis</i>	42.1979085	42.27679739	26.60941177	29.36228758	256.7936508	14.37586276	5128.713464	159.1530859	335.5873016	30.14041808
<i>Carex mitchelliana</i>	41.84542484	40.77921569	53.09875817	39.41228758	258.9528302	36.54570057	4804.612167	313.225508	321.1415094	36.47267436
<i>Carex molesta</i>	47.15777778	44.44379085	46.88771242	41.34718954	250.3726115	21.49622186	5039.822011	299.3874299	328.2547771	40.71311686
<i>Carex molestiformis</i>	60.26529412	58.61091503	52.8875817	54.55614379	290.7307692	17.83156234	5202.764198	214.1115405	358.4615385	30.14041808
<i>Carex muehlenbergii enervis</i>	51.20980392	41.49490196	51.29379085	42.19254902	267.5141509	48.86550516	4979.325064	448.4646858	324.7295597	49.42866465
<i>Carex multicaulis</i>	56.90712418	51.72281046	43.75738562	45.53732027	292.3454545	59.70238671	6029.026869	362.9681937	462.8545455	168.7352215
<i>Carex multicosata</i>	50.26568628	49.69202615	57.14372549	56.59562092	182.8376623	51.96938148	6192.285185	517.7061828	387.7142857	176.4011958
<i>Carex muriculata</i>	41.77470588	45.12150327	32.41261438	38.54222222	365	14.37586276	6355.323975	148.0688023	139.5	38.89087297
<i>Carex muskingumensis</i>	40.65601308	43.06803922	37.55836601	33.26169935	241.2625	20.06187734	4829.774921	246.7688793	299.8125	34.97569763
<i>Carex nardina</i>	42.5306536	47.25934641	68.17039216	66.29575164	89.11409396	49.50099518	3707.912197	965.9484287	205.7583893	194.7201414
<i>Carex nebrascensis</i>	47.18745098	42.24457517	66.18888889	75.54222222	199.6375618	37.82027726	5801.03169	587.9634589	209.1004942	138.5446924
<i>Carex nelsonii</i>	59.00535948	48.02653595	88.45581699	90.11019608	118.5526316	15.49838242	6921.089548	576.1221133	215.8421053	33.89213918
<i>Carex nervina</i>	49.14509804	43.94013072	46.56156863	51.97392157	189.1578947	35.56100104	6203.599532	392.0400846	385.6315789	102.3024984
<i>Carex neurophora</i>	50.31372549	55.39156863	70.16019608	66.43117647	165.3333333	38.88071087	5621.282219	656.6675592	457.1111111	338.8491486
<i>Carex nigra</i>	50.60156863	48.48901961	54.77254902	73.00908497	186.9666667	36.50553414	3855.600114	361.2961886	344.9666667	93.1711378
<i>Carex nigricans</i>	50.95830066	38.79470589	73.10477125	78.72483661	145.8117647	39.53645776	4502.760375	1287.411309	461.5862745	309.2823486
<i>Carex nigromarginata</i>	51.96470588	53.68385621	66.48732027	68.10143791	291.8102767	40.24729574	5009.077167	322.9328371	347.541502	52.52931208
<i>Carex normalis</i>	49.70222223	58.24888889	32.54588235	37.29130719	239.9234168	28.56313242	4644.288679	361.3160009	314.0073638	34.77710236
<i>Carex norvegica</i>	42.13346406	55.76797386	77.02392157	86.6651634	121.9314286	39.89794287	4342.42607	1339.86368	208.4114286	76.25073496
<i>Carex nova</i>	51.91039216	42.84529412	84.57941177	87.4206536	127.3604651	23.21847056	6868.875486	557.1998607	205.0930233	43.6533736
<i>Carex novae angliae</i>	56.15764706	45.33699347	57.7433987	48.57699347	193.6756757	15.31755103	4027.522035	211.138747	342.2927928	69.91779169
<i>Carex nudata</i>	60.66450981	55.94653595	84.58039216	87.92745098	310.928	67.22280911	5480.725861	494.7388468	536.24	261.7614464
<i>Carex obispoensis</i>	33.49261438	41.09385621	44.07477124	42.69803922	365	14.37586276	5965.724219	244.0100598	271.8	70.35592054
<i>Carex obnupta</i>	37.91895425	44.87947713	72.22450981	75.24816994	315.6823821	48.0433921	4545.069005	519.9588536	732.9776675	279.5195451
<i>Carex obtusata</i>	31.24026144	69.94862745	35.60823529	54.81281046	136.7731959	42.64719059	4176.595018	1426.920914	171.8041237	61.22276552
<i>Carex occidentalis</i>	38.8630719	40.33816994	32.54071896	47.68013072	202.6141732	62.45258087	6343.443181	600.2312443	190.492126	67.41234931
<i>Carex oklahomensis</i>	52.95869281	57.72058824	52.69562092	62.75862745	289.1354167	25.36164522	5169.244502	260.9101153	337.8541667	30.14041808
<i>Carex oligocarpa</i>	62.88385621	54.81764706	54.17071896	44.12352941	260.759375	26.47649172	5052.599361	318.9705672	332.634375	40.36798686
<i>Carex oligosperma</i>	51.49718955	47.82503268	49.61640523	54.27803922	176.4051948	29.69011121	3912.930085	441.0483881	298.6155844	49.3911462
<i>Carex opaca</i>	48.35470588	62.66915033	41.95509804	40.55202615	277.15	16.95779074	5293.519629	148.0688023	355.525	30.14041808
<i>Carex oreocharis</i>	41.77849673	44.20986928	58.24418301	47.47601307	172.1395349	29.89711038	6468.933946	656.3770181	202.3023256	41.14060379
<i>Carex ormostachya</i>	53.09915033	48.29019608	40.85816994	40.91117647	188.125	17.0178331	4046.221264	277.9598138	282.9513889	32.46522181
<i>Carex oronensis</i>	50.36470588	67.47078431	65.32398693	63.04607843	201.5	14.37586276	4158.480957	148.0688023	305.75	30.14041808
<i>Carex ouachitana</i>	47.05993464	53.45411765	47.94379085	34.47803922	325.0833333	14.37586276	5352.47111	148.0688023	423.25	30.14041808
<i>Carex ovalis</i>	39.87418301	36.68660131	49.03300654	50.60816994	301.3114754	56.07362451	4755.430972	460.1427887	540.6393443	172.0636542
<i>Carex oxylepis pubescens</i>	51.75457516	53.45248366	27.05385621	41.8006536	340.9747899	32.36928398	5374.757193	193.8329452	396.0420168	53.90235914
<i>Carex ozarkana</i>	40.73019608	50.63653595	36.02418301	39.14830066	342.4615385	27.6996251	5492.160945	148.0688023	367.8461538	30.14041808
<i>Carex pachystachya</i>	65.66215686	74.59575164	75.20039216	70.40091503	189.3623446	66.57882816	4633.673855	1259.258873	439.3783304	293.1509043
<i>Carex paeninsulae</i>	66.09522876	55.31941177	48.77601308	44.61980393	365	14.37586276	5221.095198	148.0688023	549.5357143	30.14041808

<i>Carex paleacea</i>	59.92418301	56.62535948	64.34405229	68.73189543	166.8536585	23.88963476	3657.233759	257.9523575	304.6768293	67.30517769
<i>Carex pallescens</i>	53.62287582	55.94398693	50.73496732	48.35254902	207.3562823	25.79412021	4157.282625	256.8946187	321.2185886	58.36270714
<i>Carex pansa</i>	39.51104575	75.08261438	59.33816994	73.91045752	327.5	62.5230214	4228.893207	725.5230097	799.8	259.2962072
<i>Carex parryana</i>	59.17679739	62.31699346	74.04692811	84.78947712	165.1721311	39.9167921	4594.501121	978.288358	178.4590164	54.98281438
<i>Carex pauciflora</i>	44.55281046	27.7103268	24.83111111	24.37843138	170.9089219	32.54987685	3696.737812	503.1806028	341.2081784	175.0863404
<i>Carex paupercula</i>	56.74281046	50.86954249	63.63816993	77.05503268	162.8351648	29.27790797	3871.244638	692.615597	283.4368132	75.17098135
<i>Carex peckii</i>	64.50967321	56.72098039	51.31437909	47.74849673	184.45625	17.84361907	4093.700484	346.2137936	253.0020833	38.11988007
<i>Carex pedunculata</i>	59.56882353	44.60777778	58.1230719	51.61928105	202.5710843	22.07518969	4234.95515	275.1923965	287.5506024	45.27995446
<i>Carex pellita</i>	68.85078432	59.15058824	70.40169935	59.60470588	216.5405405	42.00150045	5147.896959	803.7987171	264.9220986	107.057648
<i>Carex pelocarpa</i>	43.79477124	58.24117647	38.5333987	81.27712418	139.2	34.80562568	6346.190894	716.3900814	177.45	58.26389602
<i>Carex pensylvanica</i>	65.1979085	58.48398693	70.06921569	67.1051634	220.3551402	27.90380023	4512.762878	424.3440849	287.0722175	69.72632886
<i>Carex perdentata</i>	54.90137255	42.60633987	38.91261438	39.37712419	365	14.37586276	5845.99147	148.0688023	265.5882353	30.14041808
<i>Carex petasata</i>	62.35653595	60.63346406	47.27287582	48.98111111	175.5798319	29.25113025	5190.894449	950.6705529	163.1134454	74.47554853
<i>Carex petricosa misandroides</i>	41.8424183	72.49339869	59.50209151	71.02444444	101.5514019	30.81711422	3236.071813	451.6763623	166.4392523	65.34756158
<i>Carex phaeocephala</i>	54.755817	48.27673203	66.76450981	67.49718955	135.883959	32.32569588	5019.349085	1379.187393	327.609215	269.0573335
<i>Carex picta</i>	36.86009804	33.60058824	36.2030719	61.9606536	302.1343284	47.94121891	5154.966301	301.6845904	383.8358209	51.37904213
<i>Carex pigra</i>	63.15660131	63.77091504	60.97954248	50.57712418	339.9285714	25.19299135	5281.129569	206.9499618	389.4285714	55.26121785
<i>Carex pityophila</i>	48.87019608	62.70058824	35.45267974	41.1879085	181.6153846	45.93567409	6604.436617	683.2433076	179.6153846	52.4275324
<i>Carex planispicata</i>	50.33143791	57.77411765	48.21875817	40.08071896	302.8167939	46.87590845	5152.776293	336.5504772	353.6717557	45.72012564
<i>Carex planostachys</i>	56.83431373	49.40346405	49.42300654	47.05960784	362.9354839	15.82362464	5879.675519	198.3025326	272.3333333	40.33240507
<i>Carex plantaginea</i>	53.18006536	43.22418301	74.47450981	50.86888889	217.1512141	26.04548261	4383.019142	315.9201982	300.4172185	44.62972638
<i>Carex platyphylla</i>	56.9896732	64.79823529	61.82803922	55.70588235	225.5089686	23.13630661	4360.68863	245.4236423	294.7847534	32.43244791
<i>Carex pluriflora</i>	49.04849673	42.37189543	64.80875817	77.6754902	161.1878788	44.31863395	2920.772715	471.7317894	475.8484848	273.7518817
<i>Carex podocarpa</i>	53.12836602	48.49673203	77.53568628	84.43091503	102.8179825	24.04363673	3105.950961	447.8035311	182.9429825	89.59030704
<i>Carex polymorpha</i>	42.42169935	52.46444445	59.34366013	59.79183007	235.1666667	14.37586276	4408.59668	148.0688023	326.9444444	30.14041808
<i>Carex praeceptorum</i>	55.3006536	53.64019608	53.54	59.93568628	134.7066667	28.60862341	6345.653444	877.4480495	269.16	195.0681821
<i>Carex praegracilis</i>	37.6754902	39.31607843	31.58098039	43.86849674	210.8583984	54.68465063	5287.326536	978.8734994	196.5224609	89.65583965
<i>Carex prairea</i>	35.4824183	44.42633987	34.77732027	49.29718955	211.45	23.20859741	4439.704904	325.6868011	280.40625	39.75685485
<i>Carex prasina</i>	51.04013072	46.66470589	38.6606536	42.41300654	235.212987	27.42188408	4496.343733	283.7420186	306.5090909	35.0701016
<i>Carex praticola</i>	39.66830066	59.60869281	51.94816994	55.37241831	164.4879121	46.52529234	4217.054711	1077.28592	234.3758242	154.7648261
<i>Carex preslii</i>	61.59614379	65.39470589	61.5333987	64.16457516	173.8253012	44.42507712	5094.048703	786.8478777	606.6626506	296.8350538
<i>Carex projecta</i>	37.77333333	44.01522876	39.15633987	42.25490197	187.9663182	22.82374384	4037.933705	310.1981161	301.0696864	72.32436479
<i>Carex proposita</i>	40.05993464	37.99183007	51.40411765	56.6533987	126.6521739	25.6738436	6519.922533	650.0483514	248.4782609	103.9863932
<i>Carex pseudocyperus</i>	58.58738562	47.72588236	61.77947713	41.07091503	194.5201794	18.79489044	4159.338907	301.0851794	268.6547085	46.7049266
<i>Carex purpurifera</i>	57.68509804	49.00542484	41.50928105	34.94183007	297.1818182	19.1600685	5090.920721	148.0688023	395.9545455	36.35601381
<i>Carex pyrenaica</i>	37.05	58.65359478	70.87281046	75.37424837	127.8184818	29.26794556	4559.509591	1438.03428	341.359736	293.7881484
<i>Carex radiata</i>	44.33418301	38.35444444	29.83869281	31.93738562	230.6605891	33.87891241	4557.771999	435.9438316	306.4067321	44.25681639
<i>Carex ramenskii</i>	61.49084968	49.40555556	81.05490196	87.09699347	117.4	32.80308073	2720.108179	189.4065471	208.8	99.78323876
<i>Carex rariflora</i>	49.58542484	42.36575164	69.57006536	81.89830066	101.3463415	31.69694591	3231.971257	384.5914947	192.2195122	91.72317025
<i>Carex raynoldsii</i>	64.44333333	59.67594771	79.79104576	91.73052288	155.7314815	27.27247747	5497.6892	855.3659572	261.3240741	217.5296966
<i>Carex recta</i>	40.73313726	35.97614379	58.09045752	62.50470589	164.8125	18.81646948	3652.420719	204.7086687	298.234375	37.10078174
<i>Carex reniformis</i>	52.3375817	47.57594771	51.88751634	45.7372549	351.1147541	29.42340245	5491.322154	172.05559	378.7704918	47.77495629
<i>Carex retroflexa</i>	52.09921569	46.18496732	37.20352941	40.57725491	278.8867925	45.9818779	5011.958089	457.8181972	339.884097	51.26043773
<i>Carex retrorsa</i>	52.23738562	46.83535948	53.14797386	39.80673203	192.2795156	22.18334014	4185.133912	451.78187	268.8809284	55.93887311

<i>Carex reznicekii</i>	53.67869281	54.22712419	47.92261438	42.96084968	291.87	28.46357055	5027.363433	260.7954073	344.87	44.09508894
<i>Carex richardsonii</i>	43.24529412	37.20869281	47.40895425	54.29973857	195.5767442	25.69814748	4325.822325	428.1905965	254.8	39.2504777
<i>Carex roanensis</i>	53.32287582	49.97084968	29.36901961	42.45993464	232	NA	4550.306641	NA	337	NA
<i>Carex rosea</i>	50.7403268	34.78679739	27.46359477	29.49901961	236.0530638	32.7572918	4593.559619	371.4400616	304.3746052	46.2351822
<i>Carex rossii</i>	68.54771242	57.05196079	56.01986929	72.69640523	171.2394527	49.07095453	4943.525864	1178.426661	301.5758267	247.1769009
<i>Carex rostrata</i>	50.78686275	46.13784314	49.1679085	43.30470588	169.3916146	36.83465809	4050.285375	942.5140182	265.3443354	93.91234081
<i>Carex rotundata</i>	54.27424837	45.11856209	73.30013072	85.87098039	109.3537736	23.27259306	2996.343239	317.3214547	163.2216981	57.92242648
<i>Carex rupestris</i>	46.93614379	47.71745098	62.295817	64.20601307	84.81623932	42.60309819	3899.314541	1319.295274	152.6752137	71.5330539
<i>Carex ruthii</i>	56.03287582	51.0703268	47.62607843	45.86993464	270.125	14.37586276	4943.529541	148.0688023	456.7916667	53.93875687
<i>Carex sabulosa</i>	46.62666667	47.47477124	83.58973856	83.49431373	126.8333333	14.37586276	3384.298652	148.0688023	114.8888889	30.14041808
<i>Carex salina</i>	39.53849674	43.69215687	45.5096732	57.29718954	148.9677419	34.93921791	3583.533505	422.4844102	264.5376344	46.54113635
<i>Carex sartwelliana</i>	52.51359477	50.47849673	42.4182353	53.74398693	238.6933333	68.8539334	5280.165228	956.5930354	282.2933333	75.5587785
<i>Carex sartwellii</i>	54.06751634	60.70418301	62.57620915	52.92901961	200.4705882	30.09382898	4375.836452	529.0109832	242.8903743	62.43912865
<i>Carex saxatilis</i>	61.80777778	64.66705883	77.13143791	88.37156863	122.1168186	42.7027068	3480.654779	764.8416175	260.2485501	214.8785677
<i>Carex saximontana</i>	49.00366014	36.55196079	44.33202615	36.93372549	195.8333333	19.23710055	4824.244507	511.8625882	218.5185185	35.3365174
<i>Carex scabrata</i>	47.07679739	48.07928105	62.88013072	44.56875817	209.1181364	27.4868639	4250.601159	309.1519336	310.0732113	48.75111586
<i>Carex scabriuscula</i>	44.06518519	59.44503268	58.81111111	60.02405229	247.5416667	73.9735313	5773.433716	203.8075998	589.9791667	195.251882
<i>Carex schottii</i>	41.2096732	44.72777778	62.70052288	67.97686275	340.95	39.16157488	6242.404224	269.3172702	273.25	65.98554467
<i>Carex schweinitzii</i>	48.38679739	37.64784314	47.78150327	34.7382353	206.3404255	14.37586276	4343.166062	148.0688023	284	30.14041808
<i>Carex scirpoidea scirpoidea</i>	46.07555556	47.34542484	56.49058824	79.88300654	137.9796663	61.4560766	3875.462012	903.5233189	243.0620438	165.7235753
<i>Carex scoparia scoparia</i>	44.48071896	55.11954249	53.91045752	50.66640523	224.0897098	38.25950183	4478.806716	560.7081063	329.8372911	98.37385081
<i>Carex scopulorum</i>	63.62692811	64.66091503	93.30235294	95.3054902	141.8333333	29.70183171	5755.120689	963.9299197	340.7857143	247.1742685
<i>Carex senta</i>	57.65797386	60.96490197	79.97366013	83.45934641	324.4383562	56.81499858	6345.479813	275.1024191	249.1506849	98.66999871
<i>Carex seorsa</i>	62.16405229	49.16477124	42.19745098	51.47980392	262.45	37.33799643	4648.751944	287.3559117	319.8333333	33.11103716
<i>Carex serpenticola</i>	41.57673203	39.19294118	68.89006536	65.16810458	342.4864865	23.55445419	5604.269953	148.0688023	813.9189189	106.7352327
<i>Carex serratodens</i>	48.56941177	60.53326798	69.20189543	49.91673203	353.7941176	33.40820024	5731.237032	348.207147	495.8823529	78.60363347
<i>Carex sheldonii</i>	56.52915033	50.45751634	47.18921569	55.87542484	197.1020408	16.77454035	5751.578125	271.0434277	180.6734694	94.31582311
<i>Carex shinersii</i>	45.11993464	49.00973856	37.62673203	41.12934641	306.0377358	48.57981627	5428.431595	148.0688023	335.8113208	30.14041808
<i>Carex shortiana</i>	60.88542484	63.99797386	58.3620915	58.10490196	257.7867036	15.88487892	5018.291194	233.8013079	322.9806094	30.14041808
<i>Carex siccata</i>	51.53202615	51.47509804	33.10333333	56.87967321	181.7392086	37.41323139	4686.341529	1199.522572	235.0251799	57.76001372
<i>Carex silicea</i>	52.12392157	51.07294118	42.97163399	40.89718954	222.7194245	31.70928378	4252.949192	370.6612978	336.2230216	39.35182134
<i>Carex simulata</i>	34.70163399	55.59372549	54.62124183	62.81568628	181.902439	39.14302888	5779.486858	1009.397891	244.1121951	176.6852527
<i>Carex socialis</i>	45.33725491	43.09281046	31.1509804	34.8527451	328.21875	40.80064387	5405.0186	224.9759601	387.9375	38.47574645
<i>Carex sparganioides</i>	54.53627451	39.90143791	40.12830066	46.89849674	234.1597122	24.59075035	4633.95575	356.8342001	299.8834532	36.65391455
<i>Carex specifica</i>	60.08764706	60.29836601	51.02594772	56.36464053	176.4883721	23.97356887	6495.650493	265.9398873	432.8837209	103.9778386
<i>Carex spectabilis</i>	56.8972549	51.50333333	79.89326798	82.63875817	150.565365	39.51902008	4400.392674	1087.408518	573.3989813	345.4635337
<i>Carex specuicola</i>	41.86084967	30.16751634	39.88718954	57.30901961	254.5	14.37586276	6181.717774	148.0688023	92.25	35.83643397
<i>Carex spissa ultra</i>	31.96013072	40.97130719	45.5651634	49.73019608	365	14.37586276	6070.536088	195.9681151	197.8636364	52.92788936
<i>Carex sprengeii</i>	59.54980392	42.26901961	34.25751634	31.06862745	207.9010189	21.83937084	4502.417967	392.4365398	269.349345	47.58978253
<i>Carex squarrosa</i>	50.29973856	41.59725491	42.30209151	44.5975817	257.5299625	29.04744843	4808.171409	312.5331602	315.4550562	35.79775432
<i>Carex stenoptila</i>	51.17614379	62.56163399	59.57470588	56.34542484	134.1428571	27.961119	6641.63508	628.7620879	171.8571429	30.14041808
<i>Carex sterilis</i>	47.63379085	51.30856209	42.22111111	45.35647059	214.8526316	21.92829107	4462.660882	316.6416728	263.2192982	30.14041808
<i>Carex stevenii</i>	57.03973856	47.50679739	69.10111111	84.27960784	138.2682927	23.06408077	6799.245105	599.018377	197.6829268	30.14937219
<i>Carex stipata stipata</i>	54.54627451	34.50352941	29.64313726	30.87699347	219.9458763	46.4868474	4460.20439	596.066103	321.2927835	126.9160681

<i>Carex straminea</i>	43.91104575	38.66764706	39.87124183	41.45196079	243.0227273	23.55162136	4580.474487	361.8840903	320.6287879	45.33966891
<i>Carex straminiformis</i>	54.17718954	48.71666667	58.78	59.56385621	156.9708738	37.15480501	6266.275315	661.5553192	415.8932039	224.4489947
<i>Carex striata</i>	32.0075817	41.44326797	29.57385621	41.44326797	299.3197279	50.38454677	4901.123525	396.7357993	380.7142857	96.47116114
<i>Carex striatula</i>	54.13470588	44.60686275	29.16745098	35.21633987	321.0945946	51.584992	5091.170555	389.7461743	388.8986486	84.5986716
<i>Carex stricta</i>	50.53653595	48.76803922	59.77666667	59.27111112	216.9298541	24.77116189	4466.887579	313.8030925	276.3428732	40.24750423
<i>Carex styloflexa</i>	72.92150327	56.8782353	50.50254902	42.48359477	309.2808989	48.11356358	5005.937261	366.1818034	373.3314607	71.50407692
<i>Carex stylosa</i>	52.00392157	47.51052288	66.99176471	83.19418301	154.0588235	42.50313228	3071.741957	438.4508129	519.3137255	312.7921891
<i>Carex subbracteata</i>	51.17418301	47.65954249	58.29921569	59.22666667	347.8181818	39.3578506	5202.024392	609.4943348	575.7272727	177.3709708
<i>Carex suberecta</i>	48.64013072	39.5106536	37.30836601	48.72503268	249.2374101	22.46078152	4922.466906	243.1007818	309.1654676	31.18007472
<i>Carex subfusca</i>	59.11562092	60.28424837	55.30908497	51.75660131	243.2019868	72.98829558	6133.759347	478.493884	380.5960265	205.3937044
<i>Carex subnigricans</i>	48.32352942	56.6030719	52.19444445	71.77215686	130.6428571	26.23836786	6673.423244	404.5483753	240.5892857	77.34850925
<i>Carex subspathacea</i>	53.69784314	57.93777778	66.81640523	81.77777778	92.13333333	34.38390768	3064.215466	388.6250983	182.6129032	111.7117712
<i>Carex superata</i>	47.09117647	43.66137255	43.84777778	38.58385621	347.2608696	29.45137347	5269.372898	148.0688023	420.6521739	51.08959038
<i>Carex supina spaniocarpa</i>	45.44464053	69.49862745	57.37862745	72.2924183	105.2397661	31.94196664	3141.95442	392.4596055	143.8187135	41.66825425
<i>Carex swanii</i>	57.8824183	57.29339869	36.50366013	44.55071896	247.1752577	26.96966898	4636.024359	302.3383359	313.2989691	34.11766706
<i>Carex sychnocephala</i>	65.09235294	73.83947713	49.89627451	50.03111111	184.3590909	23.67093972	4162.136418	502.8938712	226.5136364	57.07789115
<i>Carex tahoensis</i>	53.48575164	51.68895425	56.11928105	62.39738562	145.752809	31.51669143	5033.69588	1452.050911	277.8764045	241.6753467
<i>Carex tenax</i>	64.48555556	68.41431373	62.63183007	65.04379085	365	14.37586276	5365.774613	156.3498277	442.2592593	62.88364872
<i>Carex tenera tenera</i>	58.63718954	61.78379085	54.50248366	62.12575164	203.2912088	29.04405694	4349.679682	502.9109855	265.2948718	43.81327195
<i>Carex tenuiflora</i>	52.47137255	40.49777778	21.53241831	31.01692811	150.3526882	30.79661308	3477.975832	605.6254915	237.3677419	73.74817526
<i>Carex tetanica</i>	62.8679085	43.71633987	54.91633987	42.68673203	224.3826816	19.5792273	4622.312488	260.2576154	272.4022346	32.0509957
<i>Carex tetrastachya</i>	43.00189543	44.12967321	31.1696732	36.20104575	357.2	23.6751666	5749.86806	166.3662927	307.2666667	45.83293202
<i>Carex texensis</i>	49.11287582	47.93529412	29.12411765	36.79830066	316.25	45.24053252	5332.310478	260.1839975	371.4662162	46.35113183
<i>Carex thornei</i>	47.8196732	45.26934641	38.55352941	33.78450981	365	14.37586276	5353.521118	148.0688023	425.5	47.64101874
<i>Carex thurberi</i>	44.86980392	49.03084967	52.57150327	32.40954248	365	14.37586276	6578.58138	148.0688023	191.3333333	57.73502692
<i>Carex timida</i>	44.98509804	40.31928105	43.2675817	36.69464052	294.0555556	23.79068779	5166.375448	208.5666764	374.3055556	46.96309764
<i>Carex tincta</i>	42.18692811	41.09803922	45.24653595	50.32647059	186.5	15.76473999	3969.692499	195.3864706	304.0263158	31.72473401
<i>Carex tompkinsii</i>	45.76738562	42.27921569	35.25843137	39.76633987	257.625	93.18328713	6654.738953	327.9110999	375.25	58.34564496
<i>Carex tonsa</i>	46.22705882	51.87588235	49.26339869	36.80196079	217.6775885	40.38064761	4311.575147	403.142688	294.8781127	46.16638948
<i>Carex torreyi</i>	54.11254902	49.00464052	51.4554902	51.03986928	180.245098	16.63375804	4344.64152	615.0757187	219.754902	37.6906208
<i>Carex torta</i>	53.60993464	44.44281046	61.3754902	68.34385621	227.1904762	39.9897818	4348.816162	445.0069432	343.0816327	48.46697933
<i>Carex triangularis</i>	61.48542484	59.21777778	61.65653595	77.91398693	353.2222222	24.90850641	5507.870722	183.6178618	393.3968254	45.67435212
<i>Carex tribuloides</i>	54.73862745	53.94379085	31.52816994	29.45849673	249.5199223	44.14967073	4721.541524	463.892048	320.154519	63.77041469
<i>Carex trichocarpa</i>	57.63346405	42.79071896	51.63254902	38.83444445	226.9449541	21.9573808	4661.542346	385.6888089	284.4587156	44.9191727
<i>Carex triquetra</i>	33.80862745	41.44176471	42.46810458	44.32908497	365	14.37586276	6138.632756	225.4536797	228	71.76117799
<i>Carex trisperma</i>	47.71464053	40.34522876	38.53601308	47.45993464	184.7602339	27.81977634	3983.601379	367.4425154	301.6248956	50.28384797
<i>Carex tuckermanii</i>	49.27496732	40.49150327	42.51437909	41.04895425	198.76	16.51782736	4248.246821	265.68772	271.5885714	30.14041808
<i>Carex tumulicola</i>	49.04098039	53.15718954	45.04901961	62.47732027	331.654321	41.30682767	5234.739704	554.5382598	576.1975309	219.4133895
<i>Carex turbinata</i>	49.73058824	46.39908497	41.14490196	44.28947713	354	24.59674775	6247.905176	641.5218959	318	127.1868704
<i>Carex turgescens</i>	51.92444444	65.35071896	49.84895425	55.66039216	365	14.37586276	5370.013916	148.0688023	476.5	52.6934531
<i>Carex typhina</i>	62.89196079	45.29980392	41.47235294	47.37973856	260.5992366	46.65340205	4773.332294	474.9933101	323.8091603	45.75716589
<i>Carex umbellata</i>	70.64156863	53.42653595	60.97189543	49.05104575	235.1299127	39.76971334	4607.999111	491.0254218	312.9323144	75.21996744
<i>Carex unilateralis</i>	45.36091503	44.32398693	49.13509804	53.37104575	299.4634146	36.92775567	4626.56585	445.9581947	597.8414634	156.021878
<i>Carex ursina</i>	39.24823529	41.20156863	52.62163399	66.85176471	54.80851064	35.87711302	3375.493923	426.2504968	96.44680851	51.22050518

<i>Carex utriculata</i>	60.29477124	50.53287582	65.8279085	75.02287582	174.1988866	41.90295502	4407.720549	1196.299824	302.8036437	221.7202797
<i>Carex vacillans</i>	43.94640523	37.91960784	71.24228758	67.87810458	179.1724138	21.63507233	3801.270819	183.8873139	334.862069	83.35968713
<i>Carex vaginata</i>	66.20418301	46.80156863	58.44928105	35.57673203	129.8068331	38.08060365	3442.14626	476.2419226	205.1984231	76.60138653
<i>Carex vallicola</i>	58.6133987	50.59071896	50.68437909	65.63222222	198.5944056	49.85348078	5944.573865	669.9717441	146.3426573	89.65136739
<i>Carex venusta</i>	55.05326798	63.80816994	53.5306536	51.61784314	312.3013699	45.66535428	5029.587141	329.9161312	358.6164384	64.33994572
<i>Carex verrucosa</i>	55.04921569	58.42869281	75.66052288	75.00039216	364.5130435	14.37586276	5417.770703	159.5289519	506.9478261	66.47355938
<i>Carex vesicaria</i>	63.28444445	50.57444445	68.78392157	52.35437909	190.814218	37.62328989	4492.006452	905.6224994	312.6398104	121.1422593
<i>Carex vestita</i>	55.91908497	59.36392157	59.02575164	71.53633987	240.5677083	15.75352031	4426.762393	148.0688023	317.4322917	30.14041808
<i>Carex vexans</i>	50.23673203	50.95084968	65.06535948	46.16313726	365	14.37586276	5394.048535	186.227011	567.75	47.71214434
<i>Carex virescens</i>	56.68156863	48.81052288	32.21470589	39.95869281	249.5449735	24.13202718	4621.708278	288.5770598	317.6587302	33.34463463
<i>Carex viridistellata</i>	34.67189543	34.62960785	33.4279085	32.30797386	227.4722222	15.34086254	4625.049845	148.0688023	269.0555556	30.14041808
<i>Carex viridula oedocarpa</i>	71.46091503	65.77130719	74.71104575	74.43300654	187.2857143	15.25029274	3808.459298	180.0903332	404.8571429	37.56518145
<i>Carex vulpinoidea</i>	51.53281046	37.93895425	42.77294118	47.56725491	239.7540741	41.63520677	4718.042363	495.8267484	304.6666667	65.57939112
<i>Carex whitneyi</i>	50.70398693	61.35633987	38.38836601	47.27869281	182.5671642	51.45201468	6244.749716	455.084788	386.4776119	164.2387728
<i>Carex wiegandii</i>	51.56490196	48.45209151	46.7524183	46.21189543	166.6	26.62603887	3767.955254	329.0012184	321.3733333	43.01940899
<i>Carex willdenowii</i>	47.59254902	39.14411765	35.34045752	37.87470589	288.1914894	39.48738102	4922.13729	317.6184104	334.8191489	55.04445179
<i>Carex williamsii</i>	53.03124183	61.08653595	54.76745098	69.55843138	99.14	22.43149842	3060.910371	401.3979088	154.31	61.87812965
<i>Carex woodii</i>	66.20418301	46.80156863	58.44928105	35.57673203	225.2830189	26.44410267	4579.343637	250.3348123	282.4811321	36.40832744
<i>Carex wootonii</i>	69.01117647	56.9430719	71.54392157	67.39875817	230.7058824	41.58855423	6293.333482	162.4798679	255.9411765	40.68053006
<i>Carex xerantica</i>	65.66712419	62.73333334	71.16908497	72.67379085	170.0206186	27.37242354	4602.677362	1179.436622	191.2783505	47.12963997

Table A3.2 The measured pigmentation data and extracted climatic data from each specimen utilized in the intraspecific analysis. GSL: growing season length, UV3: UV irradiance, BIO16: precipitation. Cells which are marked “NA” indicate plant structures where it was not possible to measure pigmentation data.

Image	Photosynthetic leaf	Perigynium	Male Scale	Female Scale	Collection Year	GSL	UV3 (J/m ² /day)	BIO16 (mm)
Carex_aquaticus_1	41.27191163	46.05461804	68.96284438	70.92687951	1991	119	6638.618164	135
Carex_aquaticus_2	41.66681437	28.7175499	56.67784392	45.30743683	2006	160	3542.509766	246
Carex_aquaticus_3	45.75944598	67.57180055	86.15400132	90.14543223	1937	13	2931.527344	50
Carex_aquaticus_4	46.3928171	49.64234145	NA	56.58442267	Not provided	201	4608.338867	284
Carex_aquaticus_5	57.32428785	55.55691864	47.92564568	63.85337163	1987	198	4302.648926	255
Carex_aquaticus_6	44.8639768	53.23896681	NA	68.21645833	1947	282	3951.458984	616
Carex_aquaticus_7	44.90949665	39.45539776	63.02739074	55.37969159	1951	118	3500.926514	227
Carex_aquaticus_8	54.95492431	50.88467873	64.41193896	80.64336963	1971	69	2949.455811	111
Carex_aquaticus_9	45.12098903	78.9627772	76.34015966	64.06353775	1962	74	3848.64502	137
Carex_aquaticus_10	41.89965088	39.17521613	57.67154224	66.9241804	1981	71	3565.403809	117
Carex_aquaticus_11	38.56592282	42.27748128	49.74977163	55.28576809	1882	198	4432.526367	254
Carex_aquaticus_12	57.09258452	56.48357005	81.45522016	85.5372685	1943	143	2750.729736	277
Carex_aquaticus_13	39.29202202	47.42187428	69.39283249	77.19092824	2008	136	6955.847168	157
Carex_aquaticus_14	34.44262056	38.69428829	60.6296067	58.28768636	1997	178	4219.680664	259
Carex_aquaticus_15	42.2523624	39.92133212	62.4863316	67.36366207	1990	154	2826.231445	229
Carex_aquaticus_16	41.33963171	46.28290912	63.68062304	74.12673791	1927	123	6956.217773	206
Carex_aquaticus_17	39.35675233	36.85379813	45.93613179	64.51281453	1967	148	6459.905273	172
Carex_aquaticus_18	36.67984279	46.63821051	29.27887103	44.92540553	1970	128	3222.75415	202
Carex_aquaticus_19	51.48079442	56.84627858	56.13297829	58.57304031	1972	221	4304.233887	254
Carex_aquaticus_20	45.73621693	30.71937541	42.1915645	47.89406599	2012	223	4324.887207	296
Carex_aquaticus_21	48.28982677	51.49201343	57.4879831	74.5991246	2002	223	4320.796875	265
Carex_aquaticus_22	53.08448414	40.69733478	47.76702471	60.25385067	2017	227	4538.741211	301
Carex_aquaticus_23	56.6390949	42.92317535	60.41404931	53.94977932	1979	216	4793.79248	268
Carex_aquaticus_24	79.89657892	62.91391626	84.54467188	100	2010	109	7040.604004	215
Carex_aquaticus_25	62.57703906	59.64626735	66.448709	73.58064896	2002	171	5134.370605	142
Carex_aquaticus_26	58.69359694	45.2753268	75.01287067	72.46621635	1996	79	2474.425049	188
Carex_aquaticus_27	49.05025281	36.08383948	63.98822235	73.7129341	1974	180	7338.943848	297
Carex_aquaticus_28	77.93991415	69.42365669	90.84679822	97.08983317	1978	121	7080.484863	179
Carex_aquaticus_29	77.31012377	70.87410902	98.9894013	100	1956	136	7236.378906	232
Carex_aquaticus_30	54.89882064	53.80846682	62.35483354	56.39166106	2004	174	6258.095215	158
Carex_aquaticus_31	44.84934851	62.82914719	61.36447085	71.10613885	2000	128	2905.634766	94
Carex_aquaticus_32	48.75739428	44.29011537	60.9942978	63.12040428	1934	248	4843.428711	313
Carex_aquaticus_33	48.94957084	NA	68.3356638	NA	1918	101	3375.914795	155
Carex_aquaticus_34	61.56013048	55.76650615	72.4149167	76.57352408	1918	103	2764.950928	97
Carex_aquaticus_35	50.71369966	48.97203316	73.41801692	76.83963619	2011	88	3091.099365	70
Carex_aquaticus_36	49.08868532	43.69724097	75.72072353	82.60187412	2011	129	3031.877686	171
Carex_aquaticus_37	45.52027215	53.33053543	60.65634852	70.83268144	2012	132	3333.941162	197
Carex_aquaticus_38	45.09122114	50.48936486	63.00511278	70.31008145	2007	160	3469.961914	292
Carex_aquaticus_39	47.83553943	47.05636802	61.4070989	78.61541628	Not provided	141	3075.384521	159

Carex_aquaticus_40	48.38870103	58.55032464	74.18849256	89.20294559	1972	72	3467.970215	64
Carex_aquaticus_41	49.79465417	57.71493602	85.78469371	93.90271876	1984	61	3373.578613	67
Carex_aquaticus_42	52.77564304	78.23142877	80.08036832	77.16914108	2005	0	3291.842041	50
Carex_aquaticus_43	49.99532741	50.0067142	75.84615496	80.32035136	1951	75	2656.336182	64
Carex_aquaticus_44	46.86390074	48.55409084	81.49776333	88.25263737	2003	0	3847.987549	117
Carex_aquaticus_45	48.51950428	54.21727821	72.80643654	81.11770125	2004	117	3630.043457	208
Carex_aquaticus_46	55.26651506	40.40953043	68.89336784	61.31215256	1967	221	4604.260742	260
Carex_aquaticus_47	46.06109552	50.20509477	50.99718007	76.21531058	1979	150	6240.498535	150
Carex_aquaticus_48	40.11448949	42.5735475	66.65106893	68.1057847	1987	158	5806.114746	190
Carex_aquaticus_49	52.04326286	61.80752781	52.99528771	61.94226248	1943	152	5793.132324	297
Carex_aquaticus_50	55.48146758	50.37570883	60.5410507	55.4778947	1938	255	4826.580078	317
Carex_aquaticus_51	51.03157325	53.39016374	59.90595165	63.53156302	1943	225	4870.17334	274
Carex_aquaticus_52	37.15565429	40.48856884	54.56971092	65.96820661	1985	296	4685.414551	1417
Carex_aquaticus_53	44.66634745	44.58669563	47.3391398	40.07643826	1985	204	4606.721191	300
Carex_aquaticus_54	36.57880091	42.05609244	57.28482124	67.20236348	1990	122	3127.999268	207
Carex_aquaticus_55	48.53346879	NA	70.69747948	68.76084242	1981	145	3213.456543	317
Carex_aquaticus_56	54.98941514	47.7544758	66.02295154	64.24178397	1986	169	3564.779297	281
Carex_aquaticus_57	45.1501048	38.8524314	51.34245224	60.2559034	1993	205	4133.366211	311
Carex_aquaticus_58	48.38451153	38.12997732	38.75380402	54.77142174	1992	189	4523.050781	218
Carex_aquaticus_59	40.49570387	47.16633327	37.52435912	87.99858793	1972	6	2920.748047	43
Carex_aquaticus_60	43.33418231	38.83750406	64.13067218	64.06985315	1982	188	4623.763672	255
Carex_aquaticus_61	44.17461329	34.24632937	42.91749746	59.51429433	1979	144	3362.034668	153
Carex_aquaticus_62	55.33534993	57.58143923	92.3413304	92.91951369	1991	0	3238.757568	49
Carex_aquaticus_63	40.94665682	38.77078733	49.28394037	49.34520472	1944	165	3858.760986	198
Carex_aquaticus_64	45.3456172	42.50480454	62.15833392	57.92230905	1982	263	3946.600342	630
Carex_aquaticus_65	70.5650293	51.00935061	75.38870698	82.69548068	1987	138	7238.625977	249
Carex_aquaticus_66	41.68966844	48.50300019	56.97788649	64.9212624	1982	195	6164.488281	282
Carex_aquaticus_67	53.13236728	59.96687585	61.30757702	65.83277745	1909	365	5136.327148	986
Carex_aquaticus_68	47.97755442	36.33694334	87.52573689	90.66981179	1950	155	6911.80127	478
Carex_aquaticus_69	48.84784753	43.93559248	70.01909167	61.24042175	1939	136	7210.770508	313
Carex_aquaticus_70	39.41779476	38.52369321	67.24616277	68.01457089	1891	155	6968.731934	234
Carex_aquaticus_71	43.92496716	46.57364034	61.57751197	66.29769377	1993	146	5652.415527	245
Carex_aquaticus_72	35.23721174	32.22400593	50.15362038	61.34920519	1952	171	3647.338623	293
Carex_aquaticus_73	30.23162449	32.39239469	41.62583	41.05605911	1951	180	4293.137695	170
Carex_aquaticus_74	51.88831389	48.88241652	45.07466457	44.59256174	1892	171	3881.216309	201
Carex_aquaticus_75	31.44462233	28.62582875	48.543026	61.29771637	1927	154	3826.562988	195
Carex_aquaticus_76	53.93090109	35.88113483	50.92966575	58.79552797	1958	207	4231.057129	339
Carex_aquaticus_77	57.50962786	55.52227512	55.73429362	75.49855865	1953	154	3884.430908	225
Carex_aquaticus_78	33.49783353	46.70357849	38.91556963	65.35203703	1902	159	3551.155029	199
Carex_aquaticus_79	40.1248818	43.90926532	56.76821145	61.42898852	1932	251	4883.720703	383
Carex_aquaticus_80	55.33390376	44.60659997	40.46534883	59.20465627	1953	163	3657.510254	214
Carex_aquaticus_81	48.09033505	40.26949812	42.71618615	55.64900292	1928	176	3702.167236	293
Carex_aquaticus_82	44.74032281	57.70105519	66.38026406	67.74364083	1903	282	3951.458984	616
Carex_aquaticus_83	NA	58.83637258	53.20307445	59.38877392	1960	140	3194.854492	219

Carex_aquaticus_84	44.92020477	46.86168303	60.61282118	79.64363736	1953	173	4195.947266	137
Carex_aquaticus_85	42.94133225	42.29803893	63.16066095	89.68758759	1904	104	3100.756836	217
Carex_aquaticus_86	45.73760808	54.02600393	66.30958898	69.76453248	1905	192	4091.193115	669
Carex_aquaticus_87	38.42660095	33.86559896	65.89451267	78.83087031	1938	160	3418.497803	220
Carex_aquaticus_88	49.95787918	39.69096989	63.69569523	62.27194224	1983	160	3417.557617	330
Carex_aquaticus_89	53.66523464	42.4387894	71.62106257	63.59417004	1977	175	3444.774414	439
Carex_aquaticus_90	53.24130666	42.81550928	69.61781036	69.13586607	2009	117	3181.115967	304
Carex_aquaticus_91	47.10734024	40.17867095	62.17711922	74.31400118	2007	109	3560.837158	232
Carex_aquaticus_92	40.86540859	38.47816502	68.20638426	63.68340141	1977	108	3231.481201	274
Carex_aquaticus_93	38.87472819	46.5502162	62.34576466	66.16233926	1901	179	3713.786377	422
Carex_aquaticus_94	44.56914669	43.93368822	54.30689337	60.64613965	1917	292	6123.722168	41
Carex_aquaticus_95	50.54038363	57.01423235	78.13542445	65.50811404	1925	168	4959.799805	1008
Carex_aquaticus_96	51.0781104	34.68372693	80.38847779	68.23385729	1984	150	5833.921387	684
Carex_aquaticus_97	48.61812566	35.42163708	56.10867731	60.09438241	1978	249	4823.839844	1078
Carex_aquaticus_98	51.55801986	43.94715798	67.22263089	59.0508548	1991	322	4128.342773	241
Carex_aquaticus_99	56.35990838	50.88891772	53.41128439	64.40374489	1989	224	4971.192871	294
Carex_aquaticus_100	51.62096224	57.60164974	36.01966649	54.33714728	1989	215	5515.629883	253
Carex_aquaticus_101	42.75819056	38.36174758	50.70312282	54.23607164	1941	231	4980.237305	302
Carex_aquaticus_102	45.75852798	42.99985794	56.22966045	55.26912835	1996	132	6335.92334	201
Carex_aquaticus_103	49.91037358	40.11465352	50.1608752	56.97482093	1991	170	3994.645508	293
Carex_aquaticus_104	52.60703662	42.85108269	63.21834882	65.83606325	1961	221	4477.723633	245
Carex_aquaticus_105	41.86693723	43.9582394	47.62728624	51.63842647	1982	221	4555.519043	235
Carex_aquaticus_106	40.31949302	50.10362641	62.47006943	64.18705515	2003	193	4454.021973	250
Carex_aquaticus_107	49.44190826	43.6618426	47.17737831	54.4472654	2002	221	4605.614258	252
Carex_aquaticus_108	45.88202608	47.53369977	59.08779301	71.6800117	1981	209	4408.92041	264
Carex_aquaticus_109	46.01372946	46.55259173	75.8124751	79.244187	1928	100	3609.041992	198
Carex_aquaticus_110	49.87575046	39.95660622	49.85954789	62.28306596	1958	156	3674.383057	274
Carex_aquaticus_111	46.81782112	46.8768301	65.31274075	63.70840927	1968	155	3618.721924	296
Carex_aquaticus_112	47.59179866	54.04137378	88.03302744	66.94475114	1973	144	3547.858398	319
Carex_aquaticus_113	43.76744559	48.77153405	48.53705315	51.02268334	1986	166	3800.777588	317
Carex_aquaticus_114	38.23097713	49.60238069	61.30881733	62.71707207	1987	178	3895.681641	298
Carex_aquaticus_115	42.26638773	47.93622774	61.27540501	91.84435077	1952	104	3556.225342	203
Carex_aquaticus_116	40.9858434	48.74778574	82.61675126	93.20875753	1936	79	2618.636719	97
Carex_brunnescens_1	52.70330625	42.1077188	38.85549814	45.27328525	1963	209	4015.875244	376
Carex_brunnescens_2	38.89012852	41.06570094	39.74356255	31.3682136	2005	206	4327.29248	335
Carex_brunnescens_3	39.9136994	43.4102534	29.46485153	42.42061178	1997	204	4280.971191	324
Carex_brunnescens_4	41.57098895	43.19930956	54.18368209	42.61098756	2012	259	4908.980957	367
Carex_brunnescens_5	56.8142104	61.74639992	57.75511051	62.86249713	1936	73	3964.972168	158
Carex_brunnescens_6	38.0857046	39.59918639	31.13095187	35.6213216	1954	277	4992.343262	438
Carex_brunnescens_7	53.24539008	60.26964466	38.16507582	34.96891128	1953	178	4576.304688	162
Carex_brunnescens_8	51.32671528	52.88875794	59.13318753	36.49302026	1960	182	4201.944824	272
Carex_brunnescens_9	42.64747478	66.8566589	34.77446759	37.82702039	1954	132	7068.59375	194
Carex_brunnescens_10	64.30347803	64.93573337	33.71038785	38.92514602	1953	167	3808.55249	239
Carex_brunnescens_11	60.38566543	53.09206931	32.37501271	48.71357548	1957	174	3924.68457	351

Carex_brunnescens_12	47.37788195	47.46664661	31.38712348	31.71531766	1967	188	4517.486328	298
Carex_brunnescens_13	52.95044308	57.10226401	43.69190439	37.8601795	1951	254	4667.458984	307
Carex_brunnescens_14	48.52595168	53.37864964	31.24703844	49.32983207	1951	207	5772.496582	71
Carex_brunnescens_15	50.71544804	46.30808135	42.7044138	40.71795009	1951	184	3296.679199	523
Carex_brunnescens_16	44.97142824	46.06915945	46.11253131	41.34688214	1956	158	3347.879639	451
Carex_brunnescens_17	50.37185226	48.17521164	43.4963174	37.07599614	1953	148	3250.314697	251
Carex_brunnescens_18	48.90987101	38.67544143	38.56821543	33.27898036	1957	176	4179.92627	248
Carex_brunnescens_19	42.25912263	48.00458714	40.17985164	48.189472	1953	122	3460.635742	233
Carex_brunnescens_20	41.17923507	44.86561648	43.36923038	46.52653198	1957	120	6760.071777	164
Carex_brunnescens_21	36.69931657	42.27026136	45.61289169	38.63725588	1953	209	4858.357422	327
Carex_brunnescens_22	38.07447232	39.17067967	41.31429758	45.61332392	1961	225	5316.435059	285
Carex_brunnescens_23	37.78295175	34.94969706	42.96184279	42.15773193	1956	100	3078.473877	169
Carex_brunnescens_24	43.86087699	40.40243326	34.98248064	34.89926916	1955	201	3896.181396	450
Carex_brunnescens_25	42.20074257	35.7762327	32.62387577	29.78334853	1963	187	4093.685547	347
Carex_brunnescens_26	70.90392666	74.24032099	67.93093619	76.97730067	1958	119	7129.51709	187
Carex_brunnescens_27	79.53718692	70.51407992	65.88105103	78.85553389	1957	148	6887.147461	140
Carex_brunnescens_28	73.61910153	70.07609367	70.62152451	61.4957101	1955	147	6362.489258	196
Carex_brunnescens_29	42.50634559	44.66667612	29.61571718	29.95255897	1951	118	4902.269043	235
Carex_brunnescens_30	35.90359818	39.44760567	51.28711999	NA	1941	123	6389.071777	179
Carex_brunnescens_31	47.20604781	46.47428772	32.82714753	40.60862601	1942	176	6951.650391	239
Carex_brunnescens_32	33.98247587	40.99771523	34.4091317	32.3116673	1949	156	3445.740723	393
Carex_brunnescens_33	46.00575856	53.0249396	39.30536733	46.12476712	1969	334	5352.088867	426
Carex_brunnescens_34	42.46660724	44.21573638	42.56014067	62.06376973	1987	104	2791.464111	197
Carex_brunnescens_35	49.46867182	43.48990992	6.367815563	46.37235465	1952	141	2602.802246	413
Carex_brunnescens_36	37.7918991	49.53557638	58.44346445	53.55733085	1952	183	2953.404297	850
Carex_brunnescens_37	39.84473101	45.01724853	46.39124733	35.13572421	1962	198	4356.508301	97
Carex_brunnescens_38	35.88506092	44.30124018	49.59396503	36.73173383	1939	140	3194.854492	219
Carex_brunnescens_39	31.44592836	33.97028112	53.93486024	47.10492565	1945	169	3530.929932	173
Carex_brunnescens_40	39.41201798	52.39003221	39.33159598	47.83035993	1960	136	4452.693848	106
Carex_brunnescens_41	39.0386267	37.47721657	58.24801336	57.21788153	1963	228	2906.314209	558
Carex_brunnescens_42	48.79194003	46.0826302	27.51899912	39.15705871	1953	102	3520.285645	205
Carex_brunnescens_43	35.79984185	NA	28.97694528	30.90104198	1946	133	2786.721436	171
Carex_brunnescens_44	36.47210475	41.73955862	33.3037394	36.4078172	1958	130	2591.62085	397
Carex_brunnescens_45	42.69497688	52.92448014	53.354181	51.2859625	2000	153	2844.446289	218
Carex_brunnescens_46	50.93635955	40.57733846	24.36469954	42.26828255	1971	163	3541.544678	162
Carex_brunnescens_47	43.06175626	33.53449529	53.11441413	54.02874478	1994	172	4199.418945	284
Carex_brunnescens_48	46.32130695	41.0977158	34.61486383	23.44692001	1956	273	4040.091797	577
Carex_brunnescens_49	33.07101303	48.35935574	35.6363689	33.8608231	1980	182	4475.454102	186
Carex_brunnescens_50	51.65818002	40.22837426	26.90450698	32.09910516	1956	221	2906.314209	652
Carex_brunnescens_51	33.63431858	32.84340495	31.29654739	47.52774698	1994	169	3738.892334	233
Carex_brunnescens_52	50.46963239	40.47151331	19.94250223	21.65732452	1981	186	3810.502686	190
Carex_brunnescens_53	40.98287378	46.7517851	52.04931029	38.95714333	1976	110	3506.448486	166
Carex_brunnescens_54	45.07591979	NA	36.44684833	35.36798379	1967	172	4067.167725	239
Carex_brunnescens_55	52.79280682	39.48863577	NA	35.97015023	1979	177	3807.672119	311

Carex_brunnescens_56	60.21486096	57.39529297	40.36855615	40.25384124	1979	159	3578.077148	315
Carex_brunnescens_57	40.81001673	42.17686557	41.0049207	40.74295823	1974	162	3600.585449	310
Carex_brunnescens_58	54.28279178	42.82558167	46.23175573	43.71638504	1955	149	3451.601074	406
Carex_brunnescens_59	44.61049055	39.80365667	50.10753475	33.53975181	1959	145	3213.456543	317
Carex_brunnescens_60	48.0930309	36.36041085	38.15443935	31.99141197	1964	204	3867.729492	439
Carex_brunnescens_61	45.86563052	NA	37.52615483	30.76981048	1984	202	3990.470703	381
Carex_brunnescens_62	40.93000794	40.04479185	13.99163348	34.20539356	1954	197	3867.370117	430
Carex_brunnescens_63	42.06512255	39.28147007	30.62320111	32.92571877	1964	165	3895.242676	255
Carex_brunnescens_64	49.90739027	50.26048489	32.74079096	42.50714342	1938	197	4015.76709	241
Carex_brunnescens_65	47.56531859	47.51924832	36.9516218	40.87555145	1950	189	3922.843262	340
Carex_brunnescens_66	32.66740873	36.63846414	42.02114321	40.99782943	1989	191	3841.628906	351
Carex_brunnescens_67	45.1089941	43.6702805	25.2964262	37.52284507	1967	187	3798.802002	339
Carex_brunnescens_68	49.99994822	26.17251294	28.75925402	36.13062355	1962	178	3891.244385	320
Carex_brunnescens_69	52.5383234	41.89291798	53.67569742	54.73617898	1966	178	3907.854248	296
Carex_brunnescens_70	39.39355289	39.16211058	33.11508116	29.47901514	1966	132	3421.824219	173
Carex_brunnescens_71	57.94218825	39.9590989	34.76060871	36.72729551	1949	111	3334.578857	169
Carex_brunnescens_72	46.13589348	32.56553749	35.87327403	27.7317218	1973	170	3943.064697	359
Carex_brunnescens_73	52.95095486	39.00930498	26.32610625	35.51674963	1977	173	3833.462158	306
Carex_brunnescens_74	50.57102467	41.38915861	33.20206104	39.33992988	1975	266	4982.438965	384
Carex_brunnescens_75	36.14460248	35.14488507	36.14460248	32.69034168	1967	177	3877.7229	263
Carex_brunnescens_76	46.30844566	45.14897974	39.4491047	33.69913329	1951	93	3650.770996	224
Carex_brunnescens_77	59.70873695	48.4738574	35.99704142	38.17397105	1967	173	3894.345947	234
Carex_brunnescens_78	42.53739164	44.93043473	54.76482707	58.69140836	1977	100	3039.771729	415
Carex_brunnescens_79	38.85814899	47.65223273	43.64650622	47.52976858	1961	136	3968.611816	257
Carex_brunnescens_80	47.87992461	41.67570465	39.5513153	43.85052483	1966	153	3665.821533	426
Carex_brunnescens_81	54.8697559	38.43405992	47.1598266	47.90119056	1962	171	3514.802246	203
Carex_brunnescens_82	37.39041603	63.75014889	67.29558939	69.24443995	1957	68	2924.282959	96
Carex_brunnescens_83	40.75678135	51.16263737	41.16967836	44.33582413	1951	91	2925.846924	191
Carex_brunnescens_84	44.46689743	37.29330378	50.01917261	57.10093679	1949	56	3004.326416	434
Carex_brunnescens_85	33.52375669	29.36789958	23.0469233	34.57779015	1968	159	3992.928711	232
Carex_brunnescens_86	49.62233096	45.09796201	27.80323564	36.16303889	1939	167	3808.55249	239
Carex_brunnescens_87	41.52038419	36.36694698	35.78440587	35.87032167	1975	147	3768.797852	223
Carex_brunnescens_88	44.58120481	57.54267176	50.70726319	51.03898376	1973	128	3255.919189	202
Carex_brunnescens_89	34.25351894	NA	18.42477531	34.4600251	1975	175	4133.334473	246
Carex_brunnescens_90	40.9160478	45.78416029	36.65686639	45.62649246	1977	184	3727.807373	307
Carex_brunnescens_91	52.12062033	NA	36.87115615	35.7139546	1985	199	4026.677979	351
Carex_brunnescens_92	40.98643291	35.51060656	29.23436579	26.58670202	1983	135	3073.68042	302
Carex_brunnescens_93	47.9441647	42.93448225	NA	41.1241232	1999	140	3273.054443	311
Carex_brunnescens_94	50.6434841	41.76046313	20.50965838	32.86852311	1960	199	4025.838623	371
Carex_brunnescens_95	40.61721773	43.96721558	43.75279702	36.75856594	1987	179	3713.786377	422
Carex_brunnescens_96	32.16542503	47.31863232	22.29223641	35.13231207	1999	195	3931.110596	351
Carex_brunnescens_97	43.62118469	37.87517464	48.97013554	30.73540874	2004	102	3520.285645	205
Carex_brunnescens_98	50.24575418	38.22289186	32.33007619	43.8414429	1973	123	3268.855713	124
Carex_brunnescens_99	37.52274153	43.80479168	22.8621915	33.85012389	1973	106	3263.405762	128

Carex_brunnescens_100	40.94887223	48.1659384	49.99067231	45.39425748	1968	101	3278.022705	131
Carex_brunnescens_101	40.64634922	41.9070124	31.9836367	33.14505544	1979	121	2926.138916	108
Carex_brunnescens_102	36.42947766	49.57427205	43.73338259	41.04376936	1990	123	3546.604248	224
Carex_brunnescens_103	48.31148343	33.57077286	19.49001518	32.77878888	1982	179	3923.009521	288
Carex_brunnescens_104	48.01853226	47.59160572	45.30930636	47.15969996	2006	204	4028.842773	256
Carex_brunnescens_105	61.05276707	47.55165515	27.60109286	21.49917049	1996	182	3920.075195	277
Carex_brunnescens_106	49.80286474	33.90015183	45.94549641	31.51329972	1978	167	4063.756348	272
Carex_brunnescens_107	51.75344207	36.25620562	NA	29.83357286	2012	203	4153.628906	261
Carex_brunnescens_108	36.3265979	39.26753964	21.13117099	27.35647136	1954	184	3920.743408	294
Carex_brunnescens_109	56.28096588	43.32817246	32.56330588	39.08012839	1988	194	4041.237793	322
Carex_brunnescens_110	47.25486614	43.53300176	29.48465248	39.15577656	1957	185	3922.115723	267
Carex_brunnescens_111	29.67590252	31.30966582	52.09004718	44.18303543	1951	133	3293.680908	343
Carex_brunnescens_112	46.62476143	33.96539363	30.44046668	23.94251392	1939	159	3555.150879	297
Carex_brunnescens_113	54.97733792	34.73108501	26.44484226	NA	1901	163	3747.534424	323
Carex_brunnescens_114	40.34917475	28.90463558	41.61991543	43.68821454	1889	113	3272.974609	370
Carex_brunnescens_115	50.81225747	45.31875816	42.54894529	53.11128983	1913	136	3584.348633	330
Carex_brunnescens_116	47.67412773	35.80373596	34.47085361	25.96980887	1960	199	4035.9729	287
Carex_brunnescens_117	47.57407294	38.81501593	19.28538632	41.25168269	1940	125	3217.18335	223
Carex_brunnescens_118	46.43064696	40.15839309	28.75447573	36.51941742	1929	149	3358.191895	222
Carex_brunnescens_119	45.09533677	40.0680693	24.39711163	24.77158098	2007	157	3311.628906	224
Carex_brunnescens_120	40.62433403	41.83276354	22.93866472	29.89960788	2001	146	3127.500488	169
Carex_brunnescens_121	51.69130604	36.66245928	46.24637577	39.60213314	1950	158	3349.759766	201
Carex_brunnescens_122	54.81497856	41.37510107	43.64790008	40.08721051	1936	141	3331.518555	221
Carex_brunnescens_123	39.97103791	39.1381486	49.84117079	32.95840551	1988	130	2733.216309	286
Carex_brunnescens_124	44.78409177	NA	34.39189202	47.68130603	2002	89	3070.896973	176
Carex_brunnescens_125	51.39804609	35.16175677	41.46445062	41.57972574	1980	123	3111.491211	132
Carex_brunnescens_126	31.92481146	39.0029468	30.14924636	38.18328162	1971	104	3284.767334	131
Carex_brunnescens_127	41.77340489	44.76616731	40.0399484	37.59425701	1989	119	3083.099121	217
Carex_buxbaumii_1	48.52003895	38.20256827	53.79928173	49.45903672	1897	245	4581.297852	321
Carex_buxbaumii_2	48.90638001	38.8559519	68.24151259	65.24146538	2009	200	4343.569336	262
Carex_buxbaumii_3	43.52343142	36.61969104	52.76519573	59.20768559	2003	287	5359.017578	361
Carex_buxbaumii_4	42.92239323	26.31373802	49.6377248	56.45593602	2015	269	5279.539551	354
Carex_buxbaumii_5	50.42554046	45.6156184	62.86526179	76.79763984	1883	210	4943.729004	311
Carex_buxbaumii_6	53.09603729	40.99220791	64.83286184	66.77030664	1940	237	4865.996582	301
Carex_buxbaumii_7	34.87376601	27.79023612	60.00144057	58.17734111	1928	194	5426.559082	207
Carex_buxbaumii_8	52.97421821	55.65801355	70.5305711	63.98691246	1992	221	4604.260742	257
Carex_buxbaumii_9	47.00954637	33.91711906	65.62900976	65.68417876	2012	284	4832.492188	289
Carex_buxbaumii_10	53.71323727	39.20445243	59.0467223	58.11244153	2014	297	5032.090332	481
Carex_buxbaumii_11	55.80337788	56.96253654	68.59188673	68.74637415	1958	208	4441.960449	309
Carex_buxbaumii_12	47.77225117	40.22549813	61.04263908	61.36259246	1956	233	4752.727051	296
Carex_buxbaumii_13	50.3936646	39.46353567	54.91265513	65.0978494	1964	154	7261.506836	229
Carex_buxbaumii_14	53.39861646	38.89140663	61.87381474	57.66028671	1958	172	6365.343262	100
Carex_buxbaumii_15	50.97310579	48.8918047	56.29541736	69.85882805	1958	126	6956.217773	192
Carex_buxbaumii_16	38.74077894	35.96330414	60.62461735	59.01953126	1961	177	4851.885742	216

Carex_buxbaumii_17	49.62201712	45.56845815	55.38438231	49.10401238	1937	237	4855.873535	300
Carex_buxbaumii_18	38.88565622	41.51067669	NA	69.67315231	1963	171	3269.030518	293
Carex_buxbaumii_19	51.0777407	44.0866549	75.02563081	70.82057819	1958	186	2572.786865	988
Carex_buxbaumii_20	55.47111916	49.91048797	70.62098834	69.75487208	1944	126	5592.041016	134
Carex_buxbaumii_21	46.23204548	31.33008389	48.54300056	51.17797271	1963	195	4853.821289	252
Carex_buxbaumii_22	43.60995773	38.38309704	83.72319602	64.13094754	1960	143	5868.058594	197
Carex_buxbaumii_23	36.20747737	40.29224163	62.22598105	63.05713005	1951	243	4350.229492	333
Carex_buxbaumii_24	46.78521165	39.2021268	59.59295255	55.90097532	1953	128	3084.715576	107
Carex_buxbaumii_25	44.01398142	40.25023956	64.82855525	63.70052638	1942	167	3905.532959	280
Carex_buxbaumii_26	39.63247342	37.87391523	71.10345953	62.08540187	1949	159	2850.231934	452
Carex_buxbaumii_27	38.64125368	32.46326337	57.12654793	62.09786284	1959	177	4276.846191	192
Carex_buxbaumii_28	43.84894943	32.94225657	58.53260484	77.13497064	1961	148	3894.83667	262
Carex_buxbaumii_29	40.85065457	34.44315798	54.21064771	62.60493446	1958	167	3971.209229	192
Carex_buxbaumii_30	46.71473236	41.1803856	67.2764259	69.77928499	1976	186	5410.046875	896
Carex_buxbaumii_31	41.72491937	41.77145369	45.83602315	59.67274713	1950	180	3713.486328	289
Carex_buxbaumii_32	45.65938417	35.09838615	55.56827502	63.39581785	1913	198	4014.629639	322
Carex_buxbaumii_33	69.69364172	58.86039233	87.60350438	80.65860371	1956	137	6760.071777	159
Carex_buxbaumii_34	78.74620874	68.54985677	77.54139198	71.07853557	1964	147	6362.489258	196
Carex_buxbaumii_35	63.35206279	55.74007279	77.35899208	74.91523391	1990	162	6912.897949	131
Carex_buxbaumii_36	37.75394285	32.25403096	63.25032304	60.24256873	2005	221	4391.827148	304
Carex_buxbaumii_37	37.18445387	29.12342243	65.15802738	64.82664099	1952	232	4650.240723	268
Carex_buxbaumii_38	44.86203533	35.71985846	62.20027178	63.83084362	1938	160	3467.48999	306
Carex_buxbaumii_39	56.13789534	46.2889974	81.05318805	88.63759907	1962	102	4980.327148	211
Carex_buxbaumii_40	45.08694582	48.02534691	80.38800094	84.40424319	1950	220	4610.255371	231
Carex_buxbaumii_41	52.21962144	35.35071189	59.49978287	57.95449026	1968	222	5214.533691	262
Carex_buxbaumii_42	33.77832923	37.18002566	57.71809184	72.0226811	2005	131	6389.071777	180
Carex_buxbaumii_43	33.47547771	36.70859564	58.27155235	53.86601867	1985	119	6002.505859	218
Carex_buxbaumii_44	38.43223507	33.502726	65.89795986	54.82278021	1939	137	2644.512695	208
Carex_buxbaumii_45	45.19366005	37.28944146	61.74910479	63.87611896	1963	196	2918.610596	936
Carex_buxbaumii_46	39.60545878	37.26584779	54.50808593	67.39144687	1962	118	3635.157227	163
Carex_buxbaumii_47	46.59460545	40.81800449	69.96219777	72.93836769	1979	153	2844.446289	218
Carex_buxbaumii_48	48.95316453	49.42137519	67.11879785	71.41830029	1973	111	3412.147705	251
Carex_buxbaumii_49	49.42256836	44.42638838	71.14573488	65.41901902	1947	118	2932.064209	338
Carex_buxbaumii_50	48.60290815	37.67204677	70.9515165	65.54197026	1958	141	2716.309814	210
Carex_buxbaumii_51	76.30883434	56.32865601	81.78276198	81.12788271	1961	204	4447.282715	267
Carex_buxbaumii_52	52.83831853	38.62055494	52.83831853	59.33542315	1965	182	4207.248535	282
Carex_buxbaumii_53	55.61143566	46.2500962	54.99280627	57.08811094	1951	153	6826.55127	189
Carex_buxbaumii_54	47.63451663	40.8696723	89.263491	88.49776738	2003	207	4065.275635	389
Carex_buxbaumii_55	43.02262438	29.17213642	80.20974239	74.79341739	2005	102	4980.327148	211
Carex_buxbaumii_56	47.13508267	24.81958608	56.23075506	56.15729807	1983	186	5307.947266	93
Carex_buxbaumii_57	46.36248859	21.66356096	62.9035587	59.97991341	1998	210	4276.156738	893
Carex_buxbaumii_58	37.70283599	33.40723161	55.25613787	58.81752187	1999	209	4531.581543	282
Carex_buxbaumii_59	42.04422225	43.04236021	56.90637759	63.14778125	1987	217	4740.359863	341
Carex_buxbaumii_60	50.21977011	36.50886448	81.63965199	62.20235082	1961	172	3893.756592	301

Carex_buxbaumii_61	54.4069231	52.24751187	84.05496834	91.13176754	1866	135	3333.664551	142
Carex_buxbaumii_62	48.98838296	36.49888337	61.80728569	66.80886287	2006	166	7090.489258	208
Carex_buxbaumii_63	41.70299729	47.78911025	62.70882174	58.16388971	1928	192	6358.800293	608
Carex_buxbaumii_64	61.06400426	52.92686715	68.87461847	80.89836935	1950	107	2890.108154	103
Carex_buxbaumii_65	55.89038906	46.21250337	70.04705557	70.86817534	1993	135	2720.043945	242
Carex_buxbaumii_66	39.69358241	39.94206756	53.05246999	55.33704683	1948	239	5960.194824	545
Carex_buxbaumii_67	42.40738814	33.87553022	57.54440012	67.52041063	1980	139	4148.097656	209
Carex_buxbaumii_68	48.35742137	30.13219219	71.4394758	63.4686739	2003	100	3039.771729	415
Carex_buxbaumii_69	44.22254019	28.13248366	76.01743645	81.99528752	1996	216	3119.397461	967
Carex_buxbaumii_70	33.13173616	25.87539911	51.0195201	61.39810782	1996	168	4116.687988	340
Carex_buxbaumii_71	39.21504524	34.66897144	72.50870398	68.41464993	1980	177	4276.846191	192
Carex_buxbaumii_72	60.23731177	39.55183578	61.53662351	70.51242478	1988	165	3879.405762	801
Carex_buxbaumii_73	40.48102054	38.19074927	75.91528236	69.32440928	1981	95	3455.368408	397
Carex_buxbaumii_74	44.6994858	36.36685954	64.45462273	62.86022913	2005	180	4375.02832	227
Carex_buxbaumii_75	44.76657562	38.6050132	NA	59.2239165	1999	161	3459.973633	200
Carex_buxbaumii_76	47.7884207	22.38765946	63.48548902	62.79252169	2012	203	4015.875244	378
Carex_buxbaumii_77	46.71086015	40.6560785	80.42022801	78.54065416	2014	113	3246.32959	291
Carex_buxbaumii_78	40.58196835	38.24021531	61.64483334	57.6149914	1979	174	3358.156494	298
Carex_buxbaumii_79	44.74114948	39.38101626	67.05676469	67.80639235	2004	145	3213.456543	317
Carex_buxbaumii_80	37.0708758	32.92307123	64.99991138	64.72817817	1993	182	3789.158691	444
Carex_buxbaumii_81	36.75547251	31.76052092	71.89702201	58.2012617	2001	202	3990.470703	381
Carex_buxbaumii_82	48.16729056	34.97877258	70.47611162	59.45947651	1980	112	3024.641113	109
Carex_buxbaumii_83	41.66140478	38.17109665	63.13683258	62.95823838	1941	142	3285.970703	113
Carex_buxbaumii_84	40.98694772	29.86157562	58.68867391	55.24454302	Not provided	119	3150.483398	113
Carex_buxbaumii_85	47.94381809	30.91777715	65.8871608	77.80546855	1961	201	4085.94873	256
Carex_buxbaumii_86	43.42572313	28.95702603	75.07505819	66.31161295	1961	185	3909.727051	252
Carex_buxbaumii_87	44.98712093	23.48015719	61.61543952	71.29652943	1935	168	3965.531738	255
Carex_buxbaumii_88	43.5855762	37.96215369	68.06838553	65.93779401	1958	170	4306.881348	247
Carex_buxbaumii_89	47.98622024	42.79597777	63.44445961	59.25729247	1925	198	4409.325684	240
Carex_buxbaumii_90	47.11346218	36.28929829	61.39309152	62.7290695	1982	221	4555.519043	235
Carex_buxbaumii_91	47.31029478	40.98927302	79.07281706	81.36333022	1998	196	4309.915039	284
Carex_buxbaumii_92	48.44783523	26.9117208	68.97657724	63.00766328	1893	195	4085.691162	231
Carex_buxbaumii_93	43.45216703	34.72927853	57.88889353	64.95230414	1900	197	4505.713867	244
Carex_buxbaumii_94	57.45015343	40.58362795	54.68292605	63.4450708	2002	170	3994.645508	293
Carex_buxbaumii_95	53.02562944	44.97780488	65.04559156	62.53971789	1985	185	4027.887207	251
Carex_buxbaumii_96	52.23922709	38.70245412	87.25172254	77.22310689	1989	167	4085.693848	257
Carex_buxbaumii_97	39.63177845	37.7555444	62.73894252	61.24526908	1892	139	3371.397217	343
Carex_buxbaumii_98	45.01640204	53.2259596	67.19628242	68.31198639	1994	165	3810.053955	315
Carex_buxbaumii_99	48.43015146	38.20293021	65.22180626	64.73678363	1997	161	3469.961914	308
Carex_buxbaumii_100	41.25671713	26.38228504	66.14723777	65.28362041	1974	178	3891.244385	320
Carex_buxbaumii_101	45.46463046	39.17723014	60.89914854	62.93559104	1928	111	3334.578857	169
Carex_buxbaumii_102	45.21471189	34.1035	61.23974459	62.01235636	1942	146	3219.499756	166
Carex_buxbaumii_103	46.14492771	35.72387637	63.77290549	53.51564275	1989	179	4059.774414	168
Carex_buxbaumii_104	49.15288008	36.07279596	62.63855798	65.17314668	1986	138	3167.066895	218

Carex_buxbaumii_105	47.93935249	29.09819822	NA	59.46208639	1990	365	5165.368164	536
Carex_buxbaumii_106	40.99856302	33.95414604	47.5424242	59.9203147	1984	137	7015.460449	334
Carex_buxbaumii_107	48.240369	43.01706968	61.02468297	63.02553338	1986	251	4883.720703	383
Carex_buxbaumii_108	45.01752751	19.81425305	70.99088007	66.5533018	1962	365	5107.148926	720
Carex_buxbaumii_109	44.77714655	36.08869032	65.70803331	64.3587453	1986	119	2702.122559	315
Carex_buxbaumii_110	35.94165334	33.86914087	61.33776142	61.34382552	1973	128	3071.666016	213
Carex_buxbaumii_111	42.31142407	39.62866571	56.06199419	56.48568545	1970	105	3103.636475	129
Carex_buxbaumii_112	41.80255502	30.70923742	64.38017946	66.76008687	1995	136	3253.309814	176
Carex_buxbaumii_113	33.33098189	45.09584438	61.13252631	64.66110975	1983	136	3328.590332	130
Carex_buxbaumii_114	39.30102153	37.66854919	80.86253137	76.73789602	1962	137	3289.808594	104
Carex_leptalea_1	44.41062448	50.28314485	49.93874453	43.35733511	2013	254	4549.15625	321
Carex_leptalea_2	40.01293943	44.09851082	48.79435829	44.91323269	2010	224	4513.723633	340
Carex_leptalea_3	47.99154029	43.63892963	33.71338218	41.36583511	2004	285	4852.643066	309
Carex_leptalea_4	51.49345789	51.9148237	33.4158619	47.13579041	1979	245	4536.786621	337
Carex_leptalea_5	35.02230014	43.08032861	35.38813414	37.85739392	1989	365	5566.0625	371
Carex_leptalea_6	40.09403094	41.17723938	41.01355686	38.64239182	2004	297	5294.97168	361
Carex_leptalea_7	47.62880568	32.5908811	30.32761038	NA	1978	334	5288.178223	438
Carex_leptalea_8	38.44743674	35.09653749	22.98225628	46.40228216	1888	211	4324.887207	321
Carex_leptalea_9	46.28315063	49.42329586	37.61055922	39.71611713	1910	314	5058.499023	338
Carex_leptalea_10	51.29533139	43.87534318	45.17356282	46.91097596	1946	179	5212.884277	266
Carex_leptalea_11	57.65630642	47.25553369	57.62230294	NA	1939	173	3730.138428	307
Carex_leptalea_12	50.51903388	41.84041787	47.30359483	39.70477216	1925	145	6951.549805	234
Carex_leptalea_13	60.56077488	47.37452223	51.33125576	41.36478833	1909	201	4380.523438	240
Carex_leptalea_14	38.93652316	45.40285263	38.51300774	42.67538921	1948	352	5433.658691	445
Carex_leptalea_15	46.5232511	42.83439155	36.59479356	42.88436797	1951	365	5501.886719	454
Carex_leptalea_16	49.64019388	43.64821239	40.95626515	44.23820397	1956	365	5331.111816	446
Carex_leptalea_17	48.27418561	52.43815584	35.80623593	47.32766647	1962	365	5727.972168	402
Carex_leptalea_18	47.0937038	44.26074649	35.47054525	47.0748634	1980	291	5166.645996	379
Carex_leptalea_19	41.81201682	50.32265448	38.74115544	39.73300912	1983	365	5590.53418	431
Carex_leptalea_20	46.31795427	41.89649459	36.4125733	42.48521784	1947	165	3895.242676	256
Carex_leptalea_21	46.49425762	46.53310697	33.53692715	47.09919346	2006	337	5527.550781	427
Carex_leptalea_22	39.70203298	39.22005897	41.03878642	34.87708648	2004	172	6365.343262	100
Carex_leptalea_23	45.10990914	47.88096431	36.44880052	47.03167497	2005	241	4557.843262	337
Carex_leptalea_24	51.85849649	44.19816257	40.85853894	40.76380344	1963	190	4428.529785	299
Carex_leptalea_25	49.0223681	45.97867747	44.38372813	54.54246698	1961	214	4339.571777	311
Carex_leptalea_26	48.20998064	54.97824827	48.48044801	48.67683378	1953	365	5271.806641	370
Carex_leptalea_27	57.62497835	41.61273116	38.83099129	47.10933046	1960	284	4832.492188	289
Carex_leptalea_28	42.86483479	49.89284286	39.01666643	44.84724924	1940	159	3347.301758	231
Carex_leptalea_29	66.6156553	50.92462053	43.97673033	54.19733411	1950	322	5079.913574	339
Carex_leptalea_30	42.23242627	43.30866198	33.74224881	44.11675683	1977	205	4337.727051	297
Carex_leptalea_31	58.17570958	48.09929867	47.54310895	53.09884462	1949	226	4600.740234	338
Carex_leptalea_32	44.18595245	44.47873658	36.89578369	43.86915331	1951	245	4916.444824	322
Carex_leptalea_33	37.58260289	34.93461189	32.14881277	40.53973258	1972	211	4613.651367	311
Carex_leptalea_34	41.38611019	45.91068475	41.72652126	40.54005625	1934	181	4173.990234	298

Carex_leptalea_35	52.06407892	48.22259294	42.05291851	48.16391397	1963	202	4646.312988	297
Carex_leptalea_36	74.56645403	66.70979707	64.03197858	NA	1979	113	6906.36377	196
Carex_leptalea_37	50.62251203	44.00794752	41.03107002	47.4842376	1949	227	4733.007813	293
Carex_leptalea_38	43.27854163	40.01198246	33.94923202	37.79221683	1976	249	4810.424316	305
Carex_leptalea_39	38.49153658	39.66261512	33.80374358	42.92213056	1955	232	4745.076172	279
Carex_leptalea_40	39.40864095	47.32265259	40.86677922	52.70858144	1998	305	4018.970215	371
Carex_leptalea_41	48.93883084	40.42969261	39.95602158	39.27194171	2010	179	5207.679199	154
Carex_leptalea_42	60.27187192	47.53565544	45.55946452	43.82038349	1976	224	4733.183105	314
Carex_leptalea_43	38.55719607	32.20956689	36.18625775	42.30923298	2008	139	5809.132813	202
Carex_leptalea_44	51.84742123	58.07943585	53.27582833	54.30943885	1982	365	5624.689453	565
Carex_leptalea_45	52.92467039	66.65871468	55.02042154	57.30836558	1969	365	5227.456543	523
Carex_leptalea_46	44.892423	35.28182867	44.90634698	53.21587084	1993	104	3556.225342	203
Carex_leptalea_47	50.8914454	43.62686984	45.47321982	47.37352132	1992	181	5289.517578	948
Carex_leptalea_48	51.96531122	37.12459489	42.60335054	53.65920676	1995	173	4353.769531	244
Carex_leptalea_49	51.37271554	45.89373455	35.55436035	47.02304774	1994	187	4160.842285	259
Carex_leptalea_50	47.01967192	33.35340368	45.48331959	48.80482425	1994	160	3737.824219	271
Carex_leptalea_51	48.40061019	43.74622558	48.97324117	52.15652245	1988	126	3157.921875	214
Carex_leptalea_52	60.26014385	52.55993646	48.48962161	54.12373658	2012	365	5772.14502	306
Carex_leptalea_53	45.7524193	45.42875655	40.77012738	48.31911966	2016	365	5367.813477	374
Carex_leptalea_54	56.49373027	51.18836992	47.48125025	45.60009852	1924	298	5019.562012	489
Carex_leptalea_55	48.38124375	48.95581649	44.5843114	46.68010173	1918	270	5128.662109	330
Carex_leptalea_56	56.74635359	48.66234642	43.9231599	44.06630473	1997	190	4053.364258	241
Carex_leptalea_57	52.58898511	51.68728486	48.01046542	51.86116801	1935	365	5258.559082	509
Carex_leptalea_58	55.63159716	47.82640957	54.10591018	49.37116643	1982	152	3540.7854	355
Carex_leptalea_59	55.37255939	46.85053224	43.88212645	43.95365093	1982	282	5047.265137	353
Carex_leptalea_60	57.50074386	47.57580907	44.60147434	53.03496947	2010	170	3934.475586	282
Carex_leptalea_61	45.41427735	40.29586804	44.17081497	46.81996451	1930	126	3234.801025	134
Carex_leptalea_62	45.94011016	42.27602042	48.17955677	59.12058784	1973	96	3230.623535	218
Carex_leptalea_63	41.91035958	40.51395218	49.60244904	53.39748688	2003	192	3807.680176	438
Carex_leptalea_64	52.7289456	52.23204489	39.59454829	53.26921205	2003	217	4572.57373	260
Carex_leptalea_65	55.07461731	47.25211634	42.60286191	45.43780693	1988	210	4427.643066	237
Carex_leptalea_66	42.19271709	41.02334022	37.75394136	51.44170458	1994	114	3069.517578	113
Carex_leptalea_67	52.73695966	45.83013292	47.5586035	58.65571025	1998	132	3239.984131	156
Carex_leptalea_68	51.18859226	44.24460025	46.12149912	54.62767259	2005	134	3168.334961	131
Carex_leptalea_69	43.57584834	34.46444838	35.40398533	52.88805883	1922	129	2661.633057	240
Carex_leptalea_70	60.93781804	47.49828951	50.41625087	48.90482408	1999	199	4271.058105	325
Carex_leptalea_71	46.32914837	38.70317166	54.77573009	53.89745912	1977	127	2591.62085	443
Carex_leptalea_72	43.35710837	49.8870168	38.01938988	41.90221429	1992	251	4884.803223	402
Carex_leptalea_73	41.36472854	48.49669358	40.99888931	45.51841313	1981	205	4230.742676	377
Carex_leptalea_74	47.86527787	40.34017379	46.83878104	54.91657012	1980	119	2842.556396	237
Carex_leptalea_75	54.72360473	48.48539671	42.66205797	41.41907244	1970	365	5107.148926	720
Carex_leptalea_76	32.7015552	37.15420005	47.08410745	55.58094232	1993	97	2943.137207	156
Carex_leptalea_77	47.28953985	39.43482779	40.6280624	49.41411866	1993	158	4041.555664	174
Carex_leptalea_78	32.06863293	37.741262	35.63651101	41.51260145	1998	192	3927.940918	342

Carex_leptalea_79	51.11611211	38.86057721	50.90979952	60.77990305	1966	154	3615.077393	296
Carex_leptalea_80	45.60419995	50.74210986	47.88322658	55.90619822	1954	163	3679.219482	319
Carex_leptalea_81	42.36252158	48.80627804	41.39392603	46.86907185	1970	173	3828.52002	276
Carex_leptalea_82	54.49632907	50.00526643	48.29307356	56.49093115	1999	190	3908.70166	336
Carex_leptalea_83	46.14848188	44.5701759	43.95813329	50.61542759	2000	209	4095.537842	399
Carex_leptalea_84	44.79842027	44.31150731	40.61725399	51.48041178	1951	141	3295.301758	192
Carex_leptalea_85	70.72588321	50.04985297	40.44312243	48.7814481	1987	165	3858.760986	198
Carex_leptalea_86	62.5952404	46.13442277	56.89780769	67.91109826	1993	102	4980.327148	211
Carex_leptalea_87	49.27506997	46.49978769	52.37343563	60.10419668	1928	305	3890.789063	1250
Carex_leptalea_88	55.46125667	54.21332291	37.80822628	37.09848974	1987	152	3589.349121	203
Carex_leptalea_89	52.81248407	56.54814449	50.95237973	46.40298122	1963	174	4007.546143	238
Carex_leptalea_90	54.18896632	43.06963728	48.94953729	57.04024932	2000	107	3192.757568	165
Carex_leptalea_91	57.86601196	48.41063325	56.51965977	58.5165558	1993	140	3345.660156	150
Carex_leptalea_92	61.3857778	48.82773809	50.6792592	60.43648104	1993	121	3182.071533	304
Carex_leptalea_93	57.24658151	50.0818294	46.80642019	52.64570687	2011	174	4190.02002	188
Carex_leptalea_94	50.3095139	38.19913295	48.31203425	62.56324371	1976	104	3375.914795	155
Carex_leptalea_95	46.08813215	39.79035461	63.07193398	57.76479731	1974	26	3303.903564	261
Carex_leptalea_96	52.43892042	44.0948292	36.78419927	52.42758483	2009	115	2737.696289	111
Carex_leptalea_97	69.49069012	45.12542766	33.61051087	52.03990034	2003	166	4744.932129	160
Carex_leptalea_98	40.34957865	43.12801652	51.68645065	53.73456578	1994	203	3976.174316	1048
Carex_leptalea_99	48.35602642	48.83552136	50.75398904	57.82861686	2004	198	4356.508301	97
Carex_leptalea_100	42.46487235	41.45470446	54.93088274	41.6869524	1998	117	3196.165283	210
Carex_leptalea_101	55.09617914	50.45000451	58.03929171	56.60186394	1932	181	3388.148682	385
Carex_leptalea_102	55.78945687	47.02806827	37.09076982	52.04518425	1907	128	3222.75415	202
Carex_leptalea_103	52.5897505	45.62548797	48.51266943	61.03203583	1938	159	3680.001709	205
Carex_leptalea_104	46.72020466	43.87200751	45.19476941	51.15499751	1935	171	3440.956787	311
Carex_leptalea_105	51.75252718	41.76400015	51.93527304	54.67696784	1990	145	3213.456543	317
Carex_leptalea_106	38.62456527	46.11888224	38.31446523	50.29991054	1988	127	2864.571533	142
Carex_leptalea_107	52.23209051	42.13771945	40.52113036	33.86170005	1972	181	4157.645508	157
Carex_leptalea_108	42.0716124	35.61735848	42.8531973	45.11876259	1929	111	3334.578857	169
Carex_leptalea_109	53.62487679	48.9399633	45.98303814	46.55422152	1970	155	3259.054443	202
Carex_leptalea_110	52.58633361	47.531655	45.43026106	57.32071609	1928	124	2965.005371	132

Appendix 4: Supplementary figures from chapter 2

$$ES_i = \sum_{j=1}^{N_i} l_j \frac{1}{2^{j-1}}$$

$$ES_{Carex\ cusickii} = \sum_{j=1}^3 l_j \frac{1}{2^{j-1}}$$

$$ES_{Carex\ cusickii} = (0.0081 * \frac{1}{2^{1-1}}) + (0.0067 * \frac{1}{2^{2-1}}) + (0.0050 * \frac{1}{2^{3-1}})$$

$$ES_{Carex\ cusickii} = (0.0081 * 1) + (0.0067 * 0.5) + (0.0050 * 0.25)$$

$$ES_{Carex\ cusickii} = 0.0127$$

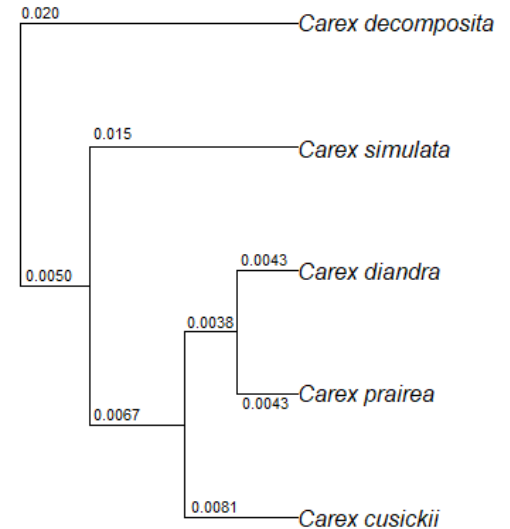


Figure A4.1 Worked out example estimating the diversification rate of *Carex cusickii* using the equal splits (ES) measure. The phylogeny is a subset of the North American *Carex* phylogeny reconstructed by Pender (2015). ES_i represents the equal splits measure for a given species i , N_i is the total number of branches between the terminal leaf and root, l_j is the branch length j beginning with the terminal branch ($j = 1$) and concluding with the root branch ($j = N_i$).

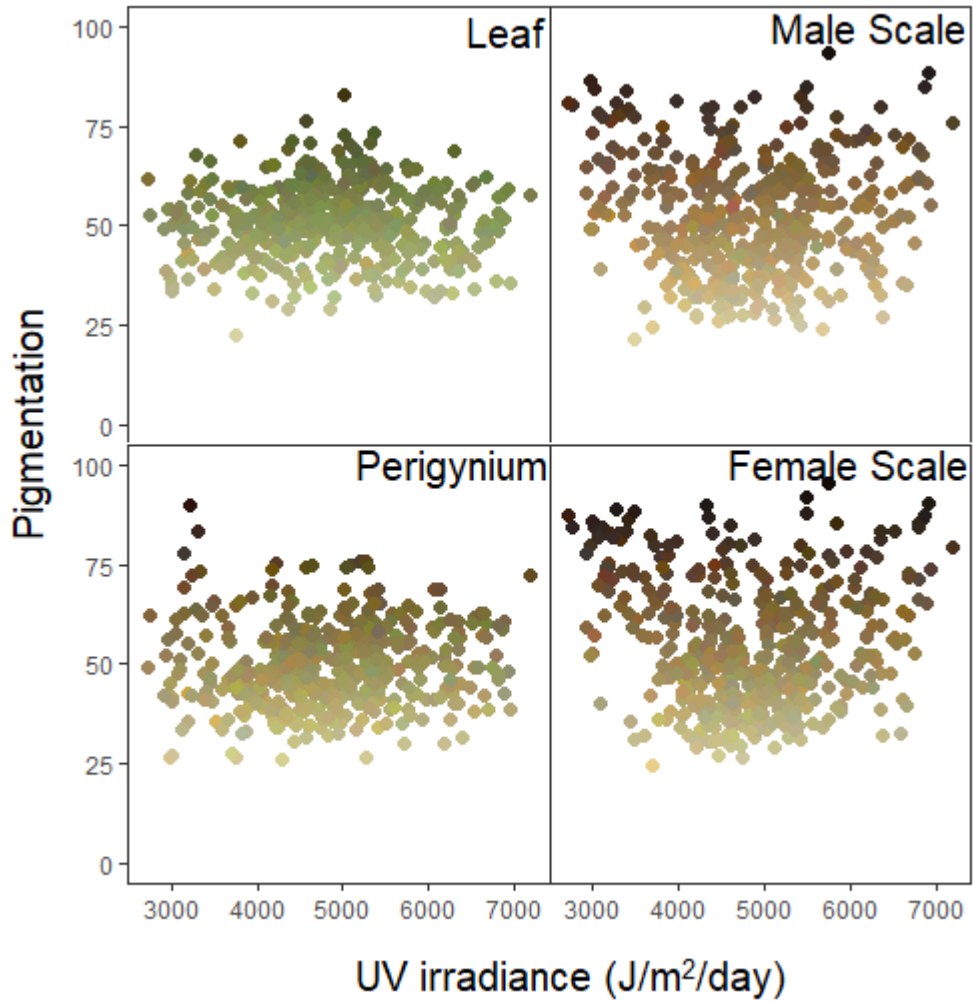


Figure A4.2 The relationship between UV irradiance and pigmentation across species. Each data point represents the averaged pigmentation for a given species. The RGB measured colour for each structure of interest (photosynthetic leaf, perigynium, male scale, female scale) was averaged among each image and is represented by the colour of each data point.

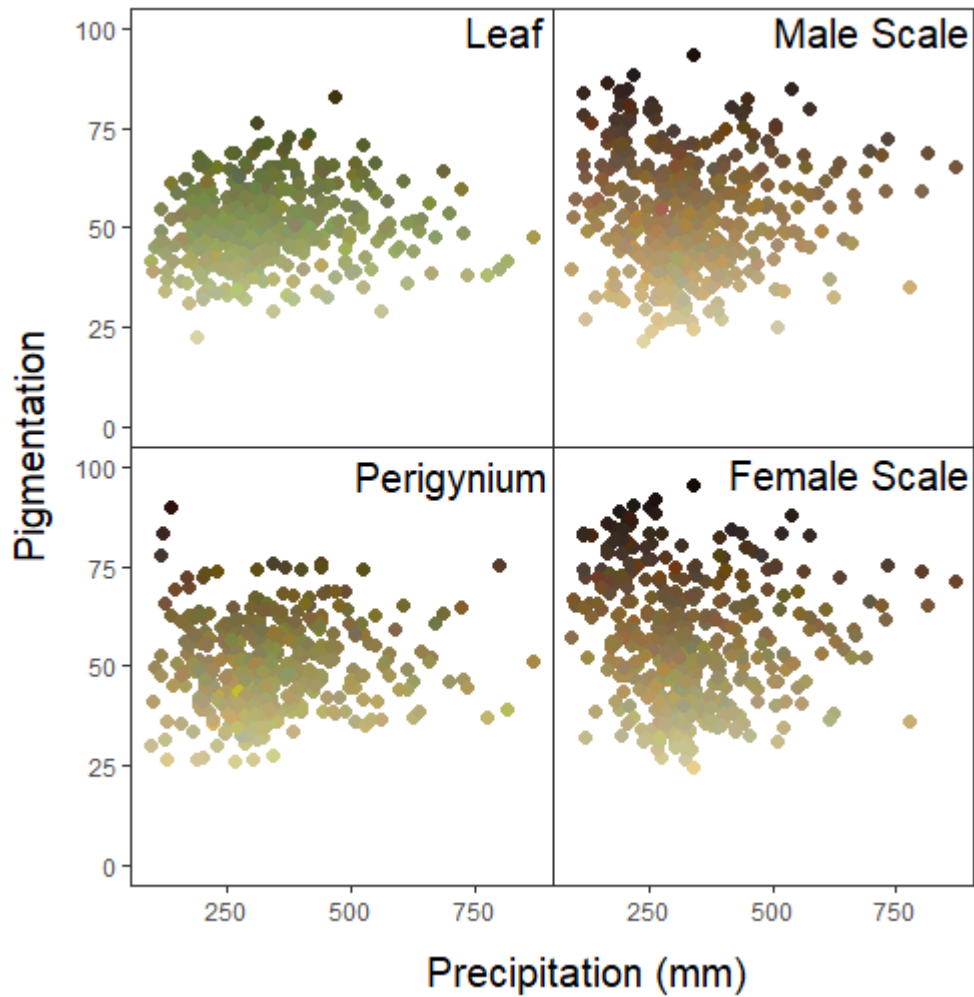


Figure A4.3 The relationship between precipitation and pigmentation across species. Each data point represents the averaged pigmentation for a given species. The RGB measured colour for each structure of interest (photosynthetic leaf, perigynium, male scale, female scale) was averaged among each image and is represented by the colour of each data point.

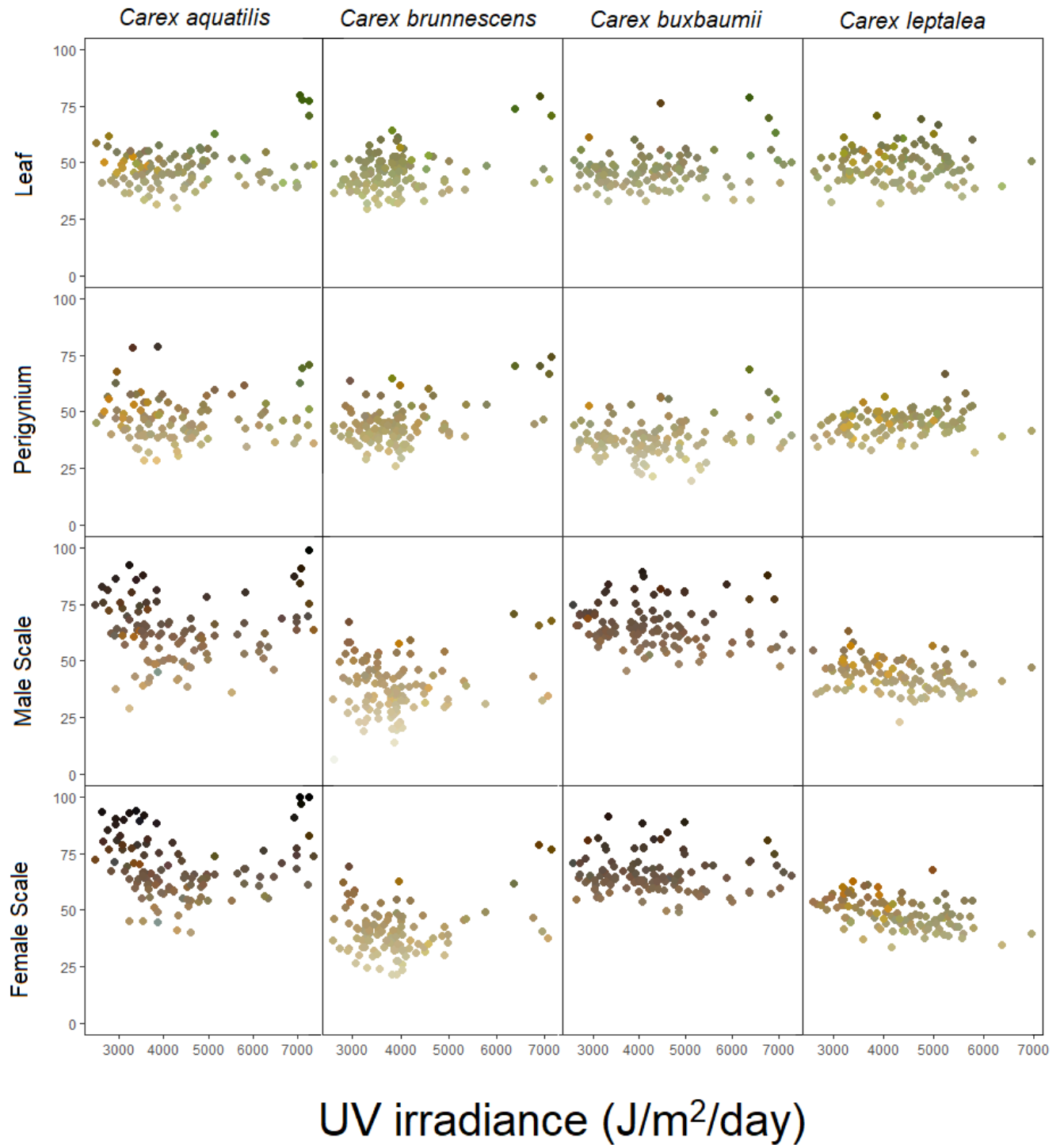


Figure A4.4 Relationship between UV irradiance and pigmentation within species. Each point represents the pigmentation (degree of darkness) for a given specimen. The RGB measured colour for each structure of interest (photosynthetic leaf, perigynium, male scale, female scale) is represented by the colour of each point.

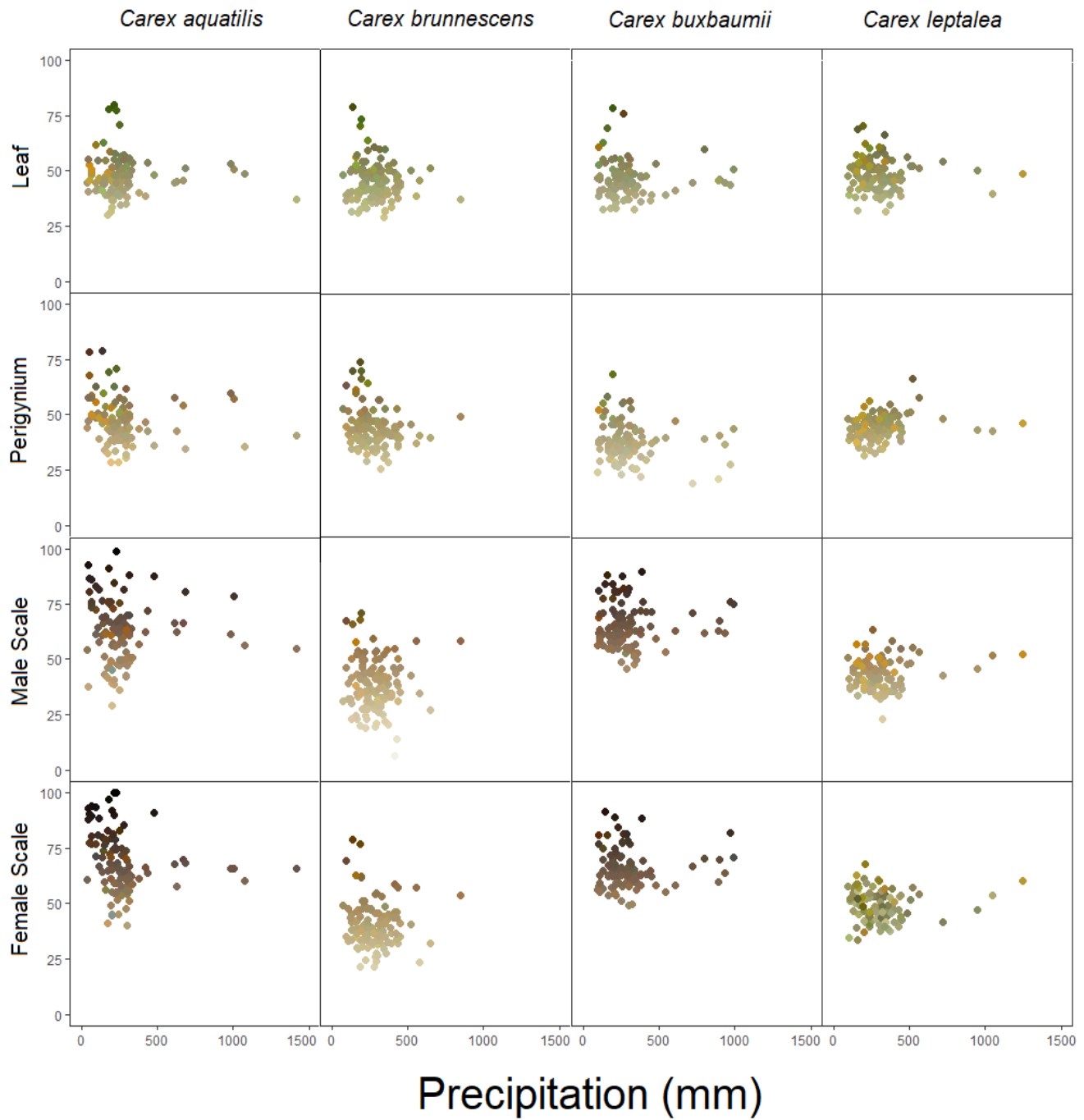


Figure A4.5 Relationship between precipitation and pigmentation within species. Each point represents the pigmentation (degree of darkness) for a given specimen. The RGB measured colour for each structure of interest (photosynthetic leaf, perigynium, male scale, female scale) is represented by the colour of each point.