

Identification Guide for Common Native and Non-Native Grass Species of Younger Lagoon Reserve

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Introduction

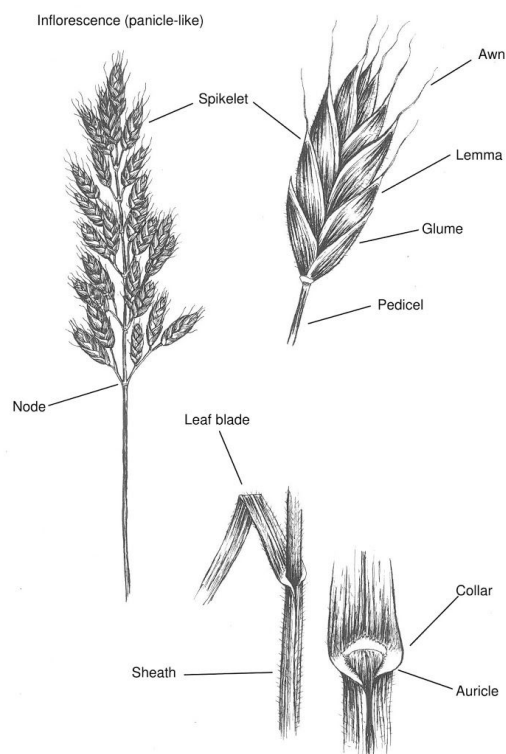
Younger Lagoon Reserve (YLR) is part of the UC Natural Reserves System and is home to a diverse assortment of habitats, many of which are threatened and dominated by non-native species. Some of the primary habitats on the upper terrace of the reserve include coastal prairie, coastal scrub, and freshwater wetlands. Grasslands, specifically coastal prairie habitats make up a large portion of the upper terrace on the reserve and contain a wide variety of species, both native and non-native. Historically dominated by perennial bunchgrasses and annual forbs, coastal prairie habitats are now heavily invaded by non-native annual grass species (Wigand 2007). Coastal prairie is the most species-rich grassland type in California and also contains the most urbanized fraction of any habitat type in North America, making it the sixth most endangered ecosystem in the country (Ford & Hayes 2007). The native grasses *Stipa pulchra*, *Elymus glaucus*, and *Danthonia californica* are generally used as indicator species in the delineation of coastal prairie habitats (Ford & Hayes 2007) and are important species that are actively being planted on the reserve. Previously a brussels sprout farm, YLR is currently undergoing an active restoration project, which heavily involves the restoration of grasslands. The poor soil conditions and heavy nitrogen levels has promoted the establishment of non-native species as well as the decline of sensitive native populations.

Though generally difficult, the identification of grass species is extremely important for those involved in habitat restoration. Being able to differentiate between sensitive native species and invading non-natives is crucial to any restoration project. When collecting seeds or weeding, it is important to know the defining characteristics of different grass genera and species. This helps ensure the preservation of native populations as well as prevents the further facilitation of non-native species. This guide will provide a reference to the important grass species at YLR, both native and non-native, as well as basic techniques and terms for defining and identifying grasses.

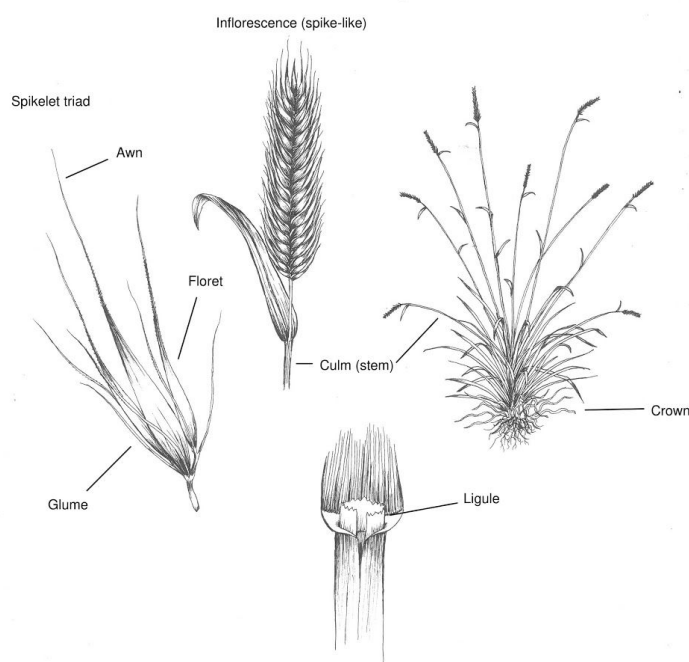
Grass Identification Techniques

When identifying a grass, it is important to closely examine multiple characteristics of the plant, including morphological features, as well as growth habit and ecological interactions. It is helpful to first note what habitat type the individual was found in, as well as the growth habit and form of the plant, e.g. whether it appears to be an **annual** or **perennial**, or if it appears dominant in its habitat (Baldwin et al 2012). In addition, one should note whether the individual exhibits a **rhizomatous** growth habit (propagating from laterally growing underground root structures), or if it exhibits clumped (**caespitose**) growth as in bunchgrasses (Baldwin et al 2012). When examining the morphological features of a grass specimen, it is extremely important to observe

the **inflorescence** of the individual, or the main flowering arrangement, making note of what growth type it exhibits, such as a **panicle** (Baldwin et al 2012). In addition, the individual **spikelets** should be examined (main flowering unit), looking for the presence and length of **awns**, if they are rough (**scabrous**) or smooth (**glabrous**), and if they are coiled, bent, stiff, or flexible (Baldwin et al 2012). In addition to the inflorescence, an identifying characteristic can be the presence of a **ligule**, a structure at the junction of the leaf and **sheath** on a grass stem. The ligule can be membranous, hairy (**ciliated**), or absent altogether (Baldwin et al 2012). Adjacent to the ligule, one can observe the **auricles**, arm-like structures which may be absent, or wrap fully around the leaf/sheath junction. The leaf sheath can be closed at the top, or open all the way down. Finally, it is important to look at the shape and texture of the leaf blade, measuring length and width, as well as observing whether it is scabrous, glabrous, or hairy (Baldwin et al 2012). The major identifying characteristics of grasses are illustrated and labelled below:



Bromus hordeaceus (non-native)

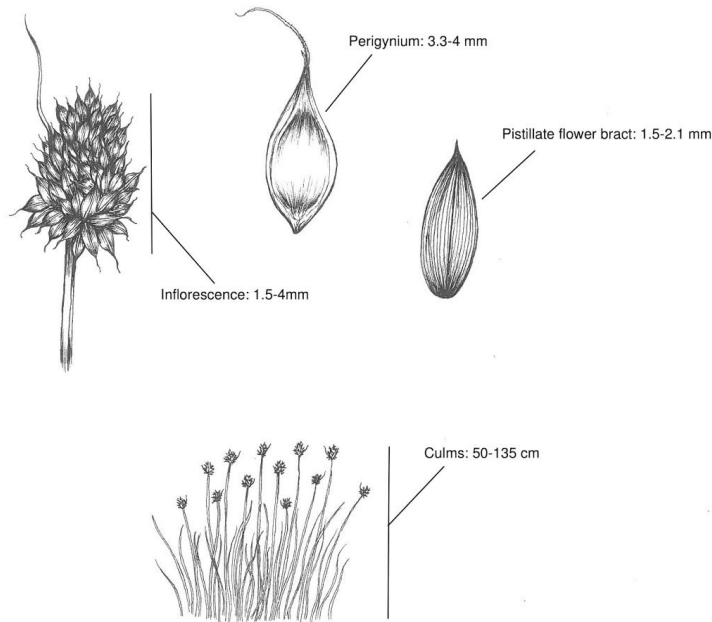


Hordeum brachyantherum (native)

Characteristics of Sedges and Rushes

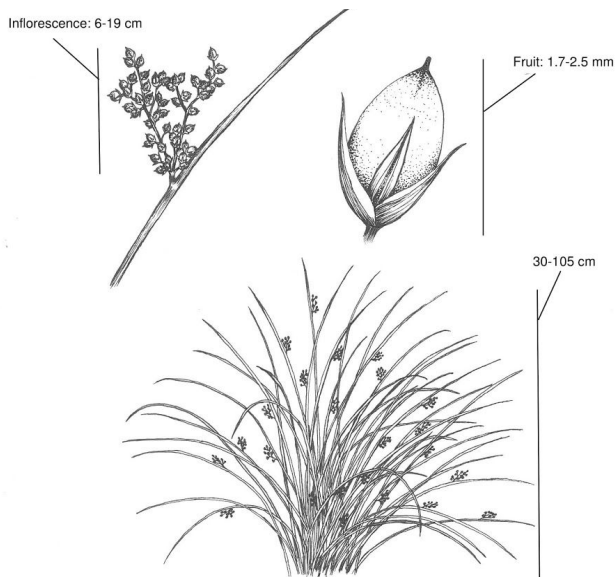
Cyperaceae (sedges): Very large family of plants that resemble grasses. Generally, sedges are characterised as having triangular shaped stems (edges), and spiraling leaves which are arranged in three ranks (as opposed to Poaceae (grasses), which have two-ranked, alternating leaves).

Sedges often have an affinity for wetland habitats and are widely distributed, with a large portion of species in the genus *Carex*, with roughly 2000 species. A common native sedge present on YLR is *Carex harfordii*, described and illustrated below.



Carex harfordii (Harford's sedge): Widely distributed native sedge. Dense, generally dark brown or black inflorescence which grows from the top of the stem. Often found in wet meadows and wetland-riparian areas, but can be found in a variety of other habitats, including coastal scrub, redwood forest, and mixed-evergreen forest. Flowers February-September.

Juncaceae (rushes): Another family of plants similar in appearance to grasses and sedges. Stems are generally cylindrical, with some exceptions. Rushes tolerate a wide range of moisture conditions, but the largest genus *Juncus* contains species which are primarily found in wetland habitats. The most widespread member in the genus, *J. patens*, can be found on YLR in moist habitats.

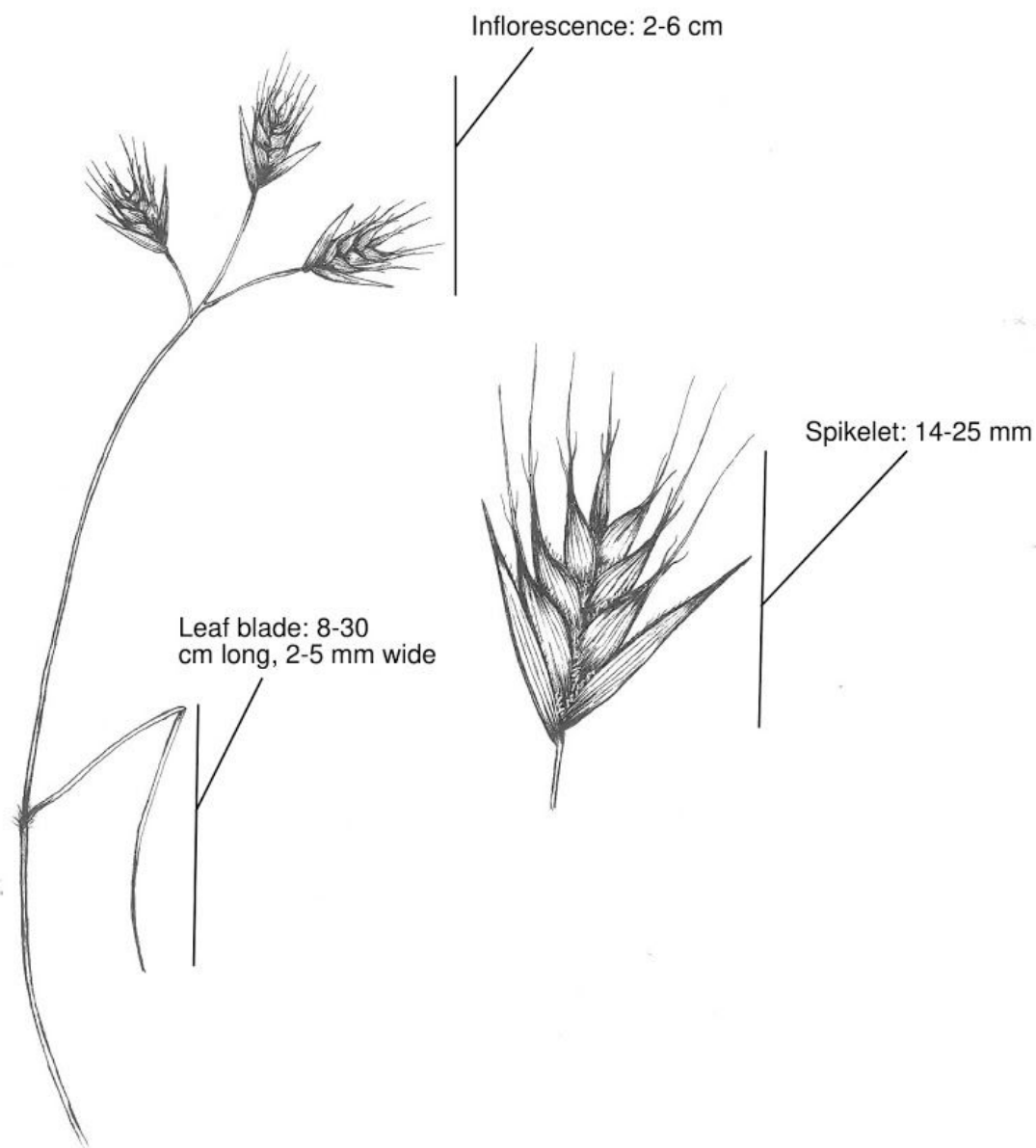


Juncus patens (common rush): Perennial, forms narrow, erect stems with a densely cespitose growth habit. Inflorescence is generally dark red to brown with many flowers, growing laterally out of the stem. Lowest bract of infl. resembles stem and grows past the inflorescence. Common in wet areas, including marshes, creeks, and seep areas. Flowers June through October

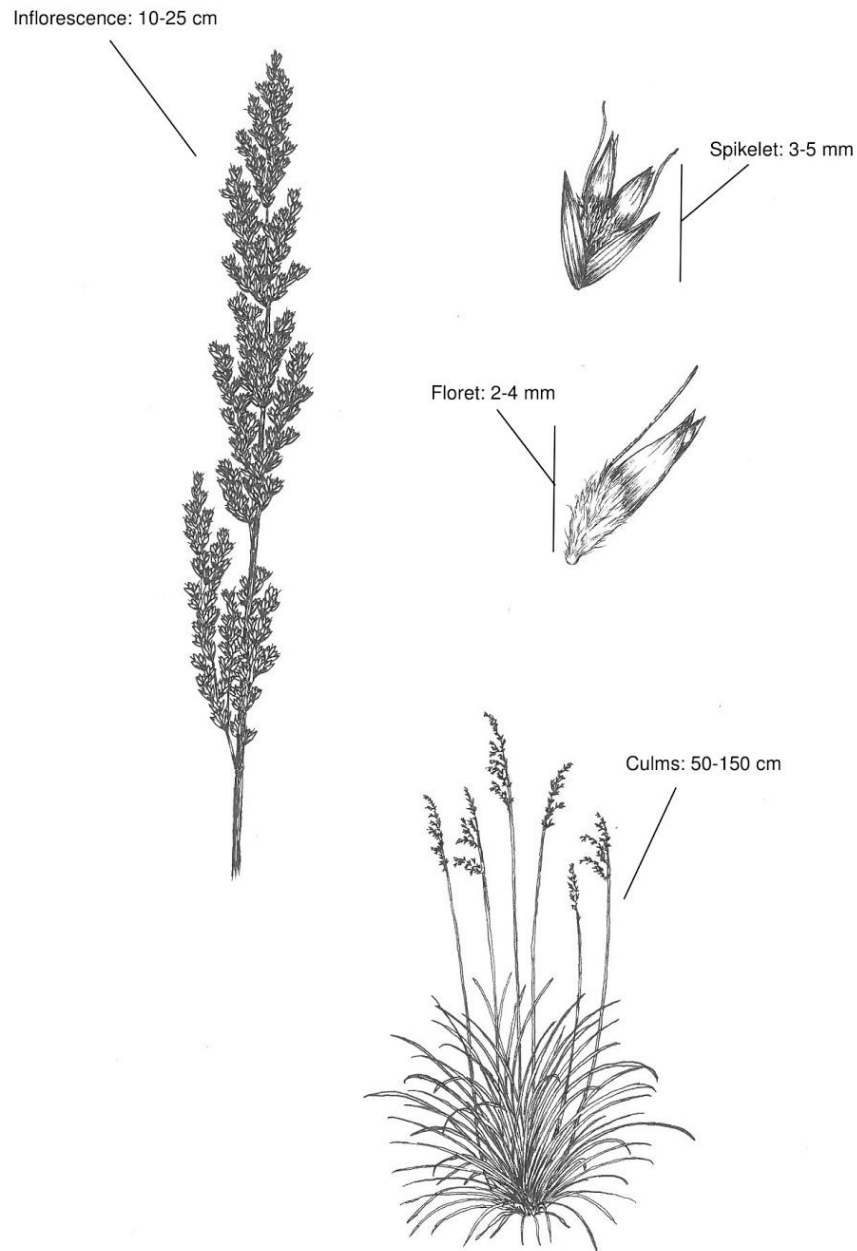
Native Grass Species of YLR



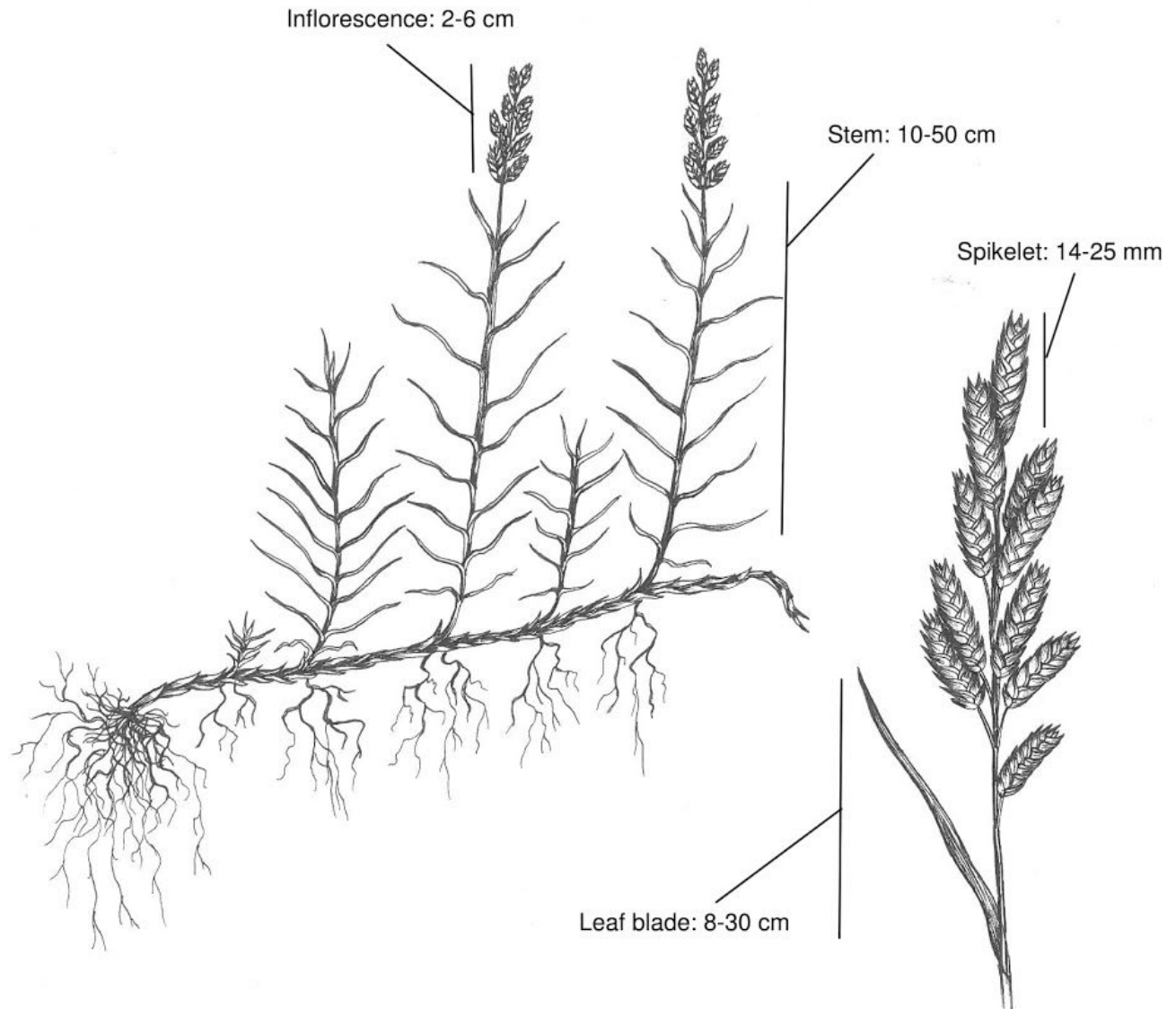
Bromus carinatus (California brome): Widely distributed, short lived perennial. Grows relatively fast. Can be distinguished from the non-native *Bromus catharticus* by its longer awns (4-15 mm), generally more slender spikelets, and a more cespitose growth habit. Flowers February through March. The species in the *Bromus* genus may be confused with those in the genus *Festuca*, but can be distinguished by a leaf sheath that closes near the top, generally larger spikelets, and two-toothed lemmas. *Festuca* species exhibit leaf sheaths which remain open for greater than half its length, and lemmas which taper to a point.



Danthonia californica (California oatgrass): Long lived, densely caespitose perennial. Highly ciliated (hairy) ligule. Inflorescence generally contains 3-6 spikelets. Cleistogamous seed present within internode region of stem. Leaves are scabrous if you run your fingers towards the tip. Can often be located in a habitat by its habit of leaning all the way over. Generally found in moist meadows or open woodland. Flowers February through March.



Deschampsia cespitosa (tufted hair-grass): Perennial bunchgrass, densely cespitose. Inflorescence arranged in a panicle, soft and appearing silvery when flowering. Callus generally hairy. Scabrous upper surface of leaf blade. Feels rough in one direction but smooth in the other. Has a long, pointed ligule. Flowers in July

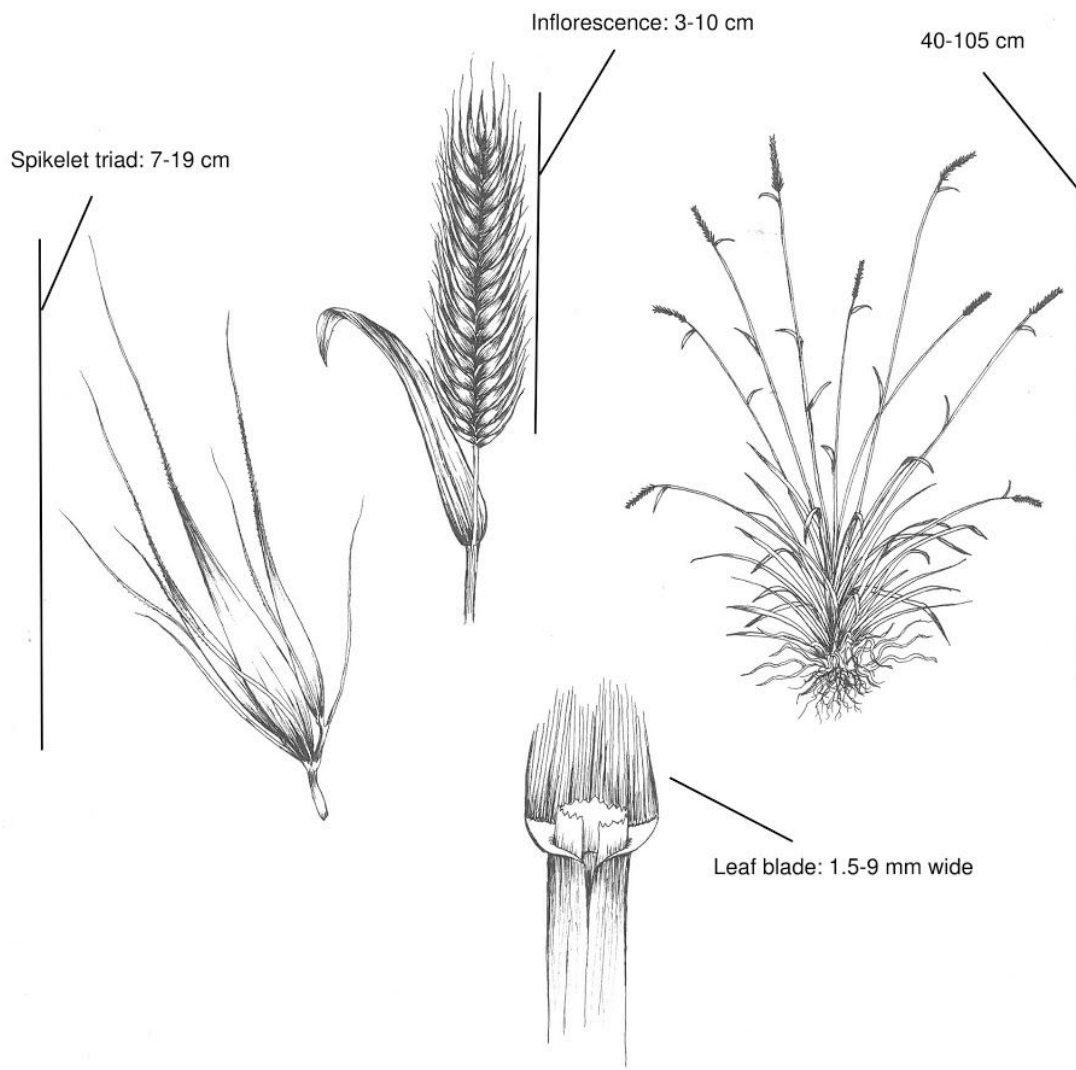


Distichlis spicata (saltgrass): Rhizomatous, perennial herb. Affinity for highly alkaline areas. Found in salt marshes, and coastal dunes. At YLR, it can be found in the freshwater wetlands on the upper terrace. Sod forming growth in large mats in low lying wetlands. Dioecious, exhibiting both male and female spikelets on separate individuals. Collected by indigenous tribes for its high salt content. Can resemble *Cynodon dactylon* (bermuda grass), a non-native grass which can be distinguished by its longer, thin spikelets that resemble fingers, as opposed to the more panicle like inflorescence of *D. spicata*. In addition, *C. dactylon* commonly reproduces through stolons (similar to rhizomes, but grow laterally above ground), which are rarely present in *D. spicata*. May also resemble *Pennisetum clandestinum* (kikuyu grass), which exhibits spikelets that are fully enclosed by the leaf sheath at maturity. Flowers July through August.

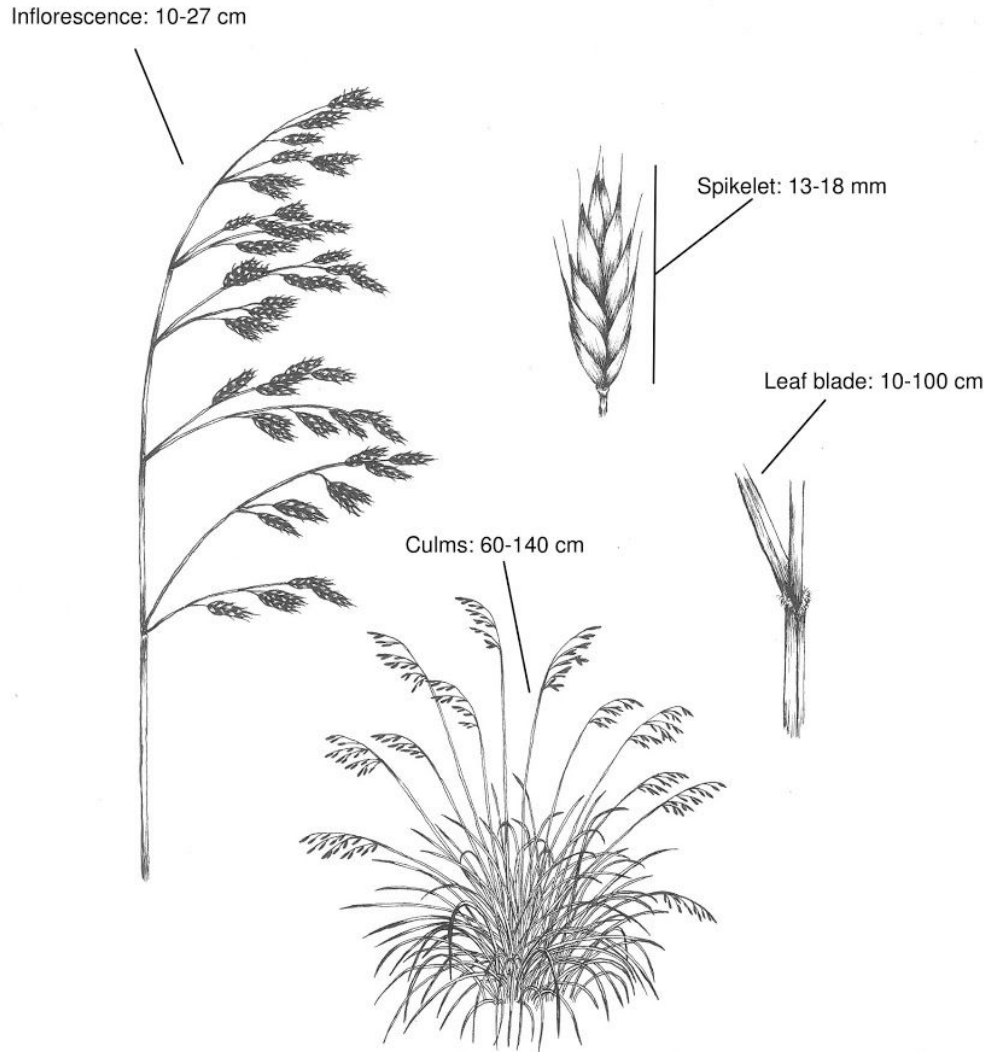
Left: *Elymus glaucus* (blue wildrye): Perennial, generally cespitose, rarely rhizomatous. Characterized by a large spike-like inflorescence. Leaves have a distinct blue-green hue and are generally very large and wide. Can be confused with *Elymus triticoides* due to its highly variable morphology and the tendency for hybridization between the two species. Can be distinguished from *E. triticoides* by its generally much longer awns (0-30 mm), and wider leaf blades (4-12 mm). Common on woodland edges. Flowers May through July.



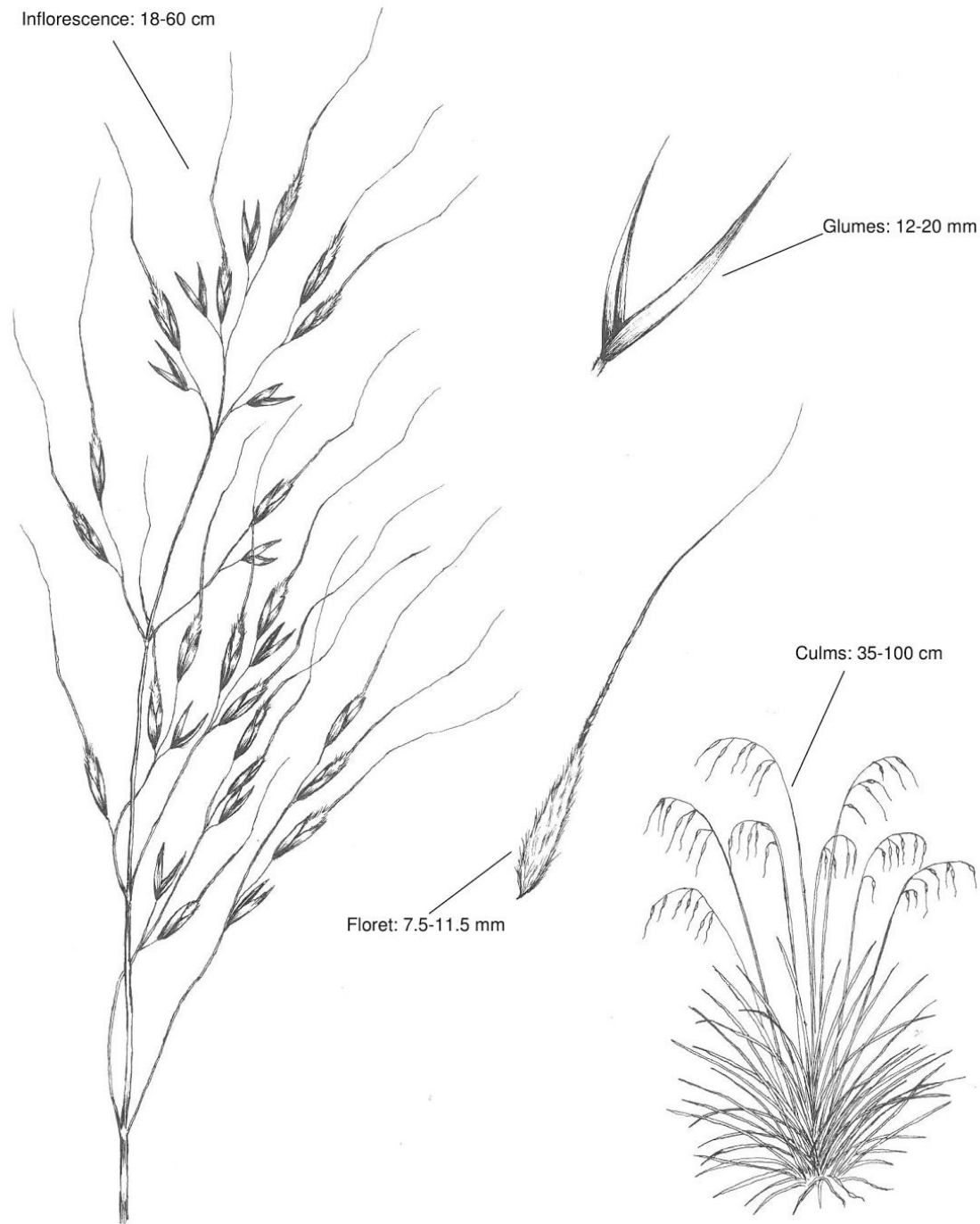
Right: *Elymus triticoides* (creeping wildrye): Perennial, often propagating through rhizomes. Inflorescence generally slender and spike-like. Can be distinguished from *E. glaucus* by its much shorter awns (0-3 mm), and more slender leaf blades (3-6 mm wide). Can be found in dry to moist areas, often in saline meadows. Flowers June through July.



Hordeum brachyantherum (meadow barley): Perennial herb. Inflorescence arranged on a spike, easily breaking apart at maturity. Loosely to densely cespitose. Leaves are generally very short and exhibit a light blue-green hue when not flowering. Can be confused with the invasive species *Hordeum marinum* or *Hordeum murinum*. Both of these species exhibit much longer awns than *H. brachyantherum*. *H. murinum* generally has a larger, fatter inflorescence and is characteristic of poor soil health. Affinity for wet meadows. Flowers June through July.



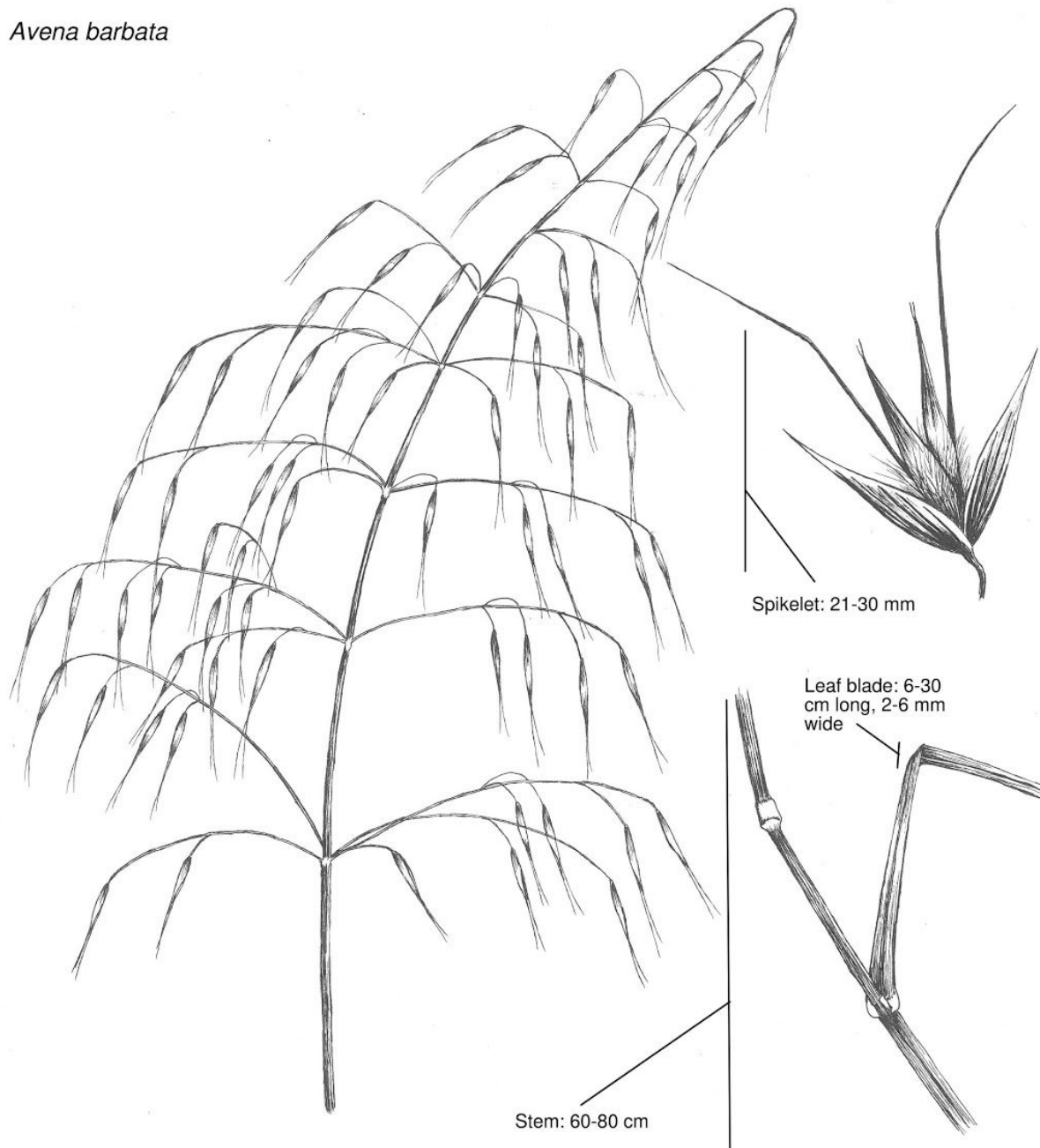
Festuca californica (California fescue): Perennial densely cespitose bunchgrass. Leaf sheath collar generally highly ciliated. Inflorescence panicle-like, stem with visible nodes. Very tall, erect culms (stems) (60-140 cm). May resemble species in the *Bromus* genus, such as *B. carinatus*, but can be distinguished by is more slender, cylindrical spikelets and greater degree of cespitose growth. Flowers March through July.



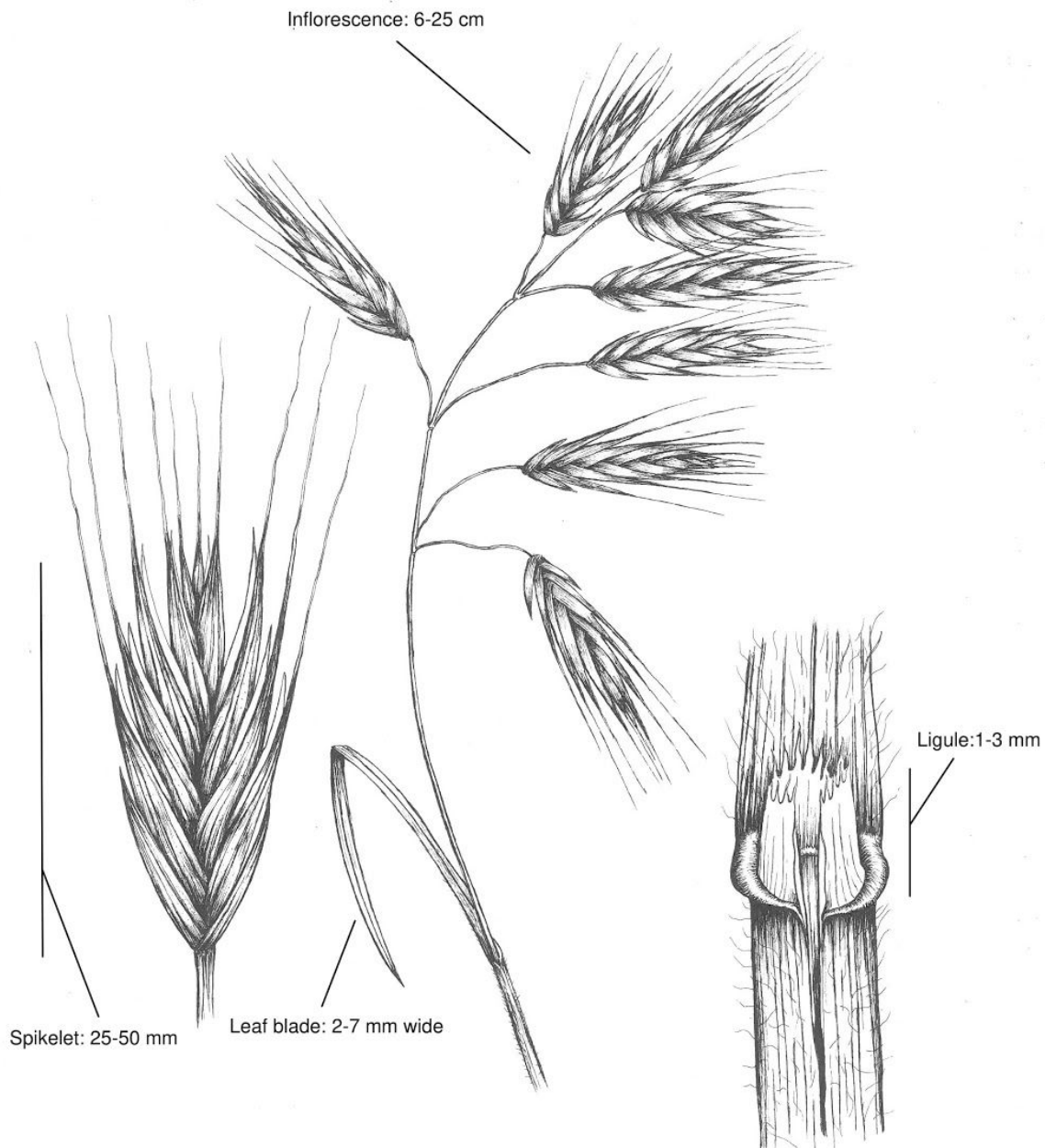
Stipa pulchra (purple needlegrass): Perennial bunchgrass with panicle like inflorescence. Lemmas exhibit a bent and/or coiled awn at maturity and are hairy throughout. Spikelets contain a single floret with lemmas that generally enclose the palea. Usually found in open, dry areas. Can be confused with the invasive *Bromus diandrus*, which is distinguished by its stiff, scabrous awns and annual growth habit. May also be confused with *Avena barbata*, which has a larger, more robust inflorescence and growth habit and much longer, wider leaves.

Non-Native Grass Species of YLR

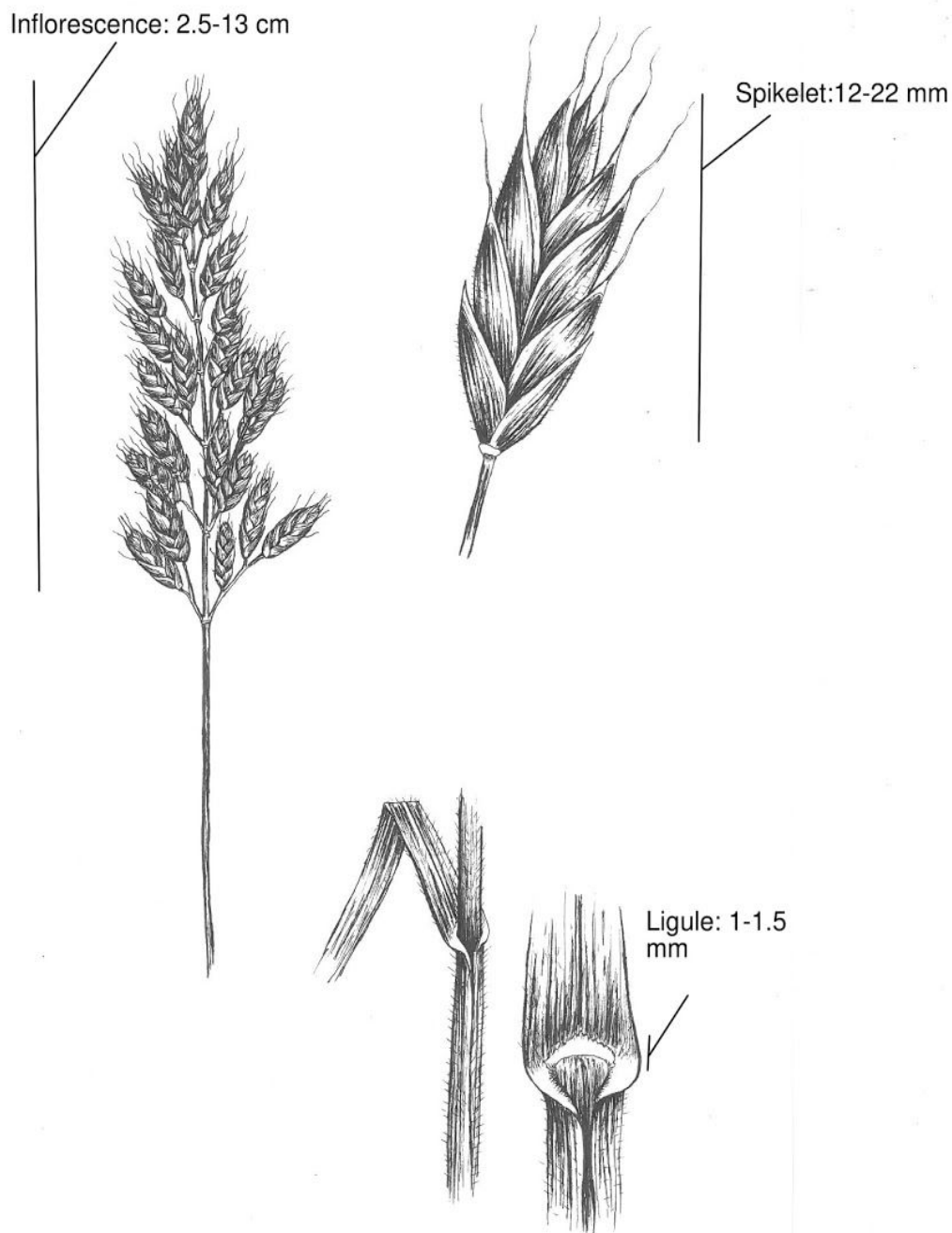
Avena barbata



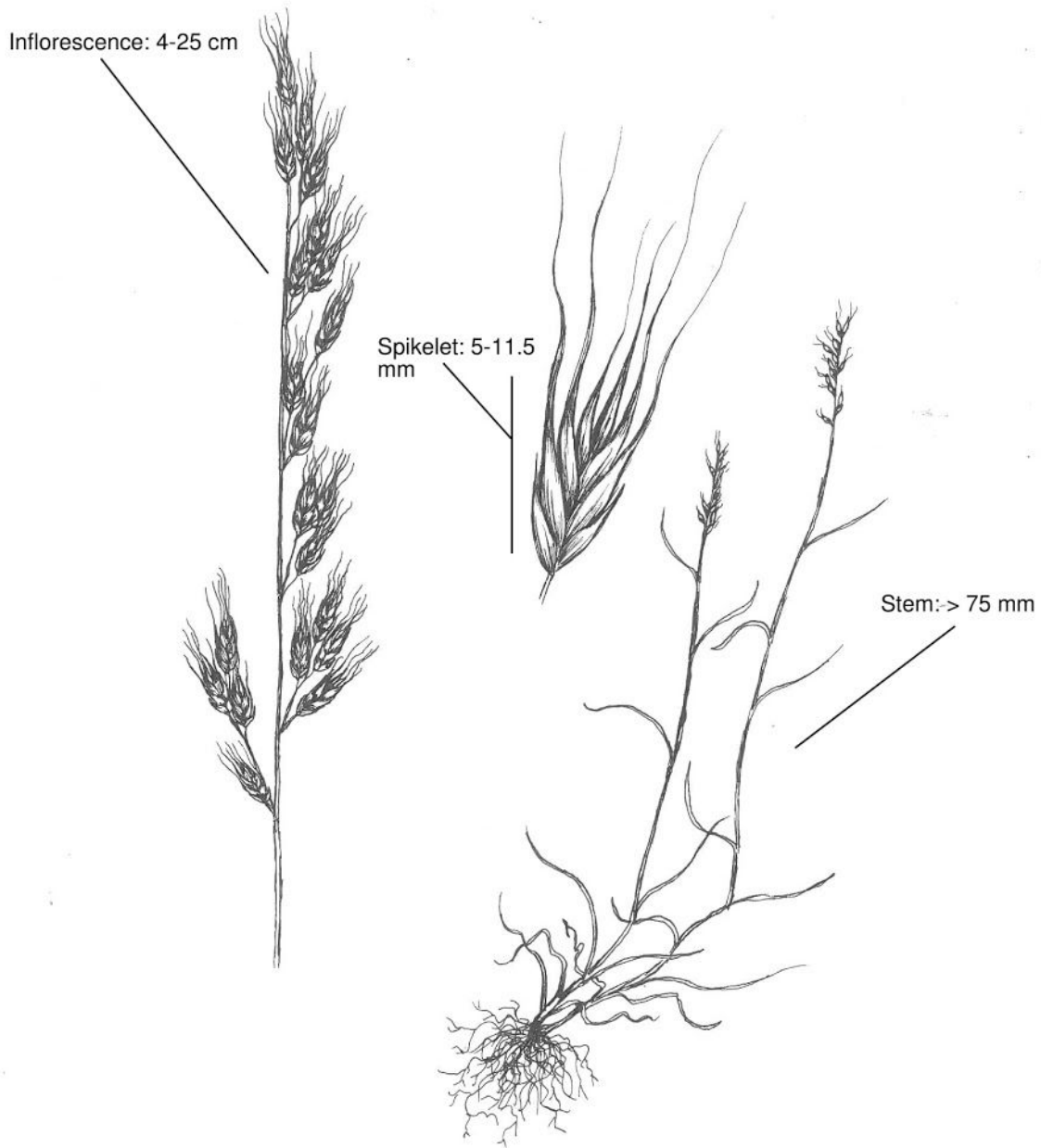
Avena barbata (slender wild oat): Invasive cool season annual, dominant at YLR. Panicle-like inflorescence. Two-forked lemma tips with bristly awns generally bent and coiled at maturity, protruding at or slightly below middle of lemma. Has a hairy callous. Common in meadows and open forest. Flowers March-June.



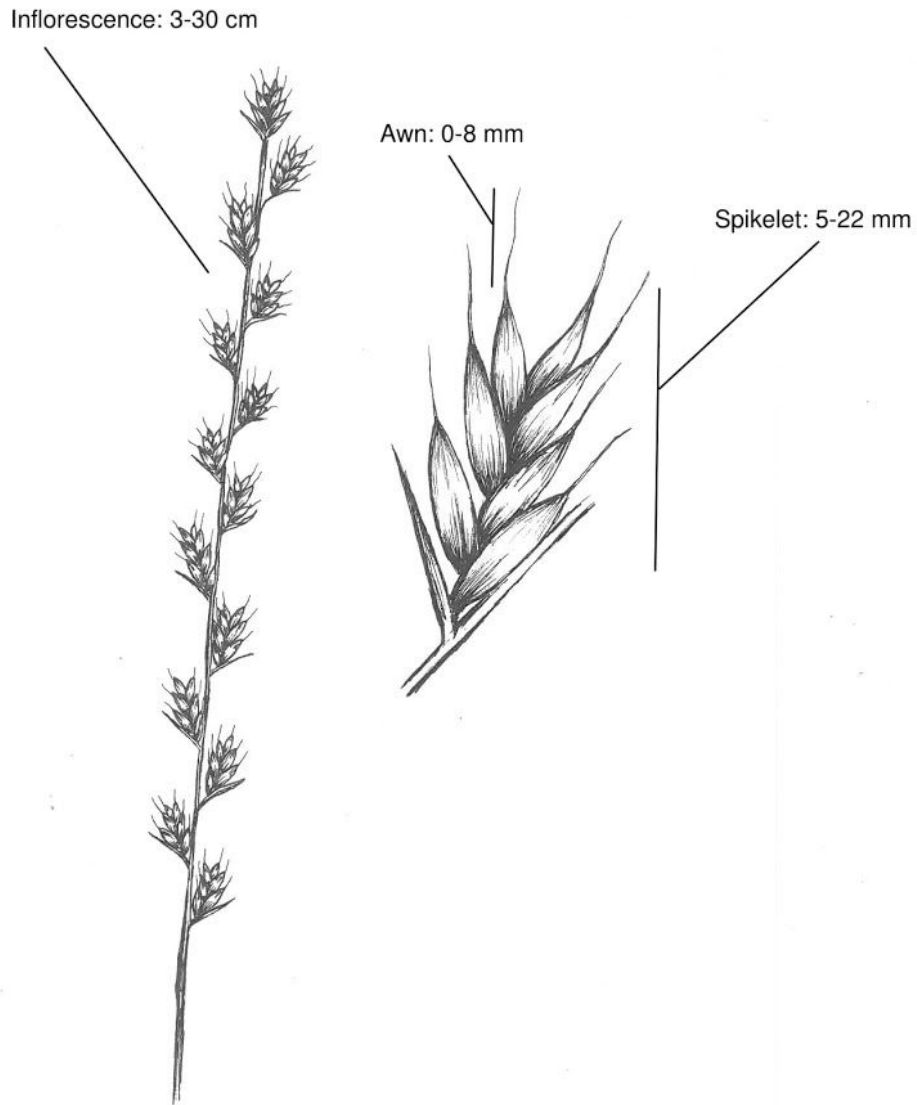
Bromus diandrus (ripgut brome): Annual. Inflorescence arranged on a raceme. Large, rough spikelets. Resembles *Stipa pulchra* but can be differentiated by its long, scabrous awns and annual growth habit, as well as its more flattened spikelets which contain several florets, as opposed to *S. pulchra* which contains only one floret per spikelet. Common in open, disturbed areas. Flowers February through July.



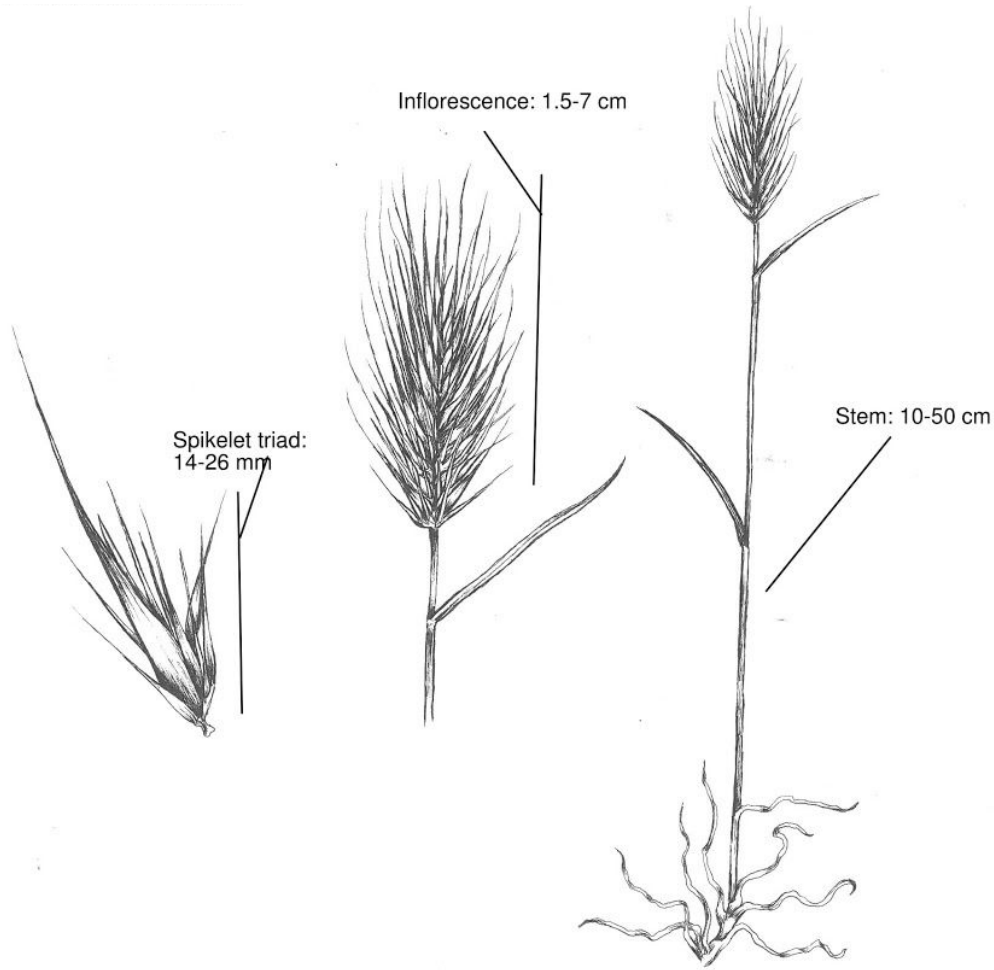
Bromus hordeaceus (soft-chess): Annual, introduced as forage source. Dense, panicle-like inflorescence. Spikelets generally hairy, not strongly flattened. Has hairy leaf blades and velvety sheaths. Common in disturbed areas, often in fields. Flowers April through July



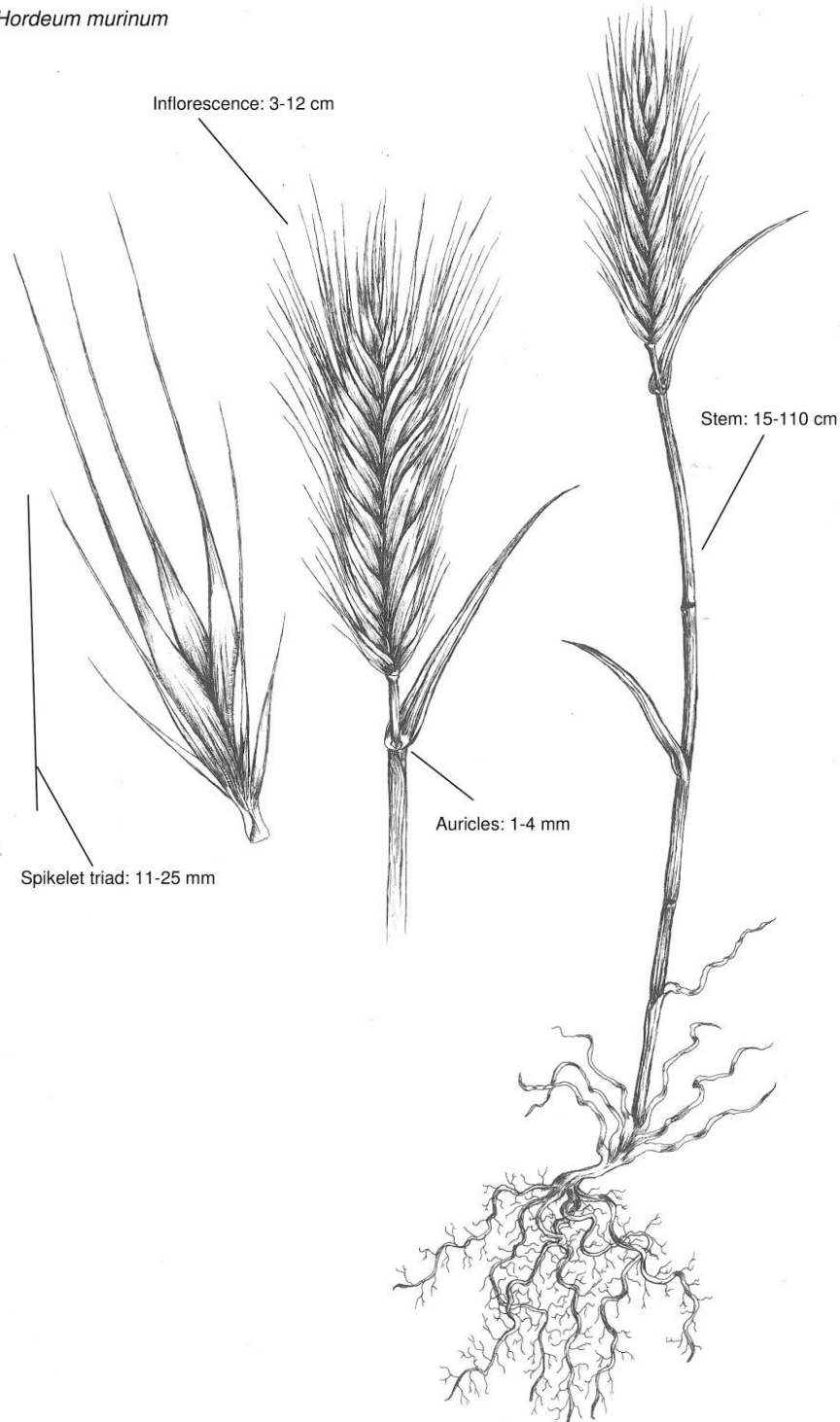
Festuca myuros (rattail sixweek grass): Aggressive annual, inflorescence generally one sided. Glumes unequal (resembles a check-mark). Tolerant of poor soil conditions. Matures earlier than most annual grasses. Common in open areas in sandy soils. Flowers February through May.



Festuca perennis (Italian ryegrass): Annual to perennial, depending on resources and climate conditions. Cespitose growth habit, with spike-like inflorescence. Long, stiff leaves. Spikelets attached to stem at 30-degree angle. Shiny leaves with large auricles. Found in dry and moist, disturbed sites. Flowers May through September.



Hordeum marinum (seaside barley): Annual, with dense, spike-like inflorescence. Long, stiff awns. Generally shorter than *H. murinum*, with smaller inflorescence. Three spikelets per node. Glumes glabrous. Inflorescence occasionally enclosed in sheath at maturity. Can be found in wet meadows in disturbed sites. Flowers April through June.

Hordeum murinum

Hordeum murinum (foxtail barley): Annual, characteristic of poor soil health. Inflorescence generally larger and fatter than *H. marinum*. Long awns, feathery glumes. Larger auricles than *H. marinum* (1-4 mm). Much longer awns than *H. brachyantherum*. Usually occurs in disturbed sites in non wetland areas. Flowers April through May.

Glossary of Terms

Annual: Growth habit in which a species completes its life cycle in one year.

Auricle: A structure at the leaf-sheath junction in Poaceae that projects from the leaf sheath on either side. May be absent or wrap fully around the stem like arms.

Awn: A bristle-like structure that projects from the lemma in many grass species. Can vary greatly in size and may be absent.

Callus: Base of floret, may be large or projecting. Can be hairy or glabrous (hairless).

Cespitose: Pertaining to grasses with densely tufted or clumped growth, e.g. *Deschampsia cespitosa*

Ciliated: Finely haired, e.g. ligule of *Danthonia californica*.

Cleistogamous: Self fertilizing, unopening flower that may be present within the plant, e.g. *Danthonia californica*.

Crown: Point of growth at the base of a grass where leaves and shoots arise.

Culm: stem or stalk of a grass.

Dioceous: Containing male and female reproductive structures on separate individuals.

Floret: A single flower in Poaceae. Generally consists of the palea, subtended by the lemma. A caryopsis (grass seed or grain) is formed within the floret after fertilization.

Glume: Lowest pair of bracts in a spikelet, encasing one or more florets.

Inflorescence: Whole set of spikelets or flower parts attached to the rachis of a grass.

Internode: Segment of the rachis or stem in between nodes, where structures may grow from.

Lemma: Larger of two sheathing bracts surrounding the flower in Poaceae. Generally subtended by two glumes.

Native: Occurring historically in a specific area. Can pertain to specific locations such as counties or larger areas such as states and countries.

Node: Position on a stem from which one or more structures arise.

Palea: Inner bract of a floret, contains the reproductive parts of a grass flower.

Panicle: Growth type in Poaceae with bracts that contain more than two degrees of branching, e.g. *Avena barbata*.

Pedicel: Stalk of an individual spikelet.

Perennial: Growth habit in which a species reaches maturity and continues to reproduce for many consecutive years.

Raceme: Growth type in Poaceae in which spikelets are attached to the rachis by pedicels.

Rachis: Main axis of a grass from which flowering parts arise.

Rhizome: An underground root-like structure which grows laterally and from which asexual volunteers grow, e.g. *Elymus triticoides*.

Rhizomatous: Propagating through rhizomes.

Scabrous: Scaly, rough to touch, e.g. spikelets of *Bromus diandrus*.

Spike: Growth type in Poaceae in which spikelets are directly attached to the rachis and do not grow from pedicels.

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