The Grasses and Grasslands of Marin and Sonoma Counties

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Unless otherwise noted, photographs are by David Amme.

Setting

The California coastal prairie of Marin and Sonoma Counties extends inland from the coast as far as the maritime influence and coastal fog penetrates the coastal hills and mountains. A low 8-mile-wide gap between Bodega Bay and Tomales Bay forms one of the largest coastal prairie expanses in California. This gap allows the coastal prairie to extend to the Sonoma Mountains east of Petaluma and spread its influence northward up the Santa Rosa Valley and as far south and east as the hills of lower Sonoma and Napa Valleys on the shores of San Pablo Bay. The Petaluma–Valley Ford Road travels through the center of this rolling, treeless plain.

A second large expanse of coastal prairie is found on the Point Reyes Peninsula and the rolling hills north of Nicasio east of Tomales Bay. Further inland, the coastal prairie is gradually replaced by what is now classified as the California Valley Grassland.

Blue wildrye in foreground, Marin hills in distance.

Recent History

It is well known that the coastal prairies and grasslands of Marin and Sonoma Counties were prehistorically grazed by large herds of elk (Burchum 1957, Linse 1998). Elk were ideally suited to this landscape: there was plenty of open grassland to graze and to escape predators like humans and roving packs of grizzly bears. The adjacent redwood and Douglas fir forests and oak woodlands provided good habitat for cover, browsing, and foaling.

California oatgrass (*Danthonia californica*)

Although it is popular to also include wildfire as a grassland management factor, the coastal prairie rarely burned close to the coast. In the inland grasslands of Sonoma County, fire frequency studies reveal that wildfires were likely to occur in 10- to12-year intervals (Amme 1987, Finney and Martin 1992).

Cattle and sheep were introduced into Marin and Sonoma Counties in the early 19th century. By 1857, the Shafter brothers had established the A-Z dairies on Point Reyes and began providing milk products to the San Francisco Bay Area. By the 1860s, butter and cheese were being shipped by schooners out of Tomales Bay and Creamery Bay (one of several small inlets draining into Drake's Estero) to markets in San Francisco to support the bourgeoning population.

A narrow-gauge railroad was built to Tomales Bay from San Rafael in the late 1870s. At this time, potatoes, the crop of choice, were cultivated along the bluffs and flats of the coastal prairie north of Tomales Bay and the prairie gap west of Petaluma. Shallow-draft schooners plied the Petaluma River, bringing wheat and barley from the grasslands of Marin and Sonoma Counties to San Francisco. Gradually, most of the grasslands of Marin and southern Sonoma Counties were cultivated for grain crops and apple orchards.

Dairies expanded into the Marin and Sonoma County valleys. Despite these impacts wrought on the native grasslands, there are still many remnant coastal and valley grasslands that have not been significantly disturbed or cultivated. More and more, these grasslands are being

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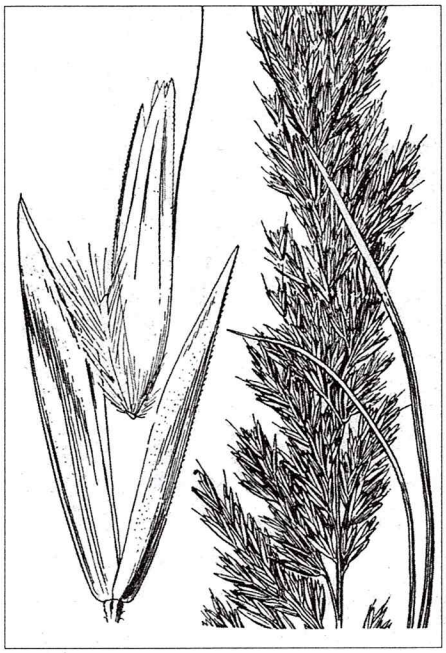


Pacific tufted hairgrass (*Deschampsia caespitosa* ssp. *holciformis*)

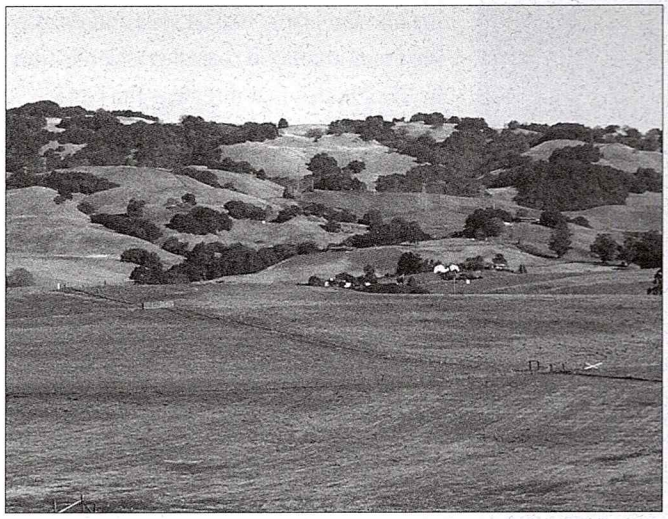
preserved and managed for the enjoyment of future generations.

The Coastal Prairie

The coastal prairie is a mesic (moist) plant community and is closely allied with grasses found in montane meadows and grasslands extending down the coastal and inland mountain ranges from Alaska. The signature bunchgrass of the coastal prairie is California oatgrass, (*Danthonia californica*). Generally, it is a long-lived, leafy bunchgrass with arching, flowering culms spreading outward from the center. The height of the grass can attain 8–12 inches; its roots descend many feet into the ground, keeping the plant green and palatable throughout the year. California oatgrass is well adapted to grazing by ungulates. Under heavy grazing it can form a tight "turf." When grazing is removed, California oatgrass can be quickly shaded out by the excess thatch of introduced annual and perennial grasses.

Danthonia californica is the only known California native grass that has long-lived seed that can stay viable in the soil seed bank for many years. Stands of exotic annual and perennial grasses in the coastal prairie setting can be managed by mowing or grazing, with the gradual and spontaneous appearance of California oatgrass taking its place in the sun (Dremann and Shaw 2002).

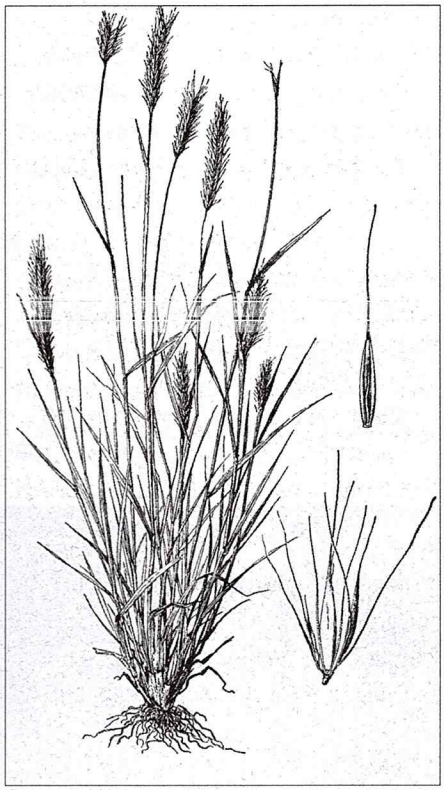
The second most common native bunchgrass of the coastal prairie is Pacific hairgrass (*Deschampsia caespitosa* ssp. *holciformis*). Large expanses of Pacific hairgrass dominate the rich soils of the coastal terraces and hills. Pacific hairgrass forms large tussocks (up to 20 inches in height) that are resistant to grazing. It has a tightly compressed panicle, unlike its airy montane cousin, tufted hairgrass (*D. caespitosa* ssp. *caespitosa*).



Flank of Sonoma Mountain east of Petaluma near Adobe Road, Fall 2007. Lower, level slopes are generally cultivated pasturage. The steeper hillsides are grazed by cattle. Remnant coastal prairie grasses (*Danthonia, Elymus,* and *Nassella* are found in the valley.

Another large tussock grass of the coastal prairie is sand reedgrass (*Calamagrostis nutkaensis*). This large, leafy bunchgrass most often grows under the shade of coastal pines and in mesic sites, but it moves out into the coastal prairie on moist north- and east-facing slopes, forming expansive, impenetrable patches and hillsides.

Along the very edge of the rocky coastal terraces grows ocean-bluff bluegrass (*Poa unilateralis*). In the peak of spring, this small bunchgrass stands out with its bluish foliage that features a tightly condensed flowering panicle. Sharing this same area is the prostrate form of meadow barley (*Hordeum brachyantherum*). It has short leaves with a bluish hue and its flowering culms sprawl on the ground, avoiding the buffeting winds.



Meadow barley (*Hordeum brachyantherum*)

On other sites along the edge of the windblown bluffs grows the tufted California bentgrass (*Agrostis densiflora*) and on sandier hollows the rare, prostrate Blasdale's bentgrass (*A. blasdalei*).

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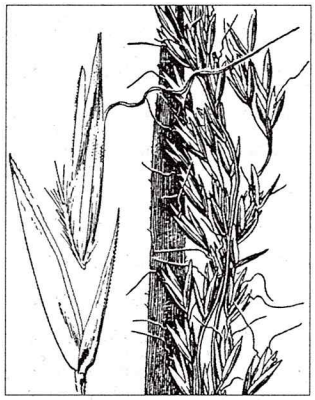


Tall trisetum (*Trisetum canescens*)

Stepping away from the sea bluff's edge, creeping red fescue (*Festuca rubra*) spreads in clonal patches on flats and in among rocky outcrops. These patches can vary from deep green to gray-blue.

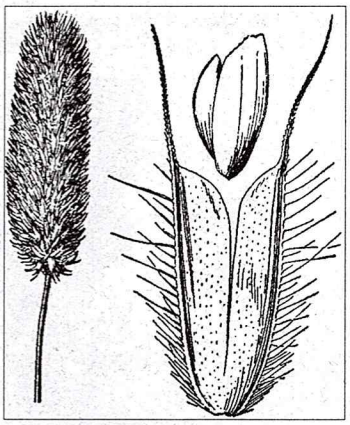
Further away from the shore bluffs, where the wind begins to die down, the almost prostrate maritime brome (*Bromus maritimus*) shares space with patches of low, blue-green forms of blue wildrye (*Elymus glaucus*) and the strictly coastal, awnless *E. virescens* that pokes its upright stem through the adjacent coastal scrub.

Scattered plants of a coastal, compact form of tall trisetum (*Trisetum canescens*) are also found in this zone, associated with the diminutive alpine timothy (*Phleum alpinum*) mixed among these grasses and flowering perennial forbs. This timothy is the same species that grows in wet mountain meadows in the high Sierra. In the wet back dune hollows of Point Reyes are found low, flattened patches of Pacific panicgrass (*Panicum acuminatum*) in wet, sandy swales.

Finally, the rare perennial, creeping Pacific dune grass (*Leymus pacificus*), can be found in isolated back dunes of Point Reyes and throughout Bodega Head (Barbour 1972). It rarely flowers, but when it does, there are only two or three compressed brome-like spikelets on the culm.

Almost without exception, all of the flowering panicles of the coastal prairie grasses are tightly compressed, flattened, and of a thin or linear shape, as a testament to the incessant coastal winds.

Several introduced invasive grasses are increasingly making inroads in the coastal prairie and wetlands of Marin and Sonoma Counties. The perennial sweet vernal grass



Alpine timothy (*Phleum alpinum*)

(*Anthoxanthum odoratum*) has replaced the native perennial grasses at Sea Ranch (Foin and Hektner 1986) and is spreading into waste places and vernal wet areas along the coastal prairie and the Laguna Santa Rosa drainage of Sonoma County and Point Reyes.

The perennial hairy oatgrass (*Danthonia pilosa*) has established itself on hard ground and waste places up and down the coastal prairie.

The annual rattlesnake grass (*Briza maxima*) has been moving into the coastal prairie at an increasing rate, often becoming the dominant cover.

Of greatest concern is the perennial velvet grass (*Holcus lanatus*), which is moving into the loamy coastal soils and swamping out unmanaged coastal grasslands with its thick thatch that threatens the fabric and stability of the coastal prairie, including the annual wildflowers and the rich perennial herbaceous plant component (Elliott and Wehausen 1974, Savelle 1977, Evans and Young 1970).

Squirreltail (*Elymus multisetus*) growing on a serpentine grassland on Coleman Road near Occidental.

Wetland Grasses

Many native wetland grasses are associated with the coastal prairie and the inland valley grasslands. *Deschampsia caespitosa* ssp. *beringensis* is an uncommon robust form of tufted hairgrass that hugs the coastal waterways, bays, wet meadows, and lagoons. Colonies of this grass are found

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along the shore of Drakes Estero in Point Reyes and the shores near the mouth of the Russian River.

The creeping Thurber's reedgrass (*Calamagrostis stricta* ssp. *inexpansa*) finds its southern limit on the wet meadows above Drakes Estero and is also found in Pitkin Marsh northwest of Santa Rosa.

The very rare perennial north coast semaphore grass (*Pleuropogon hooverianus*) is found in the vicinity of Lagunitas, and between Nicasio and San Geromino along Sir Francis Drake Boulevard in Marin County and in sites west of Santa Rosa in the wet, open meadows of the Laguna de Santa Rosa drainage.

The more common annual California semaphore grass (*Pleuropogon californicus*) is found throughout the wetland meadows and vernally flooded grasslands of the Laguna Santa Rosa drainage (Best et al. 1996). Recently it has become clear that the Laguna Santa Rosa drainage has scattered populations of the introduced *Glyceria declinata,* which has been confused with the taller native *G. occidentalis* (pers. comm. Gene Cooley, CDFG 2007). *Glyceria declinata* (Eurasian waxy mannagrass) is extremely invasive and extends from the outer high water mark that is dominated by annual ryegrass toward the deeper portions of vernal pools and ponds where the flowering vernal pool plants are found (TNC Weed Alert 2006).

The delicate, purplish annual hairgrass (*Deschampsia danthonioides*) and the short annual water foxtail (*Alopercurus saccatus*) inhabit the vernal pool margins in the Laguna Santa Rosa drainage and in the wet meadows of Mount Tamalpais, Chileno Valley, and Black Point in Marin County.

The perennial short-awn foxtail (*Alopercurus aequalis*) and taller rare subspecies *A. aequalis* ssp. *sonomensis* are found throughout the wetlands and vernal pool edges of the Laguna Santa Rosa drainage and on the Point Reyes peninsula near Abbots Lagoon and Bolinas (Howell et al. 2007). The annual Lemmon's canary grass (*Phalaris lemmoni*) is found on low, wet areas bordering salt marshes in Marin County and vernal pools in the Petaluma Valley and the Laguna Santa Rosa and as far north as Windsor.

The montane form of tufted hairgrass (*D. caespitosa* ssp. *caespitosa*), with its open, airy panicle, is found on wet serpentine meadows in Potrero Meadows on Mount Tamalpais, the grasslands of the Tiburon peninsula, and in Pitkin Marsh west of Santa Rosa.

The tall, sprawling perennial, California canarygrass (*Phalaris californica*), can be found in moist meadows and swales in the back dunes of Point Reyes, along the shore of Tomales Bay adjacent to Highway One and in scattered locations along Highway One in the vicinity of Stewarts Point, Freestone Marsh, and Plantation.

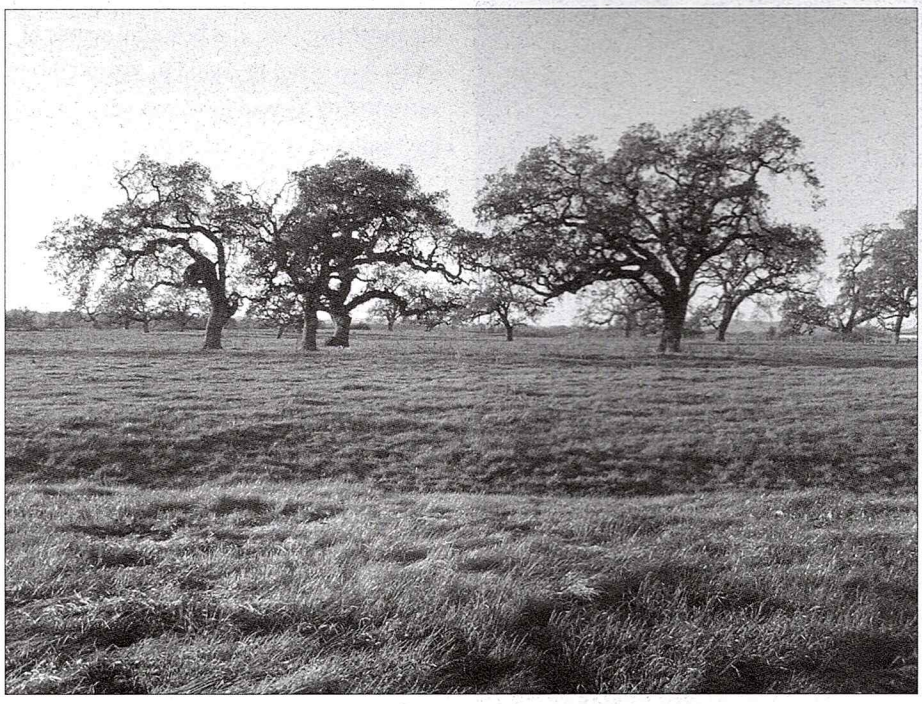
The most ubiquitous native perennial grass found in mesic grasslands and wetland meadow margins is the native meadow barley. It is found extensively throughout the low-lying grassland valleys and along the ditch banks of the narrow roads in the Santa Rosa Valley.

The Valley Grasslands

As one travels inland from the coast from Bodega and Tomales Bays to the Petaluma Valley, there is a gradual transition to the valley grassland plant community. With the encroachment of the Mediterranean annual grasses, it is difficult to call out any particular suite of native grasses as representing the valley grassland plant community.

Valley grassland is considered to have been a perennial grassland prior to the introduction of the Mediterranean grasses in the 15th century. Today, the valley grassland is considered by most investigators to be an annual grassland dominated by introduced annuals, such as slender wild oats (*Avena barbata*), ripgut (*Bromus diandrus*), soft chess (*B. hordeaceus*), foxtail (*Hordeum murinum*), ryegrass (*Lolium multiflorum*), and rattail fescue (*Vulpia myuros*), among others.

No one is sure, but the native perennial grasses that were most likely usurped by introduced annuals in the dryer interior



Valley oaks (Quercus lobata) dot the Santa Rosa Plain near Llano Road west of Santa Rosa.

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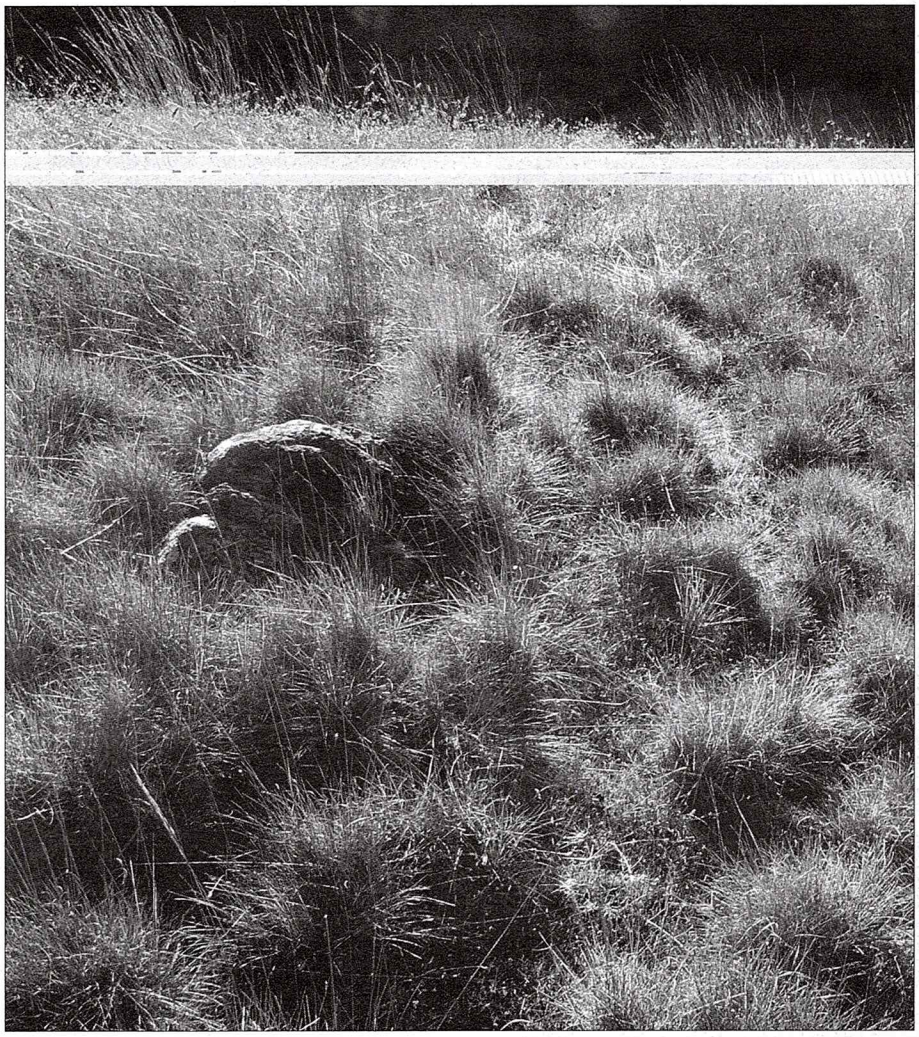
foothills and valleys were probably obligate summer-dormant native perennials like pine bluegrass (*Poa secunda*), California melicgrass (*Melica californica*), and junegrass (*Koeleria macrantha*). These grasses compete head to head with the annual grasses for available water and nutrients but at a distinct disadvantage. Native perennial grasses have seeds that are five to fifteen times smaller than the introduced annuals, whereas the annuals produce ten to twenty times more seed, which can live for 2 or 3 years in the soil seed bank (Baker 1972, 1976). Except for California oatgrass, the seed of the native perennial grasses do not live longer than a year in the soil (Major and Pyott 1966).

To get a sense of what the prehistoric valley grasslands may have looked like in Marin and Sonoma Counties, visit the serpentine grasslands scattered throughout the two counties. Native grasses evolved with serpentine soils and have adapted to the toxic heavy metals that comprise the soil derived from ultramafic rock (very low in silica and rich in iron and magnesium). Few exotic annual grasses are able to establish on serpentine soils. Stepping onto a serpentine grassland, one is greeted with a landscape almost devoid of exotic annual grasses. It is a sobering experience to visit the serpentine grasslands on the northern shoulder of Mt. Tamalpais on Bolinas–Fairfax Road overlooking Alpine Reservoir, or the many isolated grassland outcrops in the vicinity of Occidental east of Santa Rosa. Here all of the valley grassland native perennial grasses are displayed according to site, exposure, and moisture gradients.



A pure stand of Idaho fescue in the foreground backed by a stand of blue wildrye on a serpentine grassland on Coleman Road west of Occidental.

Purple needlegrass (*Nassella pulchra*) is the most abundant and widespread native perennial grass found in valley grassland. It is also found mixed in with the edge of the coastal prairie. Purple needlegrass is also an opportunistic colonizer with few of the characteristics of a typical climax species (Bartolome and Gemmill 1981). It is found primarily on clayey soils on sunny southern- and western-facing slopes but also colonizes disturbed sites and thin soils.

Associated with purple needlegrass, California melicgrass inhabits loamy soils on sunny sites and is one of the few native perennial grasses that spread from the base, forming patches. It is very palatable to livestock and is easily eliminated by year-long livestock grazing.

Pine bluegrass is also relished by livestock and is more often found on rocky, compacted sites or in isolated, shady slopes in the woodland margins where livestock seldom visit. Idaho fescue (*Festuca idahoensis roemeri*) is found among rocky outcrops and on deep, loamy soils, on northern- and eastern-facing slopes. One of the most extensive and beautiful stands of Idaho fescue can be found in Marin County surrounding Nicasio Reservoir adjacent to the Petaluma–Point Reyes Road.

Junegrass is associated with both Idaho fescue and purple needlegrass, usually on dryer, thinner soils or rocky sites. After most of the grasses have shed their seeds by June, its distinctive compressed flowering head remains intact and prominent.

California brome (*B. californica*) and blue wildrye are important components of the valley grassland, usually found mixed with annual grasses on deep soils in woodland margins and north- and east-facing grassland exposures.

Squirreltail (*Elymus multisetus*) is a short-lived perennial grass that establishes

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on disturbed sites and is often found on thin soils and dryer, south-facing slopes. The flowering culms start out like dense, reddish spikes that dry out and spread open to a fluffy tan resembling a squirrel's tail. The "tail" breaks apart in the wind and the fluffy seed is carried away.

Creeping wildrye (*Leymus triticoides*) is a tall, creeping grass. On mesic flats and slopes, creeping wildrye can form prominent pure stands, often excluding the annual grass interlopers and staying green until midsummer.

Shady grasslands of California fescue (*F. californica*) are found primarily in the white oak understory of the valley grassland, mostly on cooler, east-facing slopes. One of the best examples is the extensive stand of California fescue among a hybrid oak stand of *Quercus eplingii* (*Q. douglasii* × *Q. garryana*) clothing the eastern slope of Bennett Peak in Annadel State Park southeast of Santa Rosa.

An Afterword

The California coastal prairie is a unique plant community that is suffering from human disturbance and development and an ever-expanding invasion of perennial exotic grasses and weeds. In the recently published edition of *Terrestrial Vegetation of California* (3rd edn.), the authors of the "Northern Coastal Scrub and Coastal Prairie" chapter wrote: "Ironically, in many cases it is the coastal scrub that endangers the rare coastal prairies, as shrubs invade grasslands in the absence of grazing and fire" (Ford and Hayes 2007).

If there is a take-home message regarding the state of our coastal prairie, it is that as more of the coastal prairie becomes fallow or is purchased by public agencies and trusts for conservation, we cannot allow the land's fencing and water infrastructure to deteriorate to the point where the land cannot be managed by restorative grazing practices. This is perhaps the most important challenge to prevent the irreversible fragmentation and loss of our coastal prairies and grassland plant communities.

Literature Cited

Amme, D.G. 1987. Annadel State Park unit prescribed fire management plan. California Department of Parks and Recreation, Northern Region, Santa Rosa, CA.

Baker, H.G. 1972. Seed weight in relation to environmental conditions in California. Ecology 53:997–1010.

_____. 1976. Invasion and replacement in California and neotropical grasslands. In: Plant relations in pastures. J.R. Wilson, ed., pp. 368–384. CSIRO, Canberra.

Barbour, M.G. 1972. Additions and corrections to the flora of Bodega Head, California. Madroño 21(4):446–448.

Bartolome. J.W., and B. Gemmill. 1981. The ecological status of *Stipa pulchra* (Poaceae) in California. Madroño 28(3):172–184.

Best, C., J.T. Howell, W. Knight, I. Knight, and M. Wells. 1996. A flora of Sonoma County. California Native Plant Society, Sacramento. 347 pp.

Burcham, L.T. 1957. California rangeland: an historico-ecological study of the range resource of California. California Department of Natural Resources, Division of Forestry, Sacramento. 261 pp.

Dremann, C.C., and M. Shaw. 2002. Releasing the native seed bank: an innovative approach to restoring a coastal californica ecosystem. Ecological Restoration 20(2):103–107.

Elliott, H.W., and J.D. Wehausen. 1974. Vegetational succession on coastal rangeland of Point Reyes peninsula. Madroño 22(5):231–238.

Evans, R.A., and J.A. Young. 1970. Plant litter and establishment of alien annual weed species in rangeland communities. Weed Science 81:697–703.

Finney, M.A., and R.E. Martin. 1992. Short fire intervals recorded by redwoods at Annadel State Park, CA. Madroño. 39(4):251–262.

Foin, T.C., and M.M. Hektner. 1986. Secondary succession and the fate of native species in a California coastal plant community. Madroño 33:189–206.

Ford, L.D., and G.F. Hayes. 2007. Northern Coastal scrub and coastal prairie. In: Terrestrial vegetation of California, 3rd edn., pp. 180–207, M.G. Barbour, T. Keeler-Wolf, and A.A. Schoenherr, eds. University of California Press, Berkeley.

Howell, J.T., F. Almeda, W. Follette, and C. Best. 2007. Marin flora: an illustrated manual of the flowering plants, ferns, and conifers of Marin County, California. California Academy of Sciences, San Francisco. 510 pp.

Linse, K. 1998. Tule elk: the return of a species. Point Reyes National Seashore, National Park Service, Point Reyes Station.

Major, J., and W.T. Pyott. 1966. Buried, viable seed in two California bunchgrass sites and their bearing on the definition of a flora. Vegetatio 13:253–286.

Savelle, G.D. 1977. Comparative structure and function in a California annual and native bunch-grass community. Ph.D. dissertation, Univ. of California, Berkeley. 289 pp.

TNC (The Nature Conservancy). 2006. Weed Alert. Online at http://tncweeds.ucdavis.edu/alert/alrtgly2.html.

Author lying on a "lumpy" fescue meadow on a serpentine grassland. (Photo: Jim Hanson)