The background of the entire page is a watercolor illustration of a field. It features various plants, including tall grasses, purple flowers, blue flowers, and yellow flowers. The style is soft and artistic, with visible brushstrokes and a light, airy feel. The top half of the page is mostly white with faint, light-colored illustrations of plants and flowers. The bottom half of the page is a more detailed and colorful illustration of a field with various plants, including tall grasses, purple flowers, blue flowers, and yellow flowers.

Guide to the
PASTURE PLANTS
~~~~ of ~~~~  
Coastal San Mateo County



*Guide to the* PASTURE PLANTS  
*of* COASTAL SAN MATEO COUNTY



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# INTRODUCTION

## Why this guide?

The purpose of this guide is to share knowledge about some of the common pasture plants on the San Mateo coast. Our intended audience is those who are managing our coastal pastures, whether they be ranchers, land trusts, or others.

People managing grasslands along the San Mateo County coast are often interested in the plants growing in their pastures. Some of these plants provide forage for livestock, habitat for wildlife, and promote soil health. Other plants are considered undesirable because they provide poor forage or reduce biodiversity.

While this guide does not prescribe particular management activities, we do hope to offer clarifying information that will promote dialogue between neighbors and friends. Enjoy, and feel free to share. Additional resources and our contact information can be found at the end.

## “Native” and “Non-Native”

We find it helpful to note which plants are “native,” meaning they have existed here for millennia, and which plants are relatively new arrivals to California, or “non-native.” A plant that has inhabited coastal grasslands for millennia often plays a different role in the ecosystem than one that has arrived within the last few hundred years, so it is helpful to discuss “native” and “non-native” plants separately.

## What were our coastal grasslands like before ranching and farming?

Coastal prairie ecosystems used to be found along the cool, foggy marine terraces of Central and Northern California. These diverse grasslands had hundreds of unique species of wildflowers, grasses, insects, birds, and other life. Grasslands need some form of disturbance to persist in a robust, healthy condition (fire or grazing, for example), and indigenous people maintained open coastal prairies through extensive burning. This promoted productivity of grasses and wildflowers, whose seeds were an important food source for indigenous people living on the coast. Coastal prairies were also grazed for millennia by elk, deer, pronghorn and other herbivores.

## INTRODUCTION

### What are our coastal grasslands like today?

Today, nearly all our coastal prairie ecosystems have disappeared or changed drastically, in part because of tilling through farming and the spread of non-native plant species. Tilling native grasslands disturbs a unique seedbed and complex soil ecology that takes hundreds (or even thousands) of years to develop, while non-native annual plants often thrive in disturbed or tilled soils. Thus, the balance of plants in the coastal prairie community has changed dramatically over the last couple hundred years. Other factors, such as development and cessation of burning, have also contributed to the loss of coastal prairie ecosystems.

Agricultural production has occurred on San Mateo County's coastal terraces and bottomlands for over two hundred years. After World War II, many of the steeper, drier upland soils with remaining coastal prairie were transitioned to flax, which thrived in the foggy, cool climate between Montara and the Santa Cruz county line. Hay and other upland crops were also dry farmed.

As flax and other upland crops have declined, many of our upland ecosystems have returned to untilled grazing lands. Now, these pastures have new communities of plants, most of them non-native and introduced by humans through intentional seeding or as "hitchhiker" seeds that unintentionally travel with us around the globe and find homes in new places. Most of the coastal prairie plant species still exist, but are rarely seen. However, one coastal prairie species, California oat-grass (*Danthonia californica*), has made a comeback. It provides excellent grassland wildlife habitat, can recolonize fallow farm fields, and is a favorite forage of cattle.

In the following pages, we will discuss this and other common pasture plant species that make up today's grasslands along the San Mateo coast.

# PERENNIAL GRASSES

## What are perennial grasses?

Perennial grasses are long-lived, maintaining some green all year except during the summer drought. Yet even when they go into dormancy aboveground, their underground root systems are still alive and active. Because they live year-round, perennial grass roots are much deeper, stronger, and more complex than annual grass roots, which only live for one growing season.

## What are the benefits of perennial grasses?

Perennial grasses provide multiple benefits for livestock, wildlife, water cycling, and soil health. Because they are green for much of the year, they are important year-round forage for livestock (compared to annual grasses, which germinate in the winter and are brown by summer). Perennial grass root systems hold soil in place and help infiltrate rainwater during storms, so that it doesn't run off the soil surface and cause erosion. If managed properly, they may also help store carbon deep in the soil, although this idea is still being tested.

# NATIVE PERENNIAL GRASSES



## CALIFORNIA OATGRASS

*Danthonia californica*





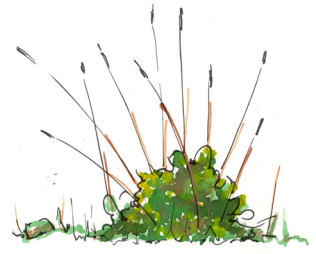
**PURPLE NEEDLE GRASS**  
*Stipa pulchra*



**BLUE WILDRYE**  
*Elymus glaucus*



**CALIFORNIA BROME**  
*Bromus carinatus*



Blue wildrye and California brome are often found growing through coyotebrush

### What are native perennial grasses?

Native perennial grasses are the long-lived, indigenous grasses of California. Their seeds are important food sources for native peoples and support many kinds of wildlife. Native perennial grasses form thick, round bunches as they age, earning them the nickname “bunchgrasses.” Some examples include California oatgrass (*Danthonia californica*), Purple needle grass (*Stipa pulchra*), Blue wild rye (*Elymus glaucus*), and California brome (*Bromus carinatus*).

### Native perennial grasses in pastures

Because of their delicate structure, native perennial grasses often blend in with the surrounding annual grasses and wildflowers. In many pastures in coastal San Mateo county, small patches of native perennial grasses are “hiding in plain sight.” Purple needle grass often forms colonies on sunny slopes, while California brome and Blue wild rye are often found growing through Coyote brush at the edges of pastures and riparian areas. These species of native bunchgrasses offer desirable forage and excellent wildlife habitat, but are usually only found in small patches.

In contrast to these rarer bunchgrasses, California oatgrass (*Danthonia californica*) is often a dominant species on coastal terraces. Its growth habit changes depending on where it grows or how it is managed. For example, when all its new growth is grazed or when it is on upland soils, California oatgrass forms a thick, flat sod and stays very short (less than six inches). Even in this phase, it can often colonize bare soils and maintain green growth nearly year-round. Yet in moisture and nutrient rich soils, California oatgrass can form thick bunches with abundant foliage over a foot tall.

### Managing California oatgrass

Fall and winter grazing of California oatgrass pastures, followed by extended rest during the time of peak growth, can have multiple benefits for both the plant and livestock. Rest during peak growth in spring and summer allows slow-growing California oatgrass to produce more seeds, seedlings, leaves, and deeper roots, while winter grazing can reduce short annual grasses such as False brome, Rattail sixweeks grass, and Brome Fescue (see “Non-native Annual Grasses”) which can out-compete California oatgrass. Cattle can benefit from fall and winter grazing of California oatgrass pastures because they get green forage during a time when pastures are mostly dry residue. Mowing California oatgrass pastures, either with or without grazing, may also encourage its production.

### Managing for grassland birds

Native perennial grasslands support abundant wildlife, including grassland birds. The secretive Grasshopper Sparrow, rare in other parts of California, is abundant in many of our coastal pastures. In the spring these birds nest on the ground, often at the base of bunchgrasses. They build a grass tunnel to their hidden cup nest and feed insects (such as grasshoppers) to their young. Without a structure to hide the nest in, like that of a bunchgrass, the nest would be obvious to predators like coyotes, skunks, or snakes.

We can support grassland birds in our pastures by promoting native perennial grasses and allowing grassland birds to complete their full reproductive cycle. In particular, not mowing pastures from April through June (the breeding bird season) protects grassland bird nests, allowing them to fledge the young birds that will maintain their future populations. Also, resting California oatgrass pastures during the grassland birds’ breeding season can reduce trampling of their nests by livestock.

# NON-NATIVE PERENNIAL GRASSES



## HARDING GRASS

~~~~~  
Phalaris aquatica

What are non-native perennial grasses?

Non-native perennial grasses are long-lived grasses that are not indigenous to California. They were planted intentionally, spread on the wind, or “hitch-hiked” from somewhere else and established themselves in our coastal pastures. Besides Harding grass (*Phalaris aquatica*) and Orchard grass (*Dactylis glomerata*), other common non-native perennial grasses in our coastal pastures include Velvet grass (*Holcus lanatus*), Purple awned wallaby grass (*Rytidosperma penicillatum*), and Pampas grass (*Cortaderia species*).



HARDING GRASS
Phalaris aquatica

Harding grass

Harding grass is a sturdy non-native perennial grass that is often included in seed mixes but also spreads rapidly on its own. Its foliage grows thick and tall, with seed stalks often shooting over cow’s heads. Harding grass thrives in coastal San Mateo county and can be found in many different conditions, especially wetter meadows and disturbed places. Its thick basal mat and deep, strong roots make it nearly indestructible, and it spreads quickly through both seeds and rhizomes (root sprouts). Unmanaged, it can take over an entire field or even an entire ranch within a few years, leaving little space for other plants that are necessary to provide adequate forage, wildlife habitat, or other benefits.

Managing Harding grass

Mowing alone does not seem to reduce the amount of Harding grass in a pasture. Cattle forage on Harding grass shoots but avoid it once it goes to seed, as it has a lot of silica. Left standing, Harding grass forms a thick, tall layer of thatch at the end of the growing season, which can suffocate new plant growth. Fall can be a good time to graze fresh Harding grass growth, while also trampling last year’s residue into the ground. Harding grass pastures can also be great places for livestock during wet winter weather, when protecting the soil and avoiding surface soil compaction are of primary concern, because its thick basal mats cover the soil surface and are resilient to trampling. Grazing and trampling Harding grass during the wet season also breaks up its basal mats and gives other plants room to grow. Depending on rainfall and timing of past grazing, fresh Harding grass shoots may be grazed several times throughout the year.



ORCHARD GRASS
Dactylis glomerata

Orchard grass

While it is not nearly as competitive (or common) as Harding grass, Orchard grass looks very similar from a distance. It prefers the wetter, richer soils near drainages and north-facing slopes, and is often found in diverse mixed pastures where it is a minority of the available forage. Orchard grass is a favorite of deer and cattle. As a result, dense Orchard grass stands can be difficult to maintain because these grazers will seek them out, thus selectively overgrazing the Orchard Grass even though the rest of the pasture has plenty of forage.

Orchard grass is a common component of seed mixes and planting it repeatedly is one way to maintain dense stands, although this is time intensive and costly. Interestingly, Orchard grass seems to prefer similar conditions to Poison hemlock, and has been observed shading out Poison hemlock seedlings when established in dense stands. For those seeking to convert hemlock patches into a high-value forage, managing for Orchard grass is a topic worthy of further investigation.

NON-NATIVE ANNUAL GRASSES



FALSE BROME BROME FESCUE
RATTAIL FESCUE ITALIAN RYE



Annual grass on left, perennial grass on right.
Notice the very shallow, tiny roots of the annual grass compared to the deep, complex roots of the perennial grass.

What are annual grasses?

All the annual grass species on the San Mateo coast are non-native. Non-native annual grasses live once, produce a great amount of seed, and die in the late summer. For the most part, they have shallow root systems that are not able to access nutrients deeper in the soil, nor are they able to hold soil in place during heavy storm events when a lot of erosion occurs. A great many non-native annual grass seeds fall into the earth below their parent plant, but they also spread rapidly on the wind or by “hitchhiking” in the fur (or socks) of passing animals, allowing them to rapidly colonize new areas.

Our tiniest annuals: False brome, Rattail sixweeks grass and Brome fescue

False Brome, Rattail sixweeks grass and Brome fescue are among the most common grasses in coastal San Mateo pastures. All three stay very short (around six inches), with few leaves and foxtail-like seeds. Because of their stunted foliage and sharp seeds, they provide little forage value to livestock. Their root systems are very shallow, so they can only capture water and nutrients from the soil surface and

prefer loose, disturbed soils. Pastures where these species dominate are often characterized by low productivity and high soil disturbance; they are some of the first plants to colonize bare soils.

Substantial annuals: Italian rye and Wild oats

These lush, thick annual grasses are some of the most favored forage for cattle during the growing season, and for finishing grass-fed cattle. Italian rye and Wild oats are much taller and have much more biomass than the small annuals mentioned above, and their root systems are deeper and more complex. Italian rye is similar to a perennial grass, with a thick basal clump and longer green season than other annuals. In fact, ground nesting Grasshopper Sparrows have been observed nesting at the base of annual Italian rye, using its leaves to build a tunnel to their nest so that it remains hidden from predators. These annuals are heavy seed producers and can propagate themselves, but they are also a common component of pasture seed mixes.

NON-NATIVE FLOWERS



BIRD'S FOOT TREFOIL
Lotus corniculatus



MEDITERRANEAN LINESEED
Bellardia trixago



COMMON FLAX
Linum usitatissimum



ENGLISH PLANTAIN

Plantago lanceolata



Plantain flower detail

What are non-native flowers?

Non-native flowers are those species that arrived in California from around the globe, starting with European exploration in the 1500s. Each non-native flower species in the pastures of San Mateo County has a unique story. Because plant seeds move around the world with humans, almost every year we find new species of non-native flowers in pastures along the San Mateo coast.

Are non-native flowers useful?

There are many species of non-native flowers in coastal San Mateo County. They provide nectar, pollen and seeds to many varieties of pollinators, birds, voles and other wildlife. Having many different non-native flowers in a pasture also increases its biodiversity, and thus its resiliency to changing conditions. For instance, some species do better in drought years and some do better in wet years, which means that in a diverse, healthy pasture, there will be something growing and flowering no matter the climate conditions. Below, we describe a few important non-native flower species in more detail.

Bird's foot trefoil

Bird's foot Trefoil is found in nearly every pasture in coastal San Mateo. It is a legume, meaning it helps increase nitrogen in the soil for other plants. Trefoil is often a favorite plant of ranchers because it re-seeds itself, mixes in with annual grasses, and provides great nutrition for livestock.

English plantain

English plantain is one of the most common flowering plants in our coastal pastures. In fact, it is one of the most common pasture plants in temperate climates around the

world. Here, it often grows alongside the native perennial California oatgrass (*Danthonia californica*), since both species do well in nutrient-poor soils. English plantain's deep taproot can break up compacted soils and gather nutrients deeper in the soil than other annual species, so it can outcompete them in these conditions. English plantain is a nutrient-dense forage and also has high concentrations of minerals such as calcium. Thus, it can be an important source of nutrition for livestock. In addition, the taproot of English plantain contributes significant soil organic matter into the soil profile once the plant dies. It germinates in winter and livestock generally prefer to graze the tender leaves before the plant flowers and gets tough stems. If English plantain makes up more than 20% of cover in a pasture, it is a sign of very nutrient-poor soil, and there will likely be a lot of bare ground in such a pasture.

Flax

Flax thrives on the steeper, drier upland soils on the coastal strip between Montara and the Santa Cruz county line. After World War II, Flax production skyrocketed throughout coastal San Mateo County and much of the remaining coastal prairie, previously untilled, was turned under for Flax during this period. In fact, Flax was often the first crop sown after brush removal from hillsides. Its seeds were used to produce linseed oil, an important product for a growing population in California. Today, Flax is an uncommon crop here, but it continues to re-seed itself in old fields. Its presence in our pastures is a reminder of our agricultural history and the many changes we have made to our coastal grasslands.

THISTLES

MILK THISTLE

Silybum marianum

ITALIAN THISTLE

Carduus pycnocephalus

BULL THISTLE

Cirsium vulgare

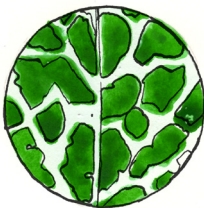
Seedling



Flower



Leaf



Silhouette (standing thatch)



What are thistles?

Thistles are a type of non-native flower. They are annual plants with thorns, deep taproots and high seed production. There are three common thistle species along the San Mateo coast: Milk, Bull, and Italian.

Thistles in pastures

Milk, Bull and Italian thistles have slightly different growing preferences, but in general they thrive in bare, open areas and nitrogen-rich soils. You will often see thistle patches in old compost or manure piles, around troughs and resting areas, or in areas with less grass cover. Each thistle variety has different levels of drought tolerance, but in general they tolerate more heat and less water than many of our other coastal annual plants. Thistles are hardy in many different growing conditions, and patches can persist for a long time once established.

Can thistles be useful?

Bees and other pollinators love flowering thistle patches, while their seeds are consumed by goldfinches and other seed-eating wildlife. In late summer, you can watch American Goldfinches go from stalk to stalk, using the thin tip of their bill to extract each seed from its husk. Dense patches of thistles provide good shelter for wildlife and nesting sites for birds, likely because their thorns deter predators. Our local bee keepers often sell thistle honey.

Managing Thistles

While cattle often avoid thistle as a forage, they will sometimes eat it at different stages (for example, fresh sprouts or dried flower heads), and it can provide valuable nutrition. Goats are the most likely livestock to eat thistles, but there are few rangeland goat operations on the San Mateo coast. Some ranchers have trained their cattle to eat more thistle, especially milk thistle, with the hope that young animals will copy this eating habit from the older animals. However, training livestock to eat thistle is unlikely to remove it from pastures if the conditions that thistle prefers, such as areas of bare ground with high nitrogen, continue to exist.

Thistles thrive on disturbed, high nitrogen soils. Activities that create bare ground or increase nitrogen levels, such as bull dozing, piling up manure in pastures, or congregating livestock to create bare ground and urine patches, provide thistles an excellent opportunity to establish.

Since thistles cannot tolerate much shade or competition, keeping a covered soil surface throughout the year, with either living plants or dry residue, may discourage germination. In high rainfall years, annual grasses usually grow faster than thistles, thus shading them out and reducing their numbers. Grazing and management strategies that reduce bare ground and encourage lush annual grasses, such as Wild oats and Italian rye, will likely have fewer thistles.

POISON HEMLOCK

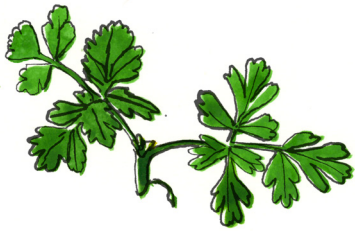
Conium maculatum



Leaf detail



Red streaks on stem



Seedling



Flowers



Silhouette
of standing
dead hemlock

What is Poison hemlock?

Poison hemlock is a tall, quick-growing annual that produces many seeds. All parts of the Poison hemlock plant are deadly poisonous to humans, livestock, and other animals. The red streaking on the stem is a tell-tale sign that you are dealing with hemlock, and not one of its look-alikes.

Hemlock in pastures

Hemlock is found in disturbed areas with moist, rich soil, such as bulldozed roadsides, mowed drainages, compost piles, or the edges of pastures and streams. Hemlock germinates in dense patches in the winter, out-competing other moisture-loving plants and setting plenty of seed for the following year.

Managing Hemlock

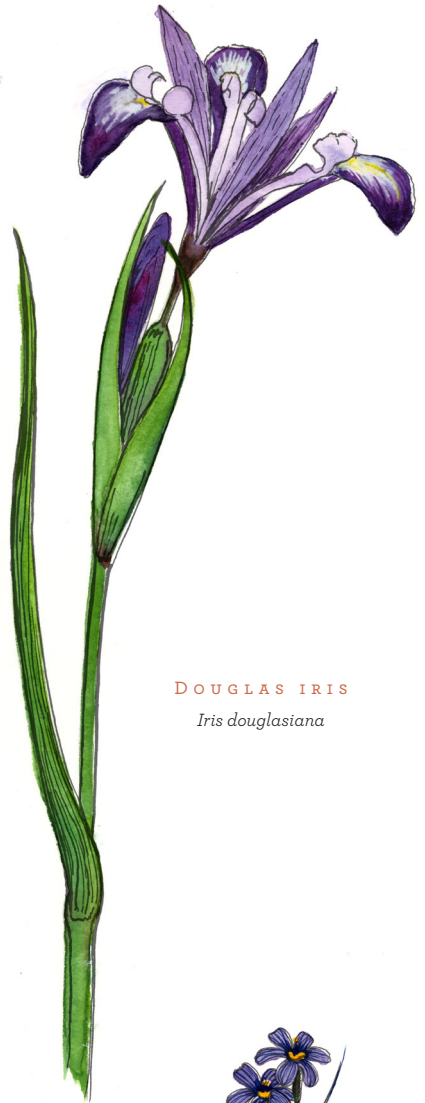
Hemlock thrives in disturbed, moist, nutrient-rich soils. It cannot tolerate much shade. Its prolific seedbed only lasts a few years, so with consistent removal or cutting before the plants set seed, one may eventually get rid of a hemlock patch. However, if the soil continues to be bare, moist, nutrient-rich, disturbed, and sunny, hemlock will re-colonize.

Ceasing soil disturbance and encouraging perennial plants to establish and shade out hemlock patches is one way to reduce it. Along moist pasture or stream edges, a shady canopy with an open understory may be enough to deter hemlock. Some perennial grasses, such as Orchard grass, prefer similar conditions to hemlock, and if they establish in enough density they will usually shade out hemlock seedlings.

NATIVE FLOWERS



SUN CUP
Taraxia ovata



DOUGLAS IRIS
Iris douglasiana



COAST TARWEED
Madia sativa



Blue-eyed grass seedpod



BLUE-EYED GRASS
Sisyrinchium bellum



What are native flowers?

Native flowers are those indigenous to our coast, and include coastal prairie wild-flower species that are much rarer now than in the past. Today, native flowers are usually the most diverse group of species in a pasture but make up the least amount of cover. Some native flower species, such as Coast tarweed, Blue-eyed grass, Sun cup and Douglas iris, prefer open grasslands, while others, such as Yerba buena, grow along the edges of pastures under shrubs.

Are native flowers useful?

Even though they generally make up very little cover, native flowers are essential to a healthy, diverse pasture because their nectar, seeds and shoots support an incredible amount of life: birds, such as hummingbirds and songbirds; prolific insect populations including bees, moths, butterflies and ants; small mammals such as voles and mice; and many others. Native flowers bloom at different times of year, so they provide year round food resources. For instance, Coast tarweed blooms much later than other wildflowers, so it is an important food resource in late summer.

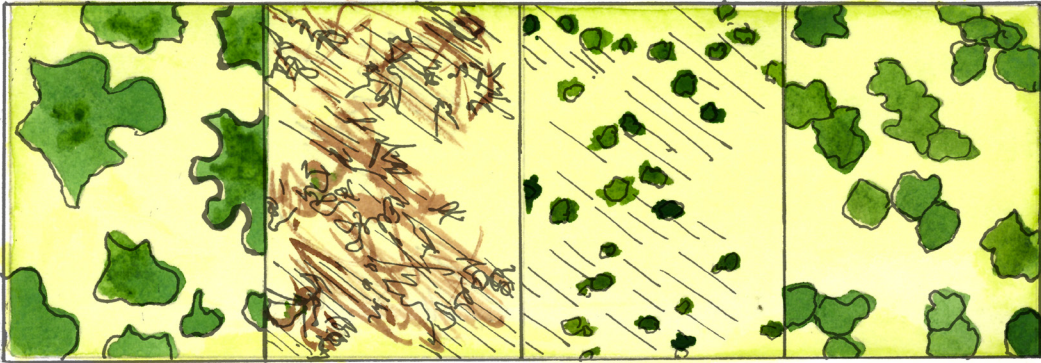
Encouraging native flowers

While there are many possible strategies, there is no “one way” to encourage native flowers to thrive in pastures. They can flourish under many different grazing patterns, and each species prefers slightly different conditions. For instance, Coast tarweed and Blue-eyed grass generally prefer more open areas, while Douglas iris often prefers seeps in thick grasses. The simplest way to encourage native flowers in pastures is to cease all tillage or mechanical soil disturbance like dozing. Tillage and dozing disrupt the seedbed and creates conditions that discourage native flowers and favor non-native plants.

COYOTE BRUSH

Baccharis pilularis

Coyote brush re-growth on a pasture after mowing



Unmowed

Just mowed

One month after mowing

One year after mowing



Left to right: budding inflorescence,
closed inflorescence, open inflorescence,
dessicated inflorescence



Coyotebrush re-growth 6 weeks after mowing

What is Coyote brush?

Coyote brush is a hardy, quick-growing, native coastal scrub species that reproduces through both seed and root re-sprout.

Coyote brush in pastures

Coyote brush is the pioneer scrub species in grasslands. Left undisturbed, it can convert a coastal grassland to complete scrub within a decade. Some pastures, especially those on coastal terraces, have very little Coyote brush and the bushes that are present are only alive at the crown; perennial grasses grow undisturbed beneath these skimpy canopies and Coyote brush is slow to reproduce in such conditions. Other pastures have thriving Coyote brush stands that will quickly convert the entire pasture to scrub.

When indigenous people managed coastal prairies, they burned every few years to prevent scrub and conifer encroachment and maintain flourishing perennial grasses, whose seeds were one of their main food sources. Today, mowing and grazing are the most common tools used to discourage Coyote brush, although herbicide, ball-and-chain, and other methods are also used.

Coyote brush often flourishes in drainages. Its deep root systems help prevent erosion of topsoil by infiltrating water and depositing organic matter into the soil. When scrub is left to grow, other species such as Sticky monkey-flower, Ceanothus and California coffeeberry will establish within Coyote brush stands, creating a diverse and complex habitat for wildlife.

How does grazing affect Coyote brush?

Cattle grazing year-round in a pasture with Coyote brush, without intervals of rest, usually discourages the growth of this native shrub. However, having livestock in pastures year-round may result in other undesired consequences such as low forage productivity, soil erosion, and compaction.

When cattle are rotated seasonally through pastures with Coyote brush, they generally create enough disturbance to slow down conversion from grasses to shrub, but not enough to stop it. During the wet season, hay, supplemental minerals, or other stimuli can be used to encourage cattle to enter and trample Coyote brush patches. Some cattle can be trained or will naturally eat Coyote brush, although this can be difficult and may depend on breed or other characteristics.

Goats are not often part of coastal herds, but goats are browsers and most will eat Coyote brush, either controlling re-sprouts after mowing or denuding older shrubs so that grasses can establish under them. Sheep will also graze young Coyote brush plants. Grazing Coyote brush with goats, sheep, or a mixed species herd likely produces different results than grazing solely with cattle, although nowadays it is not commonly done in our region.

How does mowing affect Coyote brush?

Coastal San Mateo pastures are often mowed to prevent Coyote brush from taking over grasslands. Mowing must repeat every few years because Coyote brush re-sprouts almost immediately (see illustrations). Mowing Coyote brush removes all the living material, chops it up, and spits it back on the ground in the form of woody litter. Depending how dense the stand of Coyote brush is, this can create a light dusting of organic matter or a thick woody mulch layer. Under a thick woody mulch layer, few grass seeds germinate. Small annual grasses, such as Rattail sixweeks grass and Brome fescue (discussed in Non-native Annual Grasses), do grow through these woody mulch layers. However, they form sparse carpets of grass which are of very low forage value.

In a sense, Coyote brush seems to love being mowed, as it quickly re-sprouts new, thriving growth from the mowed trunks and the woody mulch layer around it prevents most grass species from gaining a competitive foothold. Mowing without other treatments is unlikely to create a higher quality pasture. However, depending on the soil type and other factors, un-managed Coyote brush will almost certainly take over the pasture. For the land manager on the coast, Coyote brush is a difficult conundrum.

Can Coyote brush be useful?

Coyote brush provides important wildlife habitat. It flowers in the winter, when there are few other sources of flowers or seeds, so it is an important seasonal food resource for many insects and wildlife. Many of our native plants and animals depend on Coyote brush for food, shelter, and protection. It acts as a nursery for many native flowers (such as Yarrow and Yerba buena) and native perennial grasses (such as California brome and Blue wildrye). Its deep roots hold soil in place to prevent erosion, especially in steep drainages, and they may also store carbon deep underground.

ACKNOWLEDGMENTS

Produced by Point Blue Conservation Science in cooperation with TomKat Ranch and partner organizations. The guide was written and illustrated by Point Blue ecologist Mel Preston and designed by Jordan Rosenblum at Studio Clear. The guide was improved by comments from Wendy Millet, Mark Biaggi, Kevin Watt, Doug Millar, Nathaniel Seavy, Chelsea Carey, Tom Gardali, Melissa Pitkin, Libby Porzig, and Wendell Gilgert.