Midpeninsula Regional Open Space District

Memorandum

DATE: November 10, 2021

MEMO TO: Board of Directors

THROUGH: Ana Ruiz, General Manager

FROM: David Liefert, Water Resources Specialist, Natural Resources Department DL

SUBJECT: Existing Natural Resources Conditions Report, Cloverdale Ranch

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SUMMARY

The Midpeninsula Regional Open Space District (District) is preparing to bring the proposed acquisition of the Peninsula Open Space Trust (POST) - Cloverdale Ranch Property to the Board of Directors (Board) for consideration in Fiscal Year 2023. The funding for this potential purchase has been identified through the District's Measure AA Bond Measure passed by voters in 2014, and through numerous grant sources. In preparation for this potential purchase, District staff have been working to identify and document the property's existing conditions. Though staff continue to gather critical natural resources information, a preliminary summary report has been prepared (Attachment 1) to present known resource conditions and broadly identify the property's conservation values. This summary report provides important reference information to guide future management strategies and focus further investigations aimed at preserving significant natural and agricultural resources. This summary is being presented at this time to support upcoming Board discussions that may relate to this project. Important initial findings include the unique and significant onsite population of San Francisco garter snake, the diverse aquatic habitats on the property, and the importance of the various surface water bodies present on the Cloverdale property in supporting these conservation values. Given the richness of rare species, a Conservation Management Unit (or Units) is likely appropriate for Cloverdale Ranch. Staff continue exploring management options for the Lake Lucerne Water Company, which will be presented at a later date.

DISCUSSION

Cloverdale Ranch comprises approximately 6,700 acres of coastal watershed lands and contains an inter-basin reservoir system managed for irrigation of row crops, the majority of which would remain outside of future District ownership. The naturally occurring waterways and constructed reservoirs at Cloverdale Ranch provide a robust assemblage of aquatic resources for coastal agriculture and regionally significant populations of San Francisco garter snake (SFGS) and California red-legged frog (CRLF). Monitoring and maintaining the strong genetic integrity of the Cloverdale population of SFGS is of upmost importance for the overall health, well-being, and long-term survival of the species, according to US Fish and Wildlife Service studies. Protection of CRLF is also highly critical to the ongoing success of SFGS. One way to promote

ongoing conservation is to establish and manage a Conservation Management Unit (CMU). A CMU is defined in Board Policy 4.01 Open Space Use and Management Planning Process as: "areas within preserves, or possibly entire preserves, which because of certain criteria limiting their use, are planned and subsequently managed primarily for preservation of natural resources and viewshed." Based on information about both CRLF and SFGS use and distribution across the site, more than one CMU may be warranted. These habitats are centered on the reservoir system upstream of Lake Lucerne, which is managed by the Lake Lucerne Mutual Water Company, and are also supported by surrounding stockponds utilized by grazing tenants. The location and extent of the potential CMU areas requires further analysis before a recommendation can be made.

A mosaic of mixed grassland and coastal scrub comprise the rangelands at Cloverdale Ranch, but exotic grass species now dominate these sites. Other invasive species are present across the property but are not yet widespread, and four special status plant species have been documented. Initial inventorying and monitoring of population status, abundance, and distribution of invasive and special status species over the next two years would clarify the scale of future vegetation management and invasive species removal work. Additional opportunities to improve rangeland health and biodiversity include carbon farming, and the San Mateo Resource Conservation District has prepared two existing Conservation Carbon Farming Plans for grazed pastures on Cloverdale Ranch — one for the Butano Farms area (450 acres) located in the north and one for the Holm Ranch, Hidden Valley, and Goat Ranch areas (2,304 acres combined) located in the east.

Further studies on special status plants, American badger and burrowing owl habitat, and the relationship of aquatic habitat quality to water imports and reservoir management will inform future planning efforts.

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Natural Resource Management at Cloverdale Coastal Ranch (POST)

Existing Conditions and Learning Objectives

October, 2021

Midpeninsula Regional Open Space District

Department of Natural Resources

Contents

Introduction

The Midpeninsula Regional Open Space District (District) continues to assess conservation values and the natural resources at Cloverdale Ranch, an approximately 6,700-acre coastal property owned by the Peninsula Open Space Trust (POST; Figure 1). In preparation for the District's potential acquisition of Cloverdale Ranch from POST in FY23, District and POST staff have worked together since 2018 to document the property's existing conditions. District staff continue to gather critical information regarding its resources and identify outstanding questions and learning objectives required to prepare a Preliminary Use and Management Plan.

Here, the existing conditions are summarized for each primary resource—wildlife, vegetation, and physical. At this time, the District's assessment of Cloverdale Ranch's resources is preliminary; therefore, each section below includes a set of key learning objectives to guide future work. Much of this work, such as botanical surveys, will occur in FY22 and FY23.

Wildlife

San Francisco garter snake and California red-legged frog

Cloverdale Ranch contains a network of streams, springs, and ponds that support both San Francisco garter snake (SFGS) and California red-legged frog (CRLF; Figure 2). Some ponds lie just outside the proposed purchase area (yellow shaded area in Figure 1), but the three reservoirs (labeled 1, 12, and 13 in Figure 2) provide the most abundant habitat. Ongoing restoration efforts have been undertaken at many of the ponds and other features to ensure they continue to function as habitat for these species.

SFGS is a State and Federal Endangered and State Fully Protected species. Only a few sites on the San Francisco Peninsula have reproducing populations of this species. Cloverdale not only has a reproducing population, it has some of the highest genetic diversity in the region. The Cloverdale Ranch population of SFGS may be useful as a future donor base for "genetic rescue" of less diverse populations and/or for re-introduction of the species at other suitable sites. Monitoring and maintaining the robust genetic integrity of the Cloverdale population of SFGS is of upmost importance to the overall health, well-being, and long-term survival of the species.

CRLF is a State Species of Special Concern and a Federal Threatened species. They are a primary prey base for SFGS, meaning that protection of this native amphibian is highly critical to ongoing success of SFGS. CRLF at Cloverdale Ranch are currently threatened by the presence non-native bullfrogs. Bullfrogs compete with CRLF for prey and habitat and are not a preferred prey species for SFGS. Cloverdale Ranch would benefit from an ongoing bullfrog monitoring and management program to benefit both CRLF and SFGS (Table 1).

The District currently maintains a US Fish and Wildlife (USFWS) Recovery Permit for both CRLF and SFGS and an associated California Department of Fish and Wildlife (CDFW) Memorandum of Understanding (MOU) to manage SFGS and CRLF Districtwide.

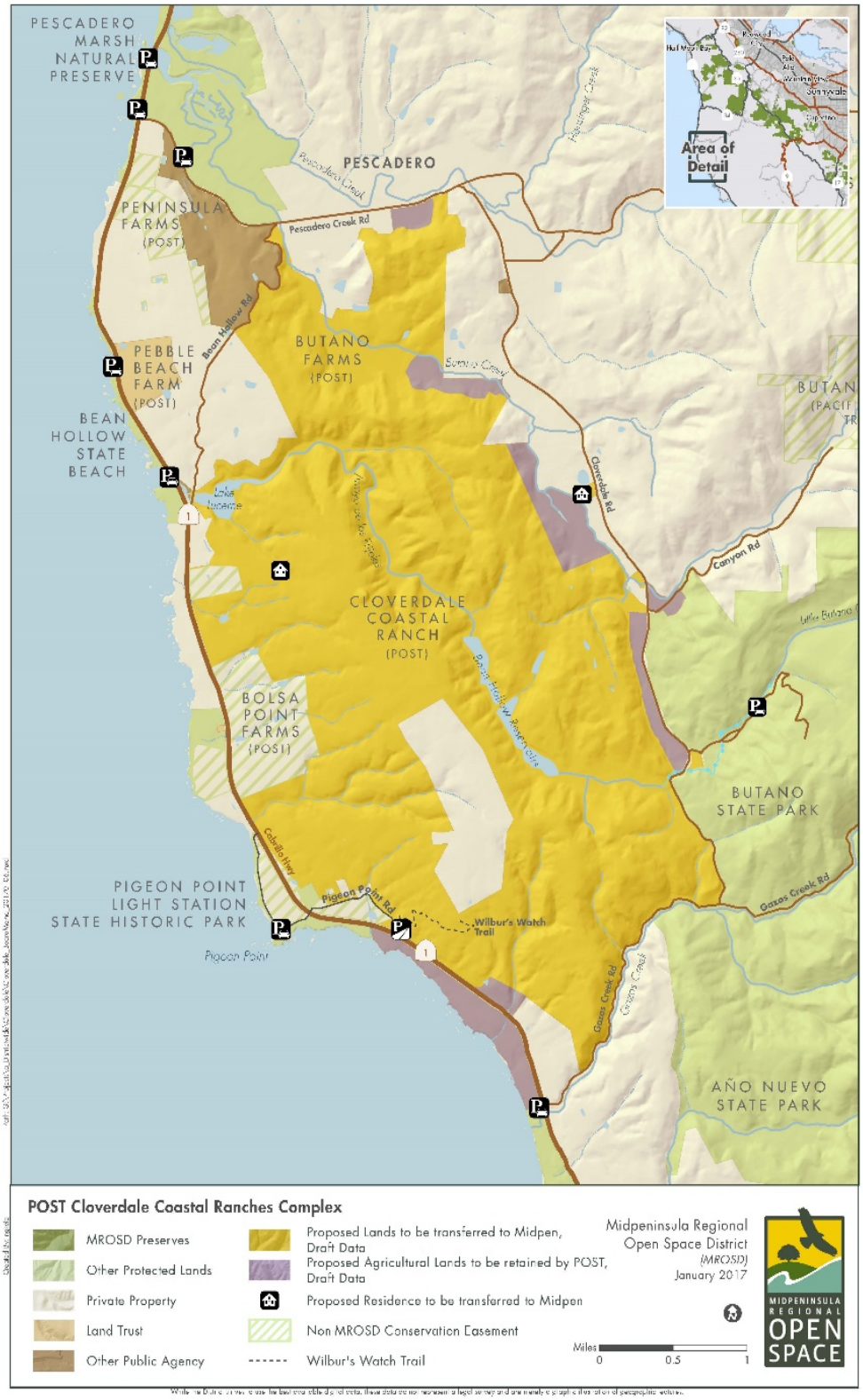


Figure 1. Overview map of Cloverdale Ranch

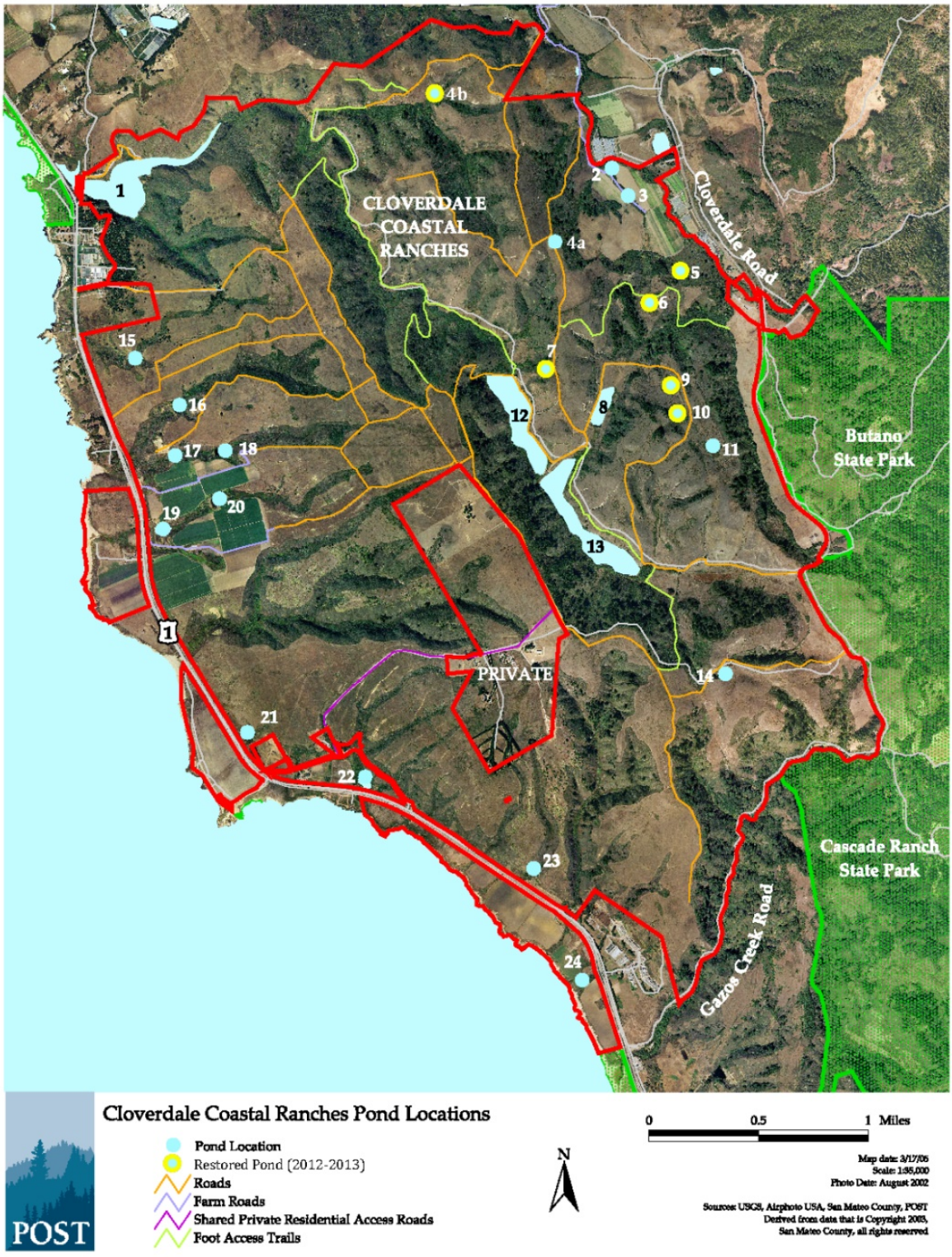


Figure 2. Ponds and reservoirs at Cloverdale Ranch.
Ponds that were part of the 2012-2013 restoration project are highlighted with yellow.

If Cloverdale Ranch is added to the District's landholdings, the property would be subject to the terms of the Recovery Permit and MOU. District activites that are not considered recovery (such as new roads and trail development) and introduced and/or changed uses (such as public access) are not covered and will require separate consultation with both the USFWS and CDFW to implement.

SFGS is especially rare and as a "fully protected species," no "take" (injury, harm, harrasment, etc.,) may occur. To avoid take, the District currently uses a suite of avoidance and minimization measures detailed in either the Recovery Permit and MOU or through project-specific consultations and permits. Such measures are not currently in effect within Cloverdale and would change the approach of current and past routine and project-specific work, such as by limiting vehicle access or requiring biological monitors.

Conservation Management Unit planning

One way to promote ongoing conservation is to establish and manage one or more Conservation Management Units (CMUs). A CMU is defined in Board Policy 4.01 Open Space Use and Management Planning Process as: "areas within preserves, or possibly entire preserves, which because of certain criteria limiting their use, are planned and subsequently managed primarily for preservation of natural resources and viewshed." Based on information about both CRLF and SFGS use and distribution across the site (Figure 3), one or more CMUs may be warranted. Managing specifically for a variety of habitats within a CMU provides multiple opportunities for SFGS such as seeking prey, foraging, reproduction, rearing, resting, cover/escape, etc. SFGS may also benefit from low-intensity conservation grazing, as long as it promotes habitat heterogeneity (diversity) in and near wetlands (Kim et al., 2017). Given this, well managed conservation grazing is not only a permissable activity under existing permits, but it may be beneficial to use it as a specific management tool within any CMUs established on the property.

Two different potential CMU models were developed for SFGS/CRLF. Option 1 follows a similar methodology to that which was used to develop the existing SFGS/CRLF CMUs located at Russian Ridge Open Space Preserve. These CMUs include a 660-foot (200-meter) buffer around all ponds and some wetlands. In the first model, this buffer was applied to the north-south Arroyo de los Frijoles Creek corridor that bisects the property to include areas where species are consistently observed and are suspected of using the corridor to connect to Lake Lucerne in the north (Halstead and Lien, personal communication, October 9 and 24, 2019). Driving and equipment use is generally restricted/limited within the 660-foot buffer and may require the use of vehicle monitors and/or biological monitors when performing work, maintenance, or even patrol within a CMU. A separate 2,000-foot driving buffer limiting travel to five miles per hour is also applied around these features. Vehicle monitors are recommended within these buffers.

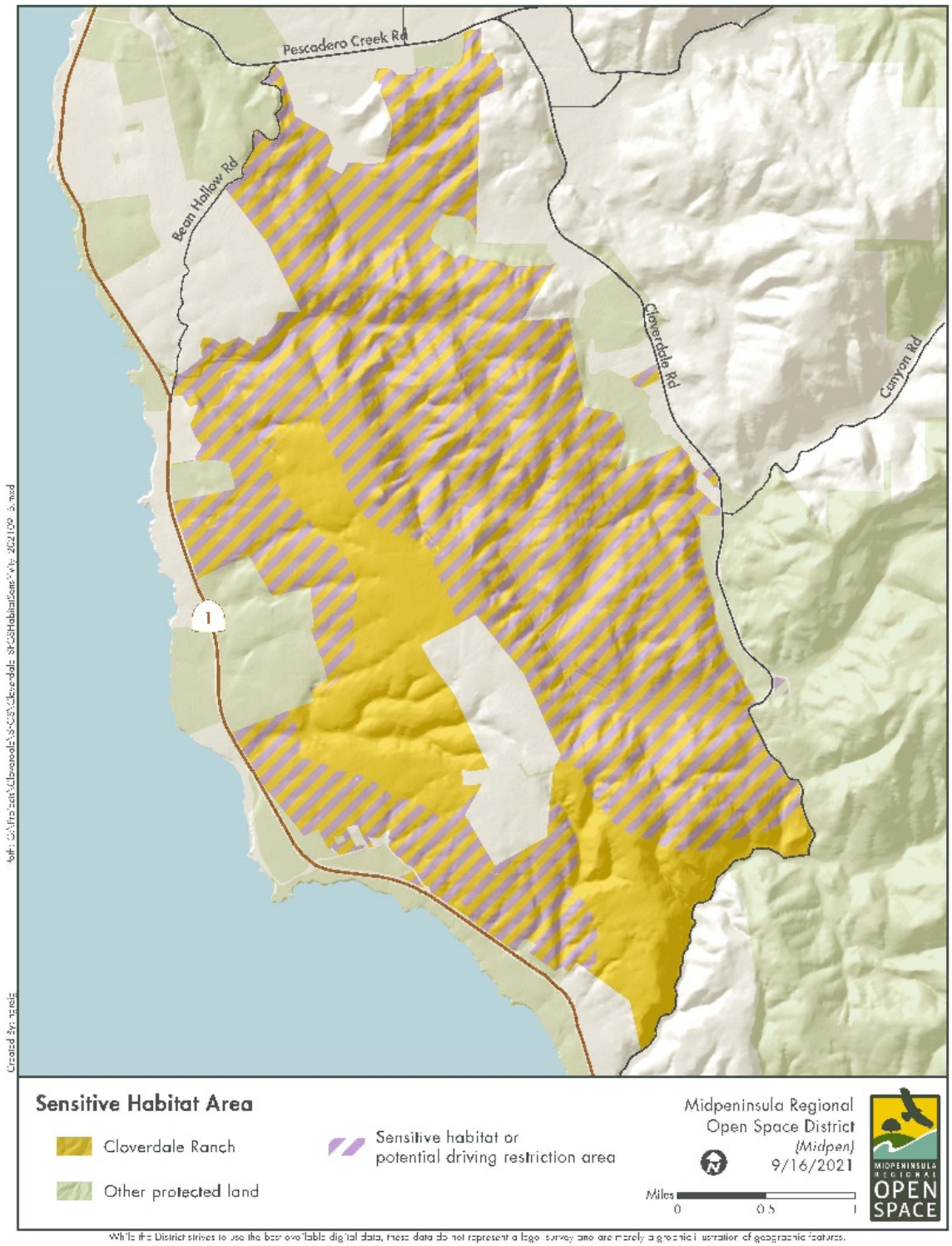


Figure 3. Sensitive Habitat Area within which one or more Conservation Management Units and/or restricted driving areas may be established for San Fracisco garter snake and California red-legged frog.

The buffers are based on distances that species are known to travel from aquatic foraging habitat to upland wintering sites. Most occurrences would be in the first 660 feet during the active months for seeking prey, foraging, mating and raising young (from mid-March through mid-June and September to October). However, SFGS may travel up to 2,000 feet to seek mates and/or to find winter hibernaculum sites where they may remain in brumation until spring when they return to aquatic areas for more rigorous activity. Known aquatic features have been identified but some are not currently buffered, as the habitat quality at some of these sites is unknown. Adjustments to proposed CMU boundaries may be warranted. This methodology to designate previous CMUs has been approved by regulatory agencies and has a high probablity of being approved, but may require some modification before final approval. This methodogy would be highly restrictive for public access and conservation grazing leases.

As an alternative, a CMU could be implemented that reduces the area with restrictive requirements (especially pertaining to driving and movement throughout the site), yet remains protective of the most suitable and valuable habitat. Areas not included in this version are upland areas surrounding Lake Lucerne and neighboring ponds to the west for which the District has little ability to control and/or influence management. This methodology instead retains high-quality habitat in the northern and southern section of the property as well as an area to provide habitat connectivity and a pathway for genetic exchange. This option requires substantially more review and negotiation with regulatory agencies to determine if they concur with the appraoch. It may or may not be approved or may require substantial modification. This methodolgy would result in smaller CMUs and more flexibility for public access and conservation grazing programs.

American Badger and Burrowing Owl

An ongoing habitat assessment study predicts that the American badger, a State Species of Special Concern, uses the grasslands throughout Cloverdale Ranch for foraging and denning. Two critical linkage pathways that provide badgers with opportunities for movement and genetic exchange have been identified in the northern and western portions of the Ranch. However, minimal badger activity has been confirmed in these habitats, which is likely partly due to the deeply incised drainages through the parcel. Further analysis will confirm the importance and functionality of the predicted habitat linkage running north-south through Cloverdale (Table 1).

The designation of a badger CMU may be more valuable along Highway 35 where the core population occurs at this time. Absent a larger population within Cloverdale, a CMU for badgers is not recommended at this time but management actions that facilitate the use and movement of badgers can be implemented. Enhancing pathways within the parcel to facilitate badger movement and maintaining favorable grassland conditions through grazing, fire management, or other tools may promote ongoing use by the species. This will also provide potential movement corridors east of the current coastal passage adjacent to Highway 1 that makes badgers suceptible to vehicular mortality. Maintaining connectivity by reducing barriers would provide ongoing opportunities for movement, genetic exchange, and overall species health. Special care should be

taken when installing fencing and allowing vehicle usage in high-quality and/or high-use badger habitat and travel corridors.

Burrowing owl (BUOW), a State Species of Special Concern, has been observed using the coastal grasslands of Cloverdale Ranch in low abundance. Because these birds are known to use unoccupied badger dens or digs as shelter during the winter months, their low abundance is likely due to limited badger burrows. The only other local observations of BUOW are along the coast. The grasslands of Cloverdale Ranch may serve as a more protected inland site for the species during heavy winter storms. BUOW prefer shorter grass around burrow sites to allow scanning for predators before emerging. Using conservation grazing, fire management, or other tools to maintain and promote grassland health, structure, and use by badgers would provide an important winter benefit for BUOW.

Grasshopper sparrow and Bryant's Savannah Sparrow

Grasshopper sparrows (GRSP), a State Species of Special Concern, are grassland-dependent birds. They are cryptic and secretive, which makes their populations difficult to study (Table 1). Surveys conducted at Cloverdale in 2014 and 2018 revealed GRSP in high densities, most frequently in areas with high perennial grass cover and shorter grass (such as California brome, as opposed to non-native Harding grass). Observations, however, have revealed that grassland bird populations overall declined by 30-40% within Cloverdale during this period, but only by 4% at nearby Butano Farms. The reason for this trend could be site-specific (e.g., management practices) or due to broad environmental impacts (e.g., drought), but causation has not yet been fully determined. Data suggest that site-specific improvements could support grassland-dependent bird species like GRSP. GRSP forage for insects on bare ground near the cover of dense grasses. Their nests are placed on the ground near or within large patches of tall grass. Preventing overgrowth or expansion of scrubby vegetation and maintaining open grassland with patches of bare ground is essential for supporting GRSP in all life stages.

Savannah sparrows (SAVS) are also a State Species of Special Concern and grassland-dependent bird with similar ecological requirements as the GRSP. Several subspecies occur in the United States. The Bryant's SAVS is endemic to California and occurs along a narrow coastal band of habitat of northern California. The Bryant's SAVS population is centrally abundant around the San Francisco Bay. Management actions that support healthy insect diversity and abundance would provide a stable food source for both sparrow species. Additionally, conservation grazing and prescribed fire management to maintain grassland health and complexity would benefit both sparrow species.

Table 1. Wildlife resources learning objectives

Learning objective	Management goal	Expected timeline
Level of ongoing effort required to control bullfrog population	Protection of SFGS and CRLF populations from invasive bullfrog	Bullfrog control efforts absent a larger regional control effort are anticipated to occur annually with higher front end expeditures to reduce initial numbers.
Identify importance of potential badger linkages	Management and conservation of Sensitive Status Species (SSS), with particular importance to genetic diversity and physical fragmentation	Ongoing / annual
Determine population status, abundance and distribution of GRSP and SAVS	Management and conservation of SSS, where little is known of extant populations	Ongoing / annual

Vegetation

Rangeland management

A mosaic of mixed grassland and coastal scrub comprise the rangelands at Cloverdale Ranch. Like other rangelands of the region, these sites have become dominated by exotic species, particularly exotic annual grasses (*Avena* sp., *Bromus* sp., *Festuca* sp.) and in some cases exotic perennial grasses (*Phalaris aquatica* and *Holcus lanatus*). Despite the prevalence of non-native species, there are scattered stands of native grassland species and a few areas with high native-species richness and cover. These remnant stands of native grassland vegetation constitute a significant biological resource. The rangelands in general support a rich assemblage of unique wildlife, including several special status species. Brush encroachment, particularly native coyote brush (*Baccharis pilularis),* is extensive at this site and has displaced large areas that were formerly grassland.

Grazing management at Cloverdale takes place under two grazing leases. One lease includes the Goat Ranch, Holm Ranch, and Hidden Valley areas comprising approximately 2,304 acres together. This lease supports a year-round, grass-fed beef operation of around 100 animal units as well as a few horses (up to 8 mares and 4 foals). The second grazing lease covers the Butano Farms area of approximately 450 acres. This lease has supported a small year-round cow/calf operation in the past but has recently shifted to primarily stockers ranging from about 15-30 head at any one time.

Invasive species

Canary Island St. Johnswort (*Hypericum canariense*)

Canary Island hypericum is a rhizomatous perennial shrub found on the central and south coast of California and in the southern San Francisco Bay region. Canary Island hypericum infests disturbed areas, especially in coastal sage scrub and grassland habitats. This ornamental shrub forms dense stands that exclude native species. It is not yet widespread (Figure 4 shows its extent in Cloverdale Ranch), but its prolific seed production makes rapid spread possible.

Figure 4. Known Hypericum extent at Cloverdale.

Jubatagrass (*Cortaderia jubata*)

Jubatagrass is a large perennial grass found along the coast of California and in the Coast Ranges. Jubatagrass favors dunes, bluffs, and disturbed areas, including inland areas where

temperatures are moderated by fog. It was introduced as an ornamental plant and for erosion control. Each plume produces up to 100,000 seeds that are widely dispersed by wind and develop without fertilization. Jubatagrass quickly colonizes bare ground, but establishment is generally poor where the seedlings must compete with other grasses or sedges.

Special Status Plant Species

Existing botancial resource documention needs additional field work to verfiy and/or update known occurences. To date, four special status plants have been documented on the site (Table 3): marsh microseris (*Microseris paludosa*), Monterey pine (*Pinus radiata*)[1], Choris' popcornflower (*Plagiobothrys chorisianus* var. *chorisianus*), and Scouler's catchfly (*Silene scouleri* ssp. *scouleri*). Several other special status plants have been documented within 5 miles of the site and there are numerous species, including many local endemics, documented in the general region. Additional special status plant species are expected to be documented during the course of the next two years (Tables 2-3). The site appears to lack some of the specialized microhabitats that support many of these special status species (vernal pools, serpentinite soils, etc.). As such, newly documented species are likely to be local endemics that otherwise occupy more common substrates and plant communities in the region.

Table 2. Potential Special Status Plant Species and Probability of Presence

Known to be Present	High Probability	Moderate Probability	Low Probability	Not Expected
4	9	15	37	15

Sensitive Natural Communities

Natural Communities have been part of the Natural Heritage conservation triad, along with plants and animals, since the inception in 1979 of California's natural heritage program. Natural Communities are evaluated using NatureServe's Heritage Methodology, the same system used to assign global and state rarity ranks for plant and animal species in the California Natural Diversity Database. California Natural Communities are ranked by their rarity and threat. For rarity, the ranking involves the knowledge of range and distribution of a given type of vegetation, and the proportion of occurrences that are of good ecological integrity. Threats and trends are likewise considered, such as residential and commercial development, traditional agriculture (e.g., row crops), energy production and mining, and invasive and other problematic species. Conservation grazing practices that the District employs can maintain and enhance senstive grassland habitats. Known presence and distribution of natural comunities at the site is outdated and is in the process of being updated (Table 3).

[1] District staff have conferred with CDFW and determined that the Monterey pines at Cloverdale are considered cultivars. CDFW has requested that the species present on site be removed to protect the genetic integrity of the naturally occurring stands.

Table 3. Vegetation resources learning objectives

Learning objective	Management goal	Expected timeline
Determine population status, abundance and distribution of special status species, including invasive species	Management and conservation of SSS	Intial inventory and monitoring (I&M) to be completed in the next 2 years and then every 5 to 10 years on an ongoing basis.
Determine distribution of sensitive natural communities	Management and conservation	Intial inventory and monitoring (I&M) to be completed by the end of calendar year 2021 and fine tuned over the next 2 years. Ongoing I&M planned for every 10 to 20 years.

Physical

Water resources and infrastructure

Water infrastructure and resources at Cloverdale Ranch support agriculture and habitats important to a variety of recovering species. Around 30 inches of rain falls annually on average and several streams intersect the property, notably the Arroyo de los Frijoles Creek that was impounded in the 1930s to create an approximately 1,500-acre-feet reservoir system used for irrigation (Figure 5). Because water storage typically exceeds irrigation demand, the reservoirs create extensive habitat for aquatic and riparian species by retaining water year-round. A network of springs, wells, ponds, and surface-water diversions enable agriculture and habitat connectivity across the property. Taken together, the naturally occurring waterways and constructed reservoirs at Cloverdale Ranch provide a robust assemblage of aquatic resources for coastal agriculture and regionally significant populations of SFGS and CRLF.

Bean Hollow Water System

The Lake Lucerne Mutual Water Company (LLMWC) owns and operates an inter-basin stream diversion, three reservoirs, and pumping infrastructure collectively known as the Bean Hollow Water System. Nineteen (19) private shareholders, including POST, oversee the LLMWC, which was founded in 2002. Rainfall over the 2,500-acre Arroyo de los Frijoles Creek watershed primarily fills the reservoirs each year. Additional water is diverted directly from a stream within Butano State Park, which may help meet irrigation demand and support aquatic habitat by bolstering reservoir levels.

- A concrete dam impounds Little Butano Creek within the State Park (right side of Figure 5) where an approximately 1-mile-long series of surface channels and buried pipeline diverts water out of the creek during winter.
- The dam negatively impacts fish habitat within the creek by altering streamflow and creating a physical barrier for fish passage.
- The piped water discharges above the upper reservoir but is unchannelized and unmeasured, so the importance of the diversion to reservoir storage and SFGS habitat is unknown.
- Further monitoring would clarify the role of this diversion to the Bean Hollow Water System, in also maintaining aquatic habitat in Cloverdale, and its potential downstream impacts to fisheries in the Little Butano, Butano, and Pescadero river system (Table 5).

Arroyo de los Frijoles Creek flows northward from Cloverdale Road into two reservoirs that impound the water (center of Figure 5).

- Overflow or manually released water from the upper two reservoirs flows back into Arroyo de los Frijoles Creek and then west to Lake Lucerne where pumps draw water for irrigation (center and left in Figure 5).
- Lake Lucerne overflows beneath Bean Hollow Road into a lagoon and then through a concrete culvert beneath Highway 1 before terminating in the Pacific Ocean at Bean Hollow State Beach.

In addition to row-crop production, management of the Bean Hollow Water System directly influences the spatial distribution and seasonal availability of aquatic habitat by modifying the extent of the reservoirs' wetted perimeters and flows in Arroyo de los Frijoles Creek between the upper two reservoirs and Lake Lucerne. Operation of the reservoirs could intentionally benefit both farming and habitat; however, while the system's maximum storage varies predictably with rainfall, monitoring data show that pumping volumes can fluctuate by 50% interannually regardless of whether it was a wet or dry year.

The uncertainty in annual irrigation demand challenges water-use planning and habitat conservation, particularly because peak pumping rates occur in mid- to late summer when aquatic habitats are most at risk of desiccation. The proportion of water in the reservoir system delivered by the Little Butano Creek diversion is also unknown. As such, a clearer understanding of irrigation demand and water supply will enable future water-use planning for farming and habitat conservation under a range of climatic conditions. The San Mateo Resource Conservation District has a long history on the property and is a logical partner to work with water users/farmers on irrigation efficiency and water demand.

Grazing infrastructure

Stockponds, springs, and wells service three grazing areas on Cloverdale Ranch: Butano Farms, Holm Ranch, and Hidden Valley/Goat Ranch. POST holds nine stockpond registrations to store up to around 34 acre-feet of water annually, and two relatively productive wells supply gravity-fed trough systems on the Holm Ranch and Hidden Valley properties. Ponds have been restored by POST in recent years to increase pond depth, duration, and open water (yellow-highlighted

dots in Figure 2). The San Mateo Resource Conservation District (RCD) has conducted wildlife and maintenance surveys of the ponds, but identifying their seasonal patterns of water loss and

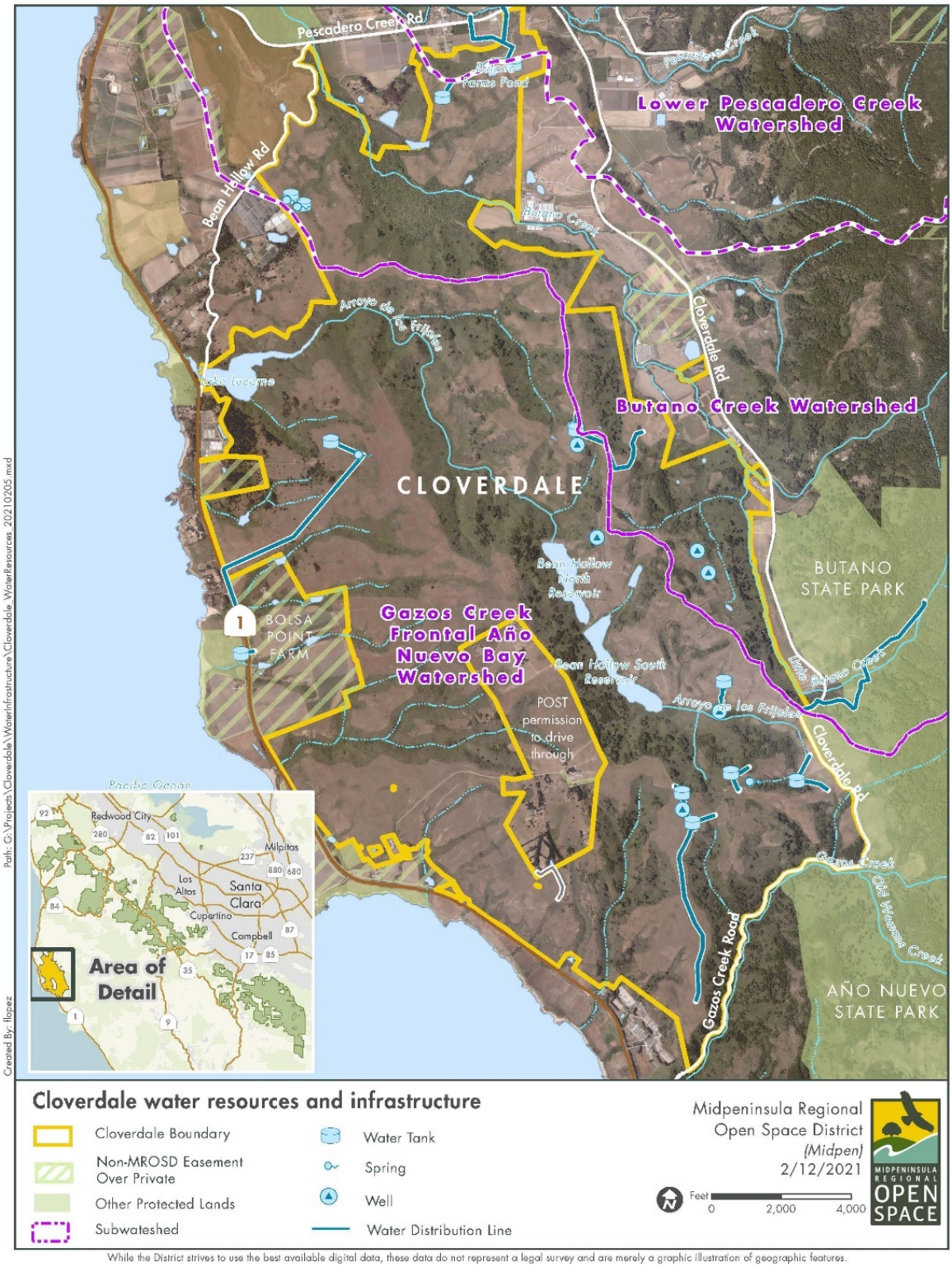


Figure 5. Water resources and infrastructure at Cloverdale Ranch. The Bean Hollow Water System contains three reservoirs and a stream diversion from Butano State Park that is transferred via pipeline to the Arroyo de los Frijoles watershed.

sensitivities to climate change will facilitate long-term planning (Table 5). Conservation grazing may additionally improve soil carbon, vegetation management, and pond function, but the existing stockwater infrastructure would likely need to be expanded.

Cultural resources

There are no known historic resources on the property, although a property-wide assessment has not been undertaken. Few structures are present. Native American and Tribal Cultural Resources have a moderate to strong potential to occur in flatter, streamside areas, as is common to all coastal lands at lower elevation. Further assessments may be warranted if there are large-scale construction projects envisioned for different areas on the property. Cultural resources do not appear to be a significant opportunity or constraint for managing Cloverdale.

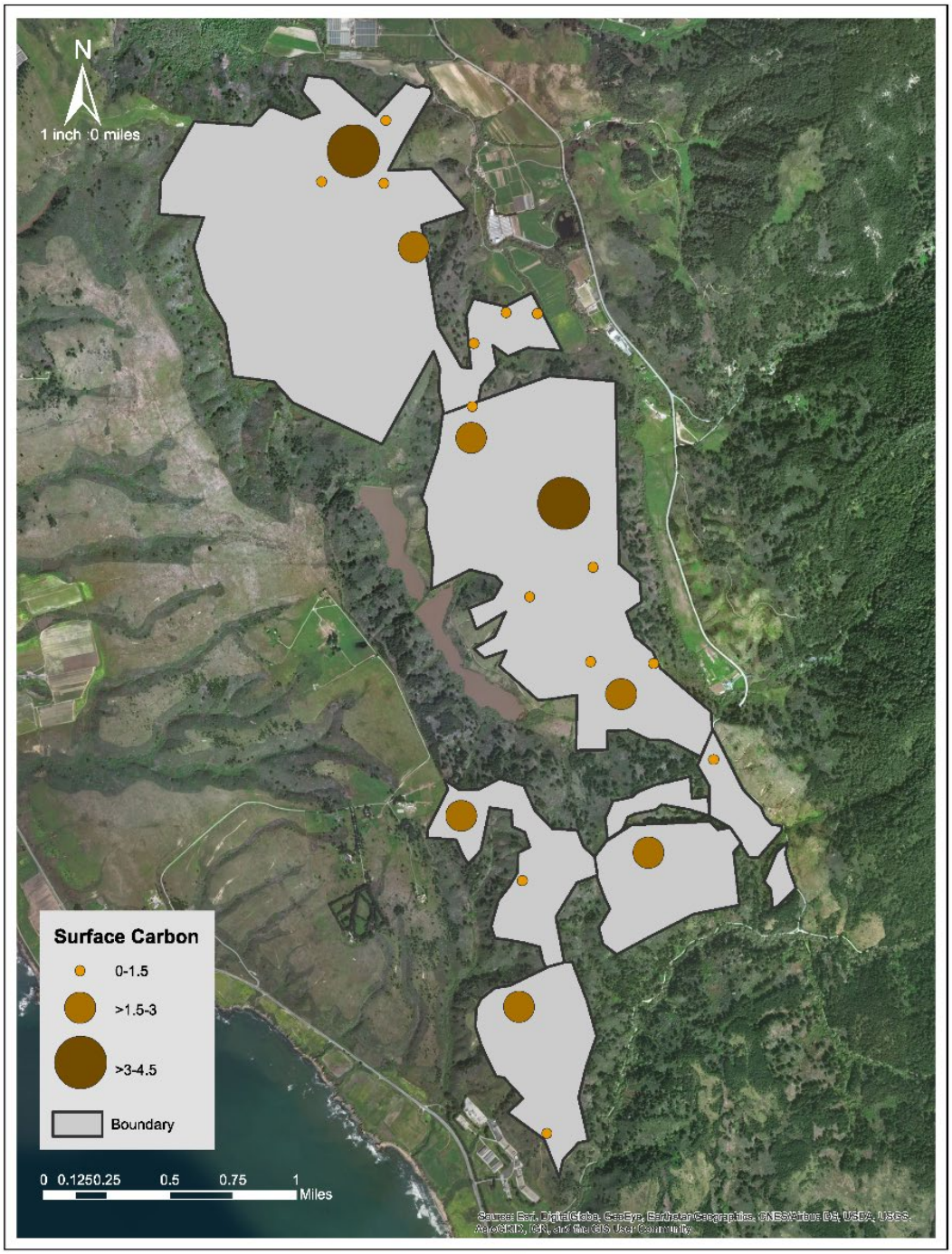
Table 5. Physical resources learning objectives

Learning objective	Management goal	Expected timeline
Importance of the Little Butano Creek diversion and patterns of transfers among reservoirs	Maximize irrigation capacity, preserve aquatic habitat and stream function	Expanded hydrological monitoring efforts are expected to occur within five years
Seasonal patterns of water loss in ponds	Maintain health and connectivity of aquatic habitat, provide stockwater for grazing	Annual assessments
Identify necessary cattle exclusion fencing and pumping from ponds to troughs	Preserve pond habitat function and maintain stockwater distribution	Annual assessments
Identify high-priority areas for implementation of Conservation Carbon Farming Plan actions	Increase carbon sequestration and storage in soil and woody vegetation	Identify high-priority projects within 2 years, implementation and monitoring for 5-10 years

Carbon storage

The Rangeland Monitoring Network conducted soil sampling across Cloverdale from 2014 through 2018 and found that in general, soil organic carbon (Figure 6) was slightly below regional averages. Two Conservation Carbon Farming Plans (CCFP) for Cloverdale were developed in 2018 with the San Mateo RCD. The CCFP for Butano Farms in the north of the

property identified actions that could sequester approximately 178 metric tons of CO_2 equivalents ($MTCO_2e$) annually over a period of 20 years. Compost application was identified as the most impactful carbon farming method, with potential for 139 $MTCO_2e$ of annual sequestration. The second CCFP focused on the Cloverdale Ranches, (the eastern portion of the



Source:
Point Blue
Rangeland Monitoring Network

Figure 6. Surface soil carbon (measured in soils from 0-10 cm) recorded by the San Mateo Resource Conservation District in the Cloverdale Conservation Carbon Farming Plan.

Holm Ranch, Hidden Valley, and Goat Ranch properties and portions of the flats and mesa adjacent). This CCFP identified actions to sequester appoximately 285 $MTCO_2e$ annually over 20 years, with compost application as the most impactful method (170 $MTCO_2e$ annually). Riparian forest buffers and silvopasture also had relatively high sequestration potential in this area, with annual sequestration potential of 59 and 40 $MTCO_2e$ respectively.

The potential sequestration increases identified in the Butano Farms CCFP average to ~5 MTCO2e/acre/year, compared to 6.4 MTCO2e/acre/year for the Cloverdale Ranches CCFP. Both are similar to the CCFP created in 2021 for the District's Bluebrush property in Purisima Creek Redwoods OSP, which suggested a potential increase of 6.6 MTCO2e/acre/year. However, for all CCFPs, the potential for increased sequestration is not distributed evenly across the landscape, but depends on which actions apply in a given area (e.g., compost application vs. riparian buffers vs. adjustments to grazing methods). Riparian buffers have proven habitat benefits while compost application primarily affects plant communities by improving soil structure and water infiltration, and contributing nutrients. However, the impacts of compost application to native perennial grassland communities are understudied and concerns about pathogen spread may limit the viability of this method on District properties. Additional work is needed to identify high-priority areas for carbon sequestration on Cloverdale Ranch (Table 5).

Since these CCFPs were completed, POST and the San Mateo RCD have done one application of compost to four acres of Goat Ranch. Monitoring of soil texture, carbon, and bulk density will continue through 2021.

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