AUDUBON CONSERVATION RANCHING PROGRAM

Audubon | Bobcat Ranch

Habitat Management Plan

GRAZED ON Audubon CERTIFIED BIRD FRIENDLY LAND

PROTECTING BIRDS - BY RESTORING - GRASSLANDS

Primary Authors: Dash Weidhofer (Audubon California), Corey Shake (Point Blue Conservation Science)

Contents

Purpose and Scope

This **Habitat Management Plan** (HMP) will help guide management on Bobcat Ranch to comply with Audubon's Conservation Ranching Program (ACR). Our management plan provides descriptions and maps of historical and current ecological conditions, recent grazing management information, a list of priority bird focal species and their habitat management needs, and clear, defined goals and objectives for management, restoration, and monitoring. On site Audubon management staff will ensure the implementation and monitoring of the progress of the HMP. In addition, an annual certification audit—conducted by Food Alliance—will be done to provide an unbiased review of the HMP and assure that ACR protocols are being met. This plan will cover the next three grazing seasons (beginning in fall 2019) and is intended to be a decision-making guide for the owner/operator and the grazing lessees. The HMP is meant to be adaptive and can be changed to reflect monitoring data and/or management priorities.

Contact Information

Ranch Location: 25929 County Rd. 34
Winters, CA, 95694
Yolo County

Grazed Acreage: 3,650

Property Owner: National Audubon Society
Ranch Manager: Dash Weidhofer, Audubon California
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Geography, History, and Ecology of the Ranch

Location and Climate

Audubon Bobcat Ranch is located in the Great Central Valley Ecoregion, west of the town of Winters, Yolo County, California. Lying where the west side of the lower Sacramento Valley meets the Northern California coastal ranges, the Ranch's elevation ranges from 175 feet near Putah Creek to just over 1900 feet at the ridge dividing the Bray Canyon and Dry Creek drainages. It is between and less than two miles from two non-contiguous parcels of the recently-designated Berryessa Snow Mountain National Monument (Fig. 1).

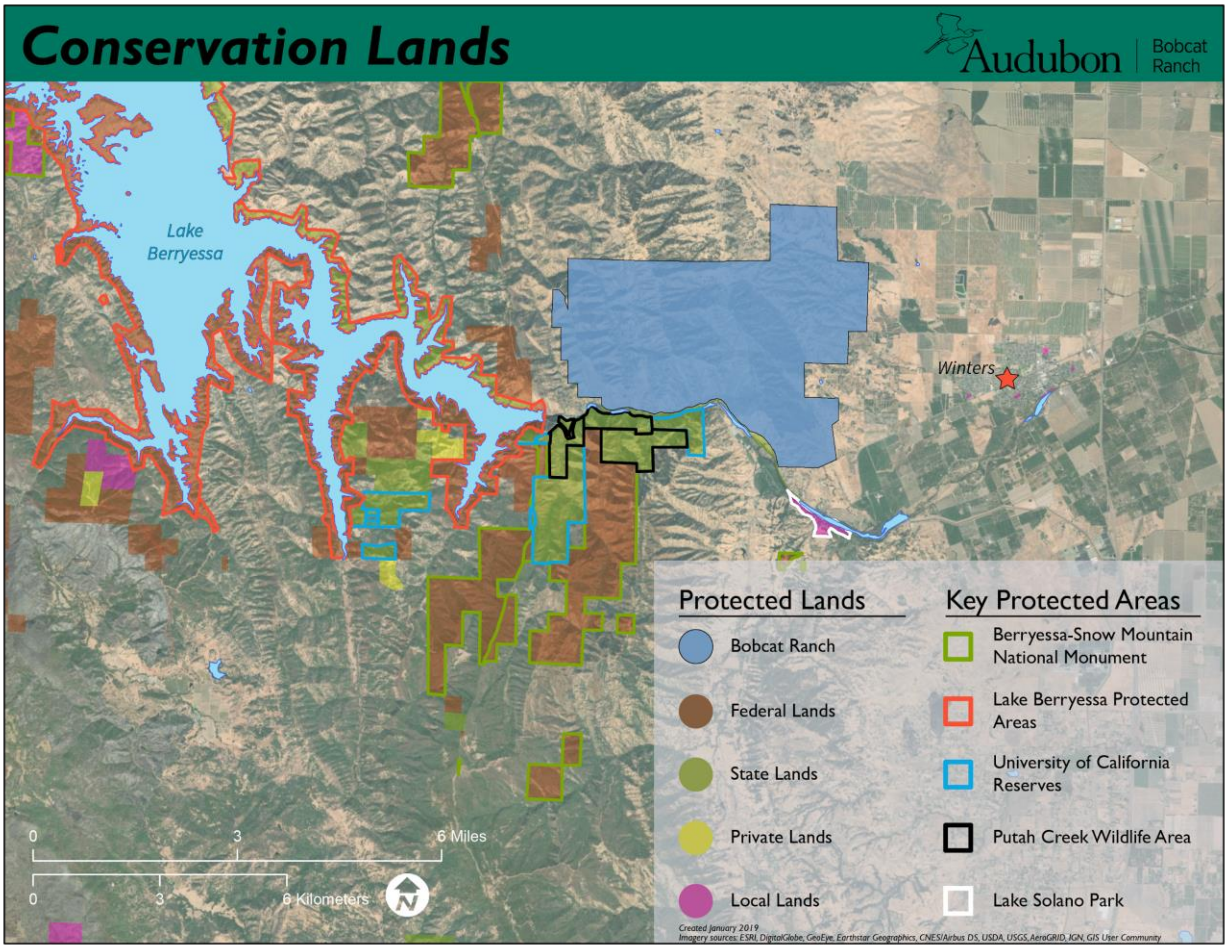

Figure 1. Location of Bobcat Ranch in landscape context with other protected lands.

Bobcat Ranch is located in a dry-summer Mediterranean climate zone, with annual average precipitation ranging from 24 to 30 inches (61-76 cm) across the different elevations of the ranch. About 85% of all of this precipitation falls, on average, from November through March, with December, January, and February each receiving 4-6 inches (10-15 cm) on average (Fig. 2). Snowfall at any elevation on the

ranch is very rare. Average July temperatures are a maximum of 97 °F (36 °C) and a minimum of 60 °F (15 °C). Average January temperatures are a maximum of 55 °F (13 °C) and a minimum of 37 °F (3 °C).

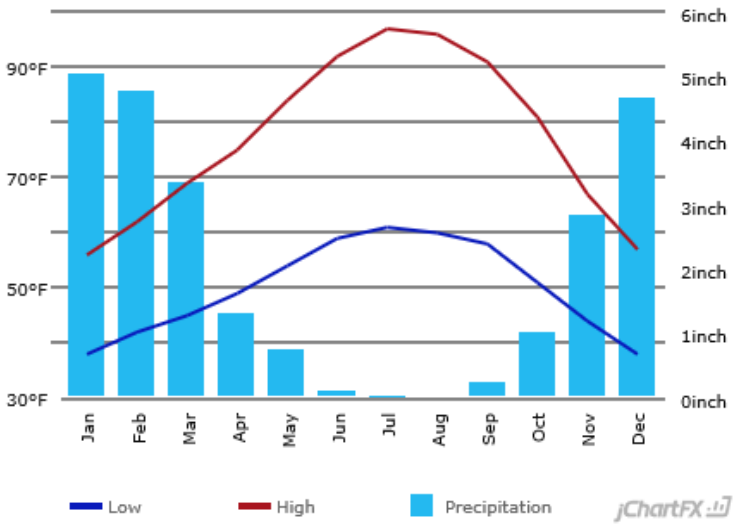

Figure 2. Climograph of Winters, CA, which is 2 mi east of Bobcat Ranch. Source: www.usclimatedata.com.

Land-use History

Prior to European settlement, Bobcat Ranch was inhabited and managed by the South Patwin Indians. Grinding stones, obsidian flakes and other native-American artifacts have been found throughout the Ranch. By 1842, land grants from the Mexican government had been established that covered the area of the present-day Ranch. Grazing by domestic livestock on the Ranch and adjacent lands probably pre-dates the establishment of these properties, but like much of this region, grazing impacts likely intensified during the Gold Rush era as demand for meat increased.

During the 19th century the Ranch transferred to the Glide Family and later in the 20th century the Visbeek family purchased the Ranch. During this time, livestock grazing continued to be the primary land use. More recent accounts of livestock grazing on the Ranch describe grazing by sheep, beef cattle and dairy heifers. It is likely that fuel wood harvest of blue and valley oaks occurred during this or prior periods on the ranch, as it did on surrounding ranches. While remaining evidence of cut trees is not obvious, areas that are treeless despite having ecological conditions that would probably support more oaks suggest that tree harvest altered the plant communities on parts of the Ranch.

The Ranch was acquired by the Regent Trust Limited in 1999 and then by Audubon California in 2007, funded primarily by the California Wildlife Conservation Board. While the Conservation Easement on the Ranch preserves oak trees and other habitat features, it has allowed for leased grazing operations. Current land uses in the broader landscape surrounding the ranch consist of working cattle ranches,

orchards, vineyards, exurban ranchettes, hunting/vacation properties, public recreational lands, and University ecological research areas.

Vegetation Communities

The dominant vegetation communities on Bobcat Ranch are grasslands, oak savanna and woodlands, and chaparral. A few seasonal creeks support very narrow strands of riparian plant communities, totaling about 4-5 linear stream miles. The California Department of Fish & Wildlife maps vegetation communities as "habitat types" in their California Wildlife Habitat Relationships (CWHR) program. According to their habitat types map, the entire ranch is estimated to be 25% grasslands, 66% oak and mixed-hardwood woodlands, and 9% chaparral (Table 1 and Fig. 3; CDFW 2014).

Table 1. Acres and proportion of habitat types on Bobcat Ranch, from California Wildlife Habitat Relationships (CWHR) habitat map (CDFW 2014). Based on current satellite imagery, it is apparent that the "Cropland" classification is erroneous.

CWHR Vegetation Type	Acres	Proportion
Annual Grassland	1673	24.5%
Blue Oak Woodland	4191	61.4%
Blue Oak-Foothill Pine	78	1.1%
Valley Oak Woodland	82	1.2%
Montane Hardwood	34	0.5%
Montane Hardwood-Conifer	125	1.8%
Chamise-Redshank Chaparral	15	0.2%
Mixed Chaparral	609	8.9%
Cropland	21	0.3%
Totals	**6829**	**100%**

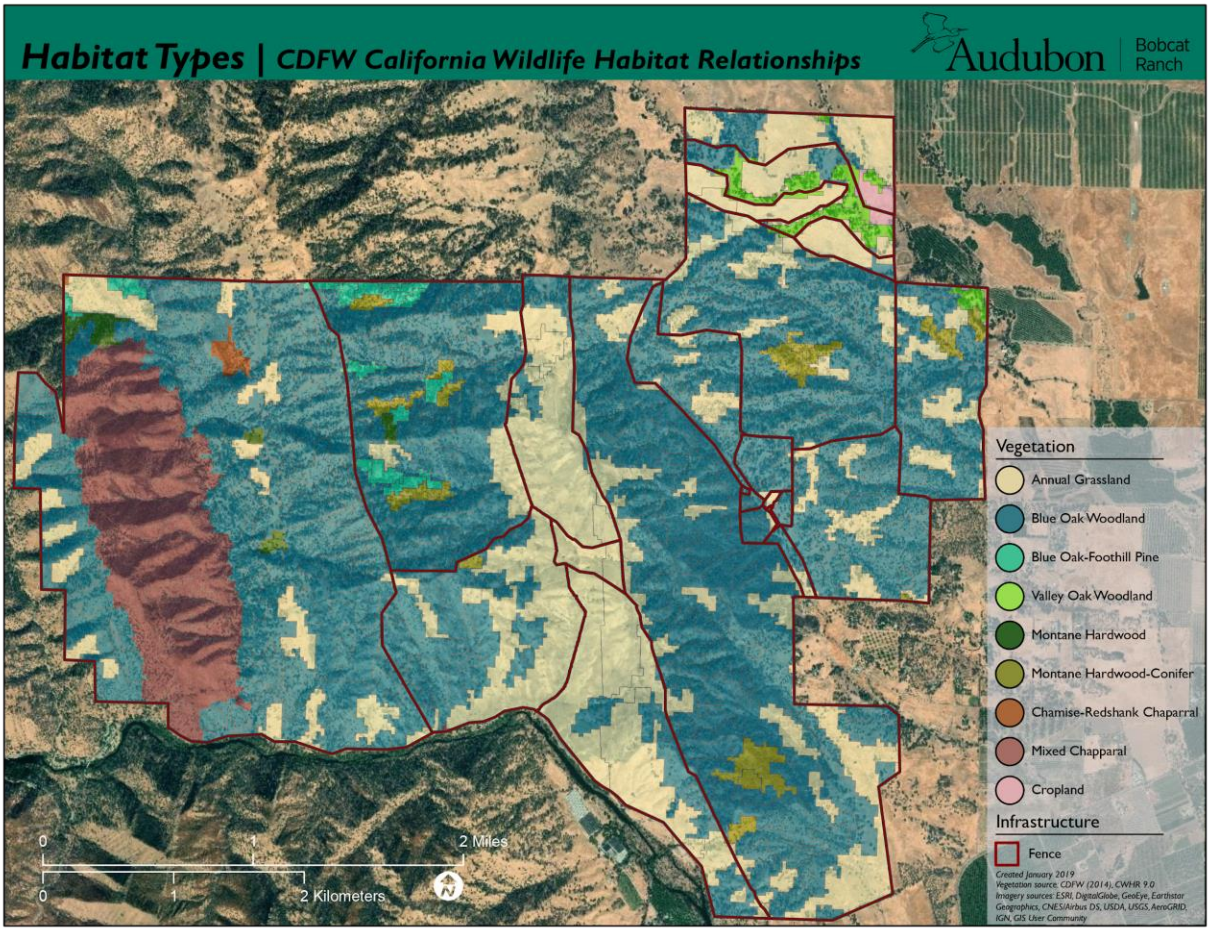

Figure 3. Mapped habitat types of Bobcat Ranch according to the California Department of Fish & Wildlife's California Wildlife Habitat Relationships program.

Two primary sources of information are on plant diversity and community composition are available for the Ranch. Ellen Dean of the University of California-Davis and her colleagues and predecessors have documented 361 plant species on the Ranch during collecting and botanizing forays, which includes one federally listed species, two California Native Plant Society rare species, and five species with no other records in Yolo County in the last 100 years (Ellen Dean, pers. comm.). As part of annual plant community monitoring by Point Blue Conservation Science (Point Blue), Corey Shake and field technicians have documented 75 species of plants at 5 randomly-selected 0.79-hectare plots in the oak savanna-dominated front fields of the ranch. Their species list includes 40 annual forbs and legumes, 19 annual grasses/rushes, 7 perennial forbs/tubers, 4 perennial grasses, 2 shrubs, and 2 trees. Nine of these species are listed as invasive by the California Invasive Plant Council. This data allows them to track trends in plant functional group composition at a specific sites over time (e.g., Fig. 4).

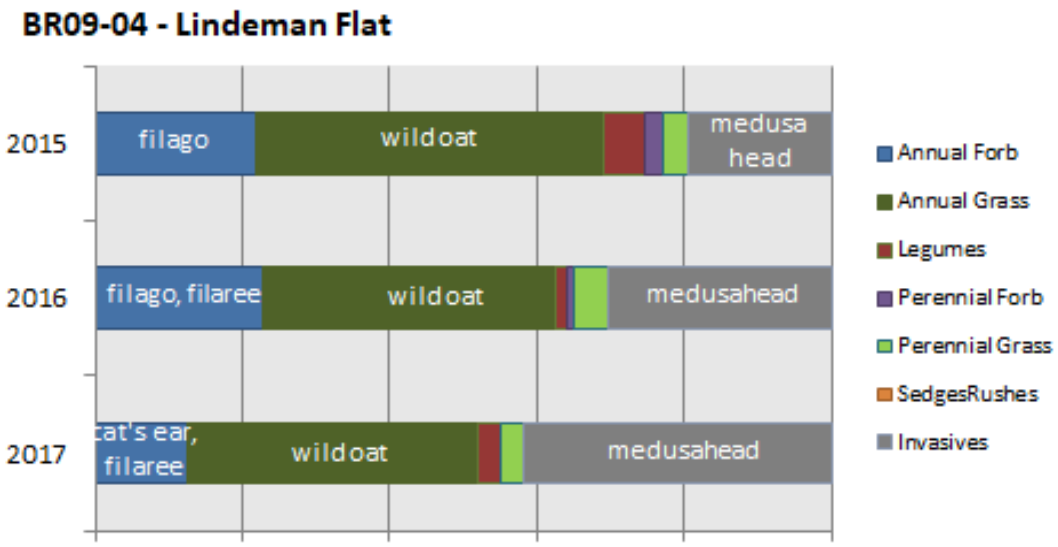

Figure 4. Composition of plant functional groups at a monitoring point in the Lindeman Flat area of Bobcat Ranch over 3 years. The common name of the most dominant 1 or 2 species is shown.

Geology, Soils, and Ecological Site Descriptions

Bobcat Ranch crosses an elevational and east-to-west gradient of geologic types from Quaternary alluvium and stream channel deposits in the lowest elevations to Late Cretaceous sedimentary rocks in the western and highest elevation half of the Ranch. The eastern half of low-lying hills is comprised of Pliocene Tehama Formation alluvium, with narrow strips or patches of Pliocene Putah Tuff and Miocene Putnam Peak Basalt (both igneous rocks originating miles away). No faults are mapped on the property, but small to medium faults are present within 1-3 miles of the property boundary.

Seventeen soil types are mapped by the Natural Resources Conservation Service Soil Survey on Bobcat Ranch, including clays, clay-loams, silty clay loams, gravelly- and rocky-loams, and rock land (Figure 5, USDA-SCS 1972). The texture of these soil types (i.e., their relative proportion of sand, silt, and clay) is an important characteristic that affects their sensitivity to the impacts of grazing on their more dynamic properties, like soil compaction and soil organic carbon content. For example, soils with high clay content may be more susceptible to compaction caused by livestock, especially when the soil is saturated with water. Therefore, we note the typical clay content of each soil type and see that, among the most abundant soil types, clay content is highest in the Sehorn series soils and lowest in the Corning, Positas, and Millsholm series soils (Table 2). We also note annual forage production in an average precipitation year as reported in the NRCS Web Soil Survey. This estimate gives some idea of the relative productivity of each soil type in aboveground biomass production each year and is used as the basis of the forage inventory of the ranch (see section below).

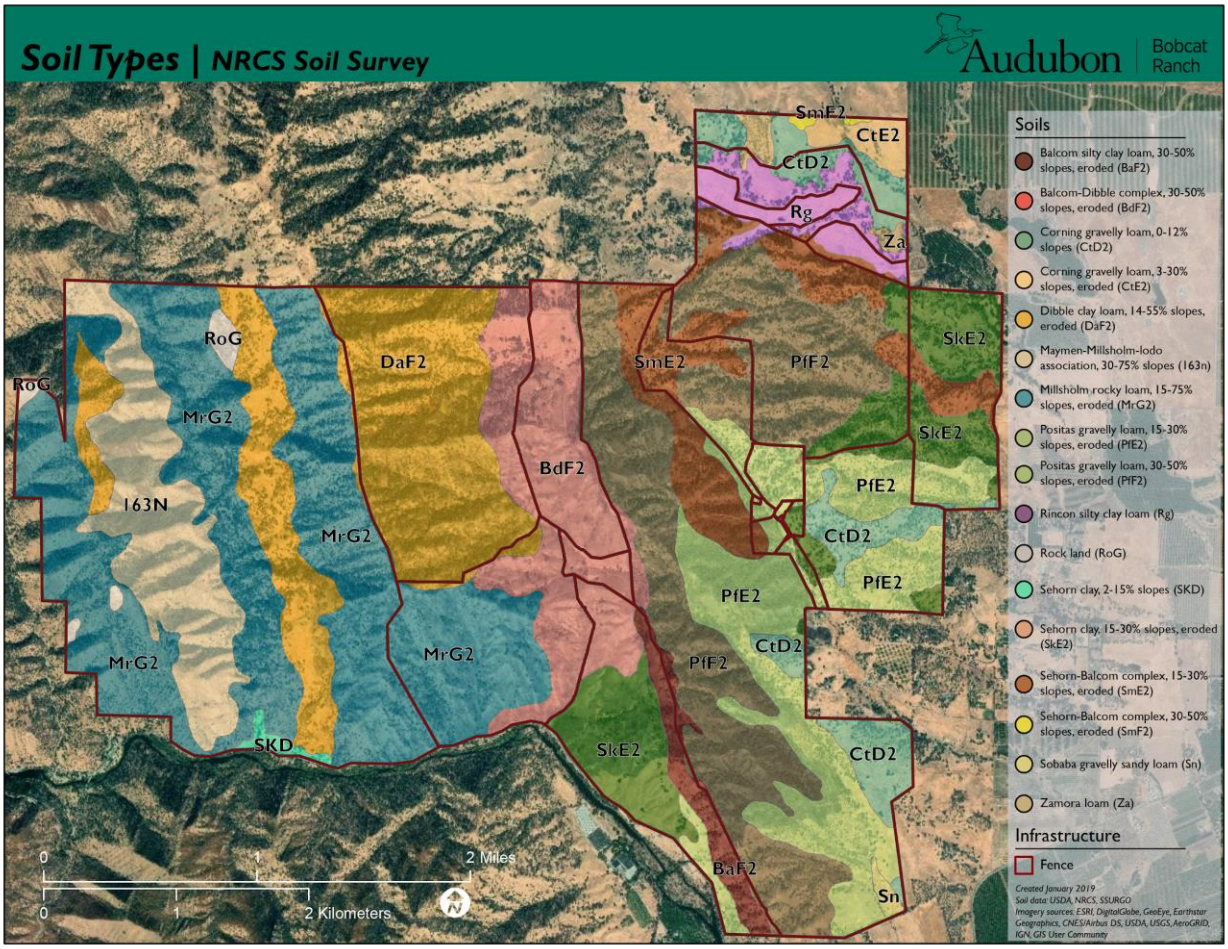

Figure 5. Map of NRCS Soil Survey soil types on the Bobcat Ranch with field and grazing unit boundaries shown.

Completed or provisional NRCS Ecological Site Descriptions (ESDs) are available for only 9 of the soil types, which are grouped into four ESDs: Clayey Hills (**R015XI001CA**), Steep Clayey Hills (**R015XF006CA**), Shallow Loamy (**R015XI006CA**), and Shallow Coarse Loamy (**R015XI002CA**, Table 2). Four soil types classified into the Claypan ESD (R015XE087CA, Corning and Positas gravelly loams) are not available in the NRCS ESD system, but rangeland site descriptions can be found in the Yolo County Soil Survey (similar but less detailed than ESDs). The soils and corresponding ESDs generally follow a rough geographic distribution with Claypan (comprising 30.6% of total ranch acreage) and Clayey Hills (23.6%) interspersed on the east half of the ranch and Steep Clayey Hills (13.7%), Shallow Loamy Hills (6.5%) and Shallow Coarse Loamy (22.2%) in the west half. The remaining 4 soil types have neither ecological or rangeland site descriptions, but comprise only 3.5% of the total ranch area (Rincon silty clay loam, Soboba sandy gravelly loam, Zamora loam, and rock land).

Table 2. Soil types mapped on Bobcat Ranch, grouped by Ecological Site Descriptions and associated plant community. For each soil type, the proportion of the total ranch acreage is provided, as well as the "representative value" of percent clay content in the top 0-10 cm and annual forage production in an average precipitation year in dry pounds per acre, as reported in the NRCS Web Soil Survey and Ecological Site Information System.

Ecological Site Description name	ESD plant community (common names)	Soil types	% of ranch area	% clay 0-10 cm	Avg. forage production (dry lbs./ac.)
Claypan	none defined by ESD, but probably: blue oak - California foothill pine / manzanita / brome - wild oat	Corning gravelly loam 2 to 15% slopes, eroded	4.3	17	1800
		Corning gravelly loam 15 to 30% slopes, eroded	1.0	17	1800
		Positas gravelly loam 15 to 30% slopes, eroded	11.1	20	2500
		Positas gravelly loam 30 to 50% slopes, eroded	14.1	20	2500
Clayey Hills	blue oak - California foothill pine / manzanita / brome - wild oat	Balcom silty clay loam 30 to 50% slopes, eroded	1.5	31	1800
		Balcom-Dibble complex 30 to 50% slopes, eroded	8.5	31	1800
		Sehorn clay 2 to 15% slopes	0.3	45	2000
		Sehorn clay 15 to 30% slopes, eroded	7.2	45	2000
		Sehorn-Balcom complex 15 to 30 % slopes, eroded	5.9	45	2000
		Sehorn-Balcom complex 30 to 50% slopes, eroded	0.1	45	2000
Steep Clayey Hills	blue oak - California foothill pine / whiteleaf manzanita / wild oat	Dibble clay loam 30 to 50% slopes, eroded	13.7	30	2900
Shallow Loamy	blue oak - California foothill pine / buckbrush - chamise / brome - barley	Millsholm rocky loam 15 to 75% slopes, eroded	22.2	24	1400
Shallow Coarse Loamy	blue oak / whiteleaf manzanita / brome	Maymen-Millsholm-Lodo assoc., 30 to 75% slopes	6.5	24	1400

None	none defined	Rincon silty clay loam	2.7	31	2500
		Rock land	0.5	--	1200
		Soboba gravelly sandy loam	0.2	10	1800
		Zamora loam	0.2	20	2500

The plant communities associated with all five of these ESDs or rangeland sites are characterized by blue oak (*Quercus douglasii*) savannas and woodlands with understories of annual grass and forbs and varying amounts of foothill pine (*Pinus sabiana*), interior live oak (*Quercus wislizeni*), buckeye (*Aesculus californica*) and native shrubs (manzanita [*Arctostaphylos* sp.], toyon [*Heteromeles arbutifolia*], buckbrush [*Ceanothus cuneatus*], and chamise [*Adenostoma fasciculatum*]). The two shallow loamy ESDs on the west end of the ranch have patches of chamise-dominated chaparral, particularly on south facing slopes or in shallow soils.

In addition to the generalized information for the soil survey mapped units, soil samples and field measurements have been taken by Point Blue Conservation Science staff to provide site-specific information on the diversity of soil textures and a few dynamic properties of these soils (i.e., soil organic carbon, water infiltration rate, and bulk density; Table 3). Soil texture at 10-40 cm depth at five monitoring points is most variable in clay content, ranging from 24.3 to 67.5% clay. These clay content numbers match relatively well with the clay content reported for their mapped soil type in the NRCS soil survey (compare Tables 2 and 3, except point BR04-08). Water infiltration time has averaged on the quick side for most sites (generally, <15 min), except at the Maxwell Flat point. Infiltration was exceptionally slow there in 2015, but data has yet to be collected again to verify the pattern. Bulk density (a measure of soil compaction) is near targets defined by NRCS for each soil type at all 5 points. Soil organic carbon ranges from 1.2 to 3.4% at 0-10 cm depth and 0.5 to 0.9% at 10-40 cm depth, and is probably most well correlated to tree cover at the site where samples were collected. The cause of variation in soil organic carbon between sample years is uncertain, but may be related to wildfire or drought.

Table 3. Soil texture and soil dynamic properties measurements at 5 soil monitoring points on Bobcat Ranch, collected between January 2015 and March 2018. Soil texture, water infiltration time, and bulk density are averaged across sample years and across 5 subsamples at each point, with full range of subsample values provided.

Field Name (Point No.)	Years sampled	Soil texture, 10-40 cm (avg. if >1 sample)	Infiltration time, avg. (minutes)	Bulk density, avg.	Soil organic carbon, range (%)

		% sand	*% silt*	*% clay*			*0-10 cm depth*	*10-40 cm depth*
Rattlesnake (BR03-02)	2015, 2018	23.1	30.6	46.3	1.3 (0.1 - 6.1)	1.14 (0.82 - 1.40)	1.7 - 3.4	0.7 - 0.8
Lindeman (BR04-08)	2015, 2018	38.1	23.8	38.1	14.7 (0.3 - 74.4)	1.20 (0.83 - 1.39)	1.4 - 2.0	0.4 - 0.9
Maxwell Flat (BR05-01)	2015	40	28.8	31.2	123.1 (79.8 - 223)	n/a	1.5	0.6
Lindeman (BR09-04)	2015, 2018	48.2	27.5	24.3	11.4 (0.8 - 24.6)	1.28 (0.93 - 1.54)	1.7 - 1.8	0.5 - 0.6
Highway (BR10-05)	2015, 2018	10	22.5	67.5	4.2 (0.3 - 17.5)	1.18 (1.00 - 1.25)	1.2 - 1.3	0.5

The state-and-transition models for each of the Ecological Site Descriptions show similar transitions and disturbances. Though they have generally retained their woody plant species components, all of them have transitioned from a historic state dominated by native herbaceous plants in the understory to a reference state dominated by introduced annual grasses in the understory. Transitions from oak woodland/savanna to open annual grasslands can result from mechanical or chemical tree removal, poor oak regeneration, or catastrophic fire. One or more of these disturbances may have been a factor in the Rattlesnake and Highway fields in the last century or two, where blue oak cover seems uncharacteristically low.

Similarly, the abundance and maturity of shrubs in these ESDs is moderated primarily by fire and grazing/browsing (though aspect, soil type/depth, and other site-specific factors play an important role). Increased frequency and intensity of these disturbances can reduce shrub density. However, since most of these shrubs are fire-adapted, periodic fire may be important to stimulate rapid growth or seed germination. This is especially true of chamise-dominated chaparral, where transitions back to annual grassland are unusual, but have been documented in some places with frequent fire and heavy grazing or browsing by goats.

Transition from annual grassland to oak woodland in these ecological sites is rare by natural processes, mostly because of the difficulty of natural regeneration of oaks. Artificial regeneration practices (i.e., restoration) may be necessary to make this transition. On the other hand, replacement of grassland by chaparral can be facilitated by protection from fire and grazing, especially on exposed, south-facing slopes.

Forage Inventory and Grazing Capacity

A previous forage inventory and associated estimates of stocking density and ranch carrying capacity were completed by NRCS and University of California Cooperative Extension (UCCE) for Bobcat Ranch in 2009 (Doran and Gallagher 2009). Due to shifting field boundaries and rangeland conditions, and a desire to simplify the estimates of forage availability, we chose to do our own forage inventory. We relied heavily on Doran and Gallagher's (2009) methods and input, and are grateful for their effort.

The forage inventory herein considers production of herbaceous plant biomass, which is the vast majority of what is consumed by the cattle that graze the Ranch. Herbaceous annual plants are by far the most abundant component of the available forage, but in limited areas of the ranch, perennial grasses and forbs contribute significantly to the total forage production. Sampling at non-random monitoring points in the Lindeman and Front fields, Doran and Gallagher (2009) estimated plant composition by weight, and found native bunchgrasses (mostly *Stipa pulchra*) to be as high as 45% in one steep, north-facing site. Visual estimates of plant cover within 50 m of 20 randomly-distributed monitoring points in the Lindeman, Highway, and Rattlesnake fields in 2014 averaged 12% perennial grass cover (range: 0-50%) and 1% perennial forb cover (range: 0-8%). Most of the biomass production occurs during the approximately 8-month green season in this Mediterranean climate. However, their annual productivity is highly variable and largely dependent on the amount and timing of precipitation and on the amount of residual dry matter (RDM) remaining at the onset of the growing season. Fluctuations in these factors make prediction of forage production and livestock carrying capacity difficult (Becchetti et al. 2016).

Rather than trying to provide estimates of production and carrying capacity for favorable, normal, and unfavorable years as is often done, we focus more on the relative productivity of one field to another based on best available estimates of productivity by soil type. We did account for the limitations of topography on cattle's ability to use available forage (see below), but we did not factor in discounts in forage production due to conditions observed in the field (e.g., composition of non-palatable weeds) or due to field size and water availability limitations. For these reasons, we acknowledge that our estimates of production and stocking densities probably do not reflect the full picture and suggest that they only be used as a comparison point to in-field observations of yearly grazing impacts during and after grazing. We also stress the importance of factoring in how accessible each field is for cattle and how that affects their ability to utilize all of the available forage.

We used forage production estimates by soil type for a "normal" year from Doran and Gallagher (2009) which were cited as coming from the Yolo County Soil Survey (Table 2). We then determined field acreage and the proportion of each soil type within each field in a GIS. We assumed that only 90% of the total forage produced was suitable for livestock consumption (due to palatability and urine/dung losses) across all fields. We then very generally factored in topography by assuming that only 95% of the remaining forage was accessible in the lower, flatter grazing units (Maxwell, Jacks, Shipping,

Cottonwood, and Headquarters), 90% was accessible in the central, somewhat steeper units (Lindeman, Highway, Rattlesnake), and 85% in the western-most and steepest ungrazed units (Upper and Lower Black Rocks and Thompson/Bray Canyon). We assumed that all fields would be managed to leave 1000 lbs./acre of residual dry matter each year, and discounted that from forage availability estimates. Last, to translate forage availability to animal unit months (AUMs) we assumed that one animal unit equivalent (AUE, i.e., a 1000-lb. cow) will consume 3% of their body weight daily, or 900 lbs. of dry forage per month. Because larger frame cows are commonly used on the Ranch, we adjusted our calculations of AUMs based on 1.3 AUEs.

Overall, our estimate of AUMs available on the currently grazed portion of the ranch is 2879, which can be thought of as 360 cow-calf pairs (1.3 AUEs) grazing for 8 months (Table 4). The range of stocking rates by field range from 0.31 AUMs/acre to 1.05 AUMs/acre and average 0.79 AUMs/acre for the grazed portion of the ranch. With its steepness and less productive soils, the ungrazed portion of the ranch has an estimated capacity of 1588 AUMs and average stocking rate of 0.50 AUMs/acre. For demonstration purposes, we also estimated the total time that a 300-head herd of cow-calf pairs (or two 150-head herds) could spend in each field per grazing season in an average forage production year based on available AUMs.

Table 4. Estimated stocking density (Animal Unit Months, or AUMs) and stocking rate (AUMs/acre) by field for Bobcat Ranch in an average forage production year for cow-calf pairs that are 1.3 Animal Unit Equivalent (AUE). Note that variation in forage quality and forage accessibility by field is not fully factored into these estimates and should be considered.

Field name	Acres	AUMs Available	AUMs/Acre	Time available for herd of 300 cow-calf pairs (months)
Maxwell complex	377	297	0.79	1.0
Upper Jack	549	481	0.88	1.6
Lower Jack	271	193	0.71	0.6
Front	285	237	0.83	0.8
Alleyway	150	129	0.86	0.4
Headquarters complex	80	74	0.93	0.2
Lindeman/House	1285	1110	0.86	3.7
Rattlesnake	234	114	0.49	0.4
Cottonwood	33	19	0.58	0.1

Highway	377	224	0.59	0.7
Upper Black Rocks	678	713	1.05	2.4
Lower Black Rocks	428	133	0.31	0.4
Thompson/Bray Canyon	2085	741	0.36	2.5
Ranch, ungrazed[1]	3199	1588	0.50	5.3
Ranch, grazed[2]	3643	2879	0.79	9.6
Ranch, total	6842	4467	0.65	>12

[1]Includes Upper and Lower Black Rocks and Thompson/Bray Canyon fields.

[2]Includes all other fields not named in note above.

Grazing Management

Grazing Units

Bobcat Ranch currently has 3,643 grazeable acres, while the remaining 3,199 acres lack the infrastructure (water and fences) to responsibly contain and sustain livestock. The currently grazed portion of the property is divided into seven Grazing Units (Maxwell, Jack, Headquarters, Shipping, Lindemann, Highway, and Cottonwood), some of which contain several fields (Fig. 6). These groups are most easily grazed together as Units due to: water availability, ease of herd movement, and calving ground preference. There are a total of 15 fields (5 of which are less than 40 acres), which are grouped into the larger Grazing Units.

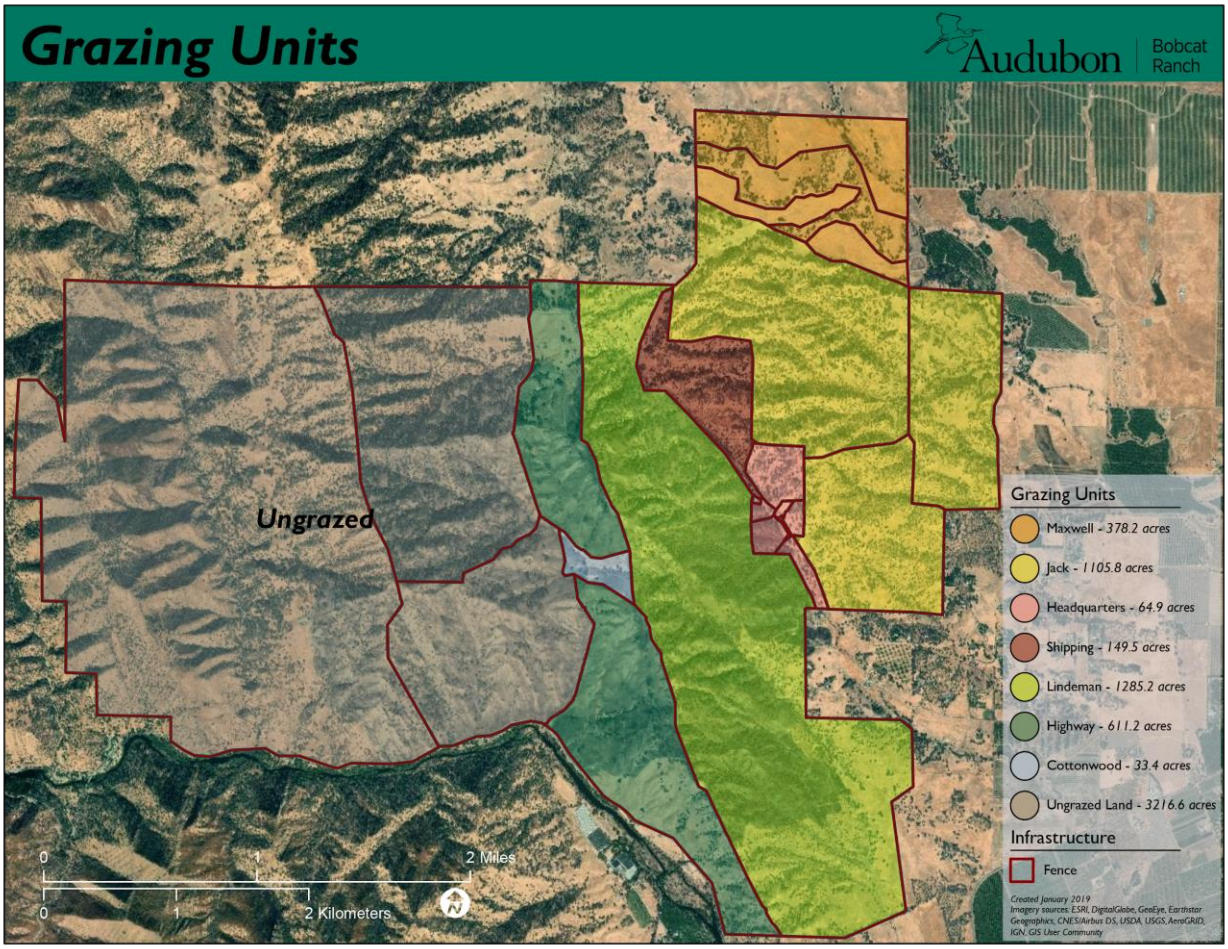

Figure 6. The eight primary Grazing Unit boundaries on Bobcat Ranch and existing functional fencing that separates each Unit or fields within Units.

Current Grazing System

Due to the moderate variability in forage production (1800 lbs/acre to 2900 lbs/acre), terrain, and water availability, a simple, moderate-to-low intensity rotational grazing system has been most successful and efficient in recent years. Grazing has typically occurred from mid-October to mid- June, with shipping coinciding with the onset of the fire season (July). At the beginning of each grazing season, a general rotation plan is developed based on the previous years' standing dry feed, current water availability and forage losses due to wildfires. This plan aims for 2-3 months of rest for each Grazing Unit, and anywhere from 2 weeks to 2 months of active grazing time for each Unit (dependent on rainfall, standing dry forage, water availability, and timing with respect to calving). Grazing Unit conditions are monitored visually on a weekly basis to determine herd movement, with an emphasis on maintaining an optimal Residual Dry Matter of 800-1000 lbs./acre. All management decisions related to grazing duration, timing, and density are contingent upon the current condition of gazing infrastructure, as detailed in Figure 7 below.

Stock Type and Herd Size

In recent years, the Ranch has supported between 175-250 Angus Cow/calf pairs, depending on rainfall, forage conditions/production and possible feed losses due to wildfires. Grazing has been achieved via two separate herds allowing for easier herd movement, higher potential for adapting cattle movement on short notice, lighter pressure on Ranch infrastructure, and grazing efficiency.

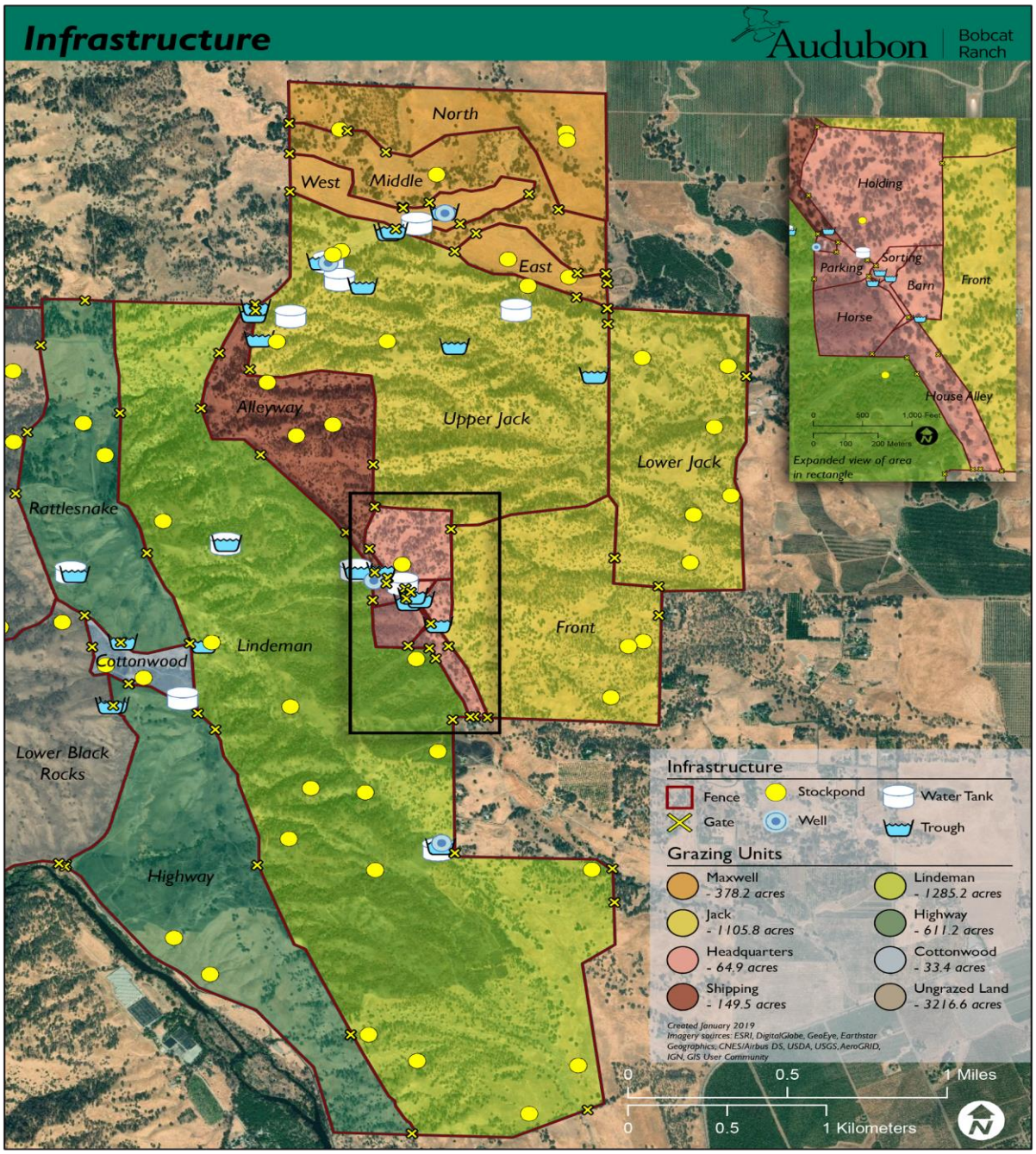

Figure 7. Grazing Infrastructure on the grazed portion of Bobcat Ranch with individual field names labeled.

Priority Bird Focal Species

For our priority bird focal species list, we referenced focal species lists created by California Partners In Flight (CalPIF) and Central Valley Joint Venture (CVJV) bird conservation plans for California's grasslands, oak savanna, and oak woodlands (CPIF 2002, CPIF 2000, Digaudio et al. 2017). We also used five years of breeding bird count data collected at Bobcat Ranch by Point Blue Conservation Science to inform priority species selection. With those information sources, we considered the following parameters to finalize our list of priority species:

- **Present and common:** are the species present at Bobcat Ranch? Are they common enough to gauge shifts in population density or occupancy relative to rangeland management changes?
- **Easy to monitor:** are the species readily detectable and relatively easy to monitor?
- **Well-distributed:** are the species found throughout significant parts of the California to make their use as a focal species relevant and comparable for other ranches?
- **Sensitive to grazing:** are the species sensitive to different grazing regimes or the ecological impacts of grazing in general?
- **Representative:** Does the set of species on the list represent the full spectrum of habitat elements and space use needs for nesting, foraging, and other critical activities of grassland and oak woodland birds. We specifically focused on activities or habitat elements that may be affected by grazing, including nesting in grass, shrubs, or tree cavities and foraging on the ground or in grass.

We selected ten priority species that best fit these criteria and summarized their migratory status and a few key habitat requirements (Table 5). To our knowledge, only one of the ten priority focal species we chose are listed by any organization as special conservation status species, the Grasshopper Sparrow (Shuford and Gardali 2008), and others are known to have experienced recent population declines in California (e.g., American Kestrel). We drew from both of the aforementioned bird conservation plans and other literature on the species to highlight the management considerations for each species that are most relevant to Bobcat Ranch, which are listed below the species lists.

We also identified a set of species that didn't satisfy all of the criteria listed above, but for which monitoring of their abundance or occupancy on the Ranch would be insightful. Some of these "secondary" species are simply not abundant enough or well-distributed across the Ranch to gauge shifts in their population densities (e.g., Rufous-crowned Sparrow), but tracking their presence or absence across the ranch may be useful. This is especially important for a few species of conservation concern that are usually present on the ranch, but very sparsely distributed (e.g., Northern Harrier, Loggerhead Shrike, and Yellow-billed Magpie).

Table 5. Priority bird species for Bobcat Ranch and some of their life history characteristics and plant community associations.

Species Common Name ***Scientific Name***	**Migratory Status**	**Nest substrate**	**Habitat and vegetation associations**
California Quail *Callipepla californica*	Resident	Ground	Oak woodland and riparian with shrub or vine understory
American Kestrel *Falco sparverius*	Resident	Cavity (secondary)	Grasslands and oak savannah
Red-tailed Hawk *Buteo jamaicensis*	Resident/ migrant	Tree	Grasslands and oak savannah
Acorn Woodpecker *Melanerpes formicivorus*	Resident	Cavity (primary)	Oak savannah or woodland
California Scrub-Jay *Aphelocoma californica*	Resident	Shrub, Low Tree	Oak woodland and riparian with shrub or vine understory
Western Kingbird *Tyrannus verticalis*	Migrant	Tree, Built Structures	Oak savannah or woodland edges
Western Bluebird *Sialia mexicana*	Resident	Cavity (secondary)	Oak savannah and woodland, often forages in open areas or grassland edge
Lark Sparrow *Chondestes grammacus*	Resident	Ground	Oak savannah and woodland edges, uses trees for foraging and singing
Grasshopper Sparrow *Ammodrammus savannarum*	Migrant	Ground	Open grasslands
Western Meadowlark *Sturnella neglecta*	Resident	Ground	Relatively open grassland, perches in trees to sing

Secondary Bird Focal Species

1. Northern Harrier
2. Mourning Dove
3. Nuttall's Woodpecker
4. Northern Flicker
5. Loggerhead Shrike
6. Black-billed Magpie
7. California Towhee
8. Rufous-crowned Sparrow
9. Lesser Goldfinch

Special Management Considerations for Priority Bird Focal Species

All photos were generously provided by Tom Grey (tgreybirds.com)

California Quail

- *Retain and restore shrubs and downed wood, especially in priority habitat corridors.*
- *Maintain a healthy, diverse herbaceous layer for nesting and production of food for chicks.*

American Kestrel

- *Maintain a healthy and diverse herbaceous layer to support the rodent populations they rely on for prey.*
- *Retain snags and other cavity trees (esp. mature oaks, cottonwoods, willows, and grey pines).*

Red-tailed Hawk

- *Maintain a healthy and diverse herbaceous layer to support the rodent populations that these hawks rely on for prey.*
- *Do not use rodenticides to manage rodent populations, especially anticoagulants.*

Acorn Woodpecker

- *Retain and restore acorn producing oaks.*
- *Retain granary trees, snags, and cavity trees (esp. mature oaks, cottonwoods, willows, and grey pines).*

California Scrub-Jay

- *Retain and restore shrubs, sapling trees, vines, and downed wood, especially in priority habitat corridors.*
- *Retain and restore acorn producing oaks.*

Western Kingbird

- *Maintain a healthy and diverse herbaceous layer to support the insects that these birds rely on for prey.*
- *Retain large mature trees for nesting and foraging.*

Western Bluebird

- *Maintain a healthy and diverse herbaceous layer to support the insects that these birds rely on for prey.*
- *Retain large mature trees and snags for nesting cavities.*

Lark Sparrow

- *Maintain a healthy and diverse herbaceous layer to provide nesting cover and to support the insects and plants that these birds rely on for food.*

Grasshopper Sparrow

- *Maintain a healthy and diverse herbaceous layer to provide nesting cover and to support the insects and plants that these birds rely on for food.*
- *Where native bunchgrasses are present, manage to maintain or increase these important habitat features, along with forb diversity.*

Western Meadowlark

➢ *Maintain a healthy and diverse herbaceous layer to provide nesting cover and to support the insects and plants that these birds rely on for food.*

Goals and Objectives

PRIORITIZATION KEY: PRIMARY SECONDARY

Over-arching goals and sub-goals are listed by Roman numerals and numbers; specific objectives and strategies are listed below these goals. Prioritization is based on two metrics; 1) Primary Goals are goals which are necessary to the continued functionality of the day-to-day and annual management of the property, and 2) Secondary Goals reflect goals which are not explicitly necessary to the functionality of the Ranch, but which are desired for other reasons - namely increased biodiversity and ecological health and resiliency.

Where goals will likely have beneficial impacts on focal bird species, those bird species are listed in parentheses in red.

All of these goals and objectives are distilled into quick reference tables for grazing management actions (Table 6) and annual action plans (Tables 7-9) in the following section.

I. Increase staff capacity, tools and infrastructure to adequately support Habitat Management Plan goals

1. Increase staff capacity.

   a. Objective: Hire a part-time Ranch Management Assistant position by 2020.

      i. Strategy: Develop two additional sources of long-term funding to help support the Ranch Management Assistant position by 2020.

2. Develop adequate water and fencing in each field.

   a. Objective: Where absent, develop year-round livestock watering sources in priority fields by 2023.

      i. Strategy: Develop an appropriate annual budget for livestock water development projects and an implementation plan for water projects in Maxwell Flat Field(s), Lower Jack Field, and the Front Field (2020).

b. Objective: Where inadequate (not cow-tight), replace priority perimeter fence alignments by 2023.

ii. Strategy: Develop an appropriate annual budget for livestock fence improvement and new construction and an implementation plan for top priorities (2020).

c. Objective: Implement one top priority project identified in Strategy i. and Strategy ii. in 2021 and 2022.

3. Develop and acquire an adequate set of tools for ranch management and restoration.

a. Objective: Replace worn out equipment, and acquire new tools to adequately support Habitat Management Goals and increased staff capacity.

i. Strategy: Inspect current equipment condition(s) and create a 3-year plan for replacement (2020).

II. Manage wildfire risk to better approximate historical fire regimes and reduce negative ecological consequences.

1. Implement prescribed burns in priority areas (areas with a high concentration of non-natives vegetation species, and areas which have not burned for 10+ years).

a. Objective: Develop a Vegetation Management Plan (VMP) with CalFire (2020), which will identify top priority locations for prescribed burns.

b. Objective: Implement (1) priority burn in 2021 and 2022, as identified in the VMP.

2. Utilize high-density stocking rate in field(s) with a high risk of ignition potential.

    a. Objective: Graze the Highway Field in late Spring, with high-intensity, moderate duration, to reduce fuel loads each year (2020-2023).

III. Maintain optimum soil health and function through management and restoration.

1. Maintain annual levels of bare ground and residual dry matter that optimize soil health. (California Quail, Lark Sparrow, Western Meadowlark)

    a. Objective: Avoid leaving more than 15% bare ground cover at any time of year (based on data collected on ranch and correlating RDM and ground cover in similar Sierra Foothills rangeland [Ralls et al. 2018, Table 2]). Small areas where animals must be concentrated for livestock movement, feeding, and handling purposes (e.g., corrals, narrow gates, and small holding fields) are an exception.

    b. Objective: Maintain residual dry matter prior to the first rains of each wet season at or above a minimum target of 700 lbs. per acre, with an optimal range of between 800 and 1200 lbs./acre to maximize both forage production and plant species richness (Bartolome et al. 2006).

2. Minimize and repair erosion, especially in areas where erosion may negatively impact infrastructure or important vegetation communities.

a. Objective: Minimize sheet and rill erosion by maintaining residual dry matter at or above targets each year (Objective 1.b, above).

b. Objective: As they are observed during regular ranch activities, write down gully and streambed erosion problems that threaten infrastructure and/or plant communities. Evaluate this list at least every half year and address them as necessary and feasible.

   i. Strategy: To reduce impacts of gully and streambed erosion, use affordable, on-site, or living materials and innovative designs.

3. Improve soil dynamic properties (soil organic carbon, water infiltration, and bulk density).

   a. Objective: Manage grazing annually to maintain adequate residual dry matter and soil cover and to maintain or increase cover of perennial grasses (see III.1 and IV.4).

   b. Objective: Increase natural regeneration of woody plants or actively plant them in strategic locations (see IV.1 and IV.2)

   c. Objective: Manage grazing annually to optimize both the diversity of herbaceous plant functional groups (e.g., perennial forbs, annual legumes, and perennial grasses) and the quality of the forage (e.g., high nutrient content and extended green season plants) (see IV.3 and IV.4).

   d. Objective: Manage grazing annually to reduce soil compaction and improve soil structure.

      i. Strategy: To the extent possible, avoid grazing flatter fields with higher clay content (Highway, Cottonwood, Rattlesnake, Lower Jacks, Maxwell [except north field]) in the wettest months (December-February). Instead, where water is available, graze these in late fall and spring.

IV. Manage and restore plant communities that maximize native plant biodiversity and ecological function.

1. Increase upland and riparian shrub abundance and diversity in critical areas on the landscape for connectivity between existing shrub habitat patches. (California Quail, California Scrub-Jay)

   a. Objective: Map shrub abundance and recruitment at a field scale and identify priority areas for shrub enhancements or special grazing regimes by spring 2020.

   b. Objective: Protect natural regeneration of upland and riparian shrubs using browse protection, electric or permanent fencing, and/or grazing management in priority enhancement areas each year.

      i. Strategy: When feasible, install browse protection tubes or fencing on naturally regenerated seedlings in priority areas.

      ii. Strategy: When feasible, install or realign cross fencing to improve ability to manage grazing in priority areas.

iii. Strategy: Adjust grazing timing and intensity annually to reduce impacts on shrub seedlings and mature shrubs in priority areas.

c. Objective: Plant and establish native shrubs and trees in at least one priority area by 2022.

i. Strategy: Secure funding and then plant site-appropriate and climate-smart shrubs and trees with irrigation system tied to livestock water in a priority area.

2. Increase blue, valley, and live oak recruitment in existing oak habitats throughout the ranch. (American Kestrel, Acorn Woodpecker, California Scrub-Jay, and Western Bluebird)

a. Objective: Map oak recruitment and size-classes based on 2010 inventory data, revisit and classify a subset of the original 100 sampling plots, and identify priority areas for oak enhancements or special grazing regimes by spring 2020.

b. Objective: Protect natural regeneration of oaks using browse protection, fencing, and/or grazing management in priority enhancement areas each year.

i. Strategy: When feasible, install browse protection tubes or fencing on naturally regenerated oak seedlings in priority areas.

ii. Strategy: When feasible, install or realign cross fencing to improve ability to manage grazing in priority areas.

iii. Strategy: Adjust grazing timing and intensity annually to reduce impacts on oak seedlings and saplings in priority areas.

c. Objective: Plant and establish oaks in at least one priority area by 2022.

i. Strategy: Secure funding and/or grow acorns in-house and then plant saplings with adequate browse protection in a priority area.

3. Maintain or increase diversity and abundance of native annual and perennial flowering forbs. (California Quail, Red-tailed Hawk, Western Kingbird, Western Bluebird, Lark Sparrow, Western Meadowlark)

a. Objective: Graze all or most units annually in winter and early spring (December - April) to benefit native annual forb diversity (Stahlheber and D'Antonio 2013). To the extent possible, this objective should be in balance with soil health grazing objectives (residual dry matter, bareground, and soil compaction, III.1.a-b and III.3.d)

b. Objective: In grazing units with significant populations of perennial forbs, especially less common species (e.g., soap plant [*Chlorogalum pomeridianum*]), avoid heavy grazing that could impact flowering and limit their reproductive potential.

4. Maintain or increase existing stands of native perennial grasses. (California Quail, Red-tailed Hawk, Lark Sparrow, Western Meadowlark)

a. Objective: In grazing units with significant stands of native perennial grasses (e.g., Maxwell, Lindeman, Jacks, and Alleyway), employ a rotational grazing system annually that provides for at least 4 weeks of rest (no grazing) following grazing during the growing season, avoids grazing below an average stubble height of 5-10 cm during the growing season, and removes standing litter during the dry season (George et al. 2013).

b. Objective: To the extent possible, avoid grazing in units with significant stands of native grasses during the flowering season of purple needlegrass (*Stipa pulchra*, April-May) for several consecutive years (George et al. 2013).

V. Limit the negative ecological consequences of invasive, introduced, or encroaching species.

1. Maintain or reduce current abundance and distribution of invasive plant species. (California Quail, Red-tailed Hawk, Lark Sparrow, Western Meadowlark)

    a. Objective: Reduce or eliminate populations of invasive species in highly disturbed locations on the Ranch (corrals, Headquarters area, parking lot, Front Alley field) by 2023.

        i. Strategy: Remove invasive plants using mowing, hand removal, or prescribed grazing by a small herd of sheep or goats.

2. Use prescribed fire where feasible to reduce populations of invasive or undesirable vegetation.

    a. Objective: Identify and incorporate prescribed burns in priority areas for invasive species treatment in CalFire Vegetation Management Plan by 2021.

VI. Monitor aspects of soil health, plant communities, bird populations, and grazing management to assess attainment of goals and to inform changes in management.

1. Monitor key habitat elements at the grazing unit scale infrequently, including: residual dry matter, bare ground, oak and shrub cover and recruitment, notable patches of perennial forb, perennial grass, and invasive species, and annual cattle numbers and movements.

    a. Objective: Note and record an average and range visual estimate of residual dry matter and bare ground of each grazing unit annually, either when cattle are moved out of a grazing unit or in late summer or fall prior to first germinating rain.

    b. Objective: Revisit a subset of plots from the 2010 tree inventory to evaluate oak and shrub recruitment and densities by late summer 2020.

    c. Objective: Opportunistically note in the field and map significant populations of perennial forbs, perennial grasses, and invasive species during other monitoring or ranch activities, and compile these observations annually.

    d. Objective: After the end of each grazing season (usually May-June), compile information on cattle numbers, class, and timing of movements in and out of grazing units.

        i. Strategy: Ranch manager and lessee will be jointly responsible for keeping track of these numbers, which can then be reported to and compiled by Point Blue Partner Biologist.

2. Monitor soil dynamic properties, plant communities, and bird populations at points already established for long-term ranch monitoring.

    a. Objective: Every 3 to 5 years in winter (December - mid-March), collect data and samples for soil compaction (bulk density and water infiltration), soil organic carbon, and soil texture per Point Blue's Rangeland Monitoring Network protocol.

    b. Objective: In years when soil is sampled or as frequently as yearly (depending on objective and suspected trends) and when vegetation is near peak standing biomass (May - June) measure plant communities along line-point intercept transects and 50-m radius species search plots per Point Blue's Rangeland Monitoring Network protocol.

    c. Objective: At least every other year in spring (mid-April - early-June), conduct bird counts at points and areas previously established per Point Blue's Point Count and Area Search protocols to estimate occupancy and/or density of all breeding bird species, but at the least, for priority and secondary bird focal species.

    d. Objective: By early spring 2020, evaluate if current point locations and sample sizes are adequate to assess long-term impacts of management on soil, plants, and birds.

    e. Objective: By March 2020, complete assessment of opportunities to develop a bird of prey count protocol and program for the ranch that would utilize volunteers.

3. On a regular basis, share raw data, communicate the results of monitoring efforts, discuss successes and challenges, and adapt management strategies among ranch manager, grazing lessee, and partners involved in monitoring.

    a. Objective: Data collected on the ranch should be provided to or accessible by the ranch manager, or otherwise be made available upon request.

    b. Objective: At least once every year, a report of monitoring results should be written and shared with the ranch manager, and discussed with the grazing lessee. It is the ranch manager's discretion who attends the annual meeting or other meetings with the grazing lessee.

Table 6. This table highlights all management and monitoring actions that are relevant to grazing management decisions by and between the ranch manager and the grazing lessees. These guidelines are intended to provide an accessible reference for annual grazing planning and meetings and come directly from the Goals and Objectives.

Grazing Management Quick Reference Guide	
Goal Category (Goal No. Ref.)	**Targets**
Infrastructure (I.2, I.3)	➢ Develop year round water sources and fencing in priority grazing units ➢ Inventory and strategically replace equipment and tools
Wildfire Risk (II.2)	➢ Concentrate livestock in or next to areas with high wildfire ignition potential to reduce fuels in late spring (e.g., Highway field)
Soil Health (III.1, III.3)	➢ Avoid >15% bare ground ➢ Residual dry matter (RDM) between 800 - 1200 lbs./ac., no < 700 lbs./ac. ➢ When possible, avoid grazing units with heavy clay soils in the wettest months (Highway, Cottonwood, Rattlesnake, Lower Jacks, Maxwell)
Plant Communities (IV.1-4)	➢ Provide browse protection to young/planted shrubs/trees, where feasible ➢ Graze all units in winter and early spring for annual forb diversity ➢ For units with abundant needlegrass, during the growing season: o Stay above 2” stubble height o Give at least 4 weeks rest o Avoid grazing during peak flowering (April-May)
Invasive Species (V.1)	➢ When available, use small livestock or electric fencing on cattle to target small areas with invasive plants
Monitoring	➢ Record RDM and bare ground average/range by unit at end of season ➢ Each year, record cattle numbers and movements by grazing unit

Table 7. Management and monitoring actions planned for 2020, which can all be found in HMP goals and objectives.

Management Action Plan: 2020	
Goal Category (Goal No. Ref.)	**Targets**
Staff Capacity, Infrastructure, and Tools	➢ Hire a part-time Ranch Management Assistant ➢ Develop two additional sources of long-term funding ➢ Develop plan and budgets for livestock water and fence projects ➢ Inspect current tools and develop 3-yr replacement plan
Wildfire Risk	➢ Develop a Vegetation Management Plan (VMP) with CalFire ➢ Graze the Highway Field in late spring to reduce fuel loads
Soil Health	➢ Avoid >15% bare ground ➢ Residual dry matter (RDM) between 800 - 1200 lbs./ac., no < 700 lbs./ac. ➢ When possible, avoid grazing units with heavy clay soils in the wettest months (Highway, Cottonwood, Rattlesnake, Lower Jacks, Maxwell)
Plant Communities	➢ Identify areas for shrub and oak restoration or special grazing ➢ Provide browse protection to young/planted shrubs/trees, where feasible ➢ Graze all units in winter and early spring for annual forb diversity ➢ For units with abundant needlegrass, during the growing season: ○ Stay above 2” stubble height ○ Give at least 4 weeks rest ○ Avoid grazing during peak flowering (April-May)
Invasive Species	➢ When available, use small livestock or electric fencing on cattle to target small areas with invasive plants
Monitoring	➢ Record RDM and bare ground average/range by unit at end of season ➢ Each year, record cattle numbers and movements by grazing unit ➢ Map shrub and oak recruitment and density by late summer ➢ Determine feasibility of volunteer bird of prey count program by March ➢ Complete annual soil, plant, and bird surveys for long-term monitoring, and assess adequacy of monitoring program ➢ Meet annually to discuss the season’s monitoring results

Table 8. Management and monitoring actions planned for 2021, which can all be found in HMP goals and objectives.

Management Action Plan: 2021	
Goal Category (Goal No. Ref.)	**Targets**
Staff Capacity, Infrastructure, and Tools	➢ Develop one priority watering source or fence (planned in 2020) ➢ Replace tools according to plan from 2020
Wildfire Risk	➢ Implement one priority burn developed in VMP ➢ Graze the Highway Field in late spring to reduce fuel loads
Soil Health	➢ Avoid >15% bare ground ➢ Residual dry matter (RDM) between 800 - 1200 lbs./ac., no < 700 lbs./ac. ➢ When possible, avoid grazing units with heavy clay soils in the wettest months (Highway, Cottonwood, Rattlesnake, Lower Jacks, Maxwell) ➢ Consider implementing priority erosion control project
Plant Communities	➢ Provide browse protection to young/planted shrubs/trees, where feasible ➢ Consider implementing all or part of priority tree/shrub planting ➢ Graze all units in winter and early spring for annual forb diversity ➢ For units with abundant needlegrass, during the growing season: o Stay above 2” stubble height o Give at least 4 weeks rest o Avoid grazing during peak flowering (April-May)
Invasive Species	➢ When available, use small livestock or electric fencing on cattle to target small areas with invasive plants ➢ Incorporate invasive species into prescribed burn planning with CalFire
Monitoring	➢ Record RDM and bare ground average/range by unit at end of season ➢ Each year, record cattle numbers and movements by grazing unit ➢ Complete annual soil, plant, and bird surveys for long-term monitoring ➢ Meet annually to discuss the season’s monitoring results

Table 9. Management and monitoring actions planned for 2022, which can all be found in HMP goals and objectives.

Management Action Plan: 2022	
Goal Category (Goal No. Ref.)	**Targets**
Staff Capacity, Infrastructure, and Tools	➢ Complete implementation of priority watering sources or fences ➢ Replace tools according to plan from 2020
Wildfire Risk	➢ Implement one priority burn developed in VMP ➢ Graze the Highway Field in late spring to reduce fuel loads
Soil Health	➢ Avoid >15% bare ground ➢ Residual dry matter (RDM) between 800 - 1200 lbs./ac., no < 700 lbs./ac. ➢ When possible, avoid grazing units with heavy clay soils in the wettest months (Highway, Cottonwood, Rattlesnake, Lower Jacks, Maxwell) ➢ Consider implementing priority erosion control project
Plant Communities	➢ Provide browse protection to young/planted shrubs/trees, where feasible ➢ Complete implementation of priority oak and shrub plantings ➢ Graze all units in winter and early spring for annual forb diversity ➢ For units with abundant needlegrass, during the growing season: ○ Stay above 2” stubble height ○ Give at least 4 weeks rest ○ Avoid grazing during peak flowering (April-May)
Invasive Species	➢ When available, use small livestock or electric fencing on cattle to target small areas with invasive plants ➢ Complete any priority weed management projects ➢ Implement one prescribed burn for invasive species, if priority
Monitoring	➢ Record RDM and bare ground average/range by unit at end of season ➢ Each year, record cattle numbers and movements by grazing unit ➢ Complete annual soil, plant, and bird surveys for long-term monitoring ➢ Meet annually to discuss the season’s monitoring results

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