2

Existing Conditions

2 EXISTING CONDITIONS

Mouth of the Russian River, Source: EDAW 2003

2.1 SUMMARY OF PARK CONDITIONS AND RESOURCES

2.1.1 EXISTING LAND USE

CLASSIFICATION

Sonoma Coast SB is part of the California State Parks System and is classified as a State Recreation Unit pursuant to Section 5019.56 of the California Public Resources Code (PRC). Under this classification State Beaches are defined as "consisting of areas with frontage on the ocean or bays designed to provide swimming, boating, fishing, and other beach-oriented recreational activities." PRC Section 5019.53 further provides for camping as a permitted activity at State Beaches and also states: "Improvements to provide for urban or indoor, formalized recreational activities are normally not permitted." With the addition of the 3,375-acre Upper Willow Creek acquisition in 2005, the park now exceeds 10,000 acres in size and has a range of resource diversity, increased recreation opportunities, as well as expanded park character through increased significance of inland areas that extends beyond what is associated with a typical State Beach. In response to this expansion in the size and landscape character of the park unit, the Plan recommends changing the unit classification from State Beach to State Park.

SURROUNDING LAND USES

Sonoma Coast SB is bordered on its eastern side primarily by undeveloped private property. At its southern end is the community of Bodega Bay. The community of Jenner is located adjacent to Sonoma Coast SB approximately 10 miles north of Bodega Bay. Four residential subdivisions, Ocean View, Carmet, Sereno Del Mar, and Salmon Creek, are also located adjacent to Sonoma Coast SB. Two regional parks in the Bodega Bay area are managed by the Sonoma County Regional Parks Department. Doran Park is located across Bodega Harbor from Sonoma Coast SB in the community of Bodega Bay. Westside Regional Park is located east of Sonoma Coast SB on Bodega Head. Immediately north of Bodega Head along the coast is the University of California's Bodega Marine Lab. Fort Ross State Historic Park and Salt Point State Park are located further north along the coast.

As shown in Exhibit 2-1, the land at Sonoma Coast SB is designated by the Sonoma County Local Coastal Plan (LCP) as primarily Institutional, with more recently acquired portions designated for Agriculture or Commercial Center. Most of the areas surrounding Sonoma Coast SB are designated for Agriculture, Recreation, and Rural Residential. Land in the nearby communities of Jenner, Bridgehaven, Duncans Mills, Ocean View, Sereno Del Mar, Carmet, and Salmon Creek are designated for Agriculture, Recreation, Rural Residential, and Village Commercial. Land use in the Bodega Bay community is varied, consisting of Agriculture, Open Space, Recreation, Institutional, Rural Residential, Low and Medium Density Residential, Planned Community, Commercial Center, Fishing Commercial, and Visitor Serving Commercial land uses. The properties in these communities and subdivisions have generally been developed. Because of the limited water supply in the area, future development is expected to be minimal in the surrounding areas, with the exception of 168 parcels in Sereno Del Mar. If sufficient water supply can be obtained, these parcels may be developed with single-family residences. Aside from these residential developments and potential additions to Sonoma Coast SB, the future land use pattern on the nearby properties is expected to remain mostly unchanged from existing conditions.

Offshore areas have been federally designated as a part of the California Coastal National Monument which runs the entire length of the California coast (1,100 miles) between Oregon and Mexico, extends 12 nautical miles from the shoreline, and encompasses thousands of BLM administered islands, rocks, exposed reefs, and pinnacles above mean high tide.

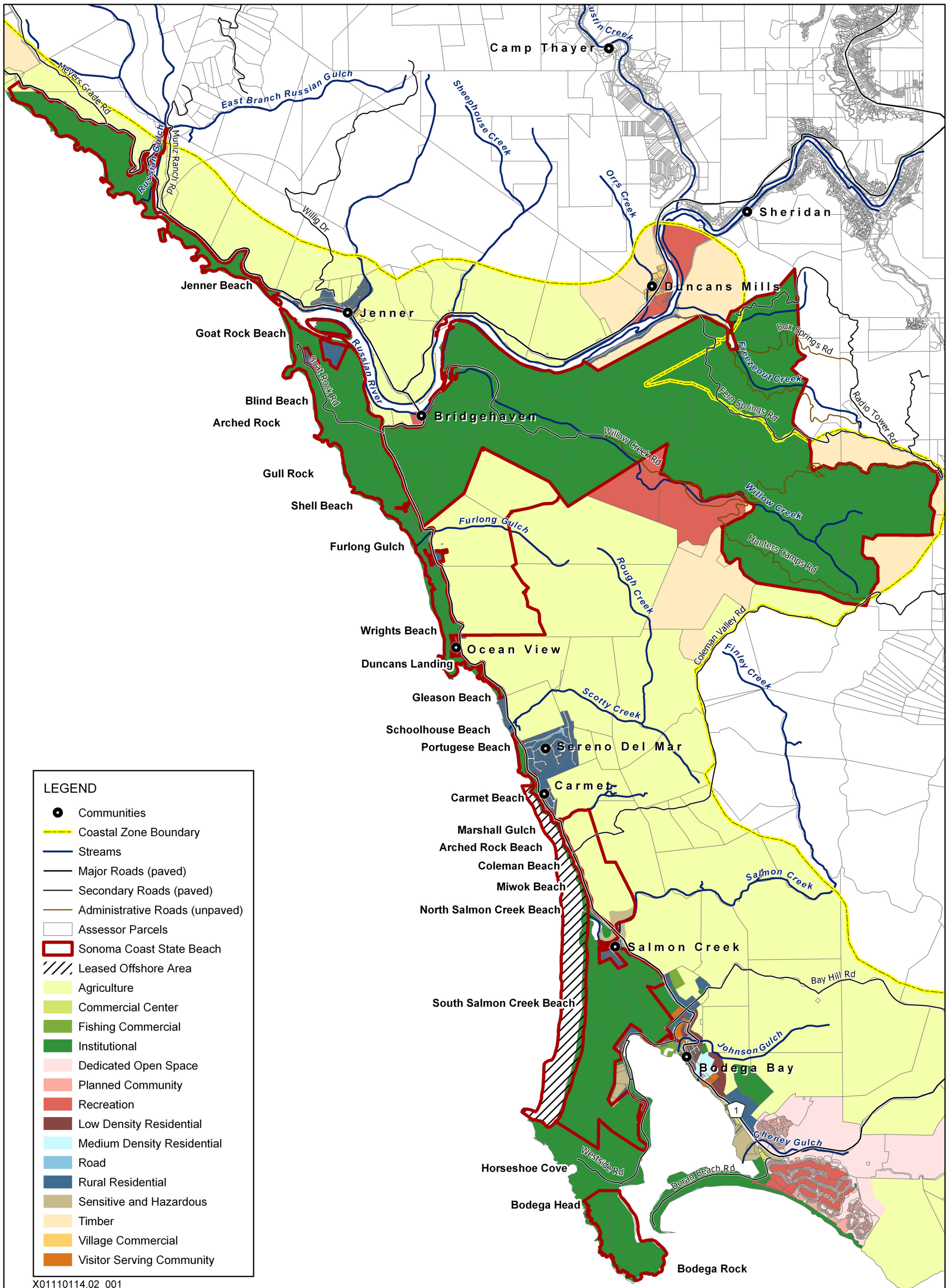
Signage at Duncan's Landing

Visitor Center at Jenner

Coastline north of Jenner

Ranch House at Willow Creek

Source: EDAW 2003



Source: DPR 2003, Sonoma County 2003

N

1 inch = 1 mile

0 4000 8000

Feet

Dec 22, 2006

EDAW

Sonoma Coast State Beach

EXHIBIT 2-1
Coastal Plan Land Use Designations

Cooperatively managed with other federal, state, local government, universities, and private interests, the primary purpose of the Monument designation is to protect important biological and geological values. The islands, rocks, reefs, and pinnacles provide forage and breeding grounds for significant populations of birds and sea mammals.

Regional Context

Sonoma Coast SB lies in a sparsely developed area dotted with seasonal residences and resort communities. Because of its abundant natural resources, high scenic value, and mild weather throughout the year, Sonoma Coast SB is one of the primary tourist attractions in the coastal area of Sonoma County. Tourism is one of the principal economic activities in the vicinity of Sonoma Coast SB, as well as Sonoma County, which is famous for its wineries. Fort Ross State Historic Park and Salt Point State Park are located farther north along the coast, and several others, including Austin Creek State Recreation Area, are located close to the community of Guerneville. Farther south in Marin County are Tomales Bay State Park, Stinson Beach (a part of the Golden Gate National Recreation Area), and Point Reyes National Seashore. Most of these federal and State recreation areas are located on or near the same roadways that provide access to Sonoma Coast SB.

Parkwide Land Uses

Parkwide land uses include open space lands used for recreation and the main transportation corridors of State Route (SR) 1 and SR 116.

Adjacent Land Uses

Adjacent land uses include privately owned lands used as ranch lands, and privately owned lands managed for commercial timber production. Lands adjacent to the Willow Creek acquisition are owned and operated by the Mendocino Redwood Company, who formerly owned the Willow Creek acquisition. Two Williamson Act preserves are located adjacent to Sonoma Coast SB; one is located next to the Willow Creek area and the other is located near Schoolhouse Beach. The properties to the east of the Willow Creek area are used for timber harvesting purposes, but none of the adjacent properties are within Timber Preserve Zones.

Park Access

The primary roadways leading to and from Sonoma Coast SB are SR 1 and SR 116. SR 1, also known as the Pacific Coast Highway, is a regional attraction in itself, drawing visitors from throughout the State and beyond. SR 1 brings visitors north from San Francisco and Marin counties and south from Mendocino County to Sonoma Coast SB. SR 116 connects Sonoma Coast SB at its northern end to Duncan Mills, Guerneville, and other communities located between Sonoma Coast SB and U.S. Highway 101 (US 101). US 101 in turn provides regional access to SR 116 either directly or via SR 12.

To access the Sonoma Coast SB, visitors typically park along SR 1 and other roadways and in turnouts and parking lots off the roadways.

There are several access routes from SR 1 or SR 116 to inland Willow Creek watershed areas of the park. These include Willow Creek Road, Freezeout, and Coleman Valley Road.

2.1.2 Visitor Profile

Existing and Potential Future Park Visitors

Existing Visitor Attendance

Visitor attendance surveys conducted since 1995 for all California State Parks show that Sonoma Coast SB is the fourth most visited park in the State Parks system. Sonoma Coast SB received more than 2 million visitors per year (Table 2-1). From a height of 2,460,195 visitors in the 1995–1996 fiscal year, when Sonoma Coast SB was the third most visited State Park, the estimated number of visitors to Sonoma Coast SB decreased to 2,013,574 during 2000–2001. Nonetheless, Sonoma Coast SB remains the fourth most visited State Park in the State and most visited unit in northern California.

Table 2-1a
Visitor Attendance at Sonoma Coast State Beach from 1996 to 2001

Visitor Type	Fiscal Year [1]					
	1996	1997	1998	1999	2000	2001
Paid Day Use	33,791	40,264	42,634	50,148	49,249	51,962
Free Day Use	2,327,889	2,154,292	2,317,060	2,312,303	2,069,547	1,869,751
Overnight	98,515	96,494	89,226	83,660	92,606	91,861
Total	2,460,195	2,291,050	2,448,920	2,446,111	2,211,402	2,013,574

[1] Based on fiscal years (i.e., 1995–1996 fiscal year shown as 1996)
Source: Sullivan 2003

Table 2-1b
Visitor Attendance at Sonoma Coast State Beach from 2000 to 2005

Visitor Type	Fiscal Year [1]					
	2000	2001	2002[2]	2003[2]	2004	2005
Paid Day Use	49,249	51,962	N/A	N/A	41,572	34,302
Free Day Use	2,069,547	1,869,751	2,273,943	2,811,892	2,476,741	2,940,163
Overnight	92,606	91,861	90,478	97,950	94,445	84,676
Total	2,211,402	2,013,574	2,364,421	2,909,842	2,612,758	3,059,141

[1] Based on fiscal years (i.e., 1999–2000 fiscal year shown as 2000)
[2] No Day Use Fees at coastal park units were collected in 2002 FY and 2003 FY
Source: California State Park System Statistical Reports (2000–2005)

Approximately 95% of the visitors at Sonoma Coast SB were day users and most of them were non-paying visitors. However, the number of paying day users steadily increased between 1996 and 2001. People visit Sonoma Coast SB year-round unlike many other Parks.

Seasonal Use Fluctuations

Because of the mild weather experienced at Sonoma Coast SB throughout the year, visitor attendance is high year-round. However, peak attendance occurs during holiday weekends from April to October.

Target Populations

In addition to the visitor attendance surveys, the California Department of Parks and Recreation (the Department) has collected visitor satisfaction surveys that include information on the originating counties of the visitors. A total of 270 visitor satisfaction surveys have been collected for Sonoma Coast SB since 1999. These surveys provide some insight into the demographic characteristics of some park users, as shown in Table 2-2. However, since 81% of the 270 survey questionnaires were completed by campers, survey results are not necessarily representative of the demographic characteristics of the majority of park visitors. Specifically, the results would tend to show a wider geographic origin of the visitors, whereas the majority of the park visitors, day users, would not be expected to have originated from areas more than 3 hours away from Sonoma Coast SB. The exception would be tourists to Sonoma County's wineries. An unknown percentage of these tourists, who would originate

Table 2-2
Source of Surveyed Visitors

	Sonoma County and Adjacent Counties		Regions in California				Outside California
	Sonoma County	Adjacent Counties [1]	San Francisco Bay Area [2]	Sacramento Area [3]	Other Northern California [4]	Southern California [5]	Other U.S. States [6]
Surveyed Visitors [7]	36	18	101	105	28	14	22
Percent of Surveyed Visitors	13.3	6.7	37.4	38.9	10.4	5.2	8.1

Notes:
1 Includes visitors from Lake, Marin, Napa, and Mendocino counties.
2 Includes visitors from Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, Sonoma counties (all in Association of Bay Area Governments [ABAG] jurisdiction).
3 Includes visitors from El Dorado, Placer, Sacramento, Sutter, Yolo, and Yuba counties (all in Sacramento Area Council of Governments [SACOG] jurisdiction).
4 Includes visitors from Butte, Calaveras, Lake, Mendocino, Nevada, Santa Cruz, San Joaquin, and Shasta counties.
5 Includes visitors from Fresno, Los Angeles, Madera, Orange, San Diego, San Luis Obispo, Santa Barbara, and Tulare counties.
6 Includes visitors from Arizona, Connecticut, Maryland, Minnesota, New Mexico, New York, Indiana, Nevada, Virginia, and Washington states.
7 Based on 270 surveys of visitors between 1996 and 2001. 81% of the surveys were completed by campers; thus, survey results do not necessarily reflect the demographic characteristics of the majority of park visitors.
Source: Veliquette, pers. comm., 2003

from locations throughout the State and the country, would be expected to take day trips from the inland areas of the county to Sonoma Coast SB. Aside from these tourists, most of Sonoma Coast SB's day use visitors are believed to originate from Sonoma County and the adjacent counties of Lake, Marin, Mendocino, and Napa, as well as other counties in the San Francisco Bay area and the Sacramento area. These areas together account for 78.5% of the originating counties reported in the 270 surveys.

Overall, the target population of Sonoma Coast SB visitors would be residents from Lake, Mendocino, and Sonoma counties, as well as counties in the San Francisco Bay area and the Sacramento area. These 18 local and regional counties are all within a 3-hour driving range of Sonoma Coast SB. A secondary target population would be tourists who come to Sonoma County primarily for its wineries.

2.1.3 Demographic Profile

Notable results of the 270 visitor satisfaction surveys were that 72% of the respondents had at least some level of college education, 73% were age 35 or older, 25% had an annual income greater than $75,000, 63% had an annual income greater than $30,000, and 70% of those who responded to the question on ethnicity listed themselves as white.

Local and Regional Residents

Population Trends and Projections

As described above, most of the park visitors are expected to have originated from Sonoma County, the adjacent counties, and the metropolitan areas of San Francisco and Sacramento. Visitors can be expected to reflect the population trends of these areas, as shown in Table 2-3. These areas are projected to grow on an annual basis of up to 2.4% through 2010, with a lower growth rate estimated between 2010 and 2020. As such, the number of visitors to Sonoma Coast SB is expected to increase correspondingly.

Table 2-3
Existing and Projected Populations

Population	Sonoma County	Adjacent Counties[1]	San Francisco Bay Area [2]	Sacramento Area [3]	State of California
2000	464,800	522,400	6,783,760	1,886,175	34,480,300
2010	557,300	588,200	7,513,800	2,340,297	40,262,400
(yearly growth rate)	(2.0%)	(1.3%)	(1.1%)	(2.4%)	(1.7%)
2020	628,400	641,900	8,014,100	2,696,205	45,821,900
(yearly growth rate)	(1.3%)	(0.9%)	(0.7%)	(1.5%)	(1.4%)

Notes:
1 Lake, Marin, Napa, and Mendocino counties.
2 Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, Sonoma counties (all in ABAG jurisdiction)
3 El Dorado, Placer, Sacramento, Sutter, Yolo, and Yuba counties, excluding Lake Tahoe Area (all in SACOG jurisdiction)
Sources: DOF 2003, ABAG 2003, SACOG 2001

Demographic Diversity

Recreation demand and use are affected by changing demographic patterns of the areas served. Aside from overall population growth described above, race/ethnicity, income level, and average age are key factors that will affect the future use patterns of Sonoma Coast SB, as described below.

The Hispanic population in the target counties is increasing proportionally faster than other populations. Relatively large Hispanic populations are present locally in the Sonoma Valley and regionally in the San Francisco Bay and Sacramento areas. These population concentrations, combined with changing ethnicity patterns in California, will directly affect the pool of potential users of Sonoma Coast SB. According to the U.S. Census, in 1990 there were about 6 million Hispanics out of the total statewide population of 29.8 million (20%). By the year 2000, this increased to about 11 million out of 34 million people (32.4%). This 12% increase in just 10 years suggests that the mix of user groups, and their subsequent facility needs at Sonoma Coast SB, may be changing. For example, Hispanic visitors tend to recreate in large (often family-based) groups, and prefer developed recreation sites, particularly those with picnic tables, barbeque grills, and parking lots (Chavez 2001). Hispanic group picnics also tend to be longer in duration than those for some other ethnic groups, as many food items are prepared from scratch onsite (Carr and Chavez 1993).

Undeveloped/wilderness-type recreation tends to be sought more by people with higher income and education levels (English et al. 1993). The visitor satisfaction surveys for Sonoma Coast SB found that on average, the surveyed visitors had higher income and education levels. The median annual household income in the San Francisco Bay area in 2000 is estimated to be $93,800 (ABAG 2000). The median household income in Sonoma County is $53,076, with 8.1% of the population living below the poverty line. Median household income elsewhere in northern California is closer to the State median; for example, Sacramento County has a median income of $43,816, with 14.1% below the poverty line (U.S. Census 2000). In comparison, the statewide median household income is $47,493, with 14.2% in poverty (U.S. Census 2000). The high income levels in some of the target counties contribute to high demand for undeveloped natural areas and wilderness-type recreation.

The average age of Sonoma County residents is increasing; combined age groups of 45–65 and 65+ represented 31.3% of the total population in 1990, but are expected to comprise 42.2% of the total in 2010 (ABAG 2000). (The 65+ category alone is 12.6% of county population according to the U.S. Census.) Based on this shift, facility improvements may be needed to meet the needs of an aging, yet often still active, population. For Sonoma Coast SB, this suggests improved interpretation or more easily accessible trails and Americans with Disabilities Act-accessible camping opportunities would also help to satisfy this changing demographic pattern.

Sub-populations

As mentioned above, an unknown percentage of tourists who come to Sonoma County primarily for its popular wineries are expected to visit Sonoma Coast SB. A study of overnight visitors to Sonoma County indicated that 42% of overnight visitors to Sonoma County originate in the San Francisco Bay area; other Northern California areas, including Sacramento, accounted for another 18%. Most of these overnight visitors came to the county for leisure/pleasure purposes (SCTP 2001).

Another study of day and overnight visitors to Sonoma County indicated that the majority of the visitors to the county are affluent, educated, and without children. Approximately 61% of visitors to Sonoma County are college graduates or have attended graduate school and 58% have an annual income of $75,000 or more. The visitors also tend to be frequent and repeat weekend visitors. Specifically, more than two-thirds (68%) of visitors to Sonoma County are repeat travelers, who are more likely to go to the coastal areas than first-time visitors (MCG 1999). According to a Sonoma County Tourism Program on-line visitor survey, after food and wine, top reasons for visiting the county include Sightseeing (22%), Nature/Wilderness (8%), and Activity/Adventure Sports (6%) (SCTP 2002). Sonoma Coast SB offers all of these activities and is in a prime position to capture the interest and participation of the returning visitor/repeat traveler to Sonoma County (MCG 1999).

Sonoma County itself contributes the largest number of day visitors of any county, providing at least 15% of the day trips. Each of the nine San Francisco Bay area counties contributes from 5%–14.9% of the total Sonoma County visitation (MCG 1999). For Sonoma Coast SB, this indicates that distance to population centers is an important factor affecting day use.

Local Market Analysis

There is a strong latent demand for outdoor recreation in Sonoma County. Studies conducted from 1988–1996 by the Sonoma County Regional Parks Department indicate that the percentage increase in visitor use for all types of outdoor recreation increased much faster than the increase in county population during the same period. Total visitor use at County-owned and operated outdoor recreation facilities increased 66%, while the county population increased 10.3%. Simultaneously, Sonoma County Regional Parks' recreation acreage increased 49%. This increase in available acreage combined with an increase in use suggests a stronger than average latent demand for outdoor recreation facilities (County of Sonoma 2000). For Sonoma Coast SB, this suggests that visitation level can increase faster than local and regional population growth.

2.1.4 Physical Resources

Meteorology

The general climate pattern of the northern California coastal area is characterized by rainy winters with some clear sunny days and dry, cool summers with many foggy or overcast days.

Source: DPR 2003, Teale GIS Solutions Group 2001, USGS 2000

N

1 inch = 1 mile

0 4000 8000

Feet

Dec 22, 2006

EDAW

Sonoma Coast State Beach

Exhibit 2-2
Topography

The coastal areas of Sonoma Coast SB experience more wind and fog than the upper Willow Creek watershed further inland.

As shown in Table 2-4, data on average temperature and rainfall at Sonoma Coast SB are recorded at the two nearest weather gauging stations with available data; the first is located on Bodega Head at the University of California Bodega Marine Laboratory, which is adjacent to Sonoma Coast SB. The second station is located in Fort Ross State Historic Park, approximately 10 miles north of the community of Jenner. Because Fort Ross is also located immediately on the coast, the temperatures and rainfall amounts are similar to those experienced at Sonoma Coast SB. Further inland in the Sonoma Valley, winters are slightly cooler and summers are slightly warmer than on the coast. The amount of rainfall in the Sonoma Valley is similar to the level experienced at Sonoma Coast SB. The upper Willow Creek watershed receives approximately an average annual precipitation of 55 inches.

Table 2-4
Average Temperature and Precipitation [1]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
UC Bodega Marine Laboratory[1]													
Average Maximum Temperature (°F)	55	55	56	56	57	59	59	61	61	60	58	55	58
Average Minimum Temperature (°F)	45	46	47	48	50	51	52	53	53	51	48	44	49
Average Total Precipitation (in.)	7	6	4	2	1	0	0	0	0	2	5	6	33
Fort Ross[2]													
Average Maximum Temperature (°F)	57	59	59	61	63	66	66	67	68	66	62	58	63
Average Minimum Temperature (°F)	41	42	42	42	44	47	48	49	49	47	44	41	45
Average Total Precipitation (in.)	8	6	5	3	1	0	0	0	1	2	5	6	39

[1] Based on average of data from 1988 through 2001; Source: University of California Bodega Marine Laboratory 2003.
[2] Source: Western Regional Climate Center 2003.

During the summer months when rainfall is scarce at Sonoma Coast SB, the frequent occurrences of fog add moisture to the State Beach. The average monthly temperature experienced at Sonoma Coast SB varies by approximately 10°F throughout the year. Sunny days may be experienced in any season. For this reason, Sonoma Coast SB is considered a year-round destination.

AIR QUALITY

Air quality in the vicinity of Sonoma Coast SB is regulated by several jurisdictions including the U.S. Environmental Protection Agency (U.S. EPA), California Air Resources Board (ARB), and Northern Sonoma County Air Pollution Control District (APCD). The U.S. EPA has established primary and secondary National Ambient Air Quality Standards (NAAQS) for carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), respirable particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), and lead, which are referred to as criteria air pollutants. The primary standards protect the public health and the secondary standards protect the public welfare. The California ARB has established California Ambient Air Quality Standards (CAAQS) for these same pollutants, as well as sulfates, hydrogen sulfide, vinyl chloride, and visibility reducing particulates, which in most cases are more stringent than the NAAQS.

The APCD is the agency primarily responsible for assuring that national and state ambient air quality standards are not exceeded and that air quality conditions are maintained in the northern portion of Sonoma County through a comprehensive program of planning, regulation, enforcement, technical innovation, and promotion of the understanding of air quality issues. The APCD ensures that air quality is protected through permit approval processes and through the review of local development projects under CEQA.

Sonoma Coast SB is located in the North Coast Air Basin, which is classified by the State as non-attainment (transitional) for ozone and non-attainment for respirable particulate matter (PM_{10}). The North Coast Air Basin is in attainment or designated unclassified for all remaining CAAQS and NAAQS (ARB 2003). The nearest air quality monitoring station, located approximately seven miles to the northeast in Guerneville, collects information on particulate matter (PM_{10}). The next nearest monitoring station, located approximately twenty miles away at the Healdsburg Municipal Airport, collects data on ambient ozone concentrations. In 2002, the monitoring stations did not record any days during which the federal and the State's ambient air quality standard for ozone and particulate matter were exceeded. In comparison, there were 3 days in 1997 and 7 days in 1998 when the ambient air quality standards were exceeded (ARB 2003). Between 1997 and 2002, ambient air quality in the Air Basin has improved based on data for these two pollutants.

The primary source of air pollutants at Sonoma Coast SB is vehicular traffic; the other typical major sources of air pollutants (intensive agricultural activities and industrial uses) are rare in the vicinity. The air quality at Sonoma Coast SB is better than the rest of the North Coast Air Basin because of the coastal weather patterns and the relatively light traffic volumes in the area.

TOPOGRAPHY

The coastal landscape of Sonoma County is characterized by large, rolling hills and coastal terraces that slope down toward the Pacific Ocean. The north Coast Ranges, which trend north-south from the Oregon border to San Francisco Bay, lie immediately east of Sonoma

Coast SB and include much of the upper Willow Creek watershed. The immediate shoreline is characterized by rocky cliffs and bluffs, with sandy beaches and dune habitats in several locations. At Sonoma Coast SB, elevations range from sea level along the western edge to approximately 1,300 feet at the Red Hill and Willow Creek properties, as shown in Exhibit 2-2. The lower lying areas of Sonoma Coast SB, including the coastline along the Pacific Ocean, Bodega Bay, and the mouths of the waterways traversing Sonoma Coast SB, are at sea level and therefore are subject to the risk of tsunamis. Offshore, there are many rock formations, called sea stacks, that rise above the wave baseline. Many of these rocks are part of the recently dedicated California Coastal National Monument.

GEOLOGY

The geology of Sonoma Coast SB is characterized by two plates divided by the San Andreas Fault, the nearest segment of which runs along the coastline. A segment of the San Andreas Fault trends inland near Bodega Bay where it forms the State Beach boundary between Bodega Head and the mainland (Exhibit 2-3). The San Andreas Fault and smaller parallel faults make up the approximately 1.5-mile-wide San Andreas Fault Zone, which marks the boundary between the North American Plate and the Pacific Plate. Please refer to the Glossary of Terms (Appendix I) for an explanation of fault types shown in Exhibit 2-3. Strong earthquakes are created by friction and stress as the two plates grind past one another along the San Andreas Fault. These earthquakes have included the devastating San Francisco Earthquake of 1906 and the Loma Prieta Earthquake of 1989. Because of these historic seismic disasters and the potential for more strong earthquakes in the future, the San Andreas Fault Zone is one of the best known earthquake-producing regions in the world. Surface fault rupture is a potential hazard in the San Andreas Fault Zone.

West of the fault on Bodega Head, the rocks are Cretaceous granites of the Salinia Terrane and overlaying sand and gravel, as shown in Diagram 2-1. Specifically, outcrops of Santa Lucia granodiorite, one of the oldest formations in the Coast Ranges, have weathered into the decomposed granite sand that forms much of Bodega Head (Fredrickson 1962). Granite originated by the cooling of molten igneous rock deep in the earth approximately 100 million years ago. Bodega Head was formed at least 345 miles to the south and was moved along the San Andreas Fault to the present location over the last 29 million years. It is the only part of Sonoma Coast SB located on the Pacific Plate (Wright 1999).

To the east of the fault on the North American Plate, the remainder of Sonoma Coast SB lies in the Franciscan Complex, an eclectic collection of various rock types that are mostly oceanic in nature. Marine sediments are mixed with iron-rich igneous volcanic and plutonic rocks and metamorphic rock as a result of faulting at the subduction zone where the Pacific Plate is subducted underneath the North American Plate. The resulting mixture is called a "mélange," a combination of harder and weaker rocks that erode at different rates (Wright 1999).

In northern California, the Franciscan Complex is divided into three belts; Sonoma Coast SB is located in the Central Belt, which is generally given an age range of Late Jurassic to

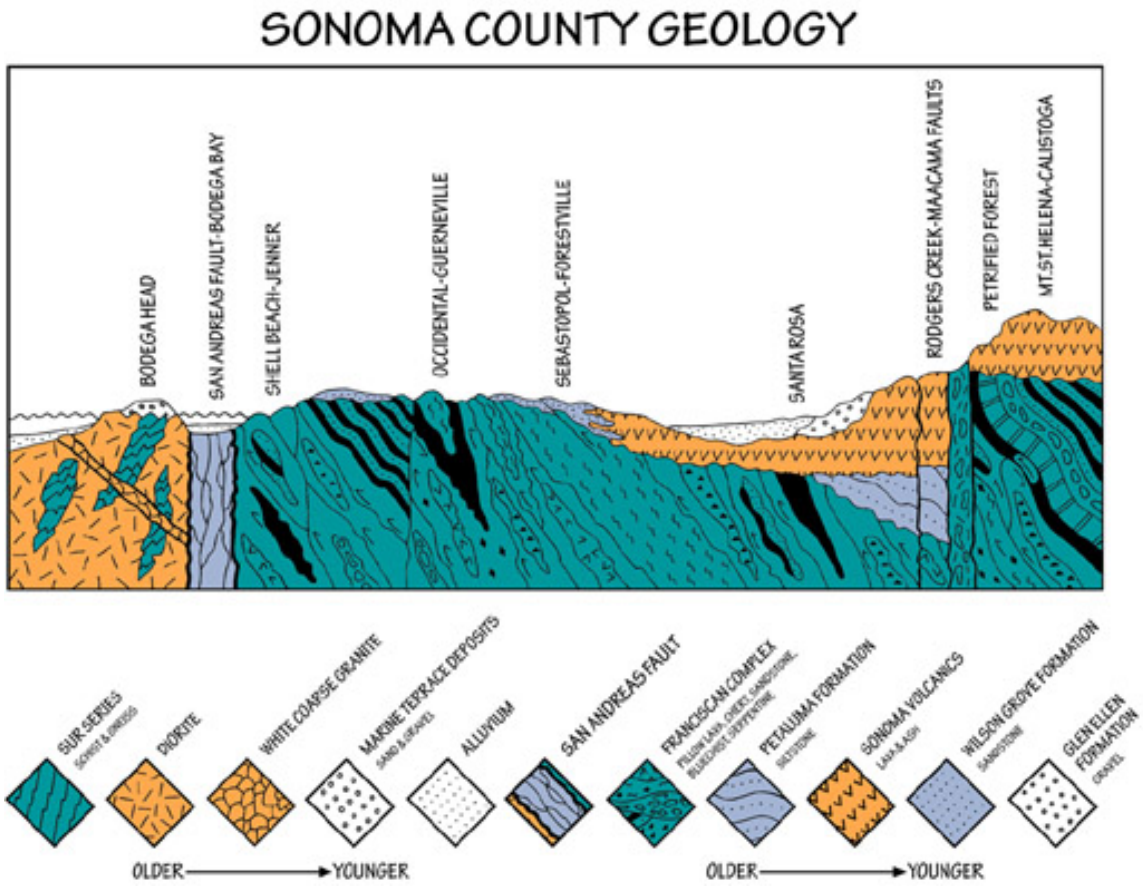


Diagram 2-1. Geologic Cross Section

Source: Wright 1999

Cretaceous time (approximately 150 million years ago). The Central Belt consists of abundant blueschist blocks enclosed in a pumpellyitic sheared matrix. Common rock types include greywacke, chert, greenstone, gabbro, serpentinite, rodingite, limestone, eclogite, and exotic blocks of other compositions (Daly 1980).

Gently sloping terraces perch above most of the coastline of Sonoma Coast SB. These are erosive surfaces with a thin covering of sand and gravel that originated beneath a shallow wave base and are pushed up by pressures along the fault (Wright 1999). Because of the seismic activities associated with the San Andreas Fault and the erosion caused by rainfall and ocean waves, many areas of Sonoma Coast SB are prone to landslides; consequently the cliffs have been retreating from the ocean because of periodic landslides. In particular, there

Source: Department of Conservation 2000, DPR 2003, USGS 1993, USGS 2000

N

1 inch = 1 mile

0 4000 8000

Feet

Dec 20, 2006

EDAW

Sonoma Coast State Beach

Exhibit 2-3
Geology

are erosion problems on the marine terraces north of Jenner created by concentrated flows across SR 1. Also, portions of Goat Rock Road have suffered geologic or soil failure leaving gullies in need of repair.

Further inland, rockslides and mass wasting is present in the upper Willow Creek watershed. The sandstone mélange present in the southern portion of the watershed is generally more unstable than the conglomeratic body to the north. Abundant rockslides are present throughout the sandstone mélange, especially at higher elevations. The well consolidated and resistant nature of the conglomerate in the northern portion has resulted in fewer and smaller landslides in this area (Daly 1980). A total of 104 shallow-seated landslides (debris slides, torrents, or flows) and 43 deep-seated landslides (rock slides or earth flows) were identified and characterized in the Willow/Freezeout Creek watersheds owned by Mendocino Redwood Company (MRC) from 1969 to 2000 (MRC 2001).

PALEONTOLOGY

Research is being conducted to verify the origin of unique rock slicks on the sides of coastal outcrops, which may have been caused by Pleistocene megafauna (mammoths or bison) rubbing against the rocks (Parkman 2002). Natural artifacts, such as the possible Pleistocene animal rubs may represent a unique resource, and need to be treated as such while attempts at identification continue. These rub areas are under investigation using a number of methodologies. Samples of the rock have been taken for scanning electron microscopy analysis and residue analysis (Parkman 2002).

SOILS

A variety of soil types are found at Sonoma Coast SB (Exhibit 2-4). A description of each of the 35 soil types found at Sonoma Coast SB is included in Appendix B. The soil types, which are categorized by their compositions and slopes, differ in permeability, runoff potential, erosion hazard, and typical uses. These different soil characteristics determine the suitability of a site for various types of development. For example, soils that are generally impermeable are usually considered unsuitable for onsite wastewater disposal systems (e.g., septic tanks and leachfields). Mitigating features (e.g., detention basins, oil traps, grassy swales) may be incorporated into developments on soils with high runoff potential. Soil testing is generally performed before site development to determine compatibility of onsite soils with the proposed development.

HYDROLOGY AND WATER QUALITY

The Russian River and several creeks traverse Sonoma Coast SB on their way to the Pacific Ocean. Willow Creek is a major tributary to the Russian River. Exhibit 2-5 shows the location of these waterways and the 100-year floodplain designated by the Federal Emergency Management Agency (FEMA). The 100-year floodplain of a river or stream defines the geographic area along this river or stream that has a 1% chance of flooding in any given year. FEMA's Flood Insurance Rate Maps typically define the 100 year floodplain for larger rivers and streams only.

The Russian River originates in central Mendocino County, approximately 15 miles north of Ukiah; water from its 1,485-square-mile watershed drains into the 110-mile-long main channel of the Russian River, which flows into the Pacific Ocean near Jenner. The mouth of the Russian River is occasionally closed to surface flow between the ocean and the river because of the buildup of sandbar formations. Willow Creek is a major tributary of the Russian River. Willow Creek and Freezout Creek are tributaries to the lower reach of the Russian River. With the recent acquisitions of a larger portion of the Upper Willow Creek watershed, more that 80% of the watershed now lies within the boundaries of Sonoma Coast SB. Parts of the Freezout Creek watershed were also added with this acquisition.

Other streams at Sonoma Coast SB include Russian Gulch, Furlong Gulch, Scotty Creek, Marshall Gulch, and Salmon Creek. These streams originate in the hills to the east of Sonoma Coast SB and flow for a few miles before draining into the Pacific Ocean. All but Salmon Creek and Willow Creek are intermittent streams. The Salmon Creek watershed consists of 34 square miles and empties into a tidewater estuary just north of Bodega Bay. Salmon Creek and its tributaries provide habitat for anadromous fish and other aquatic organisms (e.g., steelhead, coho salmon, tidewater goby, freshwater shrimp).

Groundwater in the vicinity of Sonoma Coast SB originates from infiltration and percolation of precipitation that occurs on the sand dunes and hills to the east. The sand dunes are highly permeable and readily absorb surface water so that little if any water drains over the ground surface during rainfall events. The underlying Franciscan geologic formation of the hills to the east is expected to contain very little to no groundwater that is available as a domestic water source. The overlying unconsolidated materials consist of recent marine sedimentary deposits of silts, clay, and sand. The sand deposits have yielded significant and reliable quantities of groundwater. The marine and sand dune materials in the San Andreas Fault Zone, which occur at Sonoma Coast SB near Bodega Head, also contain groundwater. (Todd 1986).

The Russian River is classified by the State Water Resources Control Board (SWRCB) as an Impaired Waterway for exceedances of water quality standards for temperature and sedimentation/siltation. In particular, segments of the river upstream of Sonoma Coast SB, such as the segment near Guerneville, have been identified as Clean Water Act (CWA) §303(d) Water Quality Limited Segments because water quality standards have not been met even after point sources of pollution have installed the minimum required levels of pollution control technology. The CWA requires the North Coast Regional Water Quality Board to establish priority rankings for these river segments and develop action plans, called Total Maximum Daily Loads (TMDL), to improve water quality (SWRCB 2003).

The quality of the seawater along most of Sonoma Coast SB is good. The only locations at Sonoma Coast SB where health standards, based on bacterial counts of the seawater, have been exceeded are at Campbell Cove Beach, located at the tip of Bodega Head, and at Salmon Creek Beach. In 2002, "Beach Warning" signs were posted for a total of 24 days between May and November at Campbell Cove Beach; signs were posted at Salmon Creek